Vojtěch Sýkora

sykoravojtech.github.io/portfolio/ sykoravojtech sykoravojtech Tübingen, Germany
sykoravojtech.de@gmail.com +49 1573 1155858 Czech Citizen Born 10/03/2001

Skills

Programming Languages: Python (PyTorch, NumPy, Pandas, Matplotlib, OpenCV, TensorFlow), C++, LaTeX, Markdown

Development Tools: Git, Github, Linux, VS Code, GitLab, Canva

Languages: 🇬🇧 English (C1), 🇩🇪 German (B1), 🇨🇿 Czech (Native)

Experience

Synthavo, Machine Learning Engineer — Stuttgart, Germany, Dec 2024 – Present

- Developing a multi-modal pipeline for extracting and analyzing switchboard schematics.
- Engineering end-to-end solutions including object detection, instance segmentation, rotation recognition, text recognition, and edge detection.
- Designing preprocessing and labeling strategies to handle diverse schematic layouts.
- Extracting semantics from intricate electric diagrams to deliver actionable insights for enterprise customers (market cap up to €180B).

Czech Institute of Informatics, Robotics and Cybernetics, Machine Learning Researcher — Prague, Czechia, Mar 2023 – Jul 2023

- Conducted research on identifying the most congested areas in urban environments, focusing on Dublin and Luxembourg.
- Developed and adapted gravitational clustering techniques to detect high-traffic regions, optimizing urban mobility analysis.
- Contributed to a larger framework integrating centralized traffic routing into the SUMO traffic simulation environment.
- Worked with publicly available traffic datasets, applying data-driven approaches to identify problematic traffic zones.
- Co-authored a paper submitted to Expert Systems with Applications (ESWA), Elsevier.

Charles University, Data Scientist — Prague, Czechia, Jul 2020 – Dec 2022

- Project 1 (2020): Analyzed 600K+ records in MySQL using Python-based algorithms to compare and extract key insights.
- Project 2 (2022): Developed an animated choropleth map for visualizing demographic shifts (Python, GeoJSON, NumPy, Pandas, Plotly).

US Air Force Research Lab & CTU FEE AI Center, Artificial Intelligence Researcher — Prague, Czechia, Sep 2021 – Jul 2022

- Contributed to the FRAS (Flexible and Resilient Autonomous Systems) research project, funded by the US Air Force Research Lab.
- Developed a Python and PDDL-based environment generator to train single and multi-agent AI planning strategies.
- Applied classical planning and game theory concepts to create robust algorithms for adversarial environments.

Education

University of Tübingen, Master's in Machine Learning — Oct 2023 – Sep 2025

- Full scholarship from the DAAD for the entire study program of 2 years.
- Focused on Deep Learning, Computer Vision, and Reinforcement Learning.

- Thesis: Multi-modal Deep Learning for Automated Schematic Analysis.

Czech Technical University in Prague, Bachelor's in Open Informatics Sep 2020 – Jun 2023

- Computer Science studies with a focus on Artificial Intelligence.
- Thesis: Proximal Policy Optimization for Car Racing with unpredictable Wind.

prg.ai & Czech Technical University in Prague & Charles University, Prague AI Minor 2021 – 2023

- An interdisciplinary AI curriculum bringing together students, teachers, and researchers from prestigious Prague universities.

Projects

Video Transformers for Classification and Captioning
VideoMamba & SVT VideoUnderstanding
Mar 2024 – Jul 2024

- Developed a transformer-based pipeline leveraging SVT and Video Mamba models on the Charades dataset.
- Engineered a custom data processing pipeline with sliding window inference, achieving up to 29.82 mAP.
- Integrated a GPT-2 based decoder for captioning, achieving BLEU-1 scores above 0.22.
- Tools Used: PyTorch, PyTorch Lightning, OpenCV, Weights & Biases, Scikit-learn.

Instance Segmentation Challenge
instance-segmentation-challenge
Oct 2024

- Leveraged Detectron2 for accurate 2D object segmentation using bounding boxes and masks.
- Used a pre-trained Mask R-CNN model, achieving an overall Average Precision (AP) of 46.1.
- Tools Used: PyTorch, Detectron2, Mask R-CNN.

Proximal Policy Optimization for Car Racing
PPOthesis
Jul 2022 – Jun 2023

- Implemented Proximal Policy Optimization (PPO) algorithm for OpenAI CarRacing with custom Wind.
- Developed robust training strategies, optimized hyperparameters, and evaluated agent performance.
- Consistently reached a score of 900+, outperforming the environment baseline.
- Tools Used: Reinforcement Learning, PPO, OpenAI Gym, Autonomous Driving.

Ischemic Heart Disease Analysis in Germany
IHD_germany_2024
Oct 2023 – Apr 2024

- Conducted an analysis of ischemic heart disease (IHD) in Germany, identifying key risk factors.
- Applied statistical analysis and Random Forest regression to assess healthcare and lifestyle impacts.
- Found that alcohol consumption, median age, and healthcare expenditures significantly affect IHD mortality.
- Tools Used: Random Forest, SHAP Analysis, Matplotlib, Pandas, NumPy.

Urban Traffic Control Framework
UTC_Framework
Mar 2023 – Jul 2023

- Conducted research on congested areas in Dublin and Luxembourg, optimizing urban mobility analysis.
- Developed and adapted gravitational clustering techniques to detect high-traffic regions.
- Integrated centralized traffic routing into the SUMO traffic simulation environment.
- Tools Used: Traffic Simulation, SUMO, PDDL, Gravitational Clustering, Python.