Prediction Of Surgical Site Infections In Colon Surgery In Belo Horizonte Hospitals

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Background

This research represents an experiment on surgical site infection (SSI) in patients **undergoing colon surgery procedures** 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).
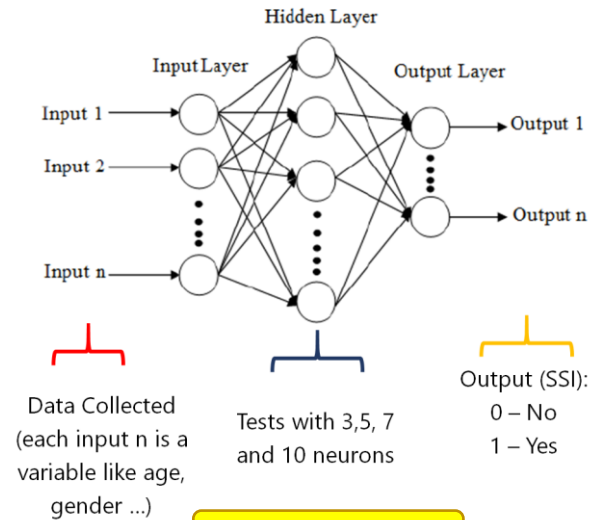
Methods

Data were collected on SSI in **five 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.
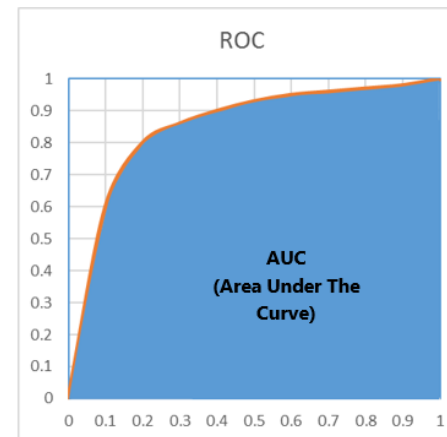
Three procedures were performed:
1 - A treatment of the database collected for use of intact samples;
2 - A statistical analysis on the profile of the hospitals collected
3 - An assessment of the predictive power of **five types of MLP** (Backpropagation Standard, Momentum, Resilient Propagation, Weight 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

Hidden Layer

Input Layer   Output Layer

Input 1 → → Output 1

Input 2

Input n → → Output n

Data Collected (each input n is a variable like age, gender ...)

Tests with 3,5, 7 and 10 neurons

Output (SSI):
0 – No
1 – Yes

AUC

ROC

AUC
(Area Under The Curve)

Results

From **2126 records**, **638** were complete for analysis.
It was found:
- The average age **is 55 years** (from 1 to 94 years);
- The surgeries had an average time of approximately **197 minutes**;
- The average hospital stay is **8 days**,
- The death rate **reached 5.625%** and the SSI rate **reached 6%**.

Regarding the predictive power, a **maximum predictive power of 0.8316** was found.

Conclusion

There was a **loss of 70% of the database** samples due to the presence of noise. However, it was possible to have a relevant sample to assess the profile of these five hospitals.

The predictive process presented some configurations with results that **reached 0.8316**, which promises the use of the structure for the monitoring of automated SSI for patients undergoing colon surgeries.

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.