

**EFFICIENCY ENHANCEMENTS FOR PRACTICAL  
TECHNIQUES FOR SEARCHES ON ENCRYPTED  
DATA**

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Thesis submitted in partial fulfilment of the requirements for the degree  
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# DECLARATION

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Dr. Chandana D. Gamage

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Date

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# ABSTRACT

Information security has become one of the major focus areas for any organization. More often, organizations see the need of outsourcing their data storages in meeting the operational and security objectives. This gives rise to a new problem of privacy protection of the data stored with a third party. As a solution the data is encrypted before storing with a third party data service provider. Thus when the users need to process the data, the safer option is to download the data into a secure user machine and perform the operations on the decrypted data. This creates an additional overhead of having to download a large amount of data and decrypt them even to perform a simple calculation on the data stored in the encrypted form. Therefore the possibility of secure data processing at the remote third party storage has become an interesting problem to solve. In order to preserve the privacy the data cannot be allowed to be decrypted at the third party storage. One form of the solution is to facilitate computations on the data stored in encrypted form. The users can make requests from the data service provider and if the service provider can perform operations on the encrypted data itself and provide the answer the above mentioned overhead can be avoided. This brings the focus of this research on to the studying of computing on encrypted data with specific focus on searchable encryption. As part of the research, the current literature of computing on encrypted data is studied to identify a suitable searchable encryption scheme for practical use. Followed by the literature study, an existing symmetric searchable encryption scheme is selected for a detailed study. Here a complete implementation of the scheme is proposed and the test results are analyzed. Based on the results, a keyword extraction mechanism is proposed to improve the performance of the scheme. Finally significant performance improvements, 89.83% reduction in extra space usage due to searchable encryption and 92.11% improvement in single keyword search time has been achieved. In addition to that, use cases in capital markets are studied to understand the possibilities of practical use and challenges.

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