# Adrian **Byrne**

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| **Technology Centre:** | CeADAR - National Centre for Applied Data Analytics & Machine Intelligence |
| **Academic Mentor:** | Dr. Quan Le |
| **Company Partner:** | Idiro Analytics |
| **Company Mentor:** | Mr. Aidan Connolly |

Adrian completed his PhD in Social Statistics at the University of Manchester (2018), MSc in Statistics at the University of Warwick (2010), MSc in Economics at Trinity College Dublin (2006), and a joint honours BA in Mathematics and Economics at Trinity College Dublin (2005). Adrian has more than ten years experience of working in the university sector as a research fellow, data analyst and associate tutor. He also has private sector experience of working as an economic consultant. Adrian is a quantitative social scientist with expertise in multilevel modelling and his quantitative assessments specialising in examining inequality at different levels and how these inequalities interact. With this fellowship, Adrian has obtained more than €500k in research funding to date.

### Dr. Quan Le

Quan is a Research Fellow and a senior member of the Applied Research Group within CeADAR at UCD. Quan completed his PhD in protein structure classification, using neural networks and kernel methods. After his PhD, he completed a postdoc in bioinformatics, working on the application of profile Hidden Markov Models in sequence alignments. He has been leading multiple industry-focused machine learning projects, and developed two deep learning libraries. His research interests include the application of machine learning in bioinformatics, healthcare, geospatial data, cybersecurity, and AI Ethics.

### Mr. Aidan Connolly

Aidan Connolly is the founder and CEO of Idiro Analytics. In 2020, Idiro Analytics were recognised as the Analytics SME of the Year and Aidan was awarded the Analytics Leader of the Year by the Analytics Institute. In 16 years of tenure as CEO of Idiro, Aidan has overseen collaboration with a number of academic institutions including University of Limerick (Industry Fellowship), IT Tallaght, UCD (SFI funded Clique Research Project), and DERI Galway (sentiment analysis project). Additionally, Aidan spent 4 years on the CeADAR Industry Steering Board and currently sits on DBS's Business and Marketing Advisory Board. From the beginning of Aidan's career in the early 1990's, he has worked in the field of analytics, first in the European Commission (DG12) and later in Vodafone Ireland before establishing Idiro Analytics in 2003. As a pioneer in advanced analytics, Idiro has developed a number of innovative products including Idiro SNA Plus, an industrial-scale social network analysis tool and Red Sqirl, a big data analytical platform. Since 2003, under Aidan's leadership, Idiro has carried out projects in over 30 countries and has worked with a roster of blue chip companies such as Verizon Wireless (USA), AIB, Telefonica (Spain), Electric Ireland and Vodafone (Germany, Spain, Ireland, UK). Advancing the field of analytics has always been core to Aidan's vision for Idiro - it is how Idiro differentiates itself from its competitors and it is why he is keen to explore the area of algorithmic auditing further.

## CeADAR

CeADAR is Ireland's national centre for Applied AI. CeADAR is a market-focused technology centre that drives the accelerated research, development, and deployment of AI and data analytics technology and innovation into businesses. The Centre is the bridge between the worlds of applied research in AI and data analytics and their commercial deployment. CeADAR is funded by Enterprise Ireland and IDA Ireland, is headquartered in University College Dublin and is a partnership with the Technological University Dublin (formerly DIT). The Centre's work focuses on developing tools, techniques and technologies that enable more people, organisations and industries to use analytics and AI for better decision making, unlocking hidden insights and sustained competitive advantage. CeADAR provides a vibrant research community with vast experience and expertise in the development and dissemination of scientific research including industry-applied data analytics. The centre is the designated EU AI Digital Innovation Hub in Ireland and is one of only 30 across the EU.

## Idiro Analytics

Idiro Analytics is Ireland's pioneering data analytics consultancy firm. Idiro was voted Analytics SME of the year at the Analytics Institute of Ireland's Analytics and AI Awards 2020. The company specialises in designing and delivering bespoke solutions using advanced analytics, artificial intelligence and business intelligence to solve complex business problems. Headquartered in Dublin, and 100% Irish owned, Idiro Analytics significantly improves commercial and operational key performance indicators (KPIs) for its clients by using the very latest in advanced analytics techniques. Idiro's expertise includes setting up the infrastructure and processes needed to help organisations understand and predict their customer behaviour. The company empowers organisations with the capability to harness the power of data for effective decision-making in order to improve overall commercial and operational KPIs. This is achieved by increasing the effectiveness of customer analytics and operational efficiency and productivity.

# Adrian's project

## "Algorithmic auditing for improving model explainability and detecting bias using sociodemographic data"

There is a growing demand for algorithms to be audited, which will be of benefit to both the private and public sector. These algorithms should be consistent with regulation and they should be furthering, not hindering, societal good. In order to understand possible impacts of algorithmic systems and improve public trust in them, there is an increased imperative for transparency, accountability and oversight of these systems. As algorithms augment, assist and eventually replace human-mediated processes, we need to have confidence in them, to understand the impact they are having and be able to identify their harmful, unlawful or socially unacceptable outcomes. To properly undertake algorithmic auditing from a bias detection/fairness perspective, demographic data must be incorporated into the algorithmic setup and the algorithms themselves must be interpretable. It is proposed in this research project to develop a process by which one can successfully incorporate demographic data (if none is readily available) into machine learning algorithms using either directly observed/collected demographic data or indirectly derived information from observed place and time characteristics linked to affected individuals. The idea is to assess the correlation between bias critical demographic data and business critical feature data to help add context to the features that create the predictions and inform business decisions. This assessment will be achieved by running existing algorithms through explainable machine learning processes. It is anticipated that this project will be of benefit to businesses (explainability of their algorithms and bias detection), customers (recourse by explaining outcomes that affect them) and regulators (auditing algorithm methods). If successful, this process can become a product/service offering for Idiro Analytics as well as help widen the scope of expertise for CeADAR.