

Experience Report for Biometrics

Ms. Promise Molale is a Certified Biometrics Professional and a PhD. student at the Department of Electrical and Electronics Engineering, University of Johannesburg, South Africa. She is currently an Assistance Vice President looking after model risk at ABSA, Johannesburg. Before then she was a Customer Value Management analyst at ABSA Home Loans, Johannesburg. She also worked as a quantitative analyst at FNB, Johannesburg. Before joining the private sector she was a lecturer of Statistics at Sefako Makgatho Health Sciences University in Pretoria, South Africa. She started her career as a biometrics researcher at the Council of Science and Industrial Research (CSIR) in Pretoria, South Africa within Modeling and Digital Science Unit. Her research interests are in classification, pattern recognition, artificial intelligence, statistical and machine learning modeling. She received her under-graduate degree in Mathematics and Statistics, honours and Masters Degree in Statistics at the University of Limpopo, Medunsa Campus in South Africa.

During her two year (February 2011-January 2013) stay at the Council of Science and Industrial Research (CSIR), she received her biometric certification and her research focused on the fingerprint biometric system. She investigated the application of classifiers to fingerprint prediction problems. She studied the following supervised learning methods in her work: linear discriminant analysis, logistic discrimination, k-nearest neighbour, artificial neural network, association rules, decision tree, naive Bayes classifier and support vector machine. She presented her peer reviewed work at the South African Statistical Association (SASA) conference.

Her research has an impact in the community of fingerprint biometrics and biometric systems as a whole. The purpose of classification is to partition a large database into clusters so that search space becomes smaller and thus reduce search time which also improves identification accuracy. Accurate identification of a person could deter crime and fraud, streamline business processes and save critical resources. In law enforcement, accurate identification of a person could be used to decrease crime rates and save the community heartache caused by repeated crimes committed by the same perpetrators. Government agencies would save time and resources on looking for criminals. Classification is applicable to different types of data, not only to biometric data; as a result Ms. Molale's research will also be beneficial to a wider audience.

Ms. Molale became a lecturer of Statistics from February 2013 – April 2015 where she prepared and presented junior and senior modules, namely: Probability Theory, Statistical Inference, and Applied Regression Analysis. Part of her responsibilities as a lecturer was supervising post graduate students on their research projects and assisting junior staff. She was also actively involved in research related to biometric studies and other subject matter, the list of publications and summary findings are given below. Community work was part of her responsibilities, this includes coming up with initiatives to support the community.

For her masters and doctoral studies (over 5 years of biometric research experience) she researched on the following project using Matlab and WEKA tools:

The purpose of the project was to do empirical evaluation of a variety of machine learning methods and develop a new strategy for predicting fingerprints. The Machine Learning and Statistical techniques used were: Decision Trees, Logistic Regression, Linear discriminant Analysis, Associate Rule, K Nearest Neighbour, Naïve Bayes Classifier, Artificial Neural Network, and Support Vector Machine. Five of the classifiers (DT, SVM, KNN, NBC, AR) are in the top ten algorithms in data mining and the summary findings are given below:

- Examining the performance of the individual classifiers showed Support Vector Machine and Decision Trees to have the highest accuracy (i.e. lowest misclassification error) on average, while Linear Discriminant Analysis had the lowest consistent accuracy (i.e. highest misclassification error). When examining the other six performance measures k-NN outperformed the other seven individual classifiers. The results also show all the multi stage systems to significantly outperform the individual classifiers. Accordingly, good performance is consistently derived from boosting. The results further show that that the initial ensemble size of eight can be reduced to five with a confidence coefficient approximately equal to 0.95.

The List of articles published related to Biometrics are listed below:

A) Publications with peer review process

1. Molale, P. T., Twala, B. & Seeletse, S. M (2011). Fingerprint prediction using classifier ensembles, 53 ANNUAL South African Statistical Association (SASA) Conference, CSIR Convention center, 47-61.
2. Molale, P.T., Twala, B. & Seeletse, S.M. (2012). Fingerprint prediction using statistical and machine learning methods, Seventh International Conference on Innovative Computing, Information and Control (ICIC2012), Shanghai, CHINA, 311-316.
3. Molale, P.T., Twala, B. & Seeletse, S.M. (2013). Fingerprint prediction using statistical and machine learning methods, ICIC Express Letters, 7(2):311-316.
4. Molale, P.T. & Twala, B. (2014) Towards Effective Fingerprint Prediction using Computational Intelligence Methods, 11th International Meeting on Computational Intelligence Methods for Bioinformatics and Biostatistics (CIBB), University of Cambridge, Cambridge, 173-181.

B) Submitted publications with peer review process

1. Molale, P. T., Twala, B. & Seeletse, S. M: Fingerprint Prediction using Multiple Classifier Learning. Submitted to: American Journal of Applied Sciences.
2. Molale, P. T., Twala, B. & Seeletse, S. M: ENSEMBLE SIZE SELECTION USING ESTIMATION STRATEGY. Submitted to: American Journal of Applied Sciences.

The following above mentioned publications have evolved from her doctoral dissertation: **A1-4, B1-2.**

Experience Report for Business Sciences

She then moved to FNB (May 2015 - February 2016), as an analyst, to join banking where she applied her statistical modeling and analytical techniques to solve business problems. The statistical modeling techniques she used were Decision Trees and regression methods in the following projects, using SAS Enterprise Guide and SAS Enterprise MINER tools:

- The purpose of this project was to identify accounts that were likely to go into excess before they do, therefore enabling early detection of risk to perform mediating actions. This was for the Overdraft facilities (Private Wealth Segment).
- The purpose of this project was to come up with an analytical model that will allow the collections team to give priority to accounts in default which have a high probability of recovery. This was for the Overdraft facilities (Business Banking).

She later joined ABSA in September 2016 where she was appointed as an assistance Vice President in Customer Value Management. As part of her work at ABSA Home Loans, she used descriptive statistics, graphical display, ANOVA, significance tests and regression techniques in the following projects:

- Deliver Effective Collection Strategy and achieve STP (Short Term Plan) target for the ABSA Home Loans portfolio;
- Proactively manage impairments to deliver in line with STP (Short Term Plan);
- Manage risk and control effectively by applying applicable risk frameworks, embedding a positive risk culture and strengthen the overall control environment.
- Embed an RMO (Risk Mitigation Officer) strategy.

The above was achieved for STP.

She currently looks after Model Risk at ABSA and her stakeholders are heads of departments. The projects she has worked on involved hypothesis testing, control testing and regulatory reporting

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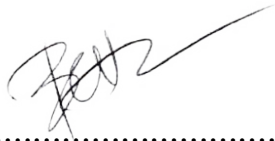
models. This is across Market and Treasury Risk, Operational Risk, Credit Risk and Model Risk for the following projects:

- For CLF (Committed Liquidity Facility) monitoring purposes, banks are required to complete the BA200 forms on a quarterly basis, based on the underlying assets in the Special Purpose Instrument (SPI). This form is signed-off by the respective bank's model risk team to confirm that the underlying assets maintained in the SPI were accurately and completely reported in the BA200 regulatory return in compliance with SARB guidance note 6/2016.
- ABSA has implemented the wholesale counterparty credit risk haircuts (under the standardized approach) as per the SARB requirements of regulation 23(9)(xi) of the Banks Act (Act no. 94 of 1990). For this testing model risk team was confirming whether the haircuts were applied correctly.
- The Model risk team performed an assessment of the Daily Liquidity Coverage Ratio (LCR). The assessment looked at the daily data sourcing, data transformation, calculation (i.e. 'Daily Cash Flow Engine' model and High Quality Liquid Assets) and the daily reporting of the LCR to the South African Reserve Bank (SARB).
- The assessment evaluates the level of compliance with the minimum requirements prescribed in the SARB's Regulations. The SARB Self-Assessments constitute an important part of the supervisory review process as the assessments are used by the SARB to assess the level of compliance by banks that adopted the IRB approach to calculate their regulatory capital relating to credit risk with the provisions of the SARB regulations. Banks are required to complete and submit the SARB Self-Assessment based on current SARB regulations. The primary purpose and intent of the SARB Self-Assessment is for both ABSA and the SARB to become fully aware of ABSA's areas of non-compliance and to ensure that the necessary steps are being taken to address any weaknesses identified.
- ABSA is undertaking a Regulatory Agreed Upon Procedures (RAUP) of Traded Market Risk: Time Series Assignment (regulatory commitments). We will be verifying that the action items (Identification and assignment of Time Series, Time Series Data clean up, Time Series Assignment Standards and Procedures) highlighted in the Traded Market Risk: Time Series Assignment model risk report and communicated to the South African Reserve Bank (SARB) as closed were remediated by Traded Market Risk Management.

For all the above projects the assessments were successfully performed and reports have been sent to SARB.

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SIGNATURE: DATE:

04 June 2018

Please print your initials and surname here (Supervisor):

B. TWALA

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