Warwick Centre for Complexity Science
Newsletter Issue 7, Winter 2017

Keep Calm and Do an Internship

by Iliana Peneva, 2nd year PhD student and Michael Pearce, Rob Eyre and Janis Klaise, 3rd year PhD students

PhD internships are becoming more and more popular in today's competitive job market, offering to PhD students the great opportunity to develop new skills, build new networks, and gain valuable work experience outside academia. As the demand for PhD internships increases, the opportunities are becoming more diverse. An internship in academia, in industry or in the third sector – there is something for everybody.

Michael Pearce, a 3rd year PhD student who works on efficient sampling for algorithm portfolios, recently completed a 6-month internship at the Warwick Medical School which aimed to derive statistical models to be used when determining the optimal sample sizes for clinical trials. He immensely enjoyed his internship: 'As a result of this internship I have come back to my PhD research with a fresh perspective leading to new ideas that I am excited to experiment with. I now have the confidence that I know what I am doing with my PhD work and I look forward to the future.'

A very popular option is to do an internship in industry. **Rob Eyre**, a 3rd year PhD student who works on applying complex statistical models in public health, spent three months doing an internship with Spectra Analytics (http://www.spectraanalytics.com/), a London-based data science consultancy, founded and run by **Marcus Ong** and **Daniel Sprague**, both alumni of the Complexity Centre. As described by Marcus: 'Spectra hire interns on a rolling basis throughout the year with the aim of teaching them the practical skills associated with data science from building databases through to data visualisation; they also get to experience working on real world problems'. This great variety of tasks was accompanied by a lot of support from Dan and Marcus, who made sure that the internship was invaluable experience to Rob. He says: 'Overall the internship was a great experience and should prove very valuable for a future career in industry.'

Another student from the Centre - **Janis Klaise,** who works on complex networks, is currently undertaking a 3-month internship with Spectra Analytics, working on projects in areas ranging from healthcare to finance. Examples include developing a sampling calculator to access vaccine coverage in developing countries and applying machine learning to detect illegal trading in financial markets. He believes: 'The skills I have acquired include data mining, web development, database management and many others, all invaluable in the toolkit of an aspiring data scientist'.

Internships can be not only the cure to the infamous 'second year slump', but also a stepping stone to your future career! So keep calm and do an internship!

Complexity at 2016 Conference on Complex Systems

by Edward Hill, 3rd year PhD student

Entering its thirteenth year, the annually held Conference on Complex Systems (CCS) returned to Europe this year with Amsterdam being the host venue (on the photo). The 2016 edition of this international conference was attended by over 750 delegates, including a contingent of student and staff members from the Centre, to discuss the latest developments in complex systems and interdisciplinary science.

For the students, this in fact began three days prior to the conference beginning, thanks to the third edition of the CCS Warmup. This workshop provided young researchers the chance to learn new methods and present their work via a five minute flash talk, while also giving an excellent opportunity for networking with fellow early-career researchers before the main conference had even begun.

Moving onto the main event, the range of research areas on show was broad, encompassing eight main themes: Foundations of Complex Systems; Information and Communication Technologies; Language, Linguistics, Cognition and Social Systems; Economics and Finance; Infrastructure, Planning and Environment; Biological and (Bio) Medical Complexity; Socio-Ecological Systems; Complexity in Physics and Chemistry.

The packed schedule included poster sessions, a huge selection of contributed talks and two sessions of 'ignite' presentations. Ignite style talks are becoming more prominent, challenging the speaker to convey their research clearly and concisely in only three minutes. The Centre had a significant presence throughout the conference, with contributions made in all presenting formats. Second year PhD student **Alex Bishop** was one of twelve ignite speakers at the conference. "Despite the tough task of delivering a coherent yet technical talk in three minutes, being able

to present on the main stage in front of a large audience was a fantastic experience. This led to productive interactions with other members of the complex systems research community throughout the conference."

As is customary at CCS, two days were predominately set aside for 'satellite' sessions. These are independently organised workshops, typically lasting a single day, with talks and discussions concentrating on a specific subject. Over 40 of these meetings took place, each one bringing together delegates involved in that particular field. One of the organisers of a satellite session, titled 'Feedback in Complex Systems', staff member **Dr. Samuel Johnson**, provided an overview of the event: "The Feedback in Complex Systems satellite was by all accounts a great success. Our speakers described cutting-edge work in physics, neuroscience and economics, with the common feature that feedback played a major role. Thanks to the broad scope of the CCS meeting, and the sheer number of participants, we were able to attract a varied audience from a wide range of backgrounds. Several discussions about potential joint projects took place later on in coffee breaks, so we are very satisfied with the outcome."

Notable talk contributions were made in other satellite sessions by third year PhD students **Federico Botta** (in 'Computational Social Science: Social Contagion, Collective Behaviour, and Networks'), **Ed Hill** (in 'Modelling of Disease Contagion Processes') and **Liz Buckingham-Jeffery** (in 'Digital Epidemiology and Surveillance'). Presenting a talk in this type of meeting is highly recommended, with **Liz** commenting on her experience: "In addition to also enjoying the broad appeal of the other days at the conference, speaking at this focused workshop provided me the opportunity to meet established academics in my field and learn novel techniques directly applicable to my work."

As CCS 2016 drew to a close, attention began to shift towards next year's edition of the conference. Convening in Latin America for the first time, Cancun, Mexico has been announced as the host city for CCS 2017. Scheduled to take place September 17-22, save the date if you are interested in attending!

Campus Party - #FeelTheFuture

by Jeremy Reizenstein, 3rd year PhD student

Campus Party came back to Europe earlier this year, Utrecht in particular, describing itself as "the greatest technological experience of the world which brings together young geeks in a festival of innovation, creativity, science, entrepreneurship and entertainment." Hundreds of people spent five days in a large exhibition centre playing videogames, coding, creating, eating and socialising. A programme of exhibits and international speakers from academia and enterprise is organised, with themes such as startups, VR-headsets, global climate, and the impact of the internet on civic society. The opening ceremony began with a welcome from a few politicians and ended with a dancing robot. It's an exciting environment to get things done, even if they are the same work you would have done back home.

Anyone can offer a talk in the #ContentByCampuseros stream, which happens at night, when the headline speakers are less available. I gave an introduction to deep learning, in particular convolutional and recurrent neural networks, and demonstrated them using the Keras library in Python. I concluded with a summary of my work on Chinese handwriting recognition. This type of forum is a friendly one, and PhD students and researchers should consider this as a way to engage people in their topic.

The Port – Uniting Innovators to Make an Impact

Our alumnus, **Peter de Ford**, just returned from CERN, where he participated in a three-day humanitarian hackathon called The Port (14-16 October). The goal of his team, called Chain Safety Investigators, was to come up with a solution to counterfeit drugs and lack of data in the medical supply chain. The team worked online six weeks prior to the hackathon discussing how to arrive at a solution. However, it wasn't until the first day of the hackathon that they agreed to solve the problem using block chain technology and QR codes. During the rest of the event they made a software prototype, researched the topic more, and received helpful feedback from their mentors.

In the next few months, the team will try to come up with a more developed prototype and apply for a grant to test the prototype in the vaccine humanitarian supply chain. We wish them the best of luck! More information about their work can be found at ChainSafe (https://chainsafe.org/).

Recent Publications from Our Staff and Students:

- **Machion T, Alexander GP.** Global Defect Topology in Nematic Liquid Crystals, Proceedings of the Royal Society A472, 20160265 (2016)
- Jatuviriyapornchai W, **Grosskinsky S.** Coarsening dynamics in a condensing zero range processes and size-biased birth death chains, Journal of Physics A: Mathematical and Theoretical 49 (18), 185005 (2016)
- Werkman M, **Tildesley MJ**, Brooks-Pollock E, **Keeling MJ**. Preserving privacy whilst maintaining robust epidemiological predictions, Epidemics 17, 35-41 (2016)
- House T, Ford A, Lan S, Bilson S, **Buckingham-Jeffery E**, Girolami MA. Bayesian Uncertainty Quantification for Transmissability of Influenza, Norovirus, and Ebola using Information Geometry, Journal of the Royal Society Interface (2016)

Viva Success

Congratulations to Mike Maitland, Peter Dawson, Dario Papavassiliou and Federico Botta for the completion of their PhDs. Mike's viva was on "Control and feedback in stochastic thermodynamics"; Peter's was on "Modelling endemic foot-and-mouth disease in Turkey. Epidemic predictions with imperfect data"; Dario's was on "Exact solutions for hydrodynamic interactions of swimming microorganisms and self-propelled swimmers", and Fede's was on 'Quantifying human behaviour using complex social datasets'.
We wish them all the best in their careers!

Welcome to the New Students

We are pleased to welcome our third intake of 13 MathSys students to Warwick this year. We wish them the best of luck in their studies!

Change in the Editorial Team

Peter de Ford, one of the members of the editorial team for the last two issues of this newsletter, is leaving the team. We thank Peter for the great work he has done and wish him all the best in his next adventures!

We welcome Nada Jankovicova, an MSc student, on to the editorial team!

Events coming soon:

Some upcoming Warwick events that may be of interest:

- 6th December, DIMAP: Andrej Grzenik, "Densities of 3-vertex graphs"
- 7th December, MathSys Open Day
- 7th December, Complexity CDT: Yuri Lifanov's pre-viva talk
- 8th December, Royal Statistical Society: Prof. Keith Miller (Glasgow), "The Arctic tragedy of the Franklin expedition of 1845: statistical and forensic insights"
- 9th December, Complexity Christmas party
- 12th – 14th December, Mathematics Institute: Algorithms, Logic and Structure workshop
- 12th – 16th December, Warwick EPSRC Symposium on PDEs and applications: Geometric PDEs
- 19th January, Mathematics Colloquim: Dusa McDuff, "Sympletic Topology for non-specialist audience"
- 1st February, MathSys Open Day
- 24th February, Centre for Interdisciplinary Methodologies: ESRC Seminar Series: Complexity and Time
- 15th March, MathSys Open Day
- 27th -31st March, Warwick EPSRC Symposium on PDEs and their applications: Stochastic PDE: Analysis and computation

Editors:
Gareth Alexander,
Ayman Boustati,
Nada Jankovicova,
Iliana Peneva,
Luke Whincop

Contact G.P.Alexander@warwick.ac.uk