

Investigating Frequent Pattern-based Models for Improving Community Policing in South Africa.

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Abstract. Identifying crime patterns in a region can provide valuable information for developing effective strategies to combat criminal activities. While frequent pattern-based models have proven useful, there is limited research that has considered this within the South African context. Therefore, this research delves into exploring two major frequent pattern-based mining algorithms, which are Frequent Pattern Growth (FP- Growth) and Hyper-Structure Mining (Hmine), and then proposes a Hybrid- Growth algorithm (Hmine_FP-Growth)-an improved FP-Growth algorithm, to generate frequent crime patterns from Crime Stats SA dataset. The study aims to evaluate the algorithms based on factors such as time complexity and memory usage, as well as the patterns' support, lift, and confidence values. The research emphasizes the importance of selecting efficient and cost-effective algorithms for large-scale crime datasets and real-time processing requirements. The results show that FP-Growth exhibits a higher time complexity and memory usage compared to the other two algorithms. Hmine stands out in terms of time complexity, with an average of 7.48 seconds and a memory usage of 0.03 GB. On the other hand, the Hybrid-Growth algorithm exhibits an average runtime of 79.97 seconds and utilizes 0.02 GB of memory for pattern generation per province. This distinction highlights Hmine as a fast-processing algorithm, while Hybrid-Growth excels in minimizing memory usage. The outcome of this research has the potential to guide law enforcement agencies in resource allocation and improving crime prevention strategies.

Keywords: Community Policing, Frequent Pattern, Data mining, Machine Learning, Hyper-Structure Mining