Christopher S. Parker

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Profile

Research associate at CMIC, UCL, working on microstructure imaging in neurodegenerative disease. Doctoral graduate in connectomics neuroimaging. Particularly interested in big-data analysis approaches to systems neuroscience and their use for disease understanding and treatment. Research experience in biomedical science areas including magnetic resonance imaging, brain stimulation and in vitro laboratory studies, with applications in neurological diseases. Versatile skill set in computational imaging including modelling and multi-modal analysis.

Employment

Research Associate
Computational Imaging Group, Centre for Medical Image Computing, UCL - 2018-present

Role: 'Microstructure imaging in neurodegenerative disease'
Managed by Prof. Gary Zhang & Dr. Rachael Scahill

PhD
Translational Imaging Group, Centre for Medical Image Computing, UCL - 2011-2016

Thesis: 'Human brain networks: consensus, reproducibility, inter-modal comparison and epilepsy pathology' http://discovery.ucl.ac.uk/1535334/
Supervised by Prof. Sebastien Ourselin & Dr. Jonathan Clayden

MRes Modules: Computational Modelling for Biomedical Imaging; Algorithmics; Introduction to Neuroanatomy, Systems and Disease; Critical Review of Key Papers in Biomedical Imaging

MRes thesis: 'Reproducibility of whole-brain structural networks'
Supervised by Prof. Sebastien Ourselin & Dr. Jonathan Clayden

Pharmacy Dispensing Assistant NVQ Level 2
Touchwood Pharmacy, 04/2009-09/2009

Medicines Counter Assistant
Touchwood Pharmacy, 2006-2009 & 06/2004-10/2005

Education

MSc. Medical Image Computing Merit
UCL, 2010-2011

EPSRC scholarship awarded (£5k)

Modules: Foundations of Scientific Computing and Anatomy; Image Processing; Programming Foundations for Medical Image Analysis; Information Processing in Medical Imaging; Imaging with Ionising Radiation; Imaging with Non-Ionising Radiation; Ionising Radiation Physics; Image Directed Analysis and Therapy

Thesis: 'Reconstruction and comparison of whole- brain structural connectivity networks'.
(supervised by Dr Jonathan Clayden & Dr Chris Clark)

MRes. Biomedical Research Merit
Imperial College London, 2009-2010

Thesis 1: 'Metabolic profiling of schizophrenia post-mortem tissue and Huntington's disease cerebrospinal fluid'
(supervised by Dr Tsz Tsang & Dr Elizabeth Want)

Thesis 2: 'The potential neuroprotective role of chemokine receptor GPR75'
(supervised by Dr James Pease)

BSc. Biological Sciences 2.1
University of Birmingham, 2003-2006

Final Year Modules: Current Issues in Biomedical Science; Cellular Neurobiology; Integrative Whole-organism Biology; Animals, Climates and Distributions; Insect Biology and Pest Management

Final Year Thesis: 'Animal Behaviour: A web-based learning resource for undergraduates'

Secondary Education
Drayton Manor High School, 1996-2003

A Levels: Biology B, Mathematics A, Economics A
AS Level: Computer Studies A
GCSEs: 12 including Mathematics A, English Language B, Science (Double Award) A

Skills

Research
Brain observations, analyses and applications
- Experiments: Diffusion-weighted MRI, Multi-echo multi-contrast FLASH imaging, intracranial EEG, single-pulse electrical stimulation
- Biophysical signal analysis:
  - Diffusion MRI: simulations, artefact correction, microstructure modelling, tensor registration, tractography, regional analysis, partial volume effects, population templates, g-ratio, tract-based spatial statistics, clinical trials
  - Connectomics: Reconstruction methods, connectivity quantification, graph theory topological analysis, reproducibility, methods consensus, group comparisons, inter-modal comparison, anatomical validity
  - Multi-parametric mapping: myelin imaging, g-ratio
  - Intra-cranial EEG: Cortico-cortical evoked potentials, ictal-onset connectivity, seizure spread, pre-surgical evaluation
- Neurological disease applications: Alzheimer's disease, Huntington's disease, epilepsy, schizophrenia

Scientific Computing
Programming, qualifications and examples of applied methods
- Languages: R, MATLAB, Bash, Python, LaTeX
  (beginner: C++, java, html)
- Qualifications: MSc Medical Image Computing (Image Processing > 90%), Computer Studies AS-level (Grade A)
- Medical image computing: transformations, registration, modelling, optimisation, segmentation, machine learning, filters, morphological operations, pattern recognition, edge detection, DICOM images, parallel computing, GUIs, debugging
- Statistical analysis: general linear models, regression, group comparisons, significance testing, permutation testing, bootstrapping, multiple testing correction, probability, Bayesian inference, data projection (PCA, PLS-DA, ICA), disease progression modelling, visualisation, reproducibility, null models
- Code repository: https://github.com/csparker

Science Communication
Function organisation and participations
- DRC-CMIC Working Group
- CMIC Scientific Day & Open Day
- MIG-POND Journal Club
- Brain Hackathon 2021
- Oral presentations at international conference
- Poster presentations
- Inter-departmental collaboration
- Grant-writing practice 'Assessing the potential neuroprotective role of chemokine receptor GPR75 in vivo'

Laboratory Research
In vitro and ex vivo experimental analyses
- NMR, mass spectrometry, gene cloning, protein and cytotoxicity assays, DNA amplification, cell culture

Publications

Journal papers

C.S. Parker[†], T. Veale, M. Bocchetta, C. F. Slattery, I. B. Malone, N. Fox, J. M. Schott, D. M. Cash, H. Zhang. Not all voxels are created equal: reducing estimation bias in regional NODDI metrics using tissue-weighted means. *Neuroimage*. 2021

E. B. Johnson, **C. S. Parker**, R. I. Scahill, S. Gregory, M. Papoutsi, P. Zeun, K. Osborne-Crowley, J. Lowe, A. Nair, C. Estevez-Fraga, K. Fayer. Altered iron and myelin in premanifest Huntington's Disease more than 20 years before clinical onset: Evidence from the cross-sectional HD Young Adult Study. *EBioMedicine*, 65: 103266. 2021 https://doi.org/10.1016/j.ebiom.2021.103266

R. I. Scahill, P. Zeun, K. Osborne-Crowley, E. B. Johnson, S. Gregory, **C. S. Parke**r, J. Lowe, A. Nair, C. O'Callaghan, C. Langley, M. Papoutsi. Biological and clinical characteristics of gene carriers far from predicted onset in the Huntington's disease young adult study (HD-YAS): a cross-sectional analysis. *The Lancet Neurology*, 19(6): 502-12, 2020 https://doi.org/10.1016/S1474-4422(20)30143-5

C.S. Parker, J.D. Clayden, M.J. Cardoso, R. Rodionov, J.S. Duncan, C. Scott, B. Diehl, S. Ourselin. Structural and Effective Connectivity in Focal Epilepsy. *Neuroimage: Clinical*, 17: 943-952, 2018 https://doi.org/10.1016/j.nicl.2017.12.020

C.S. Parker, F. Deligianni, M.J. Cardoso, P. Daga, M. Modat, M. Dayan, C.A. Clark, S. Ourselin, and J. Clayden. Consensus between Pipelines in Structural Brain Networks. *PLoS one*, 9(10): e111262, 2014 https://doi.org/10.1371/journal.pone.0111262

Conference abstracts

C. S. Parker, A. Foulkes, C. F. Slattery, T. Veale, D. M. Cash, F. Fox, J. M. Schott, H. Zhang. Disentangling axonal loss and demyelination using multi-modal imaging: application to young onset Alzheimer's disease. In *Alzheimer's Association International Conference*, 2021

C. S. Parker, T. Veale, M. Bocchetta, C. F. Slattery, F. Fox, J. M. Schott, D. M. Cash, H. Zhang. Not all voxels are created equal: reducing estimation bias in regional NODDI metrics using tissue-weighted mean. In *Proceedings of the ISMRM 29th Scientific Meeting and Exhibition*, Vancouver, Canada, 2021

C.S. Parker, F. Deligianni, M.J. Cardoso, P. Daga, M. Modat, M. Dayan, C.A. Clark, S. Ourselin, and J. Clayden. Consensus between Pipelines in Structural Brain Networks. Presentation in *Proceedings of the ISMRM, Milan*, Italy, 2014

C.S. Parker, F. Deligianni, M.J. Cardoso, P. Daga, M. Modat, M. Dayan, C.A. Clark, S. Ourselin, and J. Clayden. Consensus between Pipelines in Structural Brain Networks. In *Proceedings of the ISMRM British Chapter*, Edinburgh, UK, 2014

C.S. Parker, C.A. Clark, S. Ourselin, and J. Clayden. Agreement in Reproducibility of Whole-brain Structural Connectivity Networks with Alternative Pipelines. In *Proceedings of the 22nd ISMRM British Chapter Symposium*, UCL, UK, 2013

C.S. Parker, J. Clayden, and S. Ourselin. Effect of reconstruction pipeline on reproducibility of whole-brain structural networks. In *Proceedings of the Annual Meeting of the ISMRM British Chapter*, Cambridge, UK, 2012

C.S. Parker, C.A. Clark, and J. Clayden. Reproducibility of whole-brain structural connectivity networks. In *Proceedings of the Annual Meeting of the ISMRM British Chapter*, Manchester, UK, 2011

Additional Information

I like to exercise, play football and go climbing. Music is a particular interest and I have grades in violin and piano. I have played drums in a band that has recorded, produced and sold copies of our album. I also find it stimulating to play chess and solve tactics.