Predicting Emergency Department Length of Stay Benchmark

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1 Objective

Emergency Department (ED) crowding is serious issue confronting hospitals around the world that results in poor patient care. The novelty in this project is using machine learning techniques to classify if a patient's length of stay (LOS) meets the national benchmark. Such knowledge could help hospitals anticipate overcrowding, identify sources of delay, and plan accordingly.

2 Methods

A data set with 99 features was collected from the Foothills Medical Center ED in 2017. Support Vector Machines (SVM), Random Forest (RF), and a Customized Artificial Neural Network (ANN) model were used to create classifiers that identify whether a patient's LOS will meet the national benchmark. The performance of these classifiers was then compared and investigated. A Decision Tree was used for feature selection.

3 Results

The ANN outperformed other classifiers using 42 features while achieving an accuracy of 0.726, recall 0.737, and specificity 0.648.

	Accuracy	**Sensitivity**	**Specificity**
SVM-Poly	0.69879	0.6243	0.6795
SVM-Linear	0.6644	0.5686	0.69631
SVM-RBF	0.7026	0.6299	0.6916
RF	0.7166	0.6907	0.5613
ANN (13 Features)	0.6976	0.7366	0.6093
ANN (42 Features)	0.726	0.737	0.6483
ANN (49 Features)	0.7271	0.7333	0.6513

Table 1: Metrics measurements for the classifiers.

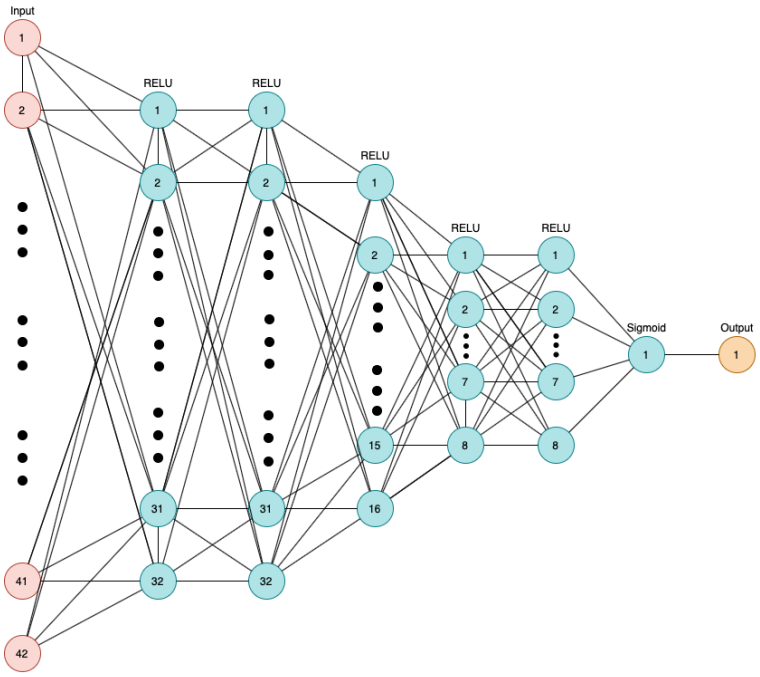

Figure 1: ANN general infrastructure

4 Future Scope

An extension study can detect which access blocks in ED are causing the delay and the turnover rate in ED for patients. Additionally, we would be interested in expanding this approach in other hospitals in Alberta and Canada.