№ 025

Data-Driven Triage: Exploring AI Models for Predicting Emergency Department Outcomes

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INTRODUCTION

- A subset of AI, machine learning, predicts outcomes by analysing data patterns automatically (Mitchell, 1997).
- ML could be a solution in improving the triage system (Elhaj et al., 2023).

OBJECTIVES

To identify the correlation between triage data and ML models, determine the best ML models and to predict triage outcomes based on the Malaysian Triage Scale.

METHODS

- Retrospective cohort study.
- 80% Training and 20% Testing set.
- 312 completed data out of 79891 patients (2019-2023).
- Instrument: Python 3.11, Scikit-learn Python package.

RESULTS & DISCUSSION

- DBP and SBP have a high correlation (R-value 0.61).
- Correlation shows RR has a high impact on triaging to the red zone (Actual_Class_5) with an R-value of 0.36.
- RR has a highly negative impact on SpO_2 (R-value 0.49) and a positive impact on body temperature (R-value 0.32), supported by El-Haj (2023) (R-value 0.47).
- Random Forest, Gradient Boosting and XGBoost are the best ML models with accuracy, precision, recall and F1-score of 100%.
- ROC graph shows that the best three ML models can perfectly distinguish between positive and negative classes involving GZ (fast lane), yellow zone and resus zone with the result of 1.00 (Similar to Gao et al., 2022).

CONCLUSION & RECOMMENDATION

- There are one or more relations between each feature in the triage data, and RF, GBDT, and XGBoost are the best algorithms in developing ML models and predicting triage data accurately.
- Future study to train ML models using a larger dataset.

REFERENCES

1. Mitchell, T. M. (1997). Does Machine Learning Really Work?. *AI Magazine*, 18(3), 11.
2. Elhaj H., Achour N., Tania MH & Aciksari K. (2023). A comparative study of supervised machine learning approaches to predict patient triage outcomes in hospital emergency departments. *Array, Vol* 17.
3. Gao Z. et al. (2022). Developing and Validating an Emergency Triage Model Using Machine Learning Algorithms with Medical Big Data. *Risk Management and Healthcare Policy,* 19:15:1545-1551.

Table 1: Demographic data

Gender	Frequency	Percentage (%)
Female	141	45.34
Male	170	54.66
Age_Group		
18-27	21	6.75
28-37	18	5.79
38-47	29	9.32
48-57	40	12.86
58-67	108	34.73
68-77	70	22.51
78-87	24	7.72
88-97	1	0.32
Race		
Chinese	3	0.96
Indian	14	4.5
Malay	294	94.54
Actual_Class		
0	2	0.64
1	8	2.57
2	59	18.97
3	1	0.32
4	180	57.88
5	61	19.61

Table 2: Correlation Matrix

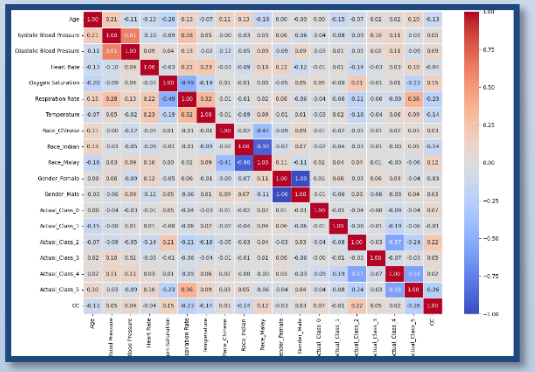

Table 3: Performance Tests

Models	Accuracy (%)	Precision (%)	Recall (%)	F1-score (%)
RF	100	100	100	100
GBDT	100	100	100	100
XGBoost	100	100	100	100
KNN	53.97	48.02	53.97	41.51

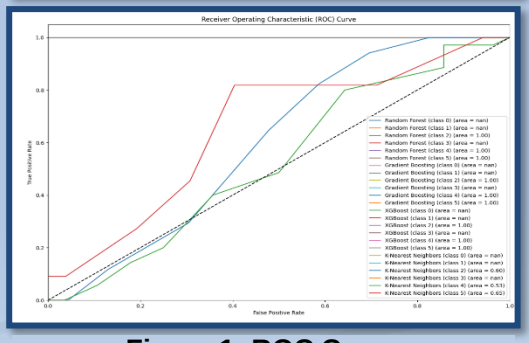

Figure 1: ROC Curve