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**.
- Studies also included **computer science**, **environmental science**, **electronics**.
- 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

- GHD are a global engineering consultancy focussing on the built environment.
- I work as a **data scientist** and **simulation specialist** within the Insights & Analytics team.
- We specialise in **data science** for **asset management** and **infrastructure engineering** projects
- 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.
  - **Network Rail**: Development of a **proof-of-concept web-app** to identify and communicate insights from network planning data. This app helps users understand factors that have led to work on the rail network going wrong historically, and flags risks within upcoming work.
  - **National Highways**: Investigation into the organisational factors holding back adoption of a new **enterprise data tool**. This included conducting interviews with users, building out training material, and delivering workshops.

Senior Consultant | Amey Strategic Consulting | 2019–2021

- Amey Strategic Consulting is a UK-based engineering consultancy and service provider.
- I worked as a **data scientist** and **software developer** on public infrastructure projects.
- Projects/clients have included:
  - **Kent County Council**: Development of a web-app to help manage road operations (**React Bootstrap + Plotly + PostgreSQL**). My focus is on identifying and communicating road accident risk to planners, and developing a **causal machine learning model** of this risk to help direct interventions.
  - **Ofgem**: **Development of regulatory policy** to ensure energy network companies plan asset maintenance/improvements to minimise monetised risk to consumers. This involved extensive data analysis, workshopping, development a scenario exploration tool (**Plotly Dash**), **quality-assurance checks** on, and subsequent refactor of the pipeline for setting risk-targets (**VBA + Power Query**).
  - **Network Rail**: Development of a dashboard for improved train delay quantification and allocation/communication of responsibility to station managers (**Power BI + PostgreSQL**). This involved development of an analytics pipeline and database.
  - **New York Metropolitan Transportation Authority**: Development of a web-app to facilitate data-driven asset investment decisions (**Power BI + SQL**). I was the **lead developer**, and my analytics work focussed on elevator and escalator investment prioritisation.
  - **Ferrovial Centre of Excellence for Asset Management**: Development of a web-app to simulate the effect of new EU regulation on recycling contracts (**R-Shiny**).

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 use as an antimicrobial agent. This innvolved **molecular dynamics** and **metadynamics** simulations (**NAMD**, **LAAMPS**).
  - Improving the lifespan of ion thrusters (a form of **spacecraft propulsion**) though careful choice of materials. This was informed by simulations of sputtering.
  - Modelling transverse deformation in **carbon fibres** to develop a methodology for characterising their elastic properties. This involved **finite-element modelling (COMSOL)**.
- I also conducted one project in collaboration with a gender studies scholar: Investigating 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.
- **Prepared teaching material** on vehicle design for the Australian Defence Force Academy.
- Administrated and created website content on military vehicle history.

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**: Numerical methods for differential equations, optimal transport

Communication

- **Can present work clearly** in a variety of contexts, including client meetings, departmental seminars, and international conferences.
- **High-quality writing**, as evidenced in industry by successful bid-writing, and in academia by numerous peer-reviewed journal papers and my PhD thesis.
- **Can confidently and convincingly construct arguments**, as I've demonstrated over seven years defending my contributions to scientific research within the academic community.
- **Effectively teach complex material** to graduate and undergraduate students
  - Teaching assistant at University College London (lab technique, coursework evaluation).
  - Head Engineering tutor at John XXIII residential hall, Australian National University.
  - Prepared course materials for the Australian Defence Force Academy.
  - Demonstrated ultrasound imaging to aspiring scientists at open days.