

# Andrew M. Webb

RESEARCH SCIENTIST · RESEARCH ENGINEER

☎ +44 7903 202284 | ✉ andrew@awebb.info | 🏠 awebb.info | 📺 grey-area

Produced 22/02/2019—up to date CV at [www.awebb.info/cv](http://www.awebb.info/cv)

## Experience

### Research Associate, LAMBDA/PAMELA Projects

2017–Present

UNIVERSITY OF MANCHESTER

In my role in the PAMELA project, I am integrating object detection into a state-of-the-art SLAM (simultaneous localisation and mapping) system. I am also working on the LAMBDA project, studying explicit diversification methods for ensemble methods in deep learning.

### Research Software Engineer, SpiNNaker Project

2016

UNIVERSITY OF MANCHESTER

I was employed to modify the code for generating neural data structures for the SpiNNaker many-core neuromorphic (spiking neural network) computing platform, so that some of the most commonly built data structures are built in parallel on the machine itself, in order to drastically decrease loading times. (See [github.com/project-rig/pynn\\_spinnaker](https://github.com/project-rig/pynn_spinnaker))

### Research Software Engineer, SpiNNaker Project

2012

UNIVERSITY OF MANCHESTER

I was employed to develop ray and path tracing (graphics rendering) software for the SpiNNaker many-core neuromorphic computing platform. Challenges included becoming familiar with the SpiNNaker API, writing fixed-point arithmetic functions, and avoiding communication bottlenecks within the machine. This software was demonstrated to visitors from Samsung, and is still in use. (See [github.com/SpiNNakerManchester/spinnaker\\_tools/tree/master/apps/pt\\_demo](https://github.com/SpiNNakerManchester/spinnaker_tools/tree/master/apps/pt_demo))

## Publications

- A. M. Webb, C. Reynolds et al.: *Joint Training of Neural Network Ensembles*, preprint arXiv:1902.04422 2019 (*under review, ICML*)
- S. Saeedi, B. Bodin et al.: *Navigating the Landscape for Real-Time Localization and Mapping...*, Proc. IEEE Vol. 2018
- A. M. Webb: *On Selection for Evolvability*, PhD thesis 2016
- A. M. Webb, J. Handl, and J. Knowles: *How Much Should You Select for Evolvability?*, ECAL 2015
- A. M. Webb and J. Knowles: *Studying the Evolvability of Self-Encoding Genotype-Phenotype Maps*, ALIFE 2014

## Education

### PhD in Computer Science, Machine Learning and Optimization Group

2012–2016

UNIVERSITY OF MANCHESTER

Synopsis of research: Evolutionary algorithms are a family of heuristic algorithms for solving optimization problems, inspired by evolutionary processes. Solutions can differ in their ‘evolvability’—their propensity to give rise to good descendant solutions. In my research I model the evolvability of each solution as a hidden variable about which we can learn something by making noisy observations. I use sequential Bayesian filtering algorithms to estimate the evolvability of each solution in the population, in order to select evolvable solutions. Theoretical results obtained by analysing a probabilistic model of my algorithm, and experimental work, showed that periodically selecting solutions based on evolvability estimates can lead to increased expected performance on some optimization problems. (Thesis available at [awebb.info/misc/thesis.pdf](http://awebb.info/misc/thesis.pdf)) During the PhD I attended master’s degree level course units on machine learning and data dimensionality reduction, and also undergraduate course units in the mathematics department.

### BSc in Artificial Intelligence, First Class Honours

2006–2010

UNIVERSITY OF MANCHESTER

## Skills

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### Programming (see [github.com/grey-area](https://github.com/grey-area))

- PyTorch
- Python (with NumPy, SciPy, scikit-learn, pandas, and compiled Python with Cython)
- TensorFlow
- C++
- C

### Machine Learning/Inference/Probability

- Experience implementing deep neural networks from scratch (for learning purposes) and in the PyTorch and TensorFlow frameworks
- Bayesian statistics, including alternatives to null hypothesis significance testing
- Metaheuristic optimization algorithms such as evolutionary algorithms
- Familiarity with the scikit-learn machine learning library
- MCMC sampling with Stan and PyMC
- Experience with spiking neural networks and neuromorphic hardware

### Other Computing Skills

- Experience writing software for unusual, distributed architectures
- Mathematica
- Git version control
- Graphics with OpenGL

### Communication/Other Skills

- Presented peer-reviewed work at international conferences
- Co-chaired a regular research seminar
- One-to-one teaching and marking on a *Mathematical Techniques for CS* course unit

## Interests

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Hobbies and interests include guitar, fishkeeping (tropical fish and invertebrates), science fiction, board games, and fitness, and I'm a keen fan/follower of the space industry. I maintain a blog (at [awebb.info/blog](http://awebb.info/blog)), that I mostly use to write about topics as I learn or to explore problems that are too small to lead to publication.