Dr Colin Mclean

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Research Interests

Computational modeling and statistical analysis of biomedical and physical data. Survival statistics. Networks science. Machine Learning applied to real world data. Parameter fitting and multivariate analysis techniques applicable to large datasets. Postgraduate supervision. Data science training policies. Scientific outreach.

Academic Experience

Senior Research Fellow in Data Science, University of Edinburgh, Scotland.
Cancer Informatics September 2021 - Present
I am funded by the Cancer Research UK (CRUK) to develop and apply ML/AI methodology to cancer data. For example, I have develop a deep learning model to predict competing cancer and cardiac risk after anthracyline exposure for early breast cancer patients. I am community lead in training and careers for CRUK's Data Research Strategy. I supervise PhD students in cancer informatics. I hold honorary NHS contracts to analysis national cancer data. I work on federated real-world evidence studies with NHS Lothian oncology data as part of OHDSI consortium. I am seconded into Public Health Scotland (PHS) to link national cancer datasets for the Scottish Cancer Registry and Intelligence Service (SCRIS).

Postdoctorate Researcher, University of Edinburgh, Scotland.
NeuroInformatics October 2010 – September 2021
Analysis and modeling of synaptic mammalian proteomic data for the EU projects: EuroSpin, SynSys, and Human Brian Project. Implementing and developing unsupervised machine learning algorithms from network science, to find underlying community structure in Protein-Protein Interaction networks. Analysis of the SAFARI SPARK ASD patient datasets, building of patients networks and use of graphical databases – Neo4j, to store patient data. PhD and MSc supervision, and lecturing network science to MSc BioInformatics students.

Postdoctorate Researcher, INFN Fellowship, Bologna, Italy.
Particle Physics May 2010 - October 2010
Analysis of LHC data for the LHCb experiment. Particle identification (PID) measurements used as input into the B->hh analysis, to measure the CKM angle γ.

Postdoctorate Researcher, MPI for Nuclear Physics, Heidelberg, Germany.
Particle Physics January 2010 - April 2010
Measurement of V^0's, K^0's mesons and $\bar{\Lambda}^0$ baryons polarisation angles, these early studies were used to calibrate and align the detectors tracking systems.

Software Developer, SpinSight, Edinburgh, Scotland.
Computer Vision July 2009 - November 2009
Software development and research, for university spin-off company, into a Monte Carlo Markov Chain (MCMC) particle filter for realtime target tracking for sports matches. This involved designing a ratio to select the best particles within a sample, to follow each target in consecutive image frames. The ratio was built from a series of likelihood functions multiplied together using the segmented image data and observational information available: colour histograms, position, velocity and size.

Physics Tutor, University of Edinburgh, Scotland.
Physics Teaching 2008 - Present
I have demonstrated 1st and 2nd year courses in experimental physics. Tutored 2nd, 3rd and 4th year courses in physics and computational physics. 1St year laboratory demonstrator at Aberdeen (2004).

Clinical Scientist, Grade A Medical Physicist, NHS TaySide, Dundee, Scotland.
Medical Physics October 2004 - August 2005
Clinical research work involving the cancer treatment Photodynamic Therapy. Clinical duties included: liaising with medical staff before and after cases and administering laser treatment to patients whilst in theatre. Medical cases included cholangiocarinomas and tumours of the esophageal, bronchial and brain. Research and development of the clinical laser systems and medical attachments: including measuring the diffusion pattern of laser light produced from paediatric catheter balloons used in neurosurgery.

Education

The University of Edinburgh, Edinburgh, Scotland.
Ph.D. Experimental Particle Physics September 2005 - July 2009
Thesis title: "CP Violation in B_s->J/$\varphi\theta$ decays at the LHCb and Sensitivity to the Weak Mixing Phase β_s".
Adviser: Prof. Peter Clarke

The University of Aberdeen, Aberdeen, Scotland.
BSc Physics (1st Class Hons) October 2000 - June 2004
Honours thesis: "Modeling electron wave packet propagation at hetro-junction barriers."
Adviser: Dr. Dunn.

Publications

• Mclean, C. et al. A Computational Pipeline for Analysis of Biomedical networks with BioNAR: Current Protocols, 3, e940, doi:10.1002/cpz1.940 (2023).
• Mclean, C. et al. BioNAR: An Integrated Biological Network Analysis Package in Bioconductor. Bioinformatics Advances, Volume 3, Issue 1, vbad137 (2023).
• Sorokina, O., Mclean, C., Croning, M.D.R. *et al.* A unified resource and configurable model of the synapse proteome and its role in disease. *Sci Rep* **11,** 9967 (2021).
• Kanellopoulos, A. et al: Aralar Sequesters GABA into Hyperactive Mitochondria, Causing Social Behaviour Deficits, Cell, 180, 1-20 (2020).
• Chapelle, J. et al: Dissecting the shared and context-dependent pathways mediated by the p140Cap adaptor protein in cancer and in neurons, Front. Cell Dev. Biol., 15 (2019).
• R. Roy, et al: Regional Diversity in the Postsynaptic Proteome of the Mouse Brain, Proteomes, 6, 31, (2018).
• Chen, N. et al: Combined high-density interaction proteomics and unsupervised protein-protein association analysis delineates distinct presynaptic protein networks, (submitted MSB, 2018).
• A. Alfieri, et al: Synaptic Interactome Mining Reveals p140Cap as a New Hub for PSD Proteins Involved in Psychiatric and Neurological Disorders, Front. Mol. Neurosci., 10, (2017).
• E. Fernandez, et al: Arc requires PSD95 for assembly into postsynaptic complexes involved with neural dysfunction and intelligence, Cell Reports, 21, 679-691, (2017).
• C. Mclean, X. He, I.T Simpson, D.J Armstrong: Improved Functional Enrichment Analysis of Biological Networks using Scalable Modularity Based Clustering, (2016), J Proteomics Bioinformatics, 9:9-18, doi:10.4172/jpb.1000383.
• R. Aaij et al. (LHCb collaboration): Title: Prompt K short production in pp collisions at sqrt(s)=0.9 TeV, Physics Letters B 693 (2010) 69-80.

• P. Clarke, C. Mclean, A. Osoria-Oliveros: Supplementary studies of the B_s->$J/\varphi\theta$ analysis: Measurement of mis-tag rate directly from the signal, (2008), CERN-LHCb-2008-013.
• P. Clarke, C. Mclean, A. Osoria-Oliveros: Sensitivity studies to Φ_s and $\Delta\Gamma_s$ using the full angular B_s->$J/\varphi\theta$ angular analysis at the LHCb, (2007), CERN-2007-101.
• H. Moseley, C. Mclean, S. Hockaday, S. Eljamel: In vito light distribution from intracranial PDT ballons, Photodiagnosis & Photodynamic Therapy, 2007, Volume 4, issue 3, pg 213-220.

Computer Skills

• *Repository*:
  - Github: https://github.com/cmclean5/
• *Applications*:
  - BioNAR: Biological Network Analysis package in R,
                    https://github.com/lptolik/BioNAR
  - rSpectral: Modularity based clustering algorithm,
                    https://cran.r-project.org/web/packages/rSpectral/index.html
  - HEP parameter fitting code written in C++ and using Minuit, for one and three angular analysis of PesudoScalar to Vector Vector B decays on simulated LHCb Monte Carlo data.
• *Languages*: C/C++, Java, R, Python, interactive C, Fortan, Matlab, JavaScript.
• *Command-line shells*: Bash, PowerShell.
• *Deep learning Packages*: Keras API, Tensorflow.
• *Statistical Packages*: ROOT/TMVA, GSL, Armadillo, graphtool, stan.
• *Parallel programming*: OpenMP, CUDA.
• *High Performance Computing*: Altair Grid Engine (20 years experience) for data analysis, parameter sensitivity and randomisation studies.
• *Databases*: SQL Server Manager, Neo4J/Cypher.
• *Mathematical Packages*: Maple.
• *Engineering Packages*: Labview, Multisim.
• Debugging *Packages*: Valgrind.
• *IDEs*: Emacs, Rstudio, PyCharm.
• *Document Editors*: LaTeX, Keynote, Rmarkdown.

Extra curricular Activities

• Languages: Basic French and Italian.
• Tutoring: Private physics and mathematics tutoring for High school students (Scottish Highers).
• Outreach: Demonstrator for primary school science and technology exhibition in Aberdeen and Edinburgh science festival (part-time SCI-FUN staff).
• Camp Counselor: Worked for a special needs camp in Minneapolis/St Pauls (U.S.A) with children and adults with mental and physical disabilities.
• Sport: Member of the Edinburgh Triathlete club. North-East of Scotland rugby. Scottish touch rugby open player, and level two touch referee. Member of the university hill-walking club and Scottish country dance society.

Referees

Please contact myself first before contacting my referees.
• Prof. Douglas Armstrong, University of Edinburgh, Douglas.Armstrong@ed.ac.uk
• Prof. Peter Clarke, University of Edinburgh, Peter.Clarke@ed.ac.uk
• Prof. Phil Clark, University of Edinburgh, P.J.Clark@ed.ac.uk
• Dr. Oksana Sorokina, Oksana.Sorokina@ed.ac.uk
• Dr. Esperanza Fernandez, Esperanza.Fernandez@vib-ugent.be