Dr Elliott Wise

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Education

PhD | Numerical Analysis | University College London | 2018
BEng (Hons) | Mechatronics | Australian National University | 2012
BSc | Mathematics | Australian National University | 2012

- Expert in **applied mathematics**, **high-performance computing/simulation**, **acoustics**.
- Focus was on **scientific and industrial modelling**.
- Dean's Prize: Scholarship (£88,000), Faculty of Engineering, University College London.
- Summer Research Scholarship (AU$4,000), Math. Sci. Inst., Australian National University.

Experience

Senior Advisor | Gutteridge, Haskins & Davey (GHD) | 2021–Present

- **Data scientist** and **simulation specialist** within the **Insights & Analytics** team.
- Clients construct and/or manage **large-scale public and private infrastructure**.
- Personal focus is on **building a new capability** in the UK: The use of **dynamic simulation** for **commercial analysis** of large-scale infrastructure.
- Projects/clients have included:
  - **City of Toronto**: Development of a **techno-economic model** of a proposed **renewable natural gas** facility, capturing both the physical dynamics of the system and subsequent commercial performance. This is helping engineers to undertake **optioneering** and provide financially justified technical advice.
  - **Central Government**: Development of a **dynamic simulation** of border infrastructure and future configurations to inform a capability review against anticipated demand.
  - **Network Rail**: Development of a proof-of-concept **web-app** to identify and communicate insights from network planning data. This helps users understand factors that have led to historical underperformance, and flags risks within upcoming work.
  - **National Highways**: Investigation into the factors holding back adoption of a new **enterprise data tool**. This included **conducting interviews** with users, building out **training materials**, and **delivering workshops**.

Senior Consultant | Amey Strategic Consulting | 2019–2021

- **Data scientist** and **software engineer** within the **Data Science & Analytics** team.
- Clients were organisations involved in the management of public infrastructure, including **Kent County Council**, **Ofgem**, **Network Rail**, the **New York Metropolitan Transport Authority**, and the **Ferrovial Centre of Excellence for Asset Management**.
- Work included the development of **web apps** for managing operations, developing and assuring new **regulatory policy** addressing **risk management** for large asset bases, data analysis through both classical **statistics and machine learning**, and the **simulation** of operational systems of assets for **commercial analysis**.
- Work also included substantial elements of **management consulting**, including **stakeholder management** and **leading workshops**.
- Tools included **Plotly Dash**, **React Bootstrap**, **Power BI**, **R-Shiny**, **PostgreSQL**, **VBA**, and **Power Query**.
- Techniques included **Causal Bayesian Networks**, **SHAP** (explainable machine learning), **clustering** (DBSCAN), and **topic modelling** (latent dirichlet allocation).

Research Associate | Imperial College London | 2018–2019

- Mathematician within the Non-Destructive Evaluation group, which develops **ultrasonic measurement** techniques for detecting flaws in mechanical components.
- Development of **ultrasonic imaging algorithms** for pipe inspections (corrosion in difficult-to-inspect locations). This included software development in **Matlab**, and the design of deep learning algorithms for image processing (a **convolutional autoencoder** built with **Pytorch**).
- Simulation of **metamaterials**, a hypothesised mechanism for sound damping in moth wings that is thought to aid them in avoiding predation by echolocating bats (joint work with the Mathematics department).

PhD Researcher | University College London | 2014–2018

- I was a member of the Biomedical Ultrasound Group, which develops new **ultrasonic therapies** (e.g. **cancer ablation**, **neuro-stimulation**) and associated modelling and simulation tools. I also collaborated with computer science researchers at Brno University of Technology.
- I contributed to the development of the *k*-Wave **Matlab** toolbox for medical ultrasound simulation. This has over **10,000 registered users** and more than **700 citations**.
- My research included four projects, which tackled different aspects of the computational efficiency of the mathematics (**Fourier collocation**) underlying the toolbox's acoustic model.
- I authored **7 journal papers** and **2 conference papers** based on work conducted here.

Mathematician | Commonwealth Scientific & Industrial Research Organisation | 2013–2014

- This is Australia's national science agency, whose chief role is to improve the economic and social performance of Australian industry.
- My role was within Mathematics, Statistics, and Informatics, primarily applying modelling and numerical simulations to **materials science** problems, including:
  - Designing a polymer filter to bind and capture proteins for antimicrobial use. Involved **molecular dynamics** and **metadynamics** simulations (**NAMD**, **LAAMPS**).
  - Improving the lifespan of ion thrusters (a form of **spacecraft propulsion**) though better material choice informed by simulations of sputtering.
  - **Finite-element modelling (COMSOL)** the transverse deformation in **carbon fibres** to aid characterisation of elastic properties.
- I also collaborated with a gender studies scholar to investigate changes to the content of AfterEllen (a queer pop-culture news site) before and after its acquisition by MTV. This involved **web-scraping** and **topic modelling**.

Consultant | Eggler Consulting Engineers | 2010–2012

- Eggler Consulting Engineers provides **systems engineering** management for military vehicle projects, as well as related **teaching services** to both industry and academia.
- Worked as a consultant to **Rheinmetall MAN Military Vehicles** on a response to a Defence tender for a fleet of modular logistics vehicles, and **prepared teaching materials** for the Australian Defence Force Academy.

Skills/Tools

Software, **computing**

- **Languages**: Python, Javascript, SQL, Cypher, Julia, Matlab, R
- **Web-app development**: React-Bootstrap, Flask, Plotly Dash, R-Shiny
- **Deployment**: AWS e.g. EC2, or serverless via Chalice/Lambda
- **Version control**, **issue tracking**: Git, GitHub/GitLab
- **Microsoft enterprise tools**: Power BI, Power Apps, Power Query/M, DAX

Data science, **mathematics**

- **Libraries**: Pandas, Plotly, scikit-learn, Pytorch, Kedro, Causalnex, networkx, BeautifulSoup, D3
- **Classical machine learning**: Classification (Random Forests, LightGBM, Naive Bayes, Causal Bayesian Networks), clustering (DBSCAN), NLP (topic modelling via LDA)
- **Deep learning**: Convolutional autoencoders, TabNet (attention, encoding categorical variables)
- **Databases**: PostgreSQL, PostGIS, Neo4j
- **Applied mathematics**: Discrete event simulation, numerical methods for differential equations, optimal transport