INCREASING DATA ANONYMITY USING PRIVACY TECHNIQUES AND ADVANCED ENCRYPTION STANDARD

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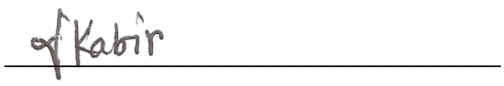

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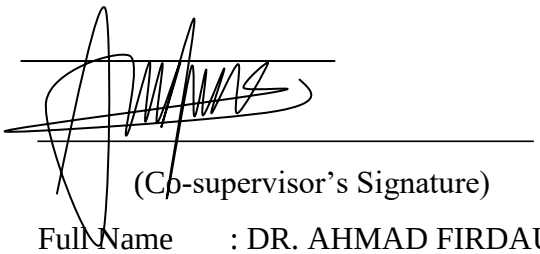

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ABSTRAK

Keselamatan data dan privasi data telah menjadi bidang yang perlu diberi perhatian sejak akhir-akhir ini. Dataset sering terdiri dari bidang data sensitif dimana pendedahan ia mampu membahayakan individu yang berkaitan dengan data tersebut. Dengan kemajuan teknologi terkini, penyerang mampu membangunkan kaedah baru dari semasa ke semasa untuk mendapatkan akses ke maklumat sensitif dari kad pengenalan bank, kad warganegara dan pengundi. Untuk menyelesaikan masalah ini, teknik privasi menghalang pengenalan orang tersebut melalui peningkatan anonimitas individu dalam set data untuk melindungi maklumat sensitif. Tesis ini menangani masalah melindungi data pengguna sensitif dalam set data dari pelanggaran privasi dan keselamatan dan aktiviti jahat oleh penyerang dengan menggunakan teknink bersepadu antara teknik privasi dan sekuriti Advanced Encryption Standard (AES). Objektif kajian adalah untuk membangunakan teknik terpadu diantara teknik privasi dan teknik keselamatan untuk melindungi data dalam set data. Untuk melaksanakan teknik bersepadu antara teknik privasi dan sekuriti untuk melindungi data pengguna dalam set data. Untuk validasi teknik bersepadu dengan membandingkan keputusan ketepatan sebelum dan selepas menggunakan teknik privasi dalam set data menggunakan teknik perlombongan data. Kajian metodologi mengandungi tiga fasa. Fasa pertama menentukan set data yang sesuai dan menyiasat teknik dan memahami teknik dan rangka kerja berkaitan dengan privasi dan sekuriti. Fasa kedua melibatkan perlaksanaan teknik bersepadu oleh teknik privasi bersama AES. Fasa ketiga melibatkan penilaian hasil klasifikasi dari pelaksanaan eksperimen proses teknik yang dicadangkan. Metodologi kajian ini terdiri daripada tiga fasa. Fasa pertama menentukan set data yang sesuai dan menyiasat serta memahami teknik-teknik dan rangka kerja berkaitan dengan privasi dan sekuriti. Fasa kedua pula melibatkan perlaksanaan teknik bersepadu oleh teknik privasi dengan AES. Fasa ketiga melibatkan penilaian keputusan klasifikasi selepas bereksperimen dengan pelaksanaan proses teknologi yang dicadangkan. Dalam penyelidikan ini, teknik keselamatan yang digunakan adalah AES, dan teknik privasi adalah privasi berbeza, k-Anonymity, Sampel-uniqueness; dan teknik perlombongan data (Naive bayes, J48 dan Neural network) dengan menggunakan Weka Experimenter Environment (Weka). Pelbagai ujian telah dilakukan menggunakan Weka untuk mengklasifikasikan data untuk memeriksa kegunaan data untuk tujuan analisis. Hasil klasifikasi sebelum dan sesudah menggunakan teknik privasi. Didapati bahawa perbezaan privasi pada kolum jantina set data memberikan keputusan terbaik dalam ketepatan dan mengungguli teknik k-Anonimiti dan teknik sample-uniqueness. Walau bagaimanapun, teknik k-Anonimiti dan sampel-uniqueness pada kolum umur dan kolesterol menunjukkan hasil yang lebih baik dalam keputusan daripada teknik privasi pembezaan. Selain itu, diperhatikan bahawa untuk ketepatan klasifikasi pada Weka, Naïve bayes memberikan hasil yang lebih baik daripada Neural network dan J48. Untuk mengelakkan set data dari penyerang luaran, AES digunakan untuk mengenkripsi set data yang dilalui melalui teknik privasi. Untuk meningkatkan keselamatan, fail yang dienkripsi kunci umum yang terlibat dengan penyulitan adalah dibahagikan kepada lima fail dan kemudian setiap subfile dan subkunci dilampirkan dan disimpan di lima pelayan. Hasil ujian menunjukkan keputusan yang positif dengan menggunakan teknik bersepadu menggunakan teknik privasi dengan teknik keselamatan untuk melindungi data pengguna sensitif dalam set data. Untuk kajian akan datang, kajian boleh difokuskan pada peningkatan ketepatan klasifikasi skema perlindungan dengan memeriksa lebih banyak teknik privasi dan menerapkannya pada data awan.

ABSTRACT

Data security and data privacy have been an important area in recent years. Dataset often consists of sensitive data fields, exposure of which may jeopardize individuals associated with the data. With the technological advancement, the attackers have been developing new methods from time to time to gain access to sensitive information from the bank, national and voter identification cards, etc. To resolve this issue, privacy techniques hinder the identification of the person through an increase of the anonymity of the individual in the dataset to protect sensitive information. This thesis addresses the problem of protecting sensitive user data in the dataset from privacy and security violations and malicious activities by attackers of the system using the integrated technique between privacy techniques with a security technique *Advanced Encryption Standard* (AES). The research objectives are to design an integrated technique between privacy techniques with a security technique for protecting data in the dataset. To implement the integrated technique between privacy techniques with security techniques to protect sensitive user data in the dataset. To validate the integrated technique by comparing the accuracy results before and after applying privacy techniques in the dataset using the data mining techniques. The research methodology consists of three phases. The first phase constitutes determining the suitable dataset and investigating the techniques and understanding of techniques and frameworks related to security and privacy. The second phase involves implementing the integrated technique of privacy techniques with AES. The third phase involves evaluating the classification results after experimenting with the implementation of the processes of the proposed technique. In this research, the security technique that was used is AES, and privacy techniques were differential privacy, k-Anonymity, Sample-uniqueness; and the data mining techniques: Naive Bayes, J48 and Neural Network were used under Weka. Many tests were conducted using Weka Experimenter Environment to classify the data to check the usefulness of the data for analysis purposes. Classification results before and after using privacy techniques were compared. It was found that differential privacy on the gender column of the dataset provides the best results in accuracy and outperforms the k-Anonymity technique and sample-uniqueness technique. However, k-Anonymity and sample-uniqueness techniques on the age and cholesterol columns show better results in accuracy than the differential privacy technique. Besides, it was observed that for classification accuracy on Weka Experimenter Environment, Naïve Bayes presented better results than Neural Network and J48. To avert the dataset from external attackers, AES was used to encrypt the dataset passed through the privacy technique. To increase the safety, the encrypted file the general key involved with the encryption was split into five files and then each subfile and the subkey were attached and stores in five servers. The test results demonstrate the success of using the integrated technique using privacy techniques with the security technique to protect sensitive user data in the dataset. The future work can be focused on enhancing the classification accuracy of the protection schemes by examining more privacy techniques and applying them to big data and carrying out experiments on the big data in the cloud.

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LIST OF SYMBOLS

=	Equality
≠	Inequality
>=	Greater than or equal to
<=	Less than or equal to
<	Less than
>	Greater than
×	Multiplication
−	Subtraction
+	Addition
÷	Division
/	Division
%	Percentage
&	Ampersand
Φ	Phi
?	Question mark
XOR	Exclusive OR
( )	Parentheses

LIST OF ABBREVIATIONS

AES	Advanced Encryption Standard
AUC	Area under the curve
CSV	Comma-Separated values
DES	Data Encryption Standard
DSA	Digital Signature Algorithm
ECC	Elliptic Curve Cryptography
EEG	Electroencephalogram
FP	Functional Tree
FPGA	Field Programmable Gate Array
FT	False positives
IB	InfiniBand
ICN	Information Centric Networking
LCA	Latent Class Analysis
LLP	Learning from label proportion
LMT	Logistic model trees
LR	Linear regression
NIST	National Institute of Standards and Technology
PD	Parkinson’s disease
ROC	Receiver Operating Characteristic
RSA	Rivest Shamir Adleman
SCIS	Smartphone-based Compression-Induced Imaging System
SLDC	Shipment Lead time with Delivery Confirmation
SLECR	Shipment Lead time with Empty Container Return
SSL/ TLS	Secure Sockets Layer/Transport Layer Security
SVM	Support Vector Machine
TXT	Text File

LIST OF APPENDICES

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