

The ODCSSS Programme 2006

(The Online Dublin Computer Science Summer School)

Final Report

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Final report on a program of research internships for 17 international and local undergraduate students of computing and engineering in two Dublin Universities, during the Summer of 2006.

Executive Summary

Vacancies in the ODCSSS programme were advertised on a specially created website <http://www.odcsss.ie> and mailing lists and targeted mailings to colleagues in Ireland, Europe and Internationally were used to advertise the programme. Even with a short application time window, by the closing date we had almost 90 applications from undergraduate students throughout the world. A panel of those involved in ODCSSS selected 17 students for the programme after independently ranking them by order according to a series of metrics including, academic results, letters of reference, statement of interest, subject match, degree match etc. All accepted and most worked for 12 weeks with different academic, postdoctoral and postgraduate researchers in the two institutions.

1. History

Over the last several years, the School of Computer Science and Informatics at UCD and the School of Computing at DCU have each run an informal and unstructured programme of research internships during the summer. Individual research investigators would use their own research funding to pay for research intern students to work on research grant projects for up to 3 months. In addition the School's offered a number of academics research internship support (often to junior academics to help them become established). The students involved would typically be final year undergraduate students from the same institution. For the undergraduates it would represent a piece of stop-gap summer research work to give them a taste of what research might be like, as well as giving them some work experience.

However, a major disadvantage in this model was that the experience of the research interns was very variable and depended upon the availability of the research supervisor, his or her existing research infrastructure and the demands of the funding research project. There was no coordination among research investigators in recruiting Summer interns, no consistency of selection, no consistency in stipends paid and no shared experience i.e. there was no collegiate environment and certainly no view of what was occurring beyond the four walls of the research lab each student was in. There was no crossover between research projects and no benefit from having the cohort of summer interns as a whole. As a consequence the amount of follow-on from summer internships into postgraduate research applications was not as high as it should have been because the internships were unstructured and didn't deliver a sense of team to the individual students. The sense of team is what many postgraduate students credit as one of the strongest aspects of our respective research groups in UCD and DCU. Somehow, this was not translating to our research interns.

In 2005 Science Foundation Ireland launched a programme of structured summer research internships called UREKA (Undergraduate Research Experience & Knowledge Award) based on the NSF's Research Experiences for Undergraduates (REU) Programs. This provided for student stipends as well as support for over-arching program activities and also had some provision for student travel for international students and some

provision for equipment for the internship activities although there was no explicit provision for UREKA programme which spanned across Irish Universities.

In early 2005 the CSI (UCD) and CDVP (DCU) both made independent applications to SFI for UREKA sites. Neither was funded but both were highly ranked, and encouraged to reapply for 2006. Our experiences in running our own research internship programme focused on the benefits of local interaction without considering the benefits from leveraging our collaborative engagements with other research groups in Ireland.

The Adaptive Information Cluster (AIC) is an SFI-funded cluster of research investigators working in DCU and in UCD. Building upon the AIC's position and history of working successfully across these two institutions, the School of Computer Science and Informatics at UCD and the School of Computing at DCU came together to apply for a UREKA award in 2006 for a summer UREKA site. This application was unsuccessful but we were able to find enough funds so that we decided to run a programme of Summer research internships which would be based partly in UCD and partly in DCU and would replicate some of the characteristics of the SFI's UREKA and the NSF's REU programme. This programme was called ODCSSS (Online Dublin Computer Science Summer School) after the figure from Greek mythology and ran during Summer 2006 with 17 undergraduate students involved. This report summaries the activities and outputs from the programme.

2. ODCSSS Logistics

2.1 Aims and Objectives

The primary goal of the ODCSSS program is to afford exceptional undergraduate students the opportunity to participate and contribute to exciting research projects at our leading research facilities and to inspire these students to take the first step on a path to a research career. Specifically, we aimed:

- To afford undergraduate interns the opportunity to undertake research in a distributed yet cooperative research environment;
- To introduce our research to undergraduates through exciting real-world applications that will actually be deployed, used or incorporated into ongoing research projects;
- To expose students to novel research problems, cross-cutting research exploration, specialised state of the art equipment and inter-disciplinary research expertise;
- To provide a foundation of basic research skills to the undergraduate interns which will aid them in transforming their research internship experience into a long term plan for final year research or subsequent research career options;

- To stimulate enrollment in graduate studies through involvement of talented undergraduate students in scientific investigation under mentorship of researchers and prepare scholars for graduate studies;
- To raise awareness and understanding of the areas defined as themes in Odysseus;
- To develop showcase exemplars that will allow us to tell the story of our research to the wider lay community.

This represents an ambitious set of goals but with the support of the two Universities, and the fact that ODCSSS was cross-institutional meaning it would attract attention, we felt that the goals were achievable.

2.2 Overall organisation

The first step in running ODCSSS was to create the programme of projects. Academic staff in both Schools were canvassed and outline descriptions of research projects were gathered. These represented a wide range of research activities, which were grouped into themes. We decided to recruit c.16 students from the 30+ projects submitted and we also decided to let the student preferences dictate which projects would actually run. The logistics of ODCSSS were that each summer intern worked on a predefined project with an academic supervisor and a secondary mentor (usually a postdoc researcher or a PhD student). Half of the students would be based at each site but we organized regular, at least fortnightly mass get-togethers, and several collaborative events during the 12 weeks (see later).

A website to advertise and generally coordinate activities on the programme was created and this was done using the URL www.odcsss.ie Individual students on the ODCSSS programme were funded either from the School of Computer Science and Informatics, the School of Computing or individual research investigators' research funding. We used the SFI UREKA programme guidelines on stipends for students and after some initial teething problems with the respective Universities' Finance Offices it was accepted that these would be paid as tax-exempt research student scholarships.

In both Universities there was a dedicated space in the research labs for the programme of UREKA students. This gave the students a sense of identity and team spirit and it was notable that there was great crossover and collaboration among the students as a result of this. Students generally worked under supervision of their sponsoring academic researcher but worked on a day-to-day basis with the PhD student(s) or postdoc(s) from that sponsor's team. The programme was limited to undergraduate students of Computer Science, Computer Engineering or a related discipline from Ireland or abroad as these characteristics matched the project requirements from the individual project sponsors and we did not seek any special skills for any of the specific projects.

2.3 ODCSSS Applications

ODCSSS applications were advertised using email distribution lists and applications were submitted via the website only. Each applicant was asked to provide a personal statement of why they wanted to pursue a research activity during the summer, to indicate their preferred projects from the descriptions on offer. Applicants were also asked to provide the names and contact points for two referees and these were contacted and references gathered.

The student selection procedure was based on the quality of the student primarily and considered past exam performance and support from referees. The process of matching applicants to projects was done on the basis of student preferences, minimizing the number of second and third choice project matches.

A total of 90 students applied for the ODCSSS programme and 17 were finally selected and offered positions. All accepted. The students and their home institutions are listed below:

Daniel Kersten, Dublin City University Ireland: mLearning SMS:

Dan is a 21 year old Computer Applications (Software Engineering stream) student in DCU, where he has also worked as a lab tutor over the past year. His computer related interests include Operating Systems (design and development), programming languages, AI, 3D graphics and game development. His favorite programming languages are C++, Python and MIPS64 assembly. He likes most things to do with technology, both hardware and software and enjoy low level programming most of all "nothing like having total control over the hardware," he says. Besides computers, he also enjoys most kinds of music, rock climbing and anime.

Aidan Flanagan, Dublin City University Ireland: Speaker Identification:

Aidan is a 20 year old student living in Dublin. Currently he is in second year studying Information and Communications Engineering in DCU. Originally from Cork he to Dublin two years ago to study in DCU. Last summer he worked in computer support in a pharmaceutical company in Cork. In his spare time he enjoys listening to music and participating in watersports.

Patrick Tierney, University College Dublin Ireland: Wikipedia (integration):

Patrick is a 19 year old, 3rd year BA student, from Cavan. Apparently, he is supposed to be studying Mathematical Studies and Computer Science in college. But like most other BA students, he is expansive in his interests. While not "studying", he spends his time listening to rock music, watching TV and meeting with friends. He also spends a lot of time playing many different sports.

Sean Hegarty, Trinity College Dublin Ireland: Speech-to-Speech 3:

Sean is 22 and grew up in Derry - hidden away in quiet suburbia from the continually mellowing 'troubles' - he toyed and tinkered with an Amstrad CPC-464, and learnt Basic programming at an early age. Now a student of Trinity College Dublin he is taking an interdisciplinary degree in Computer Science, Linguistics, and French. He has just finished his 3rd year, which he have spent studying in Grenoble, the 'Silicon Valley' of

France. Sean feels that for the larger lay community to be able to exploit machines, and thus converse with computers, the gap must be bridged between artificial, mathematical languages and natural languages.

Barry Carroll, Institute of Technology Tallaght Ireland: Secure Streaming

Barry is 25 and grew up in county Kildare to where he regularly returns. He is a third year in IT-Tallaght studying computing, specialising in 'Information Systems'. He is also half way through a Cisco CCNA course. His main love in life is rock music, including silverchair and weezer, and he plays the guitar whenever he can. He also loves motor biking and fixing bikes up. Barry just bought an old bike from 1990 specifically for getting to UCD this summer and he is now busy making it road worthy at the weekends.

Joel Seligstein, University of Tennessee USA: Collaborative Visualisation

Sandrine Aime, ESIAL France: SenseCam images:

Sandrine is 21 from Nancy, a town in the East of France. She is currently a 2nd year student at ESIAL, a French "Grande Ecole" and will obtain a Master's degree in Computer Science, with a specialization in Information Systems. She is a big fan of rock music and has been playing the electric guitar for a year and enjoys going to concerts and festivals in Europe. She practices sports like badminton, roller-skating and enjoys doing other things like hanging with her friends and going to the cinema.

Jing Chen, University College Dublin Ireland: 3D Museum:

Jing is 22 years old and from China. She has been living in Dublin for the past 5 years now and did her Leaving Certificate in Ireland. For the past three years, she has been studying computer science in UCD. She likes graphics, web design and database study. In her free time, she likes to listen to music, shopping and going out with her friends.

Shauna Harris, Dublin City University Ireland: Shape Matching:

Shauna is currently studying computer applications specialising in software engineering in Dublin City University. At the moment she is working as a laboratory tutor supervising first year students during their programming and computer architecture labs. Her interests include socialising, going to the cinema, fashion, technology and swimming. She also enjoys traveling abroad and has visited several countries including Portugal, Greece, France, and UK. Saudi Arabia, Kuwait, Bahrain, Spain, Germany, Austria and the USA.

Joanne Doyle, University College Dublin Ireland: Recommendation Kiosk:

Joanne is a 21 year old 2nd BSc Computer Science student in UCD. Before this, she was a student of Mathematical Physics for 3 years. Her main interests include taekwon-do (she is one of the instructors with the UCD club), video games, rock and metal music, movies and anime. Her particular interests in computing include programming, operating systems and web design and technologies.

Tadhg O'Sullivan, University College Dublin Ireland: Glow tags:

Tadhg is from Canada but now lives in Ireland. He is currently a 2nd year Denominated Computer Science student in UCD but holds an Honours Degree in Behavioral

Science/Psychology. His interests include Computer Gaming, Basketball and Music. He can be found online at AOL/AIM: mysticmonkey3110

Graham Healy, Dublin City University Ireland: Low power hardware:

Graham is currently a Computer Applications Software Engineering student in Dublin City University in his second year. In DCU so far he has enjoyed a broad range of subjects from Probability and Statistics to Advanced Computer Architectures. His interests in the field of computing include computer networks, security, operating Systems and programming.

Jason Barns, University of Tennessee USA: Privacy Management:

Jason is 21 and from Fayetteville, Tennessee. Despite still not knowing what he wants to be when he grows up, he is a third year student studying Computer Science at the University of Tennessee. He has several addictions that cut into his studies, which include movies, board games, movies, getting lost in strange places, and movies. Contrary to the common computer scientist cliché, Jason actually grew up with a strong hatred of computers and thus today, feels an irresistible urge to develop software that is correct and easy for end-users to use.

Neil Cowzer, University College Dublin Ireland: Archive searching:

Neil is from Dublin and is currently a 2nd BSc Computer Science student in University College Dublin. His interests include Web design and technology, along with GUI design.

Gary Sibley, University College Dublin Ireland: Twigstack:

Gary is a 21 year old student from Dublin. He has just finished his third year of the BSc. Computer Science course in UCD. His interests include loud music, sport, gaming, graphics and tweaking his Linux and OpenBSD machines. He spends a lot of his time on the internet doing nothing in particular, and can be usually found haunting sites such as slashdot, ign and boards.ie. He also finds it very strange talking about himself in the third person.

Barnard Kroon, NUI Maynooth Ireland: Mobile voting:

Barnard is from South Africa, and is currently living in Co. Longford. He's a 2nd year Computer Science and Software Engineering Student at NUI Maynooth. His interests mainly consist of gaming and that's what most of his spare time is spent doing.

Brendan Maguire, University College Dublin Ireland: Web services:

Brendan is from Dublin but grew up in Philadelphia in the United States. He attended primary and secondary school in the US before returning to Ireland to attend University College Dublin. For the past three years, he has been studying computer science in UCD. He is very interested in software design and engineering and would like to one day have a career in software development.

Students commenced work on the programme on 6th June 2006 and worked for 12 weeks until 25 August when we hosted a showcase of the work accomplished during the programme.

2.3 The ODCSSS Projects

The original list of 34 project proposals, as submitted by research investigators from both institutions, was divided into 4 themes and these 34 were reduced to 17 projects, which actually ran. These projects, the theme under which they ran, the sponsoring research investigator and the primary site for the project, are listed below.

Speech and Language Processing (10 projects)

Code	Short Title	Supervisor	Site
0106-UCD	Speech-to-Speech 1	Dr. Julie Berndsen	UCD
0206-UCD	Speech-to-Speech 2	Dr. Julie Berndsen	UCD
0306-UCD	Mining WordNet	Dr. Tony Veale	UCD
0406-UCD	Mining Wikipedia	Dr. Tony Veale	UCD
0506-UCD	mLearning SMS	Dr. Joe Carthy & Dr. Michela Bertolotto	UCD
0606-UCD	Speaker Identification	Dr. Fred Cummins	UCD
0706-DCU	Wikipedia (integrate)	Prof. Josef van Genabith	DCU
0806-DCU	Wikipedia (interface)	Prof. Josef van Genabith	DCU
0906-DCU	Speech-to-Speech 3	Dr. Andy Way	DCU
1006-DCU	Speech-to-Speech 4	Dr. Andy Way	DCU

Imaging and Visualization (9 projects)

Code	Short Title	Supervisor	Site
1106-UCD	Holographic info	Dr. Michela Bertolotto & Dr. Eleni Mangina	UCD
1206-UCD	Secure streaming	Dr. Eleni Mangina	UCD
1306-UCD	Collaborative Vis	Dr. Aaron Quigley and Dr. Lorcan Coyle	UCD
1406-UCD	Distributed Vis	Dr. Aaron Quigley and Dr. Hamish Carr	UCD
1506-DCU	SenseCam images	Prof. Alan Smeaton	DCU
1606-DCU	3D Museum	Dr. Noel O Connor	DCU
1706-DCU	Irish sign language	Dr. Alistair Sutherland	DCU
1806-DCU	Shape matching	Dr. Alistair Sutherland	DCU
1906-DCU	Google Earth photos	Dr. Gareth Jones	DCU

Pervasive Computing (8 projects)

Code	Short Title	Supervisor	Site
2006-UCD	Wearables	Prof. Barry Smyth	UCD
2106-UCD	Reco. Kiosk	Prof Barry Smyth and Dr. Lorraine McGinty	UCD
2206-UCD	Glow tags	Dr. Simon Dobson, Prof. Paddy Nixon	UCD
2306-UCD	Tyndall motes	Prof Paddy Nixon	UCD
2406-UCD	Low power hardware	Dr. Chris Bleakely	UCD
2506-DCU	Breathable fabric	Prof. Dermot Diamond	DCU
2606-DCU	Garment construction	Prof. Dermot Diamond	DCU
2706-DCU	Low power hardware	Dr. Noel O Connor	DCU

Software Engineering (7 projects)

Code	Short Title	Supervisor	Site
2806-DCU	Privacy management	Dr. Steve Blott	DCU
2906-UCD	Archive searching	Dr. Jill Freyne and Dr. Lorraine McGinty	UCD
3006-DCU	Twigstack	Dr. Mark Roantree	DCU
3106-DCU	Identity management	Dr. Steve Blott	DCU
3206-UCD	Mobile voting	Dr. John Murphy	UCD
3306-DCU	Web services	Dr. Claus Pahl	DCU
3406-DCU	P2P Simulation	Dr. Mark Roantree	DCU

2.4 ODCSSS activities

- Aug 25 End of Internship Showcase UCD - all scholars/supervisors Poster Session and Lunch Research Futures...Talk presented by postdocs and postgrads Talk: Virtual Machines for Resource-Constrained Platforms. Prof. Hitoshi, University of Aizu, Japan End of summer school social event
- Aug 14 ODCSS and IBM Dublin Extreme Blue Day Industrial research lab visit and research exchange IBM
- Aug 4 UCD to DCU ODCSSS Research Visit
- July 28 DCU to UCD ODCSSS Research Visit Office of Funded Research Support Services UCD Science SPIN Ireland's first science magazine, David Duke One Minute Madness and Group Presentations
- July 7 Internal research highlights DCU with over 30 visitors, which highlights the efforts in each projects to date!
- June 30 Second return visit from DCU to UCD with all summer scholars for a day of research activities, One Minute Madness, NOVA UCD Commercialization talk, How to give a research presentation
- June 16 First return visit from UCD to DCU with all summer scholars, One Minute Madness, Online project updates, followed by a movie outing
- June 6 ODCSSS starts with morning tea in DCU and UCD followed by ODCSSS lab orientation and supervisor, student meetings
- May 7 Student biographical page goes online
- April 22 "Dublin Summer School to Bring Adventures in Computer Science to Two University of Tennessee Students" from University of Tennessee (news item)
- April 12 University College Dublin News Item on ODCSSS: "Internships offer UCD students invaluable access to industry experience"
- April 9 Student Support Page Launched
- Apr 4 Invitations posted to 16 students for 2006
- Mar 24 2006 Over 80 students from sixteen countries apply to Odysseus
- Mar 4 2006 Number of students to be supported in 2006 (16) due to funding
- Feb 23 2006 Odysseus Site Launched
- Jan 7 2006 Internal Final Project Selection
- Dec 10 2005 Internal Project Deadline
- Dec 1 2005 DCU-AIC-UCD Consortium Formed

3. ODCSSS Outcomes

Students will continue to be tracked on a 6 monthly basis by the current directors for ODCSSS to determine the long lasting impact this research internship has had. Each student will also be asked to act as buddies for the subsequent cohort of students.

Finally we will wrap-up with some anecdotes about student experiences:

One student from who had no strong mathematical or theoretical computer science background, spent his first 7 weeks reading about number theory and cryptography. He was then given 2 papers, which described theoretical implementations of a hard Crypto problem. He implemented them, found one didn't work quite as expected and found one line in one of the proofs he didn't like so he changed his implementation which then made it work, and he went back to the 1 line on the proof and modified it. He is awaiting a response from the authors of the original paper to his suggested modification.

A second student who was a classically trained programmer and very skilled, was presented with new and novel research problems in the development of a tabletop visualisation system. There are very few people with experience in software development for vertical multi-user gesture driven surfaces such as the Diamond touch. This student was further presented with the research problem of applying a new information visualisation paradigm to the presentation of large tissue micro array images. The result of this students efforts was a highly intuitive gesture driven interface, on a tabletop, for clinicians who are studying cancers biopsies in the form of Tissue Micro Array data, as shown below. The student and researchers are currently working on a research paper submission of a follow up user study from this summer project.

The final student anecdote is for a student who came into the internship program and was nervous to start out. Through the course of the project, they made the research project their own and became very passionate about the user population (deaf people) to whom the project was targeted. This student presented on behalf of their thematic area when at IBM. During the course of the talk, the student pointed out that a small investment was all that was needed to help realize this socially minded application. The head of the IBM lab and the country manager for IBM were both impressed by the students knowledge, commitment and dedication to what was, after all a new project to them. This student has left a lasting impression that will not soon be forgotten in IBM Ireland.

4. Acknowledgements

We would like to thanks all the students who applied and took part in ODCSSS 2006. We would also like to thanks all the academics, postdoctoral research, postgraduate students, administrators, technical staff, office of funded research staff, library staff, pay office staff, NOVA UCD, conference office staff and accommodation office staff.

Some of the ODCSSS Student 2006

