Topic for a Bachelor/Master’s Thesis:

Survival analysis on dynamic event streams

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The extension of machine learning methods from static to dynamic environments has received increasing attention in recent years; in particular, a large number of algorithms for learning from so-called data streams have been developed. An important property of dynamic environments is non-stationarity, i.e., the assumption of an underlying data generating process that may change over time.

An event stream is a data stream consisting of events that occur in the course of time. Event data has a long tradition in statistics, where it has been studied under different names, such as survival analysis in medicine and event history analysis in sociology. Shaker and Hüllermeier [1] propose a method that learns a Cox proportional hazard model [2] on streaming data. Their approach allows events to be recurrent but assumes them to be emitted from a fixed set of sources (objects) that does not change over time.

The question to be addressed in the thesis is how survival analysis can be applied on dynamic event streams, in which the objects generating events are not predefined but may change over time. As an illustration, consider the browsing behavior of internet users. Here, objects may correspond to browsing sessions or the users themselves, and events occur whenever a session is started or ended. The goal of survival analysis is to model this kind of data, i.e., to induce models that explain the observations and can be used to predict future events based on properties of users and websites.

Requirements: Formalization of survival analysis on dynamic streams of events; development and analysis of methods for this problem; implementation and empirical evaluation of the methods.

Prerequisites: Basic knowledge in machine learning, statistics, and data analysis; programming skills.

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References
