Yanni Papandreou

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EDUCATION

Imperial College London
PhD Mathematics — 2019 - 2023
Section: Statistics
Supervisors: Dr Andrew Duncan & Dr Jon Cockayne
Thesis ↗ : Bayesian uncertainty quantification for PDE models: new perspectives on inference and dimension reduction
Research interests: Kernel-based methods for inference of complex models, Gaussian processes, Machine learning, Bayesian modelling of differential equations, Probabilistic modelling

Imperial College London
MSc Statistics — 2018 - 2019
Grade: **Distinction** (85.7%) Thesis: Kernel-Based Inference Methods for Ordinary Differential Equations (awarded a **distinction**: 84.5%)

University of Cambridge
BA Mathematics — 2015 - 2018
Grade: **High 1st Class Honours** (76%)

PROFESSIONAL EXPERIENCE

Bayforest Technologies - Quantitative Researcher — September 2023 - Present

- Researching, back-testing, and developing new signals for Bayforest's propriety financial models.

- Research experience with data pipelines: from ingestion to processing and storing.

- Experience writing custom parsers to extract information from the web.

Arabesque AI - Research Intern — Aug - Nov 2021

- Investigated approaches for Market Regime Detection utilising Change-point Detection (CPD) algorithms.

- Adapted a kernel CPD algorithm which maps time-series into a high-dimensional feature space in order to detect arbitrary changes in distribution for the original time-series for Market Regime Detection.

- Developed a Python package that combined some of these methods for use by Arabesque.

- Presented my findings to the AI team at the end of the internship and advised further research into Market Regime Detection.

GTA and Tutoring — 2018 - 2023

- Graduate Teaching Assistant helping out with tutorials/marking for Maths undergrads and MSc Stats students.

- Online maths tutor with MyTutor UK and Keystone Tutors.

TECHNICAL SKILLS

Programming Languages

- **Core:** Python

- **Intermediate:** Julia, R, MATLAB, Lua, C++

- **Python Frameworks/Packages:** JAX, Numpyro, Numpy, Pandas, Scipy, PyTorch, Matplotlib, Jupyter, Papermill, Sphinx, Airflow

Tools

- **OS:** Linux (have used several distributions including NixOS, Ubuntu, and Manjaro)

- **Version control:** Git, GitHub, Gitkraken, Lazygit

- **Shells:** Fish, Bash

- **Other:** Nix, Docker, LaTeX, Neovim, Vscode, CLI, Excel, SSH

Research and Projects

Publication ⧉ : Theoretical Guarantees for the Statistical Finite Element Method

- Published in the **SIAM/ASA Journal on Uncertainty Quantification (JUQ)**.

- Presented a new theoretical analysis of the Statistical Finite Element Method (StatFEM), demonstrating that it has similar convergence properties to the finite element method on which it is based.

- Demonstrated a bound on the 2-Wasserstein distance between the ideal prior and posterior and the StatFEM approximation thereof, and showed that this distance converges at the same mesh-dependent rate as the finite element solution converges to the true solution.

- **Coded up simulations in Python** demonstrating the error bounds. This involved using the popular open-source package **FEniCS ⧉** to apply the FEM method to various PDEs as well as working with Gaussian Processes using a combination of **Numpy**, **Scipy**, and **Numba**. The Python package **joblib** was utilised to parallelise some of the computations required. The code is publicly available on **GitHub ⧉** and can be run as a **Docker** container.

PhD Project ⧉ : GrassGP

- PDE models often involve a large number of parameters increasing computational burden. Thus, the study of methods to perform dimension reduction are of vital importance.

- Introduced and motivated the concept of a **localised active subspace** for dimension reduction, where the dimension reducing subspace varies smoothly as a function of the input parameters.

- Presented a fully Bayesian model based on **Gaussian Processes**, called **GrassGP**, which can be used to estimate and interpolate localised active subspaces by viewing them as a field of subspace-valued response-variables.

- Provided a **code implementation** of this model in Python using **JAX** and the probabilistic programming package **NumPyro**. The code is publicly available on **GitHub ⧉** and my **PhD thesis**, which can be found **online here ⧉**, contains a detailed description of this project.

MSc Thesis ⧉ : Kernel-based Inference Methods for Ordinary Differential Equations

- Investigated the use of Maximum Mean Discrepancy for parameter inference in generative models based on ODEs.

- Studied an adjoint method for gradient descent in high-dimensional parameter spaces.

- Developed **Jupyter Notebooks** for demonstration purposes. **Numpy** and **Scipy** were used to solve the ODEs involved. **Vanilla and Natural Gradient Descent** were utilised for parameter fitting. **PyTorch** was utilised for some experiments involving **neural networks** and for its autodiff capabilities. The code is publicly available on **GitHub ⧉**

MSc Coursework

- Sampling and simulation methods such as inverse transform, rejection sampling, and MCMC methods including Metropolis-Hastings and Gibbs samplers, and particle filters (achieved distinction grades of 82.9% and 80.5% on Computational Statistics and Advanced Simulation Methods courseworks respectively). All code for this coursework was implemented in **R**.

- Machine Learning algorithms including: fitting models using Gaussian Processes, binary classification using methods such as logistic regression and generative linear classifiers and PCA (achieved a distinction grade of 83.5% on Machine Learning Coursework). All code for this coursework was implemented in **R**.

- Time series modelling. All code for the coursework was implemented in **MATLAB**.

- Big Data - Map-reduce, Hadoop, Spark (with **Scala**)

- Added a feature to the popular probabilistic programming package **Numpyro ⧉** via a successful pull request. My contribution helped enable rendering of deterministic sites for Bayesian Models.

- Active on GitHub: $\approx$ 700 commits, 4 pull requests, and 12 issues in 2022-2023.

Awards

- **Winton Capital Prize** awarded for best MSc Statistics student (top of class) at Imperial College London.

- **Georges Lemaître Prize** awarded for achieving the highest mark in the Maths Tripos at St Edmund's College, University of Cambridge.

- **Imperial College MSc Stats Challenge - 1st place**: Winning team in the annual challenge where we had to fit a model to noisy financial time-series data in order to optimize the Residual Sum of Squares. Our algorithm later went on to be in the top bracket of Auquan's spring challenge competition.

- **A Level Highest Subject Marks** (2013): Maths (Internationally), Further Maths, and Physics (in Cyprus).

Additional Information

- A Levels: Maths (A*), Further Maths (A*), Physics (A*), Chemistry (A*)

- Languages: English (Native), Greek (Conversational)

- Citizenship: Cyprus (EU), USA