


Professional Experience

Applied Mathematician; Machine Learning, Finance, and Analog Computing


Signaloid Limited 

Apr 2024 – present
Cambridge, UK

Skills: C, Python, Go, C++, Machine Learning, Probability Theory, Monte Carlo methods, Analog Computing




- Made mathematical and representational improvements to Signaloid's uncertainty-tracking processor.
- Applied Signaloid's uncertainty-tracking processor to Machine Learning and Finance.
- Developed improved processor representations that enabled uncertainty tracking in new applications.
- Designed an analog computer for representing and sampling from arbitrary probability distributions.
- Architected and refactored Signaloid's core and foundational software (written in C) for improved performance (10x speed up), testability, and maintenance.

Research Associate in Probabilistic Computing


Physical Computation Laboratory , University of Cambridge

Apr 2022 – Apr 2024
Cambridge, UK

Skills: C, Go, Python, OCaml, Verilog, Automation scripting (Make), Processor design, Uncertainty Quantification, Gaussian Processes, Bayesian Neural Networks, Monte Carlo methods, Embedded Systems, PyTorch, TensorFlow



- Wrote research papers (see Publications section).
- Designed and implemented Pascal  an extensible tensor operation and automatic differentiation framework in C for use in embedded systems - available on GitHub .
- Wrote a SDK for running uncertainty-tracking experiments on the Signaloid Cloud Compute Engine .
- Wrote firmware for flash storage (AT45DB and IS25XP) on embedded systems.
- Collaborated on topics including Control Theory (handling uncertainty in closed-loop control) and Materials Science (Lagrangian modelling of dislocation dynamics).

Research Student Placement

PROWLER.io (now SecondMind Labs) 


Aug 2018 – May 2019
Cambridge, UK

Skills: PyTorch, Python, Multi-task Reinforcement Learning, Deep Learning, Variational Inference

- Devised and implemented multi-task RL models using PyTorch.
- Wrote a paper: Disentangled Skill Embeddings for Reinforcement Learning .
- Gave an oral presentation  at the Learning Transferable Skills workshop at NeurIPS 2019.


🎓 Education

PhD in Computing: On the Structure of Learning and Transfer in Machines

Imperial College London; Supervised by Prof. Marc Deisenroth 

Oct 2017 – Jun 2022
London, UK

Skills: Reinforcement Learning, Gaussian Processes, Transfer Learning, Multi-task Learning, Meta Learning, Deep Learning, Differential Geometry, Linear Algebra, Measure Theory, PyTorch, TensorFlow, JAX


- Introduced a differential-geometric first-principles theory of learning and transfer in machines. .
- Carried out projects in Gaussian Processes and Multi-task reinforcement learning.

MEng in Aerospace Engineering (First Class Honours)

University of Sheffield

Sep 2013 – Jun 2017
Sheffield, UK

Skills: Reinforcement Learning, Machine Learning, Control Theory, Thermodynamics, Fluid Dynamics, Aerodynamics, Materials Science, Electrical and Electronic Engineering, Differential Equations, Linear Algebra, Finite Element Methods, Computational Fluid Dynamics


- Thesis  (supervised by Prof. Neil Lawrence) explored the use of Model-based Reinforcement Learning for control of a simulated robotic system.

🔗 Programming Languages


Python



Deep understanding of core language, Machine Learning frameworks (NumPy, PyTorch, TensorFlow, JAX), web frameworks.

Go

Developed a SDK for interacting with the Signaloid Cloud Compute Engine API , other automation tools.

Minor Experience

Rust: Created an automation tool that generates API endpoints on GCP with GitHub integration. Contributed to Meilisearch .


Web/Cloud: Designed and built websites for UCL-ELLIS  (paid) and Farming on Crutches  (not paid). Built backend REST API on GCP.

C++: Worked with internals of QuantLib and used in personal project building a custom database framework.

C

Architected and developed a Machine Learning framework and wrote firmware for embedded systems. Use daily at Signaloid.

OCaml

Completed Advent of Code (2023) problems and wrote a build-utility tool. Wrote parser for annotating CV. Contributed to the OCaml compiler .

Skills

Software Engineering: {High-level, Low-level} programming languages (Python, C, Go, OCaml), Git, GitHub, LaTeX, Scripting, Docker, GCP.


Research: Machine Learning, Differential Geometry, Probability, Linear Algebra, Science Communication.

Machine Learning: Deep Learning, Gaussian Processes, Reinforcement Learning, {Multi-task, Meta, Transfer} learning.


Notable Projects

Gaussian Process Predictions with Uncertain Inputs Enabled by Uncertainty-Tracking Processor Architectures

Nov 2023 – Dec 2024
Cambridge, UK

Accepted at MLCNP Workshop at NeurIPS 2024 

Skills: Gaussian Processes, C, Python, Uncertainty Quantification, Monte Carlo methods, Microprocessor design

- Formulated a method using an uncertainty-tracking microprocessor to efficiently compute the Gaussian Process predictive posterior distribution on uncertain inputs.
- Code can be found on GitHub .

The Monte Carlo Method and New Device and Architectural Techniques for Accelerating It

Jan 2023 – Dec 2023
Cambridge, UK


To be submitted

Skills: C, Go, Python, Uncertainty Quantification, Monte Carlo methods, Microprocessor design


- Conceived a unified view of the Monte Carlo method.
- Designed, implemented, and analysed experiments that compared Monte Carlo methods to automatic uncertainty quantification using an uncertainty-tracking microprocessor.

Arbiter : A unit testing framework for C

Oct 2023 – present
Cambridge, UK


Available on GitHub 

Skills: C, Unit testing


- Wrote Arbiter , a simple-to-use lightweight unit testing framework written in C for C.

Pascal : A tensor operation and automatic differentiation framework in C

Dec 2022 – present
Cambridge, UK

Available on GitHub 

Skills: C, Python, NumPy, Automatic Differentiation, SIMD



- Wrote Pascal , a tensor operation and automatic differentiation framework written in C.
- Written to be easy-to-use, be easily extensible, and compile to a low-memory-footprint binary.
- Tested possible SIMD optimisations.

On the structure of learning and transfer in machines

May 2021 – Jun 2022
London, UK

PhD Thesis

Skills: Reinforcement Learning, Differential Geometry, Measure Theory, Transfer Learning, Multi-task Learning, Meta Learning, Deep Learning


- Developed a differential-geometric first-principles theory of learning and transfer in machines.
- Presented a poster  at the Mathematics of Machine Learning Symposium 2020 .

Disentangled Skill Embeddings for Reinforcement Learning

Aug 2018 – May 2019
Cambridge, UK


Research Student project at PROWLER.io

Skills: Python, PyTorch, Reinforcement Learning, Transfer Learning, Variational Inference, Machine Learning

- Developed a multi-task RL model for disentangling known structure in the rewards and dynamics spaces.
- Gave an oral presentation  at the Learning Transferrable Skills workshop at NeurIPS 2019.


Development of Machine Learning based controller for problems of control

Sep 2016 – Apr 2017
Sheffield, UK

MEng dissertation (Supervisor: Prof Neil D. Lawrence )

Skills: Python, Reinforcement Learning, Gaussian Processes, Robotics

Refer to the Education section (MEng) for details.



- Documented experience and progress of the project on blog posts .


Sheffield Eco Motorsports

Sep 2015 – Apr 2017
Sheffield, UK

Co-founder and Technical Director of University engineering team

Skills: Technical Director, Leadership and Team Management, Fund raising, Gaussian Processes, DC Motor design, Materials Science and Manufacturing

Founded (obtained funding, recruited team, etc) and led a student engineering team  to compete at the Shell Eco Marathon .

- Documented 2 years of experience founding and leading the team on a blog post .
- Gave a public presentation on the car at the Sheffield Festival of Science and Engineering 2017.

Electronic Analogues of Regulatory Networks in Biological Systems [↗](#)

Sheffield Undergraduate Research Experience project

Jun 2015 – Jul 2015

Sheffield, UK

Skills: Dynamical Systems, Genetic Regulatory Systems, Analog Computing, Analog Electronics design

Engineered analog circuits that simulate genetic regulatory systems (supervised by Prof Nick Monk)

- Presented a poster [↗](#) at the Physics of Living Matter 2016 symposium.

📖 Publications

Sensitivity Analysis of the Laser Power Control System to Measurement Noise in SLS 3D Printers ↗	2025
<i>H Toshani, J Petangoda, C Samarakoon, P Stanley-Marbell (ArXiv)</i>	
Gaussian Process Predictions with Uncertain Inputs Enabled by Uncertainty-Tracking Processor Architectures ↗	2024
<i>J Petangoda, C Samarakoon, P Stanley-Marbell (MLCNP Workshop at NeurIPS 2024)</i>	
On the structure of learning and transfer in machines ↗	2022
<i>J Petangoda; (PhD Thesis)</i>	
Learning to Transfer: A Foliated Theory ↗	2021
<i>J Petangoda, MP Deisenroth, and NAM Monk; (Under review at JMLR)</i>	
GENNI: Visualising the Geometry of Equivalences for Neural Network Identifiability ↗	2020
<i>D Lengyel*, J Petangoda*, et al; (DiffGeo4DL Workshop at NeurIPS 2020: poster presentation ↗)</i>	
A Foliated View of Transfer Learning ↗	2020
<i>J Petangoda, NAM Monk, and MP Deisenroth; (ArXiv)</i>	
Disentangled Skill Embeddings for Reinforcement Learning ↗	2019
<i>J Petangoda, S Pascual-Diaz, V Adam, P Vrancx, and J Grau-Moya; (Learning Transferable Skills Workshop, NeurIPS 2019: oral presentation ↗)</i>	