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Abstract

Analysis of heterogeneous multivariate time stamped data is one of the most challenging topics in data science in general, and in healthcare analytics specifically. Time stamped data can be sampled in a fixed frequency, commonly when measured by electronic means, but also in a non fixed frequency, often when made manually - a typical situation in biomedical data, whether fast data such as in ICU, or slow such as generally in EHR. Additionally, raw temporal data can represent durations of a continuous or nominal value represented by time intervals. In this talk the idea of transforming time point series into meaningful symbolic time intervals, using a process often called Temporal Abstraction, will be presented to bring all the temporal variables, having various representations, into a uniform representation. Then, KarmaLego, a fast time intervals mining method for the discovery of non-ambiguous Time Intervals Related Patterns (TIRPs) represented by Allen's temporal relations, will be presented. TIRPs can be used for several purposes: temporal knowledge discovery, and classification of multivariate temporal data, using the KarmaLegoS framework, in which TIRPs are used as classification features. To increase the classification accuracy a novel supervised Temporal Discretization for Classification (TD4C) method will be introduced, including an evaluation on three real life datasets from the biomedical domain. Finally, results of the use of TIRPs for outcomes prediction in patient data, such as clinical procedures or conditions, will be demonstrated on Columbia University Medical Center EHR data.

Bio

Dr. Robert Moskovitch is the head of the Complex Data Analytics Lab, as a faculty member of the department of Software and Information Systems Engineering at Ben Gurion University, Israel. He is a member of BGU's Zlotowsky Center for Neuroscience, and BGU's @Cyber security center. Before his post doc fellowship at the department of Biomedical Informatics at Columbia University, he headed several R&D projects in Information Security at the Deutsche Telekom Innovation Laboratories. He is an Academic Editor at PLOS ONE, member of the editorial board of the Journal of Biomedical Informatics (JBI), and served on other journal editorial boards, as well as on program committees of conferences, such as ACM KDD, IJCAI, IEEE ICHI and more, as well as workshops in Information Security and Biomedical Informatics. Recently, he co-edited special issues at JASIST and JBI. He published more than seventy peer reviewed papers in leading journals and conferences, such as IEEE ICDM, Data Mining and Knowledge Discovery, KAIS, JAMIA, JBI and more, several of which had won best-paper awards. His lab focuses mainly on the development of Temporal Data Analytics methods, and their applications to the biomedical domain, but not exclusively. Dr. Moskovitch's lab is funded by IBM, Amdocs, and governmental agencies, and collaborates with scientists from university medical centers, such as NY Presbyterian Columbia University, Mount Sinai, Maccabi Healthcare Services, Assuta and more.

CDALab

The Complex Data Analytics Lab (CDALab) headed by Dr. Robert Moskovitch researches in the space of data science (Ai, Data Mining and Machine Learning) in general, and focusing specifically on Temporal Data Analysis. The lab develops novel methods for the analysis of heterogeneous multivariate longitudinal data analysis, including the development of fast temporal patterns discovery algorithms. We then focus on the use of the temporal patterns for classification, and the discovery of predictive patterns, as well as learning prediction models. The lab focuses mainly on the healthcare domain, but also works in cyber security and telecom data. The lab is funded by the Israeli ministry of science and technology in several projects. These include collaboration on complications prediction in Intensive Care Unit with the largest medical center in New Delhi, with a hospital in Taiwan, with Mount Sinai in New York and Assuta in Israel. Additionally, we collaborate with Maccabi Healthcare Services on prediction of outcomes in diabetic patients' data, using Maccabi's Electronic Health Records dataset along ten years. In addition, we have recently a funded project in collaboration with Maccabi and Assuta medical centers on Sleep Apnea. In addition, we have a project funded by Amdocs' data science group in predicting when users will contact the call center based on their usage data. We have also recently funding from prime minister office in cyber security on anomaly detection in computers networks.