

DELFT UNIVERSITY OF TECHNOLOGY
REINIER DE GRAAF HOSPITAL

**Project: Predicting Patient Discharge Dates
Using Machine Learning**

Supervisor(s):

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Motivation

The increasing demand for healthcare continues to rise, while at the same time healthcare expenses are also growing. These challenges have an effect on both patients and personnel, showing the need for practical and data-driven solutions. This requires us to look at our care in an innovative way and apply new and creative techniques to tackle these issues that have an enormous effect on our healthcare system.

The Reinier de Graaf hospital in Delft is one of those hospitals that wants to apply new techniques to improve their processes. They want to look into the possibilities of applying innovative models to help create insight in the usage of their resources. One of the challenges that they are currently facing is the occupancies of their clinical beds vs. the arrival of (new) patients. They notice that the discharge date varies over patient groups and is an important variable to estimate. To maximize the usage of their resources and be able to create a reliable schedule, an accurate indication of the discharge date of a patient is required. By predicting how long a bed will be occupied within the hospital, they can better anticipate the supply and demand for care.

Problem description

With this Master assignment, you will be designing a model to predict the discharge date of a patient using state-of-the-art machine learning techniques. To create a proper prediction, you will use real-world (anonymized) historical data from thousands of patients that are made available by the hospital. This project will at least consist of the following two aspects:

1. **Data preprocessing:** the first part is to preprocess the data. Interesting steps could include exploratory data analysis, handling missing values, feature scaling and feature engineering. The chosen approach depends on the data and the steps you think are relevant to create a reliable dataset.
2. **Model design:** The second part focuses on building a machine learning model to make predictions based on the preprocessed data. You can explore various algorithms such as decision trees, support vector machines, or neural networks, depending on the complexity of the problem and the nature of the data. Additionally, model evaluation will be crucial, where techniques like cross-validation and performance metrics (e.g., MSE, precision, recall) will help assess the model's effectiveness in making reliable predictions.

During this project, you are closely collaborating with experts from the hospital to design this model and predict when current (hospitalized) clinical patients will be discharged, preferably at the individual patient level. This will give the hospital the insight they need to use their resources to the fullest. Depending on the performance of the model, the ambition is to incorporate your model into the dashboard with the current clinic overview, allowing the Reinier de Graaf to predict the discharge date of individual hospitalized patients.

Prerequisites

As a student, having some experience with data processing and Python — particularly with libraries like NumPy, Pandas, and Scikit-learn—will be beneficial. While these skills are not mandatory, you should be comfortable learning them independently as needed throughout the project. The starting date for this project is flexible and can be decided in consultation with the hospital.

Contact

Are you interested or do you have any questions? Send an email to Alexander Heinlein (a.heinlein@tudelft.nl) and/or Cindy Pistorius (c.pistorius@tudelft.nl).