

# PAVAN CHAGGAR

DPhil Student ◊ Mathematical Institute ◊ University of Oxford  
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## EDUCATION

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**University of Oxford**, DPhil, Mathematical Institute *2019 — 2023*

Provisional Title: Data-Driven Mathematical Modelling of Neurodegeneration

Academic Advisors: Alain Goriely (primary), Saad Jbabdi

Industrial Advisors: Stefano Magon (Roche), Gregory Klein (Roche)

Funding: EPSRC CDT for Sustainable Approaches to Biomedical Sciences

**University College London**, M.Sc in Neuroscience *2018 — 2019*

Merit with Distinction in thesis

Thesis Advisors: Maria Chain, Karl Friston, Gareth Barnes

**King's College London**, B.Sc in Biomedical Sciences *2012 — 2016*

Upper Second Class Honors

Thesis Advisor: Clive Coen

## RESEARCH INTERESTS

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Differential equations, dynamics, probabilistic inference, scientific machine learning, neurodegenerative disease, neuroscience

## JOBS

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**University of Cambridge**, Research Assistant, Machine Learning Group *Sept 2021 — Present*

Working as a software engineer with Dr Hong Ge. I work on developing Turing a high performance probabilistic programming language written in Julia. Primarily, I have been working on developing AbstractPPL.jl, a package for defining a common API for probabilistic programming languages.

## PUBLICATIONS

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Amelie Schäfer, **Pavanjit Chaggar**, Alain Goriely, Ellen Kuhl, Alzheimer's Disease Neuroimaging Initiative, et al. Correlating tau pathology to brain atrophy using a physics-based bayesian model. 2021 (**Joint first author. In review.**)

Amelie Schäfer, **Pavanjit Chaggar**, Travis B Thompson, Alain Goriely, Ellen Kuhl, Alzheimer's Disease Neuroimaging Initiative, et al. Predicting brain atrophy from tau pathology: A summary of clinical findings and their translation into personalized models. *Brain Multiphysics*, 2:100039, 2021 (**Joint first author.**)

Prama Putra, Travis B Thompson, **Pavanjit Chaggar**, and Alain Goriely. Braiding braak and braak: Staging patterns and model selection in network neurodegeneration. *Network Neuroscience*, 5(4):929–956, 2021

Travis B Thompson, **Pavanjit Chaggar**, Ellen Kuhl, Alain Goriely, Alzheimer's Disease Neuroimaging Initiative, et al. Protein-protein interactions in neurodegenerative diseases: A conspiracy theory. *PLoS computational biology*, 16(10):e1008267, 2020

## CONFERENCE PRESENTATIONS

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Pavanjit Chaggar. Mathematical modelling of alzheimer's disease. Early Career British Mathematicians' Colloquium, July 2021

Pavanjit Chaggar. Pryon: Proteopathy modelling on connectomes with python. International Brain Mechanics and Trauma Workshop, April 2021

Roberta Bianco, Pavanjit Chaggar, Rosemary Southwell, Sven Bestmann, Gareth Barnes, and Maria Chait. A brain network of temporo-frontal areas supports pattern detection in rapid sound sequences. Advances and Perspectives in Auditory Neuroscience, August 2020

## INVITED TALKS

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Predicting patient outcomes using mathematical models of alzheimer's disease. Presented at the Clinical Biomarkers Group, Roche, December 2021

Inference methods for mathematical models of neurodegeneration. Presented at the Raj group seminar, UCSF, July 2021

Analysing ADNI sMRI and PET data with SPM. Presented at the UCL Wellcome Trust Centre for Neuroimaging Methods Seminar, July 2020

Optimising MEG source localisation of hippocampal regions. Presented at the UCL Wellcome Trust Centre for Neuroimaging MEG Seminar, July 2019

## SOFTWARE

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### **AbstractPPL.jl**

Defining a common API for probabilistic programming languages.

Part of the TuringLang project, the leading high performance probabilistic programming language in the Julia programming language. <https://github.com/TuringLang/AbstractPPL.jl>.

### **Connectomes.jl**

Julia package for plotting and manipulating connectome graphs using the graphml format.

<https://github.com/PavanChaggar/Connectomes.jl>.

### **ECIQC**

Automated quality control and validation for medical imaging data. C++.

<https://github.com/Extensible-Clinical-Imaging-QC-Tool/ECIQC>.

### **Paint4Brains**

Machine learning tool for fast and accurate segmentation of degenerated brains. Python.

<https://github.com/SABS-R3-projects/Paint4Brains>.

### **In Development:**

#### **ConnectomeDynamics**

Package for performing Bayesian Inference (variational and sampling methods) for differential equation problems on graphs. Python and Julia.

#### **Pryon** (in preparation for publication)

Scientific computing software for efficiently solving high dimensional non-linear ordinary differential equations on graphs. C++ and Python.

## TEACHING

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### **Software Engineering**

Doctoral Training Center, University of Oxford

*2020-2021*

