Christopher SIMPSON

Senior Researcher | Data Scientist/Computer Vision Engineer

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⚲ Bristol, UK

Successful senior researcher who specialises in Data Science and Computer Vision, and is working to solve NDE data challenges for Industry 4.0. Dr. Simpson has developed widely used tools built on Python's scientific stack to efficiently process, analyse and visualise the high volume of complex data that his research relies upon. He has recently applied for, and won, funding to study Offshore Wind Structures and is interested in businesses and technology that help society move towards a low carbon future.

≡ SKILLS

Programming	Python, MATLAB
Scientific Python	Tensorflow, pyTorch, scikit-learn, scikit-image, pandas
Development tools	Jupyter, VS Code, git, continuous integration
Other tools	LaTeX, SQL, Avizo, Abaqus, imageJ
Specialisms	Computer Vision, Deep Neural Networks, Data Analysis & Visualisation

💼 PROFESSIONAL EXPERIENCE

Present
September 2019

Senior Research Associate | Data Science for NDE, UNIVERSITY OF BRISTOL, Bristol
Using deep neural networks (primarily CNNs) to analyse large ultrasound non-destructive evaluation (NDE) data sets. Applying state of the art computer vision techniques to classify and quantify material damage and degradation. Working with the Turing Institute to advance and promote the use of Data Science and AI within NDE/Engineering.

> ❭ Generating hyper-real synthetic data to augment small experimental data sets
> ❭ Applying 1D CNN/RNNs to run time series analysis for NDE corrosion assessments
> ❭ Defect classification and quantification from 2D phased array ultrasound

pyTorch Tensorflow scikit-learn CNN computer vision

Present
June 2017

(Senior) Research Associate | Structural Integrity, UNIVERSITY OF BRISTOL, Bristol
Modelling and evaluating key physical phenomena that underpin the UKs energy security and manufacturing industries. Emphasis is placed on data rich 3D materials and damage characterisation, that techniques such as high-energy synchrotron X-ray diffraction and X-ray computed tomography enable.

> ❭ Quantifying aleatory uncertainty and error in XRD/ND measurements
> ❭ Developing a Bayesian inference approach to residual strain prediction
> ❭ Applying supervised machine learning to XRD strain tensor evaluation
> ❭ Grant writing - notably winning £200k for research into offshore wind farms
> ❭ Project management and delivery to tight timeframes
> ❭ Managing two Ph. D students (guiding their research, running progress reviews etc.)
> ❭ Writing and peer reviewing research articles, presenting at international conferences

scikit-learn SciPy

March 2017
July 2014

Research Associate | Fracture Mechanics, DIAMOND LIGHT SOURCE, Oxfordshire
Worked as part of a multi-disciplinary research team at a data intensive, large-scale research facility, supporting research into everything from osteoporosis to volcanoes. Helped develop world leading material damage and failure characterisation techniques.

> ❭ Developed the pyXe X-ray diffraction strain analysis toolkit
> ❭ Produced automatic damage segmentation techniques using Python and scikit-image
> ❭ Wrote research articles and successfully applied for research facility access/funding

NumPy OpenCV scikit-image NeXus Linux

🖥 PROJECTS

BAT-NET   2019 -

An automatic bat species identification solution being marketed to Ecological Consultancies (bats are protected under European law and development work is contingent on due consideration of their presence). A CNN classifier has been built from 10,000+ labelled ultrasonic bat vocalisations and the associated predictive accuracy (>90% precision) streamlines the time intensive bat species identification procedure.

[pyTorch] [scikit-learn] [pandas] [CNN] [KNN] [Decision Trees]

PYXE   2015 -

⚙ github.com/casimp/pyXe

A comprehensive suite of tools for the analysis and visualisation of X-ray diffraction data acquired at European synchrotron facilities. The toolkit enables researchers to wrangle meaning from the temporally and spatially complex data associated with high throughput experiments and is widely used at universities across the UK.

[h5py] [NeXus] [numba] [SciPy] [regression] [significance testing] [anomaly detection]

LIGHTCT   2015 - 2016

⚙ github.com/casimp/lightct   ↗ 4DSci at RSSE 2016

A codebase for running visual light computed tomography using the input from a webcam. Developed as part of @4DSci for use in an interactive exhibit at the prestigious Royal Society Summer Exhibition. Used to explain X-ray CT and the exciting science carried out at the Diamond Light Source.

[tomopy] [sci-kit image] [OpenCV]

🎓 EDUCATION

2010 - 2014	Ph. D in Aerospace Materials, University of Birmingham
	Microstructural and mechanical characterisation of the IW Ni-base superalloy RR1000
2005 - 2008	B. Eng Mechanical & Materials Engineering (1st Class Hons), University of Birmingham

💲 GRANTS

OFFSHORE WIND ACCELERATOR - LIFETIME EXTENSION, Carbon Trust (£200k)   2018 - 2019

↗ Carbon Trust (OWA Programme)

Won funding (in collaboration with Atkins) from the Carbon Trust to study corrosion-fatigue in offshore wind structures. The OWA Programme funds research guided by nine international energy companies (Ørsted, SSE Renewables, Vattenfall Wind Power, etc.) who account for 76 % of Europe's offshore wind capacity.

> Proposal preparation (including full economic costing for project)
> Project planning and delivery within tight timeframes

📖 SELECT PUBLICATIONS

Zhang, W., Simpson, C. A., et al. (2019). Effect of anisotropic microstructure on the fatigue overload behavior of ultrafine-grained nickel. *Acta Materialia* ↗ doi.org/10.1016/j.actamat.2019.11.024

Reid, A., Simpson, C. A., et al. (2019). Measurement of Strain Evolution in Overloaded Roller Bearings using Energy Dispersive X-ray Diffraction. *Tribology International* ↗ doi.org/10.1016/j.triboint.2019.105893

Simpson, C. A., et al. (2019). Validating 3D two-parameter fracture mechanics for structural integrity assessment. *Theoretical and Applied Fracture Mechanics* ↗ doi.org/10.1016/j.tafmec.2019.102281

Simpson, C. A., et al. (2018). Quantifying fatigue overload retardation mechanisms by energy dispersive X-ray diffraction. *Journal of Mechanics and Physics of Solids* ↗ doi.org/10.1016/j.jmps.2018.10.020

Oliver, S., Simpson, C., et al. (2018). An experimental method of measuring stress during thermal shock in clad reactor pressure vessel material using time-resolved in-situ SXRD. *PVP 2018* ↗ doi.org/10.1115/PVP2018-84676