# SILAS BRACK

*Copenhagen, Denmark* github.com/silasbrack linkedin.com/in/silasbrack

## WORK EXPERIENCE

### Machine Learning Engineer, Senior Associate — Apr 2023 – Present

*Saxo Bank A/S — Department of Predictive Models and AI* — *Copenhagen, Denmark*

- Designed & optimized a real-time recommendation system architecture by adapting industry best practices to our internal data and business objectives, ensuring a p99 latency under 100ms. Other factors I took into consideration were integration of A/B testing and flexibility towards future changes in features and business requirements. Presented this architecture consisting of user embeddings and content embeddings to various cross-functional areas of the company (business stakeholders, platform engineers, and other data scientists). Designed data preprocessing pipeline (translation, text embeddings, tagging, duplicate detection, etc) for preparing recommended content. Trained neural networks for representation learning, developed a reranking model, and set up the deployment of the recommender to production.
- Re-designed chatbot combining simple open-source embeddings models and other NLP methods, yielding a 170% improvement in question-answering accuracy, decreasing the yearly number of manual agent chats by 20k, and saving around $150k in yearly agent costs. Furthermore, I developed proof-of-concept of extended chatbot and search functionality for searching for / interacting with news and other content, stocks, charts, and more. Presented and demoed to business stakeholders to extend this system for use in in-platform search engine and digital sales trader.
- Performed core MLOps / DevOps tasks, such as standardising data science workflows and development environments with cookiecutter templates, extending Docker environments for development, unifying linting and formatting approaches, and standardising and automating database authentication on dev machines. Led code reviews and onboarded new members of the team regarding coding practices and infrastructure.

### Machine Learning Engineer, Student Assistant — Sep 2021 – Feb 2023

*Saxo Bank A/S — Department of Predictive Modelling* — *Copenhagen, Denmark*

- Developed a machine learning model using methods from NLP for finding stocks "Others were interested in", resulting in our team winning an internal Hackathon competition for improving client experience. Packaged, containerised, and deployed this model in Kubernetes, exposing it via FastAPI + OpenAPI, achieving a response time of under 10 ms. As of March 2023, this system has been integrated into the official Saxo Bank trader and investor platforms, which is used by nearly one million active clients. As of April 2024, the tool sits at around 70 000 monthly interactions.

## PROJECTS

### Marginal Likelihood Training of Linearized Laplace Approximations Without Hessian Reductions — Sep 2022 – Feb 2023

*Copenhagen, Denmark*

*Supervised by Søren Hauberg — DTU Compute*

- Developed a novel method for computing the Laplace approximation using only Jacobian-vector products in JAX so as to sample from a multivariate normal distribution and compute the log-determinant of the Laplace covariance without explicitly instantiating this covariance.
- Developed a robust method for evaluating the quality of the approximate sampling algorithm under different configurations.

### Bayesian Metric Learning for Uncertainty Quantification in Image Retrieval — Apr 2022 – May 2023

*Supervised by Søren Hauberg, Frederik Warburg, and Marco Miani — DTU Compute* — *Copenhagen, Denmark*

- Developed a method for training Bayesian embeddings neural networks (metric learning) and demonstrate its effectiveness on small- to large-scale image datasets in yielding well-calibrated uncertainty estimates. We proved that contrastive loss constitutes a valid log-likelihood in spherical space and present a novel decomposition of its Generalized Gauss-Newton (GGN) approximation.
- Our paper was accepted to NeurIPS 2023 [1] in New Orleans, which I had the fortune of attending.

## EDUCATION

### M.Sc. Mathematical Modelling and Computation — Sep 2017 – Feb 2023

*Technical University of Denmark* — *Copenhagen, Denmark*

- Specialisation in *machine learning and signal processing*.
- Thesis: "Effortless Bayesian Deep Learning: Tapping Into the Potential of Modern Optimizers," supervised by Søren Hauberg.

## SKILLS

| | |
|---|---|
| **Languages** | Python, R, SQL, C#, Scala, Gleam / Elixir / Erlang |
| **Technologies** | Spark, Databricks, Docker, Kubernetes, Airflow, git, Azure Cloud, Terraform, Kafka |
| **Models** | Gradient-boosted trees (LightGBM), neural networks (PyTorch, JAX), Word2Vec, text embeddings, LLMs |

## PUBLICATIONS

[1] F. Warburg, M. Miani, S. Brack, and S. Hauberg, "Bayesian Metric Learning for Uncertainty Quantification in Image Retrieval," in *Advances in Neural Information Processing Systems*, 2023.