

MacKenzie, R.

Roderick MacKenzie, MEng, Ph.D

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Nationality: British
Languages: English – native, German – fluent.



OVERVIEW

- I enjoy using **mathematics, computing and programming** together to build predictive computational models and solve hard real world problems.
- I am very good at **Python, C, the GNU tool chain and Linux**– see [github profile](#). I enjoy using these tools to turn mathematics into efficient computer code/algorithms.
- Experienced cluster/supercomputer user, I use these tools to fit highly non-linear custom models to complex data sets.
- I have authored [+40 scientific publications](#) most of which develop numerical models to understand experimental results. I have published a [book chapter](#) on numerical modeling.
- I enjoy being on the edge of understanding and solving problems which we don't yet know how to solve. I have a drive to learn and tenacity/determination.
- For the last year I have been developing machine learning codes based on Neural Networks. Previously I have also written preprocessors to extract feature vectors from Arabic Handwriting for Hidden Markov Models.
- I am highly flexible and am able to **learn new technical skills knowledge quickly**.
- Enjoy working in a team, and have experience managing projects/budgets.
- I have good written/verbal communication skills and regularly give technical talks to large audiences of +300 people.

EMPLOYMENT

1/9/2012-present, University of Nottingham, UK - Lecturer

- **1/05/2017-present: Data science adviser to UK Parliament**, I am currently spending 2-3 days a week in Parliament on secondment, at the **Parliamentary Office of Science and Technology** (POST). POST provide scientific support to members of parliament. I am using **data science/data mining** techniques to help the scientists who work there understand and predict demand by MPs on the teams human resources. This involves harvesting social media feeds from members of parliament and performing analysis on the collected data to track how hot topics rise and fall within the chamber.
- **07/07/2018: Successful application to NVIDIA** for a GPU hardware for training **deep Neural Networks** to design better solar cells.
- **01/01/2017-present**: I am using/developing **complex computational models** to be used together with **deep Neural Networks** to sift large experimental data sets.

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- **01/01/16-present, Open source software:** I'm the author of the worlds only free and open source computational model to simulate solar cells <https://www.gpvd.com>. It has +20k **downloads to date**, it is written in C (~50k lines) and python (~50k lines). The model is used to support my research. Development was particularly hard due to the **highly non-linear set of equations** which must be solved. It uses the autotools build system and is cross platform (Windows/Linux, ARM/x86.). The user interface is written in QT, and it also has custom load balancing capability for use on supercomputers and an easy to use windows installer. [[Youtube channel](#)]
- **Research/collaborations/Publications:** All my publications derive from working in large international teams of scientists, I provide domain knowledge on mathematical modeling of data. Many of the people I work with on a daily basis I have yet to meet face to face, I enjoy working in teams and on collaborative projects. Key to working in this environment is to be predictable and build trust.
- I have published one [book chapter](#) on using numerical models to understand novel semiconductors, the majority of the theory in the chapter comes from papers I have previously developed and published.
- **PhD students:** I currently have 4 PhD students, two of whom are using advanced computational techniques to better understand renewable energy systems.
- **Teaching:** I currently teach **computer programming in MATLAB** to large classes of ~300 **students**. I regularly win teaching prizes for my lectures. I enjoy communicating hard to understand topics such as algorithms in a simple form to a broad audience. I also teach on an MSc course in **renewable energy** (~60 students). I have won two faculty awards and a Lord Dearing Award for my teaching. Many of my lectures can be found on my [youtube channel](#).
- **Ad hoc Reviewer for:** Organic Electronics, ACS Nano, Advanced Materials, Advanced Energy Materials, Applied Physics Letters, Journal of Chemical Physics, Chem Physics Letters, Optical Quantum Electronics, Journal of Applied Physics, and IOP Journal of Physics D.

5/11/2011-31/8/2012 University of Freiburg, Germany - Post Doctoral Research Associate

- I developed complex computer models to understand data from organic semiconductor devices measured by the following scientists: Uli Würfel, Fraunhofer-Institute Freiburg, Germany, Enrico Da Como, LMU Munich, Germany, Elizabeth von Hauff, Physics department Freiburg, Germany.

5/5/2009-31/10/2012, Imperial College London (Physics)- Post Doctoral Research Associate

- I used advanced computer modeling techniques to understand charge transport in organic semiconductors. These techniques included:
 - Monte-Carlo methods to calculate mobilities of thin films of derivatives.
 - Using molecular dynamics to generate thin film morphologies of fullerene Derivatives.

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- Quantum chemical methods (Density Functional Theory) to calculate molecular orbitals.
- Application of Quantum mechanics to calculate inter-molecular hopping rates.
- The tools used to write this paper have been open sourced at www.rmollib.com.

01/03/2008-01/07/2008, University of Nottingham - Post Doctoral Research Associate

- Collaboration with Modulight Ltd., Finland and the European Space Agency (ESA)
- Wrote tools to design and optimized state-of-the-art 880nm laser diodes for inter-satellite communication.
- My asymmetric cavity designs out-performed their predecessors in terms of maximum power output and lifetime.
- Collaboration with **OSRAM, Regensburg, Germany**, Measurement of gain, refractive index, and cavity defects within 660 nm laser diodes used for photoactive cancer therapy.

EDUCATION

1/09/2004-1/09/2008 (Viva date: 10/06/08)

- **Ph.D (~Engineering/Computing/Physics), University of Nottingham**
 - Thesis title “Thermal Simulation and Temperature dependent Measurement of Quantum Wells Laser Diodes”
 - Developed drift diffusion models, thermal models, and electromagnetic mode solvers to design state of the art lasers for telecommunication systems in collaboration with Chalmers University of Technology (Sweden) and Modulight Inc (Finland) within the framework of EU project Fastaccess. (www.fastaccessproject.eu).
 - Used computational analysis techniques to design lasers within the EU project Brighter (www.ist-brighter.eu) in collaboration with Thales III-IV Lab, Paris.

01/9/2001-01/7/2004

- **The University of Nottingham, Department of Electrical and Electronic Engineering**
 - 1st Class MEng (Hons), Electronic Engineering with German. Averages: 4th year: ~81%, 2nd year: 81%, 1st year: 83%
 - 3rd year taken in German as an ERASMUS exchange student at the Technische Universität Carolo-Wilhelmina zu Braunschweig (TU-BS), Germany

Summer semester of 2003:

- **Institute for Telecommunication systems at the University of Braunschweig, Germany**
 - Worked with automated Arabic handwriting recognition systems (Hidden Markov Models) for sorting hand written Arabic addresses on letters.
 - Wrote tools for Arabic speakers to examine and correct the learning data base of hand written words. (www.ifnenit.com)

2000

- **Marconi Telecommunications, Beeston** - work experience

FREE TIME

Hiking, running (10km/40 min, 20km/1hr 24min), and fixing bugs in <https://www.gpvdm.com>.