Artificial Neural Networks to Predict Surgical Site Infection in Aorta Artery Aneurysm Correction

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Background

This research represents an experiment on surgical site infection (SSI) in patients **undergoing surgeries to correct aortic artery aneurysms** in hospitals in Belo Horizonte,

Period: between July 2016 and June 2018.

Objectives:
1 - Statistically evaluate SSI incidences
2 - Enable a study of the prediction power of SSI of pattern recognition algorithms based in Multilayer Perceptron (MLP).

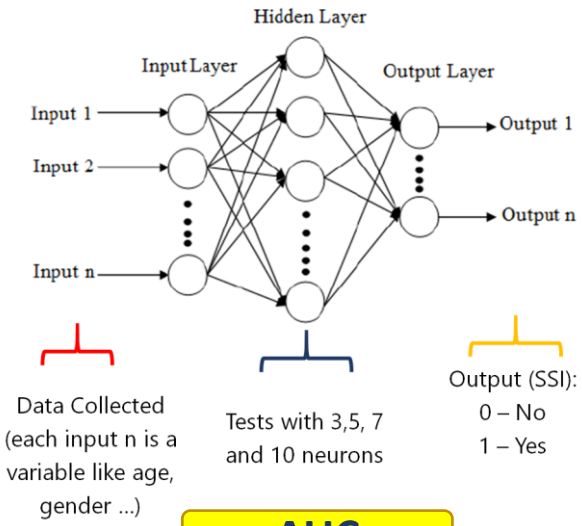
Methods

Data were collected on SSI in **three hospitals.**

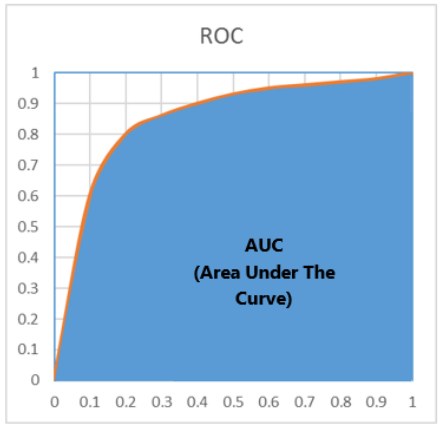
The **Hospital Infection Control Committees (CCIH)** of the hospitals involved collected all data used in the analysis during their routine SSI surveillance procedures and sent the information to the **Nosocomial Infection Study Project (NOIS)** through the **Software Automated Hospital Infection Control System (SACIH)** to collect data from a sample of hospitals.

Three procedures were performed:
1 - A treatment of the database collected for use of intact samples;
2 - A statistical analysis on the profile of the hospitals collected
3 - An assessment of the predictive power of **five types of MLP** (Backpropagation Standard, Momentum, Resilient Propagation, Weight Decay, and Quick Propagation) for SSI prediction. They were compared by measuring AUC (Area Under the Curve - ranging from 0 to 1) presented for each of the configurations.

MLP



AUC



Results

From **600 records**, **575** were complete for analysis.

It was found that:
- The average age is **68 years** (from 24 to 98 years);
- The average hospital stay is **9 days** (with a maximum of 127 days);
- The death rate **reached 6.43%** and the **SSI rate 2.78%.**

A **maximum prediction power of 0.75** was found.

Conclusion

There was a loss of **4% of the database samples** due to the presence of noise.

It was possible to evaluate the profile of the three hospitals.

The predictive process presented configurations with results that **reached 0.75**, which promises the use of the structure for the monitoring of automated SSI for patients undergoing surgery to correct aortic artery aneurysms.

To optimize data collection and enable other hospitals to use the SSI prediction tool (available in www.sacihweb.com), two mobile application were developed:
1 - for monitoring the patient in the hospital
2 - for monitoring after hospital discharge.