William Dorrell

Trained as theoretical physicist, now working in neuroscience and machine learning

06/2018 BA, Physics, 1st - 80% Emmanuel College, Cambridge

RESEARCH

Gatsby Unit – University College London

09/2020 - Present PhD student in Theoretical Neuroscience and Machine Learning, projects:

i) Using Group Theory to design a normative principle for predicting or explaining certain neural representations, among them grid cells.
ii) Applied and modified a hierarchical Bayesian point process algorithm to study action representation and replay in dorsolateral striatum.
iii) Mentoring an undergraduate whose project involves building neural networks to learn the function of simple neural circuits from connectivity data

Okinawa Institute of Science and Technology

02/2020 – 08/2020 Research intern with Prof. Erik de Schutter.
I designed a biologically-plausible hierarchical reinforcement learning agent.

Harvard University

04/2019 – 12/2019 Research fellow with Prof. Cengiz Pehlevan.
I demonstrated the presence of structured connectivity in the mouse olfactory cortex using experimental data from a collaborator, Prof Venkatesh Murthy.

08/2018 – 03/2019 Research scholar with Prof. Jennifer Hoffman.
I created a scheme for replicating van der Waals behaviour in metamaterials.

TEACHING

09/2021 – 05/2022 Teaching Fellow for 1st year PhD students in 3 courses: Systems Neuroscience, Theoretical Neuroscience, and Probabilistic Learning.
Crafted new set of tutorials for Systems Neuroscience course aiming to give a diverse set of students (from maths to cell bio) the requisite background

09/2019 – 12/2019 Teaching Fellow in an Applied Maths course on Neural Computation for 20 graduate students. Helped to design problem sets.

10/2016 – 05/2017 Volunteer teacher in local Cambridge School for GCSE Science

06/2016 – 08/2016 Private tutor for key stage 3 science in Worcester, UK.

AWARDS

2021/22	Selected as Mentor in Simons Foundation Undergraduate research initiative
2018/19	Herchel Smith Scholarship - $80,000 to attend Harvard for a year
2017	Davies Senior Scholarship & Mainhood Prize
2017	Summer research fellowship – Harvard PRISE programme
2016	Davies Scholarship & Mainhood Prize – for university exam performance
2015	British Chemistry Olympiad Roentgenium Award – highest performance

OTHER

10/2021	Attendant, CIMER Entering Mentoring Training, a mentorship training program
01/2020	Attendant, Imbizo Computational Neuroscience Summer School, South Africa
06/2019 – 08/2019	Proctor, looked after students doing research at Harvard over the Summer
09/2017 – 06/2018	Founded and ran a weekly discussion club: the Big Thinks' Club
Computer	MATLAB, python, some Julia, some app & website development
Languages	English (native), French (B2)

PUBLICATIONS

J Grimaud, **W Dorrell**, C Pehlevan, V Murthy, *"Bilateral Alignment of receptive fields in the olfactory cortex points to non-random connectivity"*, bioRxiv:2020.02.24.960922 (2020).

S Verduzco-Flores, **W Dorrell**, E De Schutter, *"An Approach to Synaptic Learning for Autonomous Motor Control"*, arXiv:2006.13471 (2020).

S. Gardezi, H. Pirie, S. Carr, **W. Dorrell**, J. Hoffman, *"Simulating twistronics in acoustic metamaterials"*, 2D Materials, (2021). (Journal link, Arxiv link)

W Dorrell, H. Pirie, S. Gardezi, N. Drucker, J. Hoffman, *"van der Waals metamaterials"*, Phys. Rev. B (2020). (Arxiv link)

CONFERENCES & TALKS

[poster] *"A Normative Route to Grid Cells via Group Theory"*, Gatsby Quinquennial Review, London, 2021

[talk] *"Point Process analysis of action representation and replay in Striatum"*, Linderman Lab, 2021

[poster] "*To what extent can the olfactory cortex be modelled by random connectivity?"*, Computational and Systems Neuroscience (Cosyne) Conference, Denver, 2020.

[talk] *"Twisted Bilayer Graphene as a Phononic Metamaterial"*, APS March Meeting, Boston, 2019.