Faculty of ICT

B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

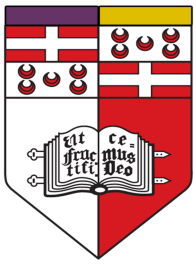
Proposal Form

Title:	**ACE2: Academic Collaboration analyzEr**
Project Supervisor:	Dr Charlie Abela
Project Co-supervisor: ***(if applicable)***	
Main Subject Area/s:	Network Analysis, Web Intelligence, Knowledge Discovery.
Brief Project Description inc. References: ***(word limit approx. 300 words)***	In this project students are expected to focus on the area of Scientometrics[1] and continue the development of ACE[2], an academic collaboration analyzer discussed in [1]. Through ACE it is possible to discover interesting collaborations among scientists and researchers by focusing on the research that they conduct, the research topics they focus on, the type of publications they produce and where they submit them. ACE also allows for the analyses and visualisation of "strong" and successful collaborations among authors as well as collaborations that do not exhibit such success. Some of the main objectives behind this project include: i. Find and analyse dense communities of interests through collaboration patterns; ii. Track the dynamics in collaboration networks: how does the information changes over time? Is it possible to discover interesting events in the evolving citation network for some particular pattern? iii. Perform association and correlation analysis. Given a set of keywords describing research area/topics: a. define and discover associations between authors and keywords; b. allow Information Retrieval of authors and associated sub-graphs based on topic keywords; c. perform clustering of authors based on their association to key-words so as to recommend potential collaborators. [1] Zammit, A., Penza, K., Haddod F.M, Abela, C. and Azzopardi, J. 2017. "ACE: Big Data approach to Scientific Collaboration Patterns analysis". *1st Scientometrics Workshop, co-located with the 14th Extended Semantic Web*

[1] http://link.springer.com/journal/11192

[2] http://www.ai.edu.mt/?page_id=2654

	Conference (ESWC), Portoroz, Slovenia 2017.
Resources Required:	Personal Computer AWS account
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	This research builds upon material covered in the following study units: • ICS2205 – Web Intelligence • ICS3204 – Advanced Web Intelligence
Foreseeable Ethical Issues and How these will be tackled: (if applicable)	N/A



Faculty of ICT

B.Sc. I.T. (Hons.) in Artificial Intelligence

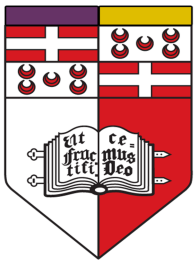
ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	Simulating traffic Worlds: SimWorlds (Traffic)
Project Supervisor:	Dr Charlie Abela
Project Co-supervisor: ***(if applicable)***	
Main Subject Area/s:	Machine Learning, Web Intelligence, Knowledge Discovery.
Brief Project Description inc. References: ***(word limit approx. 300 words)***	The idea behind this project is to provide an environment whereby it is possible to simulate road network scenarios for planning and modeling tasks. There exist numerous packages that allow for such simulations, like TransModeler[3] and Trafficware[4], which are ideal for complex networks but these also very expensive. Other solutions like AnyLogic[5] bring together system dynamics, process-centric, discrete events, and agent based methods within one modeling language and one model development environment. Some other inspiring examples include: a. http://volkhin.com/RoadTrafficSimulator/ b. http://www.traffic-simulation.de/ SimWorlds will need to make use of open source software (such as OpenStreetMap[6]) and datasets as much as possible and provide an effective solution. Some of the main objectives for SimWorlds include: i. allow the user to model and visualize the behavior of traffic systems in a 2-dimensional environment to illustrate and evaluate traffic flow dynamics, traffic signals and overall network performance; ii. consider road networks as a graph and allow for interesting network analysis; iii. scenarios will need to be saved and exported in different formats.

[3] http://www.caliper.com/transmodeler/
[4] http://www.trafficware.com/
[5] http://anylogic.com/
[6] https://www.openstreetmap.org

Resources Required:	Personal Computer Cloud resources such as AWS
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	This research builds upon material covered in the following study units: • ICS2205 – Web Intelligence • ICS3204 – Advanced Web Intelligence • CSA3220- Machine Learning, Expert Systems and Fuzzy Logic
Foreseeable Ethical Issues and How these will be tackled: (if applicable)	N/A



Faculty of ICT

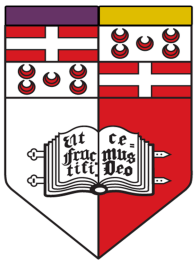
B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	Automatic Acronym and Abbreviation Detection and Definition
Project Supervisor:	Dr Chris Staff
Project Co-supervisor: ***(if applicable)***	Dr Joel Azzopardi
Main Subject Area/s:	Open Information Extraction; Information Retrieval
Brief Project Description inc. References: ***(word limit approx. 300 words)***	Acronyms and abbreviations are both contracted forms of word, phrase, or name replacements and typically, acronyms are considered to be a form of abbreviation. Identifying, recognizing, disambiguating, and defining acronyms and abbreviations can lead to not only improved accuracy in both general-purpose and domain-specific (e.g. medical) knowledge discovery and information retrieval, but also to human understanding. In this research, you are encouraged to investigate unsupervised approaches (i.e., fully automatic solutions that do not require training) to tackle this problem. The medical domain is a rich source of acronyms and ambiguous acronyms. However, we will also evaluate approaches to acronym detection and definition in an open domain, using, for instance, the Reuters Collection. H. Liu, Y. A. Lussier, and C. Friedman. A study of abbreviations in the UMLS. In Proceedings of the AMIA Symposium, page 393. American Medical Informatics Association, 2001. Wu, Yonghui, et al. "A comparative study of current Clinical Natural Language Processing systems on handling abbreviations in discharge summaries." *AMIA*. 2012. V. N. Garla and C. Brandt. Knowledge-based biomedical word sense disambiguation: an evaluation and application to clinical document classification. Journal of the American Medical Informatics Association, 20(5):882–886, 2013. A. Yarygina and N. Vassilieva. High-recall extraction of acronym-definition pairs with relevance feedback. In Proceedings of the 2012 Joint EDBT/ICDT

	Workshops, pages 21–28. ACM, 2012.
Resources Required:	Gold Standard collections for evaluation are available for free.
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	Prior knowledge of Information Extraction and/or Natural Language Processing and/or Information Retrieval is helpful but not essential (ICS2203, ICS2206, ICS2205). If you take this FYP, it is recommended that you also register for ICS3216 and LIN3012.
Foreseeable Ethical Issues and How these will be tackled: (if applicable)	None



Faculty of ICT

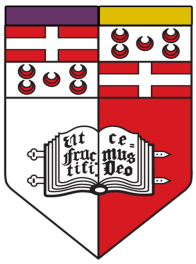
B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	Navigating through a Clustered Search Space
Project Supervisor:	Dr Chris Staff
Project Co-supervisor: ***(if applicable)***	Dr Joel Azzopardi
Main Subject Area/s:	Information Retrieval; Clustering; Automatic Query Expansion;
Brief Project Description inc. References: ***(word limit approx. 300 words)***	The most popular way of presenting search results is as a flat list spread over multiple pages (e.g., Google). Search results are known to usually contain non-relevant results as well as relevant ones, often due to query terms ambiguity. No-K-Means is a clustering algorithm that can cluster search results into term *senses*. Apap, Falzon, Buhagiar, and Schembri (2016) built a Chrome extension to present clustered search results to users, allowing them to select the most appropriate cluster following which a modified user query is automatically generated and submitted. The new search results are clustered and presented to the user. The iterative interaction continues for as long as the user wishes. For this FYP, you will need to i) potentially improve the clustering algorithm; ii) rank clusters in the order of likely relevance to the user (e.g., based on browsing history); iii) evaluate how well users can identify which cluster is mostly likely to eventually result in a cluster that contains the information the user is looking for; iv) determine how efficiently and effectively a user can search through clustered search space compared to a flat list of results. Azzopardi, J., Staff, C., and Layfield, C., 2016, Extended No-K-Means for Search Results Clustering, 2nd International Symposium on Web Algorithms (iSWAG), Deauville, France. Apap, A., Falzon, A., Buhagiar, J., and Schembri Y., 2016, Search Result Clustering, B.Sc. IT (Hons) Artificial Intelligence Assigned Practical Task (report and Chrome extension), University of Malta.

Resources Required:	None
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	Prior knowledge of information retrieval and/or clustering techniques and/or building Web browser extensions would be useful but is not essential. Ideally, the student would also register for ICS3216 and ICS3211.
Foreseeable Ethical Issues and How these will be tackled: (if applicable)	Potentially, human participants will be recruited to assist with the evaluation in either a controlled environment or at a distance. However, it is not essential that personal information will be collected and processed, although it will be necessary for them to install the Chrome extension onto their PCs if they participate at a distance. In this case, usage data can be collected automatically and anonymised at source prior to being sent for analysis, unless they have agreed to not anonymise the data.



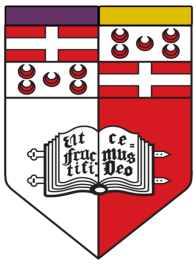
Faculty of ICT

B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	FINSENT – Financial News Sentiment Analysis
Project Supervisor:	Dr Claudia Borg
Project Co-supervisor: ***(if applicable)***	
Main Subject Area/s:	Natural language processing, Sentiment Analysis, Machine Learning
Brief Project Description inc. References: ***(word limit approx. 300 words)***	Opinions and sentiment can affect the financial market dynamics. Sometimes sentiment is derived from news, which for example can provide company-specific or political information. Good/positive news can increase optimism and therefore could also increase prices of stocks. The analysis of public sentiment is a powerful tool to predict market reaction. In this project we will use tweets and other forms of microblog messages to analyse the sentiment towards particular stocks and classify the sentiment accordingly. The techniques will compare different levels of linguistic annotation to determine to what extent this is helpful.
Resources Required:	None, train/test data is available
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	ICS2203, ICS2207, LIN3012
Foreseeable Ethical Issues and How these will be tackled: ***(if applicable)***	none



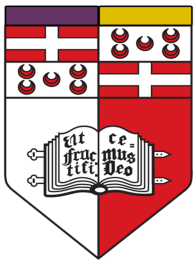
Faculty of ICT

B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	Multilingual Morphological Analysis
Project Supervisor:	Dr Claudia Borg
Project Co-supervisor: ***(if applicable)***	
Main Subject Area/s:	Natural Language Processing, Machine Learning
Brief Project Description inc. References: ***(word limit approx. 300 words)***	This project will look at techniques in morphological analysis that can be applied across different languages, with a particular focus on morphologically-rich languages like Maltese, Spanish and German. Knowledge in these languages is not required since we will use training and testing dataset that already contain the correct segmentations and annotations of words. Morphological analysis is an important and foundational tool for the computational processing of any language, and through this project we will aim to gain insight on whether we can use multi-lingual sources to aid the annotation of low-resourced languages.
Resources Required:	n/a, train/test data is available
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	ICS2203, ICS2207, LIN3012
Foreseeable Ethical Issues and How these will be tackled: ***(if applicable)***	none



Faculty of ICT

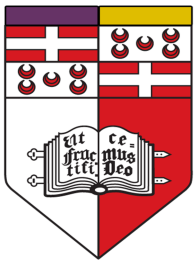
B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	RumouT – Rumours Out
Project Supervisor:	Dr Claudia Borg
Project Co-supervisor: ***(if applicable)***	
Main Subject Area/s:	Natural language processing, Machine Learning
Brief Project Description inc. References: ***(word limit approx. 300 words)***	Media and websites are full of false claims and with the rise of fake news and how this impacts the outcomes of major political events, it has become essential to identify and discredit information which is based on rumours and has no substantive sources. Just recently, Wikipedia founder announced an initiative that will fight fake news through a new site Wikitribune. The project will analyse rumours in the form of claims made in user-generated content, and where users respond to one another within conversations attempting to resolve the veracity of the rumour. A rumour is defined as a "circulating story of questionable veracity, which is apparently credible but hard to verify, and produces sufficient skepticism and/or anxiety so as to motivate finding out the actual truth". While breaking news unfold, gathering opinions and evidence from as many sources as possible as communities react becomes crucial to determine the veracity of rumours and consequently reduce the impact of the spread of misinformation.
Resources Required:	None, train/test data is available
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	ICS2203, ICS2207, LIN3012

Foreseeable Ethical Issues and How these will be tackled: (if applicable)	none



Faculty of ICT

B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

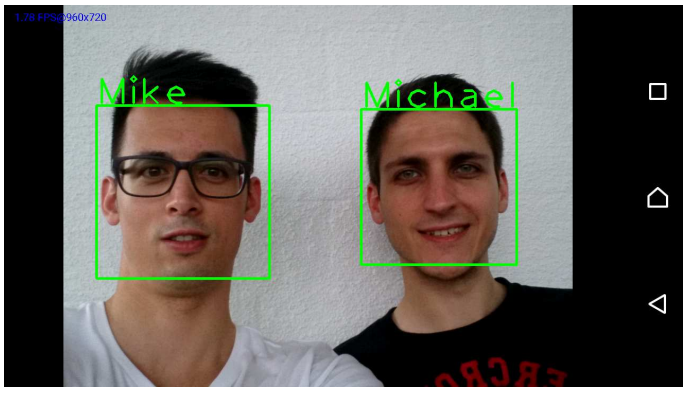
Title:	Automatic recognition of age group from face images
Project Supervisor:	Dr George Azzopardi
Project Co-supervisor: ***(if applicable)***	
Main Subject Area/s:	Computer Vision Machine Learning
Brief Project Description inc. References: ***(word limit approx. 300 words)***	The aim of this project is to infer the age group (e.g. 0-10, 11-20, etc …) of a person from a face image. Azzopardi et al (2016) already published papers on how gender recognition can be achieved from face images. In this FYP we will be looking at how we can adapt and/or extend the gender recognition method for the detection of the age group. Reading: Azzopardi et al (2016): http://tinyurl.com/kcl8f9q Matlab code of gender recognition: http://tinyurl.com/kj54rx4
Resources Required:	N/A
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	Pre-requisites: preferably ICS2129, but not mandatory Supporting 3rd year study unit: ICS3129 – Content Based Image Retrieval and Categorization
Foreseeable Ethical Issues and How these will be tackled: ***(if applicable)***	N/A

Faculty of ICT

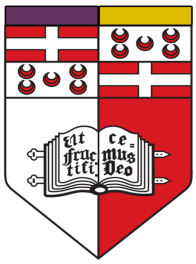
B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	Automatic and fast face recognition
Project Supervisor:	Dr George Azzopardi
Project Co-supervisor: ***(if applicable)***	
Main Subject Area/s:	Computer Vision Machine Learning Search
Brief Project Description inc. References: ***(word limit approx. 300 words)***	Given the image of a person, the idea is to detect the face of the person and recognize the identity of that person as quickly as possible. This requires to describe a bounding box (i.e. the face) in a vector of numbers and use it to match it with a database of such face vectors. The main questions that will be covered in this project are:  *Figure 1: Example of a face recognition application* 1. What is the best feature descriptor that we can use to describe faces in vectors of numbers? 2. How to best index a database of faces that leads to a fast match process? We will investigate techniques such as convolutional neural networks, transfer learning, COSFIRE filters, among others.

Resources Required:	N/A
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	Pre-requisites: preferably ICS2129, but not mandatory Supporting 3rd year study unit: ICS3129 – Content Based Image Retrieval and Categorization
Foreseeable Ethical Issues and How these will be tackled: (if applicable)	N/A



Faculty of ICT

B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	Automatic parameter selection of COSFIRE filters with application to object recognition and image classification
Project Supervisor:	Dr George Azzopardi
Project Co-supervisor: ***(if applicable)***	
Main Subject Area/s:	Computer Vision Machine Learning Search
Brief Project Description inc. References: ***(word limit approx. 300 words)***	COSFIRE filters have already been demonstrated to be effective in various computer vision applications. Their main advantage is that they can be configured to be selective for any pattern of interest, such as a face, a traffic sign, among others. Like other computer vision models they rely on the fine tuning of a set of parameters. Azzopardi et al (2016) have already shown how genetic algorithms, for instance, can be used to automatically select the most important salient features in a pattern of interest. In this FYP we will be focusing on the automatic selection of other parameters that will further help in the generalization ability of the COSFIRE filtering approach. Reading: Azzopardi et al (2016) - http://tinyurl.com/k5dlrnz
Resources Required:	N/A
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	Pre-requisites: preferably ICS2129, but not mandatory Supporting 3rd year study unit: ICS3129 – Content Based Image Retrieval and Categorization

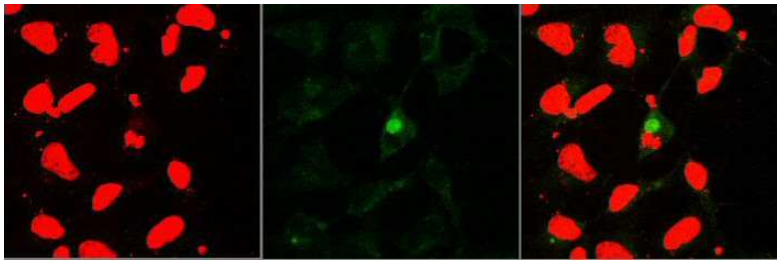
Foreseeable Ethical Issues and How these will be tackled: (if applicable)	N/A

Faculty of ICT

B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	Automatic cell counting via recognition of morphological characteristics
Project Supervisor:	Dr George Azzopardi
Project Co-supervisor: ***(if applicable)***	Dr Byron Baron Center for Molecular Medicine and Biobanking
Main Subject Area/s:	Computer Vision Machine Learning Search
Brief Project Description inc. References: ***(word limit approx. 300 words)***	The aim is to design a system that can count the total number of cells (based on the number of stained nuclei) and the number of modified cells (by counting the number of GFP-transfected cells) so that a percentage efficiency can be worked out by using these two values. This will require the software to recognise the boundary of each shape/stain assuming that nuclei are ovoid to spherical (and always stained red), while each single cell will be surrounding one nucleus (and stained green).  *Figure 2: Example of cell recognition and counting application. Panel A – cell nuclei stained red; Panel B – GFP transfected cells; Panel C – overlay to determine percentage of transfected cells.* The main questions that will be covered in this project are: 1. What size parameters and shapes best capture nuclei? 2. What is the best way to determine the outline of a cell? 3. What exclusion criteria should be applied to eliminate artefacts?

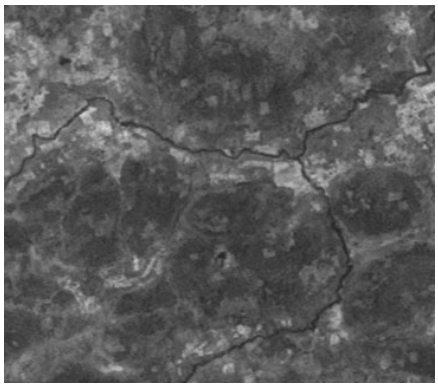
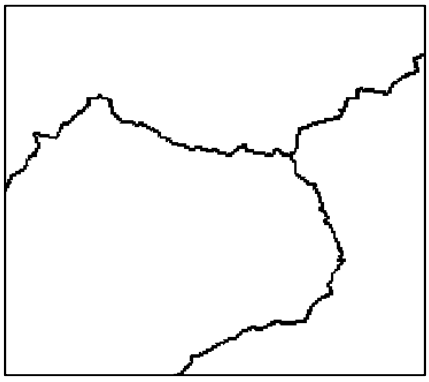
Resources Required:	N/A
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	Preferred Pre-requisites: ICS2129 Supporting 3rd year study unit: ICS3129
Foreseeable Ethical Issues and How these will be tackled: (if applicable)	N/A

Faculty of ICT

B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	Development of curvilinear operator with application to satellite images
Project Supervisor:	Dr George Azzopardi
Project Co-supervisor: ***(if applicable)***	
Main Subject Area/s:	Computer Vision Machine Learning
Brief Project Description inc. References: ***(word limit approx. 300 words)***	The aim of this project is to adapt an existing algorithm, namely B-COSFIRE, which was found to be very effective for vessel segmentation in retinal fundus images (Azzopardi et al, 2015), to the detection of any curvilinear structures in other type of images; e.g. delineation of rivers or roads from satellite images, among others. The images below show examples of an input satellite image of a river and the desirable output of the algorithm.   ***Reading:*** George Azzopardi, Nicola Strisciuglio, Mario Vento, Nicolai Petkov, Trainable COSFIRE filters for vessel delineation with application to retinal images, Medical Image Analysis - http://tinyurl.com/koq8ln5 ***Existing Matlab of B-COSFIRE for retinal vessel segmentation:*** http://tinyurl.com/ltjvnaq

Resources Required:	N/A
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	Pre-requisites: preferably ICS2129, but not mandatory Supporting 3rd year study unit: ICS3129 – Content Based Image Retrieval and Categorization
Foreseeable Ethical Issues and How these will be tackled: (if applicable)	N/A

Faculty of ICT

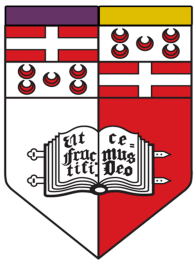
B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	ACCEPTOr – Automatic Construction of a Catalogue of EU ProjecTs' Outcomes
Project Supervisor:	Dr Joel Azzopardi
Project Co-supervisor: ***(if applicable)***	
Main Subject Area/s:	Text Mining, Web Intelligence
Brief Project Description inc. References: ***(word limit approx. 300 words)***	Every year, the European Union allocates a significant part of its budget to fund a number of research projects whose overarching aim is to benefit the lives of the European Citizens. Given that the EU is funded by the European tax payers, ultimately, the public should be aware of the projects that are taking place. Also, the members of the public should know about project outcomes that can be of benefit to them directly or indirectly. Towards this end, each EU project needs to have a portion of its budget allocated to information dissemination and outreach. This generally includes the development of a project website. In addition, the EU typically publishes lists of the funded projects in its data portal (https://data.europa.eu/). Nevertheless, it is quite difficult to keep track of the outcomes of all the different projects that may be of interest to a particular person. The aim of this project is to analyse a list of FP7 projects, and identify those that fall within a particular area of interest (e.g. environment, or ICT). Then, the webpages of those projects should be crawled and analysed in an attempt to build a catologue of the services and products that resulted from these projects. Research objectives include: • Classification of research projects into different fields. • Scraping of the projects' websites to identify the outcomes. • The construction of a structured catalogue of services and products developed as part of the different projects.

Resources Required:	Personal Computer
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	Prerequisites: • ICS2205 – Web Intelligence Recommended 3rd Year Study Units: • ICS3216 – Advanced Web Intelligence
Foreseeable Ethical Issues and How these will be tackled: (if applicable)	N/A



Faculty of ICT

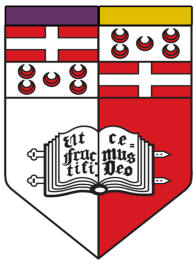
B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	NEuRiTIS - linking News Reports with TIme Series data
Project Supervisor:	Dr Joel Azzopardi
Project Co-supervisor: ***(if applicable)***	
Main Subject Area/s:	Text Mining, Web Intelligence
Brief Project Description inc. References: ***(word limit approx. 300 words)***	It is common knowledge that news events can have various effects on a country's economical indicators – e.g. civil unrest or war may be the cause of a down-turn in a country's economic health and activity. Government Agencies as well as pan-national agencies (such as world bank and EuroStat) collect various statistics and economic information, and often make them available for public use. The aim of this project is to develop a system that can analyse economic time series data (such as development indicators, GDP, …) to identify 'events' from them – i.e. identify unusual changes/trends. These changes will then be mapped to corresponding news reports in a bid to automatically identify news events that may have been the cause of those changes. Research objectives include: • Identification of events from time series data. • Identifying historical news reports that can be the causes behind the events in the time series data. • Using identified historical causal relationships to predict possible future effects of current news events.
Resources Required:	Personal Computer

Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	Prerequisites: • ICS2205 – Web Intelligence Recommended 3rd Year Study Units: • ICS3216 – Advanced Web Intelligence
Foreseeable Ethical Issues and How these will be tackled: (if applicable)	N/A



Faculty of ICT

B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	Inside Virtual Reality: A comparison of interaction techniques for improved sense of presence in VR
Project Supervisor:	Dr Vanessa Camilleri
Project Co-supervisor: ***(if applicable)***	Prof Alexiei Dingli, Prof Matthew Montebello
Main Subject Area/s:	Virtual Reality, interaction techniques
Brief Project Description inc. References: ***(word limit approx. 300 words)***	A new wave of VR head mounted displays is being developed and released to the commercial market at a very fast rate. Research directions are moving in the field of interaction techniques and how these techniques can increase and improve the sense of presence in VR. Despite research publications in the area, picking the right technique for a given scenario remains a challenging task. This study proposes to investigating the qualitative and more subjective aspects of usability of the techniques for different interaction patterns. The scope of this investigation is to provide guidelines to help future immersive VR interaction designers and researchers. Interaction techniques will be chosen to represent any of the interaction metaphors such as selection and manipulation as well as viewpoint control patterns (navigation). The question we shall be asking in this study is: How do we design and implement a specific interaction technique chosen to complement a specific interaction pattern, to achieve a high grade of usability for immersive VR interaction? In this regard the study will focus on evaluating the usability of interaction techniques from a qualitative perspective and using a test scenario close to what a real end user would experience. To answer this research question, the study will build on an existing VR project experience to further develop and refine the interaction techniques for improved sense of presence in VR.

Resources Required:	VR Headset, Motion input controller
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	N/A
Foreseeable Ethical Issues and How these will be tackled: (if applicable)	N/A

Faculty of ICT

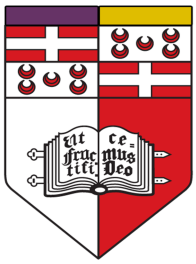
B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	Investigating Virtual Reality Interaction Techniques
Project Supervisor:	Dr Vanessa Camilleri
Project Co-supervisor: ***(if applicable)***	Prof Alexiei Dingli, Prof Matthew Montebello
Main Subject Area/s:	Virtual Reality, interaction techniques
Brief Project Description inc. References: ***(word limit approx. 300 words)***	A new wave of VR head mounted displays is being developed and released to the commercial market at a very fast rate. While the promises of VR may be exciting due to the problems it can solve and new experiences it can offer, there are still numerous issues to be addressed in order to achieve maximal immersion in VR. Research directions are moving in the field of interaction techniques and how these techniques can improve immersion in VR. Despite increasing research in the area, picking the right technique for a given scenario remains a challenging task. This study proposes to investigate different interaction techniques in VR. Interaction techniques will be chosen to represent any of the interaction metaphors such as selection and manipulation as well as viewpoint control patterns (navigation). Building up on a previous VR project involving the experience of child migrants in a Maltese classroom, two different interaction techniques for selection & navigation will be investigated, implemented and tested for increased immersion and sense of presence. The outcome from this thesis will result in a comparison of interaction techniques in VR for an optimal immersive setting. The question we shall be asking in this study is: What interaction techniques best suit selection, manipulation and navigation interactions, to achieve a high grade of usability for an immersive VR interaction? In this regard the study will take into consideration the usability of interaction techniques from a qualitative perspective and using a test scenario close to what a real end user would experience in a local classroom scenario.

Resources Required:	VR Headset, Motion input controller
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	N/A
Foreseeable Ethical Issues and How these will be tackled: (if applicable)	N/A



Faculty of ICT

B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	Big Data Predictions
Project Supervisor:	Prof. Alexiei Dingli
Project Co-supervisor: ***(if applicable)***	
Main Subject Area/s:	Big Data, Social Networking, Machine Learning
Brief Project Description inc. References: ***(word limit approx. 300 words)***	In the past years, we have seen several prediction mechanisms fail. One of them which succeeded was BrandsEye, a tool that looks at people's tweets, correctly predicted both the vote to leave the EU in June's referendum and a Trump victory in the US election, but how did it do this? For both elections, Brandseye measured which side had more tweets in its favour on Twitter - predicting that the most popular of the two on the social media platform would win. They compared the volume of pro-Trump and pro-Clinton tweets in key battleground states. As the chart above shows, between 1 October and 7 November Trump's popularity in key states on Twitter was greater than most of the traditional polls were suggesting. But is social media really a good source of data for predicting how people are going to vote? After all, there are far fewer people on Twitter than in the US electorate so is it really representative? And there are many other social media sites, so only looking at that one platform may not be a true reflection of how people feel. This thesis is aimed at investigating this topic.
Resources Required:	Online

Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	Big Data
Foreseeable Ethical Issues and How these will be tackled: (if applicable)	None since public data will be collected online or with user's consent.

Faculty of ICT

B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	Holographic Humans 2
Project Supervisor:	Prof. Alexiei Dingli
Project Co-supervisor: (if applicable)	
Main Subject Area/s:	Investigate the use of Intelligent Interfaces in a museum.
Brief Project Description inc. References: (word limit approx. 300 words)	The student will be expected to use a real 3D model and use holographic technology to project 3D avatars in order animate the model. The model of the temple and the model of the humanoids will be obtained from collaboration with other departments. The task of the student will be to investigate ways in which visitors can interact with these humanoids, maybe through speech or through an app on the their mobile devices. The humanoids will be there to explain and show what used to happen in these temples. The thesis builds upon this project … https://www.um.edu.mt/library/oar/handle/123456789/10986 https://www.youtube.com/watch?v=gEai4fQE0SA 

Resources Required:	Tablet Device or TFT Display
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study -units:	Intelligent Interfaces 2, Advanced Game AI
Foreseeable Ethical Issues and How these will be tackled: (if applicable)	

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B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	Interactive Painting
Project Supervisor:	Prof. Alexiei Dingli
Project Co-supervisor: ***(if applicable)***	Claudia Borg
Main Subject Area/s:	Intelligent Interfaces, Conversational Agents
Brief Project Description inc. References: ***(word limit approx. 300 words)***	The idea behind the Interactive Painting is to make use of an existent famous portrait (such as the Mona Lisa) and make her talk. The student needs to create a sophisticated chat bot capable of engaging in a meaningful conversation with the user. Students are encouraged to use existent frameworks such as ChatScript, the open-source Natural Language scripting language and engine running bots, which successfully managed to win the Loebner Prize. The main challenge is to make these engines run on a mobile device. The system should also make use of the camera on the mobile device in order to identify people and make the painting interact with the people and the environment in front of it. The final deliverable in this case is a painting running from a mobile device and capable of conversing with the users. The topics discussed should be related to the environment in which it is placed and the painting i.e. the context in which it was painted, the artist, the subject of the painting, etc. Such a project will be used in schools in order to teach children about art since they can easily start a conversation with the agent.
Resources Required:	Mobile Device

Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	Intelligent Interfaces, NLP
Foreseeable Ethical Issues and How these will be tackled: (if applicable)	No

Faculty of ICT

B.Sc. I.T. (Hons.) in Artificial Intelligence

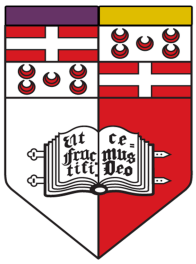
ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	Slot Machine AI Player
Project Supervisor:	Prof. Alexiei Dingli
Project Co-supervisor: ***(if applicable)***	
Main Subject Area/s:	Deep Learning, Pattern Matching, Reinforcement Learning
Brief Project Description inc. References: ***(word limit approx. 300 words)***	A recent report in WIRED magazine entitle “Russians Engineer a Brilliant Slot Machine Cheat—And Casinos Have No Fix“ (see link below) explains a way of beating slot machines. The outcomes of a slot machine are controlled by programs called pseudorandom number generators that produce baffling results by design. As the “pseudo” in the name suggests, the numbers aren’t truly random because human beings create them using coded instructions. They take an initial number, known as a seed, and then mash it together with various hidden and shifting inputs such as the time from a machine’s internal clock, for example in order to produce a result that appears impossible to forecast. But if hackers can identify the various ingredients in that mathematical stew, they can potentially predict the output. Knowing the secret arithmetic that a slot machine uses to create pseudorandom results isn’t enough to help hackers, though. That’s because the inputs vary depending on the temporal state of each machine. The seeds are different at different times, for example, as is the data culled from the internal clocks. So even if they understand how a machine functions, hackers would also have to analyze the machine’s gameplay to discern its pattern. That requires both time and substantial computing power, and pounding away on one’s laptop in front of a Slot Machine is a good way to attract the attention of casino security. The Russian scam works as follows; the operatives use their phones to record about two-dozen spins on a game they aim to cheat. They upload that footage to a technical staff in St. Petersburg, who analyze the video and calculate the machine’s pattern based on what they know about the model’s pseudorandom

	number generator. Finally, the St. Petersburg team transmits a list of timing markers to a custom app on the operative's phone; those markers cause the handset to vibrate roughly 0.25 seconds before the operative should press the spin button. The normal reaction time for a human is about a quarter of a second, which is why they do that. The timed spins are not always successful, but they result in far more payouts than a machine normally awards: Individual scammers typically win more than $10,000 per day. The scope of this project is to determine whether Deep Learning Algorithms can be used for this. The OpenAi initiative just released Universe (see link below), a software platform which allows an AI agent to use a computer like a human does: by looking at screen pixels and operating a virtual keyboard and mouse. The idea behind it is to train AI systems on the full range of tasks we expect them to solve, and Universe lets us train a single agent on any task a human can complete with a computer. In this project, we will make use of Universe to play a number of slot machines in the hope that it manages to learn the bias behind the game and thus win. To achieve this, we will make use of jQuery-SlotMachine and the AI agent will play a number of games until it manages to win at Slot Machines. By doing this experiment, we will show that such a system can beat a human player using a random strategy. The tasks involved: 1. Setup Universe and create an AI agent 2. Setup the jQuery Slot Machine 3. Get the agent to play an infinite number of matches and record the results. 4. Get a non-intelligent agent to play randomly and record the results. 5. Compare the two results together The deliverables will be: 1. The code 2. A technical report on how Universe works and how it was setup for this experiment (5 pages max) 3. A scientific paper (12 pages max) to report the experiment.
Resources Required:	https://openai.com/blog/universe/ http://josex2r.github.io/jQuery-SlotMachine/ https://www.wired.com/2017/02/russians-engineer-brilliant-slot-machine-cheat-casinos-no-fix/
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	Machine Learning

Foreseeable Ethical Issues and How these will be tackled: (if applicable)	None



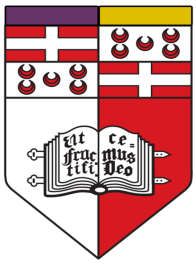
Faculty of ICT

B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	ADRIFT – Autonomous Navigation
Project Supervisor:	Prof. Matthew Montebello
Project Co-supervisor:	-
Main Subject Area/s:	Ambient Intelligence
Brief Project Description inc. References: ***(word limit approx. 300 words)***	Work within the area of ambient intelligence was initially directed towards intelligent homes but the same concepts have been transferred to any environment particularly those that are finitely contained like cars, planes, trains and eventually ships. Intelligent ships can be either controlled remotely taking advantage of a globally connected world, or autonomously independent reacting to the physical surroundings, weather and other constraints in real time. As a deliverable the student is required to produce a prototype software system that simulates an autonomous ship based on theoretical research and literature.
Resources Required:	None
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	AI fundamentals
Foreseeable Ethical Issues and How these will be tackled: ***(if applicable)***	n/a



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B.Sc. I.T. (Hons.) in Artificial Intelligence

ICT3909 (Final Year Project in Artificial Intelligence – 30ECTS)

Proposal Form

Title:	AMICO – AMbient Intelligent ClassrOom
Project Supervisor:	Prof. Matthew Montebello
Project Co-supervisor:	-
Main Subject Area/s:	Ambient Intelligence
Brief Project Description inc. References: ***(word limit approx. 300 words)***	The ultimate teaching aid to any educator is an intelligent environment within the same classroom to assist not just the teaching process but the individual learner needs. As a deliverable the student is required to produce a prototype software system that simulates an ambient intelligent classroom based on theoretical research and literature.
Resources Required:	None
Recommended Prerequisites / Knowledge Required and Supporting 3rd Year Study - units:	AI fundamentals.
Foreseeable Ethical Issues and How these will be tackled: ***(if applicable)***	Prototype model that will not involve testing with real students.