

# Janith Petangoda

 janith.io

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 London, UK

## # Professional Experience

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### Director of Research Engineering (Founding)

Ren 

Sep 2025 – present  
London, UK

**Skills:** Python, Rust, Machine Learning, Artificial General Intelligence, Linear Algebra

- Develop a novel, truly scalable artificial general intelligence system.
- Lead the development and research of the mathematical foundations for Ren's proprietary technology.
- Lead the experimental research of performance and capabilities of proprietary technology.
- Contribute to the performance optimization of software implementation of core technology.

### Applied Mathematician; Machine Learning, Finance, and Analog Computing

Signaloid Limited 

Apr 2024 – Sep 2025  
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

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### 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.

## Skills

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**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.

## </> Programming Languages

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### 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 [↗](#). Use at Ren.

**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.

### 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 [↗](#).

## 🔗 Notable Projects

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### 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.

### reserves.fyi [↗](#): A simulator for financial scenarios

Dec 2022 – present  
London, UK

Live on web

**Skills:** Python, Docker, nginx, Web development and Deployment, Api Design, Financial Simulation

- reserves.fyi [↗](#) can simulate financial scenarios with complex cash flows and asset allocations.
- Architected, implemented, and deployed the core simulator.
- Simulator is fully configurable using JSON with the input robustly tested using custom validators.
- Currently implementing framework for expressing arbitrary tax codes.

### 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 [↗](#)

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 [↗](#).

Sep 2016 – Apr 2017

Sheffield, UK

## Sheffield Eco Motorsports [↗](#)

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.

Sep 2015 – Apr 2017

Sheffield, UK

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

Sheffield Undergraduate Research Experience project

**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.

Jun 2015 – Jul 2015

Sheffield, UK

## 📖 Publications

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### A Tensor Train Approach for Deterministic Arithmetic Operations on Discrete Representations of Probability Distributions [↗](#)

2025

G Kristen, B Bilgin, J Petangoda, P Stanley-Marbell (ArXiv)

### Sensitivity Analysis of the Laser Power Control System to Measurement Noise in SLS 3D Printers [↗](#)

2025

H Toshani, J Petangoda, C Samarakoon, P Stanley-Marbell (ArXiv)

### Gaussian Process Predictions with Uncertain Inputs Enabled by Uncertainty-Tracking Processor Architectures [↗](#)

2024

J Petangoda, C Samarakoon, P Stanley-Marbell (MLCNP Workshop at NeurIPS 2024)

### On the structure of learning and transfer in machines [↗](#)

2022

J Petangoda; (PhD Thesis)

### Learning to Transfer: A Foliated Theory [↗](#)

2021

J Petangoda, MP Deisenroth, and NAM Monk; (Under review at JMLR)

### GENNI: Visualising the Geometry of Equivalences for Neural Network Identifiability [↗](#)

2020

D Lengyel\*, J Petangoda\*, et al; (DiffGeo4DL Workshop at NeurIPS 2020: poster presentation [↗](#))

### A Foliated View of Transfer Learning [↗](#)

2020

J Petangoda, NAM Monk, and MP Deisenroth; (ArXiv)

### Disentangled Skill Embeddings for Reinforcement Learning [↗](#)

2019

J Petangoda, S Pascual-Diaz, V Adam, P Vrancx, and J Grau-Moya; (Learning Transferable Skills Workshop, NeurIPS 2019: oral presentation [↗](#))