

John Fitzgerald

CONTACT INFORMATION

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EDUCATION

InFoMM DPhil (PhD), University of Oxford (2018–2022)

Thesis: *Statistical models for dynamic networks with metadata.*

The focus of the project is to develop statistical models for dynamic (i.e. time-dependent) networks that include metadata – information other than the connections between nodes. These are applied along with other existing methods to large-scale publication data, to better understand the global development of knowledge.

Fourth year (current)

- Presented talk at the Conference on Complex Systems 2021;
- Work completed sufficient for several upcoming papers to be published in coming months, along with an accompanying R package;
- Participating in Creative Destruction Labs Oxford entrepreneurship program.

Third year

- Attended NeurIPS conference;
- Helped organise the Oxford Summer School in Economic Networks;
- Acted as facilitator in an ATI Data Study Group (DSG) for Entale;
- Presented lightning talk at Networks 2021 conference.

Second year

- Accepted poster for CompleNet conference;
- Participated in an ATI DSG, working with The National Archives;
- Participated in Policy Hacks Oxford;
- Attended GeoInno2020 conference.

First (training) year

Courses: *Mathematical modelling; Scientific computing; Modelling, analysis and computation of discrete and continuous real-world problems; Maths for energy; Contemporary numerical techniques; Mathematical analytics*

- Awarded IMA prize for Best Team Performance in the UK Graduate Modelling Camp, for vasculature reconstruction from RGB facial images;
- Investigated neural network defences for DSTL at ESGI 145, with promising leads for adversarial example detection.

MMath Mathematics, University of Oxford (2014–2018)

Fourth year (MMath) – 1st Class Honours (80.6%)

Topics in fluid mechanics; Mathematical mechanical biology; Elasticity and plasticity; Networks; Perturbation methods; Statistical mechanics; Applied complex variables; CCD Dissertation

Awarded Lincoln College scholarship on the recommendation of tutors for academic achievement and exceptional promise.

Third year (BA) – 1st Class Honours (79%)

Viscous flow; Waves and compressible flow; Numerical solution of differential equations I; Applied PDEs; Classical mechanics; Nonlinear systems; BEE Extended essay

Awarded a grant from the Senior Tutor's Fund (Lincoln College) to conduct extra-curricular research in the summer before the start of the year.

Further educational background available on request.

SELECT
EXPERIENCE

Data Scientist, innerworks (2021-)

While commissioned by innerworks – a start-up company that is developing a new, network-based method for personality testing – I have conducted a variety of data analysis and visualisation tasks. These include proposing innovative methods for verifying identities and relationships given user responses, combined with associated metadata, along with predicting the strength of such relationships. I have also generated a prototype interactive user interface to ask questions and produce results, and worked directly with the founders to posit how to best leverage user data, and shape future avenues to explore for the product.

University teaching (2019-)

I have been both a teaching assistant (TA) and lead tutor for intercollegiate classes for undergraduates in the university – these typically include around 10-12 students. Being a TA entails marking sheets and leading parts of classes, while as a tutor I oversee TA performance and lead the bulk of the class. I have been a tutor for the third year Graph Theory, and fourth year Networks modules, while previously I was a TA for the third year Logic, and fourth year Theories of Deep Learning modules. Clarity in conveying different ways of understanding the same question and being engaging while teaching are key in ensuring students gain the most benefit from our time together.

PAPERS
/PROJECTS

Is academia becoming more localised? The growth of regional knowledge networks within international research collaboration (2021)

In collaboration with Dr Neave O’Clery and Sanna Ojanperä, accepted to Applied Network Science

Uncovering significant inter-country research ties using Scopus co-authorship data, we show that within-region collaboration has increased over the past five decades relative to international collaboration, and accordingly research communities have become more regional in recent years. These findings are unexpected in light of a presumed continual increase in globalisation, and have significant implications for the design of programmes aimed at promoting international research collaboration and knowledge diffusion.

ATI DSG project with Entale (April 2021)

Recommendation Systems for Podcast Discovery

In this challenge, we proposed and implemented a method for capturing relationships between podcasts and what’s mentioned in them, and worked towards building a podcast recommendation system. We then constructed a variety of recommendation pipelines, including a network topic model based approach, conventional matrix factorisation, deep learning techniques, and topic similarity methods, and evaluated these against real user data. I helped facilitate this project – managing the team as a whole, our relationship with members of the company, and taking a holistic view for overall direction. I also implemented a deep learning matrix factorisation based method for recommendation (ConvMF).

ATI DSG project with The National Archives (December 2019)

Discovering topics and trends in the UK government web archive

The challenge we addressed in this report was to make steps towards improving search and discovery of resources within this vast archive for future archive users, and how the UKGWA collection could begin to be unlocked for research and experimentation by approaching it as data (i.e. as a dataset at scale). I suggested several options for hierarchical search implementations using a network constructed from topic similarity on documents, along with investigation and application of both NLP and network methods in general.

InFoMM mini-project (April 2019 – July 2019)

Compression and Bayesian inference for deep neural networks

Supervised by Prof. Stephane Chretien and Prof. Jared Tanner

In collaboration with the National Physical Laboratory, I investigated the applicability of deep neural networks for the task of semantic segmentation of satellite images of the sea. The project then evolved into an exploration of a variety of network compression techniques, and also (of particular interest to NPL) methods for uncertainty quantification. The combination of these techniques may additionally provide a means of detecting adversarial examples, thus assisting NPL in their pursuit of high-accuracy, robust neural networks for use in a variety of real-world tasks.

GENERAL

Knowledge of Python, MATLAB, L^AT_EX and Mathematica, with frequent use.

Some past experience and capability in R and C++.

Lifelong interest and commitment to music, expert on several instruments and continue to play.

Intermediate ability Spanish.