Francesco Pinto

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Third-year DPhil student in machine learning at Torr Vision Group, Department of Engineering Science, University of Oxford. Currently focusing on: probabilistic programming, uncertainty quantification in deep learning (calibration, data-shift robustness, out-of-distribution detection and misclassification detection), Transformers, Bayesian deep learning, Gaussian processes, Out-of-Domain generalization, Causality

EDUCATION

University of Oxford, Oxford (United Kingdom)
Torr Vision Group, DPhil Student of Engineering Science
September 2019–Present
Supervisors: Philip Torr, Atilim Gunes Baydin, Victor Prisacariu
Other collaborations: Puneet Dokania, Ser-Nam Lim (Facebook)

Australian National University, Canberra (Australia)
Robotic Vision Summer School 2020, Student
Winner of a grant to attend the school

Politecnico di Milano, Milano (Italy)
Computer Science and Engineering, Master Degree
July 2019
Thesis subject: Image Inpainting and Object Removal — Grade: 110L/110

Music Conservatory G. Martucci, Salerno (Italy)
Piano Master Diploma
September 2019 — Grade: 10L/10

Politecnico di Milano, Milano (Italy)
Computer Science and Engineering, Bachelor Degree
February 2017 — Grade: 110L/110

Liceo Scientifico Giovanni Da Procida, Salerno (Italy)
Diploma di maturità scientifica
July 2013 — Grade: 100L/100

EXPERIENCE

FiveAI Research Intern — **June–March 2021**
Work at FiveAI to carry out research on Transformers and Uncertainty Estimation. I am currently involved in a project analysing the uncertainty estimation quality of transformers and convolutional neural networks for autonomous driving applications.

GirlsWhoML — **April 2021**
Contributed to the teaching material for the GirlsWhoML initiative
https://twitter.com/GirlsWhoML
Reference: tomjoy@robots.ox.ac.uk

ESA Frontier Development Lab — **June–August 2020**
Working with the European Space Agency (ESA) for a research sprint on machine learning applied to spacecraft collision avoidance, using Bayesian deep learning and probabilistic programming.

PUBLICATIONS

Conference Papers
Giacomo Acciarini, **Francesco Pinto**, Francesca Letizia, José A Martinez-Heras, Klaus Merz, Christopher Bridges, Atılım Güneş Baydin, 2021. *"Kessler: A machine learning library for spacecraft collision avoidance"* In 8th European Conference on Space Debris
Github: https://github.com/kesslerlib/kessler

Francesco Pinto, Andrea Romanoni, Matteo Matteucci, and Philip H.S. Torr. 2020. *"SECI-GAN: Semantic and Edge Completion for Dynamic Objects Removal"* In 25th International Conference on Pattern Recognition (ICPR 2020), Milan, Italy.

Workshop Papers

Francesco Pinto, Philip H.S. Torr, and Puneet K. Dokania. 2020. *"Are Visual Transformers always more robust than Convolutional Neural Networks?" In Distribution Shifts Workshop (NeurIPS 2021)*

Francesco Pinto, Harry Yang, Ser-Nam Lim, Philip H.S. Torr, and Puneet K. Dokania. 2020. *"Mix-MaxEnt: Improving Accuracy and Uncertainty Estimates of Deterministic Neural Networks" In Distribution Shifts Workshop (NeurIPS 2021)*

Francesco Pinto, Giacomo Acciarini, Sascha Metz, Sarah Boufelja, Sylvester Kaczmarek, Klaus Merz, José A. Martinez-Heras, Francesca Letizia, Christopher Bridges, and Atılım Güneş Baydin. 2020. *"Towards Automated Satellite Conjunction Management with Bayesian Deep Learning."* In AI for Earth Sciences Workshop at NeurIPS 2020, Vancouver, Canada.

Acciarini, Giacomo, **Francesco Pinto**, Sascha Metz, Sarah Boufelja, Sylvester Kaczmarek, Klaus Merz, José A. Martinez-Heras, Francesca Letizia, Christopher Bridges, and Atılım Güneş Baydin. 2020. *"Spacecraft Collision Risk Assessment with Probabilistic Programming."* In Third Workshop on Machine Learning and the Physical Sciences (NeurIPS 2020), Vancouver, Canada.

Working Papers

Francesco Pinto, Harry Yang, Ser-Nam Lim, Philip H.S. Torr, and Puneet K. Dokania. 2020. *"Mix-MaxEnt: An Extremely Simple Regularizer to Improve Accuracy and Uncertainty Estimates of Deterministic Neural Networks " (Conference Paper, under review)*

Tom Joy, **Francesco Pinto**, Ser-Nam Lim, Philip H.S. Torr, and Puneet K. Dokania *"Revisiting temperature scaling for improved calibration for out-of-distribution generalization" (Conference Paper, Submitted at CVPR 2022)*

Francesco Pinto, Robert Zinkov, Philip H.S. Torr, and Atılım Güneş Baydin. 2020. *"A Sanity Check Methodology to Assess the Expressivity of Bayesian Deep Learning Predictive Posteriors" (Conference Paper, ongoing)*

INVITED TALKS

Atılım Güneş Baydin and **Francesco Pinto**, *"Spacecraft Collision Avoidance with Bayesian Deep Learning" In Bayesian Deep Learning Workshop (NeurIPS 2021)*

TECHNICAL SKILLS

Programming Languages: Proficient: Python, Java, Matlab, C++; Familiar: Javascript, R
Database Management: MySQL, XPath/XQuery, Neo4j, MongoDB, Esper
Tools/Frameworks:
PyTorch+Numpy+ScikitLearn+NLTK+PySpark+OpenCV(Python),
PyProb+Pyro (Probabilistic Programming),
Unreal Engine 4 (C++, Blueprints), Blender (Python) and Carla (Synthetic Data Generation)
ROS+Gazebo+RViz (C++); OpenGL (C++),
Java SE+Java EE+Spring+HTML+CSS+jQuery+Knockout.js (Java),
Ecore + Eugenia + XText + Acceleo + ATL + OCL + XMI (Metamodeling),
ER+UML+IFML(Modeling); Git

Android App Development; RDF+RDFS+SPARQL, PDDL

TEACHING & SUPERVISION EXPERIENCE

University of Oxford : Tutor **2020-2021**
Tutor in Advanced Machine Learning at OPUS, defining a syllabus covering Image Synthesis, Self-Supervision, Amortized Inference, Intuitive Physics, Visual Question Answering, Face and Gesture Recognition. Tutor in Artificial Intelligence (Space State Search, Linear Planning, Genetic Algorithms, Bayesian reasoning) and Machine Learning (Fundamentals, Linear Regression, Logistic Regression, Neural Networks).

University of Oxford : Tutor **Michaelmas - Hilary 2020/2021**
Tutor in Image Processing, Signal Processing, Bayesian Statistics and Inference for Undergraduate students of the Engineering Science course.

University of Oxford : Co-supervisor Undergrad Intern **Summer 2020**
Teaching Probabilistic Programming and Model-Based Bayesian inference to Ryan Marsten, supervising the implementation of a simple application project.

University of Oxford : ML Course Demonstrator **Michaelmas 2019**
Assisting students in carrying out practical exercises about fundamental machine learning algorithms

REVIEW SERVICE

ICML 2021, NeurIPS 2021

RESEARCH PROJECTS

Evaluation Suite for Bayesian Neural Network Predictive Posteriors **Ongoing**

Implementing a novel methodology to evaluate Bayesian Neural Network (BNNs) Predictive Posteriors. The method allows to perform a sanity check on BNNs, identifying inadequate expressiveness in the Predictive Posteriors in the limit of infinite training data.

Benchmark for uncertainty estimation **January-June 2021**

Implementing a benchmark containing all SOTA deep-learning uncertainty estimation methods in Pytorch. The benchmark will be made publicly available upon acceptance of the Mix-MaxEnt paper.

Kessler: ABC and ML for SCM **April 2021**

Contributor for the Development of the Kessler package, a software for Approximate Bayesian Inference (Probabilistic Programming) and Bayesian Machine Learning applied to Satellite Conjunction Management.
Github: https://github.com/kesslerlib/kessler

COURSE PROJECTS

Some of my course projects are publicly available on **GitHub: https://github.com/FrancescoPinto**

Course Project: PF and EKF for Target Localization **July 2019**

Implementation of a Particle Filter (PF) and of an Extended Kalman Filter (EKF) for a point target localization problem in the 2D plane (MATLAB).

Course Project: Social Media Analysis **February 2019**

The system included a twitter scraper. The Social Media Analysis was applied to the tweets by performing: exploratory analysis, natural language processing, unsupervised

topic extraction, sentiment analysis, visualization. The Time Series Prediction was applied to tweets and parking and telco data: time series preprocessing, forecasting using ARIMAX models, static predictions using linear regression, regression trees and gradient boosted trees. Results evaluation and visualization.

Course Project: Differential Drive Robots Simulation **December 2018**

Simulation of a differential drive robot using ROS and Gazebo. I built a differential drive model and developed an encoder and odometry plug-in (with data coming from IMU/Encoder Bags). The resulting model was used to perform environment mapping and localization using the ROS libraries.

Course Project: Data-Processing Modeling Language **December 2018**

Usage of EMF (and related languages) to develop a DSL for data-processing pipelines modeling (abstract syntax + OCL constraints, graphical syntax, code generation).

Course Project: Web-based crowdsourcing platform for image annotation September 2018

Design and development of a web-site for the crowdsourcing of image annotations of mountain profiles. The system was made of a Single Page Application (Knockout.js + MVVM Design Pattern) that called a REST API (Spring (Java)) hosted on a server that interacted with a Relational Database (MySQL) following the MVC2 pattern.

Course Project: Others

Discrete signals and Image processing projects (MATLAB and Python). OpenGL projects. Usage of IFML+UML+ER for model-driven web development.

RELEVANT COURSES

• Machine Learning • Cognitive Robotics • Digital Image Processing
• Information Retrieval and Data Mining • Robotics • Computer Graphics
• Model Identification, Data Analysis and Adaptive Systems
• Probability • Statistics • Signal Processing • Artificial Intelligence
• Foundations of Operations Research • Advanced Linear Algebra • Web Science and Technologies
• Automatic Controls • Industrial Automation • Algorithms and Data Structures

REFEREES

Prof. Philip H.S. Torr
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www.robots.ox.ac.uk/~tvg/

Dr. Puneet Kumar Dokania
Senior Researcher at the University of Oxford, Principal Researcher at FiveAI
Department of Engineering Science,, Parks Road, Oxford OX1 3PJ, United Kingdom
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Dr. Atılım Güneş Baydin
Departmental Lecturer, Department of Computer Science, University of Oxford
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