

## Machine learning approach to detect adverse outcomes after CABG surgery derived from cardiovascular time series extraction

In this thesis machine learning algorithms should be used to predict adverse outcomes of coronary bypass graft (CABG) surgery. This is motivated by a correlation of morbidity and the postoperative complications considered in this work, specifically acute kidney dysfunction (AKD), atrial fibrillation (AF) and low cardiac output syndrome (LCOS). By being able to predict those complications life-saving measures could be taken earlier. Since past studies indicate a correlation between the cardiovascular control system and those complications, markers of the baroreflex sensitivity (BRS) are to be used for the desired prediction. In a clinical study of the IRCCS Policlinico San Donato (GR-2013-02356272) data from about 290 patients undergoing CABG was collected. This includes time series of an electrocardiogram (ECG) signal as well as systolic arterial pressure (SAP) before and after propofol general anesthesia induction. Additionally, there are features regarding the background of the individual patients as well as information about post-surgery complications. Based on the collected data several clinical markers were already computed which should be used as basis for the prediction process.

The work in this thesis is divided in two parts. First the provided markers should be evaluated in terms of their ability to predict the adverse outcomes of CABG, i.e. these markers should be rated by their correlation to the post surgery complications. Afterwards machine learning algorithms are to be implemented with the goal of predicting the outcome of a surgery based on the given markers. The evaluation of the markers should be used as basis to choose promising approaches. If these tasks are implemented to a satisfying extent, the computation of additional markers based on the raw time series and their evaluation could be an additional topic that completes the thesis work.

The thesis project will be developed in collaboration with Laboratory of Complex Systems Modeling, University of Milan, located at IRCCS Policlinico San Donato (Prof. Vlasta Bari, Prof. Alberto Porta), San Donato Milanese. Part of the project will be developed at DEIB – Politecnico di Milano.