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(AELA & ADELI)

THE INTEGRATION OF ARTIFICIAL INTELLIGENCE IN THE AFRICAN HUMANITIES SCHOLARSHIP

TABLE OF CONTENTS

i

Editorial: The Integration of Artificial Intelligence into the African Humanities Scholarship

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The rapid increase of internet connectivity has resulted in 5.52 billion global internet users in 2024, including approximately 570 million in Africa (Kemp). This exponential growth has catalysed significant sociocultural transformations and computationally-assisted studies, forming the foundation for contemporary African digital culture. African users, in particular, leverage platforms such as TikTok, Facebook, and X (formerly Twitter) as tools for liberation and social activism, often operating beyond the direct influence of global powers, including the United Nations (Waliya 23). Notable examples include the socio-political upheavals of the Arab Spring in Egypt, Tunisia, and Libya; the #EndSARS protests in Nigeria; and the recent Gen Z-led protests in Kenya.

African digital culture, undoubtedly, has become an enduring phenomenon, yielding substantial benefits. These include enabling digital activism, providing pathways to stardom through video content creation, and compelling governments to address pressing societal issues. The youth, in particular, have embraced digital technologies for their socio-technological and socioeconomic advantages, fostering a collective sense of empowerment and social responsibility. While challenges inherent to these digital transformations exist, this discourse emphasises their positive impacts.

Unlike traditional African cultural practices—such as the communal decision-making that required a market-day assembly—modern digital platforms like WhatsApp forums, Facebook Village Groups, Zoom, and Google Meet now facilitate instantaneous interactions and conversations. These tools have reshaped social exchanges, fostering sustainable and harmonious environments, physically or virtually.

Moreover, the integration of artificial intelligence (AI) into African digital ecosystems has further transformed its socioeconomic dynamics. Platforms such as Facebook Reels, YouTube, and TikTok have enabled Gen Z creators to achieve financial independence through their innovative digital skits and content creation. These advancements underscore the transformative potential of AI in alleviating poverty and redefining African digital culture.

The transformative landscape of African digital humanities inspired the theme of Volume 2, Number 1 of the *Multilingual African Digital Semiotics and e-Lit Journal (MADSEJ)*, October 2024: *The Integration of Artificial Intelligence into the African Humanities scholarship*. This edition

deliberately highlights the role of AI in African humanities scholarship, focusing on digital humanities, literary production, algorithmic vernaculars, and the linguistic practices of African Gen Z on platforms like TikTok, X, and Facebook, reemphasising the different roles that virtual spaces have played "in vulgarising African digital contents" (Ajah 59) .

One significant contribution to this Number is the work of Odili and Mabude, who explore the application of algorithmic models in preserving African digital culture through the African Buffalo Optimisation (ABO) algorithm. Their study demonstrates how ABO can fine-tune algorithmic Djembe, digital Griot narratives, optimised Adinkra symbols, cultural heritage analytics, and African digital art generation, while safeguarding the African identity in the digital age.

Ajah's article advances the discourse by employing stylometry and computational literary studies (CLS) tools such as AntConc to analyse Ahmadou Kourouma's *Quand on refuse on dit non (QOR)*. His research elucidates the author's artistic engagement with interethnic conflict in Côte d'Ivoire, showcasing how CLS methods give insights into postcolonial dynamics, otherness, and identity that elude traditional literary analysis.

Ugwumbo and Egbe's contribution focuses on digital poetics and the climate crisis through their analysis of Waliya's *Climatophosis*, a digital eco-poem. By applying Halliday's systemic meta-function of ideation and Di Rosario's Entax theory, they argue for the eco-poem's efficacy as a medium for climate advocacy, emphasising its potential to inspire environmental stewardship.

Similarly, Waliya and Mbey examine the dynamics of sentiment polarity within a WhatsApp group of lecturers and administrative staff in the Department of Modern Languages and Translation Studies, University of Calabar. Using Jacques Derrida's concept of "pharmakon" to analyse 5,727 messages, their study uncovers the coexistence of positive and negative sentiments, highlighting the nuanced interplay of human emotions in digital communication.

Finally, we express our profound gratitude to Mr. Tomsmith O. Unimuke of the University of Sydney's School of Chemical and Biomolecular Engineering for his invaluable contributions to this journal. His rigorous plagiarism checks and quality assessments ensure the scholarly integrity of the works we publish.

Works cited

Ajah, Richard. "Introduction to African Electronic Literature." *MADSEJ,* vol.1, no. 1, 2023, p.56-66.

Kemp, Simon. « Digital 2024 October Global Statshot Report ». *DataReportal*, 23 October 2024, https://indd.adobe.com/view/56eac68a-1f77-422d-87ed-2f5a5230e9ad?allowFullscreen=true&wmode=opaque.

Waliya, Yohanna Joseph. « Digital Activism & "Botification" of Janusz Korczak's Concepts in "Twitterature" ». *WHAT WOULD KORCZAK DO? Reflections on Education, Well-being and Children's Rights in the Times of the COVID-19 Pandemic*, Wydawnictwo Akademii Pedagogiki Specjalnej, 2020, p. 21-40.

African Buffalo Optimization to African Digital Culture and African Humanities

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Abstract

The technological invasion of modern societies all over the globe has not spared African culture and humanities. This paper examines the application of the African Buffalo Optimization algorithm to African digital culture and African humanities. The study unravels the great potentials of the optimization algorithm when deployed to the African cultural space. One of this is the capacity of the African Buffalo Optimization algorithm to efficiently store and retrieve African cultural artifacts, music and art in digital archives when properly programmed. Next, by careful deployment of the algorithm to analyse and understand African cultural and historical patterns, trends, and dynamics, researchers are able to preserve the African cultural identity to generations yet unborn. Finally, the African Buffalo Optimization is applicable to the following areas of the African digital culture and African humanities, namely, algorithmic Djembe, digital Griot, optimized Adinkras, cultural heritage analytics and African digital art generation. In the light of the findings of this study, we recommend the application of swarm intelligence optimization techniques to all researchers and scholars involved in African digital culture and African humanities.

Keywords: Artificial Intelligence, African Digital Culture, African Digital Humanities

Résumé

L'invasion technologique des sociétés modernes à travers le monde n'a pas soutenu la culture et les humanités africaines. Cet article examine l'application de l'algorithme d'African Buffalo Optimization à la culture numérique et aux humanités africaines. L'étude révèle le grand potentiel de cet algorithme d'optimisation lorsqu'il est déployé dans l'espace culturel africain. L'un de ces potentiels est la capacité de l'algorithme d' African Buffalo Optimization à stocker et à récupérer efficacement des artefacts culturels, de la musique et de l'art africains dans des archives numériques lorsqu'il est correctement programmé. Ensuite, grâce à un déploiement minutieux de l'algorithme pour analyser et comprendre les schémas, tendances et dynamiques culturels et historiques africains, les chercheurs sont en mesure de préserver l'identité culturelle africaine pour les générations futures. Enfin, l'algorithme d' African Buffalo Optimization est applicable aux domaines suivants de la culture numérique et des humanités africaines, à savoir : Djembé algorithmique, Griot numérique, Adinkras optimisés, analyse du patrimoine culturel et génération d'art numérique africain. À la lumière des résultats de cette étude, nous recommandons

l'application des techniques d'optimisation basées sur l'intelligence collective à tous les chercheurs et universitaires impliqués dans la culture numérique et les humanités africaines.

Mots-clés : Intelligence Artificielle, Culture Numérique Africaine, Humanités Africaines.

1.0.INTRODUCTION

In modern research efforts, so much emphasis has been placed on interdisciplinary researches due to its capacity to hugely provide remarkable solutions to seemingly intractable problems (Abbamonte and Antinucci). This has led researchers to delve into the application of computing methods, tools and approaches to humanities research leading to the Digital Humanities discipline as we know it today (Makhachashvili and Semenist).

Digital Humanities (DH) is an interdisciplinary field that combines humanities research with digital tools and methods. It involves the use of digital technologies to analyse, represent, and disseminate humanities research in areas such as text analysis and mining, historical research and archives, cultural heritage and museums, language and linguistics, literature and poetry, history and archaeology, philosophy and ethics, art and design, music and sound studies as well as film and media studies (Christie).

DH involves a wide range of digital methods, including digital editing and publishing, data visualization and analysis, computational modelling and simulation, network analysis and visualization, Geographic Information Systems (GIS), digital pedagogy and curriculum design, digital curation and preservation, digital scholarship and publishing etc.(Viola)

The goals of DH include expanding access to humanities research and materials, enhancing research and analysis capabilities, fostering collaboration and interdisciplinary work, promoting digital literacy and critical thinking in addition to supporting innovative forms of scholarship and creativity. In the 21st century, some key features of DH include inter-disciplinary, digital experimentation and innovation, collaboration and community engagement,(De Luca et al.) focus on digital methods and tools as well as emphasis on accessibility and openness

Similarly, DH has many applications in various fields, including academia and research, cultural heritage institutions and museums, libraries and archives, publishing and media industries, education and pedagogy, art and design practices, policy and governance etc.(Makhachashvili and Semenist) In Africa, the massive penetration of technology has led to DH gaining increasing popularity, especially in Nigeria, Ghana and South Africa amongst others (Ope-Davies).

African digital culture refers to the ways in which digital technologies are shaping and transforming African cultures, societies, and economies. Some of the major areas technological influences in African societies are their histories, philosophies, literature, politics etc. African humanities, therefore, is an interdisciplinary field that encompasses various disciplines, including African histories, languages, literatures, philosophies politics and cultures (Kiplang'at and Keah). In the light of the above, this study focusses on examining the application of an Artificial Intelligence technique called African Buffalo Optimization (ABO) to DH in the African setting.

The ABO algorithm is chosen for this study because of its versatility and operational efficiency cum effectiveness in the areas of its previous applications. The algorithm has performed

excellently, when compared to its peers like the Genetic Algorithm (GA), Particle Swarm Optimization (PSO), Cuckoo Search (CS), Teaching-Learning Based Optimization (TLBO) and Gaya Algorithm, in its application to solving the travelling salesman's problem (Odili and Mohmad Kahar 1), numerical function optimization (Odili and Kahar 4), global optimization test functions (Odili and Noraziah 874), strategic integration of battery energy in distribution networks (Singh et al. 14290), optimization of decision trees (Panhalkar and Doye 5), fault coverage-based test prioritization and selection,(Singhal et al. 6758), intelligent routing of sensor networks (Bera et al. 127), green-flexible job-shop scheduling(Jiang et al. 4579), stomach disorder detection (Baljon 98), tuning of the Peripheral, Integral and Derivative parameters of Automatic Voltage Regulators (Julius Beneoluchi Odili et al. 2 "Parameters-Tuning of Pid…) etc.

Overall, the success of the ABO is attributable to its effective search capabilities, efficient search capacity, global and local search combination in the search procedure and quick convergence once the optimal search solution is obtained. These characteristics have distinguished as one of the most successful in the 21st century and this is our motivation for applying the algorithm to African digital culture and humanities.

The rest of this paper is presented as follows: section two presents a review of relevant literature on the African digital culture; section three discusses the methodology of study; section four applies the African Buffalo Optimization algorithm to African culture and African humanities and section five draws conclusions from the study. ABO code in Java for this study is attached as appendix A.

2.0. LITERATURE REVIEW

African digital culture is a term encompassing the ways in which digital technologies shape and transform African cultures, societies and economies. African digital culture includes digital art and design, music and sound studies, film and video production, literature and publishing, social media and online communities, gaming and animation, digital activism and social justice, e-learning and digital education, digital entrepreneurship and innovation, cybersecurity and digital rights (Ndzendze et al.).

In the book "Everything is Sampled," Akinwumi Adesokan argues that it is necessary to consider African art forms beyond the confines of discipline, genre, authorship and hierarchies of artistic value to better understand African cultural production (Adesokan) . Similarly, Popoola believes that the consideration of how technological changes have played a role in the history of African art forms and how they will continue to do so in the future will find relevance in appropriate documentation in digital forms (Popoola).

Moreover, since digital media and globalization have a significant influence on the production and consumption of media and acculturation in Africa, it is expedient that African digital culture should be emphasized so as to place the continent in its rightful position whenever the issues of technology are discussed (Louadi). Though, digital media and globalization has affected a lot of African value system and the humanities of the African person, Africans have made tremendous contributions in technological developments, the world over, and African societies can still adopt development policies that honour their cultural value systems in the midst of technological invasion of modern online, cable and other social media platforms (Agana). This is one of the motivations for this study

Some popular examples of African humanities projects successfully executed in the past decade aimed at sustaining the humanity of the African value and cultural systems include digital editions of historical texts and manuscripts, virtual museum exhibitions and cultural heritage websites, historical video games and interactive simulations, data

visualizations and analyses of literary and historical datasets, digital pedagogy and online course development, digital art installations and performances, virtual reality experiences and 3D modelling. (Ogbu and Igwebuike), Overall, African digital culture offers new opportunities for humanities research, collaboration, and innovation in the digital age (Cele et al.).

To the best of our knowledge, there is almost no study that applied a swarm Intelligence technique in Artificial Intelligence domain to the above listed projects. This is the primary motivation for this study: the application of the African Buffalo Optimization algorithm which is a swarm Optimization algorithm to African digital culture and African humanities. ABO draws its inspiration from the continuous movement attitudes of the African wild cows, called

African buffalos in the vast African forests,

1. Initialize the buffalos within the search space;
2. Calculate the buffalos' exploitation:

$$m_k{'} = m_k + lp1(bg - w_k) + lp2(bp_k - w_k)$$

3. Calculate the buffalo's locations using:

$$w_k{'} = \frac{(w_k + m_k)}{\lambda}$$

4. Determine if the bg is updating Yes, proceed to 5. Else return to 2
5. Crosscheck stopping criteria. Not reached, return to step 2, else proceed to 6
6. Output best solution.

Figure 1: Buffalo Mathematical Algorithm

savannah and grasslands in search of fresh green grasses to satisfy their humongous appetites (Odili and Fatokun). The African buffalos have attracted the attention of researchers in modern times due to their special characteristics. One of such is that in spite of these giant African wild cows being grouped in large herds of sometimes up to 1000 individual buffalos, they have no clear leader. Again, they are able to control their large population using just two dominant vocalizations, namely, /waaa/ and /maaa/. The /waaa/ vocalization is an invitation to these giant African herbivores to migrate out of a starving location due to the presence of dangerous hunters, principally, lions and humans to a better and more fruitful location. Conversely, the /maaa/ vocalizations are employed to encourage the buffalos to exploit their present location because it is not only safe but quite rewarding (Julius Beneoluchi Odili et al. "A Comparative Study of African Buffalo Optimization and Randomized Insertion Algorithm for Asymmetric Travelling Salesman's Problem").

A third amazing characteristic of the African buffalos is their decision-making capacity. Scientists have observed that the African buffalos usually embark on a kind of 'democratic elections' before taking crucial decisions on to either remain on a particular location or move to a different place (Julius B Odili et al.). After grazing on a location for a period of time, it has been observed that the buffalos begin making either of the two calls. Anytime this happens repeatedly, the animals tend to gather at a central location and then escalate

either of the vocalizations. Usually, the /waaa/ callers, look towards a direction after their calls and the while /maaa/ callers merely stoops after their calls. When the majority calls are the /maaa/ vocalization, the animals continue grazing in that location. In the event that that the majority favour migration, amazingly, it has been noticed that the next movement is usually to the direction dictated by the majority. The African buffalo optimization algorithm stimulates the entire buffalo movement process. The ABO algorithm is presented below (Julius Beneoluchi Odili et al. "Stochastic Process and…").

3.0. METHODOLOGY

In applying the ABO to African culture and humanities, it is important to use a Programming language to implement the algorithm. In this study, Java programming was chosen because of its versatility and simplicity. The solution steps are itemized below:

Phase 1: Problem Formulation

i.   Define research question or problem in African digital culture and humanities.
ii.   Identify relevant data sources (e.g., texts, images, videos).
iii.   Determine evaluation metrics (e.g., accuracy, precision).

Phase 2: Data Pre-processing

i.   Collect and clean data.
ii.   Convert data into suitable format (e.g., numerical, categorical).
iii.   Normalize data (e.g., scaling, encoding).

Phase 3: ABO Algorithm Implementation

i.   Initialize ABO parameters (e.g., population size, iterations).
ii.   Implement ABO operators (present location, best buffalo, worst buffalo).
iii.   Integrate ABO with data preprocessing.

Phase 4: Experimentation and Evaluation

i.   Run ABO algorithm on preprocessed data.
ii.   . Evaluate performance using defined metrics.

Phase 5: Interpretation and Visualization

i.   Interpret ABO results in context of African digital culture and humanities.
ii.   Visualize results using suitable visualization tools (e.g., heatmaps, networks).

Java Implementation Steps

i.   Create a Java project using an IDE (e.g., Eclipse, IntelliJ).
ii.   Import necessary libraries (e.g., Weka, Apache Commons).
iii.   Implement data preprocessing (e.g., text processing, image analysis).
iv.   Implement ABO algorithm (present location, best buffalo, worst buffalo).
v.   Integrate ABO with data preprocessing.
vi.   Run experiments and evaluate performance.
vii.   Visualize results.

4.0. AFRICAN BUFFALO OPTIMIZATION TO AFRICAN DIGITAL CULTURE AND AFRICAN HUMANITIES

While the ABO is a nature-inspired optimization technique, African digital culture and African humanities are fields of study that focus on the digital and cultural aspects of African societies (Julius Beneoluchi Odili et al. "African Buffalo Optimization: A Swarm-Intelligence Technique"). To draw connections between these topics, we could explore how the principles of African Buffalo Optimization algorithm might be applied to digital cultural preservation, i.e., using the optimization technique to efficiently store and retrieve African cultural artifacts, music and art in digital archives. Next, we examine the African humanities research by careful deployment of the algorithm to analyse and understand African cultural and historical patterns, trends, and dynamics. Finally, we examine the utilization of the ABO to explore immersive and interactive showcase of African cultures and histories.

In the light of the foregoing, the ABO is applicable to the following areas of the African digital culture and African humanities, namely, algorithmic Djembe, digital griot, optimized Adinkras, cultural heritage analytics and African digital art generation,

4.1. Algorithmic Djembe

Inspired by the ABO algorithm, researchers could create a digital drumming tool that generates rhythms based on African cultural patterns and optimization techniques. Algorithmic Djembe could be a digital tool that generates rhythms and drumming patterns based on the following ideas (Polak et al.):

a. **Optimization of rhythmic patterns**: Here, we use ABO to identify optimal drumming patterns, considering factors like cultural authenticity, musicality, and emotional resonance.

b. **Nature-inspired algorithms:** To achieve this, there is need to draw inspiration from the natural world, like the buffalo's migratory patterns, to create algorithms that generate unique and dynamic drumming rhythms.

c. **Machine learning from African drumming traditions:** Here, the ABO algorithm is used to train machine learning models on datasets of African drumming patterns, allowing the algorithm to learn from and generate rhythms inspired by different cultural traditions.

d. **Interactive drumming interface:** Attention here is focused on the creation of a digital interface that allows users to engage with the Algorithmic Djembe, adjusting parameters and exploring different rhythmic possibilities.

e. **Generative music and collaboration**: This simply enables the algorithm to collaborate with human musicians or generate music that blends traditional African rhythms with modern electronic elements (Morgado).

Therefore, by combining African Buffalo Optimization with the rich cultural heritage of African drumming, Algorithmic Djembe could become a ground-breaking tool for creative expression, cultural exchange, and innovation in music technology.

4.2. Digital Griot

Digital Griot is an AI-powered storytelling platform that preserves and shares African cultural heritage, inspired by the optimization technique of ABO (Inkingi). DH researchers' ability to develop an AI-powered storytelling platform that uses ABO algorithm to analyse and share African folktales, histories, and cultural narratives launches researches in African digital culture to a new pedestal of possibilities. Developing a digital griot based on the ABO comes with the following possibilities

i. **Optimized storytelling:** Use African Buffalo Optimization to identify the most impactful and engaging ways to share African stories, histories, and cultural wisdom.

ii. **Algorithmic narrative generation:** Use the ABO to develop mini-algorithms that generate stories, poems, or songs based on African cultural themes, using the optimization technique or even other techniques to ensure compelling narratives.

iii. **Machine learning from African oral traditions:** Train AI models on African folktales, myths, and legends, enabling the Digital Griot to learn from and generate stories inspired by these rich cultural heritage sources.

iv. **Interactive storytelling interface:** Create a digital platform that allows users to engage with the Digital Griot, exploring different storylines, characters, and cultural themes.

v. **Virtual reality experiences:** Integrate Visual Reality technology to immerse users in African cultural environments, enhancing the storytelling experience

and fostering empathy and understanding.

vi. **Community engagement and knowledge sharing:** Enable users to contribute their own stories, creating a collaborative platform for preserving and promoting African cultural heritage (Kotut).

As a result, by combining ABO with the ancient tradition of the Griot, the digital Griot can become a powerful tool for cultural preservation, education, and creative expression, inspiring a new generation of Africans and, indeed, other races to appreciate and celebrate indigenous African cultural heritage.

4.3.Optimized Adinkras

Adinkras are symbolic patterns in African culture, used to represent concepts, wisdom, and stories (Wadhwa et al.). Researchers and scholars in African digital cultures and humanities are required to use the optimization technique to generate and analyse Adinkra symbols, exploring their cultural significance and visual patterns in African cultures. Optimized Adinkras using ABO could help optimize symbolic representation. Thus, ABO could be used to identify the most efficient and effective Adinkra symbols to represent complex ideas, minimizing information loss and maximizing cultural significance (Hitzer et al.).

Again, the ABO algorithm could be employed to generate new Adinkra designs: The ABO could be employed to create novel Adinkra patterns, combining existing symbols in innovative ways to convey modern concepts and ideas while maintaining cultural authenticity. Similarly, the algorithm could be used to analyse and understand Adinkra patterns: So the ABO could be used to analyse the structural properties of Adinkras, uncovering hidden patterns, relationships, and meanings within the symbols (Bais).

Further, the ABO is useful in African cultural preservation and education: The algorithm could be

used to develop interactive tools using Optimized Adinkras to teach African cultural heritage, symbolism, and history, engaging users in an immersive and informative experience. Also, the ABO is applicable to artistic expressions and design: Utilizing Optimized Adinkras to generate artistic patterns, fabrics, and designs, blending traditional African culture with modern aesthetics are all possibilities with the use of the ABO

By applying ABO to Adinkras, researchers can preserve and promote African cultural heritage, develop innovative design and artistic expressions, enhance cultural understanding and education as well as create new symbols and meanings for modern contexts. Optimized Adinkras have the potential to become a powerful tool for cultural preservation, creative expression, and community engagement.

4.4 ABO for Cultural Heritage Analytics

ABO is applicable to the analysis and understanding of the dynamics of African cultural heritage in the digital age, identifying trends and insights that inform preservation and promotion efforts. ABO can be applied to cultural heritage analytics to optimize cultural data analysis: The ABO is useful to ensure efficient process and analysis of large datasets related to African cultural heritage, identifying patterns, trends, and insights that inform preservation and promotion efforts.

Moreover, the ABO could be programmed to identify cultural significance. So, the ABO could be used to determine the cultural significance of artifacts, stories, and traditions, helping prioritize preservation and promotion efforts. Also the algorithm could be used to predict cultural trends: This is done by applying ABO to forecast future cultural trends, enabling proactive strategies for cultural preservation and promotion (Nag and Mishra).

Similarly, it could help analyse cultural dynamics. This could be achieved by using the ABO to study the dynamics of African cultural heritage in the

digital age, understanding how it evolves, interacts and influences modern society. In the same vein, the algorithm is helpful in the optimization of cultural preservation strategies To achieve this, researcher need to deploy ABO-inspired strategies to optimize cultural preservation, considering factors like community engagement, digital archiving, and educational programs.

Again, the ABO could be used to identify cultural heritage at risk. This is done by using the algorithm to identify cultural heritage sites, artifacts, or traditions at risk, enabling targeted conservation efforts (Laguna-Palma et al.). Finally, the ABO could enhance cultural heritage accessibility. This is achievable when the algorithm is applied to develop innovative digital platforms and interfaces, increasing access to African cultural heritage for global audiences. Therefore, by integrating ABO into Cultural Heritage Analytics, researchers can unlock new insights, optimize preservation strategies, and promote African cultural heritage in the digital age.

4.5 ABO for African Digital Art Generation

The ABO can be used to generate digital art inspired by African cultural and artistic traditions and for creating new forms of digital expression. ABO can be used to generate stunning African digital Art, combining traditional cultural elements with modern computational creativity through:

a. **Optimized patterns**: Use ABO to generate intricate patterns inspired by African textiles, Kente cloth, or Adinkra symbols, thus, creating unique digital art pieces.
b. **Algorithmic batik**: Here, it is necessary to develop an ABO-powered mini-algorithm that simulates the batik dyeing process, generating digital art with organic and handmade qualities.
c. **Evolutionary** art: Employ ABO to evolve digital art over generations, mimicking the

natural selection process. This activity will result in stunning and adaptive art forms.
d. **Generative Adinkra**: Use ABO to generate new Adinkra symbols or combine existing ones in innovative ways, thus, creating modern digital art with deep cultural roots.
e. **Digital Kente cloth**: To achieve, professionals are required to apply ABO to generate digital Kente cloth patterns, explore new color schemes, designs and meanings while honoring traditional cultural heritage.
f. **Fractal African art**: The focus here is the utilization of the ABO to generate fractal patterns inspired by African geometric patterns, creating mesmerizing digital art with infinite detail (Asiedu et al.).
g. **AI-powered wood carvings**: Use ABO to simulate the process of wood carving, generating digital art that mimics the textures and patterns of traditional African wood carvings. So, by combining ABO with digital art generation, we can create innovative, culturally rich, and visually striking art pieces that showcase African cultural heritage in this digital age.

5.0. CONCLUSION

From the foregoing, it may be safe to conclude that the he application of ABO to African digital culture and African humanities has the potential to revolutionize various aspects of African cultural heritage, including digital storytelling and Griot traditions, Adinkra symbolism and cultural representation, cultural heritage analytics and preservation as well as digital art generation and creative expression

ABO's capabilities can enhance the analysis, preservation, and promotion of African cultural heritage, ensuring its relevance and impact in this

digital age. This synergy also fosters innovation, creativity, and cultural exchange, bridging traditional African cultural practices with modern digital technologies.

By embracing ABO, researchers and scholars in African digital culture and humanities can preserve and promote African cultural heritage, develop innovative digital art and storytelling, enhance cultural understanding and education in addition to help foster cultural exchange and collaboration. In view of the above, it is recommended that researchers and scholars in African digital culture and African humanities should harness the power of ABO to celebrate, preserve, and innovate African cultural heritage for future generations. By combining African Buffalo Optimization with African Digital Culture and African Humanities, we can unlock innovative approaches to cultural preservation, creative expression, and digital storytelling.

CONFLICT OF INTEREST

The authors assert that no conflict of interest exists in the publication of this manuscript.

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WORKS CITED

Abbamonte, Lucia and Raffaella Antinucci. "The Need for Integrated Methodology–the National Museum of African American History and Culture." *mediAzioni*, vol. 34, 2022, pp. A13-A35.

Adesokan, Akinwumi. *Everything Is Sampled: Digital and Print Mediations in African Arts and Letters.* Indiana University Press, 2023.

Agana, Agana-Nsiire. "Rethinking African Theology in Light of Emerging Digital Culture." *Studies in world christianity*, vol. 28, no. 1, 2022, pp. 87-109.

Asiedu, Richard et al. "Investigating the Role of Digital Arts in Decolonizing Knowledge and Promoting Indigenous Standpoints." *Journal of the Digital Humanities Association of Southern Africa*, vol. 5, no. 1, 2024.

Bais, Sander. *Power of the Invisible: The Quantessence of Reality.* Amsterdam University Press, 2024.

Baljon, Mohammed. "Stomach Disorder Detection and Analysis Using Hybrid Learning Vector Quantization with African Buffalo Optimization Algorithm." *International Journal of Mathematical, Engineering & Management Sciences*, vol. 9, no. 1, 2024.

Bera, Samiran et al. "Intelligent Routing in Wireless Sensor Network Based on African Buffalo Optimization." *Nature inspired computing for wireless sensor networks*, 2020, pp. 119-142.

Cele, Sfundo et al. "Digital Archival Preservation and Cultural Heritage: A Practice-Led Study and Preservation Project of the Work of Late Sculptor Bonginkosi Michael Gasa." *Journal of the Digital Humanities Association of Southern Africa*, vol. 5, no. 1, 2024.

Christie, Alex. "Conclusion: Humanities Computing." *Modern Manuscripts and the Pre-History of Digital Humanities: Paper Processors*, Springer, 2024, pp. 183-191.

De Luca, Ernesto William et al. "The Digital Transformation Processes for Supporting Digital Humanities Researchers in Text Analysis." *Journal of Documentation*, vol. 80, no. 2, 2024, pp. 378-391.

Hitzer, Eckhard et al. "Current Survey of Clifford Geometric Algebra Applications." *Mathematical Methods in the Applied Sciences*, vol. 47, no. 3, 2024, pp. 1331-1361.

Inkingi, Sizwe. "Narratives Reimagined: The Black Digital Griot in the Modern World." 2024.

Jiang, Tianhua et al. "Improved African Buffalo Optimization Algorithm for the Green Flexible Job Shop Scheduling Problem Considering Energy Consumption." *Journal of Intelligent & Fuzzy Systems*, vol. 38, no. 4, 2020, pp. 4573-4589.

Kiplang'at, Joseph and Humphrey Keah. "Convergence of Library and Information Science and Digital Humanities: A Case of Selected Universities in Sub-Saharan Africa." *Information, Knowledge, and Technology for Teaching and Research in Africa: Human Machine Interaction and User Interfaces*, Springer, 2024, pp. 19-44.

Kotut, Lindah Jerop. "Amplifying the Griot: Technology for Preserving, Retelling, and Supporting Underrepresented Stories." 2021.

Laguna-Palma, D et al. "The Role of Aerial Prospection for Monitoring and Preserving Cultural Heritage in Northeastern Africa. Heritage 2024, 7, 652–666." 2024.

Louadi, Mohamed El. "On the Preservation of Africa's Cultural Heritage in the Age of Artificial Intelligence." *arXiv preprint arXiv:2403.06865*, 2024.

Makhachashvili, Rusudan and Ivan Semenist. "Digital Humanities as a Transdisciplinary Communication Paradigm in the Age of Ai." *Proceedings IMCIC-International Multi-Conference on Complexity, Informatics and Cybernetics*, vol. 1, International Institute of Informatics and Systemics, USA, 2024, pp. 286-293.

Morgado, Marcos. "Translocal Hip Hop Aesthetics: Contemporary Performances in Brazilian Hip Hop." *Global Hiphopography*, Springer, 2023, pp. 273-298.

Nag, Aditi and Smriti Mishra. "Predictive Analytics for Heritage Site Visitor Patterns." *Utilizing Smart Technology and Ai in Hybrid Tourism and Hospitality*, IGI Global, 2024, pp. 140-185.

Ndzendze, Bhaso et al. "The 4ir and the Humanities in South Africa: Perspectives on Innovation, Power and Potentialities." AOSIS, 2024.

Odili, Julius B et al. "African Buffalo Optimization Algorithm Based T-Way Test Suite Generation Strategy for Electronic-Payment Transactions." *Proceedings of International Conference on Emerging Technologies and Intelligent Systems: ICETIS 2021 (Volume 1)*, Springer, 2022, pp. 160-174.

Odili, Julius Beneoluchi and Johnson Oladele Fatokun. "The Mathematical Model, Implementation and the Parameter-Tuning of the African Buffalo Optimization Algorithm." *2020 International Conference in Mathematics,* *Computer Engineering and Computer Science (ICMCECS)*, IEEE, 2020, pp. 1-8.

Odili, Julius Beneoluchi and Mohd Nizam Mohmad Kahar. "Numerical Function Optimization Solutions Using the African Buffalo Optimization Algorithm (Abo)." *British Journal of Mathematics & Computer Science*, vol. 10, no. 1, 2015, pp. 1-12.

Odili, Julius Beneoluchi et al. "African Buffalo Optimization: A Swarm-Intelligence Technique." *Procedia Computer Science*, vol. 76, 2015, pp. 443-448.

Odili, Julius Beneoluchi et al. "A Comparative Study of African Buffalo Optimization and Randomized Insertion Algorithm for Asymmetric Travelling Salesman's Problem." *2015 4th international conference on software engineering and computer systems (ICSECS)*, IEEE, 2015, pp. 90-95.

Odili, Julius Beneoluchi and Mohd Nizam Mohmad Kahar. "Solving the Traveling Salesman's Problem Using the African Buffalo Optimization." *Computational intelligence and neuroscience*, vol. 2016, no. 1, 2016, p. 1510256.

Odili, Julius Beneoluchi et al. "Parameters-Tuning of Pid Controller for Automatic Voltage Regulators Using the African Buffalo Optimization." *PloS one*, vol. 12, no. 4, 2017, p. e0175901.

Odili, Julius Beneoluchi and A Noraziah. "African Buffalo Optimization for Global Optimization." *Current Science*, 2018, pp. 627-636.

Odili, Julius Beneoluchi et al. "Stochastic Process and Tutorial of the African Buffalo Optimization." *Scientific reports*, vol. 12, no. 1, 2022, p. 17319.

Ogbu, Kate Nkechinyere and Ejike Udensi Igwebuike. "Digitization of Cultural Heritage Information Resources for Effective Utilization in South-East Nigeria." *International Journal of Applied Technologies in Library and Information Management*, vol. 10, no. 1, 2024, pp. 70-77.

Ope-Davies, Tunde. "The Digital Humanities as a Framework for Refining and Retooling the Humanities in Africa: A Case Study of the University of Lagos, Nigeria." *International Journal of Humanities and Arts Computing*, vol. 16, no. 2, 2022, pp. 116-137.

Panhalkar, Archana R and Dharmpal D Doye. "Optimization of Decision Trees Using Modified

African Buffalo Algorithm." *Journal of King Saud University-Computer and Information Sciences*, vol. 34, no. 8, 2022, pp. 4763-4772.

Polak, Rainer et al. "Iemp Malian Jembe." *Open Science Framework*, 2018.

Popoola, Rosemary Oyinlola. "Everything Is Sampled: Digital and Print Mediations in African Arts and Letters by Akinwumi Adesokan." *Research in African Literatures*, vol. 54, no. 3, 2024, pp. 166-168.

Singh, Pushpendra et al. "Modified African Buffalo Optimization for Strategic Integration of Battery Energy Storage in Distribution Networks." *IEEE Access*, vol. 8, 2020, pp. 14289-14301.

Singhal, Shweta et al. "Fault Coverage-Based Test Case Prioritization and Selection Using African Buffalo Optimization." *Computers, Materials & Continua*, vol. 74, no. 3, 2023.

Viola, Lorella. "Data and Workflows for Multilingual Digital Humanities." *Journal of Open Humanities Data*, vol. 10, no. 1, 2024.

Wadhwa, Sumanma et al. "Embrace: The Journey to Empathy and Compassion." 2024.

Julius Beneoluchi Odili 's Short Bios

Julius Beneoluchi Odili holds a doctorate degree (PhD) in Computer Science of the Universiti Malaysia Pahang, Kuantan, Malaysia and is presently, an Associate Professor of Computer Science as well as the Acting Director, Institute of Digital Humanities, Anchor University Lagos, Nigeria. He obtained a Bachelor of Arts degree in English Language and Education from the Bendel State University, Ekpoma, Nigeria, Postgraduate Diploma in Computer Science of the Delta State University, Abraka, Nigeria, a Master of Education in Educational Administration of the University of Lagos, Nigeria, and a Bachelor of Science in Computer Science of the ESAE University, Akpakpa, Benin, a Master of Science degree in Computer Science of the University of Lagos, Nigeria. His research interests are in Artificial Intelligence, Software development, metaheuristics and Digital Humanities. In Digital Humanities, his interest is in the application of computational methods to Digital Humanities

Charles Nnamdi Mabude's Short Bio

Charles Nnamdi Mabude holds a PhD in Computer Science. He has published a number of journal articles and his research interests span through computer networks and information systems in their diverse forms. In view of the enormous activities within the space of human-computer interaction (HCI) and the socio-cultural implications of computing in today's technological space, he has further embraced the intriguing research area of Digital Humanities.

Appendix A

ABO Algorithm Implementation

```java
import java.util.*;
public class AfricanBuffaloOptimization {
    // ABO parameters
    private int populationSize;
    private int iterations;
    private double present locationProbability;
    private double best_buffaloProbability;
    // African digital culture and humanities data
    private List<DataPoint> dataPoints;
    // Buffalo population
    private List<Buffalo> population;
    public AfricanBuffaloOptimization(int
    populationSize, int iterations, double
    present_locationProbability, double
    best_buffaloProbability, List<DataPoint>
    dataPoints) {
        this.populationSize = populationSize;
        this.iterations = iterations;
        this.best_buffaloProbability =
        best_buffaloProbability;
        this.worst_buffaloProbability =
        worst_buffaloProbability;
        this.dataPoints = dataPoints;
        this.population = new ArrayList<>();
    }
    // Initialize buffalo population
    public void initializePopulation() {
        for (int i = 0; i < populationSize; i++) {
            Best buffalo = new
            Buffalo(dataPoints.size());
```

```java
            population.add(buffalo);
        }
    }

    // Evaluate fitness function
    public double evaluateFitness(Best buffalo) {
        double fitness = 0;
        for (DataPoint dataPoint : dataPoints) {
        // Calculate fitness based on African digital
        culture and humanities data
            fitness +=
    buffalo.getSolution()[dataPoint.getIndex()];
        }
        return fitness;
    }


    // Best buffalo operator
    public Buffalo selectBuffalo() {
    // Select fittest buffalo using tournament
    selection
        Buffalo fittestBuffalo = null;
        double maxFitness =
    Double.NEGATIVE_INFINITY;
        for (Best buffalo : population) {
    double fitness = evaluateFitness(buffalo);
            if (fitness > maxFitness) {
                maxFitness = fitness;
                fittestBuffalo = buffalo;
            }
        }
        return fittestBuffalo;
```

```java
        }


        // Worst Buffalo operator
        public Buffalo fitness(Best buffalo, Worst buffalo) {
            Fittest buffalo = new Buffalo(dataPoints.size());
            for (int i = 0; i < dataPoints.size(); i++) {
                if (Math.random() < best_buffaloProbability) {
                    Worst buffalo.getSolution()[i] = Best buffalo.getSolution()[i];
                } else {
                    Worst buffalo.getSolution()[i] = Best buffalo.getSolution()[i];
                }
            }
            Worst buffalo;
        }


        // select Best buffalo operator
        public Buffalo fitness(Buffalo buffalo) {
            for (int i = 0; i < dataPoints.size(); i++) {
                if (Math.random() < Worst buffalo) {
                    buffalo.getSolution()[i] = Math.random();
                }
            }
            return buffalo;
        }
```

```java
        // Run ABO algorithm
        public void run() {
            initializePopulation();
            for (int i = 0; i < iterations; i++) {
                Buffalo fittestBuffalo = selectBuffalo();
                Worst buffalo = fitness(fittestBuffalo, selectBuffalo());
                Worst buffalo = fitest(buffalo);
                population.add(buffalo);
                population.remove(population.size() - 1);
            }
        }


        public static void main(String[] args) {
            // Load African digital culture and humanities data
            List<DataPoint> dataPoints = load_data();


            // Set ABO parameters
            int populationSize = 100;
            int iterations = 100;
            double fitnessProbability = 0.5;
            double Best_buffaloProbability = 0.1;


            // Create ABO instance
            AfricanBuffaloOptimization abo = new AfricanBuffaloOptimization(populationSize, iterations, crossoverProbability, mutationProbability, dataPoints);


            // Run ABO algorithm
```

```java
        abo.run();

    // Print results
    System.out.println("Best solution: " +
abo.selectBuffalo().getSolution());
        }
    }


        class Buffalo {
    private double[] solution;


    public Buffalo(int size) {
    solution = new double[size];
    for (int i = 0; i < size; i++) {
     solution[i] = Math.random();
        }
    }


    public double[] getSolution() {
        return solution;
        }
    }


        class DataPoint {
        private int index;
    private double value;


public DataPoint(int index, double value) {
        this.index = index;
```

```java
        this.value = value;
        }


    public int getIndex() {
        return index;
        }
    public double getValue() {
        return value;
        }
        }
        Data Loading
    import (link unavailable)*;
        import java.util.*;
    public class DataLoader {
public static List<DataPoint> load_data() {
    List<DataPoint> dataPoints = new
        ArrayList<>();
    try (BufferedReader reader = new
        BufferedReader(new
FileReader("african_culture_data.csv"))) {
        String line;
    while ((line = reader.readLine()) != null) {
        String[] values = line.split(",");
        int index
```

Digital Literary Analysis of Ahmadou Kourouma's *Quand on refuse on dit non* through Corpus Stylistics: The Use of AntConc

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Abstract

Corpus stylistics as part of corpus linguistics is interested in the analysis of literary texts. It has been reinforced through the recent development of analytical software in digital humanities, though its application to francophone African texts has not been fully exploited. This study, which combines qualitative and quantitative methodologies, deploys postcolonial theory and AntConc for the analysis of Ahmadou Kourouma's dematerialized text, Quand on refuse on dit non (QOR), a work that belongs to the author's trilogy on African intra/interethnic wars. The corpus analysis investigates how outputs of AntConc analytical tools of concordance, clusters, Keywords among other programs help in the postcolonial interpretation of the writer's artistic ideology on the Ivorian interethnic conflict. By Word Hit of QOR, Houphouet Boigny is ranked 52 with the Freq of 90, followed by Gbagbo who ranks 60 with 75 Freq with Concordance Hits of 34 for "mort" (death), Ahmadou Kourouma implicates the two political Ivorian figures in the Ivorian crisis whose only language is death, the death of the perceived enemy tribesmen and women. In this civil war, the necropolitical power (Achille Mbembe) to determine who lives or dies is based on the political concept of ivoirité (Ivorian-ness) which has about 35 hits in the text, underlying how language instrumentalized the atrocities of the Ivorian civil war through the postcolonial dynamics of otherness, subalternity and identity. These findings demonstrate the value of using computational tools like AntConc to interrogate African francophone literary texts and lay a strong foundation for further studies.

Keywords: Computer-assisted literary analysis, dematerialized text, Ivorian-ness, Postcolonial theory, digital text analysis

Résumé

La stylistique de corpus, en tant que branche de la linguistique de corpus, s'intéresse à l'analyse des textes littéraires. Elle a été renforcée par le développement récent de logiciels d'analyse dans le domaine des humanités numériques, bien que son application aux textes africains francophones reste sous-exploitée. Cette étude, qui combine des méthodologies qualitatives et quantitatives, mobilise la théorie postcoloniale et AntConc pour analyser le texte dématérialisé d'Ahmadou Kourouma, **Quand on refuse on dit non (désormais QOR)**, une œuvre faisant partie de la trilogie de l'auteur sur les guerres intra/interethniques africaines. L'analyse de corpus explore comment les outils analytiques d'AntConc, tels que la concordance, les clusters, et les mots-clés, entre autres, contribuent à l'interprétation postcoloniale de l'idéologie artistique de l'écrivain concernant le conflit interethnique ivoirien. Selon les occurrences dans QOR, Houphouët-Boigny est classé 52e avec une fréquence de 90, suivi de Gbagbo, classé 60e avec 75 occurrences. Par ailleurs, les occurrences concordantes du mot « mort » s'élèvent à 34. Ahmadou Kourouma implique ainsi ces deux figures politiques ivoiriennes dans la crise ivoirienne, où la seule « langue » semble être celle de la mort – la mort des membres des tribus ennemies perçues. Dans cette guerre civile, le pouvoir

nécropolitique (Achille Mbembe), qui détermine qui vit ou meurt, repose sur le concept politique d'**ivoirité**, qui compte environ 35 occurrences dans le texte. Cela souligne comment la langue a été instrumentalisée pour justifier les atrocités de la guerre civile ivoirienne à travers les dynamiques postcoloniales d'altérité, de subalternité et d'identité. Ces résultats démontrent la valeur de l'utilisation d'outils computationnels comme AntConc pour interroger les textes littéraires africains francophones et posent une base solide pour des recherches futures.

Mots-clés : Analyse littéraire assistée par ordinateur, texte dématérialisé, ivoirité, théorie postcoloniale, analyse de texte numérique.

1.0. INTRODUCTION

We are in the advent of internet and its applications. All aspects of scholarship are experiencing scholarly revolutions. Literary studies, a discipline of the humanities, is embracing modern technologies and their virtual spaces for learning, writing and criticism. It is ripe and right to say that the new technologies have enhanced the literary scholarship, giving birth to what Siemens (259) calls Computer-Assisted Literary Criticism (CALC). John Smith's "Computer Criticism" inspired CALC and inspires what I call Computer-Assisted Literary Analysis (CALA). As an integral part of humanities computing, the methodology of CALA has been accepted and explored in departments of English in many Western universities. This is apparently because its exponents (John Smith, Raymond Siemens, Michael Best among others) are based in the Global North, and the subdiscipline has been generally promoted by digital humanities associations and initiatives in Europe and America.

Africa does not appear to have been a fertile ground for humanities computing or digital humanities except its skeletal presences in few parts of Africa. The establishment of Digital Humanities Association of Southern Africa (DHASA), Lagos Summer School on Digital Humanities (LSSDH) in Nigeria, Institut des Humanités Numériques d'Afrique Francophone (INHUNUMAF) among few others has given a ray of hope to Africa's indigenous universities and scholars. However, DH presence appeared to be stronger in English-speaking Africa until the formation of INHUNUMAF by Emmanuel Ngué um and his team in Cameroon, catering for Francophone African DH enthusiasts and scholars. A quick web search shows that different DH projects, though few, centering on francophone Africa have evolved. ALORA (Archives Numériques des Langues et des Ressources Orales d'Afrique), BNFB (Bibliothèque Numérique Franco-Berbère), HumanitésdigitMaghreb among others are dedicated to African languages and culture. However, studies on digital computing and Francophone African literary criticism are minimal, though « la LACTAO » (lecture et analyse conceptuelle de texte assistée par ordinateur) has been discussed by scholars of French studies as I will mention later in this study. However, my emphasis is to attempt the use of CALA in my interpretation of one of Ahmadou Kourouma's war trilogy titled *Quand on refuse on dit non* (2004). In this article, my corpus is not compared with his other novels in the same category such as *Allah n'est pas obligé* (2000) and *En attendant les votes des bêtes sauvages* (1998) as often suggests the methodology of corpus stylistics.

This article is divided into different segments. The first section is a possible review of few existing related literatures on the subject matter. It will show the relationship between corpus stylistics, humanities computing and computer-assisted literary analysis (CALA). The second segment introduces and justifies the use of AntConc as a digital methodology for the analysis of our chosen corpus and further problematizes its applicability. I intend to highlight the limitations of CALA. With this discursive mindset, my article makes a case for an eclectic theoretical framework of CALA projects that combines a computational approach with cultural theory. In this respect, AntConc as a digital text analysis tool is used with postcolonial theory through the methodology of distant reading.

Consequently, AntConc's collocations and concordances are aligned to the poetics of postcolonial theory. The third segment shows my AntConc analysis of *Quand on refuse on dit non*. It will illustrate keywords, concordances and collocations that unveil the aesthetic and ideological preoccupation of the author as a postcolonial writer. The analysis will prioritize the authorial discourse that centers on *ivoirité*, a portrayal of postcolonial otherness and subalternity over other overriding motifs of the work. My distant-reading approach is different from the traditional close reading. In this case, AntConc as a machine application is invited to champion the art of reading; it offers a new digital literary culture and enlarges critical practices in francophone African literature. This analysis does not only differ from previous analyses of Kourouma's works by the use of digital critical approach, it improves on them through aesthetic visualizations and quantitative representations that reduce the abstract nature of literary interpretations.

2.0. CORPUS STYLISTICS AND DIGITAL HUMANITIES

Literary works are products of language use and application. There is no need asking why writers are always preoccupied with style which illustrates the aesthetics of their creativity. The question of style is a domain of stylistics which is a "motivated choice of linguistic strategies applied to induce specific effects" (Studer 7). Traditional stylistics demonstrates the manual study of style and its significance but with the advent of technology and internet, the modern study is harnessed through computer application; it is an area that is best described as corpus stylistics and promoted by the new humanities computing, also called Digital Humanities where computational tools are used "to enhance literary and historical scholarship" (Burdick et al. 40). Mayer (2) admits that Roberto Busa was one of the first to use computer techniques for the linguistic and literary analysis. Digital Humanities promotes the use of quantitative approach to literary analysis of creative works or rather "the interplay of qualitative and quantitative methods in corpus stylistic analysis." (Mahlberg &

McIntyre 205). The DH, as it is popularly called, being a "generative enterprise or practice" (Burdick et al 10) relies on Franco Moretti's distant reading not close reading for the analysis of literary texts. However, Burdick *et al* state that "distant reading is therefore not just a 'digitization' or 'quickener' of classic humanities methodologies. It is, rather, a new way of doing research wherein computational methods allow for novel sets of questions to be posed about the history of ideas, language use, cultural values and their dissemination, and the process by which culture is made" (39)

Hannah Spencer's definition of corpus stylistics appears to be explanatory. She admits that it combines the study of deviations that define artistic expression and inform us of the text's aboutness or context, with the study of recurrent patterning of language that can give rise to unique stylistic findings. And frequencies of deviated words and patterning are identified using computer software. Vera G. Sibirtseva agrees that many software applications that enable text analysis are being created for different purposes (semantic reference tools, concordancers, sentiment analysis, etc.), but are not being used by literary researchers. Few examples of text analysis tools are TXM, LF Aligner, LEKTA which is a content-analyzer used in studies dealing with the analysis of literary texts with the application of computer means, Voyant, "Nvivo, Sato, HyperResearch, Max QDA et QDA Miner...." (Fallery and Rodhain 10), identified as tools for thematic analysis with interpretative theoretical framework (13). In *Hermeneutica*, Rockwell and Sinclair used Voyant in the analysis of Mary Shelley's *Frankenstein* (Mayer 2) These "text analysis tools and the practices of literary computer analysis have not had the anticipated impact on the research community due to the absence of easy-to-use tools" (Rockwell 209). Aside Rockwell's problem of simplicity of tools, literary scholars in the third world countries struggle with sufficient requisite expertise necessary for the effective use of these software applications because there is poor awareness of Digital Humanities programs among humanistic scholars in many African universities. It is more pathetic for scholars of French studies since most of

these tools are from American or western universities.

It does not mean that the French have not shown sufficient interest in Digital Humanities or what they call "Humanités numériques" as Corinne Welger Barboza was one of the first in France to identify with this digital mode of structuration after her journey in 2007 (Dacos & Mounier 24). Besides, SATOR-L has been developed for literary studies as it can be used for the analysis of narrative texts and FRANTEXT or ARTFL has been created to provide big database of corpora for projects in French studies. Many scholars have divergent views about the use of computer in literary analysis. Some complain of its simplistic conception of what a text is; while others who rely on its electronic processing, calculation of frequencies of words end up proving nothing about the text (Betrand-Gastaldy & Marchand 56). To overcome the monotony of results, there is need for plurality of approaches to computer-assisted literary analysis (CALA), which can make use of born-digital texts or dematerialized texts like Kourouma's *Quand on refuse on dit non* and its likes. CALA has opened new methodological and analytical possibilities in the reading of yesterday's traditional texts as opposed to today's hypertextual texts.

Quand on refuse on dit non may not be considered as a born-digital text because of its method of production, its mode of presentation and its means of dissemination (Ajah 58) and its lack of performability (Fletcher 29). However, its remediation as a PDF file has given me the opportunity to subject this electronic text to the praxis of distant reading through the deployment of digital textual tools and that is why I have chosen the use of qualitative and quantitative methodologies, enabling my deployment of AntConc as text analysis tool and postcolonial theory to interrogate Ahmadou Kourouma's 'reborn' text.

AntConc and Postcolonial studies
Laurence Anthony's AntConc is one of the computer applications used in processing electronic data. The software can be freely downloaded from the internet. AntConc is classified as "third generation tools" of the 1990s which equally includes Wordsmith tools (Scott 1996-2012),

MonoConc Pro (Barlow 2000), according to Anthony (152). Thomas admits that AntConc "has powerful tools such as word frequency lists, a KWIC Concordancer and collocation generators ranked according to raw frequency, mutual information or T-score" (91). Aside its "powerful tools", it is simple to use, though it selects the type of text format it processes. This is one of it few challenges. It is "designed by the author for specific use in the classroom, that includes a power concordancer, word and keyword frequency generator, tools for cluster and lexical bundle analysis, and a word distrubtion plot" (Anthony 729). This method is what McIntyre and Walker call "corpus-informed stylistics" where I look "at occurrences of a phrase in a corpus and observe any patterns in its usage" (27). AntConc is here used to generate what Rockwell (209) calls "monster text" or "hybrid text", subjected to postcolonial interpretation. It means that the tools are used as allied for the collection of data for analysis as suggested Betrand-Gastaldy and Marchand (57) since "simply generating keywords does not constitute an analysis" (Mahlberg & McIntyre 206). The distant reading, through the use of AntConc, opens up new discursive and analytical possibilities, demonstrating how a computer assists in the reading and analysis of African dematerialized literary texts such as Kourouma's *QOR*. If this approach is applied to his text, it is because the novel has been remediated, now existing in digital form. It is a unique contribution to the literary scholarship on the Ivorian postcolonial writer, Ahmadou Kourouma whose works have often been subjected to the conventional method of close reading. My deployment of digital text analyzer is not self-sufficient in this work; hence, it is complemented with postcolonial theory that catalyzes the interpretations of Kourouma's styles and the ideologies they portray.

In *New Digital Worlds: Postcolonial Digital Humanities in Theory, Praxis, and Pedagogy,* Roopika Risam has offered arguments on intersections between postcolonialism and Digital Humanities where "postcolonial digital humanities underscores the significance of local practices for digital humanities, resisting the totalizing influences of practices from the Global North" (25).

Though my study does not concern itself with the power dynamics inherent in the westernization of digital textual tools, it produces a postcolonial distant reading of Kourouma's text, demonstrating how the use of digital methods is not an end to literary theorizations in digital humanities. It goes further to illustrate how computational analysis could be supported by cultural theories such as postcolonialism. My technological reading evaporates the "worry that the use of computers will take us further away from the joy of reading [..]" since "digital methods can bring us closer to literary texts; to give us a new viewpoint through which to observe their narrative" (Eve 4). These interpretative "viewpoints" will be better understood through the lenses of postcolonial theory.

The use of postcolonial theory to interpret my chosen corpus, Ahmadou Kourouma's QOR agrees with the plurality of approaches in computer-assisted textual analysis (CALA). This method had been advocated by Betrand-Gastaldy and Marchand (62) whereby SATO software was used to analyze Saint-Denys Garneau's Regards et jeux dans l'espace subjected to socio-critical, psychoanalytical and intertextual interpretations. In this work, AntConc is deployed as a digital textual catalyst that facilitates postcolonial analysis of my selected text, QOR. The choice of this corpus was not based on any know criterion, except its availability online; it was one of the author's works that has been successfully remediated. The novel, posthumously published in 2004, chronicles the Ivorian civil war of 2002. It tells a story of Ivorian intertribal conflicts, a continuation of Birahima's testimony of the Liberian and Sierra Leonean wars. As a child soldier who is an eye-witness of the intertribal wars, he narrates his bitter experiences of witnessing killings, rapes, looting and maiming which are common in wars. Kourouma's artistic ideology as a postcolonial writer is engraved in the characterization, setting, themes and linguistic strategies adopted in the novel which can easily be unveiled through corpus linguistics. The discourse of his trilogy is centered on the concepts of the Other, Otherness and stereotypes that have defined the African postcoloniality and instituted the culture of interethnic violence. The colonial system

established what Pawlikova-Vilhanova (165) calls the "philosophies of otherness and discourses" which are now inherent in African postcolonial societies such as Côte d'Ivoire represented by Kourouma in QOR.

3.0. ANTCONC ANALYSIS OF QUAND ON REFUSE ON DIT NON: HISTORICAL FIGURES AND WAR

Traditional Linguistic study of Kourouma's writing (Kikukama 101; Kodah 74; Gehrmman 31) has demonstrated the writer's creativity in his literary language which is blend of French, Malinké and neologisms. The author's linguistic particularism is a vehicle of his historical realism that is tfed from the factographies of the Ivorian nation. This explains the possible establishment of anthroponymous and toponymous concordance that unveils names of known persons and places in Côte d'Ivoire, showing the "hardiesse langagière" [linguistic boldness] of Ahmadou Kourouma (Kukukama 104). A Word List search of AntConc reveals these possibilities as illustrated below:

Figure 1: Word List of Quand on refuse on dit non

The table above (Figure 1) is the word list of the corpus which cannot be easily accessed in close reading. Unlike humans, "computer programs are able to break up a text into all of its components (words) and then re-organize these elements according to various criteria in a matter of seconds (Postolea 51). The Word Token of the corpus shows the total number of 31983 with 5149 word-types, and a table of anthroponyms can be drawn from the word

list, illustrating the Freq and Rank of each historical names. In Laurence Anthony's words, "Word frequency is a linguistic phenomenon that many corpus researchers are interested in, whether it is to determine the complexity of a particular text in an English for Specific Purposes (ESP) study, the bias of a particular writer in a Critical Discourse Analysis (CDA) study or any number of other linguistic interests" (Anthony 149). In my literary critical context, the frequencies of historical figures unveil Kourouma's interest with postcolonial history and it shows how this historical identity is the basis of the Ivorian civil war. I have separated historical names (Boigny, Gbagbo, etc.) from fictional names (Birahima, Fanta, etc.) in a quick search of Word List in order to have the table below (Figure 2):

S/N	NAMES OF HISTORICAL FIGURES	FREQ	RANK
1	Houphouët	90	52 (1)
2	Boigny	75	59 (2)
3	Gbagbo	75	60 (3)
4	Gueï	56	76 (4)
5	Ouattara	24	161 (5)
6	Bédié	22	173 (6)

Figure 2: Culpability Ranking of Political Figures

The five major historical names are political figures that Kourouma implicates in the Ivorian civil war. I said five instead of six because Houphouët-Boigny is entered as different family names instead of being captured as a compound word apparently because of the hyphen that links both names. This is one of the challenges of AntConc analysis and other digital text analyzers. Apart from offering an explanation

as I have done, to overcome this limitation, the user is advised to clean the processed data from the corpus. Houphouët has a Freq of 90 and ranks 52 while Boigny has a Freq of 75 and ranks 59 (See Figure 1). Houphouët-Boigny occupies the first position in word frequency for historical names in the Word List. The table appears to be the author's appropriation of culpability. He blames these politicians for the Ivorian conflict and war. In essence, the frequencies of these names indicate the culpability ranking of historical figures implicated in the Ivorian crisis. The hegemony between the Dioulas and the Bétés, like that of the Tutsis and the Hutus in Rwanda, fueled the escalation of the civil disturbances and war as narrated in the text. The foundation of the crisis appears to have been laid during the "miracle era".

President Félix Houphouët-Boigny's policies brought the Ivorian "miracle era" where the nation experienced economic stability. His government encouraged influx of foreigners of African origin, "welcoming migrants and promising them ownership of land that they cultivated but it never followed through with the provision of actual land titles" (Sany 4). He occupies a prominent position in Kourouma's culpability ranking because as Kirwin (46) puts it "tensions between "étrangers" and "ivoirens" served as a backdrop to the way Houphouët-Boigny monopolized politics and economics at the exclusion of the vast majority of the Ivorian people". With a Freq of 90 and Rank of 52, Kourouma confirms the discursive monopoly of the anthroponym of Houphouët-Boigny in his narrative because the virus that destroyed the relative peace of Côte d'Ivoire originated from his government. He was the President "du pays pendant la guerre froide" (Kourouma 9) and that of his appointee, Henri Konan Bédié who became the President after his death in December 1993. Incidentally, it was Bédié who "introduced into the public discourse the concept of *Ivoirité*" (Sany 4), an identity policy that disqualified Alassane Quattara from presidential elections and brought national division between the South and the North, Christians and Muslims and the perceived 'étrangers' and 'Ivoiriens'" during the General Robert Gueï's military government.

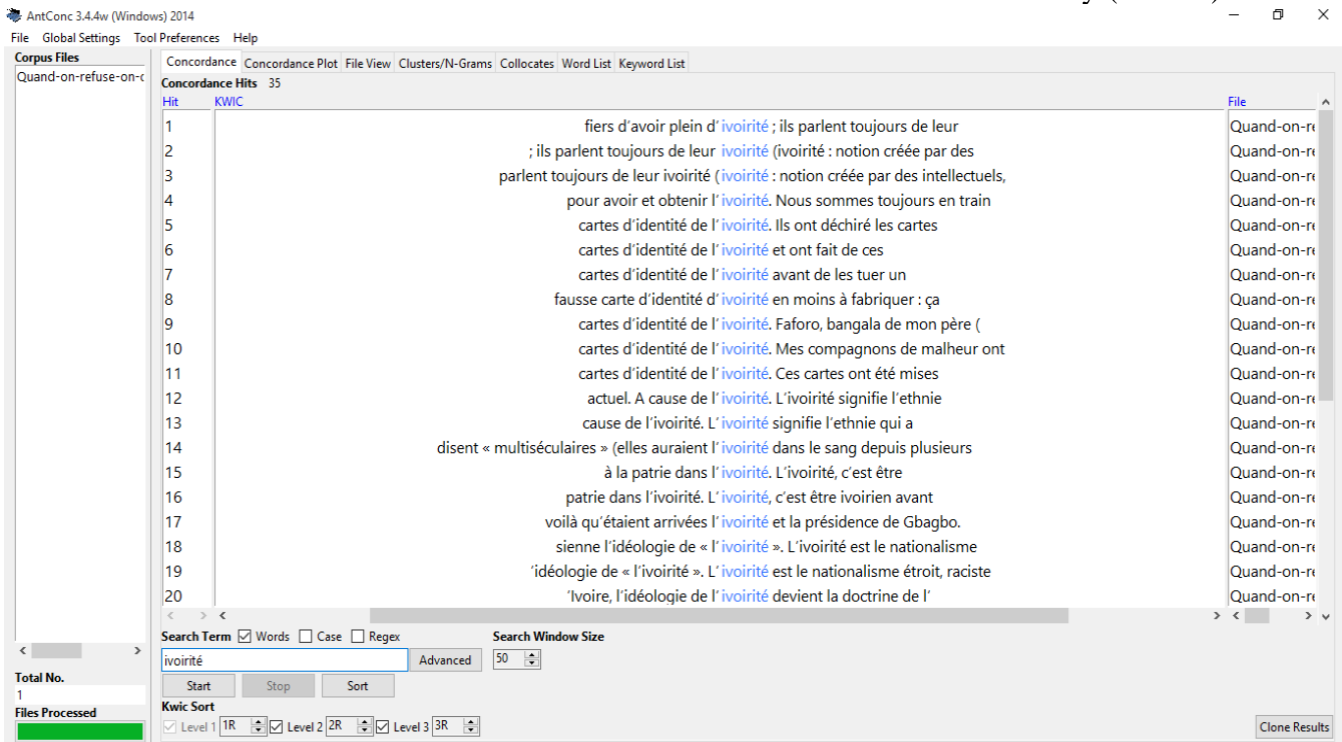construction of African unity (Boa 75). Introduced

Figure 3: Concordance and Collocates of Ivoirité

Laurent Gbagbo's government came after the military coup and his second-position ranking in the Word List justifies the fact that he ratified the concept of *ivoirité* and used it as a political gain. In Kourouma's views, the civil war came to be because of the politicization of identity based on national origin thereby creating a security dilemma, a "situation in which each party's efforts to increase its own security reduce the security of the others" (Kirwin 43). Gbagbo as a Bété ensured the hegemony of his tribe over the Dioula. In *QOR*, Birahima as a Dioula narrates his experiences that illustrate the vengeance of the Bété on the Dioula, though it was not the beginning of ethnocentrism that culminated into the politics of ivoirité in Côte d'Ivoire.

4.0. DYNAMICS OF *IVOIRITÉ* AS POLITICS OF OTHERNESS

The term *ivoirité* was coined in 1974 by Pierre Niava while he was speaking of Niangoran Porquet's work and project as a young scholar and it described the Ivorian's specific values for the

into politics by Bédié, *ivoirité* [ivorianness] is now a political and xenophobic concept that "vise à identifier les ivoiriens purs des étrangers ayant acquis la nationalité ivoirienne, la confiscation des avantages et privilèges acquis par ceux-ci au profit des ivoiriens purs en un mot leur persécution » (Sanoussi 320). As a political category, ivorianness deepened the social, political and religious differences between the Christian Bété who "sont fiers d'avoir plein d'ivoirité" (Kourouma 16) and the Moslem Dioula described as foreigners. A quick concordance search gives an output as seen below:

Kourouma's text is majorly concerned with the problem of identity as the root cause of the Ivorian civil war and this discourse of identity is premised on the concept of *ivoirité* which gives 35 as Concordance Hits in AntConc. It ranks 108 with Freq of 35 as stated. The "collocation study" of the term shows its total number of collocate types as 147 and its collocate tokens as 350. In Sorina Postolea's words, *type* refers to a particular word taken into account only once, while *token* refers to all of its occurrences or instantiations in that corpus (Postolea 53); "Cartes" [card] and "identité"

[identity] are recognized collocates in context of ivoirité. While "Cartes" ranks 25 with Freq of 10, Freq (L) of 6 and Freq (R) of 4, "Identité" ranks 35, with Freq of 7 and Freq (L) of 7. It is important to point out that AntConc analysis sees the words as separate because it is a compound noun "Carte d'identité" [Identity card] as seen from its Key Words In Context (KWIC). This is a major limitation of the software when applied to a foreign language like French. Collocations are those lexical items that natural and commonly keep company (Awa 13) and "three criteria for identifying collocations have been proposed. These are: distance, frequencies and exclusivity" (Brezina, McEnery & Wattam 140). In essence, "Carte d'identité" naturally and commonly keeps company with "ivoirité" if measured with the criterion of frequencies and this occurrence is not linguistically accidental; it is ideologically charged in language use.

Structures of language stand for ideological orientation (Awa 15) and it is evident that "Carte d'identité" as frequent collocate of ivoirité in Kourouma's text is symbolic. It illustrates the postcolonial use of identity cards to materialize and dematerialize nationalism and nationhood. Identity card becomes a symbology of nationalistic/ethnic identity and consciousness, and it explains why the Dioula people are "toujours en train d'achéter des fausses cartes d'identité pour avoir et obtenir l'ivoirité" (Kourouma 16). Right from the governments of Houphouet-Boigny, Bédié, Gueï and Gbagbo, political machinery has been on the shoulders of the Bété and it implies that the Dioula have some difficulty in obtaining real identity cards; if not, there is no need for their recourse to fake identity cards as a means of affirming their Ivorian-ness. It further means that the existential presence of the Dioula is *othered* in the Ivorian space that has become what Achille Mbembe (42) refers to as "the society of enmity" where hostility becomes the order of the day because the Ivorian identity has been made a subject of dispute.

From Kourouma's discourse on identity, the Ivorian *ivoirité* demonstrates the dynamics of otherness and the hegemony of ethnic dominance. Othering, in

Brons's words, "sets up a superior self/in-group in contrast to an inferior other/out-group" (70) In colonial and postcolonial discourse, othering appears an analytical poetics that explains the cultural dynamics and *différend* in contact zones. Edward Said's explication of its workings is instrumental to the understanding of Kourouma's use of ivoirité as an othering element and my position is acceptable because the Ivorian war is an offshoot of colonialism that unified different African tribes into nationhood without considering their sociohistorical and cultural inclinations. Said argues that the colonized countries were described in ways which denigrated them, which represented them negatively, as an *Other*, in order to produce a positive, civilized image of British society (Mills 96). Kourouma does not intend to challenge but to describe othering as a stereotypical raw material for the construction of the Other in where tribes and cultures seek domination. His discourse positions the Dioula as the subaltern subject, who is defined in Gayatri Spivak's term as "the non-elite colonized subject." (Mills 107) and the dominant tribe is the Bété and the young narrator, Birahima, himself a Dioula admits that "les bétés n'aiment pas les Dioulas" And to justify this accusation, a concordance search is administered. "Dioulas" has a Concordance Hits of 66 and the writer uses qualificative adjectival words such as "tremblants", "terrorisées", "arrêtées", "fusillées" to demonstrate the unfortunate result of othering before and during the Ivorian civil war. In that case, the Dioula can be compared to the Tutsi, referred to as "inyenzi ou les cafards" [cockroaches] by the Hutu in Scholastique Mukasonga's post-Rwandan genocide literature. Kourouma rather compares the slaughtered Dioula as "des lapins", "des cancrelats" and "des sauterelles" (13).

"Rabbits", "roaches" and "grasshoppers" refer to the Dioula who are considered as "étrangers" [foreigners]. Two interpretations are possible for this metaphorical *othered* comparison. Roaches and grasshoppers are non-human creatures with high fertility rate because "les Dioulas sont toujours nombreux en Côte d'Ivoire" (Kourouma 13). Besides, grasshoppers have destructive tendencies against green vegetations. In essence, the existence

of the Dioula is considered inimical to the sustenance and survival of the Bété. Secondly, rabbits and roaches are delights of hunters and fishermen while grasshoppers are children's favorite in African context. If all these animals are used as referents to the Dioula, it means that they are not considered to be human. It explains why the Ivorian gendarmerie killed them and cast them into Yopougon's open pits. It is apparent that the genocidal dimension of interethnic wars or conflicts is premised on the stereotypes that are elements of othering enemy tribes.

5.0. DEATH OF THE ENEMY TRIBE IN KOUROUMA'S IVORIAN CIVIL WAR

this can be revealed through what I call the "concordance of death". By concordance of death, I intend to say a list of occurrences of the word "mort" (death) in the corpus under study. In the word list presented in Figure 1, the word "mort" (death) occurs 34 times and maintains 111th position in rank while a wild card search gives 50 Concordance Hits. It means that a mention of "mort" is done after three (3) pages as the pagination of the *Quand on refuse on dit non* is less than 151, thereby showing the omnipresence of deaths of the enemy tribe in the war narrative.

An AntConc processing of the corpus demonstrates patterns of death and the instrumentations that
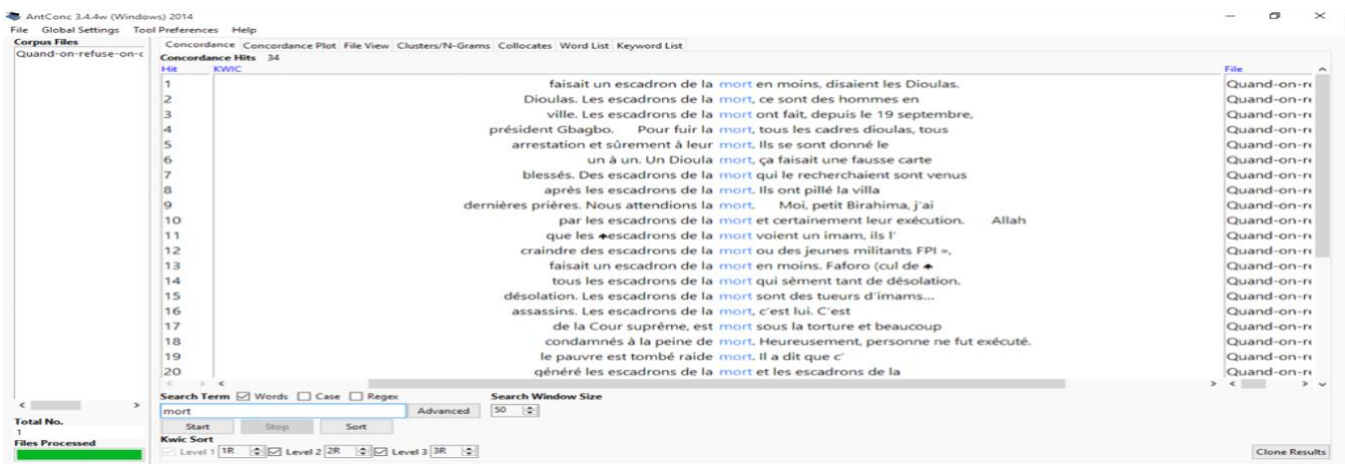

Figure 4: KWIC of "Mort

facilitate them. A study of Key Words In Context (KWIC) Concordance illustrates this point below.
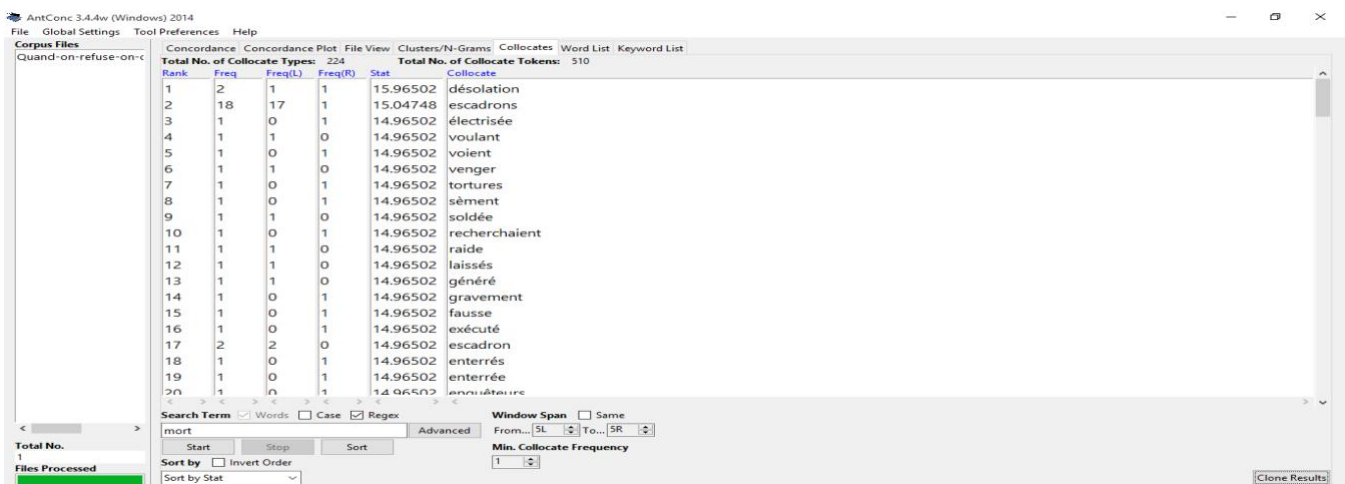

Figure 5: "Escadrons de la mort" (Squadrons of death)

Kourouma is preoccupied with the massacre of the Dioula who are perceived as the enemy tribe and

The Key Words In Context list shows the ubiquity of a phrase "escadrons de la mort" (squadrons of death" throughout the corpus. When a collocation analysis of AntConc is done, "escadrons" occupies the second position in the ranking of the total number of 218 collocate types and 500 collocate tokens of the word "mort" as Kourouma intends to demonstrate by these frequencies the "how" of the deaths of the Dioula tribe during the Ivorian civil war. Its Freq is 18 and Freq (L) is 17. The first collocate in Rank is "désolation" (desolation) which is the direct consequence of the activities of the "escadrons de la mort" or young militants of FPI as shown below:

Aside "désolation", other collocates of "mort" (death) that are worthy of mention are "venger" (avenge), "tortures" (tortures), "exécuté" (executed), "enterrées" (buried) among others; they describe the misery and monstrosity of death, experienced by the Dioula ou Malinké who are stereotypically animalized in the psyche of the squadrons of death. Deaths are equally experienced by the camp of Gbagbo and the Bété. The Dioula rebels or "les Kamajors" show as well mastery of dramatized massacre of government gendarmes who are "mitraillés comme des bêtes sauvages" (Kourouma 17). Like Sierra-Leonean and Liberian civil wars described in Kourouma's *Allah n'est pas obligé*, the Ivorian war chronicles destructions and deaths of both parties: the Dioula and the Bété, thereby undermining the social co-existence of different ethnic groups in Côte d'Ivoire.

Conclusion

With the electronic corpus of Kourouma's *Quand on refuse on dit non*, using AntConc as corpus tools, I was able to create word-lists and keywords that are analyzed through postcolonial theory. My postcolonial analysis is premised on the insufficiency of corpus tools to interpret literary works and the need for corpus linguistics and its tools to become methodological catalyst for multiple theoretical interpretations. With AntConc tools applied to my corpus, I understood that the corpus' Word-List is influenced by the artistic

ideology of Kourouma and the position of culpability occupied or appropriated to all political figures implicated in the Ivorian crisis. The occurrences of a highly-contested term "ivoirité" are indicative of the root cause of the war and its collocates demonstrate consciously or unconsciously how enemy tribes are *othered* and stereotypically represented in African war narratives. Othering becomes facility and instrumentation for animalization of opposing ethnic groups in the dynamics of hegemony that characterizes postcolonial African societies. Therefore, the subalterns can only speak through weapons of war because it is the only language opposing ethnic groups understand. These findings demonstrate the value of deploying computational tools like AntConc to interrogate African francophone literary texts and lay a strong foundation for further studies in African digital humanities and francophone studies. It, however, problematizes the use of digital textual tools without proper theoretical foregrounding in cultural studies.

Without the deployment of cultural theories in literary discourses of digital humanities and its digital methodologies, the exploration of the full potentials of African (remediated and born-digital) literary texts will be greatly undermined. This is because different computational features of digital text tools are insufficient to interpret the linguistic and ideological nuances inherent in African creative works. If digital humanities scholarship is to discover and enrich the epistemic resources of African literature, literary scholars should be open to theoretical frameworks that shape literary understanding and interpretations of textual meanings. Secondly, if digital humanities and corpus stylistics are to flourish with African literary texts in the future, there is need to build a repository for African literary works through remediation and dematerialization. The reason is based on the fact that works of first-and-second generation writers exist mainly as hard copies in different libraries and bookshops in Africa.

WORKS CITED

Ajah, Richard. "Introduction to African Electronic Literature." *MADSEJ,* vol. 1, iss.1, October 2023, pp.56-66.

Anthony, Lawrence. "A Critical Look at Software Tools in Corpus Linguistics." *Linguistic Research*, vol.30, no.2, 2013, pp.141-161.

Anthony, Lawrence. "AntConc: Design and Development of a Freeware Corpus Analysis Toolkit for the Technical Writing Classroom." *2005 IEEE International Professional Communication Conference Proceedings*, 2005, pp.729-737.

Awa, Onyekachi Jacinta. "Deviant Collocations as a Writing Technique in African Literature: A Stylistic Study of Helon Habila's *Measuring Time.*" *European Journal of English Language and Literature Studies*, vol.4, 2016, pp.13-21.

Betrand-Gastaldy, Suzanne & Marchand, Paul. « L'analyse du texte littéraire assistée par ordinateur : Essai d'illustration avec regards et jeux dans l'espace, de Saint-Denys Garneau, traite avec le logiciel SATO. » *Documentation et bibliothèque*, vol.4, no.52, 1999, pp.55-66. https://doi.org/10.7202/1032764ar

Boa, Thiémélé Ramsès. « Ivoirité, identité culturelle et intégration africaine : Logique de dédramatisation d'un concept. » *Synergies Afrique Centrale et de l'Ouest*, no.3, 2009, pp.75-83.

Brezina, Vaclav, McEnery, Tony & Wattam. Stephen. "Collocations in Context: A New Perspective on Collocation Networks." *International Journal of Corpus Linguistics*, vol.20, n.2, 2015, p.139-173. https://doi.org/10.1075/ijcl.20.2.01bre

Brons, Lajos. "Othering, An Analysis." *Transcience*, vol.6, no.1, 2015, pp.69-90.

Burdick, Anne et al. *Digital Humanities*. The MIT Press, 2012.

Dacos, Marin & Mounier, Pierre. *Humanités numériques*, Institut Français, 2014.

Eve, Martin Paul. *Digital Humanities and Literary Studies*. Oxford University Press, 2022.

Fallery, Bernard & Rodhain, Florence. Quatre approches pour l'analyse de données textuelles : lexicale, linguistique, cognitive et thématique. *XVIème Conférence de l'Association Internationale de Management Stratégique AIMS*, 2007, pp.1-16. https://hal.science/hal-00821448

Fletcher, Jerome. "Performing Digital Literature." *Caracteres. Estudios Culturales y Criticos*, vol.4, no.2, 2015, pp.18-42.

Gehrmman, Suzanne. "The Child Soldier's Soliloquy. Voices of a New Archetype in African Writing." *Etudes littéraires africaines*, no.32, 2011, pp.31-43. https://doi.org/10.7202/1018640ar

Kikukama, Monzat O. « Les hardiesses langagières dans *Quand on refuse on dit non* d'Ahmadou Kourouma. » *Synergies Afrique des Grands Lacs*, no.1, 2012, pp.101-117.

Kirwin, Matthew. "The Security Dilemma and Conflict in Cote d'Ivoire." *Nordic Journal of African Studies*, vol.15, no.1, 2006, pp.42-52.

Kodah, Mawuloe. K. "The Language of a Child-soldier Narrator as the Voice of Truth: a Critical Study of Ahmadou Kourouma's *Allah n'est pas obligé.*" *IOSR Journal of Humanities and Social Sciences (IOSR-JHSS)*, vol.15, no.2, 2013, pp.74-83. http://dx.doi.org/10.9790/0837-1547483

Kourouma, Ahmadou. *Quand on refuse on dit non*, Editions du Seuil, 2004.

Mahlberg, Michaela & McIntyre, Dan. "A Case for Corpus Stylistics: Ian Fleming's *Casino Royale*. *English Text Construction*, vol.4, no.2, 2011, pp.204-227.

Mayer, Ariane. « *Hermeneutica,* une expérience numérique de l'interprétation. » *Sens Public*, no.03, 2017, pp.1-8. https://doi.org/10.7202/1048829ar.

Mbembe, Achille. *Necropolitics*. Translated by Steven Concoran. Duke University Press, 2019.

McIntyre, Dan & Walker, Brian. *Corpus Stylistics: Theory and Practice*. Edinburgh University Press, 2019.

Mills, Sara. *Discourse*, Routledge, 2014.

Pawlikova-Vilhanova, Viera. "The African Personality or the Dilemma of the Other and the Self in the Philosophy of Edward W. Blyden, 1832-1912." *Asian and African Studies*, vol.7, no.2, 1998, pp.162-175.

Postolea, Sorina. "State-of-the-art Text Linguistics: Corpus-Analysis Tools. A Practical Demonstration." *Philologica Jassyensia*, vol.1, no.19, 2014, pp.51-59. http://dx.doi.org/10.13140/RG.2.1.2380.59 28.

Risam, Roopika. *New Digital Worlds: Postcolonial Digital Humanities in Theory, Praxis, and Pedagogy*. Northwestern University Press, 2019.

Rockwell, Geofrey. "What is Text Analysis, Really?" *Literary and Linguistic Computing*, vol.18, no.2, 2003, pp.209-219.

Sanoussi, A. « Expérience politique au Nigéria : Une panacée au conflit de l'ivoirité dans *Quand on refuse on dit non* d'Ahmadou Kourouma. » *Language and Literature in the Dis/service of* Humanity, edited by Kayode Atilade et al, God's Grace Prints, 2016, pp.318-331.

Sany, Joseph. "Education and conflict in Cote d'Ivoire." *Special Report 235*, United States Institute of Peace, 2010.

Sibirtseva, Vera. "Computer-Based Processing of Literary Works and Study of Literature" (April 28, 2014). *Higher School of Economics Research Paper No. WP BRP 07/LNG/2014*, Available at http://dx.doi.org/10.2139/ssrn.2430175.

Siemens, Ray G. "A New Computer-Assisted Literary Criticism? *Computers and the Humanities*, vol.36, no.3, 2002, pp.259-267. https://doi.org/10.1023/A:1016134426453

Spencer, Hannah. *Semantic Prosody in Literary Analysis: A Corpus-based Stylistic Study of H. P. Lovecraft's Stories*. Master's Thesis, University of Huddersfield, 2011.

Microsoft Word - Hannah Spencer MA by Research.doc (hud.ac.uk)

Studer, Patrick. *Historical Corpus Stylistics*. Continuum, 2008.

Thomas, Ed. "Word Frequency and Collocation: Using Children's Literature in Adult Learning." *ICAME Journal*, vol.39, 2015, pp.85-110. DOI: 10.1515/icame-2015-0004.

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Environmental Digital Literature: An *Instrumentum Laboris* for Eco-social Engineering

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Abstract

Climate crisis is a global concern as manifested in unprecedented flooding, bushfires, heat waves, global warming, and desertification amongst others. There is also a growing attention in terms of scholarship and research across disciplines to address and understand the debilitating effects of environmental crises. Using Halliday's systemic meta-function of ideation and Di Rosario's entax theory, this paper examines "Climatophosis", an eco-digital poem in order to identify the eco-lexicons in the poem, and the semiotics of digitalization as tools for making environmental statements for intervention in the climate crisis. The analysis reveals the frequency of the eco-lexicon items, the affordances of environmental digital literature such as hybridity, multimodality, multilingualism, audio-visuality, ergodic features, and the human-computer interaction. Also important is the extension of Di Rosario's entax theory to include meta entax as identified in this study. The conclusion is that environmental digital literature is a veritable instrument to promote eco-advocacy and eco-social engineering through the creation of environmental consciousness and ethical considerations in the care for the environment to mitigate the climate crisis.

Keywords: Climate crisis, Digital Humanities, eco-social engineering, environmental digital literature, meta entax

Résumé

La crise climatique est un problème mondial, comme le montrent les inondations sans précédent, les feux de brousse, les vagues de chaleur, le réchauffement climatique et la désertification, entre autres. De plus, il y a de plus en plus d'attention dans les études et la recherche dans plusieurs disciplines pour comprendre et traiter les effets négatifs des crises environnementales. En utilisant la méta-fonction systémique d'idéation de Halliday et la théorie d'entax de Di Rosario, cet article analyse Climatophosis, un poème éco-numérique, afin d'identifier les éco-lexiques dans le poème et la sémiotique de la numérisation comme outils pour faire des déclarations sur l'environnement et proposer des interventions face à la crise climatique. L'analyse montre la fréquence des éléments de l'éco-lexique et les avantages de la littérature environnementale numérique, comme l'hybridité, la multimodalité, le multilinguisme, l'audio-visualité, les caractéristiques ergodiques et l'interaction humain-ordinateur. Il est également important de noter l'extension de la théorie d'entax de Di Rosario pour inclure la méta-entax, telle qu'identifiée dans cette étude. La conclusion est que la littérature environnementale numérique est un outil efficace pour promouvoir l'éco-militantisme et l'éco-ingénierie sociale en créant une conscience environnementale et en mettant en avant des considérations éthiques pour le respect de l'environnement afin de réduire la crise climatique.

1.0. INTRODUCTION

Pervasive and persistent environmental crises resulting to climate change demand persistent individual and collective attention. Global concerns and responses to mitigate the climate crises have occupied centre stage in the global environmental discourse space. Notable is the fact that attention is shifting to interdependent and multidisciplinary scholarship to address environmental and global issues. This is the impetus in the growing scholarship in digital humanities which covers digital literature. This paper is an exploration of environmental digital literature as an emerging disciplinary discourse by analyzing "Climatophosis", an environmental digital poem by Yohanna Joseph Waliya. The aim is to identify the features of digital literature in the poem and to argue that eco-digital literature is a veritable instrument for eco-social engineering. Specifically, the paper seeks to identify the features of digital environmental poems using Climatophosis to examine how the digital affordances can be deployed for advocacy to create environmental awareness for the safety and survival of the environment.

The advent of digital media as well as the general advancement in science and technology has brought many changes to human culture and society. It has changed the way people live, think, move, write, study, and even worship. It can simply be said that computers reconfigured the world or in the words of Marc Andreessen, "software is remaking the world" (cited in Gobble 1). This remaking or reconfiguring has also brought changes to the methods, themes, and tools of studies in different disciplines. One of the effected disciplines is Humanities. Stepanskaya et al., see the discipline of Humanities as a humanizing messiah in the universities of Russia and by extension the society (8718). Digital Humanities' practical and applied appeals, make it one of the ways to sustain the discipline of humanities in the face of a generation whose research is driven by applied, practical, and productive scientific orientation. It is a hybrid discipline, which combines computing/digital skills and skills and knowledge of humanities. Its goal is "to model the world around us through success and failure in order to arrive at a better understanding of what we know and don't know about humankind, their activities, artifacts, and record" (Vanhoutte 147).

More still, Digital Humanities makes use of digital literacy and skills in solving human problems. Given that we are in the digital era, the understanding and utilization of digital literacy drives human engagement in all spheres of life (Egbe 20). It is in this light that the domain of digital literature finds relevance in the integration of digital literacy and humanities. The present research examines *Climatophosis,* a digital poem, which was inspired by the environmental crises in northern Nigeria and to demonstrate how the digital affordances can be used as instruments for eco-digital social engineering to mitigate climate crisis.

1.1. Clarification of Concepts

Certain concepts are necessary for the understanding of this investigation. These concepts are highlighted below.

i. **Electronic Literature**: This refers to "works with important literary aspects that take advantage of the capabilities and contexts provided by the stand-alone or networked computer" (Simanowski 27). Digital literature has the following features: It is digitally born with hyperlink and hypertext as well as coded. It is a literary creation within the popular culture genre that is hybrid, multimodality, multilingual, and interdisciplinary. As a digital creation, it involves human-computer interaction; it is user-friendly, aesthetic, combining audio-

visual as well as ergodic features (see Ugwumgbo, *Eco-Linguistics* 25).

ii. **Features of digital literature (Adapted from Ugwumgbo, *Eco-Linguistics* 25, Di Rosario, *Electronic poetry* 11-23, Egbe 20)** Digitally born, 2. Has hyperlink and hypertext, 3. Coded, 4. Literary creation, 5. Hybridity, 6. Multimodality, 7. Multilingual, 8. Aesthetics, 9. User-friendliness, 10. Audio-visuality, 11. Ergodic features, 12. Interdisciplinary, 13. Popular culture, 14. Involves Human-Computer interaction.

iii. **Digital eco-literature verses Eco-digital literature:** These concepts are related but not the same. Digital eco-literature is an umbrella concept, which includes eco-digital literature as well as other works of eco-concern on social media or any digital platform. It covers any literature of environmental concern that is composed on and with any digital aid. Eco-or environmental digital literature refers to graphically programmed literary works that are of eco-concern which is digitally born. This means it has features of electronic literature as outlined above. While every eco-digital literature is digital eco-literature, not every digital eco-literature is eco-digital literature, essentially because of how each is created and the medium of its creation. The present research is falls under eco-digital literature since the poem under investigation is digitally born with the identified features of digital literature which addresses environmental issues.

1.2.Digital Literature and Scholarship

A growing literacy in literature and language is digital or electronic literature and language. However, what have not been so popular among scholars are studies centered on digital texts that dwell on environmental crises. There few research studies of digital eco concern despite the promising role of the digital platform with regard to the promotion of ideology and social engineering in general. Nevertheless, African electronic literature

is gradually gathering momentum following the first African Electronic Literature Alliance International Workshop Conference (AELAIWC) was held in 2021, at the University of Lagos. While one agrees with Ajah (56) that "African electronic literature lacks critical attention, with scholars questioning the Electronic Literature Organization's limited representation of African works like Flash Fiction Ghana and Bent not Broken", the digital space will open gradually for digital literary works with focus on the environment.
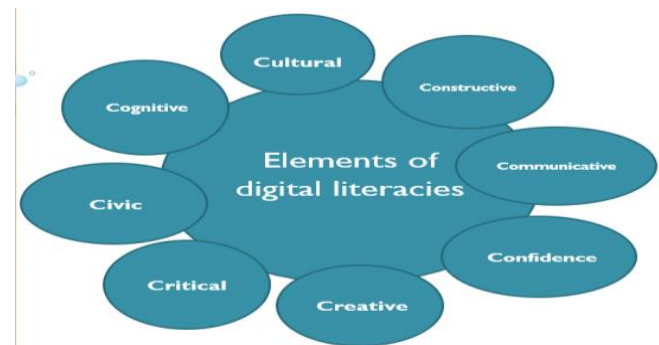
Elements of Digital Literacy:

Figure 1. Elements of digital literacies (adapted from Source: Egbe 20)

1. Cultural: Requires technology use in different contexts and awareness of the values and practices specific to varying contexts. Technology can be used in sociolinguistic studies.
2. Cognitive: Enables mastery of the use of technological tools, software, and platforms.
3. Constructive: Requires reusing and remixing existing resources depending on need, or possibly adapting them into new resources. In fact, Digital Humanities originated as a result of adapting technology to the study of humanities.
4. Communicative: Requires awareness of different communicative devices that are both digital and mobile.
5. Confidence: Places emphasis on gaining competence with digital technologies and, the ability to create an environment for practicing skills and self-learning.

6. Creative: Creates new data in digital environments while taking risks, developing skills, and producing new things. A major creative tool of digital literacy is the multilingual and multimodal feature of the digital platform.
7. Critical: Requires the digital learner to develop various perspectives while actively taking different circumstances into account.
8. Civic: Develops and helps acquire the concepts of democracy and global citizenship as individuals become participants in society (O'Byrne, qtd. in Egbe 21-23).

Hence, digital literature as a branch of digital humanities combines studies in digital literacy and humanities. In environmental digital literature, in which digital literature becomes a medium for eco advocacy, the elements of digital literacy shines out as veritable tools for eco-social engineering.

2.0. LITERATURE REVIEW

Ugwumgbo (*Re-Greening*) *investigated* environmental literature and identified the types, causes and consequences of environmental degradation. Although the study was not on eco-digital literature per se, it suggested the use of eco-techno-criticism theory, which is a practical approach to eco-criticism by advocating technologically-driven text analysis as well as tech-solutions to environmental problems. The present study benefits from the eco perspectives of Ugwumgbo (*Re-Greening*) and extends its focus to digital eco-critical studies.

Earle is one of the few early works to review the digital affordances of *Climatophosis*, which he describes as a digital work, which neither begins nor ends. The fluidity of the poem is interpreted as a metaphor for the seemingly intractable environmental problem in the universe. This current study leans on the eco-interpretation of the digital affordance of *Climatophosis* by Earle on one hand and the textual analysis of the poem with regard to the themes of the poem and how to read the poem by Gackowski on the other. Ajah explored African electronic literature, describing its subgenre, origins, authorship, etc. noting that there is need to

explore African electronic literature as an agent that can reshape global culture. In like manner, Waliya ('African Literature on MAELD' 56-57) discussed the canonicity, importance, and future of African electronic literature in terms of data documentation and the creation of database for African electronic literature, which offers hope to greater exploration and advancement of scholars of African electronic literature. From the literature review, it is obvious discourse of African electronic literature is still at its infancy and has no generated enormous critical attention and study. This is one of the impetuses for the current focus on *Climatophosis* by Waliya.

3.0. METHODOLOGY

Mixed-theoretical approach was used in this study. Halliday's systemic meta-function of ideation is used in order to identify the eco-lexical items of the poem used to depict and speak about the environment. Such an analysis shows how eco-concepts and perspectives used in the digital poem express issues relating to the environment. With reference to the digital affordances of the poem, Di Rosario's entax theory was employed to account for the semantics of semiotics within and beyond the texts. Although there are other digital theories such as Aarseth's cybertext theory, Hayles' technotext theory, amongst others, Di Rosario, (*Electronic poetry* 86-91) was found to be more appropriate for this research. This is because, Di Rosario's entax theory is suitable for the analysis of forms, structures and typography of electronic poetry, in order to build a syntax of the electronic space. Unlike syntax, which refers to grammar rules of linguistic signs, entax considers the relation between letters in the space (Giada, 149). Di Rosario (*Electronic poetry* 86-87) identifies three domains of entax, namely micro, meso and macro entax, which corresponds to the three levels of linguistic studies, morphology, semantics and pragmatics.

At the micro-entax level, which roughly corresponds to morphology, words become an entity or a whole with parts but not within a context. It concerns the internal arrangement, relationship and features of the items that make up the E-words

in E-literature; text movement, fonts, letters, color change, and the configuration of typographic signs in lines and text blocks. It deals with the morphemes of the text. It is not meaning centered, though can be metaphorically applied, with literary license. At the meso-entax domain which roughly equates semantics, a word is considered as a whole without a part, a whole within a part (the entire text), and relates to the graphic structure of the entire document. This domain deals with the lexeme by recreating an image with words as with calligrams or reproducing a movement with words such as describing pregnancy by writing the word such that it has the shape of a woman or a car written with the shape of a car. The macro-entax, which relates with pragmatics, concerns the interpretation of the graphic and visual structures of the whole document, together with the textual meaning and theme of the poem within a given context especially through the deployment of metaphors.

Data Presentation and Analysis

What follows is a presentation of the data of this investigation. The textual version of the poem is presented in both the English and French versions. The text and some parts of the graphics are presented through a screenshot of the poem. A pie chart containing the percentage of the different types of words as well as a word cloud representing the word frequency of the text are presented.

Text of *Climatophosis* in English and French

Climatophosis by Yohanna Joseph Waliya, Nigeria

English Version

The earth shrugs,
Says,
Humanity is a problem to itself
and other living things:
they have learned to take but,
not to give to their environment.

The sea overflows,
Says,
People fill me with plastic,
change my temperature and currents,
and kill my living things.

The glaciers melt,
Say,
I am thousands of years old
but now am disappearing
and will raise the ocean levels to flood the cities.

The sun scorches,
Says,
People are to blame because they cut down the trees
and burn so much carbon, they warm the earth itself.

French version

La terre hausse les épaules,
dit-elle,
l'humanité est un problème pour elle-même
et pour les autres êtres vivants:
ils ont appris à s'en bénéficier,
sans donner à leur environnement.
La mer déborde,
dit-elle,
Les gens me remplissent de plastique,
modifiant ma température et mes courants,
et tuent les êtres vivants.

Le glacier fonde,
dit-il
J'ai des milliers d'années,
mais maintenant je disparais
et je vais élever le courant de l'océan,
pour inonder les villes.
Le soleil brûle,
dit-il
Les gens sont à blâmer parce qu'ils coupent les arbres
et brûlent tellement de charbon qui réchauffent la terre-même.

4. ANALYSIS

Climatophosis is a coinage from two words: 'climate', and 'metamorphosis'. It refers to the changes in the environment occasioned by climate change which is the focus of the poem. This eco-

digital poem makes the environment speak for herself through digital affordances by which the environment blames climate change on the activities of humans. The poem was electronically composed, written in simple English and French in which the texts crisscross each other, highlighting multimodality as a feature of eco-digital literature. The texts combine graphical features along with literary narrative. The entire texts, not just a word or an alphabet, have the movement feature technically known as ergodic feature, which exemplifies the meta entax dimension of the poem. Waliya's environmental poem is a poem of lamentation, in which the environmental bodies: *sea, glacier, sun and earth*, are personified to create awareness about climate change. The poem written in a reported speech, blames the whole issue of climate change on humanity. No wonder there is high frequency of words related to human agents in the poem. There is also the presence of flora lexicon because the trees (*People are to blame because they cut down the trees (*Waliya, *Climatophosis*) are one of the recipients of the activities of humanity, which cause harm on the environment. This point is also supported by the high frequency of abiotic eco-lexicon such as: *things, people, says, living, earth* in the poem.

Personification is a major literary tool used in the poem to create concreteness. The environmental bodies mentioned in the eco-digital poem took up human qualities as illustrated in these extracts from the poem:

The <u>earth shrugs…says</u>…. The <u>sea overflows, says</u>…. The <u>glacier …says</u>…. The <u>sun… says</u>….

Through the use of first-person personal pronoun, "I' the environment is personalized as a living being which narrates its story of lament of what it was and is but no longer that which it was and it is. These are conveyed in the following:

I am thousands of years old
but now am disappearing
and will raise the ocean levels to flood the cities

People fill me with plastic,
change my temperature and currents,
and kill my living things

The diction of the poem is in simple English and French. The texts of both languages crisscross each other thus accentuating the digital affordance of the poem as digitally created. The use of these two languages is symbolic. Earle provides a metaphorical nuance to the multilingual feature which gives the feeling of many different conversations going on at once, all on the same topic but unrelated directly. These features are mostly within the domain of micro-entax, which include, "fonts, letters, and the configuration of typographic signs in lines and text blocks. It deals with the morpheme – like for instance words' forms, colors changing" (Di Rosario, *Digital poetry,* 115). The texts' ergodic or non-ergodic behaviors and the background colors and designs which add to the multimodality of the poetic digital features are included as seen in Figure 2 below.

Figure 2: Digital Face View of "Climatophosis" before it is launched.

Before the launching, everything is static (Figure 2 above). There is no movement. The texts, the background, the sun, are all serene. The background has ergodic features of a moving cloud when launched. The background of the poem is made up of multiple colors and features. There is neither color change nor changes in font size. Nevertheless, three major features appear static throughout the dynamic movement of the poem*:* the name of the author/ the place / year of publication, the title of the poem and the sun.

The texts have many features, which include animation features, font size, type, color, and movement. Some palpable animation features are span, transition, move-left infinite, move-right, row-reverse, rotate. Text colors are floral-white, #f0e129", light-sky-blue, hsl (22, 94%, 50%). Text alignment features are left, center, justify.

Figure 4. Pie chart of the biotic eco-lexicon of "Climatophosis".

Figure 3: Screenshot of the first verse of the poem

In addition, a digital affordance added to the digital text which is so important is how to read the text of the poem. The poem is read by launching the poem and hovering the mouse on the texts. The texts on which the mouse is hovered stops moving. This allows the reader to read the particular block of texts. When the mouse is released, the texts continue to move. The data presented below are a summary of the abiotic eco-lexicons of the poem presented in a pie-chart and word cloud as shown in Figures 3 and 4 respectively.
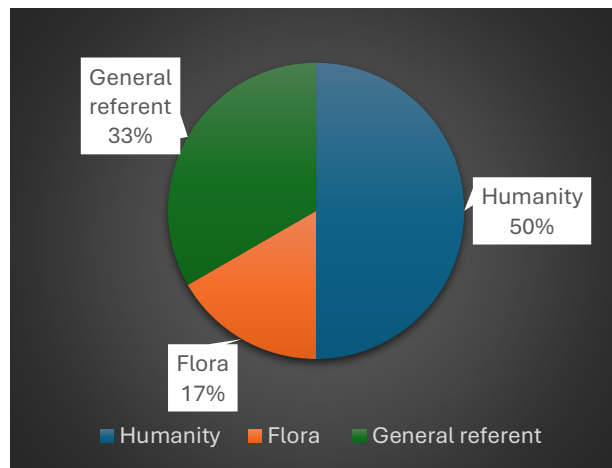
Figure 4 contains the percentage representation of the biotic referents in "Climatophosis". There are three referents, *humanity, flora,* and *general referents*. While *humanity* has 50 percent, which is the highest percent, *flora* and *General* have 17 and 32 percent respectively. Recall that the lexicons under *humanity* are *humanity and people.* Consequently, *humanity* having the highest frequency rhymes with the concern of the poem, which laments the effect of human activities on the environment.

The biotic *flora* has only one referent (*trees*) in the poem. It shows that, the eco-digital poem did not go into looking at the effect of climate change on the many types of *flora* that are in existent. However, he used the word '*trees'* as a synecdoche and metonymy for *flora*. *Tree* is a type and part of *flora* (plants), which is used for the entire class of *flora* in the universe. It is the word that is mostly associated with the word *flora*. This helps the poet to achieve economy of words. And that is one of the functions of language- one can say less or more with language as a system.
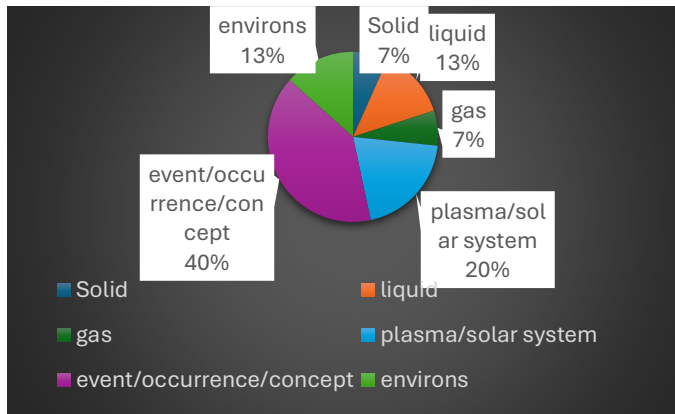
Figure 5. A pie chart showing the Abiotic eco-lexicons of "Climatophosis"

In Figure 5, among the abiotic (non-living things) eco-lexicon referents, *events/occurrence/concepts* rank highest with 40 percent. This shows how the poet describes environmental concepts and situations. He simply retells the environmental crises with the tool of language. Next in rank are *liquid* and *plasma/solar system*, having 20 percent occurrence each. This shows that the water bodies and the solar systems are well considered in the poem. And they are concrete places often affected by environmental crises. In fact, in the poem, they are personified as lamenting and blaming *humanity* as the architect of climate change. The *environs*, which refers to the terms used for places or locations in the poem has 13 percent. This is indicative of the settings in the poem. *Solid* and *Gas* have the lowest and the same percent.

Figure 6: Word cloud of "Climatophosis"

From the word cloud above, the most conspicuous words are: *people, earth, says, living, things*. This shows the interaction between the things within the environment. It is important to point out the process verb, *says/say* which occurs four times in the poem. The verb is used in the context of a participant, in this case, the earth/environment reporting the process of destruction and harm done to it. It is an important epistemic choice because the environment speaks for itself and tells of its debilitating narrative of what it has suffered through human hands and actions.

The multimodal and multilingual affordances and features are highlighted by the visual platform with text features in two different languages all helping in meaning-creation. The background's multiple colors with its ergodic features is taken to be at micro entax, as the environment where the text stays, just like in any writing platform-writing page background. The multiple colour effects highlight types of environmental crises, highlighting the environmental theme and feature of the work. The poem is static before launching. It becomes ergodic after, with the texts stopping only when the mouse is hovered over them. Prior to moving the mouse, the scene depicts pristine nature, which degrades with the action of humans. The digital reading skill highlights the human-computer interaction affordance of the text.

The suggestive meaning of the title and behavior: *Climatophosis* symbolizes how Nigeria or the world is plunging the environment and creating climate change. This is the domain of linguistic semantics – where words suggest behavior and coinage suggests meaning. The text features which include animation, font size, type, color, and movement are under the domain of micro entax-morphological features. They can be interpreted as the small human actions that lead to big environmental issues, since the texts builds up from alphabet, morpheme to sentence. The interpretation of the texts and graphics of the poem within ecosophy is under the domain of macro entax-pragmatics while the reading style and skill are under meta-entax. Akin to the above, the ergodic features, and the multiple color features are metaphors for the multiple areas experiencing climate change. They connote the different aspects and types of environmental crises.

They also resonate with the multiple activities that cause environmental crises. The background is in constant flux. Even hovering the mouse does not stop it. It stops only the texts. This is typical of the moving sky, and a metaphor for the continuous changes in the environment as time passes by. It also shows the helplessness of man in the face of natural disaster.

Furthermore, "The text keeps moving around the world symbolizing all the discussion that goes on surrounding climate change whilst the temperatures of the earth remain the same" (Earle). The moving texts are stopped by hovering the mouse on them. This reminds humanity that just as they caused the change, they can also stop the crises through their actions. Besides, the static features show that even in the changing climate, there are unchanging things, like the earth itself, which has continued to exist despite the changes within it. They are also pointers to human problems, which are constant, but in different forms.

The constant moving of the text and the temperature map (Earle) cloud-background of the digital text is a creative way of showing the universality of environmental crises, which has engulfed the universe. Consequently, the hovering of the mouse, which stops the movement of the portion under the mouse, is indicative of human-computer interaction. In the context of text. This signifies the fact that humanity must act fast to stop the environmental crises.

The research has shown that in the theory of entax as outlined by Di Rosario (*Electronic poetry* 117), there are digital affordances that are beyond the three domains of entax (micro, meso, and macro). These affordances are beyond the entax because they have nothing to do with the texts of the poem, yet they contribute to the meaning and understanding of the poem. This fourth domain identified as meta entax (beyond entax) (Ugwumgbo, *Eco-Linguistics,* 89*)*, reveals how the poems are read, the human-computer interaction, the sounds if any, technical features, which contribute to meaning creation and interpretation of the poem. An instance is the reading of *Climatophosis* in which the texts stop when the mouse is hovered on them. This affordance is interpreted as humanity's control as well as impact on nature (see Ugwumgbo, *Eco-Linguistics,* 87). These features when interrogated further are seen as veritable tools for promotion of ideologies. These features enable digital poems to create images that speak to multiple and wide audiences and invoke the need to act.

5.0. CONCLUSION

The paper examined the place of digital literature through an analysis of Climatophosis by Waliya. In doing that we identified the biotic and abiotic eco-lexicons found in the poem using Haliiday's meta-function of ideation within Systemic Functional Grammar as well as Di Rosario's digital theory to interrogate the digital affordances of the poem. This is done in the context of a growing digital culture and global digital citizenship through the genre of environmental digital literature, which opens a fresh and refreshing window within the domain of digital literature and digital humanities. This paper contextualizes the global environmental crises on one hand, and advocates the use of eco-digital literature as an instrument to create a new sense of being to protect, care and safeguard the environment for the flourishing of humanity and the ecosystem in general.

WORKS CITED

Aarseth, Espen Jørgen. *Cybertext: Perspectives on Ergodic Literature*. Johns Hopkins University Press, 1997.

Ajah, Richard. "Introduction to African Electronic Literature." *MADSEJ*, vol. 1, no. 1, Oct. 2023, pp. 56-66.

Andreessen, Marc Lowell. "Why Software Is Eating the World." *The Wall Street Journal*, 20 Aug. 2011, www.wsj.com/articles/SB100014240 53111903480904576512250915629460.

Di Rosario, Giovanna "Digital Poetry: A Naissance of a New Genre?" *Carnets, Cultures littéraires : Nouvelles performances et développement*, special issue, autumn/winter 2009, pp. 183–

205. www.researchgate.net/publication/279476044_Digital_Poetry_a_Naissance_of_a_New_Genre.

Di Rosario, Giovanna. *Electronic Poetry: Understanding Poetry in the Digital Environment*. University of Jyväskylä, 2011. https://jyx.jyu.fi/bitstream/handle/123456789/27117/9789513943356.pdf.

Egbe, Grabriel. *Post-COVID-19 and Digital Citizenship: Exploring Essential Virtual Tools for Collaborative Literacy Learning and Assessment*. Virtual, 2020.

Earle, Ashley. *Climatophosis. Electronic Literature Directory*, 2022. https://directory.eliterature.org/individual-work/5482.

Faloye, Boluwatife Olaitan, Olatunji Tayo Obateru, and Samuel Gbenga Alonge. "Language Teachers and Digital Literacy: Assessing Viewing and Representing as Language Skills." *International Journal of Education, Learning and Development*, vol. 9, no. 3, 2021, pp. 1–10.

Giada, Gruppo. *Diffusion, Analysis and Discussion of Electronic Literature in Italy (DADELI)*. Centro de Literatura Portuguesa; Imprensa da Universidade de Coimbra, 2016. http://hdl.handle.net/10316.2/39101, DOI: http://dx.doi.org/10.14195/2182-8830_4-2_7.

Gobble, MaryAnne M. "Digitalization, Digitization, and Innovation." *Research-Technology Management*, vol. 61, no. 4, 2018, pp. 56–59. DOI: 10.1080/08956308.2018.1471280.

Hayles, N. Katherine (N. Katherine Hayles). *Writing Machines*. MIT Press, 2002.

Oha, Anthony Chukwudi, and Charles Chijioke Uwaegbute. "The Use of Ellipsis in Modern Literary Texts." *Journal of Literary Devices*, 2010.

Simanowski, Roberto. *Digital Art and Meaning: Reading Kinetic Poetry, Text Machines, Mapping Art, and Interactive Installations*. University of Minnesota Press, 2011.

Stepanskaya, Tatiana Mikhailovna, et al. "Digital Humanities in Russia: Challenges and Prospects." *Digital Scholarship in the Humanities*, 2016.

Ugwumgbo, Augustine Emeka. *Re-Greening the Yellow and Preserving the Green: An Eco-Critical Study of Kaine Agary's Yellow-Yellow*. BA Thesis, Veritas University, Abuja, 2020.

Ugwumgbo, Augustine Emeka. *An Eco-Linguistic Study of "Climatophosis" and "Prosthetics for a Changing Climate"*. MA Thesis, Veritas University, Abuja, 2022.

Vanhoutte, Edward. "Modeling the World through Digital Humanities." *Journal of Digital Humanities*, 2013.

Waliya, Joseph Yohanna. *"Climatophosis"*, T*he New River: A Journal of Digital Art and Literature,* 2020. https://thenewriver.us/climatophosis/

Waliya, Joseph Yohanna. "African Literature on MAELD and ADELD Platforms: Grafting the Buds of a Nascent E-Literature." *Afrique(s) en Mouvement*, vol. 7, no. 1, 2024, pp. 55-64.

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« Pharmakon » pour les usagers : Analyse des sentiments du récit dans WhatsApp

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Résumé

Bien que la notion derridienne de « pharmakon » utilisée pour définir la double valence positive et négative des écritures orales ou écrites ait été beaucoup examiné dans les études littéraires, philosophiques et culturelles, son rapport avec les conversations sur la plateforme socio-numérique telle WhatsApp et avec son analyse des sentiments reste à explorer. Cet article vise à décortiquer un échantillon de 5.727 messages de professeur(e)s et de personnel administratif dans l'agora de WhatsApp du Département de Lettres Modernes et Traduction de l'Université de Calabar, collectés du 30 avril 2019 au 27 mars 2024. Nous appliquons des techniques de traitement automatique de langage (TAL) avec R, le grand modèle de langage (GML), et Microsoft Excel comme outils techniques numériques pour classifier les sentiments textuels ainsi que les sentiments des clavardeurs. Cette analyse a pour but d'améliorer la paisible convivialité durable pour une production prolifique.

Mots-clés : Récit, WhatsApp, pharmakon, réseaux socio-numériques, R, analyse des sentiments, humanités numériques africaines.

Abstract

Although Derrida's concept of "pharmakon," which denotes the dual valence-positive and negative in oral and written texts, has been extensively investigated in literary, philosophical, and cultural studies, its application to conversations on social media platforms like WhatsApp, particularly in the context of sentiment analysis, remains underexplored. This study scrutinises a dataset of 5,727 messages exchanged by lecturers and administrative staff in the WhatsApp group of the Department of Modern Languages and Translation Studies at the University of Calabar, collected between April 30, 2019, and March 27, 2024. Using natural language processing (NLP) techniques with R, a large language model (LLM), and Microsoft Excel as digital tools, we classify both textual sentiments and participants' sentiments. The analysis aims to foster sustainable peaceful interactions, thereby enhancing productive collaboration within the group.

Keywords: Narrative, WhatsApp, pharmakon, social media networks, R, sentiment analysis, African digital humanities.

1.0. INTRODUCTION

WhatsApp est une plateforme socio-numérique reconnue par des usagers de tous milieux sociaux pour ses affordances narratives multimodales. En d'autres termes, il permet aux usagers de raconter toutes sortes de récit (Waliya « E-literary creativity… » 146). Le récit, en effet, est un racontage de l'expérience vécue, saturée d'une double valence émotionnelle, positive ou négative. Cette dynamique reflète la condition humaine, où les sentiments sont ressentis à la fois par les interlocuteurs et dans l'esprit du narrateur lui-même. Le récit est toujours originaire du locuteur (Calciolari) et s'utilise souvent pour investir la cathexis ou la decathexis dans la communauté sociolinguistique, ce qui fait du récit un véritable *pharmakon*–un terme qui désigne le racontage comme à la fois remède et poison, sans opposition entre les deux (Taylor 3; Calciolari). C'est de cette relation symbiotique entre la double valence dans les clavardages qui ouvre le volet aux textos de devenir outils de transmettre des sentiments complets des clavardeurs envers les inter-clavardeurs vice versa. Ce partage des émotions est l'une des facteurs qui diffuse un texto à la une des journaux et le rend aller viral sur Internet

En effet, dans la littérature, il existe cet amalgame des récits fictifs et non-fictifs qui révèle également des expressions émotionnelles, tantôt positives, tantôt négatives, ou parfois neutres, c'est-à-dire sans sentiment plausible (Liu 20). Le récit fait partie intégrante de notre vie et se reflète dans notre production culturelle comme cinéma, festival ; et littérature qui représente une émotion matérialisée « par un verbe saisissant la vie pour nous aider à exister » (Richard, Préface).

Donc, le récit mérite notre regard critique, car il touche à nos sentiments. Ces sentiments qui définissent notre existence (Piorecký et Husárová 196), notre prise de décisions, et notre dignité dans le monde du travail. Cet aspect participe au développement d'une convivialité paisible et d'un progrès économique durable, tout en construisant une forte intelligence émotionnelle, une clé de succès dans les organisations (Kotsou 14). Les succès des organisations bâtissent l'économie durable nationale dont on envisageait partout.

Avec la flambé de l'utilisation messagerie instantanée, il nous faut une analyse des sentiments des récits sur WhatsApp car ces récits sont une réflexion directe des émotions des utilisateurs (Concentrix), non seulement des émotions sous-jacentes aux textos.

Cet article, hormis introduction et conclusion, est reparti en 4 segments : problématique et le concept de pharmakon de Derrida dans l'analyse des sentiments, objectif cible de cette recherche, méthodologie, analyse des sentiments de clavardeurs et analyse des sentiments de clavardages.

2.0. PROBLEMATIQUE ET LE CONCEPT DE PHARMAKON DE DERRIDA DANS L'ANALYSE DES SENTIMENTS

Comme le mentionne, l'idée derridienne, une écriture – par exemple, le clavardage dans notre contexte – est un composite symbiotique de négativité et de positivité, qui donne naissance au concept de pharmakon, dont remet en question la philosophie constructiviste des oppositions binaires (Calciolari). Ce concept semble d'ailleurs stimuler l'analyse des sentiments via l'interception de l'informatique dans les humanités.

Bien que de nombreuses études aient exploré l'analyse des sentiments sur les réseaux socio-numériques tels que Twitter, Facebook, LinkedIn et YouTube, l'analyse des sentiments dans le clavardoir de WhatsApp n'a attiré l'attention des chercheurs en Humanités Numériques et en sciences de gestion ou sciences sociales que plus récemment. Notamment, Tejwani et al.(436, 440) ont utilisé Python et des modèles d'apprentissage automatique ainsi que de diverses bibliothèques, telles que Matplotlib, Seaborn, NumPy, TextBlob, NLTK, et CSV, pour analyser les sentiments dans les conversations WhatsApp. Ils ont classé les

sentiments en fonction de polarités émotionnelles (positives, négatives ou neutres), identifié et visualisé les tendances émotionnelles dans les échanges, observé l'évolution des émotions au fil des conversations, et considéré les limites et les implications éthiques de l'analyse des sentiments et de la confidentialité des données.

De même, Al-Busairi (source :LinkedIn) a également utilisé Python, mobilisant quatre bibliothèques – NLTK, Pandas, Matplotlib, et VADER – pour préparer les données et obtenir des scores de sentiments, afin de déterminer l'intensité émotionnelle dans le clavardage.

Cette étude, quant à elle, vise à combler une lacune dans la recherche en utilisant le langage R et ses packages pour la préparation des données, la tokenisation, et l'analyse des sentiments dans les conversations sur WhatsApp. Elle se propose également de comparer les sentiments exprimés dans les textes et ceux ressentis par les usagers lors des échanges. Ceci est pour bâtir sur le travail d'Isasi Jennifer dit « Sentiment Analysis with "syuzhet" Using R » publié en 2023 et celui de Mesfin Gebeyaw dit « Parsing Text for Emotion Terms: Analysis & Visualization Using R: Updated Analysis » publié en 2019 (Gebeyaw).

2.1. QUESTIONS DE RECHERCHE

Ainsi, les questions que nous posons sont les suivantes : Peut-on utiliser R pour analyser les sentiments dans les conversations de groupe sur WhatsApp ? En termes de sentiments, en quoi le récit dans cette agora numérique est-il émotionnel ? Les textes expriment-ils fidèlement les émotions des utilisateurs ou vont-ils au-delà des sentiments éprouvés ? Enfin, toutes ces questions seront abordées dans les résultats de notre étude.

3.0. OBJECTIF CIBLE DE CETTE RECHERCHE

Cet article se concentre sur l'analyse des sentiments dans le clavardoir de WhatsApp. Il aborde également l'utilisation du langage R comme outil de lecture distante pour l'analyse des sentiments, permettant de détecter les émotions implicites dans les textos (les termes uniques) ainsi que les

sentiments potentiels des utilisateurs lorsqu'ils échangent des messages dans le clavardoir.

4.0. METHODOLOGIE : EXPORTATION ET PREPARATION DE DONNEES DE WHATSAPP

i.   Collecte de données du clavardoir de WhatsApp

Notre jeu de données relationnelles comprend uniquement les échanges sur WhatsApp entre les professeurs et le personnel administratif du Departement of Modern Languages and Translation Studies, Calabar-Nigeria, dans une période de cinq ans (du 30 avril 2019 au 27 mars 2024). Nous l'avons exporté manuellement sous forme de fichier CSV en accédant au groupe, puis en cliquant sur les trois points verticaux situés en haut à droite de la fenêtre de discussion. Le menu ouvre de diverses options telles qu'Infos du groupe, Médias du groupe, Rechercher, Mode silencieux, Messages éphémères, Fond d'écran et Plus. Nous sélectionnons l'option *Plus*, qui affiche d'autres fonctionnalités : Signaler, Quitter le groupe, Effacer le contenu, Exporter discussion et Ajouter un raccourci. Ensuite, nous utilisons la fonctionnalité *Exporter discussion* pour enregistrer le jeu de données sous forme de fichier CSV dans le dossier de notre choix, prêt à être transféré sur l'ordinateur.

Ces étapes sont illustrées dans les captures d'écran montrant le processus depuis la sélection du nom du groupe (Étape I) jusqu'aux trois points de suspension (Étape II), puis l'option *Plus* (Étape III), cliquant sur l'option plus, lie à l'option *Exporter discussion* (Étape IV), et enfin l'initialisation de l'exportation (Étape V), pour enregistrer dans le dossier choisi (Étape VI) (voir Figures 1 et 2).
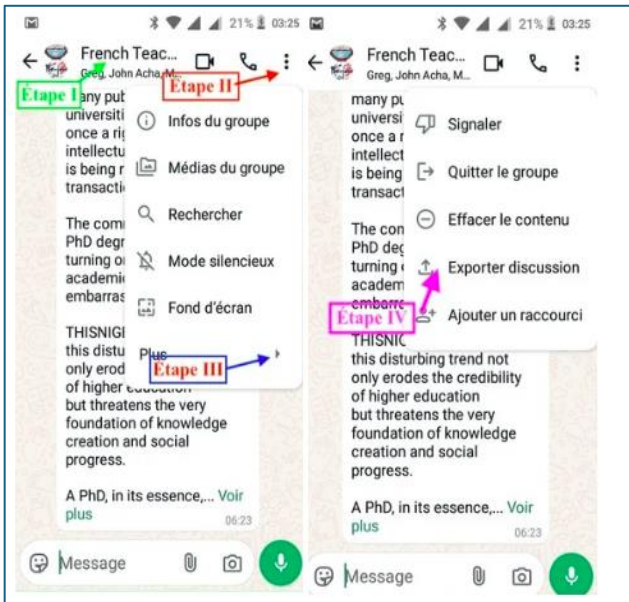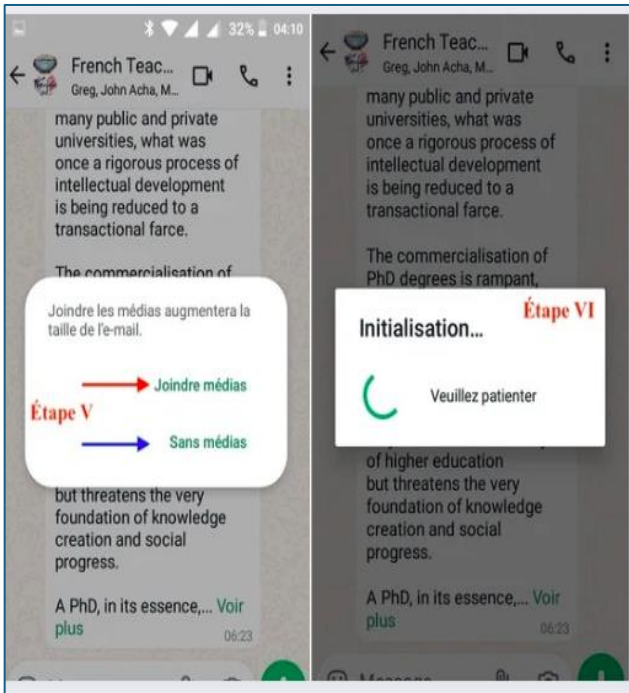
Figure 1: Étapes d'exporter le jeu de données I-IV

Figure 2: Étapes d'exporter le jeu de données V-VI

ii.   Prétraitement de données et nature de données

On convertit le fichier CSV sous forme xlsx de Microsoft Excel pour bien nettoyer les données. Lors de la préparation des données, nous avons constaté que le clavardoir contenait initialement des

échantillons de 5. 727 clavardages échangés. Après le nettoyage du jeu de données pour obtenir des données propres, ce nombre a été réduit à 791 messages, c'est-à-dire, 13,81 % de clavardages initiaux. Cette réduction s'explique en partie par la suppression de nombreux messages par les utilisateurs eux-mêmes, pour des raisons inconnues ou les clavardeurs sachent que les textos envoyés dans l'agora peuvent nuire la joie de la convivialité et raison d'être de la plateforme.

De plus, certains messages contenaient des liens hypertextes, des emojis sans rapport avec notre étude actuelle, qui se concentre spécifiquement sur les textos alphanumériques et les clavardeurs eux-mêmes.

Nous avons pu obtenir des données propres grâce aux techniques de traitement automatique du langage naturel (TALN), en utilisant notamment le langage de programmation R, et l'IA générative.

iii.   Clavardeurs

Il existe 33 personnes échangeant les textos pour cinq ans dans le groupe de WhatsApp dont leurs noms sont codifiés pour des raisons éthiques ainsi : **AA, AB, AC, DA, DD, DG, DL, DN, DP, DV, EA, EB, FE, GM, IB, JI, JO, KM, MI, MJ, ND, NG, NI, OG, OI, OK, PA, PB, PF, PN, TA, VK, et YJ.** On se sert des noms codifiés pour calculer leurs émotions d'après les clavardages.

iv.   Utilité du langage de programmation R dans cette recherche

Le langage R est en fait une invention de Ross Ihaka et Robert Gentleman, développée dans les années 1990 pour la réalisation d'analyses statistiques, bien que Joseph J. Allaire et d'autres aient contribué à la création de RStudio en 2011, un environnement de développement intégré (IDE) populaire pour R.(Perdoncin), Par extension, ce langage a aussi été employé pour des analyses cartographiques, littéraires et pictographiques. Il représente un outil précieux pour les humanités numériques,

particulièrement pour la lecture distante ou « distant reading » (Moretti 44).

Le R possède deux environnements de développement multiplateformes à libre accès : R lui-même et RStudio, qui forment des espaces de travail pour la codification. Après avoir installé ces IDE, à part des packages génériques qui s'installent automatiquement, l'utilisateur doit installer des packages spécifiques pour chaque projet, ceux-ci étant nécessaires pour des tâches comme la modélisation statistique des distances, la fréquence ou occurence des termes, les analyses des sentiments, les visualisations et la création de nuages de mots des données de clavardages.

Dans notre analyse des sentiments, les packages requis incluent :

    i.   *tidyverse*: Un ensemble de packages pour une codification propre et efficace ;

    ii.   tidytext : Pour la fouille de texte.

    iii.   *syuzhet* : Contient le dictionnaire de registres de sentiment en anglais du Conseil national de recherches Canada (CNRC), basé sur les recherches de Saif Mohammad, et comprenant 5.636 termes pour détecter les huit émotions de base—joie, tristesse, colère, peur, surprise, anticipation, confiance et dégoût (Isasi).

    iv.   *wordcloud* : Pour générer des nuages de mots .

    v.   readxl : Pour lire des fichiers Excel facilement .

    vi.   *RColorBrewer* : Pour colorer et améliorer la lisibilité graphique.

    vii.   *ggplot2*: Un package de grammaire de visualisation pour structurer des graphiques.

    viii.   *gsub()*: Une fonction de base de R utilisée pour les remplacements de texte.

    ix.   Curl : permet de lire des données directement depuis un lien de site web sans devoir les télécharger complètement avant de les traiter.

    x.   tm : un package d'exploration de texte ainsi que de fouille de données.

Les packages peuvent être installés en une seule ligne de commande : par exemple, « install.packages(c('tidyverse','syuzhet','wordcloud','readxl','ggplot2','RColorBrewer')) ». Une fois installés, ils doivent être chargés dans l'environnement R ou RStudio via la commande « library() » i.e. bibliothèque, car la plupart des langages de programmation reconnus ont des bases lexiques anglaises (Waliya « Technolinguisme…» 124). Voici trois méthodes pour charger ces packages :

1. **Avec *purrr* pour charger plusieurs packages en une seule ligne :**
purrr::walk(c("NLP", "syuzhet", "ggplot2", "tidyverse", "wordcloud", "RColorBrewer", "curl"), ~ library(.x, character.only = TRUE))

2. **Utilisation de *lapply* pour charger des packages :**
lapply(c("tidytext", "syuzhet", " readxl", "tidyverse", "wordcloud", "RColorBrewer", "curl"), library, character.only = TRUE)

3. **Chargement manuel :**
library(tidyverse)
library(tidytext)
library(readxl)
library(syuzhet)
library(curl)

Ces étapes sont essentielles pour préparer les données à des fins de manipulation et d'analyse des sentiments (voir Annexes I-III pour les codes d'analyse des sentiments).

5.0. ANALYSE DES SENTIMENTS DE CLAVARDEURS
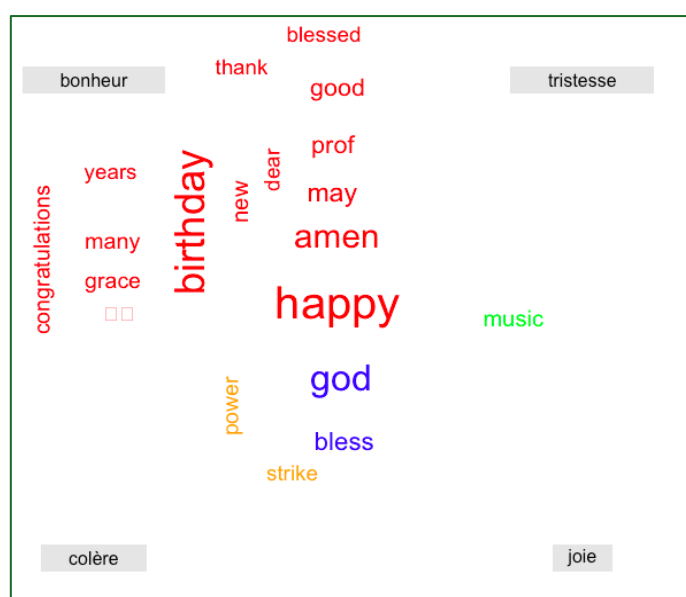
5.1. Le nuage de mots

Les émotions sous-jacentes aux messages révèlent les comportements des participants entre eux. Le nuage de mots illustrant la fréquence des termes (Figure 3.0) montre que les usagers font preuve de respect et de politesse. Par exemple, le terme « Prof », apparaissant 144 fois, est proéminent, représenté en grande taille et en marron, témoignant ainsi de leur civilité. La présence des mots anglais « god »

(67 occurrences) et « amen » (63 occurrences), ainsi que leurs équivalents français « dieu » et « amen », suggère une dimension religieuse dans leurs échanges. Le mot positif « happy » (joie) est le deuxième terme le plus proéminent, apparaissant 103 fois, suivi de « birthday » (89 occurrences) et d'autres termes tels que « dr » (60 occurrences), « congratulations » (59 occurrences), « thanks » (merci), « thank » (merci) et « may » (que), qui indiquent une forte collocation de politesse et de courtoisie, notamment lors des célébrations d'anniversaires. Ainsi, leurs émotions semblent influencées par la religion, la bienséance sociale et la courtoisie. En plus, leur profession invoque le respect du savoir.   Autrement dit, leur comportement, vision de monde et culture sont aussi influencés par l'écosysteme professionnel (Waliya « Ecopoiesis and econoesis… » 143). Ceux-ci les prouvent cultivés exprès.

En bref, le nuage de mots avec la fréquence des termes révèle un groupe de participants engagés et respectueux. À ce sujet, Heras (166) paraphrase les réflexions de Bender et al., selon lesquelles l'interaction homme-machine (IHM) incite les humains à créer des religions et à développer des attachements amoureux envers les machines, de la même manière qu'ils le font avec d'autres êtres humains. Par ailleurs, dans le cadre d'une comparaison des sentiments sur une période de cinq ans, 20 mots ont été sélectionnés aléatoirement parmi les 2 632 mots de 791 phrases présents dans les données. Les résultats montrent clairement que les participants aux conversations investissent davantage dans la cathexis (bonheur : 15 mots sur 20 en rouge ; joie : 2 mots sur 20 en bleu) que dans les émotions négatives-decathexis (colère : 2 mots sur 20 en orange ; tristesse : 1 mot sur 20 en vert) dans leurs échanges (voir Figure 3B).

A

B

Figure 3 : Les fréquences de termes et Le nuage de mots de clavardages 2019-2024

L'analyse des différentes représentations graphiques, telles que l'histogramme de distribution des émotions (Figure 4), la fréquence des mots à connotation émotionnelle dans les données (Figure 5), le diagramme en barres (Figure 6) et le diagramme circulaire (Figure 7), met en évidence une récessivité intrinsèque des émotions négatives dans les textos. Cette tendance contraste avec les résultats obtenus à partir du nuage de mots (Figure 3A). Grâce à la tokenisation des phrases et à la vectorisation des caractères, qui segmentent le corpus en unités lexicales ou en jetons phrastiques,

le processus de traitement automatique du langage naturel (TALN) met en lumière cette dichotomie.

5.2. L'histogramme de distribution des émotions par personne

En outre, la distribution des émotions par personne (Figure 4) dans l'histogramme révèle que les participants aux conversations présentent une tendance intrinsèquement négative, bien qu'ils se montrent polis, agents moraux et religieux. La légende graphique, qui illustre la polarité négative (colère en orange foncé, dégoût en vert olive, tristesse en rose, peur en bleu foncé) et positive (attente en rouge orangé, confiance en vert, joie en bleu clair, surprise en violet), permet une lecture détaillée des comportements émotionnels des participants. Par exemple, bien que certaines personnes comme **OI, OG, MI, IB et AB** apparaissent neutres dans les conversations, il est évident que leurs interactions sur une période de cinq ans dans cette agora sont dénuées d'émotions, tandis que **TA, NI et AA** montrent très peu d'émotions. Cela peut s'expliquer par leur faible participation aux discussions, ce qui conduit le package *syuzhet* à les classer dans cette catégorie de valence des sentiments.

Concernant la positivité, les barres vertes représentent le sentiment de confiance. Les personnes affichant le plus de confiance selon cette distribution sont **GM**, avec un nombre d'occurrences de l'émotion de confiance dépassant 75, suivi de **DA, DV et PF**, chacun dépassant 50 co-occurrences. Cela pourrait s'expliquer par la fréquence de leurs interventions ou par la nature de leurs interactions.

Bien que la colère soit marginale et moins présente par rapport aux autres émotions, elle est observable chez **DA, DD, DL, DP, DV, GM, KM, NJ, OK, PF et YJ**. Une autre émotion négative notable est la tristesse, représentée par la couleur rose, principalement visible chez **DV, GM et PN**, avec quelques proportions chez d'autres participants.

En bref, bien que les clavardeurs soient globalement plus positifs que négatifs dans leurs conversations, l'intensité émotionnelle sous-jacente révèle qu'ils entretiennent parfois des interactions marquées par la négativité les uns envers les autres.

6.0. ANALYSE DES SENTIMENTS DE CLAVARDAGES ECHANGEES DES 2019 A 2024

Outre ces interprétations, nous avons utilisé le dictionnaire NRC, l'un des modules du package *syuzhet*. Lors de l'exécution des codes R, l'application parcourt les 5636 termes qui correspondent aux jetons anglais présents dans les données et les catégorise selon les 8 émotions suivantes : attente, colère, confiance, dégoût, joie, peur, surprise et tristesse (Isasi).

6.1. Distribution des émotions de clavardage et camembert

En ce qui concerne les marqueurs de sentiments, la confiance (vert), la joie (bleu clair) et l'attente (rouge orangé) sont les émotions les plus expressives dans les textos. Le diagramme circulaire (Figure 7) confirme ces résultats en pourcentages : l'attente représente 22,1 %, la confiance 27,6 % et la joie 24,3 %, comme le montrent également le diagramme en barres (Figure 5) et la fréquence des jetons comptés (Figure 6). Les comptes de jetons ou de mots révèlent que la confiance est associée à 726 jetons, la joie à 639 jetons et l'attente à 581 jetons, ce qui en fait les émotions les plus fréquentes. À l'inverse, la surprise, avec seulement 222 jetons, est l'émotion positive la moins représentée. En revanche, les jetons liés aux émotions négatives, comme la colère (87 jetons), le dégoût (62 jetons) et la peur (184 jetons), sont peu nombreux comparativement aux émotions à polarité positive. Cela se voit sur Figure 6 où les bares de sentiments positives sont envolésau-dessus de toutes barres.

6.2. Arc narratif des clavardages

Dans cette analyse, l'arc narratif ou arc du récit est fragmenté en trois segments, représentés dans les Figures 8 à 10. La première figure compare l'arc

narratif par personne parmi les 33 participants (Persons). La deuxième figure analyse les émotions exprimées sur une période de 24 heures répartie sur cinq ans, et la troisième se concentre sur les années récentes. L'arc du récit permet d'illustrer le flux et l'amplitude des émotions ressenties dans le clavardoir entre 2019 et 2024.

6.2.1. Arc narratif des émotions des clavardages

La narration est clairement visible dans le graphique de la Figure 8, où les lignes représentant l'arc narratif de la confiance (vert), de la joie (bleu) et de l'attente (orange) s'élèvent bien au-dessus des autres émotions. En revanche, les lignes correspondant au dégoût (vert-jaune), à la colère (rouge), à la peur (bleu foncé), à la tristesse (violet clair) et à la surprise (rose) restent en bas du graphique. La surprise, en particulier, est un sentiment ambigu qui peut être perçu comme négatif ou positif selon le contexte et le contenu du récit. L'arc du récit montre que PF est la personne la plus surprise parmi tous les participants à la discussion, suivie de MJ, qui se distingue également comme le plus joyeux. En comparaison, GM est apparu comme le participant le plus confiant dans son récit.

6.2.2. Arc narratif des émotions des personnes par heures

La Figure 9 montre que l'arc narratif des 33 participants sur une période de 24 heures, couvrant cinq ans, est marqué par 620 nœuds. Parmi ceux-ci, 565 nœuds, situés au-dessus de la ligne zéro (indiquant la neutralité), représentent une valence positive, tandis que 55 nœuds, situés en dessous de la ligne zéro (ligne or), indiquent une valence négative. La ligne zéro de l'arc narratif signifie l'absence d'émotions exprimées, marquant un état neutre. Sur une période de cinq ans, l'analyse de l'arc narratif révèle que le moment le plus négatif des échanges est observé à 10 heures, avec un score de -9 pour la valence négative. En revanche, le sommet de la valence positive est atteint à 21 heures, avec un score de 9,5, représentant le point d'intensité émotionnelle le plus élevé. Les

participants tels que **DV, EA, FE, GM, IB et JI**, représentés par des nuances de vert, montrent une activité positive durant la journée. En comparaison, OK et PA, identifiés par des couleurs magenta clair, manifestent des échanges positifs la nuit, mais expriment des émotions négatives durant la journée, notamment à 10 heures.

6.2.3. Arc narratif des émotions des personnes par année

La Figure 10 met en évidence les années où les échanges textuels ont pris une tournure plus émotionnelle. D'après l'analyse, l'année 2022 se distingue par un pic d'intensité émotionnelle, atteignant un score de valence positive de 9,6, ce qui représente le sommet des interactions émotionnelles. Cela correspond à environ huit mois de grève en 2022 des professeur(e)s et du personnel administratif des universités nigérianes, en raison de conditions de travail défavorables par rapport à la réalité socioéconomique du Nigéria. Cette situation les a poussés à réclamer une augmentation de salaire. Pendant cette période, ils disposaient de beaucoup de temps pour échanger entre eux, grâce à l'interruption des activités académiques causée par la grève.

En revanche, en 2023, les relations entre les participants semblent devenir plus tendues, marquées par une baisse notable de la ligne magenta clair jusqu'à un niveau neutre, ce qui témoigne d'une diminution des échanges émotionnels. Cela est particulièrement évident dans les couleurs violet et magenta clair, représentant les participants identifiés par les initiales **OK, PA, PN, TA, VK et YJ**, qui montrent un déclin de l'engagement émotionnel avec des scores inférieurs à 5 entre 2022 et 2024.

À l'inverse, les participants identifiés par les couleurs bleu clair (**MJ, ND, NG, NI**) et orange (**DD, DG, DL, DA**) ont maintenu des scores émotionnels compris entre 4,99 et 5,0 en 2022, mais ces scores ont également chuté entre 2023 et 2024. Cela suggère que les interactions entre les participants se sont raréfiées, comme en témoignent les scores émotionnels en déclin. Probablement, la

reprise des sessions académiques vers la fin d'octobre 2022 jusqu'en avril 2024 ne leur laissait plus autant de temps pour échanger. De plus, les revendications des enseignants ayant été partiellement prises en compte par le gouvernement fédéral du Nigéria, cela a pu également contribuer à cette baisse d'interactions.
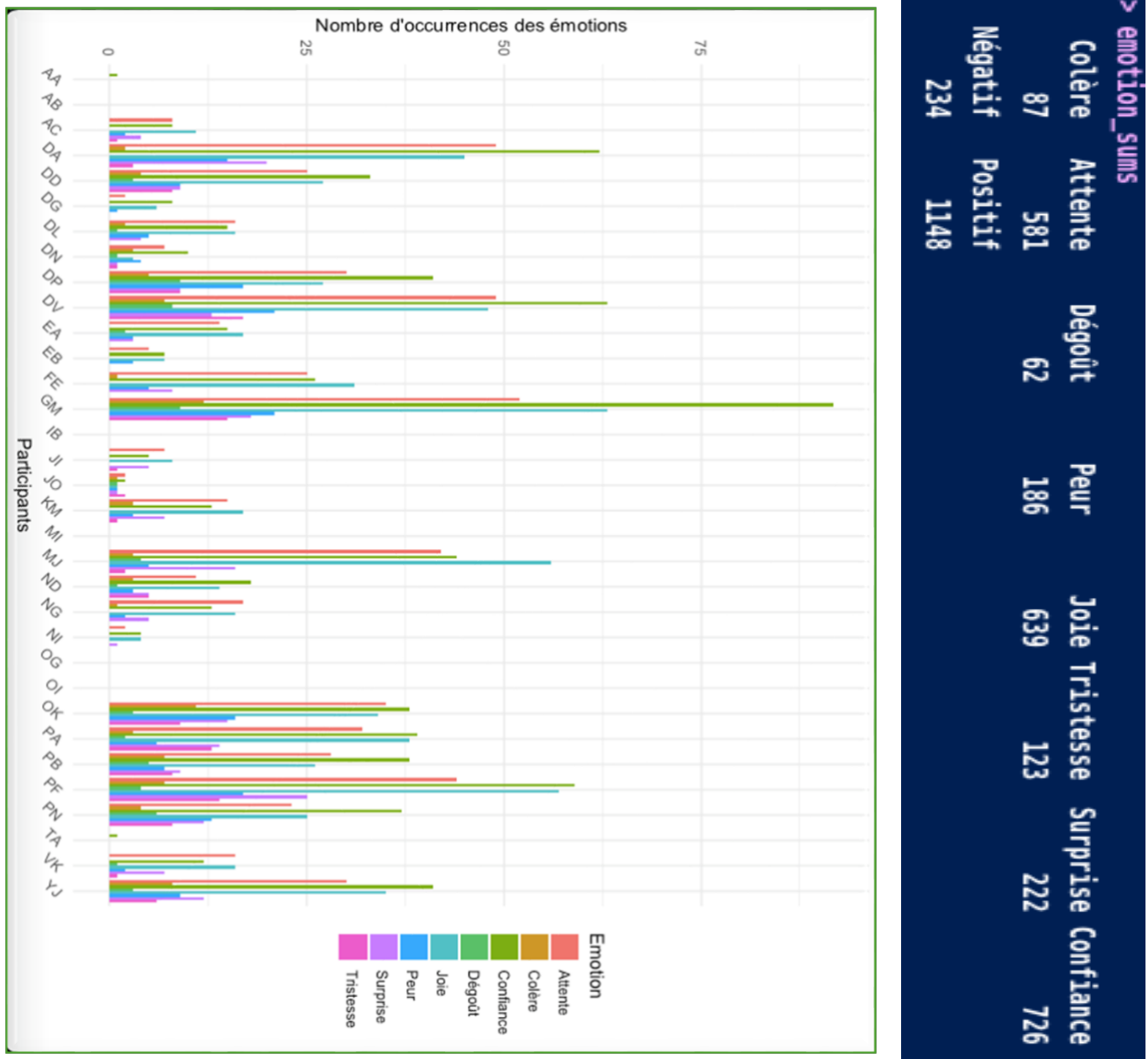

Figure 4 : Distribution des émotions spécifiques par personne

Figure 5 : Distribution des clavardages émotionnels échangées de 2019 à 2024
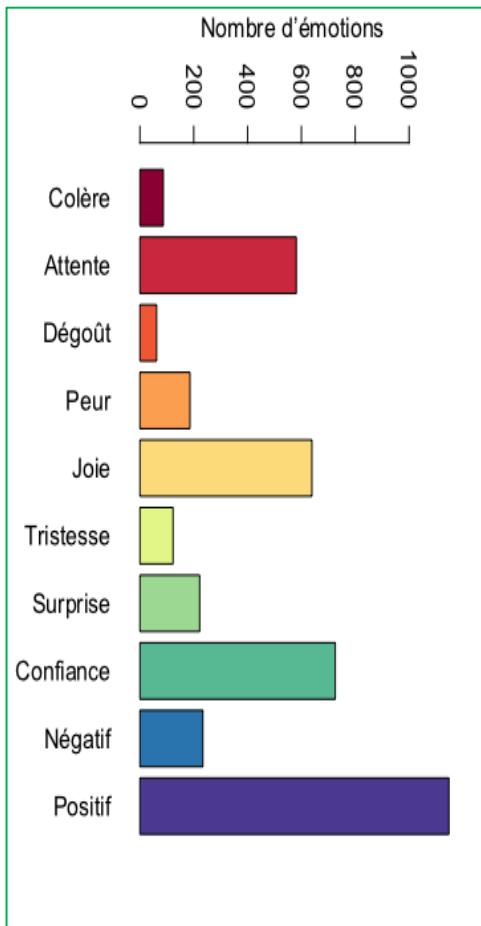
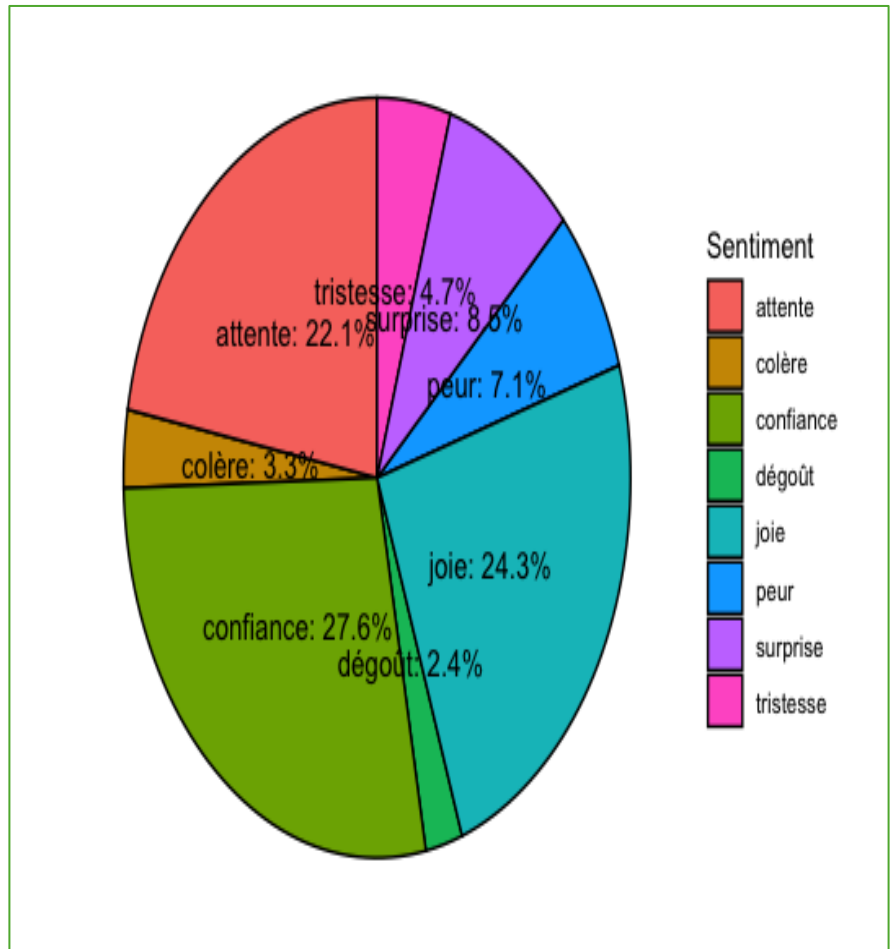*Figure 6: Distribution des émotions dans les clavardages*

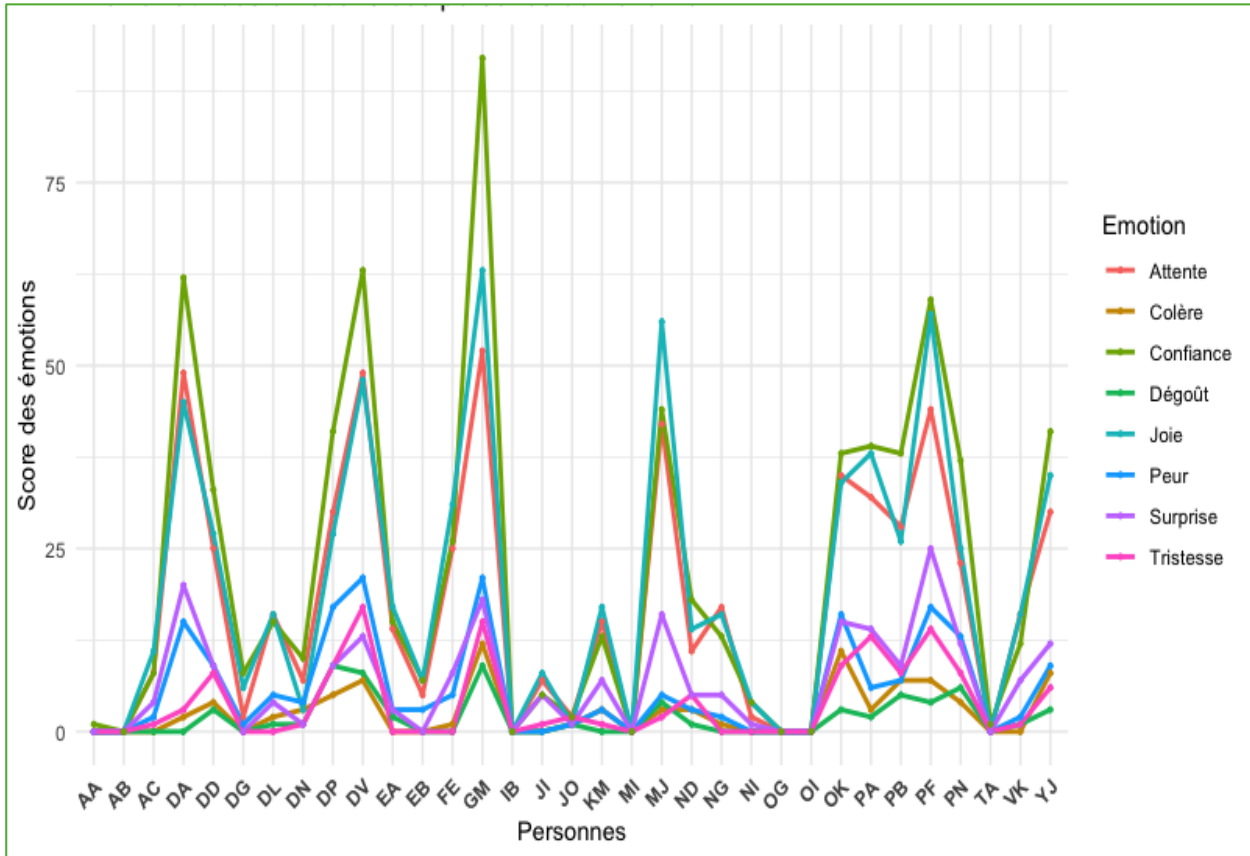*Figure 7: Les sentiments de clavardages en pourcentages*

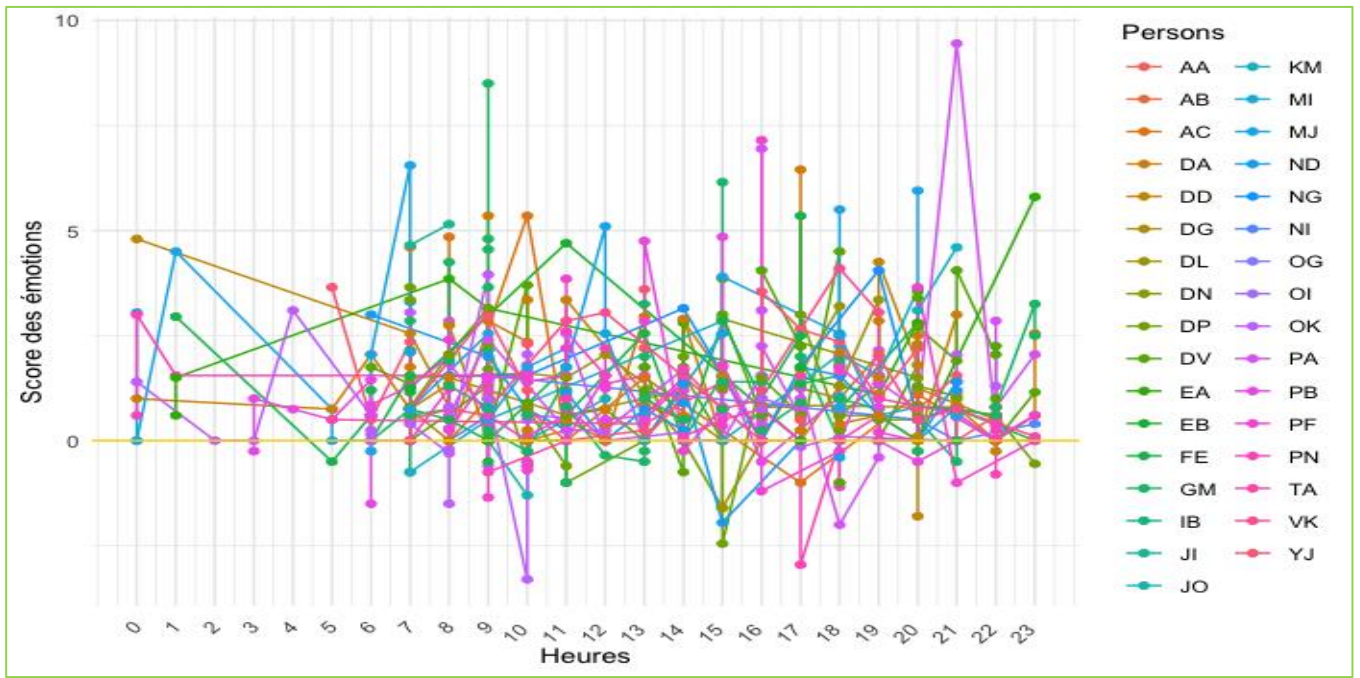*Figure 8 : Arc narratif des émotions des personnes depuis 2019 à 2024*

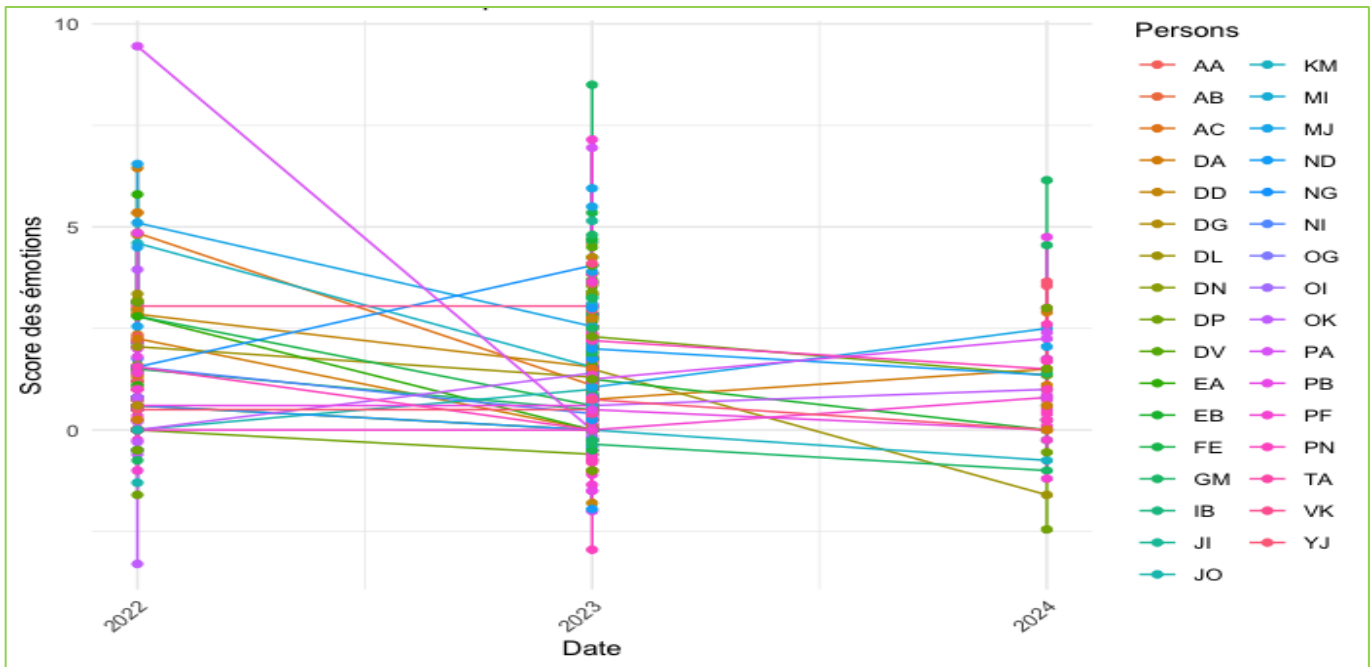*Figure 9 : Arc narratif des émotions des personnes par heures depuis 2019 à 2024*

Figure 10 : Arc narratif des émotions des personnes par année

7.0. RESULTATS ET TROUVAILLE

L'analyse des sentiments dans les échanges du groupe WhatsApp du Département de Lettres Modernes et Traduction de l'Université de Calabar révèle que ces interactions sont globalement plus positives que négatives. Cette tendance est confirmée par les données graphiques présentées de la Figure 3B à la Figure 10. En particulier, l'étude des clavardages indique que l'année 2022 se distingue comme l'une des périodes où les participants manifestaient un optimisme notable.

Il convient de rappeler qu'au Nigéria, en 2022, les enseignants et le personnel administratif des universités étaient engagés dans un mouvement de grève prolongé pour protester contre le gouvernement, dans l'espoir d'obtenir une amélioration des conditions de vie, exacerbées par une inflation galopante. Cet optimisme pourrait avoir été nourri par l'attente d'une réponse favorable de la part des autorités pendant cette période de crise.

Les émotions exprimées dans les messages reflètent de manière fidèle les états d'âme des participants lorsqu'ils interagissent dans cet espace numérique. Ces dynamiques suggèrent également que tout discours contient en lui-même les germes du *pharmakon*, en raison des processus de *cathexis* (investissement émotionnel) et de *decathexis* (désengagement émotionnel) qui se manifestent chez les interlocuteurs.

Les expériences vécues durant la crise socioéconomique au Nigéria ont, à certains moments, influencé le ton des échanges. Cependant, les participants ont souvent adouci ces interactions en supprimant des messages susceptibles de provoquer des tensions ou des malentendus. C'est cette pratique qui explique la réduction des échantillons de 5 727 à 791 messages après le nettoyage du corpus de données.

L'aspect positif du *pharmakon* textuel se manifeste particulièrement dans les moments de célébration, comme les vœux d'anniversaire adressés aux membres du groupe. Bien que les sentiments exprimés soient en partie façonnés par des perceptions culturelles spécifiques (Waliya et Tijani 7), l'utilisation du langage R a permis de déchiffrer les émotions latentes des messages et des auteurs.

8.0. CONCLUSION

En définitive, cette recherche s'appuie sur un échantillon de 791 messages extraits de 5 727 échanges collectés sur une période de cinq ans, en raison de la nature désordonnée des données initiales. Après un nettoyage et une vectorisation des données en phase de prétraitement, l'analyse des sentiments a révélé que la technique du nuage de mots ne parvient pas à refléter efficacement la polarité émotionnelle en tant que *pharmakon* dans le cadre de cette étude. Cette méthode se limite principalement à présenter la fréquence des termes, sans capter la complexité des émotions exprimées.

Il est apparu qu'aucun récit ne peut être perçu comme étant entièrement positif ou entièrement négatif. La polarité émotionnelle est souvent masquée ou imbriquée, les émotions positives et négatives coexistant de manière nuancée. De plus, les messages les plus visibles dans le clavardoir ne reflètent pas toujours fidèlement la réalité émotionnelle des participants, sauf si les résultats sont confirmés de manière répétée à l'aide de modèles statistiques robustes.

Les résultats ont également montré que, bien que les sentiments exprimés dans les clavardages (textes) soient globalement positifs, ils comportent des éléments de négativité récessive. Ces nuances apparaissent dans le *récit*, révélant des arcs narratifs complexes et des distributions émotionnelles variées.

Ainsi, le langage R s'est avéré être un outil fiable pour l'analyse des sentiments, offrant des perspectives utiles pour comprendre les émotions sous-jacentes des participants dans un contexte numérique.

ŒUVRES CITEES

Al-Busairi, Faisal. « Analyzing WhatsApp Chats and Generating Sentiments in Python with NLTK and VADER ». *Linkedin*, 28 mai 2023, https://www.linkedin.com/pulse/analyzing-whatsapp-chats-generating-sentiments-nltk-vader-albusairi/.

Calciolari, Giancarlo. « La pharmacie de Jacques Derrida - Exigence : Littérature - Anciennes archives ». *Litterature*, https://www.e-litterature.net/pub/spip.php?article414. Consulté le 4 août 2024.

Concentrix, Netino. « Analyse de sentiments | Captez l'émotion derrière chaque interaction ». *Linkedin*, 17 octobre 2024, https://www.linkedin.com/pulse/analyse-de-sentiments-captez-l%C3%A9motion-derri%C3%A8re-chaque-interaction-wudue/?trackingId=u4nZ6s5JRu2O%2ByFdIrOajw%3D%3D.

Gebeyaw, Mesfin. « Parsing Text for Emotion Terms: Analysis & Visualization Using R: Updated Analysis | DataScience+ ». *Datascience+*, 9 août 2019, https://datascienceplus.com/parsing-text-for-emotion-terms-analysis-visualization-using-r-updated-analysis/.

Heras, Daniel Chávez. *Cinema and Machine Vision: Artificial Intelligence, Aesthetics and Spectatorship*. 1st éd., Edinburgh University Press, 2024.

Isasi, Jennifer. « Sentiment Analysis with "syuzhet" Using R ». *Programming Historian*, édité par Maria José Afanador-Llach et Rolando Rodriguez, traduit par Adam Crymble, nᵒ 12, avril 2023. *DOI.org (Crossref)*, https://doi.org/10.46430/phen0110.

Kotsou, Ilios. *Intelligence émotionnelle et management: comprendre et utiliser la force des émotions*. De Boeck Supérieur, 2019.

Liu, Bing. *Sentiment Analysis: Mining Opinions, Sentiments, and Emotions*. First published, Cambridge University Press, 2015. *K10plus ISBN*,

https://doi.org/10.1017/CBO9781139084789.

Perdoncin, Anton. « Installer R et RStudio (presque !) sans peine ». *QUANTI / Sciences sociales*, 7 novembre 2017, https://doi.org/10.58079/t4c0.

Piorecký, Karel, et Zuzana Husárová. *The Culture of Neural Networks Synthetic Literature and Art in (Not Only) the Czech and Slovak Context*. 1st éd., Institute of Czech Literature of the Czech Academy of Sciences, 2024.

Richard, Philippe. *Lectures critiques et écritures littéraires*. Ellipses, 2022.

Taylor, Gabrièle Wersinger. « Jeux d'Érôs dans « La Pharmacie de Platon » de Jacques Derrida ». *Du jeu dans la théorie de la lecture*, édité par Christine Chollier et al., Éditions et Presses universitaires de Reims, 2020, p. 37-70. *DOI.org (Crossref)*, https://doi.org/10.4000/books.epure.2258.

Tejwani, Palak, et al. « Whats App Chat Sentiment Analysis ». *International Research Journal of Modernization in Engineering Technology and Science*, vol. 5, nᵒ 11, 2023, p. 436-40.

Waliya, Yohanna. « E-literary creativity on the dark web: Covid-19 Whatsapp bot's interactive storytelling in WhatsApperature ». *Texto Digital*, vol. 18, nᵒ 2, novembre 2022, p. 145-60. *DOI.org (Crossref)*, https://doi.org/10.5007/1807-9288.2022.e86373.

Waliya, Yohanna Joseph. « Ecopoiesis and econoesis of Okam's Difu ». *GNOSI: An Interdisciplinary Journal of Human Theory and Praxis*, vol. 5, nᵒ 2, 2022, p. 136-43.

Waliya, Yohanna Joseph. « Technolinguisme et multilinguisme sur web 3.0-Ubek et Rica ». *Orbis Linguarum*, vol. 22, nᵒ 3, p. 118-30.

Waliya, Yohanna Joseph, et Mufutau Tijani,. « Technodiscursive Analysis of Twitterbot Poetry ». *Digital Studies in Language and Literature*, vol. 1, nᵒ 1, 2024, p. 1-24, https://doi.org/10.1515/dsll-2024-0005.

COURTE BIOGRAPHIE DES AUTEURS

Yohanna Joseph Waliya est un poète numérique nigérian, écrivain distant, écrivain ludocinétique, romancier, dramaturge, programmeur en Python, lauréat du prix Janusz Korczak pour le Sud global 2020, chercheur à l'Electronic Literature Organization, boursier Janusz Korczak de l'UNESCO, créateur et conservateur de MAELD et ADELD [mention honorable du prix Emerging Open Scholarship 2022 de l'Institut canadien de la connaissance sociale (C-SKI)], directeur exécutif d'AELA et ADELI (https://africanelit.org), boursier de la Conférence internationale sur l'intelligence artificielle et les médias sociaux [ICWSM] 2021-2022, boursier Scrimba 2022-2023, et boursier Hastac 2021-2023. Il écrit en anglais et en français. Parmi ses œuvres figurent : *La récolte de vie* (pièce de théâtre)*, Monde 2.0* (pièce de théâtre)*, Hégémonie Disparue* (roman)*, Quand l'Afrique se lèvera* (roman)*, Homosalus* (poésie numérique)*, Momenta* (poésie numérique), @*TinyKorczak* (poésie via Twitterbot), *Climatophosis* (poésie numérique : Meilleure utilisation des humanités numériques à des fins ludiques en 2020), *Inferno 2.0* (poésie ludocinétique), etc. Il est également enseignant au Département des Études Littéraires et Culturelles, Le Village Français du Nigéria, Ajara-Badagry, Lagos, Nigeria. Il a obtenu une maîtrise en Littérature Française à l'Université Ahmadu Bello, Zaria, Nigeria. Ses domaines de recherche incluent l'écriture distante, la lecture distante, la poésie numérique, la littérature métaverselle, la Twitterbot poésie, la Twittérature, les humanités numériques et le discours numérique.

Etete Gregory Mbey est enseignant au Département de Lettres Modernes et Traduction à l'Université de Calabar, Calabar. Il est titulaire d'un Doctorat en Philosophie (PhD) en français dans les Relations Internationales, obtenu en 2021, d'une Maîtrise en Traduction (M.A. Traduction, 2015) et

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Annexe I : **Distribution des émotions par personne, fréquences de mots et le nuage des mots**

Charger les bibliothèques nécessaires

library(NLP)

library(syuzhet)

library(ggplot2)

library(tidyverse)

library(wordcloud)

library(stringr)

library(tm) # Text Mining package for text wrangling

library(RColorBrewer)

library(readxl)

library(dplyr)

library(purrr)

Définir le répertoire de travail avec les données

setwd("/Users/apple/Desktop/DH2024")

list.files()

```r
# Lire les données et les convertir en tibble pour une manipulation facile

mlts_unical <- read_excel("cleanmltswhatsapp.xlsx") %>% as_tibble()

view(mlts_unical)

# Nettoyage des données/textes avec tm

# Convertir 'Chats' en un vecteur de caractères si ce n'est pas déjà fait

whatsApp_messages <- as.character(mlts_unical$Chats)

# Créer un corpus de texte

whatsApp_corpus <- Corpus(VectorSource(whatsApp_messages))

# Appliquer les transformations avec tm

whatsApp_corpus <- tm_map(whatsApp_corpus, content_transformer(tolower))   # Conversion en minuscules

whatsApp_corpus <- tm_map(whatsApp_corpus, removePunctuation)        # Suppression de la ponctuation

whatsApp_corpus <- tm_map(whatsApp_corpus, removeNumbers)            # Suppression des chiffres

whatsApp_corpus <- tm_map(whatsApp_corpus, removeWords, stopwords("en"))   # Suppression des mots vides (stopwords)

# Convertir de nouveau le corpus en texte

whatsApp_messages <- sapply(whatsApp_corpus, as.character)

# Créer un nuage de mots

wordcloud(whatsApp_messages, colors = brewer.pal(10, "Spectral"), min.freq = 45)

# Analyser les sentiments avec NRC

mlts_whatsApp_senti_scores <- get_nrc_sentiment(whatsApp_messages)

mlts_whatsApp_senti_scores
```

```r
sad_words <- whatsApp_messages[mlts_whatsApp_senti_scores$sadness > 0]

sad_words

# Calculer la valence des sentiments

sentiment_valence <- (mlts_whatsApp_senti_scores$negative * -1) + mlts_whatsApp_senti_scores$positive

# Visualiser les scores de sentiments

simple_plot(sentiment_valence)

# Traduction des étiquettes des sentiments en français

noms_sentiments_fr <- c(

  "anger" = "colère",

  "anticipation" = "attente",

  "disgust" = "dégoût",

  "fear" = "peur",

  "joy" = "joie",

  "sadness" = "tristesse",

  "surprise" = "surprise",

  "trust" = "confiance"

)

# Résumer les scores de sentiments

sentiment_totals <- colSums(mlts_whatsApp_senti_scores)

# Exclure les sentiments positifs et négatifs

sentiment_totals <- sentiment_totals[!(names(sentiment_totals) %in% c("positive", "negative"))]

# Remplacer les noms par les traductions

names(sentiment_totals) <- noms_sentiments_fr[names(sentiment_totals)]

sentiment_totals <- sentiment_totals[sentiment_totals > 0]  # Filter out sentiments with zero counts
```

```
# Créer un graphique à barres avec les étiquettes en français

barplot(sentiment_totals,

    las = 2,

    col = brewer.pal(10, "Spectral"),

    ylab = "Nombre d'émotions",

    main = "Scores de sentiments de MLTS Unical")

# Préparer les données pour le nuage de mots des émotions

cloud_emotions_data <- c(

paste(whatsApp_messages[mlts_whatsApp_senti_scores$sadness > 0], collapse = " "),

paste(whatsApp_messages[mlts_whatsApp_senti_scores$joy > 0], collapse = " "),

paste(whatsApp_messages[mlts_whatsApp_senti_scores$anger > 0], collapse = " "),

paste(whatsApp_messages[mlts_whatsApp_senti_scores$fear > 0], collapse = " "))

cloud_corpus <- Corpus(VectorSource(cloud_emotions_data))

# Créer une matrice de termes (Term-Document Matrix)

cloud_tdm <- TermDocumentMatrix(cloud_corpus)

cloud_tdm <- as.matrix(cloud_tdm)

head(cloud_tdm)

# Nommer les colonnes de la matrice pour les émotions

colnames(cloud_tdm) <- c('tristesse', 'bonheur', 'colère', 'joie')

# Afficher les premières lignes de la matrice
```

```
head(cloud_tdm)

# Générer le nuage de mots comparatif

set.seed(757) # this can be set to any integer

comparison.cloud(cloud_tdm, random.order = FALSE,

        colors = c("green", "red", "orange", "blue"),

        title.size = 1, max.words = 20, scale = c(2.5, 1), rot.per = 0.4)

# Calculate sentiment scores for each message

messages_sentiment <- mlts_unical %>%

  mutate(mlts_whatsApp_senti_scores = map_dbl(Chats, ~ sum(get_sentiment(.x)))) %>%

  filter(!is.na(mlts_whatsApp_senti_scores))

messages_sentiment

# Check structure to ensure it's correct

# Ensure Time is treated as numeric for the x-axis

messages_sentiment <- messages_sentiment %>%

 mutate(

   Time = as.numeric(Time),  # Convert Time to numeric if it represents only hours

   Date = as.Date(Date)      # Ensure Date is in Date format

 )

# Plot 1: Time (hour) versus sentiment score

ggplot(messages_sentiment, aes(x = Time, y = mlts_whatsApp_senti_scores, color = Persons)) +

 geom_line() +

 geom_point() +

 scale_x_continuous(breaks = 0:23) +  # Ensure all hours are shown on the x-axis

 labs(

   title = "Arc narratif des émotions par heure",
```

```r
  x = "Heures",

  y = "Score des émotions"

 ) +

 theme_minimal() +

 theme(

  axis.text.x = element_text(angle = 45, hjust =
1.5)

  )+ geom_hline(yintercept = 0, linewidth =0.5,
color = "gold")
```

Plot 2: Date versus sentiment score

```r
ggplot(messages_sentiment, aes(x = Date, y =
mlts_whatsApp_senti_scores, color =Persons)) +

 geom_line() +

 geom_point() +

 scale_x_continuous(breaks = 2019:2024) +  #
Ensure all years are shown on the x-axis

  labs(

  title = "Arc narratif des émotions par date",

  x = "Date",

  y = "Score des émotions"

 ) +

 theme_minimal() +

 theme(axis.text.x = element_text(angle = 45,
hjust = 1))
```

Annexe II : Distribution des émotions dans les clavardages

Charger les packages nécessaires

```r
library(readxl)

library(wordcloud)

library(RColorBrewer)

library(syuzhet)

library(tidyverse)
```

Définir le répertoire de travail et lire les données

```r
setwd("/Users/apple/Desktop/DH2024")

mlts_unical <-
read_excel("WhatsApp_MLTS.xlsx") %>%
as_tibble() # Télécharger le fichier xlsx ici:
```
https://yohannawaliya.github.io/datasets/whatsapp
mlts.xlsx

Conversion en vecteur de caractères, si nécessaire

```r
whatsApp_messages <-
as.character(mlts_unical$Chats)
```

Nettoyage du texte

```r
whatsApp_messages <- gsub("[[:punct:]]", "",
whatsApp_messages)

whatsApp_messages <- gsub("\"", "",
whatsApp_messages)

whatsApp_messages <- gsub("[[:digit:]]", "",
whatsApp_messages)
```

Générer le nuage de mots

```r
wordcloud(whatsApp_messages, colors =
brewer.pal(10, "Spectral"),

      min.freq = 50)
```

Analyse de sentiment

```r
mlts_whatsApp_senti_scores <-
get_nrc_sentiment(whatsApp_messages)

summary (mlts_whatsApp_senti_scores)
```

Traduire les étiquettes des émotions en français

```r
emotion_labels <- c(

 "anger" = "Colère",

 "anticipation" = "Attente",

 "disgust" = "Dégoût",

 "fear" = "Peur",

 "joy" = "Joie",

 "sadness" = "Tristesse",

 "surprise" = "Surprise",
```

```
  "trust" = "Confiance",

  "negative" = "Négatif",

  "positive" = "Positif"

)
```

Calculer la somme des émotions et renommer avec les étiquettes françaises

```
emotion_sums <-
colSums(mlts_whatsApp_senti_scores)

names(emotion_sums) <-
emotion_labels[names(emotion_sums)]

emotion_sums
```

Tracer le barplot avec les étiquettes en français

```
barplot(emotion_sums,

      las = 2,

      col = brewer.pal(10, "Spectral"),

      ylab = 'Nombre d'émotions',

      main = 'Scores de sentiment des clavardages',

      names.arg = names(emotion_sums)) #
S'assurer que les étiquettes sont affichées
correctement
```

Annexe III : Les sentiments de clavardages en pourcentages

Charger les bibliothèques nécessaires

```
library(syuzhet)

library(ggplot2)

library(dplyr)

library(readxl)
```

Définir le répertoire de travail avec les données

```
setwd("/Users/apple/Desktop/DH2024")

list.files()
```

Lire les données et les convertir en tibble pour une manipulation facile

```
mlts_unical <-
read_excel("WhatsApp_MLTS.xlsx") %>%
as_tibble() # Télécharger le fichier xlsx ici:
https://yohannawaliya.github.io/datasets/whatsapp
mlts.xlsx

view(mlts_unical)
```

Nettoyage des données/textes avec stringr

Convertir 'Chats' en un vecteur de caractères si ce n'est pas déjà fait

```
whatsApp_messages <-
as.character(mlts_unical$Chats)
```

Supprimer la ponctuation, les guillemets et les chiffres

```
whatsApp_messages <- gsub("[[:punct:]]", "",
whatsApp_messages)   # Suppression des
ponctuations

whatsApp_messages <- gsub("\"", "",
whatsApp_messages)            # Suppression des
guillemets

whatsApp_messages <- gsub("[[:digit:]]", "",
whatsApp_messages)   # Suppression des chiffres

print(whatsApp_messages)
```

Traduire les étiquettes des sentiments en français

```
noms_sentiments_fr <- c(

  "anger" = "colère",

  "anticipation" = "attente",

  "disgust" = "dégoût",

  "fear" = "peur",

  "joy" = "joie",

  "sadness" = "tristesse",

  "surprise" = "surprise",

  "trust" = "confiance"

)
```

Résumer les scores de sentiments

```
sentiment_totals <-
colSums(mlts_whatsApp_senti_scores)
```

Exclure les sentiments positifs et négatifs

```
sentiment_totals <-
sentiment_totals[!(names(sentiment_totals) %in%
c("positive", "negative"))]
```

Remplacer les noms par les traductions

```
names(sentiment_totals) <-
noms_sentiments_fr[names(sentiment_totals)]
```

```
sentiment_totals <-
sentiment_totals[sentiment_totals > 0]  # Filter out
sentiments with zero counts
```

Appliquer les traductions des sentiments au data frame

```
sentiment_data <- data.frame(

  Sentiment = names(sentiment_totals),

  Count = as.numeric(sentiment_totals)

)
```

Calcul des pourcentages

```
sentiment_data$Percentage <-
sentiment_data$Count /
sum(sentiment_data$Count) * 100
```

Créer le graphique en camembert avec le nom de chaque émotion en français et le pourcentage

```
ggplot(sentiment_data, aes(x = "", y = Percentage,
fill = Sentiment)) +

  geom_bar(stat = "identity", width = 1, color =
"black") +

  coord_polar("y", start = 0) +  # Conversion en
graphique en camembert

  theme_void() +  # Simplification du thème

  labs(title = "Analyse des sentiments des messages
WhatsApp") +

  theme(legend.position = "right") +

  geom_text(aes(label = paste0(Sentiment, ": ",
round(Percentage, 1), "%")),
```

```
          position = position_stack(vjust = 0.5), size
= 4, color = "black")  # Afficher les étiquettes de
pourcentage
```