

# 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**

2017-2019

Part IB *First Class Honours (I) - 79%*, Part IA *Upper Second Class (II.1) - 69%*

## PUBLICATIONS AND SELECT PREPRINTS

### 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 Mlodozieniec

## 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

<b>Diffusion Models for Partial Differential Equations (PDEs) modelling</b>	2023-Present
<ul style="list-style-type: none"><li>• Developing a probabilistic treatment of PDE modelling by leveraging diffusion models to solve the tasks of <i>forecasting</i> and <i>data assimilation</i>.</li><li>• Investigating the advantages and disadvantages of different conditioning mechanisms for diffusion models, including reconstruction guidance and amortising over the conditioning information.</li><li>• Implemented in <b>PyTorch</b> diffusion models based on the continuous-time formulation.</li></ul>	
<b>Transformer Neural Processes (TNPs)</b>	2023-Present
<ul style="list-style-type: none"><li>• 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.</li><li>• Investigating the influence of inductive biases such as translation equivariance in TNPs.</li></ul>	
<b>High quality IT system for emergency care in developing countries</b>	2023-2024
<ul style="list-style-type: none"><li>• Contributed to an open-source, <b>Django</b>-based application that can be used to provide emergency care in clinics/hospitals with limited technological resources (e.g. from developing countries).</li></ul>	
<b>Cuff-less Blood Pressure Estimation</b>	2020-2021
<ul style="list-style-type: none"><li>• Developed a combination of physical and machine-learning based models to perform non-invasive cuff-less estimation of the arterial blood pressure.</li><li>• Worked with a 2.4TB database in order to extract relevant physiological waveforms, such as applying pre-processing techniques (Butterworth and Chebyshev filtering) to highlight relevant features.</li></ul>	
<b>Image Processing</b>	2020
<ul style="list-style-type: none"><li>• Implemented in <b>MATLAB</b> image compression techniques which lie at the basis of the JPEG (Joint Photographic Experts Group) standards.</li><li>• Competed in pairs to design an optimised image compression scheme, with the aim of achieving good subjective visual quality of a 5kB compressed image and won the first place.</li></ul>	

## TEACHING EXPERIENCE

<b>Project Supervisor, University of Cambridge</b>	2023-Present
<ul style="list-style-type: none"><li>• Co-supervised the projects of three fourth-year Engineering students, and of one student completing an MPhil in Machine Learning and Machine Intelligence.</li></ul>	
<b>Undergraduate Supervisor, University of Cambridge</b>	2023-Present
<ul style="list-style-type: none"><li>• Inference (3F8) - topics include Regression, Classification, Clustering, Sequence Modelling.</li><li>• Statistical Signal Processing (3F3) - topics include Probability, Markov Chains, Time Series models.</li></ul>	
<b>Lab Demonstrator for the Lego Mindstorms exercise, University of Cambridge</b>	2023-Present
<b>Private Tutor</b>	2019-Present
<ul style="list-style-type: none"><li>• STEM subjects for pupils studying for final-year examinations and university level examinations.</li></ul>	

## SCHOLARSHIPS AND AWARDS

<b>Cambridge Trust Scholarship</b>	2023-2026
Awarded a full scholarship for a PhD in Machine Learning.	
<b>The Institution of Civil Engineering Baker Prize</b>	2021
Awarded for being the <b>highest candidate in the combined order of merit</b> in the Part IIB examinations from the Engineering Tripos.	
<b>The Ruth Hendry Prize</b>	2021
Awarded by Queens' College for outstanding distinction in examinations by a fourth year undergraduate.	
<b>The James &amp; Jean Bennett Prize</b>	2021
Awarded by Queens' College for distinction in Engineering.	
<b>Foundation Scholarship</b>	2020
Awarded in recognition of obtaining a First in the fourth-year examinations.	
<b>The Prigmore Prize</b>	2020
Awarded by Queens' College for distinction in Engineering.	
<b>Prizes and Medals at the Romanian Physics National Olympiad</b>	2014-2017
<b>Silver Medal at the European Union Science Olympiad, Klagenfurt, Austria</b>	2015

## SKILLS

<b>Computing</b> - Python, MATLAB, PyTorch, Tensorflow, Django, LaTeX
<b>Language</b> - Romanian: Mother Tongue, English: Fluent, Spanish: Advanced, German: Basic