# Johann Gerberding

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## Education

- **Technische Universität Braunschweig** — Braunschweig, Germany
  *Master of Science - Industrial Engineering and Management* — *October 2015 - September 2018*
  ***Courses:*** *Intelligent Data Analysis, Production Management*
- **Private Hochschule für Wirtschaft und Technik** — Diepholz, Germany
  *Bachelor of Engineering - Industrial Engineering and Management* — *August 2011 - May 2015*

## Skills

- **Languages**: Python, C/C++, SQL, Bash, HTML, CSS
- **Frameworks**: PyTorch, matplotlib, OpenCV, albumentations, Pillow, Pandas, HuggingFace, ROS 2, FastAPI, Flask, shapely, jupyter, psycopg2, langchain
- **Tools**: Git, PostgreSQL, Docker, SQLite
- **Platforms**: Linux, Mac, Windows
- **Soft Skills**: Writing, Public Speaking

## Experience

- **Software Developer - Machine Learning**
  *Nexat GmbH* — *October 2022 - today*
  - **Nexat Auto - Lane Detection in Controlled Traffic Farming scenario**: Semantic Segmentation to detect driven lanes. This is important in scenarios where the GPS signal is missing and the Autopilot needs to stay in lane.
  - **NexChat - Chatbot for Sales and Service**: Two Chatbots, backends based on FastAPI, Websockets, OpenAI-API, FAISS and LangChain. The Sales Chatbot should help customers to get to know more about Nexat and Regenerative Agriculture in general. The Service Chatbot helps our service team to identify similar problems which already occured and references them (knowledge is based on Nexat OpenProject). Both are currently tested in the company.
  - **Nexat Graincam**: Setup new training pipeline for graincam semantic segmentation pipeline. The goal is to segment dirt and broken grain. Docker deployment with ROS2 middleware.
  - **Nexat Auto - Object/Obstacle Detection**: Detect objects/obstacles around the vehicle based on different approaches. NVIDIA Deepstream + YOLOv7 on Jetson Xavier for multiple camera streams, RANSAC + DBSCAN for point cloud data.
  - **Nexat Auto - Data Logging**: Restructuring of ROS 2 data logging node. Adding a Flask API for triggering/switching between different logging strategies (Lidar/Camera logging on/off).
  - **Nexat Auto - Automatic Implement Coupling**: Implemented and integrated ROS 2 nodes for automatic coupling of new implement live on the field (switching between sprayer and sewing implement) in the behavior tree package. Identification of implement via ISOBUS, automatic height calibration for coupling via CAN.
- **Scientific Researcher - Applied Artificial Intelligence**
  *Department of Business Informatics - University of Oldenburg* — *December 2019 - October 2022*
  - **DigiSchwein - Sow Health Monitoring**: Detect sow and classify its posture (lying-site, lying-abdominal, standing, sitting) and activity (idle, eating, drinking). Analyze the behavior over time and work on a evaluation approach with domain experts / veterinarians.
  - **DigiSchwein - Piglet Birth Monitoring**: Work in Progess: Detect and count birth events in videos using different deep learning approaches (2D-Detection + Classification, 3D-Convolutions + Classification, Transformer).
  - **DigiSchwein - Activity Monitoring of Pigs**: Combined the ByteTrack with a Pose Estimation (HRNet-Lite) and a Posture Classification (EfficientNet B-0) model to analyze the activity level in a pig barn which gives you insights about their health and aggression levels.
  - **DigiSchwein - Real-time animal tracking**: Trained YOLOv5 on pig detection and combined it with SORT and ByteTrack tracking algorithms for real-time animal tracking.
  - **TaDeA - REST API for Named Entitiy Recognition**: Work in Progess: Create a API for a custom NER pipeline using HuggingFace (BERT) and FastAPI. Creation of a domain specific dataset.
  - **TaDeA - REST API for Document Layout Detection**: Prototyping / Work in Progress: Trained YOLOv5 and Faster-RCNN models on Document Layout Detection task for contracts and transfer pricing documentation (pretraining on multiple Open Source datasets, finetuning on domain specific dataset) and deployed a simple prototype with FastAPI.
  - **TaDeA - PostgreSQL Data Warehouse**: Worked with two colleagues on creating a data warehouse using PostgreSQL and implemented parsing and import scripts for different Excel and JSON files containing information about companies and employees.
  - **PROPOSE.AI - Recommendation Engine for glasses**: Implemented a deep convolutional autoencoder using PyTorch to reduce dimensions of product images for clustering (tested different clustering algorithms, evaluation was very challenging). I added a simple heuristic for navigating through the clusters based on the cluster centers.
- **Scientific Researcher**
  *BIBA - Bremer Institut für Produktion und Logistik* — *Feb 2019 - Dec 2019*

- **Binntelligent**: Worked on a system based on a Recurrent Neural Network (LSTM) to predict arrival times of inland vessels based on time series data.
- **Mittelstand 4.0 - Kompetenzzentrum Bremen**: Conceptual design and implementation of business modeling workshops.

- **Consultant - Factory Planning**
  *MR PlanFabrik GmbH* *Sep 2018 - Feb 2019*
  - **Factory Layout Design**: Conducting a value stream mapping and redesign of the factory layout of a medium-sized industrial company.
  - **Simulation study in the field of material supply**: Preparation of a simulation study for the planning of material supply for an international bus manufacturer using PlantSimulation.
- **Working Student**
  *Grimme Landmaschinenfabrik GmbH and Co. KG* *Aug 2011 - Sep 2018*
  - **Apprenticeship - Industriekaufmann**: Passage through various departments (Supply Chain Management, Sales, Production Planning, Logistics, Controlling, IT).
  - **Working Student**: Worked in supply chain engineering and corporate logistics planning during master's program.

## Projects

- **Johanns Blog - Machine Learning**: My personal blog where I write about interesting Machine Learning related topics. Tech: Hugo, Github Pages. (Work in Progress)
- **Paper Implementation - World Models**: Open source, from scratch implementation of the World Models paper from Ha and Schmidhuber. Tech: Python, PyTorch, numpy (Work in Progress)
- **Paper Implementation - VoxelNet**: Open source, from scratch paper implementation of the VoxelNet: End-to-End Learning for Point Cloud Based 3D Object Detection. Tech: Python, PyTorch, numpy (August 2022)
- **Paper Implementation - Vision Transformer**: Open source, from scratch paper implementation of the Vision Transformer (ViT). Tech: Python, PyTorch, albumentations (June 2022)
- **comma10k - Semantic Segmentation Challenge**: Open source, from scratch paper implementation of the RegSeg model for semantic segmenation to tackle the comma.ai semantic segmentation challenge. Comparison with UNet++ and DeepLabV3+ implementations (framework: pytorch-segmentation-models). Tech: Python, PyTorch, pytorch-segmentation-models, albumentations (March 2022)
- **Paper Implementations - Reinforcement Learning**: Research oriented, open source, implementation and training of multiple popular Deep Reinforcement Learning algorithms (REINFORCE, Deep Q-Networks, A2C). Tech: Python, PyTorch, OpenAI gym (February 2022)
- **Paper Implementation - Vanilla Transformer**: Research oriented, open source, implementation of the Transfomer model presented by Vaswani et al. in 2017, including an easy gradio web app for demonstration. Tech: Python, PyTorch, gradio (December 2021)
- **Paper Implementation - Neural Machine Translation by Jointly Learning to Align and Translate**: Research oriented, open source, implementation of the RNNsearch model presented by Bahdanau et al. in 2016. Tech: Python, PyTorch (November 2021)

## Publications

- **Using Deep Learning for automated birth detection during farrowing**: EnviroInfo 2022 - October 2022
- **Evaluation of Deep Learning Instance Segmentation Models for Pig Precision Livestock Farming**: 24th International Conference on Business Information Systems (BIS 2021) - July 2021
- **Analyzing different material supply strategies in matrix-structured manufacturing systems**: Procedia CIRP - June 2019

## Qualifications

- Generative Adversarial Networks (GANs) Specialization - Coursera (April, 2022)
- Natural Language Specialization - Coursera (December, 2020)
- Deep Learning Specialization - Coursera (June, 2019)

## Free time

- time with friends and family
- reading (biographies, papers, science, fiction)
- sports: fitness (mostly calisthenics) and soccer
- cooking