FRIEDRICH-ALEXANDER UNIVERSITÄT ERLANGEN-NÜRNBERG

Department of DATA SCIENCE

Master thesis:

Analysis and Prediction of Asynchronous Event Sequences Considering Uncertainty @ Medical Technology (thesis together with Siemens Healthineers, Erlangen)

Description:

Asynchronous event sequences form the basis for a variety of data services in industrial process environment and in predictive maintenance of equipment's in field. This master's thesis aims to explore methods for the analysis and prediction of event data from diagnostic imaging equipment (e.g., computer tomographs). The goal is to investigate, implement, and compare methods for predicting subsequent events. Of particular interest is capturing and elucidating the uncertainty in these predictions.

Task:

- **Comprehensive Literature Review:** Conduct an in-depth review of existing literature pertaining to prediction of asynchronous event sequences. Explore the methodologies and techniques employed in analyzing and predicting event data sequences while accounting for uncertainty factors.
- **Method Exploration and Selection:** Identify and evaluate various methodologies for analyzing and predicting asynchronous event sequences. Consider statistical methods, machine learning algorithms, and probabilistic modeling techniques that can effectively capture the dynamic relationships within the data. In the scope of this work, architectures described in the literature, specifically WGP-LN and FD-Dir, will be assessed and applied to a dataset of event data.
- **Development of Prediction Models:** Develop predictive models that utilize the identified methodologies and integrate uncertainty considerations for real-world problem from the field of medical technology together with methodologies to hedge against them.
- **Comparative Analysis and Benchmarking:** Perform a comprehensive comparison between different prediction models, considering both their predictive accuracy and their ability to capture and convey uncertainty.

Requirements:

- motivated Student in the field of Data Science, Computer Science, Mathematics, Business Mathematics, or a related field
- Proficiency in data analysis and machine learning
- Experience with Python and deep learning frameworks such as TensorFlow or PyTorch
- Interest in applying Data Science methods to real-world application data from the field of medical technology.

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Contact

This thesis will be pursued in close cooperation between the Department of Data Science DDS, FAU and Siemens Healthineers, Erlangen.

For more information on the topic, please contact frauke.liers@fau.de.