Department of Computer Science

Individual Project - CS3IP16

List of Staff Proposed Project Themes

2017-2018

This document contains a list of project themes proposed by the staff in the school. Each project theme will offer a multiple number of projects. You will select at least two project themes in the Summer term, Part 2. Your selection will then aid a supervisor allocation in the first week of the Autumn term, Part 3.

Alternatively, you can propose your own project by using the "*Student own project proposal – template*" provided in Blackboard. Such proposal will be scrutinised by an academic staff for its suitability to your study programme and adequacy to the academic standard. For those own project proposals which were not granted, a project must be selected from this document. Please check the deadline for this task.

Project theme ID:	
100	
Project theme title:	
Event Management Assistant	
Theme description:	
This theme develops a customisable assistant application for a particular type of event. The assistant should integrate a suite of tools that are potentially linked, i.e. check lists, scheduling assistant, budget tools, calculators, etc.	
Keyphrase:	
event_mgt_assistant	
Required computing skills:	
Programming, databases	
Suitability:	
CS	
Number of projects (this theme will derive a number of **individual projects**):	
4	
Indicative projects (sample ideas for individual projects)**:**	
Projects could differ in terms of the type of event the assistant targets. I.e.:	

Projects could differ in terms of the type of event the assistant targets. I.e.:
- Event Management Assistant for Visit & Open Days
- Event Management Assistant for organising academic workshops (comprises paper submission & review facilities)
- Event Management Assistant for any other type of event the student chooses (in collaboration with the Supervisor)

Projects can also different in terms of the software architecture. I.e.:
- Mobile Applications
- Desktop Applications
- Client Server Applications
- Multi User Applications
- A mix of the above

Project theme ID:	
110	
Project theme title:	
A Health/Fitness Tracker Application	
Theme description:	
The objective is to develop an application with a database backend that allows entering, tracking and analysing health and fitness data, such as weight, calorie intake, fitness activities, weight loss, etc. The backend of the application can contain information entered by the user, automatically generated information (i.e. step counts) but also may contain general information such as calorie or activity tables etc.	
Keyphrase:	
fitness_tracker	
Required computing skills:	
Java programming, database design	
Suitability:	
CS and IT	
Number of projects (this theme will derive a number of **individual projects**)**:**	
4	
Indicative projects (sample ideas for individual projects)**:**	

- Fitness on the go with an Android device: This project develops the application as an android app. This offers the additional possibility to use sensors of the phone to track activity and to display basic fitness statistics.
- Fitness Tracker Desktop Application: This project develops the application as a Java front end. Different to the former indicative project it does rely on user input but could offer a more sophisticated visualisation of fitness statistics.
- Fitness Tracker Web Application: This project is the same as the former, but develops the application as a web application. This is suitable for IT students.
- Fitness Tracker Social Application: This project develops the application as a Java or Android front end. Different to the former projects its focus is multiple users sharing their fitness progress and activities.

Project theme ID:	
120	
Project theme title:	
Computational Vision	
Theme description:	
The Computational Vision theme is concerned with image analysis, image manipulation, and pattern classification. Projects involved in this theme require students to work on digital images to produce a software product which may have functions of changing image settings, manipulating images, or interpreting images with meaningful objects.	
Keyphrase:	
Image_analysis, computer_vision, pattern_classification	
Required computing skills:	
Programming, image processing, machine learning	
Suitability:	
CS	
Number of projects (this theme will derive a number of **individual projects**):	
8	
Indicative projects (sample ideas for individual projects)**:**	

- A Face Authentication System
- A Real-Time Character Recognition System
- Vision-based Emotion Detection
- Stereo Vision for Depth Recovery
- Face Tracking in an Indoor Environment
- Manipulate Colour Images
- Image registration
- Satellite image understanding

Project theme ID:	
130	
Project theme title:	
Meet & Match in the Life and Theoretical Sciences	
Theme description:	
The development of new technologies in the life, clinical and biomedical sciences is often driven by the use of methods and technologies from the theoretical sciences (mathematics, statistics, engineering, and computer science). Progress on problems in these areas often requires the formation of a multidisciplinary team consisting of theoretical and life scientists. However, one issue that is often faced by scientists working in these areas (working in both industry and academia) is finding and sourcing expertise from outside their immediate field, e.g. a biologist looking for a mathematician to help with their problem.	
Keyphrase:	
discovery_expertise, web_app	
Required computing skills:	
Programming, Javascript, databases, profiling	
Suitability:	
CS	
Number of projects (this theme will derive a number of **individual projects**):	
2	
Indicative projects (sample ideas for individual projects)**:**	
This project theme focuses on developing a Meet & Match website for the life and theoretical sciences. The website will allow users to login, create their own profile and then peruse and contact scientists working in the field they are making contact with. In particular the background search engine to the website will allow users to search for certain groups, e.g. "mathematicians" and return users who fit certain descriptions. In many ways the website will be similar to many dating websites, but will obviously include criteria more relevant to their field and areas of interest.	

Project theme ID:	
140	
Project theme title:	
Web pages to help learn Computing	
Theme description:	
The aim of these projects is to develop a series of interactive web pages to help students to learn various aspects of computing. This could cover searching and sorting, tree structures, linked-lists, backtracking, expression trees/reverse polish, computer structure and operation, neural networks, etc. The key point is they should do more than just demonstrate the concept – users should have to interact the pages to demonstrate their understanding – the results of which could produce marks.	
Keyphrase:	
e_learning, web_app	
Required computing skills:	
Existing pages have been written in Javascript, but other languages could be utilised.	
Suitability:	
CS	
Number of projects (this theme will derive a number of **individual projects**):	
4	
Indicative projects (sample ideas for individual projects)**:**	
Some initial work is shown by the examples at http://www.personal.reading.ac.uk/~shsmchlr/jscomp/index.html. However these generally only demonstrate a concept and need to be extended to incorporate a learning component.	

Project theme ID:	
150	
Project theme title:	
Virtual Campus	
Theme description:	
The aim of these projects is to develop models of parts of the campus which can be explored remotely, possibly by a modelled robot. Detailed models of buildings would be done in some modelling package, perhaps sketchup or blender, but the environment and interaction with it would be done using Unity.	
Keyphrase:	
virtual_reality	
Required computing skills:	
Experience of relevant packages would be useful	
Suitability:	
CS	
Number of projects (this theme will derive a number of **individual projects**):	
4	
Indicative projects (sample ideas for individual projects):	

- Detailed model of various models of buildings
- Model of the campus round the lake including robot moving on uneven surface
- Detailed model of characters

Project theme ID:	
155	
Project theme title:	
Robotics	
Theme description:	
Mobile robotics has been an interest here for over 25 years. Sometimes real robots have been built and programmed, sometimes simulations of these devices have been written. Robotics feature in the Begin Robotics MOOC. The aim here is to produce new examples with which we could update the MOOC and show at open days.	
Keyphrase:	
robotics	
Required computing skills:	
Experience of relevant packages would be useful	
Suitability:	
CS	
Number of projects (this theme will derive a number of **individual projects**):	
4	
Indicative projects (sample ideas for individual projects)**:**	

- Simulations of mobile robots – different behaviour, learning, interacting
- Detailed model of ERIC/Rover robot used in MOOC
- Simulation of Baxter type robot
- Purchase a real robot and program it

Project theme ID:	
160	
Project theme title:	
Data Science, Analytics and Mining	
Theme description:	
Data Science include method, technologies and algorithms used to make sense of the large amount of digital data that is being continuously generated. Data can be turned into useful knowledge only by means of algorithms. This theme includes projects that expose the student to different aspects of Data Science to develop tools or applications that can be use in real-world cases.	
Keyphrase:	
Data_Science, software_development, Raspberry_Pi, advanced_analytics, KNIME	
Required computing skills:	
Good programming skills in Java and/or other languages, Raspberry Pi, advanced analytics, KNIME	
Suitability:	
CS	
Number of projects (this theme will derive a number of **individual projects**)**:**	
3	
Indicative projects (sample ideas for individual projects)**:**	

- Wine Cellar Hygro-thermometer Monitor (estimated cost £200): The software system is intended to monitor the conditions of wine cellars. Hygro-thermometer sensors are used to measure the temperature and humidity of the environments in which they are situated. Data is transmitted via a WiFi network to the server application. The application helps to collect, store, monitor, and analyse the conditions of the environment in which the wines are stored. Data from the sensors are stored in a database and continuously monitored. Real time alarms based on user-defined rules, are sent by email to the user. Periodic (e.g. weekly/monthly) reports are also sent by email to the user. In the project server and client applications will be developed to manage data generated by multiple sensors. The sensor devices will be built using Raspberry Pi units.

- Tracking and Analysing Twitter Data Streams: Big social data analytics arises from a big data approach to online social media and offers the opportunity to understand much more about social phenomena and their impact that until now have been difficult or impossible to measure. Twitter is a microblogging service that was launched in 2006 and has been recently reported to have over 300 million monthly active users worldwide. In the UK it is estimated that there are 14/15 million monthly active users, which is about 22% of the UK population. In this project the student will develop a tool for the collection of real-time Twitter data: the tool should include some online and offline analytics modules.

- WiFi-based Location Prediction: The Global Positioning System (GPS) is the most popular and accurate outdoor localisation system. In indoor environments, however, it often has considerable limitations. Indoor localisation can be predicted by the signal strength of WiFi access points. Many buildings are equipped with WiFi access points, whose position rarely changes and whose presence is visible to any WiFi-enabled devise. The project will implement a predictive data mining algorithm within an Android application. The signal strength of WiFi access points is used to build a fingerprint of the location. The Android app is used to collect fingerprints of different environments. The collected data will be used to generate a predictive model for indoor localisation.

Project theme ID:	
170	
Project theme title:	
Database, Network and Android applications	
Theme description:	
Many applications use a combination of technologies, such as databases, network protocols and mobile device programming. This area includes projects that require the student to develop a complex application by developing software components with different technologies.	
Keyphrase:	
Network application, Android_app	
Required computing skills:	
Programming skills in Java and/or other languages; database technologies	
Suitability:	
CS	
Number of projects (this theme will derive a number of **individual projects**)**:**	
5	
Indicative projects (sample ideas for individual projects)**:**	
• Opinion Leader: fully-decentralised online opinion polls: Surveys of public opinions are typically drawn from a very small sample of the entire population. They also rely on a centralised server or service (e.g., a poll agency). Obvious issues are associated with the centralised nature of this model. Does the (small) sample size provide sufficient guarantees for extrapolating general conclusions? Will a centralised service run under a private administrative control be unbiased and objective? Would the results be available anytime and anywhere without the interference of policy makers and private interests? Decentralised mobile applications do not rely on a server or a service provider: they rely on a voluntarily/collaborative peer-to-peer model. The project will implement "Opinion Leader", a fully decentralised online application for opinion pools. Anyone can start an opinion pool or become the next opinion leader by initiating a viral poll. No one can stop or interfere with a real-time global aggregation of opinions by means of an epidemic communication protocol. A successful project will provide an implementation of an Android P2P application with a client GUI and a server-based simulator of a P2P community to demonstrate the Android application in a large-scale simulated network.	

- Monitoring Student Well-being: The project will develop a database server application, a web-based application and an Android application to captures student well-being information. The expert will use the interface to prepare a questionnaire for a survey. The questionnaire is uploaded into the database. The server application will push the questionnaire into the Android app in the smartphones of the students who have joined the well-being survey. Anonymous data is then collected and stored in the database. In addition to collecting information from the students, the App may be used to direct students to sources of help if they are in need. The system should be scalable as large amount of data will be collected and stored from a large number of students. The system may also provide information back to the students to allow them to monitor their own well-being. For example, their well-being at different times of the year/term, their well-being compared to other students at the University of Reading.

- Wine Cellar Management Tool: The Wine Cellar Management Tool is meant to manage the wine cellars of the Senior Common Room of the University of Reading. The tool is based on a database server, a web application and an Android application. The server allows to store and update the cellar inventory, tasting notes and other information (e.g., grape varieties), user accounts with levels of authorisation. The client software has two main interfaces: the wine steward interface to manage the inventory and the standard user interface to browse available wines and to perform a few other operations (e.g., reserve a bottle, write a review or tasting notes). The Android app should allow to scan the wine UPC barcode on the bottle or to read the text on the label to identify and retrieve the wine from the inventory and other user-friendly functionalities. The project can be taken by two students who will work on two complementary aspects of the systems: wine inventory and wine data retrieval.

Project theme ID:
180

Project theme title:
Data analytics and data visualisation

Theme description:
Data are asset to users who constantly desire to make sense of them. In a sense making process, the human brain processes information to grasp the meaning of multiple data dimensions when they are displayed in charts and graphs. A number of quantitative methods are normally adopted to analyse vast amount of data and graphical tools can then be employed to present results for purposes. However, recent innovations in hardware, analytics and mobility require the analysis of data effectively and communicate results with users via statistic graphics efficiently. Projects in this theme will inquiry data visualisation concepts and principles as well as visual analytics tools, and develop interactive data visualisation methodology and device.

Keyphrase:
data_visualisation, visualisation_app

Required computing skills:
Programming, Excel/database technologies, open source visual analytical tools (e.g. Tableau, http://www.tableau.com/academic/students), KNIME

Suitability:
CS and IT

Number of projects (this theme will derive a number of **individual projects**):
4

Indicative projects (sample ideas for individual projects):
• Interactive dashboard (a dataset can be from various problem contexts) • Business Intelligence tool (making business sense from data) • CRM for information analysis and provision

Project theme ID:	
190	
Project theme title:	
Data integration and data warehousing	
Theme description:	
Data integration (DI) is a widely adopted method in commercial world that repurpose data by transforming transactional data to a common form found in a data warehouse (DW). DWs, therefore, are central repositions of integrated data from one or more disparate data sources (e.g. transactional databases, files). DI normally support two broad practical areas: 1) business intelligence (i.e. online analytical processing, OLAP) creating analytical reports to support decision making, and 2) a migration, consolidation, and synchronization of transactional databases, as well as exchanging data in a business-to-business context. Projects in this theme aim to develop a prototype of data warehousing application which enables the transactional data from multiple and distributed databases to be processed in appropriate levels of summary and abstraction. The processed data (defined as informational data) will be relevant to chosen problem contexts to support the intended business purposes. This project requires adopting the data warehousing design methods (e.g. Star Schema, and data mart) as well as good database and programming skills for an implementation of a DW application.	
Keyphrase:	
data_warehousing, OALP	
Required computing skills:	
Programming, database technologies (e.g. Microsoft SQL Server), ETL technologies (Microsoft Viso Studio), Star Schema, data mart	
Suitability:	
CS and IT	
Number of projects (this theme will derive a number of **individual projects**)**:**	
5	
Indicative projects (sample ideas for individual projects)**:**	

- Information builder to support multidimensional data queries
- Data warehousing and decision support (a dataset can be from various problem contexts)
- Data warehousing and visual data analysis
- information architecture for supplier discovery in supply chain management

Project theme ID:
200
Project theme title:
Text mining
Theme description:
Text mining is widely applied in business, publishing, social media, gaming, and information systems.
Keyphrase:
text_mining
Required computing skills:
A programming language of their choices, mathematics, essential algorithms, GUI
Suitability:
CS
Number of projects (this theme will derive a number of **individual projects**)**:**
5
Indicative projects (sample ideas for individual projects)**:**

- Novel virtual keyboard: These projects will implement ideas of virtual keyboard that will assist fast text inputs, e.g. predicted texts for word selection, moving characters for selection based on probabilities, etc.

- Text analytics application: Given a document, the projects are concerned with deriving important information from texts by ignoring commonly used stopping words, and display key information for user's benefits. For example, from scientific papers, a list of keywords may be generated through statistical analysis. Or from newspapers, the key topics are identified for a certain time period.

- Signature authentication system: This project involves building a pattern classifier to detect hand signatures. A pattern classifier model will be built that recognize signatures. You may design different demonstrators to test the system. For example, supposing one signature is used for training, then three new signatures are compared and ranked by their similarities to the trained signature.

Project theme ID:		
210		
Project theme title:		
System Maintenance		
Theme description:		
Dynamic software upgrade; a framework for applications to upgrade themselves without being shut down, using .Net		
Keyphrase:		
system_maintenance, robustness, dynamic_upgrade, distribution_management		
Required computing skills:		
.Net (c#, vb, etc.)		
Suitability:		
CS and IT		
Number of projects (this theme will derive a number of **individual projects**):		
2		
Indicative projects (sample ideas for individual projects):		
Based on MAF, on Application domains or otherwise; e.g. a game engine capable of live upgrades without downtime.		

Project theme ID:
220

Project theme title:
Archie modelling support accessories

Theme description:
ArchiMate is a powerful graphical tool that can be used far more widely than enterprise architecture; it can model almost any software and IT supported socio-technical system. It can also be used for acquiring and organising system and software requirements. Archi is an exemplar tool of this kind which is free to install and multi-platform (e.g. PC, OSX and Linux). It stores its data in XML format files and therefore can be supported by analytical applications. Projects would be expected to access and parse Archi files and produce some useful analysis. Advanced projects would incorporate networked team sharing features.

Keyphrase:
Archi, XML analysis, modelling,

Required computing skills:
Ability to write applications in any taught language (esp VB or Java). Alternatively an ability to write powerful scripting languages within applications such as Microsoft Access.

Suitability (CS/IT):
CS and IT

Number of projects (this theme will derive a number of individual projects):
2

Indicative projects (sample ideas for individual projects):
Provide a requirements elicitation support tool by placing a prospective software application in the context of its installation and usage environment. Support IT Service Management by by supporting expert judgements to indicate the vulnerability of a Service, given its implementation, and to support 'what-if' impact analyses. The results would be used by service designers and managers. Take a system blueprint and support the needs of Configuration Management and other IT Service Management activities.

Project theme ID:	
230	
Project theme title:	
Education/Productivity	
Theme description:	
Application of Software Engineering techniques to education (e.g. issue management or kanban, to facilitate structured learning approaches). Work breakdown wizard; guided dialogue to break tasks down to bite-sized pieces, including time estimation.	
Keyphrase:	
structured_learning, personal_productivity_app	
Required computing skills:	
Programming, education research	
Suitability:	
CS and IT	
Number of projects (this theme will derive a number of **individual projects**)**:**	
1	
Indicative projects (sample ideas for individual projects)**:**	

- Web service providing guided task breakdown and potentially scheduling and monitoring services

- ChiliProject is a fork of Redmine, a piece of project management software written in Ruby which includes facilities such as issue logging, source code repository integration and wikis. Modify this system to support learning a subject as a series of inter related projects, allowing for group work and individual work, and for the system to be used by a lecturer to disseminate notes, announcements, feedback and marks without compromising the privacy of any of the users.

Project theme ID:	
240	
Project theme title:	
AI/Entertainment	
Theme description:	
Platform for AI/Human interaction (text based or graphical based) to allow AI agents to work alongside humans.	
Keyphrase:	
AI_human, AI_platform, human_interaction	
Required computing skills:	
Programming, networking	
Suitability:	
CS and IT	
Number of projects (this theme will derive a number of **individual projects**):	
1	
Indicative projects (sample ideas for individual projects)**:**	
MUDs (Multi User Dungeons, or Domains) are a relatively niche field of gaming, allowing multiple players to interact within a world described by text rather than shown by graphics, and with an embedded set of rules about how things interact. Design an object oriented MUD server which allows for message passing between in-word objects to simulate physics and other interactions. The system should enable artificial agents (bots) to interact with human players, allow for in-game editing of the environment by users with sufficient rights, and for such changes to be persistent. Objects in game should also be able to be scripted to respond to stimuli, and tools to identify bots by their behaviour would be highly desirable.	

Project theme ID:	
250	
Project theme title:	
Mobile applications in education	
Theme description:	
Triangulation and location aware mobile devices.	
Keyphrase:	
locate_mobile_device	
Required computing skills:	
Programming, Java	
Suitability:	
CS	
Number of projects (this theme will derive a number of **individual projects**):	
1	
Indicative projects (sample ideas for individual projects)**:**	
Find my phone	

Project theme ID:	
260	
Project theme title:	
Education/AI	
Theme description:	
Determining narrative flow, latent semantic analysis.	
Keyphrase:	
latent_semantic_analysis, determining_narrative_flow	
Required computing skills:	
Programming, AI	
Suitability:	
CS	
Number of projects (this theme will derive a number of **individual projects**):	
1	
Indicative projects (sample ideas for individual projects):	
Essays, reports and online discussions can sometimes suffer from a sudden change in topic, which creates a level of cognitive dissonance and makes it harder for the reader to understand what the writing is trying to say. By examining adjacent sections of the text and determining the topic, it should be possible to map the narrative flow within a document, and identify rapid shifts from one topic to another, highlighting any problems found. A promising method is to use forms of Latent Semantic Analysis or related bag of words approaches, such as Kohonen networks, to produce a graphical representation of the path of the topic in a â€˜concept space. Create a system which identifies the narrative flow in a number of documents from a corpus, producing a graphical representation of how the subject shifts through the document and highlighting jumps.	

Project theme ID:	
270	
Project theme title:	
Construction/Productivity	
Theme description:	
Programming pattern recommender system.	
Keyphrase:	
recommender_system, programming_pattern	
Required computing skills:	
Programming, modelling	
Suitability:	
CS and IT	
Number of projects (this theme will derive a number of **individual projects**):	
1	
Indicative projects (sample ideas for individual projects)**:**	
A system to analyse models and recommend appropriate patterns for design	

Project theme ID:	
280	
Project theme title:	
Compiler/Optimisation	
Theme description:	
LLVM based front end, or optimisation filter.	
Keyphrase:	
Compiler, LLVM_based_front_end, optimisation_filter	
Required computing skills:	
Programming, compilers	
Suitability:	
CS	
Number of projects (this theme will derive a number of **individual projects**):	
1	
Indicative projects (sample ideas for individual projects)**:**	
Compiler for ORK or otherwise, optimisers	

Project theme ID:	
290	
Project theme title:	
Software engineering and construction	
Theme description:	
Generic Presentation layer in .net, windows forms or WPF presentation server, decoupled from business logic.	
Keyphrase:	
presentation_layer_.net	
Required computing skills:	
Programming, .net	
Suitability:	
CS and IT	
Number of projects (this theme will derive a number of **individual projects**):	
1	
Indicative projects (sample ideas for individual projects)**:**	
API front end server	

Project theme ID:	300
Project theme title:	Gaming and accessibility
Theme description:	Text descriptions of 3D models, real time for Screenreader; renderer, and attention mechanism.
Keyphrase:	gaming_accessbility, text_description_3D_modeling, real_time
Required computing skills:	Programming
Suitability:	CS
Number of projects (this theme will derive a number of **individual projects**):	1
Indicative projects (sample ideas for individual projects)**:**	Text renderer

Project theme ID:	
310	
Project theme title:	
Education/Text mining	
Theme description:	
Distributed lexical analyser serves tokens in response to API calls with text, updating as necessary.	
Keyphrase:	
distributed_lexical_analyser	
Required computing skills:	
Programming	
Suitability:	
CS	
Number of projects (this theme will derive a number of **individual projects**):	
1	
Indicative projects (sample ideas for individual projects)**:**	
Web based server, allowing multiple peers, sharing lexical database	

Project theme ID:	27
320	
Project theme title:	
Education/modelling	
Theme description:	
Application of Software Engineering techniques to education, e.g. define module learning outcomes and assessment criteria using Gherkin, with executable tests.	
Keyphrase:	
education_app_for_SE	
Required computing skills:	
Programming, testing	
Suitability:	
CS and IT	
Number of projects (this theme will derive a number of **individual projects**)**:**	
1	
Indicative projects (sample ideas for individual projects)**:**	
Suite of executable tests written in Gherkin able to evaluate suitably expressed student work	

Project theme ID:
330

Project theme title:
Web applications

Theme description:
Most web applications are based on the client-server architecture where the client enters information while the server stores and retrieves information in an anytime and anywhere fashion. Web apps commonly use a combination of server-side script (ASP, PHP, etc.) and client-side script (HTML, Javascript, etc.) to develop the application. The client-side script deals with the presentation of the information while the server-side script deals with all the computational processing as well as data management. Projects in this theme will adopt web development methods and build web software which aid end users to access to the data, process the data, and present the information for their intended purposes.

Keyphrase:
web_app

Required computing skills:
Programming, scripting language (e.g. Javascript, HTML), database technologies, website development tools

Suitability:
CS and IT

Number of projects (this theme will derive a number of **individual projects**):
8

Indicative projects (sample ideas for individual projects)**:**
- Social networking for the very old and vulnerable   - Primary school learning aid   - The Institutional Repository as a Learning Resource   - e-Mentor application   - Art Community   - Accessibility in second life   - Online dietary intake software: to develop an on-line app that can be used by older adults to select their food item, specify the portion size, record their dietary intake, and present some feedback to the user.

Project theme ID:	
340	
Project theme title:	
Mobile applications	
Theme description:	

Usage of mobile application software has become increasingly prevalent across mobile phone users. However, developing apps for mobile devices requires considering the constraints and features of these devices. Mobile devices have features such as location detection and cameras, a wide array of screen sizes, hardware specifications and configurations. Mobile user interface (UI) considers constraints and contexts, screen, input and mobility as outlines for design. Mobile UI contexts signal cues from user activity, such as location and scheduling that can be shown from user interactions within a mobile application. Projects in this theme will address these design issues and develop apps to support mobile users' activities with an understandable and user-friendly interface.

Keyphrase:

mobile_app, second_life, international_students,

Required computing skills:

Programming, networking, database technology, API, GUI

Suitability:

CS

Number of projects (this theme will derive a number of **individual projects**)**:**

5

Indicative projects (sample ideas for individual projects)**:**

- Second life and Google Maps based augmented worlds: Second life provides an interactive environment for simulating a virtual world. Google maps provides an interactive environment for simulating (aspects of) real world e.g. creating maps and navigational aids. The aim of this project is to bring together these two cutting-edge technologies to develop a new wave of applications. At a technical level this will involve methods to import Google maps into second life and to build functionality using Google maps in second life. This will involve design, development and integration of various components:
  - Novel Algorithms,
  - Biomemetic Algorithms (bee colony optimization algorithm) for solving TSP,
  - Skyline Queries Algorithms,
  - Novel Shortest path algorithms.

- A vison based attendance analyser: an application to automate the task of attendance verification in a classroom scenario, using face recognition (Eigenface approach) in the field of computer vision. The input to the system will be fed through a standard web-cam to demonstrate the system via mobile devise and synchronised with an online operational capability. A range of techniques will be implemented and evaluated as follows:
    - the robust recognition (pose, expression, colour input, etc.) by the weighted modular PCA (WMPCA) technique,
    - a GUI for displaying the attendance visually (perhaps blending with avatar technology) and to allow for manual updates to the output of the verifier.

- Mobile computing for international students: Learning, teaching and socializing using mobile devices has attracted much research attention lately. The Android Operating System has had a particular increase in attention. The aim of this project is to develop Android apps for supporting International Students at University level. There are Android tablets available for students to borrow within the school, however a student owning an Android device might find more flexibility in development of the resource.

Project theme ID:	
350	
Project theme title:	
Mind-map accessories	
Theme description:	
Mind-mapping tools are powerful graphical tools that can be used far more widely and formally than just mind-mapping. FreeMind is an exemplar tool of this kind which is free to install and multi-platform (e.g. PC, OSX and Linux). It stores its data in XML format files and therefore can be supported by analytical applications. Projects would be expected to access and parse FreeMind files and produce some useful analysis. Advanced projects would incorporate networked team sharing features.	
Keyphrase:	
Mind-mapping, XML analysis, metrics, testing, requirements	
Required computing skills:	
Ability to write applications in any taught language (esp VB or Java). Alternatively an ability to write powerful scripting languages within applications such as Microsoft Access.	
Suitability (CS/IT):	
CS and IT	
Number of projects (this theme will derive a number of **individual projects**)**:**	
2	
Indicative projects (sample ideas for individual projects)**:**	
Supporting the use of goal-oriented requirements analysis by supporting expert judgements to calculate adequacy and feasibility metrics and then produce profiles that can be used by project and development managers. Supporting the use of hierarchical test-oriented software acceptance testing by supporting expert judgements to calculate test adequacy and other metrics and then produce profiles that can be used by test managers.	

Project theme ID:	
360	
Project theme title:	
Transcomputation	
Theme description:	
Transcomputation is any computation which exploits a total arithmetic, such as transreal arithmetic. Transcomputation can be used to obtain exception-free execution of programs.	
Keyphrase:	
Transcomputation	
Required computing skills:	
Programming	
Suitability (CS/IT):	
CS	
Number of projects (this theme will derive a number of **individual projects**)**:**	
5	
Indicative projects (sample ideas for individual projects)**:**	

- Overload the arithmetical and relational operations in some language so that they provide a transarithmetic.
- Emulate transfloating-point arithmetic with variable mantissa length, exponent length, and exponent bias. Compare the numerical performance of different choices of transfloating-point format with IEEE 754 floating-point formats.
- Emulate trans-two's complement arithmetic and explore its interaction with bitwise operations.
- Develop a compiler for a source language that inherently supports transcomputation.
- Assess the potential impact of transcomputation on commercial programming.

Project theme ID:

380

Project theme title:

Big data analytics using machine learning and data mining techniques

Theme description:

Large scale data will be made available about a given domain and can be pre-processed as required. The KNIME Analytics Platform, Machine Learning libraries and bespoke designed algorithms can be designed as required to perform Analysis, Modelling of large scale structured and unstructured data using machine learning and data mining techniques and to provide appropriate visualization of results for decision support.

Final reports document technical details of all relevant aspect of the project, research, design, development, evaluation and conclusions.

Key phrase:

data analytics and modelling

Required computing skills:

Java/C++ Programming, data modelling, NLP, visualization**,** KNIME, Machine Learning, Data Mining

Suitability (CS/IT):

CS

Number of projects (this theme will derive a number of **individual projects**):

3

Indicative projects (sample ideas for individual projects)**:**

A project could be shaped based on some of the following technical aspects:
- Using Open Data sources e.g. Climate Data, Twitter Data
- Pre-processing and Structuring Data including some Natural Language Processing (NLP) as may be required
- Extracting and Modelling Data using KNIME or other platform, libraries and bespoke programming as required
- Designing the user Interface for Decision Support
- Visualisation of the results of the Analytics and Modelling
- Test and Usability Evaluation

Project theme ID:

 390   (proposed by School of Biological Sciences)

Project theme title:

Exergame for rehabilitation of people with paraplegia

Theme description:

This theme combines biomechanical engineering and computer science disciplines to create a rehabilitation system for bone health of people with paraplegia. The rehabilitation system comprises an instrumented standing frame with force sensors, a functional electrical stimulator (FES), and a motion capture system. The users (people with paraplegia) are provided with real time feedback of their exercising effort and progress through an exercising experience ("exergame"). This theme proposes the design of new "exergaming" application that can be offered for user-feedback during the exercising sessions.

Keyphrase:

 Bone rehabilitation with exergaming and FES for people with paraplegia

Required computing skills:

C/C++ or C# , HCI and applications, 3D design software or game engine software

Suitability (CS/IT):

 CS

Number of projects (this theme will derive a number of **individual projects**):

 1-2

Indicative projects (sample ideas for individual projects)**:**

Long rehabilitating exercises can be mentally tiring and unattractive to potential users. This project aims to provide an exciting experience ("exergame") during rehabilitation sessions of people with paraplegia. The student that will undertake this project will work as part of the FES research Group where a state-of-the-art instrumented standing frame has been created for use in bone health rehabilitation of people with paraplegia. The FES frame enables a paraplegic person to stand up, and exercise, whilst simultaneously recording biomechanical and postural information. The challenge of this project is to create a unique and engaging gaming experience by using the body position and force data from the user as a game controller, whilst taking into account the restrictions posed by the nature of the application. The student will be asked to design and develop an appropriate gaming experience, in close collaboration with researchers from the FES group. A data stream from the force sensors (load cells and force plates) and motion capture system (Qualisys), as well as information from a real-time, bone loading model developed by the FES group will be provided to the student. The student is tasked to use any information from this data stream to design the exergame experience. For the development of the exergame student will use the Unity3D platform.

Project theme ID:

400

Project theme title:

Kinect Exergames

Theme description:

This project aimed to develop a game to help older adults in exercises. The exercises are controlled by body joints' movements, which are captured by Kinect sensor. A graphics interface provides the interaction between the user and the game.

Key phrase:

Kinect Exergames

Required computing skills:

C#; JavaScript

Suitability (CS/IT):

CS

Number of projects (this theme will derive a number of **individual projects**):

1

Indicative projects (sample ideas for individual projects)**:**

Resources: Graphics software platform with unity game engine / Kinect sensor.