

HCT Summer Research Projects 2017/2018

HCT2017/1 Understanding power distribution in block chains : an empirical study

Primary Supervisor: Dr Ralph Holz ralph.holz@sydney.edu.au - School of Information Technologies; and Dr Hui Xue hui.xue@sydney.edu.au - China Studies Centre

Project Description: Block chains have emerged as a globally distributed phenomenon - first for cryptocurrency and now increasingly for distributed applications.

The real-world implications for regulatory actions are profound; yet there is a disturbing lack of empirical data to guide us. We have built the Blockchain Observatory in response to this: the world's first large-scale observatory of blockchain users and usage. In this work, you are going to work with data sets we have to answer the following questions:

- Where are blockchain users located?
- Where are other power factions, such as mining pools, exchanges, and developers located?
- How does the distribution of power in blockchains map out?

Depending on the skills and interests of the candidate, this project can be tweaked more towards the technical side.

HCT2017/2 EaT app

Primary Supervisor: Prof. Margaret Allman-Farinelli margaret.allman-farinelli@sydney.edu.au (SOLES-Charles Perkins Centre);

Luke Gemming luke.gemming@sydney.edu.au - SOLES-Charles Perkins Centre;

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Kalina Yacef kalina.yacef@sydney.edu.au - School of Information Technologies;

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Judy Kay judy.kay@sydney.edu.au - School of Information Technologies

Project Description: In order to provide feedback to individuals or to their health professional in ways that are meaningful we would like to create a user dashboard, which the user can feed data, for storage and review. This dashboard can give feedback on nutrient intakes and/or food group intakes and could incorporate comparisons with recommended intakes and suggestions for improving diet quality. This project will conceptualise and evaluate a the dashboard using human-computer interaction methods.

HCT2017/3 - Creative visualisation of sensor derived human data for science education

Primary Supervisor: Prof Philip Poronnik Philip.poronnik@sydney.edu.au - Sydney Medical School;

Prof Pauline Ross Pauline.ross@sydney.edu.au - School of Life and Environmental Sciences;

Prof Judy Kay judy.kay@sydney.edu.au - School of Information Technologies;

Dr Phillip Gough Phillip.gough@sydney.edu.au - School of Information Technologies

Project Description: We are developing a creative engagement strategy to make biology students more aware of the central role that sensors and data will play in the careers of the future. This project will involve developing arduino-based sensors to collect real-time physiological data (e.g. pulse, BP, respiration rate, movement etc.) and develop several platforms to display these data using Processing and various outputs such as LED lights, computer screens and as sound. These protocols will be deployed in the first year human biology classes in 2018.

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HCT2017/4 Phone-based Augmented Reality Medical Education

Supervisors:

Primary Supervisor: Dr Tegan Cheng Tegan.cheng@sydney.edu.au - School of Aerospace, Mechanical and Mechatronic Engineering and Sydney Medical School;
Prof Judy Kay judy.kay@sydney.edu.au - School of Information Technologies;
Prof Philip Poronnik Philip.poronnik@sydney.edu.au - School of Medical Sciences

Project Description: Immersive technologies have the potential to become a classroom tool which transforms medical education, the most accessible of these may be phone-based Augmented Reality. This project will develop a mobile application for use by medical students studying heart pathology. The purpose of the application is to incorporate phone-based AR and 3D printing for use in this educational context.

HCT2017/5: Detecting cyber fraud

Primary Supervisor: A/Prof Sabina Kleitman Sabina.kleitman@sydney.edu.au - School of Psychology; and Prof Judy Kay judy.kay@sydney.edu.au - School of Information Technologies

Project Description: Phishing email is one of the biggest risks to online information security due to its ability to exploit human trust and naivety. Prior research has examined whether some people are more susceptible to phishing than others and what characteristics may predict this susceptibility. However, measures used to detect phishing susceptibility are often unreliable, leading to conflicting results. To address this issue, this project aims to create a method to generate a set of items to capture phishing detection susceptibility.

HCT2017/6 Capturing Face Data for High Fidelity Avatars

Primary Supervisor: Mike Seymour mike.seymour@sydney.edu.au - Sydney Business School; and Prof Judy Kay judy.kay@sydney.edu.au - School of Information Technologies;
Prof Kai Reimer kai.reimer@sydney.edu.au - Sydney Business School

Project Description: The project will involve a review of facial capture approaches and the use of deep learning approaches within these to understanding human facial expressions. This is relevant especially with the advent of RGBD cameras in products such as the new iPhone X and also for use in facial reconstruction. This project will provide a survey and suggested path with direct access to research labs. This project forms the basis of an academic publishable paper on the topic, as well as industry collaboration, and is part of an ongoing collaboration with Sony Games in LA.

HCT2017/7 Creating Virtual Humans for Augmented Reality

Primary Supervisor: Mike Seymour mike.seymour@sydney.edu.au - Sydney Business School; and A/Prof Simon Poon simon.poon@sydney.edu.au - School of Information Technologies;
Dr Zhiyong Wang Zhiyong.wang@sydney.edu.au - School of Information Technologies;
Dr Phillip Gough Phillip.gough@sydney.edu.au - School of Information Technologies

Project Description: We have teamed up with NVIDIA and EPIC Games in the USA to explore AR with virtual humans.

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This project involves using the UE4 game engine in conjunction with ARKit to implement a virtual character for a proof of concept for AR conferencing. This project is part of a wider international research effort that builds on MEETMIKE a USYD research project from Siggraph 2017. This new project uses state of the art real time graphics, and builds on a large and ongoing development effort. The summer project is partly self-contained and should be highly rewarding. The focus is not on product development, but skills and understanding development, but the skills learnt are highly valuable right now in industry. The student should have a working understanding of UE4 and be familiar with computer graphics.

HCT2017/8 Tailored decision making aids for cancer risk assessment

Primary Supervisor: Prof Lyndal Trevena lyndal.trevena@sydney.edu.au - School of Public Health; and Dr Na Liu liu.na@sydney.edu.au - School of Information Technologies

Project Description: The project aims to design and develop an integrated risk assessment tool for 7 most common types of cancer in Australia.

HCT2017/9 Visualisation and mining of multi-dimensional genomic data on human pathogens

Primary Supervisor: A/Prof Vitali Sintchenko vitali.sintchenko@sydney.edu.au - Sydney Medical School, Westmead; and Dr Simon Poon simon.poon@sydney.edu.au - School of Information Technologies; Dr Phillip Gough Phillip.gough@sydney.edu.au -School of Information Technologies

Project description: The aim of this project is to implement new methods of visualisation of genomic, clinical and public health data to support complex analyses of their relationships. This project will involve the analysis of already sequenced genomes of two major bacterial pathogens with epidemic potential (mycobacteria and pneumococcus) with associated metadata and bacterial genome model. The student will be also guided and mentored by informaticians and domain experts from Sydney Medical School-Westmead.

HCT2017/10 Data Mining and Interfaces for I-Engage - Data Mining

Primary Supervisor: A/Prof Kalina Yacef kalina.yacef@sydney.edu.au - School of Information Technologies;
A/Prof Corinne Caillaud Corinne.caillaud@sydney.edu.au - Charles Perkins Centre);
Dr Olivier Galy -University of New Caledonia

Project description: Non-communicable diseases (NCD), including cardiovascular diseases and type 2 diabetes, are a major cause of deaths (75%) in the Pacific Islands countries. The i-Engage project aims at reducing the incidence of NCDs through increased physical activity and healthier food choices. I-Engage is a multicomponent intervention, supported by an online education platform, providing high school students with engaging learning activities, sensing devices and a team challenge to improve their health literacy with regards to physical activity and food choices, and engage them in goal setting and self-monitoring. The main research project partners are the University of Sydney and University of New Caledonia in collaboration with two NSW industry partners.

i-Engage will be deployed over a 4 week pilot study in semester 2, 2017. This project will consist in mining the data that collected from the multiple sources (e-learning platform, sensing bracelets and relevant anthropomorphic data) to extract patterns that can help improving and personalising the technology

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Using the world-class electron beam lithography facilities in the cleanroom of the University's Research and Prototype Foundry, this project aims to explore the limits of [our recent findings for new concepts in computer memory](#) using omnidirectional electric fields to control local microstructure of ferroelectric materials.

HCT2017/11 Data Mining and Interfaces for I-Engage - Visualisation and Interface Design

Primary Supervisor: A/Prof Kalina Yacef kalina.yacef@sydney.edu.au - School of Information Technologies;

A/Prof Corinne Caillaud Corinne.caillaud@sydney.edu.au - Charles Perkins Centre;

Dr Olivier Galy - University of New Caledonia

Non-communicable diseases (NCD), including cardiovascular diseases and type 2 diabetes, are a major cause of deaths (75%) in the Pacific Islands countries. The i-Engage project aims at reducing the incidence of NCDs through increased physical activity and healthier food choices. I-Engage is a multicomponent intervention, supported by an online education platform, providing high school students with engaging learning activities, sensing devices and a team challenge to improve their health literacy with regards to physical activity and food choices, and engage them in goal setting and self-monitoring. The main research project partners are the University of Sydney and University of New Caledonia in collaboration with two NSW industry partners.

This project will consist in creating a set of intuitive interfaces for various end-users (such as program directors, public health researchers, school directors, parents and children) ranging from simply monitoring progress to visualising cohorts' results and elaborating some mining and statistical queries.