Rhydian Windsor

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Education

Visual Geometry Group, University of Oxford — *Oxford, UK*

DPhil — *October 2019-*

- I work on the application computer vision techniques for medical image understanding, with a particular focus on spinal and whole body MRI. My supervisors are Professor Andrew Zisserman and Dr. Timor Kadir.
- The early part of my DPhil focused on automated detection, labelling and radiological grading of vertebral bodies for a range of common spinal disorders. This work later became SpineNetV2 (see Software Contributions).
- Topics I have been recently working on include self-supervised learning for medical image understanding, automated detection of bone metastases in whole body MRI, automated scoliosis detection and automated clinical information extraction in free-text radiological reports.
- So far, my work has lead to three first-author papers published at major conferences (see Publications).
- My studies are funded by Cancer Research UK (Oxford Centre Prize Scholarship, 1 year taught courses + 3 years DPhil).

Autonomous Intelligent Machines and Systems CDT, University of Oxford — *Oxford, UK*

Taught Course Training Year — *2018-2019*

- The AIMS CDT programme consists of six months of taught modules followed by two 3 month projects before embarking on 3 year DPhil.
- I took modules on a wide range of topics related to machine learning including; *Computer Vision, Reinforcement Learning, Robotics, Control, Optimization, Verification, Embedded Systems Programming*.
- I completed two 6-week 'mini-projects' at the end of the first year: *'Automated 3-D extraction of vertebral bodies from full spine MRI scans'* (supervised by Professor Andrew Zisserman and Dr. Timor Kadir) and *'Neural relational inference of the role of microRNA in gene regulation networks'* (supervised by Dr. Yarin Gal and Dr. Francesca Buffa).

University of Manchester — *Manchester, UK*

Master of Physics (MPhys) — *2014-2018*

- I graduated with a first class degree (78.9% average).
- I took courses across a wide range of topics relevant to physics including Quantum Mechanics, Radio Astronomy, Quantum Computing and Statistical Mechanics amongst others. I also took several courses from the mathematics school including Numerical Optimisation and Inverse Problems.
- My MPhys thesis title was *Differentiating Shrinkage and Erosion of Tumours in Lung Cancer CBCT Scans*. This was done with the Radiotherapy Related Research Group, Christie Hospital. (Supervisors: Professor Anna Scaife and Dr. Andrew McWilliam). The work received the 'best poster' award at European Congress of Medical Physics (ECMP) 2018.

Publications & Research Output

Conference & Journal Papers

- 'Context-Aware Transformers For Spinal Cancer Detection and Radiological Grading', Rhydian Windsor, Amir Jamaludin, Timor Kadir, Andrew Zisserman, *MICCAI 2022*
- 'SpineNetV2: Automated Detection, Labelling and Radiological Grading Of Clinical MR Scans', Rhydian Windsor, Amir Jamaludin, Timor Kadir, Andrew Zisserman , *Technical Report*
- 'Self-Supervised Multi-Modal Alignment for Whole Body Medical Imaging', Rhydian Windsor, Amir Jamaludin, Timor Kadir & Andrew Zisserman, *MICCAI 2021*
- 'A Convolutional Approach To Vertebrae Detection And Labelling In Whole Spine MRI', Rhydian Windsor, Amir Jamaludin, Timor Kadir & Andrew Zisserman *MICCAI 2020*, Oral Presentation
- 'The Ladder Algorithm: Finding Repetitive Structures In Medical Images By Induction', Rhydian Windsor & Amir Jamaludin, *ISBI 2020*, Oral Presentation

Software Contributions

- *SpineNet v.2*: A tool to perform automated vertebra detection, labelling and radiological grading of spinal magnetic resonance scans for several common spinal disorders. This software is being used in several clinical studies into back pain and has been validated on multiple datasets, showing performance comparable to clinical radiologists. I implemented and trained the neural networks used in this software and created the website. See the demo: `zeus.robots.ox.ac.uk/spinenet2/`.

Posters/Abstracts

- '3D Spinal Column Segmentation with Single Plane 2D-Projected Annotations', Rhydian Windsor, Amir Jamaludin, Timor Kadir, Andrew Zisserman, MedNeurips 2021
- 'A Novel Methodology To Differentiate Shrinkage versus Erosion in CBCT Images Of Lung Tumours', Rhydian Windsor*, George Needham*, Marianne Aznar, Eliana Vasquez Osorio, Marcel van Herk, William Beasley, Alan McWilliam. *ECMP 2018*, Best Poster Award
- 'Getting Accurate Full Spine Segmentations Without Ground Truths', Rhydian Windsor, Amir Jamaludin, Timor Kadir, Andrew Zisserman. *AIMS Annual Meeting 2019*, 2nd Best Poster Award
- 'Machine Learning Based Berlin Scoring Of Magnetic Resonance Images of the Spine In Patients with Ankylosing Spondylitis from the Measure 1 Study', Amir Jamaludin, Rhydian Windsor, Sarim Ather, Timor Kadir, Andrew Zisserman, Jürgen Braun, LS Gensler, Pedro Machado, Mikkel Ostergaard, Denis Poddubnyy, Thibaud Coroller, Brian Porter, Shephard Mpofu, Aimee Readie. *EULAR 2020*

Skills

Programming Languages	Python (Strong); C++, MATLAB, Javascript (Moderate); R, Julia, Lua, Kotlin (Some experience)
Deep Learning Frameworks	Pytorch, Tensorflow, Sacred
Web Programming	HTML/CSS, Flask, jQuery, Reveal.js, Three.js
Other	Slurm, LaTeX, UNIX, Git, Docker, DICOM & NifTI

Experience

Plexalis
Oxford, UK

Machine Learning Consultant — *2020 -*

- I am working on a project with Norvartis and the Big Data Institute to develop automated methods for measuring progression of ankylosing spondylitis (AS).
- My responsibilities so far have involved stitching together MRI scans with incomplete metadata and training networks to automatically segment AS lesions and to classify disease severity.

JBCA Machine Learning Club
Manchester, UK

Organising Committee — *2018 - 2019*

- During my final year of my university degree I helped organise several talks & hack nights giving astrophysics PhD students hands-on experience in machine learning.
- My role on the organising committee included negotiating budget with JBCA financial committees, deciding future directions for the club and writing tutorials and challenges for attendees.

Axilium Research
Cape Town, SA/Manchester, UK

Research Internship — *Summer 2018*

- During the summer of my third year of my undergraduate degree I undertook an internship as the result of a collaboration between Jodrell Bank Centre of Astrophysics and Axilium Research.
- I was commissioned by the V&A Waterfront in Cape Town, South Africa to develop a prototype footfall mapping system using computer vision techniques on footage from security cameras at the Waterfront.

STEM Learning
Manchester, UK

STEM Ambassador — *2016 - 2018*

- During my undergraduate degree I volunteered as STEM ambassador.
- Over 3 years, I attended several science festivals and outreach events across Manchester talking about physics to the general public.

Other Interests

- Outside of work I enjoy sports, in particular rugby, running and bouldering. During my undergraduate degree I captained Manchester Physics R.F.C.
- I enjoy playing chess and have been a member of both Oxford and Manchester University's chess clubs.
- I also enjoy learning languages and am currently taking a course in French working towards approx. B2 proficiency in CEFR framework (upper intermediate). I also speak some German (elementary to lower intermediate proficiency) and am learning Esperanto.