

Fully funded UK/EU PhD Scholarship in Predictive and Prescriptive Analytics for the Media Industry

Closing date for applications: 31st of August 2019

UK/EU PhD Scholarship is to start 1st of October 2019

Funding period: 1/10/19 – 30/09/22

Project Description:

A unique opportunity of an industrial-collaboration fully funded UK/EU PhD scholarship at the prestigious Durham University (world-wide top 79th by QS World University rankings and 5th in the UK by the Guardian) is offered by the 'Intensive Industrial Innovation Programme' and Distinctive Publishing Ltd, Newcastle. The successful PhD student is to experience both academia and industry, and spend up to 50% of her/his time at the Distinctive Publishing business premises, with the rest at the Department of Computer Science, Durham University. The main academic supervisor is to be Professor Alexandra I. Cristea, a world leader in artificial intelligence for the web and web science. The provision of a Predictive and Prescriptive analytics engine that would enable publishing enterprises to gain a competitive advantage through the use of prescriptive approaches in real time. Due to the emergence of big data technologies, there is the need for methodologies and algorithms capable of analysing and deriving useful insights that will assist management or marketing decision making. This has resulted in an increased level of research revolving around prescriptive analytics. However, the field of prescriptive analytics is still relatively immature, with generic models being somewhat conceptual and most applications being developed in an ad-hoc manner.

Since data-driven modelling has just started to emerge, there is the possibility to go a step beyond, with prescriptive models that are built by analysing data in a batch mode for automated data-driven model building, with additional opportunities to develop into more widely applicable approaches, outside the realms of existing domain knowledge.

The dynamic and complex nature of a publishing environment, and its associated reader transactions, causes a continuous change of a problem formulation, e.g., new types of constraints have to be added or there is a change in problem environment. This creates a complex and ever-changing problematic area for publishing organisations looking to enhance readership engagement with the use of technology; particularly if readership actions are event driven from external factors. These intelligent, big data analytics, can be applied to each of the main marketing management functions in order to sustain business competitiveness, allowing the publisher to be more intelligent decisions at all customer and product levels, and enhance organisational decision making. To this end, approaches and algorithms for model adapting are required. Such approaches become even more important in a real-time or streaming computational environment.

Currently, applications using feedback mechanisms for tracking the suggested recommendations and for continuously improving the prescriptive models are limited, while other relevant research works deal mainly with conceptual frameworks. Prescriptive analytics is an emerging and promising field of data analytics that aims to prescribe decisions on the basis of the predictive analytics outcomes.

There is an increasing interest in literature on this topic due to its potential for advancing data analytics and enabling enterprises to gain a competitive advantage.

The product/intervention promises to have a significant impact on an industry that is recognised as lacking the fundamental competences needed to significantly benefit from, or react swiftly to, the changing and complex needs of readers using data analytics. Moreover, the new product/intervention will surpass previously sought after customer intelligence gathering where the general need for descriptive analytics has commercially superseded the intimidating prospect of the requirements needed for a prescriptive approach to managing readership interactions due to the

fact that dissecting past data is a complicated task that few publishing firms have the technical skills to master.

It is widely accepted that due to the emergence of 'big data', prescriptive and predictive analytics have been incorporated into a host of platforms, aiming to support company/user decision making. However, existing products focus mainly on feedback mechanisms for tracking the suggested recommendations and for continuously improving the prescriptive models, meaning limited use and applicability, limited to 'decision support' usage that would provide a recommendation for the user (publisher) to implement. Additionally, other relevant research works deal mainly with conceptual models. The nature of the unstructured data that would be within Distinctive's current platform, and the consistent dynamic nature of the data would mean that the new product/service would need to have the ability to 'batch' updated data and provide 'decision automation' services based on the changing landscape of reader interactivity, allowing for utilisation for uncertain decision making ahead of time. This approach has limited research, and to the knowledge of the company, remains unavailable on the market as a commercial product for publishers.

Thus, Distinctive Publishing is looking to introduce an additional product/service to its current platform but introducing two distinct areas to enhance its existing capability of descriptive analytics:

1. Predictive Analytics Engine – modelling past data to predict future actions, behaviours, or outcomes of readers/users within the existing platform.
2. Prescriptive Analytics Engine - providing direct insight into the consequences of different actions by uncovering the key cause-and-effect relationships that impact the outcomes the publisher focuses on, and will be used for understanding what causes what, and why within the readership of content/publications

While a predictive analysis would aim to predict the value of an outcome of interest, a prescriptive analysis would aim to understand the factors that determine that outcome, so that it can influence the organization's favour.

Intensive Industrial Innovation Programme

The 'Intensive Industrial Innovation Programme' (<https://www.dur.ac.uk/iip/>) is funded by the European Regional Development Fund, and reflects North East England's universities joining forces under an extension to the £3.9m scheme which initially commenced in October 2018, to connect the region's businesses with research to encourage growth and job creation. Further funding of £3.7m has been specifically allocated to allow 45 SMEs to apply for a position on the programme. PhD students will be commencing their position 1st October 2019.

Distinctive Publishing, Ltd

Distinctive Publishing (<https://www.distinctivepublishing.co.uk/>) is a full service publishing, creative and advertising agency in the heart of Newcastle upon Tyne. Distinctive Publishing's transparent policy with clients is reflected in their hard working and friendly culture, allowing them to go the extra mile in all their working relationships and overachieve on their client expectations.

Durham University

Durham University (<https://www.dur.ac.uk/>) is one of the world's top universities (ranked 74th by the QS World University Rankings 2019; 5th in the UK by the Guardian University Guide 2020; 6th by The Complete University Guide 2020 and 7th by the Times and Sunday Times Good University Guide 2019) with strengths across the Arts and Humanities, Sciences and Social Sciences. We are home to some of the most talented scholars and researchers from around the world who are tackling global issues and making a difference to people's lives.

The University sits in a beautiful historic city where it shares ownership of a UNESCO World Heritage Site with Durham Cathedral, the greatest Romanesque building in Western Europe.

A collegiate University, Durham recruits outstanding students from across the world and offers an outstanding wider student experience.

Less than 3 hours north of London, and an hour and a half south of Edinburgh, County Durham is a region steeped in history and natural beauty. The Durham Dales, including the North Pennines Area of Outstanding Natural Beauty, are home to breath-taking scenery and attractions. Durham offers an excellent choice of city, suburban and rural residential locations. Durham University seeks to promote and maintain an inclusive and supportive environment for work and study that assists all members of our University community to reach their full potential.

The Computer Science Department

Academic staff within the Department (<https://www.dur.ac.uk/computer.science/>) consistently produce high impact research spanning several areas of Computer Science that include Algorithms and Complexity, Computer Vision and Image Processing, and High Performance Computing and Big Data Processing.

In REF2014, 85% of our research was recognised as internationally excellent or world-leading.

We work closely with industry (e.g. Jaguar Landrover, Renault, IBM, P&G) and government departments (e.g. MoD, Home Office, Department of Transport). Research-led teaching is a key strength of the Department, which came 6th in the Complete University Guide 2019 and is ranked 3rd in NSS student satisfaction out of Russell Group Departments.

The Department has an exceptionally strong External Advisory Board that provides strategic support for developing research and education, consisting of high-profile industrialists and academics.

The Computer Science Department is rapidly expanding – it will more than double in size over the next 10 years from 18 to approximately 50 staff. Existing research areas will be strengthened and new areas initiated. This is a fantastic time to join Computer Science, as the University is making a very considerable investment in the Department – both via new staff and with the construction of a new £40m+ building for the department (joint with Mathematical Sciences) anticipated to be completed in 2020. PhD students in the department are well catered for, starting with a dedicated work space, a computer up to their own specifications, as well as peripherals. Additionally, an NVidia GPU cluster is available for students to run their data-intensive tasks on, beside the Hamilton cluster available at university level. The department offers a lively and collegial research environment for PGR, with PhD student-led bi-weekly Junior seminars, as well as yearly Research Day. Enhanced pastoral care is ensured by a dual supervisory system, where each PhD student has a secondary supervisor allocated, beside the primary one. Departmental workshops are provided for usage of the NVidia cluster, for career advice, etc., beyond the workshops and courses provided by the University, via the DCAD institute (<https://www.dur.ac.uk/dcad/development/>) and beyond. The department also provides currently for PhD students a generous amount of research costs for publications/travel expenses/consumables for up to £2000 per year.

Professor Alexandra I. Cristea

Alexandra I. Cristea is Professor, Head of the Innovative Computing research group (ICG) at the Computer Science Department, Durham University. Her research includes user modelling and personalisation, web science, learning analytics, semantic web, social web, authoring, with over 250 papers on these subjects (over 3700 citations on Google Scholar, h-index 31). Especially, her work on frameworks for adaptive systems has influenced many researchers and is highly cited (with the top paper with over 180 citations and growing). She is within the top 50 researchers in the world in the area of educational computer-based research according to Microsoft Research. Prof. Cristea has been highly active and has an influential role in international research projects. She is experienced in running research projects and has led various projects - Newton funded workshop on Higher Education for All ('14-'18), Santander funded Education for disadvantaged pupils ('14-'18'), Warwick-funded project APLIC ('11-'12), EU Minerva projects ALS (06-09) and EU Minerva ADAPT ('02-'05); as well as participated as university PI in several EU FP7 projects - BLOGFOREVER ('11-'13), GRAPPLE

('08- '11), PROLEARN ('07) and as co-PI in the Warwick-funded Engaging Young People with Assistance Technologies ('13-'15) also featured by the BBC. She has been keynote/invited speaker, organizer, panelist and program committee member of various conferences in her research field (including, for example, AIED, ITS, UMAP, ED-MEDIA, Hypertext, Adaptive Hypermedia, ICCE, ICAI). She is a member of the editorial board of the IEEE Transactions on Learning Technologies, executive peer reviewer of the IEEE LITF Education Technology and Society Journal and she was co-editor of the Advanced Technologies and Learning Journal. She acted as UNESCO expert for adaptive web-based education at a high-level (Ministry of Education and Educational institutes) meeting of East European countries, educational invited expert for the Romanian prime minister, as well as EU expert for H2020, FP7, FP6, eContentPlus. She is a BCS fellow, a HEA fellow, IEEE Senior Member and IEEE CS member, EATEL (European Association of Technology Enhanced Learning) founding member, ACM member. Currently, Prof. Cristea has a very active cohort of 9 very active and dedicated PhD students, who are supported by one-to-one meetings, a reading group, task-related meetings (e.g. meetings of co-authors on a paper, brainstorming meetings, etc.) as well as the regular ICG group meetings and seminars, beyond other departmental provisions.

The studentship includes:

- A stipend (The stipend for 2019/10 is £15,009)
- Full fees covered for three years for Home/EU by Distinctive Publishing
- Research costs to cover publications/travel expenses/consumables up to £2000 per year
- PhD students in Computer Science are allocated their own desk space in the graduate students' room, usually close to other students doing related research
- a new desktop computer (based on student specifications discussed with Prof. Cristea) will be provided (GPU processor is available)
- a laptop (up to £2000) will be provided by Distinctive Publishing.

Entry Requirements:

You need minimally a 2:1 Bachelor's degree or equivalent in an appropriate subject such as Computer Science or a related discipline, from a recognised university.

EU students would also require a minimum overall IELTS 6.5 score of which no element of less than 6.0 (or equivalent).

Excellent programming skills and an interest in machine learning and AI are essential criteria. Experience in the area of machine learning and data mining is an advantage.

How to Apply:

To apply for this studentship, applicants should submit an application using the online system found at <https://www.dur.ac.uk/postgraduate/study/apply/>

Documentation should include:

- A cover letter
- An initial project proposal (minimally containing this project's application area, motivation, research questions, related research, data sources, research plan for the three years)
- A CV
- Full and final academic transcripts and certificates
- IELTS certificate
- Two references
- Academic contact is Professor Alexandra I. Cristea

- For the scholarship, put: **Fully funded UK/EU PhD Scholarship in Predictive and Prescriptive Analytics for the Media Industry.**

Informal enquiries can be made to the project supervisor:

Professor Alexandra I. Cristea (Computer Science): alexandra.i.cristea@durham.ac.uk

Further information on the department can be found at:

<https://www.dur.ac.uk/computer.science/>

Short-listed applicants will be invited for an interview (in person or VoIP, depending on applicant and interviewers' availability) to take place between 1st and 15th of September 2019