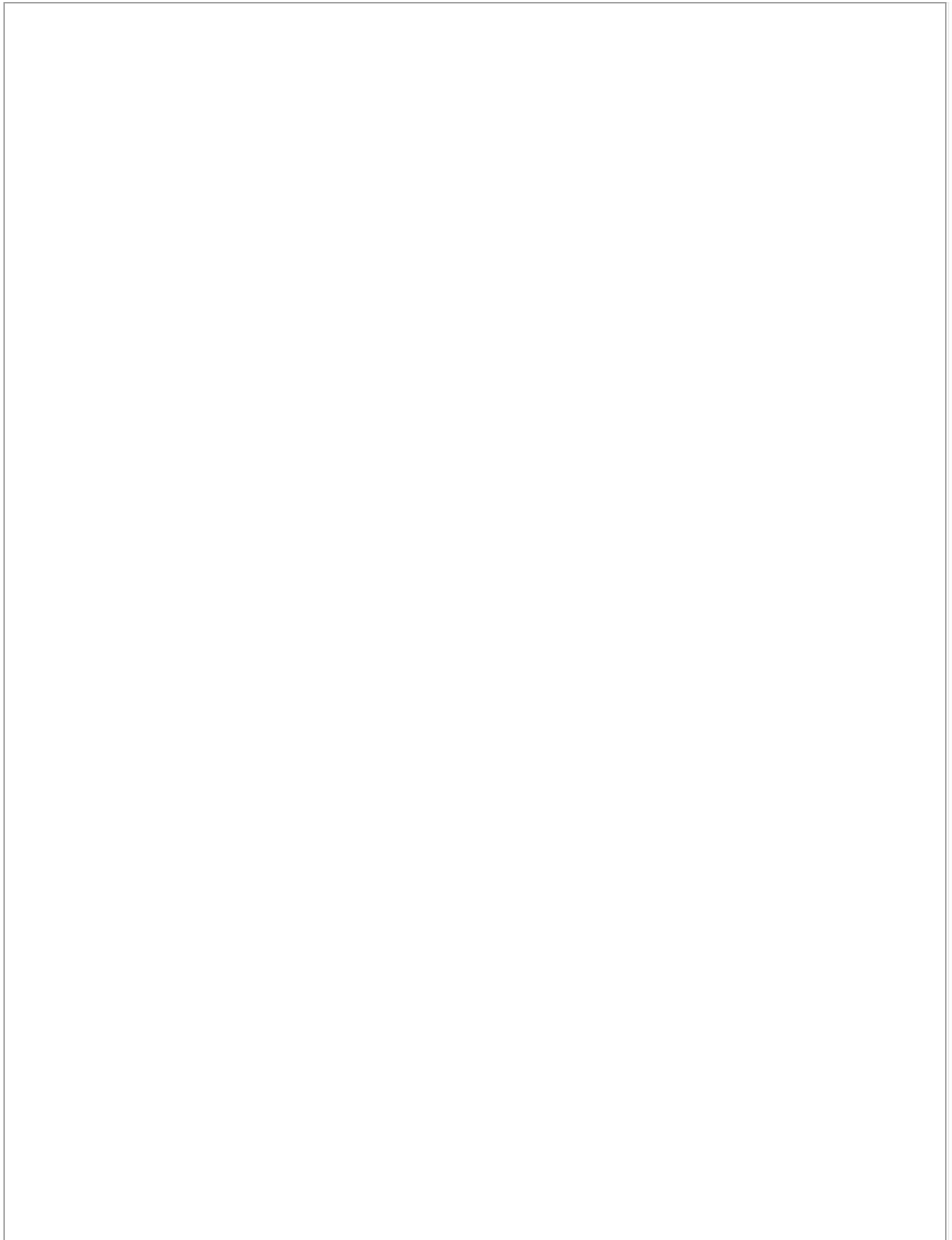# Scopus

Documents

Altalmas, T.[a] , Ahmad, S.[a] , Hashim, N.N.W.N.[b] , Hassan, S.S.[c] , Sediono, W.[b]

Characteristics with opposite of quranic letters mispronunciation detection: a classifier-based approach
(2022) *Bulletin of Electrical Engineering and Informatics*, 11 (5), pp. 2817-2827.

[a] Department of Mechanical Engineering, Faculty of Engineering, International Islamic University Malaysia, Kuala Lumpur, Malaysia
[b] Department of Mechatronics Engineering, Faculty of Engineering, International Islamic University Malaysia, Kuala Lumpur, Malaysia
[c] Centre for Languages and Pre-University Academic Development, International Islamic University Malaysia, Kuala Lumpur, Malaysia

Abstract
Reading Quran for non-Arab is a challenge due to different mother tongues. learning Quran face-to-face is considered time-consuming. The correct pronunciation of Makhraj and Sifaat are the two things that are considered difficult. In this paper, Sifaat evaluation system was developed, focusing on Sifaat with opposites for teaching the pronunciation of the Quranic letters. A classifier-based approach has been designed for evaluating the Sifaat with opposites, using machine learning technique; the k-nearest neighbour (KNN), the ensemble random undersampling (RUSBoosted), and the support vector machine (SVM). Five separated classifiers were designed to classify the Quranic letters according to group of Sifaat with opposites, where letters that are classified to the wrong groups are considered mispronounced. The paper started with identifying the acoustic features to represent each group of Sifaat. Then, the classification method was identified to be used with each group of Sifaat, where best models were selected relying on various metrics; accuracy, recall, precision, and F-score. Cross-validation scheme was then used to protect against overfitting and estimate an unbiased generalization performance. Various acoustic features and classification models were investigated, however, only the outperformed models are reported in this paper. The results showed a good performance for the five classification models. © 2022, Institute of Advanced Engineering and Science. All rights reserved.

Author Keywords
Audio analysis; Classification; Feature extraction; Feature selection; Machine learning

References
- Ali, Z., Alsulaiman, M., Muhammad, G., Elamvazuthi, I., Mesallam, T. A.
Vocal fold disorder detection based on continuous speech by using MFCC and GMM
(2013) *2013 7th IEEE GCC Conference and Exhibition (GCC)*, pp. 292-297.

- Maier, A.
Automatic detection of articulation disorders in children with cleft lip and palate
(2009) *The Journal of the Acoustical Society of America*, 126 (5).
Nov

- Lee, J., Lee, C. H., Kim, D., Kang, B.
Smartphone-Assisted Pronunciation Learning Technique for Ambient Intelligence
(2017) *IEEE Access*, 5, pp. 312-325.

- Hanani, A., Russell, M. J., Carey, M. J.
Human and computer recognition of regional accents and ethnic groups from British

- **An Efficient Mispronunciation Detection System Using Discriminative Acoustic Phonetic Features for Arabic Consonants," International Arab Journal of Information Technology, vol. 16, no. 2, pp. 242–250**
(2013) *Computer Speech and Language*, 27 (1), pp. 59-74.
English speech, Jan. [5] M. Maqsood, A. Habib, and T. Nawaz, Mar. 2019

- Witt, S. M.
Automatic Error Detection in Pronunciation Training: Where we are and where we need to go
(2012) *International Symposium on automatic detection on errors in pronunciation training*, 1.

- Alsulaiman, M.
Pronunciation errors of non-Arab learners of Arabic language
(2014) *2014 International Conference on Computer, Communications, and Control Technology (I4CT)*, pp. 277-282.

- Abdou, S. M., Rashwan, M.
  A Computer Aided Pronunciation Learning system for teaching the holy quran Recitation rules
  (2014) *2014 IEEE/ACS 11th International Conference on Computer Systems and Applications (AICCSA)*, pp. 543-550.

- Akhtar, S.
  Improving Mispronunciation Detection of Arabic Words for Non-Native Learners Using Deep Convolutional Neural Network Features
  (2020) *Electronics*, 9 (6).

- Nazir, F., Majeed, M. N., Ghazanfar, M. A., Maqsood, M.
  Mispronunciation Detection Using Deep Convolutional Neural Network Features and Transfer Learning-Based Model for Arabic Phonemes
  (2019) *IEEE Access*, 7, pp. 52589-52608.

- Maqsood, M., Habib, H. A., Nawaz, T., Haider, K. Z.
  A Complete Mispronunciation Detection System for Arabic Phonemes using SVM
  (2016) *Computer Science*,

- Khairuddin, S.
  Formant Frequency Analysis of Quranic Alphabets in Sukoon Pronunciation Between Adult Male and Female Experts
  (2019) *QURANICA-International Journal of Quranic Research*, 11 (1), pp. 37-52.
  Jun

- Tabbaa, H. M. A., Soudan, B.
  Computer-Aided Training for Quranic Recitation
  (2015) *Procedia-Social and Behavioral Sciences*, 192, pp. 778-787.
  Jun

- Alkhatib, B., Kawas, M., Alnahhas, A., Bondok, R., Kannous, R.
  Building an assistant mobile application for teaching arabic pronunciation using a new approach for arabic speech recognition
  (2017) *Journal of Theoretical and Applied Information Technology*, 95 (3).
  Feb

- Hanani, A., Attari, M., Farakhna, A., Joma'A, A., Hussein, M., Taylor, S.
  Automatic Identification of Articulation Disorders for Arabic Children Speakers
  (2016) *Proc. 5th Workshop on Child Computer Interaction (WOCCI 2016)*, pp. 35-39.

- Al Hindi, A., Alsulaiman, M., Muhammad, G., Al-Kahtani, S.
  Automatic pronunciation error detection of nonnative Arabic Speech
  (2014) *2014 IEEE/ACS 11th International Conference on Computer Systems and Applications (AICCSA)*, pp. 190-197.

- Necibi, K., Bahi, H.
  An Arabic Mispronunciation Detection System by means of Automatic Speech Recognition Technology
  (2012) *Proceedings de 13th International Arab Conference on Information Technology ACIT'2012*,

- Ahmad Khan, A. F., Mourad, O., Bin Mannan, A. M. K., Dahan, H. B. A. M., Abushariah, M. A. M.
  Automatic Arabic pronunciation scoring for computer aided language learning
  (2013) *2013 1st International Conference on Communications, Signal Processing, and their Applications (ICCSPA)*, pp. 1-6.

- S-Pathak, B., Panat, A.
  Extraction of Pitch and Formants and its Analysis to identify 3 different emotional

states of a person
(2012) *International Journal of Computer Science Issues*, 9 (4).
July 10.1.1.402.3342

- Altalmas, T., Ahmad, S., Sediono, W., Hassan, S. S.
  Quranic Letter Pronunciation Analysis based on Spectrogram Technique: Case Study on Qalqalah Letters
  (2015) *The 11th International Conference on Artificial Intelligence Applications and Innovations (AIAI'15),*

- Khairuddin, S.
  Classification of the Correct Quranic Letters Pronunciation of Male and Female Reciters
  (2017) *IOP Conference Series: Materials Science and Engineering*, 260, p. 012004.

- Azam, H.
  Classifications of clinical depression detection using acoustic measures in Malay speakers
  (2016) *2016 IEEE EMBS Conference on Biomedical Engineering and Sciences (IECBES)*, pp. 606-610.

- Hashim, N. N. W. N., Wilkes, D. M., Salomon, R.
  Timing Patterns of Speech as Potential Indicators of Near-Term Suicidal Risk
  (2015) *International Journal of Multidisciplinary and Current Research*, 3, pp. 1104-1116.
  Nov

- Czerepinski, Kareema
  Tajweed Rules of the Qur'an Part 2
  (2003) *King Fahd National Cataloging in Publication Data*,
  Jeddah: Dar Al-Khair Islamic Books Publisher, ISBN: 9660-9343-4-9

- Alom, Md. Z.
  A State-of-the-Art Survey on Deep Learning Theory and Architectures
  (2019) *Electronics*, 8 (3), p. 292.
  Mar

- Arafa, M. N. M., Elbarougy, R., Ewees, A. A., Behery, G. M.
  A Dataset for Speech Recognition to Support Arabic Phoneme Pronunciation
  (2018) *International Journal of Image, Graphics and Signal Processing*, 10 (4), pp. 31-38.
  Apr

- *Introduction to Feature Selection-MATLAB & Simulink*,
  [Online], Available: (accessed Dec. 26, 2020)

- Moore, J. H., White, B. C.
  Tuning ReliefF for Genome-Wide Genetic Analysis
  (2007) *Evolutionary Computation, Machine Learning and Data Mining in Bioinformatics*, pp. 166-175.

- *Train Classification Models in Classification Learner App-MATLAB & Simulink*,
  [Online], Available: (accessed Dec. 26, 2020)

Correspondence Address
Altalmas T.; Department of Mechanical Engineering, Malaysia; email: tareq.ma@live.iium.edu.my

Source: Scopus