DAVID N. SILVERSTEIN

davidsi@intelligent.software   (617) 468-2250

EXPERTISE OVERVIEW

I have a combination of industry and research experience in machine learning, data science, computational neuroscience and NeuroAI. Utilized ML techniques include deep learning and recurrent neural networks, unsupervised learning, classifiers, probabilistic reasoning, time-series prediction, inference engines, genetic algorithms and natural language processing, including large language models. I have development and deployment experience on local Linux systems, cloud-based platforms and supercomputers. In addition to finance models at banks and stock exchanges, I have also worked on climate-related models, including for carbon policy, management, pricing and removal. My research experience includes studying human brain dynamics using computational models at different scales to better understand awareness and decision-making. This includes an interest in integrating computational neuroscience and machine learning to develop more advanced methods, including possible approaches towards AGI. Teaching experience includes supervising a masters thesis and other projects and teaching assistance in classes for machine learning, neural networks and supercomputing.

EDUCATION

KTH Royal Institute of Technology
    PhD in computer science, specialization in computational biology (2018)

Chalmers University of Technology
    MSc in Complex Adaptive Systems / applied physics (2008)

University of California at San Diego
    BS in Cognitive Science, BA in Math and Applied Science, Minor in Computer Science (2005)

Stanford University - Certificate in Bioinformatics (2005)
Stockholm University - PhD-level courses on Introduction to Climate Modeling (2019)

TECHNICAL SKILLS

Languages: Python, Java, SQL, MATLAB/Octave, NEURON, XPP, R, C/C++
Tools: Pytorch, scikit-learn, pandas, numpy, networkx, sqlite3, gensim, etc.
LLMs: GPT-3/4, Gemini, Claude, Llama3, Mistral, vLLM, lang-chain
Databases: MySQL, MariaDB, PostgreSQL, Oracle, SQL Server, SQLite, Neo4j
Environments: Linux, Docker, Slurm, PyCharm, Git, GCP, AWS, Runpod, IoT
Modeling Domains: Finance, Neuroscience, Bioinformatics, Climate
ML: clustering, deep learning, neural networks, genetic algorithms, NLP, data visualization

PUBLICATIONS (16 listed)

Google Scholar: https://scholar.google.com/citations?hl=en&user=uc5pecQAAAAJ

INDUSTRY AND RESEARCH EXPERIENCE

Consultant & Researcher in LLMs, NeuroAI and Finance, 2013 - present

Development of specialized LLMs in several domains using both RAG with vector stores and finetuning of cloud-based and local language models (i.e. GPT-3/4, Gemini, Claude, Llama3, Mistral), as well as NLP classification, topic modeling, relevance and text/audio speech models. - Published research on language processing with reservoir computing as well as on neural simulations of recurrence and masking in human vision. - Implemented and back-tested quantitative trading strategies using time-series analytics. - Did research on modeling of carbon pricing, with analysis of IPCC climate scenarios. This included implementing a MySQL database for data analysis of indicators for GHG emissions, GDP, vulnerability, climate risk, forestry, fossil fuels, population and more. Worked with two economists on multi-regional, multi-sector models that simulate the effects of carbon prices on CO_2 emissions, as well as the economic impacts.

Postdoc in Neurophilosophy and Decision Making (part-time)
Agora for Biosystems, Sigtuna Foundation, Sep 2019 – June 2023

Worked with a consortium on the neurophilosophy of free-will and performed computational modeling and simulations using Python and XPP for questions on conscious volition and decision-making. Developed a hypothesis on subcortical contributions to the readiness potential via cortico-striatal-thalamo-cortical loops. Also investigated machine learning methods used for investigating OCD pathophysiology and treatment, and built computational and dynamical systems models in Python to better understand neural behaviors in OCD and schizophrenia.

AI Specialist (part-time), SoftRobot AB, 2018 – 2020

Design and development of components of a SaaS financial accounting and insights system for corporate accountants. Includes accounting rules for alert generation, reports and ML analytics with company clustering, time-series forecasting and NLP models. Cloud-based development includes the use of Python and ML libraries, Git, Linux, Docker and MySQL databases.

Application expert in neuroinformatics (half-time)
KTH / PDC Center For High Performance Computing, 2012 – 2014

Assisted researchers in neuroinformatics and computational neuroscience, particularly on Cray supercomputers. This included research collaborations as well as developing and maintaining software tools as needed. Developed a benchmark for a class of neural simulations and assisted on the acquisition of a supercomputer. Also assisted with user support and teaching.

Researcher in computational neuroscience and NeuroAI (full & part-time)
KTH Royal Institute of Technology & Stockholm Brain Institute, 2008 – 2013

Research was focused on implementations on supercomputers and simulations of various spiking neural attractor models of neocortex. Designed and implemented a multi-area cortical simulation library on top of parallel NEURON for Cray and IBM supercomputers. It supports several neuron types, connection geometries, multiple areas and projections, subcortical nuclei, overlapping attractor memories (neural assemblies) and short-term plasticity. I used this to explore research questions on attentional blink, backward masking, cortical dynamics, effects of tumors on brain fibers and primary visual cortex. Teaching included supervising a masters thesis project and assisting with classes in machine learning and neural networks.