Academic suggestions for

Final Year Projects 2016

School of Computing, Engineering and Mathematics
Coventry University

Project Number: 1

Proposing Staff: David Croft

Project Suitable for: Computer Science, Computing, Ethical Hacking

Project Question:

Can code style be used as a person identifier? Detecting cheating is a major problem at academic institutions. While plagiarism detection systems are relatively successful they only really work when students have copied from a pre-existing source, they are unable to detect when a student has had someone else write their work for them. This has driven the rise of essay mills. While significant research has been conducted into lexical analysis of normal text, the same level of investigation does not appear to have been carried out into software author detection. In particular there is a potential need for system that can work on student submissions where a large number of students will be submitting highly similar code.

Primary research method:

Experiment, demonstrator, application

Reading list:

Kothari, J., Shevertalov, M., Stehle, E., Mancoridis, S., "A probabilistic approach to source code authorship identification", In Proceedings of the International Conference on Information Technology, pp.243-248, IEEE, 2007. http://www.safe-corp.com/products_codematch.htm

Project Number: 2

Proposing Staff: Huma Shah

Project Suitable for:

Project Question:

Artificial conversational intelligence / Turing test: Building an interface between the human interrogator's computer and the hidden conversationalists' computers.

Primary research method:

Solution involves building a computer programme for a specific purpose: Turing test experiments. The student will need to be extremely innovative in computer programming and understand 'message box' development so be very, very good at coding. The project would be for the development of a computer programme - an application that runs a Turing test providing an interface between a human interrogator's computer and the computers being used by hidden entities (machines and humans) located in a different room. The programme should include: a) exact date/time of conversations b) at the end of any timed conversation a feature that allows the human interrogator to return 'decision' on human or machine, depending on what they believe they were talking to. c)input some bio details about the interrogator (male/female; age-range, etc. as advised by Dr. Huma Shah). Such a programme has been created in the past for previous Turing test experiments, the last at

The Royal Society London in June 2014, however it is no longer up to date with the requirements of follow up experiments planned.

Reading list:

To understand how the Turing test works in practical experiments my scholarship on academia.edu - especially these articles would be useful: Conversation, Deception and Intelligence: Turing's Question-answer game: https://www.academia.edu/2195902/Conversation_Deception_and_Intelligence_Turings_question-answer_game Turing's Misunderstood Imitation Game and IBM's Watson Success: https://www.academia.edu/474617/Turing_s_misunderstood_imitation_game_and_IBM_s_Watson_success Chapters 4-6 of my PhD: Deception-detection and machine intelligence in practical Turing tests': https://www.academia.edu/415888/Deception-detection_and_machine_intelligence_in_practical_Turing_tests

Project Number: 3

Proposing Staff: Platini Thierry

Project Suitable for: Computing

Project Question:

Walk and Colouring Problem with Prime Numbers This project can be divided in two sections: 1 - Walk guided by prime numbers. Here we generated a 2D walk following specific rules according to the distribution of prime numbers. There are many different ways to proceed. For example, considering the first prime numbers 2,3,5, ... the walker starts with 2 steps in a given direction, then turn left by 90Â° and does 3 steps forwards, then turn left by 90Â° and goes 5 steps forwards... and so on. Alternatively the angle of rotation can be proportional to the prime number, or to the difference between prime numbers. This generates 2D path, for which we are interested in the evolution of the average distance to origine, and other statistical properties. 2 - Colouring prime numbers Here we propose to arranged prime numbers on a 2D table, and colour them according to their last digit. We are then interested in analysing the distribution of clusters of a given color and other statistical properties.

Primary research method:

To proceed, the student will need to develop a code in python or C/C++.

Reading list:

Project Number: 4

Proposing Staff: Dr Maurice Hendrix

Project Suitable for: Computer Science, Games Technology, Multimedia

Project Question:

How much does a VR headset really add to the virtual experience? There is an increasing number of studies showing the benefits of VR experiences in various different fields. However most studies compare a VR experience with either no intervention or the established methods. Surprisingly very little is known specifically about how much the use of a VR headset actually adds compared to a virtual experience without VR headset (e.g. using a regular computer screen).

Primary research method:

This project would see the student run evaluation experiments where users use a VR headset and the same environment on a PC and run either a survey or set of interviews to compare the experiances.

Reading list:

There are just a few suggestions as starting points: Hoffman, H. G., Richards, T. L., Van Oostrom, T., Coda, B. a, Jensen, M. P., Blough, D. K., & Sharar, S. R. (2007). The analgesic effects of opioids and immersive virtual reality distraction: evidence from subjective and functional brain imaging assessments. Anesthesia and Analgesia, 105(6), 1776â€“83, table of contents. doi:10.1213/01.ane.0000270205.45146.db Seymour, N.E., Gallagher, A.G., Roman, S.A., Oâ€™Brien, M.K., Bansal, V.K., Andersen, D.K. and Satava, R.M., 2002. Virtual reality training improves operating room performance: results of a randomized, double-blinded study. Annals of surgery, 236(4), pp.458-464. Zyda, M., 2005. From visual simulation to virtual reality to games. Computer, 38(9), pp.25-32. Vancouver

Project Number: 5

Proposing Staff: Dr Maurice Hendrix

Project Suitable for: Games Technology, Multimedia

Project Question:

Personalization Difficulty with in an (existing) Kayaking Serious Game (using VR and the occulus) for rehalibitation and exercise

Primary research method:

This project will involve implementation within a unity game based on research followed by a small scale evaluation

Reading list:

Square-Enix (2016) Deus ex: Mankind Divided. Available at: https://www.deusex.com/game/dx-md (Accessed: 1 September 2016). Valve (2008) Left 4 Dead, Available at: http://store.steampowered.com/app/500/ (Accessed: 1 September 2016). Csikszentmihalyi, Mihaly. 1990. Flow: The Psychology of Optimal Experience. New York: Harper & Row. Hopson, J. (2000). Behavioral Game Design. [online] Gamasutra.com. Available at: http://www.gamasutra.com/view/feature/131494/behavioral_game_design.php?page=2 [Accessed 14 Jun. 2016]. Hunicke, R. and Chapman, V. (2004). http://www.cs.northwestern.edu/~hunicke/pubs/Hamlet.pdf. [online] AI for Dynamic Difficulty Adjustment in Games. Available at: http://www.cs.northwestern.edu/~hunicke/pubs/Hamlet.pdf [Accessed: 28 June 2016].

Project Number: 6

Proposing Staff: Platini Thierry

Project Suitable for: Computer Science, Games Technology

Project Question:

Toy model for simple Organisms and Evolution Principle. This project's aim is to build a toy model of an organism based an selective stochastic principles. Imagine a cell is composed of 4 genes (let's say that genes are integers from 1 to 9). The genes are coding for probability of reproduction and probability of death. When two organisms multiply, we create a new organism with mixed genetic material. The main idea is write a code in Python or C++ to simulate the evolution of such a population For a better but longer description please read https://platinithierry.wordpress.com/2015/07/22/a-toy-model-for-evolution-of-a-unicellular-mathematical-organism/

Primary research method:

Reading list:

https://platinithierry.wordpress.com/2015/07/22/a-toy-model-for-evolution-of-a-unicellular-mathematical-organism/

Project Number: 7

Proposing Staff:

Project Suitable for: Computer Science, Computing, Multimedia

Project Question:

Evaluation of current mobile platforms for collaborative Learning and development of a prototype system.

Primary research method:

an evaluation survey a prototype recommendations

Reading list:

Saleh, S. A. and Bhat, S. A., Mobile Learning: A Systematic Review, International Journal of Computer Applications (0975 â€“ 8887) Volume 114 â€“ No. 11, 2015

Project Number: 8

Proposing Staff: Dr. Xingang Wang

Project Suitable for: Computer Science, Computing, Ethical Hacking

Project Question:

Building an intranet for penetration test This project is to build an intranet and demonstrate some penetration tests on this network..

Primary research method:

An experiment; A demonstrator; System integration and network device configure; Recommendations.

Reading list:

Hacking Intranet Websites from the Outside (Take 2) http://www.blackhat.com/presentations/bh-usa-07/Grossman/Whitepaper/bh-usa-07-grossman-WP.pdf

Project Number: 9

Proposing Staff: Dr. Xingang Wang

Project Suitable for: Computer Science, Computing, Ethical Hacking

Project Question:

Building a Software Defined Network SDN network and investigate performance issues This project is to build and demonstrate a SDN network and investigate performance issues.

Primary research method:

An experiment; A demonstrator; Software development; Recommendations.

Reading list:

SDN Issues â€“ A Survey http://ijcaonline.org/archives/volume73/number18/12843-0195

Project Number: 10

Proposing Staff: Dr. Xingang Wang

Project Suitable for: Computer Science, Computing, Ethical Hacking

Project Question:

This project is to build and demonstrate a how to automate network configurations using python and ansible.

Primary research method:

An experiment; A demonstrator; Software development; Recommendations.

Reading list:

Network Automation with Ansiblehttps://www.ansible.com/network-automation

Project Number: 11

Proposing Staff: Sandy Taramonli

Project Suitable for: Computer Science, Ethical Hacking

Project Question:

Title: Multi-source log file analysis using data mining for efficient forensic investigation Research Question: Is it practical and appropriate to use data mining methods to classify events based on their severity in order to improve the efficiency of the forensic investigation? Outline of the project: In digital forensic investigations, log file analysis is crucial, as a thorough examination of log files might reveal hidden malicious activities and attacks. Combining information from different sources could provide more accurate results; however, different types of log files exist, each following their own arbitrary formats and sizes, making it hard to utilise digital evidence efficiently and reliably. This work will involve the application of a set of statistical methods, data mining techniques, as well as machine learning to detect anomalies, classify events and reveal malicious activities during the forensic investigation. The aim of this project is to provide a reliable decision making framework for log file analysis that can be used to improve the efficiency and accuracy of the forensic investigation process.

Primary research method:

An experiment, including: - system (network) implementation - testing and data collection - application of data mining techniques - result analysis and evaluation

Reading list:

Stroeh, K., Madeira, E.R.M. and Goldenstein, S.K., 2013. An approach to the correlation of security events based on machine learning techniques. Journal of Internet Services and Applications, 4(1), p.1.

Project Number: 12

Proposing Staff: Sandy Taramonli

Project Suitable for: Computer Science, Computing, BIT

Project Question:

Title: Recommendation Systems based on product comparison Research Question: Could product comparison, rather than absolute scale rating, lead to algorithms that better predict customersâ€™ preferences in a Recommendation System? Outline of the project: Recommendation systems are a vital part of todayâ€™s Web, as they are the basis for identifying potential user preferences. Recommendations can be identified based on usersâ€™ purchase and search history, as well as on other usersâ€™ behaviour. Standard user rating is made by absolute scale, i.e. 1 to 5 scale etc. However, researchers believe that users should compare products, instead of rating them on an absolute scale. For example, in a recommendation system

based on an absolute scale rating, if a userâ€™s mood is bad today, he might give 4 stars in a 1-5 scale, but tomorrow he would give 5 stars. Instead, if he had to compare two products, most likely he would remain true to that for a while. Similarly, Xâ€™s 3 stars might be Yâ€™s 4 stars or vice versa. The objective of this project is to implement and evaluate techniques for product recommendation. You will have to investigate whether the product comparison approach could improve recommendation systems in terms of the prediction accuracy regarding consumersâ€™ preferences.

Primary research method:

An experiment, including: - System (network) implementation - Testing and data collection - Application of data mining techniques - Result analysis and evaluation

Reading list:

Sun, J., Long, C., Zhu, X. and Huang, M. (2009) â€˜Mining Reviews for Product Comparison and Recommendationâ€™ Journal on Computer Science and computer engineering with applications 39, 33-40

Project Number: 13

Proposing Staff: Sandy Taramonli

Project Suitable for: Computer Science, Computing, BIT, Ethical Hacking

Project Question:

Title: Privacy-preserving in Recommendation Systems Research Question: Is Privacy-preserving efficient in Recommendation Systems? Outline of the project: Most commercial and social websites recommend options, such as products or people to connect with, to users. Recommendation systems are widely used to help deal with the problem of information overload. However, they may raise serious privacy issues, as with the development of Information Technologies and social media, there is a risk of unwanted exposure of data. For example, eccentric users (users with unusual ratings and preferences) are at a higher risk than average users, as they cannot hide in crowds of other users. Consider the case where a user who bought a book about the rare art of growing Bahamian orchids, also bought a book titled â€œThe divorce organizer and plannerâ€. His spouse, upon browsing the book â€œThe Bahamian and Caribbean speciesâ€, may get a recommendation of the type â€œPeople who bought this book also boughtâ€¦â€ for the divorce organizer book. There is therefore an inherent need to investigate the trade-off between utility and privacy in recommendation algorithms. The aim of this project is to investigate this trade-off and implement a recommendation technique in order to evaluate the privacy-preserving efficiency.

Primary research method:

An experiment, including: - System (algorithm) implementation - Testing and data collection - Application of data mining techniques - Result analysis and evaluation

Reading list:

Jeckmans, A. J., Beye, M., Erkin, Z., Hartel, P., Lagendijk, R. L., and Tang, Q. (2013). â€˜Privacy in Recommender Systemsâ€™. In Social Media Retrieval, 263-281

Project Number: 14

Proposing Staff: Sandy Taramonli

Project Suitable for: Computer Science, Computing

Project Question:

Title: Graph-based Recommendation Systems Research Question: Could Graph Theory lead to an algorithm that better predict usersâ€™ interests in a Library Recommendation System? Outline of the project: Recommendation Systems have become one of the most important tools in e-commerce. They are used to predict usersâ€™ preferences and to provide efficient suggestions, by combining usersâ€™ ratings, preferences and history. There are several types of recommendation algorithms and a graph can serve as an evaluation tool for such algorithms. Furthermore, by representing a dataset using a graph, the recommendation problem is posed as a graph projection, where similarity measures between pairs are used to produce predicted ratings and recommendations. There is therefore an inherent need to investigate the efficiency of predictions and suggestions in Graph-based Recommendation Systems. The aim of this project is to implement a recommendation technique using graph theory, for a University library. The system has to provide recommendations for books and other resources, as well as to introduce users to one another to form reading groups, based on their interests.

Primary research method:

Research methods: An experiment, including: - System (algorithm) implementation - Testing and data collection - Application of data mining techniques - Result analysis and evaluation

Reading list:

Venkatraman, Vishal, et al. "Recommender Systems using Graph Theory."International Journal of Engineering Science & Technology 5.8 (2013).

Project Number: 15

Proposing Staff: Dr Maurice Hendrix

Project Suitable for: Computer Science, Computing, Games Technology, Multimedia

Project Question:

Comparing motion sickness between different VR deliver methods

Primary research method:

Build (or tweak) a reference VR scene for delivery with different devices such as: -1 pc screen - several screens - occulus VR head set - samsung gear VR etc. Then survey participants about motion sickness and compare results between devices.

Reading list:

KlaÅ¡nja-MiliÄ‡eviÄ‡, A., Vesin, B., IvanoviÄ‡, M. and Budimac, Z., 2011. E-Learning personalization based on hybrid recommendation strategy and learning style identification. Computers & Education, 56(3), pp.885-899. Gianaros, P.J., Muth, E.R., Mordkoff, J.T., Levine, M.E. and Stern, R.M., 2001. A questionnaire for the assessment of the multiple dimensions of motion sickness. Aviation, space, and environmental medicine, 72(2), p.115. Dagger, D., Wade, V. and Conlan, O., 2005. Personalisation for all: Making adaptive course composition easy. Educational Technology & Society, 8(3), pp.9-25. Togelius, J., Yannakakis, G.N., Stanley, K.O. and Browne, C., 2011. Search-based procedural content generation: A taxonomy and survey. IEEE Transactions on Computational Intelligence and AI in Games, 3(3), pp.172-186. Treleaven, J., Battershill, J., Cole, D., Fadelli, C., Freestone, S., Lang, K. and Sarig-Bahat, H., 2015. Simulator sickness incidence and susceptibility during neck motion-controlled virtual reality tasks. Virtual Reality, 19(3-4), pp.267-275.

Project Number: 16

Proposing Staff: Mark Elshaw

Project Suitable for: Computer Science

Project Question:

A badge or bracelet that can be used to store data on a person who is attending large events such a cultural festivals, religious events' so it is possible to locate the person and determine who they are. A badget or bracelet to aid safety at large scale events.

Primary research method:

Development of the badge or arm band Determine if people will wear them The issue of big brother watching.

Reading list:

How Saudi Hajj pilgrim 'e-bracelets' works. http://www.bbc.co.uk/news/world-middle-east-37315873

Project Number: 17

Proposing Staff: Ian Evans

Project Suitable for: Computer Science, Computing, Games Technology

Project Question:

As video game worlds become bigger and more complex, the time it takes to create assets for such worlds demands more time, effort and people. Using procedural generation methods may be the answer to creating this content either in game so each play is different or before release to create content which can then be viewed and edited by a designer for final usage. There are many areas available for procedural methods in video games so I suggest pinpointing an area for use in the project as well as thinking about how realism can be achieved and how other people would use and edit the content created.

Primary research method:

A survey looking at real life examples for inspiration, A study into what methods are available and their results in terms of realism and plausibility, User evaluation of the end content

Reading list:

A survey of procedural content generation techniques suitable to game development - Daniel Michelon De Carli, Fernando Bevilacqua, Cesar Tadeu Pozzer and Marcos Cordeiro d'Ornellas Procedural Modeling of Buildings - Pascal Muller, Peter Wonka, Simon Haegler, Andreas Ulmer and Luc Van Gool Real-time Procedural Generation of 'Pseudo Infinite' Cities - Stefan Greuter, Jeremy Parker, Nigel Stewartand Geoff Leach

Project Number: 18

Proposing Staff: John Halloran

Project Suitable for: Computing, Multimedia

Project Question:

Understanding and designing temperature controls for residential housing Global warming is a major issue for the world now. It is recognised as anthropogenic, and the major contributor is CO2 emissions caused by energy usage. Therefore we all need to use less energy. This project is about (a) understanding existing problems with heating controls in domestic settings; and (b) designing solutions which empower people to take effective action to reduce their energy use around heating.

Primary research method:

HCI. 203CR is a prerequisite, and I prefer students who achieved at least 60%. Candidates should know how to carry out user studies and usability evaluations, and develop conceptual prototypes to a high standard.

Reading list:

Achieving energy efficiency through behaviour change: what does it take? http://www.eea.europa.eu/publications/achieving-energy-efficiency-through-behaviour THE EFFECTIVENESS OF FEEDBACK ON ENERGY CONSUMPTION http://www.eci.ox.ac.uk/research/energy/downloads/smart-metering-report.pdf

Project Number: 19

Proposing Staff: John Halloran

Project Suitable for: Computing, Multimedia

Project Question:

Issues in behaviour change for sustainable living Global warming is a major issue for the world now. It is recognised as anthropogenic, and the major contributor is CO2 emissions caused by energy usage. Therefore we all need to use less energy. However, peopleâ€™s behaviour is notoriously hard to change. We may just

not be motivated. Perhaps we do not believe that climate change is a problem, or we have enough money not to worry about reducing our energy consumption. Even when we are motivated, we tend to â€˜reboundâ€™ back into old habits very easily. Then there is the issue of the time and effort in changing behaviour, the learning overheads, and the interfaces we need to use (e.g. heating) which can be hard to understand. This project will be about understanding issues in behaviour change, and this will mandatorily require a major survey of the literature, which will form a significant part of the project. But this is not all. You will also, mandatorily, prototype and evaluate a new â€˜interventionâ€™, of your choice, and likely to include an interface, to encourage behaviour change.

Primary research method:

HCI. 203CR is a prerequisite, and I prefer students who achieved at least 60%. Candidates should know how to carry out user studies and usability evaluations, and develop conceptual prototypes to a high standard.

Reading list:

Achieving energy efficiency through behaviour change: what does it take?
http://www.eea.europa.eu/publications/achieving-energy-efficiency-through-behaviour

Project Number: 20

Proposing Staff: John Halloran

Project Suitable for: Computing, BIT, Multimedia

Project Question:

Flipping Crazy: Understanding and Supporting Flipped Learning Flipped learning is the new 'hot topic' in undergraduate teaching. It involves students in pre-work before learning sessions, which become interactive and practical, resulting in less need for lectures. But what do students think of it? This project will involve you in extensive survey and interview based research on attitudes and experience to undergraduate learning in general, and flipped in particular. Then, you'll review cutting edge examples of online support for flipped learning and come up with ideas based on your research for design revisions or extensions to one or more of those. You'll implement one of these ideas as a conceptual prototype for evaluation with some of your survey / interview participants.

Primary research method:

HCI. 203CR is a prerequisite, and I prefer students who achieved at least 60%. Candidates should know how to design and run surveys, do effective survey data analysis, carry out user studies and usability evaluations, and develop conceptual prototypes to a high standard. Additionally you must be willing to do extensive desk-based research into flipped learning, covering the reading and exploring the systems that are out there to support it.

Reading list:

What is flipped learning? http://flippedlearning.org/wp-content/uploads/2016/07/FLIP_handout_FNL_Web.pdf Flipped Classroom (University of Queensland, one of the major Universities in development of flipped learning) http://www.uq.edu.au/teach/flipped-classroom/

Project Number: 21

Proposing Staff: Dr Matthew England

Project Suitable for: Computer Science, Computing, BIT

Project Question:

Title: Codio and the Teaching of Programming to Beginners Description: The proposing staff member is Module Leader for 121COM: the Stage 1 module taken by all students on a computing-related degree. The module is primarily focused with teaching beginners programming using Python. Starting this academic year the module is using the Codio web platform to support the module. This is an online learning environment designed specifically to support computer science education. It provides students with a virtual Linux box as well as webpage like guides and the possibility of automated assessment. The aim of this project is to investigate measure how effective these new tools Codio offers are with students at Coventry University, in particular the use of automated assessment.

Primary research method:

Survey, questionnaire, interviews, focus groups, experimentation with task design.

Reading list:

Kirsti M Ala-Mutka A Survey of Automated Assessment Approaches for Programming Assignments Computer Science Education, vol 15:2, pages 83-102 DOI: 10.1080/08993400500150747 Download from here: http://dx.doi.org/10.1080/08993400500150747

Project Number: 22

Proposing Staff: Dr Matthew England

Project Suitable for: Computer Science, Computing

Project Question:

Title: Parallel Heuristic for Building Cylindrical Algebraic Decomposition Description: Cylindrical Algebraic Decomposition (CAD) is a fundamental algorithm in computer algebra and real algebraic geometry, with many applications. It decomposes space according to the signs of multivariate polynomials, and is heavily dependent on the choice of an ordering for those variables. There have recently been a number of attempts to devise heuristics to help with this choice and a 2014 paper proposed one which makes predictions particularly well and is suitable for parallelisation. The topic of this project would be this parallelisation; along with the necessary background study; and analysis of the results. Notes: - Ideal for students who want to explore one or more of: parallel computation, heuristics and computerised mathematics. - Students should have a decent GCSE Maths, with A-Level Maths beneficial.

Primary research method:

Software development (implementation(s) of parallel algorithm), experimentation with this. Build on existing CAD code in either / both Qepcad (free system) and Maple (proprietary system which CU has licence for).

Reading list:

Available from IEEE Explore after logging in with CU credentials: D. Wilson, M. England, R. Bradford and J.H. Davenport. Using the distribution of cells by dimension in a cylindrical algebraic decomposition. Proceedings of the 16th International Symposium on Symbolic and Numeric Algorithms for Scientific Computing (SYNASC '14), pp. 53--60. IEEE, 2014. DOI: 10.1109/SYNASC.2014.15

Project Number: 23

Proposing Staff: Dr Matthew England

Project Suitable for: Computer Science, Computing

Project Question:

Title: Machine Learning to Optimise Computer Algebra Variant 1: Algorithm choice for cylindrical algebraic decomposition via triangular decomposition. Description: Computer Algebra Systems (CAS) are software packages for computing with symbolic mathematical expressions. There are often many choices that can be made before running the algorithms implemented in CASs. The purpose of this project is to investigate how Machine Learning can assist with these choices. Notes: - Ideal for students who want to explore one or both of: machine learning and computerised mathematics. - The focus is on the machine learning but an understanding of the mathematics in the CAS will be required. Hence students should have a decent GCSE Maths, with A-Level Maths highly beneficial.

Primary research method:

Experimentation with machine learning tools (most likely SVM-Light) and computer algebra software (Maple / Sage / Qepcad).

Reading list:

Z. Huang, M. England, D. Wilson, J.H. Davenport, L.C. Paulson and J. Bridge. Applying machine learning to the problem of choosing a heuristic to select the variable ordering for cylindrical algebraic decomposition. In: S.M. Watt, J.H. Davenport, A.P. Sexton, P. Sojka and J. Urban, eds. Intelligent Computer Mathematics, pp. 92-107. (Lecture Notes in Artificial Intelligence, 8543). Springer Berlin Heidelberg, 2014. DOI: 10.1007/978-3-319-08434-3_8 Download from here: http://computing.coventry.ac.uk/~mengland/Publications/HEWDPB14.pdf

Project Number: 24

Proposing Staff: John Halloran

Project Suitable for: Computing, Multimedia

Project Question:

The Design Ethnography Project Design Ethnography is a process where data from observations of real people doing real things with real technologies is used to drive ideas and develop requirements for design revisions or

improvements to existing technologies, or come up with concepts for new ones. For this project, you'll find out about design ethnography and choose a domain of interest to you: for example, how students use Moodle, how people use devices to communicate or manage work-life balance, or how people plan and engage with public transport. Based on your analysis, you'll produce at least one conceptual prototype and carry out a user evaluation.

Primary research method:

HCI. 203CR is a prerequisite, and I prefer students who achieved at least 60%. Candidates should know how to carry out ethnographic user studies, derive requirements, develop conceptual prototypes to a high standard, and carry out user evaluations. You will also need to do critical reading about what design ethnography and 'pure' ethnography are, including different methods and approaches.

Reading list:

Crabtree, A., Rouncefield, M. and Tolmie, A. (2012) Doing Design Ethnography, Springer. Rodden, T., Rogers, Y., Halloran, J., and Taylor, I. (2003) Designing novel interactional workspaces to support face to face consultations. In Proceedings of CHI 2003, 57-64.

Project Number: 25

Proposing Staff: Dr Matthew England

Project Suitable for: Computer Science, Computing

Project Question:

Title: Machine Learning to Optimise Computer Algebra Variant 2: Variable ordering for cylindrical algebraic decomposition. Description: Computer Algebra Systems (CAS) are software packages for computing with symbolic mathematical expressions. There are often many choices that can be made before running the algorithms implemented in CASs. The purpose of this project is to investigate how Machine Learning can assist with these choices. Notes: - Ideal for students who want to explore one or both of: machine learning and computerised mathematics. - The focus is on the machine learning but a little understanding of the mathematics in the CAS will be required. Hence students should have a decent GCSE Maths, with A-Level Maths highly beneficial.

Primary research method:

Experimentation with machine learning tools (most likely SVM-Light) and computer algebra software (Maple / Sage / Qepcad).

Reading list:

Z. Huang, M. England, D. Wilson, J.H. Davenport, L.C. Paulson and J. Bridge. Applying machine learning to the problem of choosing a heuristic to select the variable ordering for cylindrical algebraic decomposition. In: S.M. Watt, J.H. Davenport, A.P. Sexton, P. Sojka and J. Urban, eds. Intelligent Computer Mathematics, pp. 92-107. (Lecture Notes in Artificial Intelligence, 8543). Springer Berlin Heidelberg, 2014. DOI: 10.1007/978-3-319-08434-3_8 Download from here: http://computing.coventry.ac.uk/~mengland/Publications/HEWDPB14.pdf

Project Number: 26

Proposing Staff: Dr Matthew England

Project Suitable for: Computer Science, Computing

Project Question:

Title: Machine Learning to Optimise Computer Algebra Variant 3: Monomial ordering / algorithms choice for Groebner Bases. Description: Computer Algebra Systems (CAS) are software packages for computing with symbolic mathematical expressions. There are often many choices that can be made before running the algorithms implemented in CASs. The purpose of this project is to investigate how Machine Learning can assist with these choices. Notes: - Ideal for students who want to explore one or both of: machine learning and computerised mathematics. - The focus is on the machine learning but a little understanding of the mathematics in the CAS will be required. Hence students should have a decent GCSE Maths, with A-Level Maths highly beneficial.

Primary research method:

Experimentation with machine learning tools (most likely SVM-Light) and computer algebra software (Maple / Sage / Qepcad).

Reading list:

Z. Huang, M. England, D. Wilson, J.H. Davenport, L.C. Paulson and J. Bridge. Applying machine learning to the problem of choosing a heuristic to select the variable ordering for cylindrical algebraic decomposition. In: S.M. Watt, J.H. Davenport, A.P. Sexton, P. Sojka and J. Urban, eds. Intelligent Computer Mathematics, pp. 92-107. (Lecture Notes in Artificial Intelligence, 8543). Springer Berlin Heidelberg, 2014. DOI: 10.1007/978-3-319-08434-3_8 Download from here: http://computing.coventry.ac.uk/~mengland/Publications/HEWDPB14.pdf

Project Number: 27

Proposing Staff: John Halloran

Project Suitable for: Computing, Multimedia

Project Question:

Designing Energy Information Global warming is a major issue for the world now. It is recognised as anthropogenic, and the major contributor is CO2 emissions caused by energy usage. Therefore we all need to use less energy. This project is about how to design energy information that can help people achieve this: for example, what is being spent from week to week, what activities it's being spent on, and what to do to save. You will study the state of the art in this area, looking at the literature on ecological psychology and information visualization, and surveying what's already out there in terms of smart meters, energy dashboards and so on. Then you'll come up with your own ideas, produce at least one conceptual prototype, and carry out a user evaluation.

Primary research method:

HCI. 203CR is a prerequisite, and I prefer students who achieved at least 60%. Candidates should know how to carry out user studies and usability evaluations, and develop conceptual prototypes to a high standard. These will be the major methods for this project. You'll also need to do critical reading and an extensive desk-based technology review.

Reading list:

Sarah Darby, DEFRA Smart Meters Report, at http://www.eci.ox.ac.uk/research/energy/downloads/smart-metering-report.pdf EU Report on Behaviour Change and Energy Efficiency http://www.eea.europa.eu/publications/achieving-energy-efficiency-through-behaviour

Project Number: 28

Proposing Staff: Xiang Fei

Project Suitable for: Ethical Hacking

Project Question:

What are the novel threats and security issues introduced by virtualization and what are the solutions?

Primary research method:

A survey and recommendations; A demonstrator or an experiment

Reading list:

M. Pearce, S. Zeadallyn, and R. Hunt, â€œVirtualization: Issues, Security Threats, and Solutionsâ€, Journal of ACM Computing Surveys (CSUR) Surveys, Volume 45 Issue 2, February 2013, available from <http://dl.acm.org/citation.cfm?id=2431216> M. Arif and H. Shakeel. â€œVirtualization Security : Analysis and Open Challengesâ€, International Journal of Hybrid Information Technology Vol.8, No.2 (2015), pp. 237-246, available from < http://www.sersc.org/journals/IJHIT/vol8_no2_2015/22.pdf>

Project Number: 29

Proposing Staff: Xiang Fei

Project Suitable for: Computer Science

Project Question:

How to develop data driven applications on Apache Spark?

Primary research method:

A demonstrator or software development An application

Reading list:

Ghaffar S. A. and Soomro T. R. (2015) Big Data Analysis: Apache Spark Perspective, Global Journal of Computer Science and Technology, 15(1) pp.7-14 Armbrust M., Xin R. S., Lian . et. al. (2015) Spark SQL: Relational Data Processing in Spark, Proceedings of the 2015 ACM SIGMOD International Conference on Management of Data, pp. 1383-1394 Apache Spark project. http://spark.apache.org.

Project Number: 30

Proposing Staff: Xiang Fei

Project Suitable for: Computer Science, Ethical Hacking

Project Question:

How to develop a demonstrable SDN (Software Defined Networking) system for 250CT Lab/tutorial sessions?

Primary research method:

A demonstrator An application

Reading list:

ONF, â€œSoftware-Defined Networking: The New Norm for Networksâ€, available from < https://www.opennetworking.org/images/stories/downloads/sdn-resources/white-papers/wp-sdn-newnorm.pdf> Open Networking Foundation (ONF): available from < https://www.opennetworking.org/> Mininet, available from < http://mininet.org/>

Project Number: 31

Proposing Staff: Rahat Iqbal

Project Suitable for: Computer Science, Computing

Project Question:

Identify emerging threats by utilizing data from publicly available web sources.

Primary research method:

â€¢ Identify web-based data sources. This includes publicly available sources, such as news providers (including websites, RSS feeds etc), social networking sites (e.g., Twitter, Facebook, Flickr, blogs etc). The student shall aim to identify events, and relate web generated data to those events. â€¢ Collect historical data from the aforementioned web information sources, which are related to specific social events. â€¢ Utilize the collected data to perform a statistical analysis and modelling, by utilizing commercially available tools and methods. Present the results of the analysis through an appropriate graphical interface.

Reading list:

Terrorism and crime related weblog social network: Link, content analysis and information visualization. In Intelligence and Security Informatics, 2007 IEEE (pp. 55-58). B. Pang and L. Lee. Opinion mining and sentiment analysis. Foundations and Trends in Information Retrieval, 2(1-2):1â€“135, 1 2008. http://www.datumbox.com/machine-learning-api/

Project Number: 32

Proposing Staff: Rahat Iqbal

Project Suitable for: Computer Science, Computing

Project Question:

Real time data mining of social network data for developing prediction models.

Primary research method:

â€¢ Identify social networking sites (e.g., Twitter, Facebook) which can be used as data sources. â€¢ Explore open source software for data mining. â€¢ Identify a basic machine-learning problem, where a predictive model, utilizing data from web sources, can be developed. â€¢ Harvest the necessary data and build a basic machine-learning model (using publicly available packages such as Matlab's NN toolbox) that provides a solution to the identified problem. â€¢ Extract data in real time and provide them to the constructed model as inputs to provide predictions.

Reading list:

Asur, S., & Huberman, B. A. (2010, August). Predicting the future with social media. In Web Intelligence and Intelligent Agent Technology (WI-IAT), 2010 IEEE/WIC/ACM International Conference on (Vol. 1, pp. 492-499). IEEE. Russell, M. A. (2013). Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, Google+, GitHub, and More. " O'Reilly Media, Inc.". http://uk.mathworks.com/products/neural-network/ https://rapidminer.com/

Project Number: 33

Proposing Staff: Rahat Iqbal

Project Suitable for: Computer Science

Project Question:

â€¢ Is it possible to improve decision making and prevention strategies of individuals and organisations, through the deployment of computerized systems? â€¢ What is the optimal framework that can be used by these systems to facilitate the effective visualization and utilization of the results produced by decision-support computer systems?

Primary research method:

â€¢ Identify a problem that can be solved with the help of statistical analysis and machine learning techniques (e.g. house price estimation, price of specific stock, currency exchange rates). â€¢ Collect the necessary data and build a predictive model. â€¢ Develop a personalised and user-friendly graphical interface to present the results of the analysis to the user. â€¢ Conduct a user study to evaluate the impact of the system on the decisions of the end user. Did the computerised system have a significant impact on the person's decisions? Were those decisions improved? What are the attributes of the interface, which can facilitate the development of effective decision support systems?

Reading list:

Bishop, C. M. (2006). Pattern recognition. Machine Learning, 128. Power, D. J., Sharda, R., & Burstein, F. (2015). Decision support systems. John Wiley & Sons, Ltd. Keller, S. O. T. T. (2005). Knowledge and information visualization.

Project Number: 34

Proposing Staff: Rahat Iqbal

Project Suitable for: Computer Science

Project Question:

A novel fuzzy mobile-application for promoting patient's emotion wellbeing.

Primary research method:

â€¢ Conduct a review study in order to familiarize with the concepts of Fuzzy Logic and Fuzzy Control Systems. Identify techniques, which can model existing knowledge (expert opinion, previous literature etc.) into interpretable fuzzy rules. â€¢ Investigate the emotional wellbeing of patient in the context of modern health care environments. Explore the potential of intelligent computer system to aid patients, and improve the quality of services offered by health care businesses. â€¢ Develop a fuzzy control system, which based on the affective state of the patient produces the appropriate outputs to promote their wellbeing. The fuzzy rules of the system will be constructed based on existing knowledge. The output of the system will target both the patient and the medical personnel. â€¢ Install the system on a mobile platform (standard smart phone) and evaluate its applicability and impact, through a limited user study.

Reading list:

Mendel, J. M. (1995). Fuzzy logic systems for engineering: a tutorial.Proceedings of the IEEE, 83(3), 345-377. Karyotis, C., Doctor, F., Iqbal, R., James, A., & Chang, V. (2016). A Fuzzy Modelling Approach of Emotion for Affective Computing Systems. Luneski, A., Konstantinidis, E., & Bamidis, P. D. (2010). Affective medicine. Methods of information in medicine, 49(3),207-218. Picard, R. W. (2002). Affective medicine: technology with emotional intelligence. Studies in health technology and informatics, 69-84.

Project Number: 35

Proposing Staff: Rahat Iqbal

Project Suitable for: Computer Science

Project Question:

An intelligent system for detecting fatigue levels by utilizing the galvanic skin response signal.

Primary research method:

â€¢ Investigate the GSR signal and the available sensors (Empatica E3 device). Familiarize with the sensors and ensure that by utilizing the sensors data is collected and stored in an effective manner. â€¢ Gain an insight concerning the signal processing methods used to process the GSR signal and study popular machine learning techniques, which are available as open source software. â€¢ Conduct a single participant experiment in order to collect the necessary data to train a model that predicts fatigue levels. â€¢ Utilize the collected data to train a model that provides estimates of fatigue levels by utilizing the GSR signal as input, and based on the calculated results, makes recommendations to the user. â€¢ Evaluate the classification accuracy of the developed system and assess its impact on the user.

Reading list:

Bishop, C. M. (2006). Pattern recognition. Machine Learning, 128. Bundele, M. M., & Banerjee, R. (2009, December). Detection of fatigue of vehicular driver using skin conductance and oximetry pulse: a neural network approach. In Proceedings of the 11th International Conference on Information Integration and web-based applications & services (pp. 739-744). ACM. M.E. Dawson, A.M. Schell and D.L. Filion,(2007) The electrodermal system, In Cacioppo, J. T., Tassinary, L. G., Berntson, G. (eds), Handbook of Psychophysiology. Cambridge University Press, Cambridge. https://www.empatica.com/

Project Number: 36

Proposing Staff: Faiyaz Doctor

Project Suitable for: Computer Science, Games Technology

Project Question:

Can players' understanding behaviours in an online gaming environment be used to determine their abilities in dealing with real life situations and scenarios? This will involve the extraction of online game players' interactions and game play data and the use of known psychological / behavioural models to translate this data to profile player's behaviour while interacting with the game and other players. This can be used to identify abilities in reasoning, social and team working skills and in order to help identify strengths and weaknesses with suggested ways in which these skills could be further improved.

Primary research method:

Data collection from users on their interaction and game play within online gaming environment. Analysis and interpretation of the data and its mapping to human behavioural traits through the use of psychological / behavioural models for human behaviour classification. Implementing a software tool for automatically profiling players based on analysing their game play data. Evaluating the tools ability in correctly profiling player behaviours through conducting user studies and analysis of player feedback.

Reading list:

http://www.gamasutra.com/view/feature/6474/personality_and_play_styles_a_.php?print=1 http://link.springer.com/article/10.1007/s11257-012-9126-z http://yannakakis.net/wp-content/uploads/2013/08/pm_submitted_final.pdf http://yukaichou.com/gamification-study/user-types-gamified-systems/ http://www.dtic.mil/dtic/tr/fulltext/u2/a549029.pdf http://ccg.doc.gold.ac.uk/papers/gow_tciaig12.pdf http://edgaps.org/gaps/wp-content/uploads/Keshtkar-2014-Using-data-mining.pdf

Project Number: 37

Proposing Staff: Diana Hintea

Project Suitable for: Computer Science, Computing, BIT

Project Question:

Can machine learning methods provide accurate results in predicting traffic in the UK?

Primary research method:

A significant volume of traffic data should be collected from certain area or areas of the UK. Machine learning methods should be implemented and tested to see which one is the most suitable for predicting traffic in those certain areas.

Reading list:

Machine Learning for Traffic Prediction by Jaroslaw Rzeszotko and Sinh Hoa Nguyen http://csp2011.mimuw.edu.pl/proceedings/PDF/CSP2011442.pdf

Project Number: 38

Proposing Staff: Diana Hintea

Project Suitable for: Computer Science, Ethical Hacking

Project Question:

Forensic Insight into Windows 10 Artifacts

Primary research method:

Establish what Windows forensic artifacts are of particular interest to forensic investigators. Study the structure of the forensic artifacts recorded in Windows 10 and compare them with the ones in Windows 7.

Reading list:

A forensic insight into Windows 10 Jump Lists by Bhupendra Singh and Upasna Singh

Project Number: 39

Proposing Staff: Diana Hintea

Project Suitable for: Computer Science, Computing

Project Question:

Can Reinforcement Learning (RL) (or other learning methods) be used accurately for semantic outdoor scene parsing?

Primary research method:

A collection of outdoor scene images will be obtained. A reinforcement learning based parsing algorithm will be implemented and the method will be tested on the data set.

Reading list:

Reinforcement Learning for Semantic Segmentation in Indoor Scenes by Md. Alimoor Reza and Jana Kosecka

Project Number: 40

Proposing Staff: Kamal Bentahar

Project Suitable for: Computer Science, Computing, BIT, Games Technology, Multimedia

Project Question:

Book Explorer The aim is to provide a tool (e.g. Android/Web App) that allows the user to read and explore the text of an ebook from different angles. The tool should display the actual text of the book, but also enrich the reading experience with digital equivalents of an index (similar to Amazon Kindle's X-Ray), footnotes, etc. (Only displayed on request to keep the reading smooth). The project proposer is interested in applying this to The Quran, but is open to other suggestions.

Primary research method:

Software development

Reading list:

The devil is in the details: indexes versus Amazonâ€™s X-Ray
http://www.ingentaconnect.com/contentone/index/tiji/2012/00000030/00000001/art00004?crawler=true
Ebook Navigation: Browse, Search and Index
http://www.tandfonline.com/doi/pdf/10.1080/00049670.2012.10739062 Vivliostyle
http://vivliostyle.com/en/ Tanzil - Quran Navigator: http://tanzil.net/ The Quranic Arabic Corpus:
http://corpus.quran.com/

Project Number: 41

Proposing Staff: Kamal Bentahar

Project Suitable for: Computer Science, Computing, BIT, Games Technology, Multimedia

Project Question:

Children's books in the digital age

Primary research method:

Either: - Extensive critical literature review - or: design/produce own product (programming/digital media design)

Reading list:

https://github.com/PBS-KIDS/HTML5-Storybook The proposer has a story to teach Arabic alphabet, related to http://www.abjad.com

Project Number: 42

Proposing Staff: Kamal Bentahar

Project Suitable for: Computer Science, Computing, BIT, Games Technology, Multimedia

Project Question:

Digital Arabic Calligraphy

Primary research method:

#NAME?

Reading list:

https://play.google.com/store/apps/details?id=com.diwan.muhtarifalkhat http://sinasoft.com/kelk.html http://sinasoft.com/Downloads/kelk2013/catalog/kelk.pdf Kamal is an amateur calligrapher himself, and can provide advice from experience, and books.

Project Number: 43

Proposing Staff: Kamal Bentahar

Project Suitable for: Computer Science, Computing, BIT, Games Technology, Multimedia

Project Question:

Mathematics - Interactive History The aim is to produce a web/mobile app that presents Mathematics history in innovative and eye-catching ways. The key concepts should be illustrated interactively whenever possible. The student may focus on specific areas if desired, e.g. produce and an app (for web or mobile) to act as a companion to the life and achievements of the mathematical genius Srinivasa Ramanujan.

Primary research method:

- Literature review - see "Initial reading suggestion" for where to start. - App development (Web, Android, ...)

Reading list:

- MacTutor History of Mathematics www-history.mcs.st-and.ac.uk/ - The Princeton Companion to Mathematics http://press.princeton.edu/titles/8350.html - History of mathematics https://en.wikipedia.org/wiki/History_of_mathematics - BBC Radio 4 - A Brief H

Project Number: 44

Proposing Staff: Kamal Bentahar

Project Suitable for: Computer Science, Computing, BIT, Games Technology, Multimedia

Project Question:

Mathematics Lab There are a number of Computer Algebra System (CAS) mobile apps, but these use the usual "command line" approach. The Mathematics Lab would allow the user to input expressions naturally (e.g. equation writer) and then *interact* with them as objects (e.g. factor, expand, select a portion of the expression for specific operations, etc.). The app may use an already available CAS and abstract the interaction (i.e. provide a GUI interface that produces the command lines for the user), or simply concentrate on Number Theory for example. Student may also consider "gamifying" it, to make something similar to DragonBox (http://www.dragonboxapp.com/) for example.

Primary research method:

Literature review. App development and testing.

Reading list:

- TI Voyage 200 Basic Tutorial https://youtu.be/2WYdlpUh1aU - Giac/xcas, a free computer algebra system http://www-fourier.ujf-grenoble.fr/~parisse/xcasen.html - PARI/GP (a widely used computer algebra system designed for fast computations in number theor

Project Number: 45

Proposing Staff: Kamal Bentahar

Project Suitable for: Computer Science, Ethical Hacking

Project Question:

(Post-)Quantum Cryptography This would review Quantum Computing, then go into Quantum Cryptography and/or Post-Quantum Cryptography. If possible/desired then a suitable computer demo can be produced.

Primary research method:

Literature review, with possibly a computer demo.

Reading list:

- Post-quantum cryptography https://en.wikipedia.org/wiki/Post-quantum_cryptography - Post-quantum cryptography http://pqcrypto.org/

Project Number: 46

Proposing Staff: Kamal Bentahar

Project Suitable for: Computer Science, Ethical Hacking

Project Question:

Authenticated documents distribution Consider the scenario where you are interested in running an online service which distributes documents, but want the users to trust that the documents come from you and are unmodified. What technology can be used? How do long-term factors affect the solution?

Primary research method:

Literature review Proof of concept implementation

Reading list:

Project Number: 47

Proposing Staff: Kamal Bentahar

Project Suitable for: Computer Science, Computing

Project Question:

Next character/word prediction Use Neural Networks, or other means, to build a piece of software that can be trained to help users to type by predicting characters or words in a given language.

Primary research method:

Literature review to explain how this works and can implemented. Actual implementation as a desktop software or mobile app.

Reading list:

Generating Text with Recurrent Neural Networks http://www.cs.utoronto.ca/~ilya/pubs/2011/LANG-RNN.pdf

Project Number: 48

Proposing Staff: Kamal Bentahar

Project Suitable for: Computer Science, Computing, BIT, Games Technology, Multimedia

Project Question:

Gamification of Grammar

Primary research method:

Literature review App development

Reading list:

Example of gamification of mathematical concepts: http://wewanttoknow.com

Project Number: 49

Proposing Staff: Kamal Bentahar

Project Suitable for: Computer Science, Computing, BIT, Games Technology, Multimedia

Project Question:

Quran and/or Hadeeth Explorer Produce a study aid app to help read and study the Quran and/or Hadeeth (preferrably in Arabic). This should use innovative visualization techniques to help get a high overview of the text(s).

Primary research method:

Software development

Reading list:

The devil is in the details: indexes versus Amazonâ€™s X-Ray http://www.ingentaconnect.com/contentone/index/tiji/2012/00000030/00000001/art00004?crawler=true Ebook Navigation: Browse, Search and Index http://www.tandfonline.com/doi/pdf/10.1080/00049670.2012.10739062 Tanzil - Quran Navigator: http://tanzil.net/ The Quranic Arabic Corpus: http://corpus.quran.com/

Project Number: 50

Proposing Staff: Phil Smith

Project Suitable for: Computer Science

Project Question:

Sentiment Analysis of Twitter Twitter is a hotbed of opinion. However, developing a programme to understand the sentiment of what is being said on Twitter is not a trivial task. This year's SemEval task series has identified seven subtasks to analyse the sentiment of tweets. Your project could therefore be in one (or more) of the seven proposed subtasks (as listed on the SemEval-2017 Task 4 website): Subtask A.: Message Polarity Classification: Given a message, classify whether the message is of positive, negative, or neutral sentiment. Subtasks B-C. : Topic-Based Message Polarity Classification: Given a message and a topic, classify the message on B) two-point scale: positive or negative sentiment towards that topic C) five-point scale: sentiment conveyed by that tweet towards the topic on a five-point scale. Subtasks D-E. : Tweet quantification: Given a set of tweets about a given topic, estimate the distribution of the tweets across D) two-point scale: the â€œPositiveâ€ and â€œNegativeâ€ classes E) five-point scale: the five classes of a five-point scale. F. Polarity classification in another language: In addition to performing subtasks A-C in English, we will also perform multilingual experiments by providing a run of these tasks using a test set containing tweets in Arabic. G. User Information: We aim to harness the user profile information provided in Twitter such as demographics (e.g., age, location) as well as the social network. We would like to analyze its impact on improving sentiment analysis. The user information will be provided for subtasks A-C and we will provide information indicating how sentiment occurs across different demographics as well as how the teams that choose to use that sentiment perform in the tasks. A dataset of tweets is provided by the SemEval organisers in both English and Arabic.

Primary research method:

Experimentation with a number of machine learning/natural language processing techniques.

Reading list:

http://alt.qcri.org/semeval2017/task4/ Kouloumpis, E., Wilson, T., and Moore, J. 2011. Twitter Sentiment Analysis: The Good the Bad and the OMG! Proceedings of ICWSM. Eshrag Refaee and Verena Rieser. Benchmarking Machine Translated Sentiment Analysis for Arabic Tweets. NAACL-HLT 2015 Student Research Workshop (SRW). 2015.

Project Number: 51

Proposing Staff: David Croft

Project Suitable for: Computer Science, Computing, Ethical Hacking

Project Question:

Can typing style be used as a biometric identifier at Coventry University?

Primary research method:

Experiment, demonstrator, application.

Reading list:

http://ai.pku.edu.cn/aiwebsite/research.files/collected%20papers%20-%20others/User%20authentication%20through%20typing%20biometrics%20features.pdf
http://ieeexplore.ieee.org/document/491588/?reload=true&arnumber=491588
http://link.springer.com/chapter/10.1007%2F978-3-642-16295-4_13#page-1

Project Number: 52

Proposing Staff: David Croft

Project Suitable for: Computer Science, Computing, Ethical Hacking

Project Question:

Vision based path detection. Can camera systems be used for path following? Potentially for autonomous vehicles, or semi-autonomous vehicles such as adaptive control wheelchairs?

Primary research method:

Experiment, demonstrator, application

Reading list:

http://www.sciencedirect.com/science/article/pii/S1877050915001258
http://www.sciencedirect.com/science/article/pii/S0921889006001011 https://hal.inria.fr/inria-00351859/document

Project Number: 53

Proposing Staff: David Croft

Project Suitable for: Computer Science, Computing, Games Technology, Multimedia

Project Question:

Can simulators assist in training for wheelchair control? Can a a simulated wheelchair with sufficiently accurate physics model improve real world control skills in a safe environment?

Primary research method:

Experiment, demonstrator, application.

Reading list:

http://www-edc.eng.cam.ac.uk/cwuaat/04/30-pat-cmc-mgrant_wc_sim1.pdf
https://arxiv.org/pdf/1601.04436.pdf https://www.youtube.com/watch?v=gl_YKla79Go

Project Number: 54

Proposing Staff: Jianhua Yang

Project Suitable for: Computer Science, Computing, Games Technology, Multimedia

Project Question:

Android Safe: an Android security app that identifies and repairs security and privacy holes

Primary research method:

Due to reduced costs and increased popularity, smartphones are being used extensively nowadays. Built on top of these smartphones are mobile apps that involve every single aspect of everyday life. This ranges from social apps such as Facebook, game apps such as Angry Birds, to car navigations such as Google Map and office apps such as MS Word. Important information is stored in these apps, for example, personal data of your friends, your gaming account credentials, or even your business plan in a Word file. The problem is: Are this information safe? How do we make sure this information are looked after sensibly? In this project, you will: (1) Review security and privacy mechanisms offered by the Android platform from a system design perspective; (2) Survey existing popular Android security and privacy apps and main vulnerabilities they deal with; (3) Create an Android app that identifies and possibly repairs security and privacy holes on an Android system; and finally (4) Give guideline principles on security and privacy considerations from app developer point of view. An Android device is available for the duration of the project. This project is co-supervised by Dr. Jianhua Yang and Dr. Xingang Wang

Reading list:

ENCK, W., ONGTANG, M., & MCDANIEL, P. (2009). Understanding Android Security.IEEE Security & Privacy. 7, 50-57. ELENKOV, N. (2015). Android Security Internals: An In-Depth Guide to Android's Security Architecture. San Francisco, CA, No Starch Press. http://www.books24x7.com/marc.asp?bookid=75477.

Project Number: 55

Proposing Staff: Jianhua Yang

Project Suitable for: Computer Science, Computing, Games Technology, Multimedia

Project Question:

Android walk: an Android walking app that monitors and corrects your walking postures

Primary research method:

Believe it or not, most of us do not walk properly. The consequences of this are that sometimes we have a bad or even laughable posture. If things go really wrong, one may develop back/spine problems later on in their lives. So, can we build a mobile app to solve the problem? In the project, you will: (1) Review current health related apps in Google Play market; (2) Explore possibilities, from a system design point of view, that can be used to detect and monitor human activity; (3) Implement algorithms that are capable of collecting sensor data on the mobile phone; and (4) Create an app on the Android platform to perform posture detection and

monitoring. An Android device is available for the duration of the project. This project is co-supervised by Dr. Jianhua Yang, Dr. James Griffin, Dr. Omid Razmkhah

Reading list:

PANTELOPOULOS A., & BOURBAKIS N.G. (2010). A survey on wearable sensor-based systems for health monitoring and prognosis. IEEE Transactions on Systems, Man and Cybernetics Part C: Applications and Reviews. 40, 1-12. PATEL, SHYAMAL, PARK, HYUNG, BONATO, PAOLO, CHAN, LEIGHTON, & RODGERS, MARY. (2012). A review of wearable sensors and systems with application in rehabilitation. BioMed Central Ltd. BioMed Central Ltd. http://www.jneuroengrehab.com/content/9/1/21. MUKHOPADHYAY S.C. (2015). Wearable sensors for human activity monitoring: A review. IEEE Sensors Journal. 15, 1321-1330.

Project Number: 56

Proposing Staff: Jianhua Yang

Project Suitable for: Computer Science, Computing, Games Technology, Multimedia

Project Question:

Android iTube : An Android Youtube helper app that reranks search results using wearable devices

Primary research method:

Todayâ€™s search engine technologies are so powerful that it is possible, in most cases, to accurately locate information that one looks for. However, there are still spaces for improvement. One of these enhancement lies in content-awareness and personalization. In other words, the same input query needs to give different outputs for different people under different circumstances. For example, a biology studentâ€™s search using â€˜dinosaurâ€™ as the keyword is probably different from the mother of a 2-year-old using exactly the same query. When you search â€˜sirloin steakâ€™ in the high street during lunch time, you probably mean different things than when you do the same search in your holiday villas. So how do we address this? In this project, we use Youtube video search as an example to showcase personalized search results reranking. Basic personal data such as gender and age come from the user profile. More importantly, current activity level indicators such as heart rate and pace of movements are measured instantly using wearable devices. In order to provide personalized and context-aware reranking, the project consists of the following steps: (1) Data acquisition using Android phones/watches. Youâ€™ll access user profiles on a typical Android system, and read sensor data on Android watches; (2) Keyword collection. Youâ€™ll collect a number of health/fitness related keywords that can be used to trigger a set of predefined rules. For example, â€˜basketballâ€™ can be used as a keyword to trigger a set of rules depending on a personâ€™s age and current activity level. (3) Rule building. This is the core part of the app. You need to set up a number of rules similar to an expert system. Rules can be something like this â€˜IF query = basketball AND activity = high THEN match OR gameâ€™ and â€˜IF query = basketball AND activity = low THEN train OR tutorialâ€™. (4) Relevance calculation. Consequences of the rules (i.e. â€˜THENâ€™ parts) will be used to perform similarity calculations in the video description texts. According to these calculations, reranking is performed and showed up in the app. An Android device is available for the duration of the project. This project is in collaboration with Dr. Lihong Jiang and Dr. Hongming Cai from SJTU.

Reading list:

MAEKAWA T., YANAGISAWA Y., SAKURAI Y., KISHINO Y., KAMEI K., & OKADOME T. (2012). Context-aware web search in ubiquitous sensor environments. ACM Transactions on Internet Technology. 11. CHEN, Y., ZHOU, J., & GUO, M. (2016). A context-aware search system for Internet of Things based on hierarchical context model. Telecommunication Systems : Modelling, Analysis, Design and Management. 62, 77-91.

Project Number: 57

Proposing Staff: Dr Dianabasi Nkantah

Project Suitable for: Computer Science, Computing

Project Question:

Deep Learning for Natural Language Parsing This project will involve investigations into models and learning algorithms in Deep Learning for Natural Language Parsing. Parsing plays a major role in accurately interpreting a sentence, and is at the centre of most automatic language processing systems. Deep Learning models have been successfully used in areas like Image Processing. It is gaining traction in Natural Language Processing. Its goal is to explore how computers can take advantage of data to develop features and representations appropriate for complex interpretation tasks. The investigations in the course of this project will lead to the development of a deep learning model for an aspect of natural language parsing.

Primary research method:

Software development Experiments

Reading list:

http://nlp.stanford.edu/courses/NAACL2013/NAACL2013-Socher-Manning-DeepLearning.pdf

Project Number: 58

Proposing Staff: Staff goeolocation tool

Project Suitable for: Computer Science, Computing, BIT, Multimedia

Project Question:

This project involves creating a google maps integrated portal for showing where Coventry University Staff are around the world. Similar to this Gitlab Staff page: https://about.gitlab.com/team/ This seems in turned to be based on this flickr tool https://www.flickr.com/map The end product would be a site that can be shown on the Coventry University Website. Tools required would be Javascript and the google maps API

Primary research method:

The primary research in this case would be a succession of web based mock ups using xampp - https://www.apachefriends.org/index.html until the tool is ready to be deployed. Final deliverable would be a

report on the process of creating the site, including the advantages of geolocation tools, and a web based staff map that can be updated from a live feed.

Reading list:

Project Number: 59

Proposing Staff: Mark Elshaw

Project Suitable for: BIT

Project Question:

Professor John MacIntyre at the International Conference on Engineering Applications for Neural Neworks looked at "Why A.I. Needs P.R.". As we get closer to true AI will we face the situation that AI is feared by the public. Popular culture often presents a very negative, even threatening, view of artificial intelligence to the public. Professor MacIntyre will ask why this is the case, and what the A.I. "community" could, or should, do about it!

Primary research method:

Do we need a new approach to understanding an prompting AI.

Reading list:

http://staffwww.dcs.shef.ac.uk/people/A.Sharkey/sharkey-granny.pdf
http://observer.com/2015/08/stephen-hawking-elon-musk-and-bill-gates-warn-about-artificial-intelligence/

Project Number: 60

Proposing Staff:

Project Suitable for: Computer Science, Computing, BIT

Project Question:

The proposing staff member is working on the redesign of the undergraduate programming curriculum. First year students now learn Python is the first semester on 121COM; and then C++ in the second semester in 122COM. Teaching is done within the new Codio online learning environment to standardise the experience and focus on the key aspects of the languages. The purpose of this project is to investigate: how best for the teaching staff to support the switch in languages; the benefits and drawbacks; whether teaching techniques are required for a second language.

Primary research method:

Survey, questionnaire, interviews, focus groups.

Reading list:

Karen P. Walker and Stephen R. Schach Obsticles to Learning a Second Programming Language: An Empirical Study Computer Science Education, vol 7, pages 1-20, 1996. I have a copy in pdf - email me to recieve it.

Project Number: 61

Proposing Staff: Dr.Mahmoud Awad

Project Suitable for: Computer Science, Games Technology, Multimedia

Project Question:

Research Questions: Is there any difference in brain-controlled device accuracy between gamers and non-gamers.

Primary research method:

Research Plan: In this project we will test the accuracy of the device among two group of users, gamers and non-gamers, the project will be executed as follow: -Develop three different games: oA game that depends on random choice (football shootout) oA game that depends on planned choice (XO Game) oA game that depends on fast decisions making (Run and Jump) -Two groups of participants will be recruited, gamers and non-gamers, gamers group are people who are heavy gamers and play games on daily basis, non-gamers are people who do not play games at all or play games very rarely. -The score of the players will be recorded; an appropriate statistical test will be used to determine if there are any differences in the score between the two groups. -The participants will be given questionnaire to evaluate their experience and accuracy of the device.

Reading list:

Brain-Controlled interface is an emerging technology that allows the human to control computers using their brains; the device is connected to a human brain using a set of Electroencephalography (EEG) sensors which measures the voltage fluctuations resulting from ionic current flows within the neurons of the brain. When the human thinks about something specific (e.g. eating candy) the signals patterns in his brain are recorded, when the same person think about the same thing, the device recognize that patterns using machine learning algorithms, the device or the computer does not know what the human is thinking about, they only can detect a pattern of signals that is mapped to something. (e.g. map when a person thinks about eating candy to C button on keyboard). The device needs training before it can be operated, however the accuracy of recognition does not only depend on the recognition algorithm, it also depends on the person if he can repeat thinking on the same thing the same way (e.g. without distraction). Please note this is the second stage of this project, we will take the project to the next level, and we will expect a high quality research paper ready for publication at the end of this project.

Project Number: 62

Proposing Staff: Dr.Mahmoud Awad

Project Suitable for: Computer Science, Games Technology

Project Question:

Developing an Intelligent Agent to simulate a childâ€™s intellect and behaviour Research Question: -Can an artificial agent be developed to think as an innocent child in a simulated world environment full of danger? - How can the agent develop skills and learn new knowledge to simulate a child learning curve.

Primary research method:

In this project we aim to develop a agent that act like a child and develop skills like a child. Before we design such an agent we have to define the Task Environment which includes: Performance measure, environment, actuators and sensors. There are different types of agents and environment we will consider before developing our new agent. Research Plan: -Study agent types, environment types, AI and machine learning algorithms. - Design our agent -Develop the AI for the agent -Develop the environment -Test the agent (test how realistic the agent is by comparing its behaviour to human children, test the performance of the agent).

Reading list:

Artificial intelligence (AI) is the science that aims to make machine thinks; AI can be classified as thinking/acting humanly, thinking/acting rationally. An intelligent agent is anything that can be viewed as perceiving its environment through sensors and acting upon that environment through actuators. Reading list: Artificial Intelligence for Games https://www.amazon.co.uk/Artificial-Intelligence-Games-Ian-Millington/dp/0123747317 THE ART OF DESIGNING SOCIALLY INTELLIGENT AGENTS: SCIENCE, FICTION, AND THE HUMAN IN THE LOOP http://www.tandfonline.com/doi/abs/10.1080/088395198117550

Project Number: 63

Proposing Staff: Dr.Mahmoud Awad

Project Suitable for: Computer Science, Games Technology

Project Question:

Best-Hit Algorithm â€“ Can the Older Performance beat the Young? Research question: -Can older adults with less physical capabilities compete and win when play fitness games against younger players.

Primary research method:

To evaluate and validate this algorithm we will develop a sport game (e.g. table tennis game), apply the algorithm to one version, apply the current model to another version of the game, then allow two group of participants to compete, group one an older adults player (65+ years old) and a younger group, we will record the scores in both cases, and the player performance profiles and use appropriate statistical tests to determine if there any difference between the two cases.

Reading list:

In fitness games or movement based games, where the main input is the playerâ€™s body movement, such as Kinect and Wii games, the current model which is used rules that the player who has better performance (e.g. faster movement, faster response time) will be the winner. This model does not allow older adults with less physical capabilities to compete and win when they play against younger players. To engage older people to play such game against younger generation a new algorithm called Best Hit Algorithm is developed that allows players of different physical capabilities to play against each other and have a fair chance of winning. Reading Lists: - Adapted Games for the Elderly, Awad M (2015), PhD thesis

Project Number: 64

Proposing Staff: Dr.Mahmoud Awad

Project Suitable for: Computer Science, Computing, Games Technology, Multimedia

Project Question:

Project Title: Children Cultural Behaviour in an Interactive Storytelling â€“ Stage 2 Research Questions: -Can interactive storytelling inform us about the behaviour of children who live in different worlds and environments? (e.g. developed vs. developing countries, safe vs. war zones). -Is there any difference in behaviour of children coming from different backgrounds when they play an interactive storytelling game?

Primary research method:

In this project we will observe the activities of different children groups inside each of the developed stories, the children will be divided into three groups, children in develop countries, children in poor countries, children in war zones, we will collect the data through their playing activities, appropriate statistic tests will be used to assess any differences in their behaviour. the research plan will be divided as follow: -Decide on which story to develop -Plan and design an interactive story for children -Implement the story (create contents and program the logic). -Recruit children from different backgrounds and countries, allow them to play the game and monitor their activities.

Reading list:

Interactive storytelling is a form of entertainment where the users can influence the story through a set of actions, the users can either influence the protagonist actions or acting as a general director of the story. In this project we will develop an interactive storytelling games based on famous tales such as Red Riding Hood, Alibaba and the Forty Thieves, Aladdin etc. The children will be able to take decision which can alter the story line of the chosen tale, in addition to interacting with the story environment. Chris Crawford on Interactive Storytelling, https://www.amazon.co.uk/Chris-Crawford-Interactive-Storytelling/dp/0321864972

Project Number: 65

Proposing Staff:

Project Suitable for: Computer Science, Games Technology, Multimedia

Project Question:

Title: a Serious Cooking Game Research Questions: -How a cooking game can be used as a method of creating and sharing recipes? -Can cooking game be used to create recipes rather than writing the recipes?

Primary research method:

Research Outline: First we will be studying relevant research and what other people are doing, and then we will study what other systems are there to author and share recipes. After that we will design the game. The

developed game should allow the player to perform exactly the recipe, save it and share it with the others. After developing the game we will conduct a usability and playability test to evaluate the product.

Reading list:

Cooking game is a popular style of games that appeal to many players, however these games usually are designed for fun and entertaining only, in this project we will take such game to the next level by making it a serious cooking game that can be used to author and share recipes. This project will require a good understanding of Unity3D game engine or a similar engine such as AS3 Starling, HaxeFlixel, Corona SDK, or Phaser. Initial reading: -â€˜Kitchen and cooking,â€™ a serious game for mild cognitive impairment and Alzheimerâ€™s disease: a pilot study, Valeria Manera et al. Serious Games: Games that Educate, Train and Inform, David R. Michael, Sande Chen

Project Number: 66

Proposing Staff: Dr.Mahmoud Awad

Project Suitable for: Games Technology, Multimedia

Project Question:

Title: Educational Game to Teach Driving Rules - Stage 2 Research Questions: -How can a serious game improve the car driver skills -Is educational game more efficient to teach the theoretical aspects of driving than traditional methods?

Primary research method:

Every driver has to pass a theory driving test before he can be granted a driving license, in this project we will be developing a game that can teach these theories. This game also will be target to current drivers to refresh or enhance their theory knowledge. This project will require a good understanding of Unity3D game engine.

Reading list:

Project Number: 67

Proposing Staff: Tariq Aslam

Project Suitable for: BIT

Project Question:

Developing a self sustaining business model for the use of recycled technology (PC's etc) obtained from UK in 'affected' countries such as - Tanzania,using our collaboration and partner reach.

Primary research method:

Interview and surveys of IT services here at Cov UNi , and other sources and Tanzania partners.

Reading list:

http://www.iied.org/business-models-for-sustainable-development http://pubs.iied.org/17051IIED/ (http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20(July%201).pdf)

Project Number: 68

Proposing Staff: Tariq Aslam

Project Suitable for: Computing, BIT

Project Question:

Can the arts help overcome global differences and help repair human conflict and despair ? by research, design and creation of a website /portal that can allow upload of artistic expression in form or song, words, stories, dance, paintings, etc - this is sponsored by an ethnic music band (Aashiq al rasul)

Primary research method:

interview members of the public, subject specialists, the sponsoring band, charities, etc, review and critique websites and software available already

Reading list:

Things to think about :(not journals) http://www.southbankcentre.co.uk/whatson/art-in-an-humanitarian-crisis-1001723 http://www.telegraph.co.uk/culture/3834863/Art-and-Conflict-Exhibition.html http://www.economist.com/blogs/prospero/2014/03/art-and-conflict

Project Number: 70

Proposing Staff: Tariq Aslam

Project Suitable for: Computing, BIT

Project Question:

Can small community clubs and organizations leverage the benefits of social media , if so how ? and if not what is the answer ? This will focus on a Target case study of a Martial Art organisation in Coventry and the findings and application will be of use to other organizations in a similar boat , where Social media is becoming a barrier as well as a trigger

Primary research method:

Guidelines and useage , resource the community club and others

Reading list:

Project Number: 71

Proposing Staff: Tariq Aslam

Project Suitable for: Computing, BIT

Project Question:

Can you manufacture the idea of making something go viral - , research into what goes viral, and whether that can be applied to any product are there a set of steps one can take in order to influence uptake and communication of a product or theme or idea ? In this competitive marker place for say music bands how can one achieve viral recognition and can that be applied to any products ?

Primary research method:

Reading list:

Project Number: 72

Proposing Staff: Victor Sanchez-Anguix

Project Suitable for: Computer Science, Computing, Games Technology

Project Question:

Title: Design and Implementation of an Intelligent Agent for the Diplomacy game Required skills: Java programming, artificial intelligence, intelligent agents, data mining Keywords: artificial intelligence, multi-agent systems, negotiation The Multi-agent systems paradigm has been proposed as a modeling tool for system where autonomous entities (either software or human) interact with each other in order to accomplish their own private goals. In such scenarios, it is only natural for some of these private goals to be in conflict with each other. For instance, in electronic commerce, sellers seek to maximize their sales while buyers attempt to save costs. In tourism applications, groups of friends may decide to go on a trip together, but each of them may have personal and conflicting preferences on where they should go, stay, or what activities should be included in the trip. As another example, in cloud environment settings, providers and users may decide on how hardware resources should be allocated. While users will aim for large amounts of resources to be used at a low price, providers will aim for exactly the opposite. In these settings, all of the entities (software or human) need to coordinate and reach an agreement that allows all entities to pursue their private goals in a way as satisfactory as possible. In the last few years there has been an special interest on researching technologies that support reaching these agreements in electronic systems formed by both human and software agents. We call these agreement technologies, and analogously to the real worlds, we use automated negotiation as a core technology for allowing software entities and humans to reach satisfactory agreements that foster cooperation. In this project you will design and implement a software agent for the Diplomacy game. Diplomacy is a board strategy game where empires attempt to conquer the world while invading other regions and using treaties and diplomacy to their advantage. Due to the fact that negotiation has been pointed as a key strategy for the game, this board game is considered as an excellent testbed for negotiation strategies for intelligent agents. For this project you will use the Bandana framework (http://www.iiia.csic.es/~davedejonge/bandana/) to design and implement an agent that plays and negotiates efficiently in the Diplomacy game.

Primary research method:

Implementation of the intelligent agent and then carrying out experiments for testing the performance of the agent in the diplomacy game.

Reading list:

Dave de Jonge, Negotiations over Large Agreement Spaces, BibTeX, PhD thesis, Universitat AutÃ²noma de Barcelona, 2015. Andre Ferreira, Henrique Lopes Cardoso and Luis Paulo Reis, Dipblue: A Diplomacy Agent with Strategic and Trust Reasoning, BibTeX, Proceedings of the International Conference on Agents and Artificial Intelligence, Volume 1, pages 54-65, Lisbon, Portugal, 10-12 January, 2015. Angela Fabregues, Facing the Challenge of Human-aware Negotiation, BibTeX, PhD thesis, Universitat AutÃ²noma de Barcelona, 2012. Angela Fabregues and Carles Sierra, DipGame: a Challenging Negotiation Testbed, BibTeX, Engineering Applications of Artificial Intelligence, Volume 24, number 7, pages 1137-1146, Elsevier, 2011.

Project Number: 73

Proposing Staff: Victor Sanchez-Anguix

Project Suitable for: Computer Science, Computing

Project Question:

Title: Tennis tournament predictor Required skills: Programming skills (Python/R, high), comfortable with maths and stats (high) Keywords: Sport analytics, machine learning, data mining, data science, artificial intelligence Machine learning and data mining are proving to be exceptionally good at predicting events in a wide variety of domains: education, consumer analytics, computer vision, text classification, and so forth. However, there is still a domain that has not been widely explored for the use of data mining techniques: sports. Sports are complex events, as not only playersâ€™ skills affect the end result of games, but also less controlled aspects like the home-away effect, playersâ€™ psychology, the media, weather conditions, etc. Due to these reasons, sports pose a big challenge for data mining and machine learning methods. Proof of this are the recent challenges hosted in Kaggle for predicting the NCAA basket competition. The interest of data mining on sports is not purely academic, as sports is one of the most prolific industries in the world. Analytics tools for sports could be the next big investment for sports industries. The challenge of this project will be predicting the result of tennis single competitions based on data available. For that, you will build machine learning algorithms that attempt to predict the result of specific tennis matches and competitions.

Primary research method:

Design and implementation of machine learning models + appropriate experimentation to assess its performance

Reading list:

Project Number: 74

Proposing Staff: Xiang Fei

Project Suitable for: Computer Science, Computing, Ethical Hacking

Project Question:

Develop a SDN (Software Defined Networking) system on the Raspberry-Pi devices Software-Defined Networking (SDN) emerges as a new networking architecture that can decouple the data and control plane to provide scalable network management. OpenFlow is the first standard interface for realizing SDN. This project aims at developing a SDN system on the Raspberry-Pi devices or other devices such as Beeglebones http://www.icact.org/upload/2014/0418/20140418_finalpaper.pdf

Primary research method:

A demonstrator and software development

Reading list:

http://www.icact.org/upload/2014/0418/20140418_finalpaper.pdf