

## **Cirrhosis Mortality Prediction as Classification using Frequent Subgraph Mining**

**Authors :** Abdolghani Ebrahimi, Diego Klabjan, Chenxi Ge, Daniela Ladner, Parker Stride

**Abstract :** In this work, we use machine learning and novel data analysis techniques to predict the one-year mortality of cirrhotic patients. Data from 2,322 patients with liver cirrhosis are collected at a single medical center. Different machine learning models are applied to predict one-year mortality. A comprehensive feature space including demographic information, comorbidity, clinical procedure and laboratory tests is being analyzed. A temporal pattern mining technic called Frequent Subgraph Mining (FSM) is being used. Model for End-stage liver disease (MELD) prediction of mortality is used as a comparator. All of our models statistically significantly outperform the MELD-score model and show an average 10% improvement of the area under the curve (AUC). The FSM technic itself does not improve the model significantly, but FSM, together with a machine learning technique called an ensemble, further improves the model performance. With the abundance of data available in healthcare through electronic health records (EHR), existing predictive models can be refined to identify and treat patients at risk for higher mortality. However, due to the sparsity of the temporal information needed by FSM, the FSM model does not yield significant improvements. To the best of our knowledge, this is the first work to apply modern machine learning algorithms and data analysis methods on predicting one-year mortality of cirrhotic patients and builds a model that predicts one-year mortality significantly more accurate than the MELD score. We have also tested the potential of FSM and provided a new perspective of the importance of clinical features.

**Keywords :** machine learning, liver cirrhosis, subgraph mining, supervised learning

**Conference Title :** ICHISCD 2021 : International Conference on Health Information Systems and Clinical Decision

**Conference Location :** Rome, Italy

**Conference Dates :** June 03-04, 2021