Carlos Medina
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1. Work Experience

08/2022 – present **Bosch Corporate Research,** Germany
Position: PhD Candidate (University of Freiburg)
Focus: Self-supervised machine learning for autonomous driving.

10/2021 – 07/2022 **smarter.ai,** United Kingdom
Position: AI Curator & Machine Learning Engineer
Focus: Building a marketplace for machine learning solutions – Implementing bespoke solutions for beta customers (see projects attachment)

04/2021 – 10/2021 **GMV NSL,** United Kingdom
Position: Machine Learning Engineer
Focus: Machine learning to forecast GNSS correction products for the European Space Agency – Machine learning to detect malicious interference with GNSS receivers for the European Space Agency (see projects attachment)

07/2019 – 09/2019 **StepStone Germany GmbH,** Germany
Position: Predictive Analytics Intern
Focus: Natural language processing (NLP) for internal job ad classification

05/2018 – 10/2018 **Eberhard Karls University Tübingen**, Germany
Position: Research Assistant with Prof. Felix Wichmann
Focus: Comparing deep neural network vision to human vision

02/2018 – 07/2018 **Psiori GmbH**, Germany
Position: Data Scientist
Focus: Various data analysis and machine learning projects for IAV GmbH, Daimler AG, Volkswagen AG, Otto Group and Andritz AG (see projects attachment)

2. Education

09/2020 – 03/2021 **University of Oxford**, United Kingdom
Master's thesis at the Visual Geometry Group (supervisors: Prof. Andrea Vedaldi and Dr. Yuki Asano)

09/2018 – 03/2021 **Swiss Federal Institute of Technology Lausanne (EPFL)**, Switzerland
MSc Data Science
Result: 5.73 (second best of my cohort)
Rated 8th best university for "Computer Science & Information Systems" by the QS World University Rankings 2020

Main projects: Self-supervised few-shot learning, semi-supervised few-shot learning, self-supervised object tracking, few-shot text classification with graph neural networks (see projects attachment)

10/2014 – 09/2017 **Eberhard Karls University Tübingen**, Germany
BSc Cognitive Science
Result: 1.11 (second best grade ever achieved in this degree)

Thesis: Comparing deep neural networks against humans: resilience against image manipulations in natural image classification (with Prof. Felix Wichmann; grade 1.0)

3. Publications

06/2020 — Carlos Medina, Arnout Devos, and Matthias Grossglauser. "Self-supervised prototypical transfer learning for few-shot classification." *7th ICML Workshop on Automated Machine Learning* (2020). **(30 citations)**

12/2018 — Robert Geirhos, Carlos R. Medina Temme, Jonas Rauber, Heiko H. Schütt, Matthias Bethge and Felix A. Wichmann. "Generalisation in humans and deep neural networks." *Advances in Neural Information Processing Systems* 31 (2018): 7538-7550. **(403 citations)**

4. Languages & Skills

German (native), Spanish (native), English (fluent), French (beginner)

Python (Pytorch, Tensorflow, Keras, Scikit-learn, Pandas, PySpark),
Java, Scala, Bash, Docker, Git, Linux, Latex

Computer Vision, Natural Language Processing, Deep Learning, Data Science, Autonomous Driving, Time-Series Forecasting, Self-Supervised Learning, Few-Shot Learning, Signal Processing, Data Analytics, Statistics, Optimisation

5. Additional Information

07/2021 – 10/2021 — President at the Rotaract Club of Oxford (Oxford student branch of the humanitarian organisation Rotary International)

11/2020 – 06/2021 — Active member and president-elect at the Rotaract Club of Oxford

09/2017 – 12/2017 — Travelling through Southeast Asia: Thailand, Laos, Vietnam, Cambodia

03/2017 – 07/2017 — Voluntary work as a sports instructor for refugee children at the school Gemeinschaftsschule West in Tübingen, Germany

07/2014 – 08/2014 — Voluntary work as an English teacher at Yayasan Widyasari, Indonesia

continuous — Machine learning conferences attended: NeurIPS 2021, CVPR 2021, ICML 2020, AMLD 2020

Attachment: machine learning projects | Carlos Medina

Projects at smarter.ai:

Year: 2021 | **Sector:** Space/GNSS | **Location**: UK

Objective: Automatic fashion product tagging based on textual descriptions and images using machine learning.

Personal role: Co-management of the customer relation – Definition of data requirements and initial data exploration - Implementation of computer vision and natural language processing methods in Pytorch

Result: Ongoing – First proof of concept

Projects at GMV NSL:

Year: 2021 | **Sector:** Space/GNSS | **Location**: UK

Objective: Machine learning to forecast GNSS clock and orbit products for the European Space Agency

Personal role: Research and implementation of current time series forecasting methods in Pytorch - Data acquisition, analysis and processing using PostgreSQL and Pandas - Documentation and presentation of results to the European Space Agency

Result: Ongoing – Improvement over current IGS corrections forecasting methods for both clock bias and orbit corrections – Extension of accurate predictions to significantly longer periods (2 hours)

Year: 2021 | **Sector:** Space/GNSS | **Location**: UK

Objective: Machine learning to detect malicious interference with GNSS receivers (spoofing and jamming)

Personal role: Research and implementation of ML models in Pytorch – Exploratory data analysis – Problem definition together with the European Space Agency

Result: Ongoing – State-of-the-art literature review

Projects at Psiori GmbH:

Year: 2018 | **Sector**: Automotive | **Location**: Germany

Objective: Extract driver statistics from tracked GPS coordinates for the Volkswagen AG

Personal role: Development of a PySpark feature extraction module combining GPS coordinates and matching OpenStreetMap information

Result: A wide range of driver characteristics to be used in driver clustering algorithms

Year: 2018 | **Sector**: Automotive | **Location**: Germany

Objective: Automatic fuel valve controller using reinforcement learning for Daimler

Personal role: Implementation and training of neural networks in Tensorflow – Data exploration in Pandas – Data augmentation to account for dataset imbalance

Result: A value network to accurately estimate control action consequences

Year: 2018 | **Sector**: Automotive | **Location**: Germany

Objective: Car engine failure detection from audio recordings for Andritz AG

Personal role: Implementation of a generative adversarial network (GAN) library for data augmentation, anomaly detection as well as data visualisation in Tensorflow.

Result: An easy-to-use GAN library

Year: 2018 | **Sector**: Internal project | **Location**: Germany

Objective: Make trained neural networks more interpretable by visualising neurons' most activating features

Personal role: Tensorflow CNN Implementation – Find input images to maximally activate selected hidden units

Result: Feature visualisation library for arbitrary CNNs

Projects at Stepstone Germany GmbH:

Year: 2018 | **Sector**: Online Job Platform | **Location**: Germany

Objective: Automatically categorise job advertisements based on textual description

Personal role: Research and implementation of classical (Random Forest, AdaBoost, SVM, Naive Bayes) and modern text classification methods (CNN, LSTM, Transformer) in Scikit-learn and Tensorflow – Feature extraction and tokenisation in Gensim and spaCy – Presentation of results to stakeholders

Result: Transformer based text classification method passing only uncertain predictions to human annotators

Projects at University (Tübingen, EPFL and Oxford):

Year: 2021 | **Topic:** Data Augmentation | **Location**: Oxford, Visual Geometry Group (VGG)

Objective: Master's thesis - Utilise deep neural networks' ability to linearalise input features in order to provide more semantic latent data augmentation at all network layers – A focus lay on data-efficient learning

Personal role: Extensive literature research – Conceptual design and implementation of a novel latent data augmentation method and its iterative improvement – Training and evaluation of popular computer vision models in Pytorch – Scientific discussions with supervisors and other experts – Paper writing in Latex

Result: A novel latent data augmentation with improvements over previous methods in a data-efficient setting across several datasets

Year: 2018 | **Topic:** DNN vs. Human Vision | **Location**: Tübingen, Neural Information Processing Group

Objective: Bachelor's thesis – Compare classification patterns between humans and convolutional neural networks on perturbed images

Personal role: Training of CNNs in Tensorflow - Implementation of image perturbations in Python – Implementation of psychophysical experiments in Matlab – Extensive literature review – Scientific writing for my Bachelor's thesis and later for the NeurIPS paper in Latex

Result: A large scale comparison between human and neural network object recognition published at NeurIPS 2018

Year: 2020 | **Topic:** Self-supervision for Few-shot Learning | **Location**: EPFL, Information and Network Dynamics

Objective: Semester project – Utilise self-supervised pre-training to improve in-domain and cross-domain few-shot learning for image classification with prototypical networks

Personal role: Extensive literature research - Training of CNNs in Pytorch – Scientific paper writing in Latex – Poster presentation at AutoML (ICML 2020)

Result: State-of-the-art unsupervised few-shot learning results in in-domain and cross-domain settings – Workshop paper published at AutoML (ICML 2020)

Year: 2019/2020 | **Topic:** Self-supervised Object Tracking | **Location**: EPFL, Computer Vision Lab

Objective: Semester project – Improvement on current unsupervised visual tracking approaches

Personal role: Training of CNNs in Pytorch – Literature review – Presentation of results within the group

Result: Slight improvement over previous discriminative correlation filter methods using DCFNet – Integration of unsupervised deep tracking into SiamRPN as an example of "tracking by detection"

Year: 2019/2020 | **Topic:** Graph Neural Networks for Few-shot Text Classification | **Location**: EPFL

Objective: Course project – Utilise graph convolutional networks (GCNs) for few-shot text classification

Personal role: Literature research – GCN implementation and training in Pytorch – Presentation of results – All work carried out as a team of three

Result: Best possible grade for all team members

Year: 2019 | **Topic:** Reinforcement Learning for the Lunar Lander Game | **Location**: EPFL

Objective: Course project – Teach an agent to play the Lunar Lander game from OpenAI Gym

Personal role: Implementation of different reinforcement learning agents using policy-gradient (REINFORCE) or value networks – Entropy regularisation of policy values – All work carried out as a team of two

Year: 2018/2019 | **Topic:** Graph Neural Networks for Movie Revenue Prediction | **Location**: EPFL

Objective: Course project – Utilise graph convolutional networks (GCNs) to predict video gross revenue on the IMDB dataset

Personal role: GCN implementation and training in Tensorflow – Presentation of results – All work carried out as a team of four

Year: 2018/2019 | **Topic:** Predicting Aerosol Particles | **Location**: EPFL

Objective: Course project – Predicting aerosol particles: sulfate, nitrate and PM2.5

Personal role: Using machine learning to predict pollutant concentrations from Fourier-transform infra-red spectroscopy applied to Teflon filters – All work carried out as a team of three

Attachment: early education | Carlos Medina

1. Early education

09/2013 – 08/2014 **University of Sussex**, United Kingdom
BSc Psychology with Neuroscience
Result: First year average of 82% (top 2%)

04/2012 – 09/2012 **Distance University Hagen**, Germany
BSc Psychology (alongside school)

08/2005 – 07/2013 **Theodor-Heuss-Gymnasium**, Germany
Higher Education Entrance Qualification
Result: 1.0 (best of my year)