JULIEN MARTEEN AKAY

Data Science in Industry & Deep Learning in Research

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EXPERIENCE

ML Research Engineer
up2parts GmbH

Jun 2024 – Ongoing Remote

Integrating machine learning research with practical applications to address industrial challenges.

Research Associate (25% role)
Hochschule Bielefeld - University of Applied Sciences and Arts

Apr 2024 – Ongoing Bielefeld

Researching Autonomous Machine Intelligence, Objective-Driven AI, Self-Supervised Learning, etc. in conjunction with my PhD.

Data Scientist
Ailio GmbH

Mar 2024 – May 2024 Bielefeld

Built a microservice to automate information retrieval from visual text in movies via computer vision and NLP.

Data Scientist
Ailio GmbH

Nov 2020 – Feb 2024 Bielefeld

- *Independent execution and completion of projects for external clients while pursuing full-time studies and holding a second part-time position in research.*
- Retrieval Augmented Generation - Fusion of OCR and ChatGPT for extracting visual text from videos into a customized JSON schema for the German Broadcasting Archive.
- ML for counting sewing processes using audio and vibration data.

Graduate Research Assistant
Hochschule Bielefeld - University of Applied Sciences and Arts

Sep 2023 – Jan 2024 Bielefeld

- Worked (contributing and implementing own ideas) at the Center for Applied Data Science (CfADS) on AI in Healthcare.
- Focused on Self-Supervised Learning, Deep Learning and Computer Vision for heightened medical image analysis.
- Achieved State-of-the-Art performance in wound image classification, surpassing competitors by a significant margin.

Graduate Research Assistant
Hochschule Bielefeld - University of Applied Sciences and Arts

Mar 2022 – Jul 2022 Bielefeld

EDUCATION

PhD Advanced Machine Intelligence
Hochschule Bielefeld - University of Applied Sciences and Arts

Apr 2024 – Ongoing

- **Organisation:** With my professor's permission, I pursue the PhD concurrently with my full-time job (up to 80%).
- Thematically inspired by Yann LeCun's "Path to Autonomous Machine Intelligence" .
- The **goal** is to enable a machine to understand the world, reason, plan, and learn as efficiently as animals/humans.

M.Sc. Research Master Data Science
Hochschule Bielefeld - University of Applied Sciences and Arts

Sept 2021 – Feb 2024

Refer to my Research Assistant role for in-depth insights into my Master's project.
Two-year project: Assistance in Wound Care through Artificial Intelligence for Wound Analysis, Assessment, and Treatment.
Thesis title: Non-Contrastive Self-Supervised Learning: A Path To Enhanced Wound Image Recognition
Collaborated with CareTech OWL on the HIS4DiaPedes project.
Important Modules: Artificial Intelligence, Reinforcement Learning and Discrete Simulation, Machine Learning and Data Mining, Big Data Architectures.
Member of the Examination Board.

B.Eng. Mechanical Engineering
Hochschule Bielefeld - University of Applied Sciences and Arts

Sept 2016 – Sep 2021

Programming as a hobby in 2018. Later focused on AI and enrolled in additional modules:

- Machine Learning and Data Mining
- Algorithms and Data Structures

Thesis title: Feature Learning on Audio Signals using Convolutional Neural Networks.
Achievements: Extracted music features from the largest dataset using SOTA CNN architectures. Applied transfer learning for

- Worked (contributing and implementing own ideas) at the Center for Applied Data Science (CfADS) on denoising Super-Resolution Structured Illumination Microscopy (SR-SIM) images using generative AI.
- Implemented custom Latent-Variable Energy-Based Models (LV-EBMs), Joint-Embedding Predictive Architectures and Generative Adversarial Networks (GAN).
- Demonstrated strong performance in denoising high-resolution SR-SIM images.

Student Assistant

Hochschule Bielefeld - University of Applied Sciences and Arts

Apr 2018 – Sep 2020 Bielefeld

Generated technical drawings. Executed manufacturing using turning and milling machines. Supervised internships.

TALKS

Artificial Intelligence Center Hamburg (ARIC)

- Non-Contrastive Self-Supervised Learning with VICReg
- Latent-Variable Energy-Based Models (LV-EBM)

Hochschule Bielefeld - University of Applied Sciences and Arts

- **Topics:** Self-Supervised Learning, Autonomous/Advanced Machine Intelligence, AI in Healthcare, Scarce Data, Cognitive Architectures, Objective-Driven AI, Latent-Variable Energy-Based Models, etc.

successful raw audio anomaly detection and binary classification in industrial settings.

SKILLS

Programming: Python

Tools: PyTorch Lightning TensorFlow Scikit-Learn Numpy Pandas JAX Docker Flask Git Data Science Stack

LANGUAGES

German (native) ●●●●●

Aramaic (native) ●●●●●

English ●●●●○

RESEARCH INTERESTS

My long-term goal is to achieve **human-level AI**, with a specific focus on implementing Objective-Driven AI (ODAI) as a foundational step. I aim to apply ODAI principles within autonomous AI systems. This will align with my PhD topic.

PUBLICATIONS

Conference Proceedings

- J. M. Akay and W. Schenck, "Transferability of non-contrastive self-supervised learning to chronic wound image recognition," in *Artificial Neural Networks and Machine Learning – ICANN 2024*, M. Wand, K. Malinovská, J. Schmidhuber, and I. V. Tetko, Eds., Cham: Springer Nature Switzerland, 2024, pp. 427–444, ISBN: 978-3-031-72353-7.

PRIVATE/UNIVERSITY PROJECTS

- **Semantic Segmentation** of different tissues in diabetic foot ulcer images.
- **Self-Supervised Learning:** Contrastive SSL (rotation prediction) on cifar-10 dataset. Implemented in Google JAX.
- **Image Denoising/Reconstruction** of microscopy images, using fully convolutional autoencoders, U-Nets, etc.
- **Reinforcement Learning:** REINFORCE, Q-Learning, (Double-) Deep-Q-Learning, (Q-, Adavantage-, Soft-) Actor-Critic used on a self-built complex plant simulation model. Implemented in PyTorch and TensorFlow/Keras.
- **Time Series Analysis** and forecasting on real monitoring data. Implemented using Facebook Prophet.

Self-Teaching/Tutorials:

- **(Vision) Transformer:**
  - Implemented the classic transformer architecture, and various vision transformers from scratch in PyTorch and JAX.
- **Machine Translation:** Automatic text translation with seq2seq models (Spanish-English) and Transformers (Portugese-English and English-German).
- **Sentiment Analysis:** Classification of text files as negative or positive ratings of movies/series using BERT.
- **Text Generation:** Automated text generation in the style of Shakespeare and for newspaper articles in German using the TensorFlow-Text-API.