

Department of Computer Science

Capstone Projects for CSC3003S - 2019

As part of the 2nd Semester Computer Science III course you will be required to undertake a capstone *three*-person project. Listed here are the project options. At the start of the second semester we will ask all students who are not doing a games project this year to provide their top five choices and indicate who their project team is. CSC3020H students who are also doing CSC3003S - the final game you create will serve as your capstone project. Your game will thus need to include a software engineering component and follow sensible software engineering practice (please refer to your games project handout to find out what deliverables are required; these will be clarified next semester).

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1. Bridge Tutor - BrdgTut

Sonia Berman <sonia@cs.uct.ac.za>

Bridge is a popular card game around the world. Many people have regular bridge lessons and there are a great many books on how to be a better player. But the game is difficult and these resources lack the drill-and-practice necessary for true learning. This project will produce a Bridge Tutor to fill that gap. It will input example lessons and, through a process of interspersed question-answering and playing of the cards, will enable the user to play a game unaided and then replay it with increasing system assistance. The Bridge Tutor will also keep track of how well the user is doing on each lesson, and ensure that those not yet mastered are shown again later, until that lesson is learnt. There is no need to know the game to do this project; a (very) little knowledge of bridge basics - as required by a complete beginner - will be provided, and will be sufficient to create the Tutor. Lesson input will be provided; in each case this specifies the cards held by each of the 4 players, the goal (e.g. win 10 of the 13 rounds in this game), the answers to the (fixed, standard) questions and the lesson text (just a String to the computer). To pass the

project the system should be able to input a lesson, allow the user to play that game - i.e. play the cards one by one - and then show the answer (lesson text). There are many ways in which the system can assist or guide the player, and the more of these that are included the better the project will become.

2. Inter-domain Routing Simulator - IDRP

Josiah Chavula <josiahchavula@gmail.com>

This project will develop an inter-domain simulator for the African Internet, useful for exploring various routing/peering scenarios and interconnection policies. The simulator will allow experimentation on inter-network configurations, such as the insertion and/or removal of links and IXPs, the implementation of different routing policies, and the introduction of content cache servers. In turn, the simulator will generate performance data related to changes in a set of key metrics (e.g. delay and throughput) from the perspective of different stakeholders, including end-users, network operators and regulators.

3. Knowledge-based data access links knowledge to data - ViKER

Maria Keet <mkeet@cs.uct.ac.za>

Google's knowledge graph is one such example, which is behind the "info box" one may see on the right-hand side of a Web search results page. Several theories and technologies to realise this have been proposed. In this project, you will zoom into the knowledge processing component of one such architecture, where a virtual knowledge graph rendered as ER diagram has to be transformed to the abstract relational model (an extension of the relational model). The envisioned tool will implement the transformation rules bi-directionally and also have a user interface to handle this process and the outputs.

4. Curating and Visualizing Data on Pneumococcal Infection - PneumoVis

Michelle Kuttel <mkuttel@cs.uct.ac.za>

Streptococcus pneumoniae (the pneumococcus) is the leading bacterial cause of respiratory diseases including ear, nose, throat and lung infections. This bacterium is particularly problematic in children and the elderly. Dr Dube is collecting data on specific strains of pneumococcus infecting a cohort of young children in the Cape Town at different stages of their life. In this project, you will develop software to support this research, enabling researchers to load new data, store data and visualize this multi-dimensional data set. The visualization should enable an overview of the data, as well as focus on specific subsets and filtering.

This project will be implemented as a web application, using Java or another suitable language.

5. A Tool for Managing Postgraduate Applications — SITPG

Tommie Meyer <tmeyer@cs.uct.ac.za>

The School of IT at UCT annually receives application for postgraduate studies for the various postgraduate degrees being offered. The goal of this project is to create a web-based tool for managing and (semi-)automating the application process.

The tool should have the following functionality.

- Potential applicants should be able to submit, modify, and withdraw an application for one of the degrees being offered.
- Administrators in the School of IT should be able to:
 - access lists of applicants filtered by various fields (including the degree being applied for);

- mark applications as being approved, denied, incomplete, or still being considered;
- generate reports filtered on various fields (including the degree being applied for);

Where possible, decisions about eligibility should be automated in the sense that the system should automatically suggest the status of an application, which is then to be checked by a School of IT administrator.

This functionality should be provided with appropriate levels of security built into it.

6. Community Notice System - Inform

Aslam Safla <aslam@cs.uct.ac.za>

With increasing accessibility and connectivity, people are looking for ways to consume different kinds of content online. Connectivity with everything and everyone has become important. While WhatsApp makes connectivity with friends and family easier, there's a need for something that makes connection with those who are unknown easier. The aim of this project is to allow Non-For-Profit Organisations, Fundraisers, and the General Public to post their events/items on the app. We basically wanted to make it simpler for people to be aware of what's going on around them. The app acts like an online platform where you can connect with your neighbours and community. It provides an easy way to share information including crime info, recommendations and tradesmen referrals, lost pets, local services and general news.

7. Community Organisation Portal - COP

Gary Stewart <gstewart@cs.uct.ac.za>

Various community organisations exist around Cape Town, as they do in any other major city. These organisations typically work in particular geographical areas or suburbs, on specific or a group of related social issues, e.g. environmental, youth development or civic matters. Some organisations are independent and unaffiliated. Some are affiliated to a larger structure, e.g. a number of civic bodies are affiliated to the Greater Cape Town Civic Alliance (GCTCA). The proposed system would allow community organisations to upload a profile of what they do, including what geographical area they work in and what social issues they work on into a database. That database should be able to be queried, e.g. for organisations in a particular area or organisations working on a particular issue. The system should also allow that information to be mapped using a resource like Google Maps. It should allow a user to see all the community organisations working in a particular geographical area, or see all the organisations working on a particular social issue. Participating organisations should also be able to upload articles on events, campaigns or projects that they are running. These are just the core proposed features. Groups are encouraged to add features they think may be useful. The proposed system will be web based.

8. Farmers to Pharaohs: Simulating Early Egypt using an Agent Based Model – EGYPT

Geoff Nitschke <gnitschke@cs.uct.ac.za>

Recently there has been increasing interest from archeologists, anthropologists and social scientists in using computational Agent-Based Models (ABMs) to simulate “what-if” hypothesis about historical societies. That is, to see how real world societies may have turned out if the decisions made by individuals or the environment had been different. In this project an ABM is used to investigate the

conditions under which small Neolithic farming communities in the ancient Egyptian Nile Valley (ca. 4000 BC) transformed into one large complex unified state led by a divinely-sanctioned king (Pharaoh).

This project involves re-implementing and extending an ABM code-base for simulating an ancient Egyptian society. The ABM can be run with different “society start parameters” and used to simulate different Egyptian states emerging from different individual agent (simulated household) actions and Nile Valley environment conditions.

The goals of this project are two-fold. First, to re-implement an existing ABM currently coded in the NetLogo language. Second, to implement class hierarchy extensions to the ABM that will make it suitable as a simulation platform for social scientists to run and test a range of simulated society parameters. That is, ideally the ABM will be an easy to use computational tool to test various “what-if” hypotheses about how and why specific social and environmental conditions resulted in specific types of (historical) societies.