JULIEN MARTEEN AKAY

Data Science in Industry & Deep Learning in Research

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EXPERIENCE

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 (80% role)

Ailio GmbH

Mar 2024 – May 2024 Bielefeld

Building data science solutions, e.g. microservices that automate information retrieval from visual text in movies via computer vision and natural language processing.

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.*
- **Latest project**: Retrieval Augmented Generation (RAG) - Fusion of OCR and ChatGPT for extracting visual text from videos into a customized JSON schema for the German Broadcasting Archive.
- **Other projects**: Machine Learning (ML) for counting sewing processes using audio and vibration data. Prediction of repair measures and costs for defect products through ML.

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.
- Engineered an image classification/segmentation experiment-runner program that allows dynamic settings, using PyTorch and TensorFlow.
- 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

- 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.

EDUCATION

PhD Advanced Machine Intelligence

Hochschule Bielefeld - University of Applied Sciences and Arts

Apr 2024 – 202x

- **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 (using Self-Supervised Learning), 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

- 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. Details will be disclosed in an upcoming paper and are currently confidential.

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)

KI @ HSBI Kongress (English: AI @ HSBI Congress)

- AI in Healthcare

Hochschule Bielefeld - University of Applied Sciences and Arts

- Delivered many technical talks to audiences including students, professors, my supervisor's working group, and others.
- **Topics:** Self-Supervised Learning, Autonomous/Advanced Machine Intelligence, AI in Healthcare, Scarce Data, Cognitive Architectures, Objective-Driven AI, Latent-Variable Energy-Based Models, etc.

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.

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. My proposed PhD topic will align closely with this strategy.