Alan O'Callaghan

Curriculum Vitae

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Skills

- Programming: R, C++, Ruby, Java, Python.
- Statistics: Bayesian modelling, GLM, survival analysis, high dimensional statistics.
- Computing: Linux/Unix, HPC, LaTeX, git, make, snakemake, unit testing, continuous integration.
- Web: HTML/CSS, JS, PHP, htmlwidgets (R).

Education

PhD, biomedical data science

MRC Human Genetics Unit, University of Edinburgh — *PhD*
2018 – 2022

- Statistical methods for, and applied statistical analysis of, single cell RNAseq with complex experimental designs.
- Implementation of scalable Bayesian inference (adaptive Metropolis within Gibbs, divide and conquer MCMC).
- Assisting other students and contributing to research and computing environment in the institute.

MSc, Bioinformatics and computational genomics

Queen's University Belfast — *MSc, (distinction)*
2014 – 2015

- Dissertation: Java-based eye-tracking and image analysis of histopathology whole slide images.
- Lectures: programming, image analysis, statistical learning techniques.
- Programming projects: Implementation of alignment, clustering, linear regression and cross-validation algorithms in R; cell detection, Ki67 quantification and image segmentation in Java.

BSc (hons), biopharmaceutical chemistry

National University of Ireland, Galway — *BSc (hons), 2.1*
2008 – 2013

- Research Project: Structure elucidation and structure-activity relationship of bioactive marine compound.
- Lectures: (bio)chemistry, toxicology, pharmacology, molecular modelling, drug discovery and design.

Experience

Postdoctoral research associate

MRC Biostatistics Unit, University of Cambridge — *2022 – present*

- Computational optimisation of Bayesian models for the identification of eQTLs from RNAseq data.
- Computational analysis of RNAseq data using gene signatures.

Research assistant

University of Edinburgh — *April 2021 – September 2021*

- Developing a Carpentries-style course in high-dimensional statistics.
- Certification as a trained Carpentries instructor.

Bioinformatician

Fios Genomics — *October 2015 – August 2018*

- Communicating regularly with clients to plan projects and explain results.
- Exploratory and statistical analysis for academics and commercial clients.
- Statistical analysis & visualisations for client publications & commercial research projects.
- Developer, author & maintainer of proprietary R packages.
- Minor system administration tasks.

Software

Bioconductor

Maintainer: BASiCS, BASiCStan, densvis, scater, snifter

CRAN

Maintainer: bayefdr, contrast
Contributor: heatmaply

StackExchange

StackOverflow reputation: 3,144
CrossValidated reputation: 1,168

Writing

Published

- **O'Callaghan, A.**, Eling, N., Marioni, J. C., Vallejos, C. A., "BASiCS Workflow: A Step-by-Step Analysis of Expression Variability Using Single Cell RNA Sequencing Data". In: *F1000Research* 11 (Jan. 2022), p. 59. ISSN: 2046-1402. DOI: 10.12688/f1000research.74416.1
- Harris, B. T., Rajasekaran, V., Blackmur, J. P., **O'Callaghan, A.**, Donnelly, K., Timofeeva, M., Vaughan-Shaw, P. G., Din, F. V. N., Dunlop, M. G., Farrington, S. M., *Transcriptional Dynamics of Colorectal Cancer Risk Associated Variation at 11q23.1 Are Correlated with Tuft Cell Abundance and Marker Expression* in Silico. Preprint. Bioinformatics, Mar. 2022. DOI: 10.1101/2022.03.29.485182
- Morgan, R., Keen, J., Halligan, D., **O'Callaghan, A.**, Andrew, R., Livingstone, D., Abernethie, A., Maltese, G., Walker, B., Hadoke, P., "Species-Specific Regulation of Angiogenesis by Glucocorticoids Reveals Contrasting Effects on Inflammatory and Angiogenic Pathways". In: *PLOS ONE* 13.2 (Feb. 2018). Ed. by Christina L Addison, e0192746. ISSN: 1932-6203. DOI: 10.1371/journal.pone.0192746
- Reijns, M. A. M., Thompson, L., Acosta, J. C., Black, H. A., Sanchez-Luque, F. J., Diamond, A., Parry, D. A., Daniels, A., O'Shea, M., Uggenti, C., Sanchez, M. C., **O'Callaghan, A.**, McNab, M. L. L., Adamowicz, M., Friman, E. T., Hurd, T., Jarman, E. J., Chee, F. L. M., Rainger, J. K., Walker, M., Drake, C., Longman, D., Mordstein, C., Warlow, S. J., McKay, S., Slater, L., Ansari, M., Tomlinson, I. P. M., Moore, D., Wilkinson, N., Shepherd, J., Templeton, K., Johannessen, I., Tait-Burkard, C., Haas, J. G., Gilbert, N., Adams, I. R., Jackson, A. P., "A Sensitive and Affordable Multiplex RT-qPCR Assay for SARS-CoV-2 Detection". In: *PLOS Biology* 18.12 (Dec. 2020). Ed. by Bill Sugden, e3001030. ISSN: 1545-7885. DOI: 10.1371/journal.pbio.3001030

In preparation

- Embracing heterogeneity in multi-donor single cell RNAseq data.
- Scalable Bayesian analysis of single-cell RNAseq data.
- Variational inference for eQTL discovery with BaseQTL.

Teaching

Presenter/helper

CARPENTRIES WORKSHOPS *Online, 2021 – ongoing*

- Data carpentries R for social sciences (presenter)
- Python Intro for Libraries (helper)
- Statistics with R (helper)
- Data analysis and visualisation with Python for Genomics (helper)

IGMM statistical seminar series

LECTURES *Online, 2020*

- Exploratory data analysis
- Experimental design, hypothesis testing, statistical power

Applied analysis workshop for single cell RNAseq
One day workshop *IGMM, 2020*

- Exploratory analysis
- Normalisation
- Feature selection
- Differential expression analysis Differential expression analysis
- Clustering

Teaching materials
Author/maintainer *2021 – ongoing*

- High dimensional statistics with R
- Orchestrating single cell analysis, multisample chapter

Conferences and meetings

European Mathematical Genetics Meeting
Presentation *Cambridge, 2022*
Optimising eQTL discovery with BaseQTL using a screening approach

IGMM internal meetings
Poster *Edinburgh, 2019 – 2020*
Scalable Bayesian analysis of single cell RNAseq
Bayesian analysis of multi-donor scRNAseq data (2^{nd} prize)

UoE Centre for Statistics conference
Poster *Edinburgh, June 2019*
Scalable Bayesian analysis of single cell RNAseq

Quantitative Genomics
Presentation *Francis Crick Institute, June 2019*
Scalable Bayesian analysis of single cell RNAseq

Genomic Medicine
Poster *Edinburgh, May 2019*
Scalable Bayesian analysis of single cell RNAseq

Edinbr (R user group)
Presentation *Edinburgh, March 2019*
Building interactive modules using htmlwidgets

Edinburgh Bioinformatics
Presentation *Edinburgh, November 2018*
Interactive data visualisation using R and plotly.

Extracurricular

Society committees
Edinburgh/Galway *Various*

- **IGMM Postgraduate Society (Edinburgh)**: Organising student events, advocating for improvements in student working conditions and well-being.
- **IGMM social committee (Edinburgh)**: Organising social events for students/postdocs/staff. Editor of noteworthy student Christmas movie, 2018.
- **Lotus society (Galway)**: Organising yoga classes and events for students/postdocs/staff.

Honors & Awards

- Best savoury food (mattar paneer), IGMM Christmas Party, 2018
- School of Chemistry Medal in Molecular Modelling and Drug Design, NUI Galway, 2011
- Entrance Scholarship, NUI Galway, 2008