Mihaela Cătălina Stoian

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EDUCATION

University of Oxford October 2021 - present
Oxford, UK
DPhil student in Computer Science
Supervised by Prof. Thomas Lukasiewicz
Research areas: Neuro-symbolic AI, Machine Learning, Generative modelling.

The University of Edinburgh September 2014 - May 2019
Edinburgh, UK
Master of Informatics with Honours, First Class

EXPERIENCE

Research Intern at FiveAI 2020 - 2021
Oxford, UK

- *Supervisor*: Dr. Tommaso Cavallari
- *Topics*: Detecting Reflective Symmetries in 3D Models, Computer Vision
- *Patent application, paper*: "Recurrently Estimating Reflective Symmetry Planes from Partial Pointclouds" (CVPR 2021 Workshop on 3D Vision and Robotics)

I proposed a new approach for detecting reflective symmetries in 3D models based on an encoding that slices the data along the height dimension and passes it sequentially to a 2D convolutional recurrent regression scheme. Thus, this novel approach avoids expensive 3D convolutions, which are typically utilised for processing 3D data. The tools I used include PyTorch, TensorFlow, TensorBoard, PyTorch Lightning, Docker.

Research Assistant at The University of Edinburgh 2019

- *Supervisor*: Prof. Sharon Goldwater
- *Topic*: Speech-to-Text Machine Translation
- *Publication*: "Analyzing ASR pretraining for low-resource speech-to-text translation" (in Proc. of ICASSP 2020).

In this project I pretrained neural network models on high-resource automatic speech recognition (ASR) data and transferred the encoder parameters to zero-resource settings, showing that combining pretraining with data augmentation on the target language improves performance. The models I worked with include CNNs, RNNs, and LSTMs; the techniques include data agumentation and data perturbation; the tools include the Kaldi toolkit (in Shell) for speech recognition.

Student Summer Research Fellow at ETH Zurich 2018

- *Supervisors*: Prof. Martin Vechev, Assistant Prof. Dana Drachsler Cohen
- *Topic*: Program Behaviour Synthesis

I worked on program behaviour synthesis for P4 (Programming Protocol-Independent Packet Processors). First I wrote a parser for P4 programs in Python. Then, using Z3 (constraint solver), I implemented an encoding of the desired behaviour of P4 programs.

LFCS Research Intern at The University of Edinburgh 2017

- *Supervisor*: Prof. Kousha Etessami
- *Topic*: Branching Markov Processes

I implemented a program that computes the reachability probabilities in Branching Markov Processes, based on a state-of-the-art P-time algorithm. Since non-reachability is captured by the Greatest Fixed Point (GFP), the initial goal was reduced to computing the GFP using the Generalized Newton's Method (GNM). Part of the project's scope was evaluating the application of theoretical results in a real-world setting in terms of computational resources.

SELECTED PUBLICATIONS

• Mihaela C. Stoian, Salijona Dyrmishi, Maxime Cordy, Thomas Lukasiewicz, and Eleonora Giunchiglia. **How Realistic Is Your Synthetic Data? Constraining Deep Generative Models for Tabular Data**, in Proc. of ICLR 2024.

• Mihaela C. Stoian, Alex Tatomir, Thomas Lukasiewicz, and Eleonora Giunchiglia. **PiShield: A PyTorch Package for Learning with Requirements**, in Proc. of IJCAI 2024.

• Mihaela C. Stoian. **Deep Learning with Requirements in the Real World**, in Proc. of IJCAI, Doctoral Consortium 2024.

• Eleonora Giunchiglia, Alex Tatomir, Mihaela C. Stoian, Thomas Lukasiewicz. **CCN+: A neuro-symbolic framework for deep learning with requirements**, in International Journal of Approximate Reasoning, Volume 171 (2024).

• Mihaela C. Stoian, Eleonora Giunchiglia, and Thomas Lukasiewicz. **Exploiting T-norms for Deep Learning in Autonomous Driving**, in Proc. of NeSy 2023.

• Eleonora Giunchiglia, Mihaela C. Stoian, Salman Khan, Fabio Cuzzolin, and Thomas Lukasiewicz. **ROAD-R: The Autonomous Driving Dataset with Logical Requirements**, in Machine Learning, Volume 112 (2023). (best paper award at the AI4AD workshop hosted by IJCAI 2022 and best student paper prize at IJCLR 2022)

• Eleonora Giunchiglia, Mihaela C. Stoian, Thomas Lukasiewicz. **Deep Learning with Logical Constraints**, in Proc. of IJCAI, 2022.

• Mihaela C. Stoian, Tommaso Cavallari. **Recurrently Estimating Reflective Symmetry Planes from Partial Pointclouds**, in CVPR Workshop on 3D Vision and Robotics, 2021.

• Mihaela C. Stoian, Sameer Bansal, and Sharon Goldwater. **Analyzing ASR pretraining for low-resource speech-to-text translation**, in Proc. of ICASSP 2020.

TEACHING

Class Tutor at The University of Edinburgh 2017 - 2019

My role was to go through the weekly problems proposed by the course organisers and guide the students in finding the solutions. I was a tutor for the following courses:

- Processing Formal and Natural Languages
- Discrete Mathematics
- Algorithms, Data Structures and Learning

SERVICE

Organiser for workshops and challenges

• ROAD-R: The Road Event Detection with Requirements Challenge, hosted by NeurIPS 2023

• ROAD++: The Second Workshop & Challenge on Event Detection for Situation Awareness in Autonomous Driving, hosted by ICCV 2023

Reviewer

• Conferences: NeurIPS, IJCAI, ICML, NeSy, ICPR.

• Workshops: ROAD++ (hosted by ICCV 2023), RepL4NLP (hosted by ACL 2022), NeSy-GeMs (hosted by ICLR 2023).

• Journals: Machine Learning.

SCHOLARSHIPS AND GRANTS

EPSRC Scholarship for doctoral studies October 2021 - March 2025

St Hilda's College Travel for Research Grant May 2023 - February 2024

IJCAI-AIJ 2024 Travel Grant Program 2024

TOPICS

Neuro-symbolic AI
Generative Modelling
Knowledge-Aided Machine Learning
Computer Vision, 3D Shape Completion
Speech Processing, Neural Speech-to-Text Machine Translation