# Cristiana Diaconu

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## Education

**Machine Learning Group, University of Cambridge** *2023 - Present*
PhD in Machine Learning
Supervised by Prof. Richard Turner, Advised by José Miguel Hernández Lobato

**MEng in Information Engineering and Bioengineering, University of Cambridge** *2019-2021*
Part IIB Engineering *Distinction 83% - top of the Part IIB order of merit*, Part IIA *89%*

**BA Hons Natural Sciences - Physics and Materials Science** 2017-2019
Part IB *First Class Honours (I) - 79%*, Part IA *Upper Second Class (II.1) - 69%*

## Publications and Select Preprints

**Gridded Transformer Neural Processes for Large Unstructured Spatio-Temporal Data**
Matthew Ashman*, **Cristiana Diaconu***, Eric Langezaal*, Adrian Weller, Richard E. Turner

**On Conditional Diffusion Models for PDE Simulations**
*Accepted at the Thirty-eighth Annual Conference on Neural Information Processing Systems (NeurIPS), 2024*
Aliaksandra Shysheya*, **Cristiana Diaconu***, Federico Bergamin*, Paris Perdikaris, José Miguel Hernández-Lobato, Richard E. Turner, Emile Mathieu

**Approximately Equivariant Neural Processes**
*Accepted at the Thirty-eighth Annual Conference on Neural Information Processing Systems (NeurIPS), 2024*
Matthew Ashman*, **Cristiana Diaconu***, Adrian Weller, Wessel P. Bruinsma, Richard E. Turner

**Translation Equivariant Transformer Neural Processes**
*International Conference on Machine Learning (ICML), 2024*
Matthew Ashman, **Cristiana Diaconu**, Junhyuck Kim, Lakee Sivaraya, Stratis Markou, James Requeima, Wessel P. Bruinsma, Richard E. Turner

**In-Context In-Context Learning with Transformer Neural Processes**
*Proceedings of the 6th Symposium on Advances in Approximate Bayesian Inference, 2024*
Matthew Ashman*, **Cristiana Diaconu***, Adrian Weller, Richard E. Turner

**Guided Autoregressive Diffusion Models with Applications to PDE Simulation**
*AI4DiffEqtnsInSci Workshop at International Conference on Learning Representations (ICLR), 2024*
Federico Bergamin*, **Cristiana Diaconu***, Aliaksandra Shysheya*, Paris Perdikaris, José Miguel Hernández Lobato, Richard E. Turner, Emile Mathieu

**Denoising Diffusion Probabilistic Models in Six Simple Steps**
Richard E. Turner, **Cristiana Diaconu**, Stratis Markou, Aliaksandra Shysheya, Andrew Y. K. Foond, Bruno Mlodozeniec

## Work Experience

**Data Scientist/Machine Learning Engineer at L2S2** 2021 - 2023

- Analysed and developed machine learning models on big medical data sets (1M+ datapoints); examples include predicting the mortality risk of patients using Hospital Episode Statistics (HES) data, investigating the risk of deterioration of elderly people by analysing vital signs data.
- Developed an automatic pupil detection algorithm using the **OpenCV** library in **Python**.
- Developed an emergency department simulator using a discrete event simulator (**Simpy** in **Python**).
- Enhanced **Pandas** skills and developed medical coding skills, by working on the data development of the Emergency Care Data Set (ECDS) Max.

**Data Analyst Summer Intern at Intropic** 2020

- Performed an event study that analysed the impact of Passive Fund demand and supply, and proposed a simple long-short strategy based on the findings.
- Produced a white paper used as sales material showing how Intropic's data can be leveraged to generate positive market adjusted returns.
- Cleaned and processed the 4-year historical dataset on which the event study was performed; was responsible for the final version of the dataset that was shared with the clients.

**Investment Banking Summer Intern at HSBC** 2019

- Analysed over 25 companies within the technology, media & telecommunications (TMT) sector, performed financial modeling and assisted with marketing and execution work for potential buy- and sell-side M&A deals.

## Research and Projects

**Diffusion Models for Partial Differential Equations (PDEs) modelling** 2023-Present

- Developing a probabilistic treatment of PDE modelling by leveraging diffusion models to solve the tasks of *forecasting* and *data assimilation*.
- Investigating the advantages and disadvantages of different conditioning mechanisms for diffusion models, including reconstruction guidance and amortising over the conditioning information.
- Implemented in **PyTorch** diffusion models based on the continuous-time formulation.

**Transformer Neural Processes (TNPs)** 2023-Present

- Researching how to best include transformer techniques into neural processes (NPs), a family of models that combines the benefits of stochastic processes and neural networks.
- Investigating the influence of inductive biases such as translation equivariance in TNPs.

**High quality IT system for emergency care in developing countries** 2023-2024

- Contributed to an open-source, **Django**-based application that can be used to provide emergency care in clinics/hospitals with limited technological resources (e.g. from developing countries).

**Cuff-less Blood Pressure Estimation** 2020-2021

- Worked with a 2.4TB database to develop a combination of physical and machine learning-based models, with the aim to perform non-invasive cuff-less estimation of the arterial blood pressure.

**Image Processing** 2020

- Implemented in **MATLAB** image compression techniques which lie at the basis of the JPEG (Joint Photographic Experts Group) standards.

## Teaching Experience

**Project Supervisor, University of Cambridge** 2023-Present

- Co-supervised the projects of three fourth-year Engineering students, and of one student completing an MPhil in Machine Learning and Machine Intelligence.

**Undergraduate Supervisor, University of Cambridge** 2023-Present

- Inference (3F8) - topics include Regression, Classification, Clustering, Sequence Modelling.
- Statistical Signal Processing (3F3) - topics include Probability, Markov Chains, Time Series models.

**Lab Demonstrator for the Lego Mindstorms exercise, University of Cambridge** 2023-Present

**Private Tutor** 2019-Present

- STEM subjects for pupils studying for final-year examinations and university level examinations.

## Scholarships and Awards

**Cambridge Trust Scholarship** 2023-2026

Awarded a full scholarship for a PhD in Machine Learning.

**The Institution of Civil Engineering Baker Prize** 2021

Awarded for being the **highest candidate in the combined order of merit** in the Part IIB examinations from the Engineering Tripos.

**The Ruth Hendry Prize** 2021

Awarded by Queens' College for outstanding distinction in examinations by a fourth year undergraduate.

**The James & Jean Bennett Prize** 2021

Awarded by Queens' College for distinction in Engineering.

**Foundation Scholarship** 2020

Awarded in recognition of obtaining a First in the fourth-year examinations.

**The Prigmore Prize** 2020

Awarded by Queens' College for distinction in Engineering.

**Prizes and Medals at the Romanian Physics National Olympiad** 2014-2017

**Silver Medal at the European Union Science Olympiad, Klagenfurt, Austria** 2015

## Skills

**Computing** - Python, MATLAB, PyTorch, Tensorflow, Django, LaTex

**Language** - Romanian: Mother Tongue, English: Fluent, Spanish: Advanced, German: Basic