# NEWSLETTER

Centre for Doctoral Training
Mathematics of Real-World Systems

Issue 9, June 2018


## DID YOU KNOW...?

In the current issue of the MathSys Newsletter, we focus on research internships of our Ph.D. students; Michael's journey into London's DeepMind, Tim's placement with the Newton Bhabha programme in India, Sami's stay at the Institut Curie in Paris, Ayman's adventure at the Alan Turing Institute in London and Simon's visit to the Chinese University of Hong Kong.

We also do not forget about the exciting current events happening in the department! The 10th anniversary celebration of the Centre for Complexity held at the Shard, as well as the annual retreat, this year non-traditionally taking place in the Lake District.

Quite a few epidemiologists have attended the Epidemics[6] conference in Spain last December and many machine learning researchers regularly contribute to the Data Study Groups at the Alan Turing Institute. Two students write about their experiences and inspire more students to attend in the future. We also present an interview with the main organiser of the Machine Learning Reading Group Iliana Peneva.

Since this issue, there is a new section titled Useful Advice, which will contain practical information for students. This time, it contains information on applying for travel grants.

We conclude the issue with a special recognition to our own Heather Robson and mention the regular information about successful Ph.D. vivas, and recent publications and the future events.

We hope you will enjoy reading!

Editorial Team

Life at MathSys

## COMPLEXITY 10TH ANNIVERSARY CELEBRATION

Gareth Alexander

This year marked the tenth intake of students to the two doctoral training centres associated to the Warwick Centre for Complexity Science. To mark the milestone, a special event was held at The Shard in London, organised by Colm Connaughton and Martine Barons. Former and current students and staff from the Centre, as well as friends, associates and external partners, all made the trip to central London on a gloriously sunny spring day and were greeted by spectacular views over the river Thames and both London and Tower Bridges from the 19th floor of the Shard. In total, over 90 people attended what was an equally successful and enjoyable day away from the office.

The programme for the day included seven presentations, covering the history and future of the Centre, the successes of our former students, and perspectives from colleagues. Robin Ball, founding Director, kicked things off with reminiscences of how he and Robert MacKay got the doctoral training centre started 10 years ago, and the research of their joint student, Maria Diakonova, one of the first intake in 2007. This was followed by a talk on traffic modelling from Eddie Wilson, Chair in Intelligent Transport Systems at Bristol and our external examiner 2008-2013, who explained how to select the optimal lane on the motorway and what can happen if you don't. Taking on the baton from Eddie, Karoline Wiesner, Reader in Complexity Sciences at Bristol, grappled with the challenge of defining a complex system and talked about the Complex Systems Centre in Bristol.

**"A special event was held at The Shard in London, organised by Colm Connaughton and Martine Barons"**

After a break for lunch, we heard from some of our former students, with Marcus Ong (2010), CEO at Spectra Analytics, telling us about the company that he cofounded with Daniel Sprague (2010), how they are bringing complexity science to modern business practices, their future plans and the

Drinks reception at The Shard

innumerable helpful tips and insights they have gained in setting up their own company. Martine Barons (2008) then gave a delightful talk about how she came to academia in mid-life to pursue a passion for how mathematics can help to improve the world; Martine is now the Director of the Applied Statistics & Risk Unit in the Statistics Department.

Big data was the buzzword of the day before deep learning, and Sandra Chapman, professor of physics and currently on sabbatical at Boston University, entertained us with her data driven approach to space weather. Finally, Robert MacKay talked about the future of Complexity Science, both as a subject and a Warwick institution.

The day ended with a drinks reception admiring the stunning views over the Thames and with plenty of time for discussions about the future and networking.

# ANNUAL RETREAT 2018 - LAKE DISTRICT

Annika Stechemesser, M.Sc. student

On the 1st of May 2018, all members of the MathSys Centre travelled to the Lake District for the annual retreat. We spent four great days in the YHA Hawkshead with beautiful views, inspirational talks and nice company.

The first day of the retreat was especially exciting for us M.Sc. students, as we presented posters about our research group projects. During the course of the next two days, each Ph.D. student gave an interesting talk in a format of five minute presentations. The prize for the best talk was awarded to Sami Al-Izzi who, despite all obstacles, impressed everyone with his live demonstration of fluid structure interactions. The second place went to Jack Binysh for his talk about Maxwell's theory of solid angle and the construction of knotted vortex fields. The third place was awarded to Joseph Pollard who was talking about singularity theory in physics.

In the workshop sessions of the retreat, Gareth Alexander, Colm Connaughton, Federico Botta, Elizabeth Buckingham-Jeffery and Martine Barons gave us valuable tips for our M.Sc. or Ph.D. progress.

The highlight of the annual retreat were talks given by our guest speakers. Professor Eddie Wilson, the Head of Department of Engineering Mathematics at the University of Bristol, talked about the capacity of communication systems and offered a few insights into the complexity of this topic. Samuel Johnson, who is a Lecturer in Applied Mathematics at the University of Birmingham and also a former member of our centre, explained topology and dynamics in neural networks. An insight into work in the public sector was given by Peter Dawson, a former Ph.D. student at the Centre for Complexity Science and now a Senior Scientific Officer in the UK Home Office. Finally, Christopher Nemeth, Lecturer in Statistical Learning at the University of Lancaster, explored whether Monte Carlo Methods are dead (they are not!).

The Warwick Annual Retreat Projects returned this year with a variety of great ideas that got everyone engaged. Some of the projects included: coding in Befunge-93 - an esoteric programming language, developing reinforcement learning agents for the Pommerman competition, building mathematical models of eusociality and others. I felt especially happy as the project of my group won the best project prize. We invented a game called SUDO, that was aimed at teaching non-scientists basic coding skills.

On the afternoon of the second day, during the “scheduled fun” time slot, everyone had the opportunity to explore the surrounding area, either kayaking on the beautiful Coniston Water lake or going on various long walks, to Lake Windermere or towards Grizdale Forest. In the evenings, we relaxed, visited the local pub and some of us played board games together. Overall the annual retreat 2018 was a very fun and social experience and I am already looking forward to the next year!

## Academic Events

From machine learning to epidemiology... some students have a story to tell.

# MATHSYS AT EPIDEMICS[6]

Joe Hilton, Ph.D. student, 3rd year

Epidemics'6, the sixth edition of the International Conference on Infectious Disease Dynamics took place in the town of Sitges in north-west Spain last November. Myself along with a large group of students and staff from MathSys and beyond were on hand to present our work and touch base with the worldwide community of mathematical modellers.

The conference began with a workshop on outbreak analysis using R, run by Thibaut Jombart and Anne Cori of Imperial College London. This workshop introduced us to some of the software used by the team at Imperial during the 2014 Ebola pandemic and gave us a hands-on look at how epidemiologists use maths and statistics to deal with real-world crises.

**"MathSys made an impressive contribution to the nightly poster sessions"**

The attendees at Epidemics[6] included researchers at all stages in their career, giving us the chance to meet some of our field's most established academics whilst also comparing experiences with fellow PhD students from around the world. Alongside the contributed talks and posters were an excellent set of talks by invited speakers, including figures from both academia and the World Health Organisation. My personal favourite was a talk on bovine TB by Christl Donnelly, who shed some scientific light on the controversial issue of badger culling.

MathSys made an impressive contribution to the nightly poster sessions, with seven students presenting posters on subjects ranging from outbreak management to the ecology of white blood cells and TB bacteria. Myself and Alex Bishop delivered talks on childhood diseases and helminth (worm) infections respectively. This was an exciting opportunity to share our research with the wider epidemiological community, although with my talk taking place the morning after the conference dinner I suspect some audience members may have been more focused on warding off a hangover than listening to me speak!

Sitges is just a short train journey away from Barcelona and a few of us took the opportunity to explore the city in our free time. The highlights for me were a visit to the Roman city buried underneath the modern streets, and some amazing food, including fresh xurros and a phenomenal array of pintxos (basically tiny tapas served on a stick).

Epidemics6 was a brilliant opportunity to get a close look at the current state of epidemic modelling, and to share some of the contributions Warwick and MathSys are making to the field. If you're a MathSys epidemiologist be sure to come to the next Epidemics in 2019.

# DATA STUDY GROUPS IN LONDON

Ayman Boustati, Ph.D. student, 2nd year

The Data Study Group week, hosted by the Alan Turing Institute, is a bi-annual event where PhD students and early-career researchers participate in a week-long challenge to tackle data science problems posed by the institute's partners.

Participating in the DSG is a lot of fun! Over the course of three DSGs, I got to meet many smart and experienced researchers. I got to learn many skills that I otherwise wouldn't have; on my second DSG, I got to play around with probabilistic programming. I got to use methods that I was working on for my PhD in a real-world setting and heard immediate feedback on their efficacy from the stakeholders. I even got to do karaoke for the first time in my life on one of these weeks!

For my fourth DSG, I was selected to facilitate one of the challenges. Facilitating is a very different experience than participating. As a participant, my only responsibility was to work on implementing some solution for one of the sub-problems at hand and write about it in the report. As a facilitator, my responsibility was to manage the whole project. This was both a difficult challenge and a great learning experience. In the beginning, I faced issues with organising the team and leading the discussions, but as the week went by, I developed the skills necessary to ensure that the project was progressing smoothly.

**"I even got to do karaoke for the first time in my life"**

Having become a veteran DSG participant, I was recruited to join the organisation team. Organising such an event is a whole different ball game! It starts with weekly 2-hour long meetings more than four months in advance of the event. Everything is discussed from the quality of the reports to the type of food served. And tasks are handed out to members of the team according to interest and skills needed. Working in such a team is a great experience to appreciate the impact of events such as the DSG on both the challengers and the

## Research Interships

These are the stories of our MathSys Ph.D. students around the world!

# ENTERED THE DEEPMIND

Michael Pearce, Ph.D. candidate

In June 2017, Warwick Complexity held a machine learning summer school. Silvia Chiappa from Deepmind gave a talk on recent advances in reinforcement learning which a group of us had also been working on for traffic light control. After talking for a while she invited me to visit the Deepmind office to which I almost jumped over the moon with excitement! As an operational research student in the business school I always considered myself outside of the machine learning community and never thought they would give someone like me a chance.

In August I visited the office and had meetings talking about many topics in machine learning and spending the whole day "getting my nerd on". And yes, the office was bright, there were beanbags, and loads of free food including a buffet lunch. The next step in the application process was a 2 hour quiz. They asked theoretical questions about measure theory, Turing machines and NP-completeness and practical questions about clustering and reinforcement learning and types of neural network.

**"I almost jumped over the moon with excitement!"**

**"spending the whole day 'getting my nerd on"**

Two weeks later, to my great relief, I got an email to say I had passed the interview and they'd like me to meet more research staff members. Finally there was the culture interview, a non academic meeting about why I want to work at Deepmind and how I deal with stress, or roadblocks, in my work. It seems they liked what I said and in November I got the email to say that they wanted to offer me an internship place and they hoped I would accept it, who on earth would say no?

After various other commitments, I decided to start the 20 week internship in the Google HQ in central London in June 2018. Looking back, I think the fundamental things that led to the offer were that I get excited by statistics, machine learning and computers in general -- training my first neural network to classify hand written characters blew my mind. And as part of the Warwick Machine learning reading group I have learnt about many algorithms and models over the years.

I had never considered applying for an internship before having been invited to by a staff member, I had casually assumed it would be too competitive and out of reach. So in future I will avoid making such assumptions and encourage others to do the same!

# ANALYSING A NEGLECTED TROPICAL DISEASE IN BIHAR

Tim Pollington, Ph.D. student, 2nd year

Last summer, I was in India for four months as part of the Newton Bhabha PhD placement programme delivered by the British Council. The Newton Bhabha scheme promotes Indo-Anglo collaboration from research scholars of both countries with institutes relevant to the student's research. I was working with two organisations to better understand the transmission of a neglected tropical disease that continues to plague rural Bihar. The disease - visceral leishmaniasis (VL) - is transmitted between people by sandflies, with the poor living conditions in rural Bihar contributing to its sustained transmission. Most of the population lives below the government's poverty line, in homes made of natural materials, which also provide ideal indoor breeding sites for sandflies.

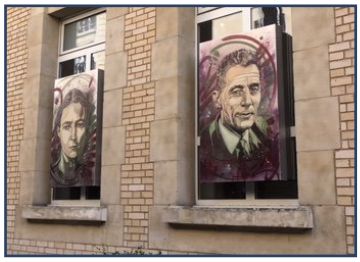
My projects included measuring the effectiveness of an integrated VL control programme, assessing if follow-up of family and neighbours of treated VL cases is worthwhile in detecting new cases, and creating a real-time epidemic predictor to indicate which low-endemicity villages are most likely to experience outbreaks and need intensified surveillance.

I have really enjoyed my time in Bihar. I made working relationships there that I am sure will continue throughout my PhD and beyond. I hope that my Indian PhD friends will apply in the next funding round and come to the UK to experience the same hospitality I received from my hosts.

# PHYSIQUE EN FRANCE

Sami Al-Izzi, Ph.D. student, 2nd year

I was lucky enough to spend the last 6 months visiting my second supervisor, Prof. Pierre Sens, at Institut Curie in Paris. Institut Curie is a research institute that has laboratories working on everything from fundamental biophysics to cutting edge medical research. It was exciting working in the theory group of an experimental lab, and I met a lot of excellent researchers who were always happy to talk about interesting science. Curie was a really welcoming and friendly place, and because of the international nature of the lab there wasn't really a language barrier.



The institute has a long and prestigious history, dating back to Marie and Pierre Curie's discovery of radium (there are still traces of this radioactivity around, and the institute is subject to monthly Geiger-counter tests).

**“There are still traces of radioactivity around”**

I had a great time in Paris which was also really productive. I would definitely recommend it as a destination for anyone considering a research career (particularly if, like me, you enjoy Patisserie, Crepes and Cheese!).

# ENRICHMENT YEAR AT THE ALAN TURING INSTITUTE

Ayman Boustati, Ph.D. student, 2nd year

Since September, I have been based at the Alan Turing Institute in London as an enrichment student. Along with fifteen other enrichment students (two of which, Jessie and Guillem, are also from the centre), we form the enrichment cohort for this academic year. Ever since I started, I have been trying to make the most out of this placement.

Moving to London was a big change for me as London is quite different from what I was used to around Warwick. Everything operates at a much faster pace, and everyone is rushing to be somewhere. I found this to be very uncomfortable for my first week. However, as the saying goes: if you can’t beat them, join them! So soon, I settled into a fast paced regime myself, and adopted a typical Londoner’s irritability and impatience during the commute on public transport! Surprisingly, I think that this has had a positive impact on me, as it started trickling into my work ethic and I have become, ever so slightly, more productive and efficient because of it!

Adjusting to life at the Alan Turing Institute was less of a problem. The Institute is very well located inside of the British Library, close to central London. The space itself is very open. There are no offices for academics or students; instead, it has a large open-plan office that operates on a hot desking system. The premises also contains a communal kitchen with free amenities like fruits, biscuits, fizzy drinks and, most importantly, coffee served from an iPad-operated tap! Everything is designed to make the researchers and the business team feel very welcome and to encourage them to talk to each other and collaborate. I found this space to be the ideal working environment for me, as it allows me to focus on my work when I am feeling productive, while also being able to unwind and have informal chats and brainstorming sessions with other researchers when I am in procrastination mode.

**"If you can’t beat them, join them!"**

Many people ask me: “What exactly are you doing at the Turing this year?” The simple answer is: just my normal PhD work! The main objective of the enrichment scheme is to give the students access to the Institute’s resources allowing them to improve their research without any strings attached. So for the past eight months or so, I have been mainly continuing with the work that I have done in my first year at Warwick. At the Turing, I got support in various aspects concerning my PhD. For instance, I was given guidance by a member of the Research Software Engineering team on how to properly create and test software that I was writing for my PhD. I was also given cloud computing credits to run my experiments on high performance virtual machines when I was scrambling for computational resources before the NIPS deadline!

One of the perks of being based at the UK’s national institute for data science and artificial intelligence is that I got to be exposed to many of the problems and challenges faced in these two areas. There are numerous partners to the institute that come with interesting problems, and there are opportunities for PhD students to be involved in these projects. I am involved in a project with Samsung, where I am part of a 3-member team working on building a recommender system for mobile games. My role in this project is mainly scientific, working model development in TensorFlow and Spark.

All in all, my time at the Alan Turing Institute so far has been very exciting and rewarding. I have learned a lot from being there, while also having so much fun. I hope that I can still continue working with the Institute when my placement ends and I am back at Warwick.

# DIGITAL PATHOLOGY IN HONG KONG

Simon Graham, Ph.D. student, 2nd year

For two months at the start of this year, I visited The Chinese University of Hong Kong (CUHK), where I worked as a deep learning research assistant within the department of computer science and engineering. I worked closely with students that specialised in deep learning using medical images. Specifically, my aim was to develop a method for automatic gland segmentation within colon histopathology images. This method is an important prerequisite step in the pathology workflow because morphological features can subsequently be extracted from the segmented glands for prognostic assessment.

During my time in Hong Kong, I lived in the centre of Mong Kok and travelled every day to the mountainous CUHK campus in Sha Tin. Weekdays on campus were busy, where I learned lots off the other students within the lab, whereas during weekends I made the most of exploring the local area. Some of my favourite things that I did included hiking up to 'Suicide Cliff' on the Kowloon Peninsula and visiting the Big Buddha statue on Lantau Island.

**"Some of my favourite things that I did included hiking up to 'Suicide Cliff' on the Kowloon Peninsula"**

As a result of my time in Hong Kong, the gland segmentation algorithm has now been finalised and has been accepted for presentation at the Medical Imaging for Deep Learning (MIDL) in Amsterdam in July this year. The visit has also led to further collaboration on a handful of projects between Warwick and CUHK within the field of computational pathology.

## Interview

Talking to people who inspire us.

# WOMEN IN SCIENCE

Iliana Peneva, Ph.D. student, 3rd year

More and more academic conferences, and institutions are addressing the issue of lack of diversity in academia. For example, in machine learning communities, events like Black in AI, Deep Learning Indaba, Women in ML events (WiML) are a great example of highlighting the work of female researchers and underrepresented minorities.

Inspired by these movements, students within MathSys urge to address these issues through their leadership as well. Recently, we had an opportunity to speak to Illiana Peneva, who besides excelling in her research, also takes on an active leadership role in addressing important social issues, such as women in science and women in machine learning in particular.

Iliana is finishing her PhD, during which she worked on developing clustering methods to model high-dimensional health data. This year, she took on a role to run the Machine Learning Research Group (MLRG) at MathSys, the goal of which is to discuss various novelties within the field, inviting speakers and with that bringing new perspectives to the group.

***Iliana, how did you get started in Machine learning?***

I did my undergraduate degree in Mathematics at the University of Edinburgh and I didn't know about the existence of Bayesian Statistics and Machine learning until I started my M.Sc. at Warwick. I found out about Machine learning during my group project and I was instantly fascinated by its wide range of applications.

**"I think it's quite important to make students more aware of the work and achievements of female researchers."**

***Iliana, how did you feel at first about an opportunity to run MLRG?***

I was very excited when I got handed over the MLRG - I was going to be the first female organiser of the club and to have the opportunity to influence its direction in times when machine learning is becoming increasingly more popular! Rob and Jim ran the Machine Learning Club (ML Club) very successfully over the last three years; however, there was definitely room for improvement. I felt like the ML Club had the potential to expand and connect with other machine learning groups both from academia and industry. I also wanted the group to become more diverse and inclusive, and to encourage students and researchers from underrepresented minorities to join the weekly meetings.

***What were your main goals for the year?***

Having done an undergraduate degree where I didn't have a female lecturer, I think it's quite important to make students more aware of the work and achievements of female researchers. That was why I wanted to create more opportunities for women in machine learning to present and promote their research. Thanks to RSSP funding, we were quite lucky to hear from some great female early-career speakers, both from academia and industry - more than half of the speakers this year are women. We also managed to establish valuable connections with different universities, the Alan Turing

Institute, Mind Foundry and Microsoft Research Cambridge.

***Were there any personal highlights in terms of talks for you this year?***

My personal highlights are definitely the series of female speakers' talks in the first term (Alejandra Avalos Pacheco, Laura Guzman Rincon, Bhavan Chahal and Elena Kochkina) and the talk by Alessandra Tossi from MindFoundry.

***Are there already any future plans for next year, for the reading group and for you personally?***

I hope that the MLRG will continue to expand and attract more people. A lot of interesting research is happening in the industry and it will be great if we get more speakers from a variety of companies showcase their work. For me personally, I'm planning to continue working in the area of cance research because I find the problems in the area very interesting and think that I can make a difference with the skills and knowledge I have.

## Useful Advice

Search for opportunities you cannot miss.
Travel grants you didn't know existed.

# APPLY APPLY APPLY

### Federico Botta, Complexity alumni

Applying for travel grants during your PhD is a good way of showing that you can attract funding, which may be useful in future applications and interveiws if you are planning an academic career. There usually are several options to apply for funding. Conferences and summer schools often have their own funding scheme. Learned societies also offer travel grants. Examples include: the Complex Systems Society and its young researchers community (yrCSS), the London Mathematical Society, and the European Society for Mathematical and Theoretical Biology. There are also opportunities from within the university, such as the scheme funding research trips to North America or China.

It is important to remember that some of these applications require a reference letter from your supervisor, so make sure you give them enough time to write the letter before the deadline. In the application itself, make sure you highlight why it is important for you to attend the event, how it will help your research and career, and how good it will be in terms of networking opportunities.

# EUROPEAN COLLABORATION

### Roger Hill, Ph.D. student, 2nd year

Short Term Scientific Missions (STSM) are designed to be a simple way to apply for money for European collaborations, with minimal bureaucracy, run by the European Cooperation in Science and Technology (COST) organisation. There are numerous different COST actions which can be applied to, so there is usually one that will fit with any research project.

I personally used the grant to visit France to collaborate with an industrial partner. The funding meant that I could spend a week in France to talk with the industrial partners and advise them on how to improve their modulated delivery pump in accordance with the modelling I had undertaken. The STSM had a simple application, which involved a brief (2000 words max) outline of the project, its goals and how it fits with the COST action. When the mission was complete I had to write a short report (2000 words) to describe how the mission had gone and the main results of the mission. Overall, it is designed as a way to collaborate across Europe in a quick and simple manner, which for me was exactly what it did.

## Regulars

# VIVA THRIUMPHS

We would like to congratulate the following students who successfully completed their vivas: Jennifer Jackson (Ph.D. awarded for Bio-Inspired Hetrogeneous Ad Hoc Networks), Elizabeth Buckingham-Jeffrey (Ph.D. awarded for Mathematical and Statistical methods for disease surveillance, a focus on gastrointestinal disease), Neil Jenkins (M.Phil. awarded for Mechaniochemical cell biology and molecular motors), Stamatios Katsikas (Ph.D. awarded for Game Theoretic Models of Networks Secruity), Ellen Webborn (Ph.D. awarded for Energy Storage and Demand Side Response), Janis Klaise (Ph.D. awarded for Topology and dynamics of complex networks), Robert W. Eyre (Ph.D. awarded for Health networks in resource poor setting).

We would also like to congratulate the last year's M.Sc. students who graduated in January.

**Hats off** during M.Sc. graduation

# RECENT PUBLICATIONS IN MATHSYS

• "Hydro-osmotic Instabilities in Active Membrane Tubes", **Sami C. Al-Izzi** et.al., Phys. Rev. Lett. 120, 138102 (2018).

• "Relaxation dynamics of maximally clustered networks", **Janis Klaise** et.al., Phys. Rev. E 97, 012302 (2018).

• "Concurrency of partnerships, consistency with data, and control of sexually transmitted infections", **Trystan Leng** et.al., Epidemics, 2018.

• "Modelling fertility in rural South Africa with combined nonlinear parametric and semi-parametric methods", **Robert W. Eyre** et.al., Emerging Themes in Epidemiology 15:5 (2018).

• "Spreading of components of mood in adolescent social networks", **Robert W. Eyre** et.al. (2017). R. Soc. open sci. 4: 170336.

• "A Stability Analysis of Thermostatically Controlled Loads for Power System Frequency Control," **Ellen Webborn** et.al., Complexity, vol. 2017, Article ID 5031505, 26 pages, 2017.

• "Efficient expected improvement estimation for continuous multiple ranking and selection", 2017 Winter Simulation Conference (WSC), **Michael Pearce** et.al., DOI: 10.1109/WSC.2017.8247948

• "Bayesian simulation optimization with input uncertainty", 2017 Winter Simulation Conference (WSC), **Michael Pearce** et.al., DOI: 10.1109/WSC.2017.8247958

• "Value of information methods to design a clinical trial in a small population to optimise a health economic utility function", **Michael Pearce** et.al., BMC Med. Res. Meth. 18:20 (2018).

• "Continuous multi-task Bayesian Optimisation with correlation", **Michael Pearce** et.al., Eur. J. Op. Res., available online (2018).

• "Classification of lung cancer histology images using patch-level summary statistics", **Simon Graham** et.al., Proc. SPIE 10581, Medical Imaging 2018: Digital Pathology, 1058119 (6 March 2018).

• "SAMS-NET: Stain-aware multi-scale network for instance-based nuclei segmentation in histology images,", **S. Graham** et.al., 2018 IEEE 15th International Symposium on Biomedical Imaging (ISBI 2018), Washington, DC, 2018, pp. 590-594.doi: 10.1109/ISBI.2018.8363645

• "MILD-Net: Minimal Information Loss Dilated Network for Gland Instance Segmentation in Colon Histology Images"., **Graham, Simon** et.al., Medical Imaging With Deep Learning (MIDL 2018), Amsterdam.

*(Complete citations with DOI links can be found on newsletter web.)*

# SPECIAL RECOGNITION

At this year's University Awards, our Administrator, Heather Robson, has been nominated for two very special prizes, the Unsung Hero Award and the Service Excellence Award! The first one honours the people who make the difference in your daily life and the second one appreciates individuals who are commited to offering excellent professional service at all times, and work proactively to improve Warwick life. As the text of Heather's nomination says, "The department would not be the same without her, it is a well-functioning place of work where people feel as if at home though her kindness." The editorial team would also like to say one big "Thank you"!

# FUTURE EVENTS

- 2nd - 3rd July 2018: Baysm 2018 (by Statistics Warwick)
- 9th - 13th July 2018: Statistics LMS Invited Lecture Series and CRiSM Summer School in Computational Statistics 2018 (by Statistics Warwick)
- 11th - 12th July 2018: Introduction to GPU Programming Summer School
- 19th July 2018: Mathematics Graduation (University)
- 20th July 2018: MIR@W day: Multiscale Modelling approach to Fluid Flows involving Phase Change (by Mathematics Institute)
- 17th - 19th September 2018: Recent Developments in the Study of Growth Processes (Workshop by Mathematics Institute)
- 25th (2-5pm) - 26th (all day) September 2018: MathSys M.Sc. project presentations
- 27th September 2018: MathSys Exam Board
- 5th December 2018: MathSys Open Day

**Editors**
Gareth Alexander
Jevgenij Gamper
Laura Guzman Rincon
Nada Jankovicova
Annika Stechemesser

We would like to welcome Annika and Laura on to the editorial team! For current and previous online versions please visit www.warwick.ac.uk/fac/cross_fac/complexity/newsandevents/newsletter
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