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Comparative Analysis for Machine Learning Algorithms in Email Spam Filtering: Evolution, Performance and Future Directions

KKVC Devindi[1#] and GAD Ganepola[1]

[1]Faculty of Computing, General Sir John Kotelawala Defence University, Ratmalana, Sri Lanka

[#]38-bis-0023@kdu.ac.lk

Abstract

Email remains a cornerstone of digital communication, facilitating fast and efficient Internet communication. The growing reliance on email has led to numerous issues caused by spam. Spam infiltrates personal and professional accounts, posing threats ranging from phishing scams to malware dissemination. There is an urgent need to develop stronger dependable antispam filters is crucial to protect users from spammers evolving tactics and maintain the integrity and safety of digital communication channels. Spam emails can now be efficiently recognized and filtered thanks to recent developments in machine learning algorithms like hybrid approaches, corporate email systems, ad anti-spam software solutions. We provide an in-depth examination of several popular machine learning-based email spam filtering methods. An outline of the main concepts, approaches, efficacy, and future directions of spam filtering research is provided in our review. Machine learning-based spam filters like naive bayes, support vector machines, decision trees, neural networks, ensemble methods and their variants are our primary emphasis. We present the results of a thorough analysis that includes a survey of relevant concepts, efforts, efficacy, and recent developments. Our evaluation rigorously compares the benefits and limitations of current machine-learning techniques with the unresolved issues in spam filtering research. We conclude by discussing performance evaluation measures of machine learning-based filters and explore challenges and future directions of the latest developments.

Keywords: *Email, Spam, Antispam filters, Machine learning algorithms, Performance evaluation measures*