TETAM PhD Seminars – 30.11.2018, 10:00-11:35
TETAM Roof Conference Hall

Title: Gait Analysis and Fall Risk Assessment with Wearable Sensors

Can Tunca

Abstract: The gold standard for gait analysis are instrumented walkways and marker-based motion capture systems, which require costly infrastructure and are only available in hospitals and specialized gait clinics. Even though the completeness and the accuracy of these systems are unquestionable, a mobile and pervasive gait analysis alternative suitable for non-hospital settings is a clinical necessity. Using inertial sensors for gait analysis has been well explored in the literature with promising results. However, the majority of the existing work do not consider realistic conditions where data collection and sensor placement imperfections are imminent. Moreover, some of the underlying assumptions of the existing work are not compatible with pathological gait, decreasing the accuracy. To overcome these challenges, we propose a foot-mounted inertial sensor-based gait analysis system that extends the well-established zero-velocity update and Kalman filtering methodology. Our system copes with various cases of data collection difficulties and relaxes some of the assumptions invalid for pathological gait (e.g., the assumption of observing a heel strike during a gait cycle). The system is able to extract a rich set of standard gait metrics, including stride length, cadence, cycle time, stance time, swing time, stance ratio, speed, maximum/minimum clearance and turning rate. We validated the spatio-temporal accuracy of the proposed system by comparing the stride length and swing time output with an IR depth-camera based reference system. Furthermore, we analyzed the gait parameters representative of common gait abnormalities in neurological disorders with feature selection and statistical significance analysis methods, to come up with reduced set that is as descriptive as the full gait parameters set.

Bio Can Tunca received his BS degree in Computer Science & Engineering from Sabanci University, Istanbul, in 2010. He received his MS degree in Computer Engineering from Bogazici University, Istanbul, in 2012. He is currently a PhD candidate and a research assistant in Computer Engineering in the same university. His research interests include network protocol design, internet of things, body area networks, wearable computing, pervasive healthcare and indoor localization.

Title: Ontology-based Entity Tagging and Normalization

İlknur Karadeniz

Abstract: The number of published articles in biomedical domain is increasing every day. Many text mining methods are implemented to help scientists deal with these huge data without time-consumption. One of the challenges for scientists in this domain is the huge amount of information buried in the text of electronic resources. Developing methods to automatically extract biomedical entities from the text of these electronic resources and identify the relations between the extracted entities is crucial for facilitating research in many areas such as health sciences, microbiology, and food processing and preservation. In biomedical domain, two main problems, which have to be solved to accomplish this goal, are the extraction and normalization of entities, and extraction of relations between the extracted entities from a given text. Until now, many text mining approaches, most of which are supervised and/or require domain-specific data, have been proposed as a solution for these two tasks. Recently, unsupervised and domain unspecific approaches have gained popularity with their ease of applicability to different tasks in biomedical domain. We proposed two approaches with two different perspectives for the extraction/normalization of entities and relations. First approach makes use of shallow linguistic knowledge to extract entities and normalize them through an Ontology. On the other hand, second approach makes use of word embeddings which convey semantic information for the normalization of entities in a text. Both of the proposed methods are unsupervised and domain unspecific. We applied the proposed approaches to the task of bacteria localization information extraction. Promising results are obtained in both approaches.

Bio: Ilknur Karadeniz is a Ph.D. candidate in Computer Engineering at Boğaziçi University. She holds M.Sc in Computer Engineering from Istanbul Technical University and B.Sc. in Computer Engineering from Yeditepe University. She worked both in the telecommunication industry and as an research assistant in Istanbul Technical University. Her research interests include natural language processing, text mining, and bioinformatics.

Title: eBlocBroker: A Blockchain Based Autonomous Computational Resource Broker

Alper Alimoğlu

Abstract: Recently, peer-to-peer based blockchain infrastructures have emerged as disruptive technologies and have led to the realization of cryptocurrencies and smart contracts that can be used in a globally trustless manner. Due to their open and public nature, blockchain technologies can have many uses in e-Science. eBlocBroker is a blockchain based autonomous computational resource broker that is currently being developed on our local Ethereum blockchain. It is an open distributed autonomous market that is being implemented as an Ethereum Solidity Language smart contract that runs under the control of no one. It will integrate (i) crowds of users that need to run applications utilizing computational and data resources (ii) providers of computational servers on clouds and (iii) operate on data that resides on the IPFS file system, EUDAT data infrastructure, Google Drive cloud storage, and GitHub. (iv) caching mechanism for received jobs on each cluster that will provide data reusability and reduce bandwidth I/O (v) DAG workflow system support. The Slurm workload manager, or Slurm, is an open source and free job scheduler for Linux, used for execution of jobs submitted to eBlocBroker. We have implemented and deployed eBlocBroker, for which, we provide results from demonstrations on our local Ethereum based blockchain system.

Bio: Alper Alimoğlu is a Ph.D. student in Computer Engineering at Boğaziçi University under guidance of Prof. Dr. Can Özturan. He received his M.S. in computer science from Binghamton University, State University of New York. He holds a B.S. in Information Systems Engineering from Dual Degree Program between Binghamton University, State University of New York and Istanbul Technical University. Before joining Bogazici University, he was an research assistant in the department of computer science at Binghamton university. His master thesis subject was Smart Load Balancer: workload time series predictions for data centers. He Implemented machine learning concept that is Echo State Network algorithm to achieve accurate predictions for the short, medium and long term. His current research interest include Ethereum smart contracts and Blockchain.