Thesis Proposal Presentation

Shiyao Wang
M.Sc. Thesis Proposal
Co-Supervisors: Drs. Minglun Gong, Oscar Meruvia-Pastor and Andrew Smith

Computer-Mediated Reality for Telemedicine

Department of Computer Science
Tuesday, October 18, 2016, 2:00 p.m., Room EN 2022

Abstract

Rural areas have been constrained by a lack of access to health care due to the inherent difficulties in attracting health professionals to them. Telemedicine, which uses communication technology to deliver medical services over distance, is an economical and effective way to address this problem. Immersive Telepresence is a specific application of Telemedicine which can be used to deliver medical services over a distance. In this research, a new Telepresence application using computer-mediated reality technique is studied. We aim to capture the 3D appearance of a simulated remote emergency room(ER) and present it locally to the observers, commonly the clinical mentors or medical experts. This virtually positions the observers in the remote environment and assistance can then be provided directly. In this research, Augmented Reality (AR) devices such as the Microsoft HoloLens will be provided to remote practitioners, and Virtual Reality(VR) devices such as a VR headset will be used by the observers simultaneously. We believe that remote learners can still observe clearly in their original environment without interference with the AR device. Health professionals can also gain a better understanding of the remote room with the help of VR techniques. In this application, one way of conveying the information is to draw specific marks and tags on a virtual patient by the mentors. Also, the capture of objects such as an ultrasound transducer held by the mentors to be displayed virtually to the remote users is considered another solution. In this project, we will investigate the most efficient way to present healthcare required information to the rural practitioners through several control experiments.

Thesis Proposal Presentation

Farhad Mohammad Kazemi
M.Sc. Thesis Proposal
Co-Supervisors: Drs. Wolfgang Banzhaf and Minglun Gong

Automatic Image Analysis for High Content Screening

Department of Computer Science
Tuesday, October 18, 2016, 2:20 p.m., Room EN 2022

Abstract

High Content Screening (HCS) technologies that combine automated fluorescence microscopy with high throughput biotechnology have become powerful systems for studying cell biology and drug screening. These systems can produce more than 100 000 images per day, making their success dependent on automated image analysis. HCS experiments can contain tens of thousands of images, including millions of cells. Researchers have to utilize Artificial Intelligence algorithms to classify or cluster cells that they cannot evaluate manually. In this work, we are interested in the application and provision of cutting-edge methods for HCS data analysis, which are tailored to suit its specific conditions and challenges. This research focuses on the challenge of using information content that is as high as possible, by considering per-cell information and all the available features, to build a system for high content analysis.

Thesis Proposal Presentation

Sara Ayubian
M.Sc. Thesis Proposal
Co-Supervisors: Drs. Shadi Alawneh, George Miminis and Martin Richard

GPU Based Monte-Carlo Simulation for Sea Ice Load Application

Department of Computer Science
Tuesday, October 18, 2016, 2:40 p.m., Room EN 2022

Abstract

In recent years, high Performance Computing (HPC) has been considerably improved. For instance General Purpose computation on Graphics Processing Units (GPGPU) has been developed to accelerate parallel computing by using hundreds of cores simultaneously. GPU computing with Compute Unified Device Architecture (CUDA) is a new approach to solve complex problems and transform the GPU into a massively parallel processor. The present study applies this new technology to a Monte-Carlo simulation for a sea ice load application.

The goal of this study is to measure and compare the performances of GPU and Multi-GPU implementations to Central Processing Unit (CPU) implementations written in two programming languages: (1) a serial and a parallel (OpenMP) CPU implementation in C++; and (2) a serial and a parallel CPU implementation in MATLAB. As the number of GPU cores far outnumber that of CPU cores, it is expected that GPU implementations be faster than all CPU implementations, resulting in considerable speedup in computational times.

Thesis Proposal Presentation

S. Sadra Mirhendi
M.Sc. Thesis Proposal
Co-Supervisors: Drs. Lourdes Peña-Castillo and Ting Hu

Discovering Type 1 Diabetes Risk Factors through Integrative Analysis of Heterogeneous Data

Department of Computer Science
Tuesday, October 18, 2016, 3:00 p.m., Room EN 2022

Abstract

Type 1 diabetes (T1D) is a disease in which the pancreas does not produce insulin to control the level of glucose in the human blood. Our research will investigate whether risk factors for developing of complications or secondary disease related to T1D can be identified by integrating demographic, clinical and genetic data. Regarding this purpose, we obtained an input dataset that includes environmental, clinical and genotype information from patients with T1D. We will explore three methods including Generalized Low-Rank Models (GLRM), Similarity Network Fusion (SNF) and Information-theoretic measures to analyze this dataset and to discover connections among different features including gene mutations, lifestyle, etc. The result of our algorithms can be used to identify patients at a higher risk of developing T1D complications to allow them to take preemptive steps for reducing their risks of complications. Our research result may also enable health-care providers to design strategies for better diagnostic.

Thesis Proposal Presentation

Mohammad Hoseyn Sheykholeslam
M.Sc. Thesis Proposal
Supervisor: Dr. Saeed Samet

Privacy-Preserving Query Processing on Health Data

Department of Computer Science
Tuesday, October 18, 2016, 3:20 p.m., Room EN 2022

Abstract

Due to the enormous amount of digital productions and the underlying complexity of data management, people and companies are motivated to out-source their computational requirements to the cloud. A significant portion of these productions are used in health field. While popular cloud computing platforms provide flexible and low-priced solutions, unfortunately, they do so with little support for data security and privacy. This shortcoming clearly threaten sensitive data in cloud platforms. This is especially true for health information, which should always be adequately secured via encryption. Providing secure storage and access to health information that is generated by systems or used in applications, is the main challenge in today's health care systems. As a result, owners of sensitive information may hesitate in purchasing such services, given the risks associated with the unauthorized access to their data. Considering this problem, researchers recommended applying encryption algorithms. No body never disclose the encryption key of sensitive encrypted information. It is supposed that data owner conceal their secrets with searchable encryption algorithms. Searchable encryption is a family of cryptographic protocols that facilitate private keyword searches directly on encrypted data. These protocols allow users to upload encrypted versions of their documents to the cloud, while retaining the ability to query the database with plain text keyword queries. In this project, we focus on public-key encrypted data and introduce the first method that supports ranked results from multi-keyword searches. Our solution extends some recent studies about public key encryption schemes and employs an indexing structure, and leverages homomorphic encryption and private information retrieval (PIR) protocols to process queries in a privacy-preserving manner. In addition to fixing the recognized flaws of discussed schemes, we demonstrate our method provides an acceptable level complexity and security. Finally, we prove the method's security.

Thesis Proposal Presentation

Zaynab Musa
M.Sc. Thesis Proposal
Supervisor: Dr. K. Vidyasankar

A Fog Computing Framework for Scalable RFID Systems in Global Supply Chain Management

Department of Computer Science
Tuesday, October 18, 2016, 3:40 p.m., Room EN 2022

Abstract

With the rapid proliferation of RFID systems in global supply chain management, tracking every object at the individual item level has led to the generation of enormous amount of data that will have to be stored and accessed quickly to make real time decisions. Harvesting data from so many endpoints and aggregating it all in one location poses a lot of challenges for retailers and manufacturers. The challenges include getting right storage infrastructure, bandwidth bottleneck and expense, latency reduction and data security. In cloud-based RFID systems, all operations have to be sent to the cloud and the network journey introduces risk of dropped or corrupted packets, potentially compromising the data. Fog Computing allows work to be done at the edge of the network thus reducing latency and conserving bandwidth. This paper investigates in-depth: (i) outstanding problems hindering the widespread adoption of RFID in global supply chain management; and (ii) application of fog computing in global supply chain management. It also analyses the architectural elements for integrating fog computing into cloud-based RFID while the advantages, challenges and future work are addressed.

Thesis Proposal Presentation

Navid Shekoufa
M.Sc. Thesis Proposal
Supervisor: Dr. Saeed Samet

Continuous Authentication and its Application in Personal Health Record Systems

Department of Computer Science
Tuesday, October 18, 2016, 4:00 p.m., Room EN 2022

Abstract

Authenticating users in commercial smartphones is currently a very naive process putting the smartphone owner in security risks in events such as unauthorized device sharing, device lost or theft and session hijacking. With the recent interest of governmental and health organizations to provide their users with applications that can be run on their smartphones, securing these devices with measures above the current solutions is imperative. In this thesis proposal, we propose a continuous authentication module for a Personal Health Record system that monitors its users for authenticity over time via their touch biometrics and denies access to users that can not satisfy authentication criteria. The proposed solution can be used in any smartphone application that is highly sensitive in terms of privacy and security which needs continuous authentication while running. We will also propose a notification module that helps building transparency for the user about how their shared personal information is used in the system, so they will be more willing to trust our application. The proposed approaches will be implemented in an actual Personal Health Record system for Android enabled smartphones to make it more secure and practical to use. Finally, we will compose an open-source dataset for touch biometrics and will make it available for the public.