Robert L. Peach

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EDUCATION

Barahona and Yaliraki Group, Department of Mathematics, Imperial College London **London, UK**
PhD in Applied Mathematics and Physical Chemistry *2014 – 2017*
MRes in Applied Mathematics and Physical Chemistry, Distinction *2013 – 2014*
Thesis Title: Exploring protein dynamics using graph theory and single-molecule spectroscopy

- Development of computational tools for predicting the effect of mutations on protein dynamics.
- Implemented statistical and data science methods to analyse both theoretical and experimental data.
- Built novel algorithms for supervised and unsupervised learning on networks.
- Imperial College and Warwick collaborative conference: CDT Poster Prize (2015).
- Imperial ambassador to Tokyo Tech (2017) workshop and EMBL Heidelberg (2015)

University of Bristol **Bristol, UK**
MSci (Hons) Physics, 1st Class *2008 – 2012*
Thesis Title: A study of Penetration Depth Anisotropy in Sr_2RuO_4.

- Commendations from the Faculty of Science at Bristol University for excellence in 2010 and 2011.

De Lisle Catholic Science College ***Loughborough*, UK**
A-level, 4 A's (Maths, Further Maths, Physics and Biology) *2001 – 2008*

- Award for best scientist in 2008.
- Won Gold in the Intermediate National Maths Olympiad award.

PROFESSIONAL POSITIONS

Department of Neurology, University hospital Wurzburg, Wurzburg **Wurzburg, Germany**
Research Associate. Diagnosis of movement disorders. *2020 - present*

Centre for Mathematical Precision Healthcare, Department of Brain Sciences, Imperial College London **London, UK**
Honorary Research Fellow. Frequency mixing in brain signals. *2020 - present*

Onnela Lab, Department of Biostatistics, Harvard School of Public Health **Boston, US**
Visiting Scholar. *2020*

Centre for Mathematical Precision Healthcare, Department of Mathematics, Imperial College London **London, UK**
Research Associate / Senior Data Scientist. Graph theory, learning analytics, maths for healthcare. *2017 – 2020*

Fresh Check Inc, Imperial College London **London, UK**
Chief Financial Officer and Co-founder *2015 – 2019*

MBDA (BAE, EADS and Finmeccanica subsidiary company) **Stevenage, UK**
Systems Design Engineer (10 weeks) *2011*

Evance Wind **Loughborough, UK**
Software and Hardware Intern (8 weeks) *2009*

PATENTS / TRADEMARKS

PCT for chemical invention that changes colour in presence of bacteria of harmful chemicals.
IPN: WO 2018/185486 A1
Owner: Fresh Check Ltd.

Trademark for Fresh Check
European Union Trademark Application No. 017931182
Owner: Fresh Check Ltd.

RESEARCH MANUSCRIPTS

Published / under review

- **Peach, Robert L.**, et al. HCGA: Highly Comparative Graph Analysis, (2021) (under review)
- **Peach, Robert L.**, et al. *Unsupervised learning predicts mutations that alter adenylate kinase thermostability and thermophilic adaption*, (2020) (under review)
- Koca, E., **Peach, R.** *Double Utilization of Consumer Appreciation: Is the Ecosystem Linkage the New Leverage?* (2021) (under review)
- Myall, Ashleigh., **Peach, Robert L.**, et al. Network memory in the movement of hospital patients carrying drug resistant bacteria, (2020) (under review)
- Chrysostomou, S. et al. *Targeting RSK4 prevents both chemoresistant and metastasis in lung and bladder cancer: potential of re-purposed floxacins as novel therapeutic agents*, Science Translation Medicine (2019) Accepted.
- **Peach, Robert L.,** et al. *Data-driven modelling and characterisation of task completion sequences in online courses*. Scientific Reports (2021). Accepted.
- Schreglmann, Sebastian R.*, Wang, David.*, **Peach, Robert L.***, et al. *Suppression of essential tremor via phase-locked driven disruption of temporal coherence*, Nature Communications (2020) Accepted.
- Alexis Arnaudon*, **Robert L. Peach***, Mauricio Barahona. *Scale-dependent measure of network centrality from diffusion dynamics.* Physical Review Research 2.3 (2020): 033104.
- **Peach, Robert L.**, Alexis Arnaudon, and Mauricio Barahona. *Semi-supervised classification on graphs using explicit diffusion dynamics*, Foundations of Data Science (2020).
- **Peach, Robert L.,** et al. "Data-driven unsupervised clustering of online learner behaviour." *NPJ science of learning* 4.1 (2019): 1-11.
- **Peach, Robert L.,** et al. *Unsupervised graph-based learning predicts mutations that alter protein dynamics*, bioRxiv preprint bioRxiv:847426 (2019). (under review)
- Hugh Sowley, ZhiQiang Liu, Julia Davies, **Robert Peach**, Rui Guo, Sophie Sim, FengQin Long, Geoffrey Holdgate, Keith Willison, Wei Zhuang, David R Klug. *Detection of Drug Binding to a Target Protein Using EVV 2DIR Spectroscopy*, *J. Phys. Chem. B,* 123 17, 3598-3606 (2019).

*joint first author

PRESENTATIONS

Talks

- COXIC, London, UK – *Overshooting behaviours in networks* (December 2020)
- Complex Networks, Rome, Italy (online) – Highly comparative graph analysis (November 2020)
- iFest 2019, Alexandria, US – Panel discussion, *Good practices in distributed and online learning* (August 2019)
- Complexity in the 21st Century, Institute of Physics, London - *Tremor Analysis in Essential Tremor patients* (July 2019).
- GMAC Leadership conference Fort Lauderdale – *Using time-series engagement data to predict student performance* (Jan 2019).
- Imperial College Business School – Business School Round Table (Nov 2018).
- FOME Oslo – *Learning analytics dashboard and student engagement behaviours* (Nov 2018).
- Centre for Mathematical Precision Healthcare – *Predicting patient tremor response to TACS* (Oct 2018).
- Imperial College Business School EdTech April (2018).

Posters

- Tokyo Tech-Imperial College workshop – Bioscience and its interface with technology (33rd-5th Nov 2016) .
- EMBO Practical Course – Single molecule and single cell fluorescence (15th-22nd Mar 2015) .
- Biophysical Society – Conformational ensembles from experimental data and computer simulations (25th-2th August 2017).
- Doctoral training centre Imperial-Warwick conference (2015).

SOFTWARE PACKAGES

- *Highly comparative graph analysis (hcga)*. Main developer of graph feature extraction package (Python) https://github.com/ImperialCollegeLondon/hcga.
- *MultiPool*, graph neural network deep learning package for graph classification (Python).
- Developer of *Multiscale centrality* python package for identifying nodes of influence or anchoring within a network (Python) https://github.com/barahona-research-group/MultiscaleCentrality.
- Learning analytics data analysis package for Imperial College Business School EdTech group (SQL, Python).
- Protein mutation and energy minimisation pipeline (MatLab, PyRosetta, GROMACS, Python).
- *Graph diffusion reclassification* – developed algorithm and python package for semi-supervised learning on graphs (Python) https://github.com/barahona-research-group/GDR.
- *Relaxed minimum spanning tree (RMST)* – converted MatLab code into Python package for producing a relaxed minimum spanning tree of a network (Python).

STUDENT SUPERVISION

- Zhihao (Harold) Wang – Bsc final year project (2014-2015).
- Dominik Saman – Msci final year project (2016-2017). Awarded 'Best Physical Chemistry project'.
- Junheng Li – Msc project, Department of Electrical Engineering (2017-2018). PhD project, Department of Brain Sciences (2019 -)
- Dominik Klein – Bsc final year project, Department of Mathematics (visiting from ETH Zurich) (2019-Present)
- Hossein Abbas – MSc project, Department of Mathematics (2019)
- Isabel Ashman – MSc project, Department of Mathematics (2019)
- Jose Folch – MSc project, Department of Mathematics (2019 – present)
- Eduado Conesa-Pietscheck – MSc project, Department of Mathematics (2019 – present)
- Zhaolu Liu – MSc project, Department of Mathematics (2019 – present)
- Computing Student group – Joint MSc project, development of peer review app for Business School (2019)
- Henry Palasciano – UROP (2019, 2020).

COURSES TUTORED/TAUGHT

Lecturing

- Network Analytics, Business Analytics MSc, Imperial Business School, Lecturing (Spring term, 2021)
- Data science and machine learning, 3rd year undergraduates, Maths department, Lecturing (Autumn term, 2019)

Teaching Assistant

- Statistics and Econometrics, Business Analytics MSc, Business school (Spring term, 2021)
- Network Analytics, Business Analytics MSc, Business school (Summer term, 2020)
- Statistics and Econometrics, Business Analytics MSc, Business school (Spring term, 2020)
- Maths and Statistics, Business Analytics MSc, Business school (Autumn term, 2019)
- Network analytics, Business Analytics MSc, Business school (Spring term, 2019)
- Thermodynamics, 2nd year undergraduates, Chemistry department (2013-2017)
- Laboratory assistant, designed experiments, 2nd year undergraduates, Chemistry department (2014).

Marking

- Business Analytics MSc, Business school (2019).
- 2nd year undergraduate laboratory coursework, Chemistry (2013-2017).

RESEARCH GRANTS / PRIZES

UK DRI - Pilot project grant (2019)
Shell livewire – Innovation competition prize (2017)
CDT den – Innovation competition prize (2017)
Forbes 30-under-30 (2017)
IC Trust – Travel grant (2017)
RSC Analytical Biosciences – Travel grant (2017)
Climate-KIC – Innovation grant (2016)
Greenhouse – Innovation grant (2015)

OUTREACH

Festival of Science, Imperial College London (2016) – Fresh Check
Festival of Science, Imperial College London (2017) – The science of detecting bacteria
Imperial Lates, Imperial College London (2018) – Visualising deep learning