DR. LIAM BURROWS

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LinkedIn Github Home

SKILLS

- MATLAB, Python.
- Tensorflow, Keras, NumPy, SciPy, Scikit-Learn, Matplotlib, OpenCV, Pytorch.
- Computer vision, Image processing, Deep learning, Image segmentation, Image registration, Convolutional neural networks (CNNs), UNets, Variational calculus, Convex optimisation, Numerical methods.
- Familiar with Excel, ImageJ, ITKSnap, LaTeX, Linux, QuPath.

EXPERIENCE

Research Associate - University of Bath November 2023-Present

- A collaboration with the Royal United Hospitals (NHS, Bath) to develop an AI based pulmonary hypertension screening tool using routine computed tomography pulmonary angiography (CTPA).
- Use of novel image segmentation methods to segment pulmonary arteries and ascending aorta.
- Research into statistical shape methods to inform diagnosis of pulmonary hypertension.
- Assisted with the supervision of final year (masters) students projects.

Temporary Clinical Imaging and Data Specialist - University of Cambridge June 2023-October-2023

- Investigated the application of machine learning segmentation methods to brain tumours in images of paediatric and young adult patients.

Algorithm Engineer - Oxford Cancer Biomarkers May 2023 - June 2023

- Responsible for the development of more reliable tumour segmentation algorithms for digital pathology
- Company became insolvent in my second week of employment, leading to redundancy.

Research Associate - University of Liverpool. March 2022-April 2023

- Research primarily focused on the topic of medical image segmentation with elements of image registration for the purpose of disease tracking, in collaboration with The Walton Centre NHS Trust and AstraZeneca.
- Validated and developed a semi-automatic framework for segmentation of meningiomas with The Walton Centre on MR images, driven by variational segmentation methods.
- Developed an automatic pipeline for segmentation of tumours in mouse models, estimating tumour burden over time for drug discovery, in collaboration with AstraZeneca.
- Collaborated internally with Liverpool CS department, and University of Nottingham on a project involving segmentation of histopathology cancer images.
- Delivered lectures on introduction to python, pytorch and deep learning to CMIT summer internship undergraduate students.

EDUCATION AND TRAINING

PhD in Mathematics - University of Liverpool. (Under supervision of Prof. Ke Chen) 2017-2022

- EPSRC iCase funded, partnered with the NHS via the Smith Institute. Collaboration with the vascular department at the Royal Liverpool Hospital, assisting with the follow up treatment for abdominal aortic aneurysms after endovascular repair to develop a 3D segmentation

pipeline for the application.

- Project focused on image processing, mainly on image segmentation and some registration. Primarily using variational methods, but in the second half incorporating deep learning methods into investigating the intersection between variational and deep learning works.
- Methods include optimisation of variational problems, numerical solutions to PDEs and deep learning, all on the application of image processing problems.
- Teaching and marking assistant for undergraduate modules.

MMATH: Master's Degree in Mathematics - University of Liverpool. 2013-2017

- First class degree with honours, and 2017 Rosenhead prize for Mathematics for best overall results in the year.
- Final year project: 'Farey Tessellation and Hyperbolic Geometry.' (Supervisor: Dr. Anna Pratoussevitch)
- Modules included a range of pure and applied topics, such as: Classical Mechanics, Fluid Dynamics, Quantum Mechanics (& QFT) and Differential Geometry.

3 GCE A Levels - Birkenhead Sixth Form College. 2011-2013

- Mathematics (A*); Further Mathematics (A*); Physics (A)

SELECTED PUBLICATIONS & PRESENTATIONS

Publications:

- *Zhang, H.*,* ***Burrows, L.*(*equal contribution)*** *et al. (2023). Weakly supervised segmentation with point annotations for histopathology images via contrast-based variational model. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (pp. 15630-15640)*
- ***Burrows, L.****, Chen, K., Guo, W., Hossack, M., McWilliams, R. G., & Torella, F. (2022). Evaluation of a hybrid pipeline for automated segmentation of solid lesions based on mathematical algorithms and deep learning. Scientific reports, 12(1), 1-11.*
- ***Burrows, L.****, Guo, W., Chen, K., & Torella, F. (2021). Reproducible kernel Hilbert space based global and local image segmentation. Inverse Problems & Imaging, 15(1), 1.*
- ***Burrows, L****., Theljani, A., & Chen, K. (2021). On a Variational and Convex Model of the Blake–Zisserman Type for Segmentation of Low-Contrast and Piecewise Smooth Images. Journal of Imaging, 7(11), 228.*

See Google Scholar for a full list.

Presentations:

- SIAM Conference on Imaging Science (IS22) 2022: *"An Exploration of Implicit Regularisation by Deep Image Prior in Learning Models."*
- Scale Space and Variational Methods in Computer Vision (SSVM) 2021: "*A Deep Image Prior Learning Algorithm for Joint Selective Segmentation and Registration."*
- SIAM Computational Science and Engineering (CSE) 2021: "*A New CNN Algorithm for a Joint Model of Image Segmentation and Registration."*

See Home Page for full list.

REFERENCES

Available on request.