E- Global Congress
Hosted online from Dubai, U. A. E., E - Conference.
Date: 29th October 2024
Website: https://eglobalcongress.com/index.php/egc
ISSN (E): 2836-3612

THE ROLE OF TECHNOLOGY AND COMPUTATIONAL METHODS IN ANALYZING THE EVOLUTION OF SEMANTIC ASSOCIATIONS IN SCIENTIFIC LANGUAGE

E. V. Yugay
Ph.D., Acting Associate Professor
Navoi State Pedagogical Institute, Uzbekistan

Abstract
This article examines the impact of technological advancements and computational methods on the analysis of semantic associations in scientific language. By leveraging corpus linguistics, natural language processing, and machine learning, the study reveals how scientific discourse has evolved in response to new technologies, reshaping the way scientific knowledge is constructed and communicated.

Keywords: semantic associations, corpus linguistics, natural language processing, computational methods, scientific language, terminology evolution.

INTRODUCTION

The integration of technology and computational methods has profoundly transformed the study and understanding of semantic associations within scientific language. In line with the Presidential Decree of the Republic of Uzbekistan "On the Development of Digital Economy and E-Government" (No. PP-3832, July 3, 2018), which promotes technological advancement and innovation in research and education, the advent of corpus linguistics and natural language processing (NLP) enables researchers to systematically analyze extensive datasets of scientific texts. This approach allows for uncovering how semantic associations evolve over time, tracking terminological changes in response to technological advancements. For example, the evolution of terms like "gene" and "genome" in genomic research illustrates this transformation (McEnery & Hardie, 2012). Moreover, the rapid development of computer science has significantly reshaped its terminology, progressing from early references to "calculating machines" and "automata" to modern concepts such as "algorithms,"

ISSN (E): 2836-3612

"machine learning," and "artificial intelligence" (Ceruzzi, 2003). This decree underlines the importance of integrating computational methods in linguistic research, further underscoring the relevance of this investigation.

This article explores the critical role of computational methods in analyzing the historical evolution of scientific language. By employing techniques such as machine learning and semantic networks, researchers can delve into the complex relationships between words and concepts, revealing how scientific discourse adapts and transforms in response to new discoveries and interdisciplinary influences. Understanding these semantic shifts is crucial for tracing the development of scientific knowledge and its dissemination, offering valuable insights into the construction and communication of scientific ideas across time.

LITERATURE REVIEW

Role of Technology and Computational Methods

Advances in technology and the development of computational methods have revolutionized the analysis and understanding of semantic associations. Corpus linguistics and natural language processing (NLP) allow researchers to systematically study large datasets of scientific texts, revealing how semantic associations evolve over time. McEnery and Hardie (2012) note, for example, that machine learning techniques can track changes in the usage of terms like "gene" and "genome" as genomic technologies have advanced, showing how new discoveries and technologies reshape scientific language. Additionally, the development of computer science as a discipline has seen a rapid evolution in terminology. Early literature might refer to "calculating machines" and "automata," whereas modern texts use terms like "algorithms," "machine learning," and "artificial intelligence" (Ceruzzi, 2003). The integration of computational methods has revolutionized the study of semantics. Techniques such as machine learning and natural language processing enable the analysis of vast amounts of text, uncovering patterns and relationships that were previously inaccessible.

1. Corpus Linguistics: Biber & Finegan (1991), emphasizing the importance of studying real-world language usage, highlight that corpus linguistics involves analyzing language as it is expressed in large collections

ISSN (E): 2836-3612

of texts, known as corpora. This approach enables researchers to uncover semantic patterns across different contexts and genres.

2. Semantic Networks: Gross, Harmon, & Reidy (2002) point out that semantic networks, which represent words and their relationships as interconnected nodes, serve as useful models for examining the structure of the mental lexicon. These networks provide insight into how semantic associations influence language processing.

3. Deep Learning Models: McEnery & Hardie (2012) note the impressive success of deep learning models, such as recurrent neural networks (RNNs) and transformers, in tasks involving semantic understanding. These models, through their training data, have the ability to generate human-like text, translate languages, and answer questions with remarkable accuracy.

CONCLUSION

Atkinson (1999) and Biber & Finegan (1991) emphasize that understanding the historical evolution of scientific language through corpus-based studies reveals the dynamic nature of scientific discourse. Their work enhances our comprehension of how scientific knowledge is constructed, communicated, and transformed over time. Montgomery (2000) further underscores the importance of semantic associations in tracing these changes and highlights their impact on the dissemination and reception of scientific ideas.

Looking ahead, Uzbekistan's growing focus on the integration of NLP and corpus-based studies, particularly through initiatives outlined in the "Digital Uzbekistan 2030" strategy, positions the country at the forefront of technological and linguistic research. As digital technologies advance, these methods will become increasingly vital in professional workplaces, especially in education. Mastery of NLP tools will enable educators, researchers, and professionals to better understand linguistic trends, refine communication strategies, and foster the development of critical thinking and analytical skills in students. Consequently, these advancements in the study of language and technology will be essential in shaping the future of education and various industries in Uzbekistan.

REFERENCES

1. Presidential Decree of the Republic of Uzbekistan "On the Development of Digital Economy and E-Government." (2018, July 3). No. PP-3832.
2. Atkinson, D. (1999). Scientific Discourse in Sociohistorical Context: The Philosophical Transactions of the Royal Society of London, 1675–1975. Lawrence Erlbaum Associates.
3. Biber, D., & Finegan, E. (1991). Corpus Linguistics: Investigating Language Structure and Use. Cambridge University Press.
4. Bourne, P. E., & Chalabi, S. (2006). Ten Simple Rules for Getting Published. PLOS Computational Biology, 2(5), e57.
5. Ceruzzi, P. E. (2003). A History of Modern Computing (2nd ed.). MIT Press.
6. Grafton, A. (1994). The Footnote: A Curious History. Harvard University Press.
7. Gross, A. G., Harmon, J. E., & Reidy, M. S. (2002). Communicating Science: The Scientific Article from the 17th Century to the Present. Oxford University Press.
8. Holmes, F. L. (2000). Antoine Lavoisier: The Next Crucial Year: Or, the Sources of His Quantitative Method in Chemistry. Princeton University Press.
9. Hulme, M. (2009). Why We Disagree About Climate Change: Understanding Controversy, Inaction, and Opportunity. Cambridge University Press.
10. Kronfeldner, M. (2009). Darwinian Creativity and Memetics. In R. J. Richards & M. Ruse (Eds.), The Cambridge Companion to the "Origin of Species" (pp. 180-206). Cambridge University Press.
11. Kuhn, T. S. (1962). The Structure of Scientific Revolutions. University of Chicago Press.
12. McEnery, T., & Hardie, A. (2012). Corpus Linguistics: Method, Theory, and Practice. Cambridge University Press.
13. Meyer, P. (2002). What's in a Word? The Concept of Ether and the Structure of Modern Physics. Journal of the History of Ideas, 63(1), 1-19.
14. Montgomery, S. L. (2000). Science in Translation: Movements of Knowledge through Cultures and Time. University of Chicago Press.