



Natural Language Processing Frontiers in African Languages of Kenya: Challenges and Opportunities

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Abstract

Natural Language Processing (NLP) has emerged as a critical tool for automating language understanding in various applications. However, its application to African languages remains underexplored, particularly in contexts like Kenya where multiple indigenous languages coexist and are increasingly used in digital communication. A mixed-method approach was employed, including a survey among linguists and developers, as well as an empirical analysis of language-specific characteristics using statistical models. The preliminary findings indicate that the complex grammatical structures in some African languages significantly complicate the application of existing NLP algorithms, necessitating the development of specialized models for these languages. While there is a significant need to develop tailored NLP solutions for African languages in Kenya, this study highlights the importance of understanding language-specific features and developing robust statistical models that can accommodate these differences. Future research should focus on building comprehensive datasets and developing machine learning algorithms specifically designed for African languages, with an emphasis on iterative refinement based on empirical testing. Model estimation used $\hat{\theta} = \operatorname{argmin}\{\theta\} \operatorname{sumiell}(y_i, f\theta(\xi)) + \lambda \operatorname{Vert}\theta \operatorname{rVert}^2$, with performance evaluated using out-of-sample error.

Keywords: *Bantu languages, Computational linguistics, Data-driven methods, Grammatical frameworks, Machine learning, Morphology, Text processing*

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