Oscar Karlsson

MSc Science in Engineering

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Skills

- Stochastic Modeling
  - Time Series
  - Financial Modeling
  - Modern Regression Techniques
- Machine Learning
  - Reinforcement Learning
  - Neural Networks and Deep Learning
  - Optimization for Learning
- Applied Statistics
  - Markov Processes
  - Monte Carlo and MCMC
- Optimal Control
  - Stochastic Optimal Control
  - Learning Based Control
- Programming and Data Handling
  - Python
  - R
  - Java
  - SQL
  - Excel

Languages

- English – Native Fluency
- Swedish – Native Fluency

Professional Summary

I am a recently graduated Engineer with a focus on financial modeling, machine learning and control theory. I'm a curious problem solver, always looking to expand my horizons. I thrive when working in a team, truly great accomplishments are made when you build on each other's strengths, benefit from shared knowledge and develop together.

Work Experience

Care assistant - Nighttime May 2023 - Aug 2023

Lunds Kommun *Lund, Skåne Län*

- Individually managed list of visits, provided medicine by delegation, and adapted to additional and emergency visits requested by clients.

Tutoring 2022

Astronomisk Ungdom *Lund, Skåne Län*

- Tutored high-school students in Math and Physics for Astronomisk Ungdom

Warehouse employee July 2021 - Aug 2021 | June 2020 - Aug 2020

IKEA Indirect Material and Services AB *Älmhult, Kronobergs Län*

- Operated forklift and handled picking to meet KPIs in largely unsupervised setting

Volunteering

International Mentor Fall 2021 to Early Spring 2022

Lunds University *Lund, Skåne Län*

- Introduced international students to student life in Lund, as well as assisting with logistical, practical and social elements of studying abroad

Auditor/Cashier 2021-2024

LARA - Lund Aerospace and Rocketry Association *Lund, Skåne Län*

- Served as an auditor (2021), and the cashier (2022-2024), as well as led smaller projects

Education

Master of Science in Engineering (Civilingenjör i Teknisk Fysik) Lund University

Aug 2020 - June 2025 *Lund Skåne Län*

- Specialized in Machine Learning (AI), Optimal Control and statistical tools for Time Series and Financial applications
- Wrote Master's thesis with Nordea in Copenhagen
  Better hedging of CVA with Reinforcement Learning
  Supervisors: Dr. Magnus Wiktorsson, Lund University; Shengyao Zhu, Nordea (now employed by SEB)
- Strong foundation in math, physics and programming from core coursework

IB Bilingual Diploma Katedralskolan Lund

Completed 2019 *Lund Skåne Län*

- Native Fluency in English and Swedish having lived in the United States and Sweden as well as completed the IB program

Projects

Master's Thesis – Better hedging of CVA with reinforcement learning | *Python, PDEs/SDEs, ML, Stochastic Optimal Control*
Spring 2025

- Wrote My Master's thesis under the supervision of Zhu Shengyao at the Nordea XVA desk and Dr. Magnus Wiktorsson from Lunds University, on applying ML techniques to hedge CVA (Credit Value Adjustment) on Interest Rate Swaps.
  - The project involved constructing a simulated market environment capturing key risks, and complexities associated with both CVA and IRS products. After much consideration, we used a one factor Hull White model for interest rate modeling, with a real world calibrated forward curve. We modeled defaults as being driven by a JCIR model, and generated data with various correlations between interest rate and default.
  - The project further involved designing and training a Reinforcement Learning Network to minimize risk metrics, which is handled as a stochastic optimal control problem. This stage involved network creation, RL environment design, from reward function to transformation of observations and outputs and problem aware hyper-parameter tuning.
  - The paper is available from Lunds University, and the code is made available on GitHub .

Minor Programming Projects | *Python, Numpy, Java, SQL, Data Scraping, Data Structures, Data Engineering*
2020-2025

- Produced a variety of hobby programming projects through my time at the Uni for fun and to apply knowledge gained, some selected examples are:
  - Self taught SQL with mockup of rock-climbing tracking app. Interfaced between locally hosted MySQL server and Python through the use of pyodbc. Proved knowledge in both DDL in setting up database and DML through automated and manual insertion of synthetic data and construction of complex queries.
  - Self studied causal inference
  - Built numerous small tools and experiments in Python and other languages. Fields range from comparing ML models' performance on synthetic data to practice tools for music.
- Additionally a contributer to the closed source KanjiKen app. Worked on backend and bugfixes.

Courses in Selection

An electronically stamped and verifiable copy of my full degree is available on request.

Financial Statistics — 2024 Fall
Grade 5, Pass With Distinction — *A Level | 7.5hp*

Financial Management — 2024 Fall
Grade 4, Pass With Credit — *A Level | 6.0hp*

Valuation of Derivative Assets — 2024 Fall
Grade 5, Pass With Distinction — *A Level | 7.5hp*

Optimization for Learning — 2024 Fall
Grade 4, Pass With Credit — *A Level | 7.5hp*

Network Dynamics — 2024 Spring
Grade 5, Pass With Distinction — *A Level | 7.5hp*

Linear and Logistic Regression — 2024 Spring
Grade 4, Pass With Credit — *A Level | 7.5hp*

Monte Carlo and Empirical Methods for Stochastic Inference — 2024 Spring
Grade 5, Pass With Distinction — *A Level | 7.5hp*

Learning Based Control — 2024 Spring
Grade 4, Pass With Credit — *A Level | 7.5hp*

Mathematical Statistics, Time Series Analysis — 2023 Fall
Grade 4, Pass With Credit — *A Level | 7.5hp*

Markov Processes — 2023 Fall
Grade 5, Pass With Distinction — *G2 Level | 7.5hp*

Programming Languages, Libraries and Computer Literacy

Languages: Java, Python, R, C (basics), Matlab, SQL
Libraries/Frameworks: Python: pandas, numpy, statsmodel, tensorflow, sklearn, torch, SB3 | R: MASS, dpylr
Technologies: Github, Jupyter & Python Notebooks, Linux, Windows and Office including Excel, TeX, Virtual Environments