Lars Lien Ankile

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EDUCATION

Harvard University | M.Eng. in Machine Learning — Aug 2022 - May 2024

- GPA: 4.0/4.0
- *Coursework:* MIT6.7900 Machine Learning, MIT18.435 Quantum Computation, STAT120 Bayesian Modeling, MIT6.8200 Sensorimotor Learning, CS205 High-Performance Computing, AC209B Advanced Data Science, CS282r Inverse Problems in Reinforcement Learning
- *Scholarship:* Aker Scholarship, Norwegian top-talent program, full scholarship
- *Thesis: 'Improving Human-AI Interactions Understanding Behavior, Mitigating Exploitation, and Enabling Instruction'*
- *Research:* Projects spanning modeling of human decision-making with RL [3, 5], mitigation of adversarial behavior in markets [4], and deep reinforcement learning for long-horizon complex robotic manipulation [6, 7, 8, 9, 10]

Norwegian University of Science and Technology (NTNU) | M.Sc. in Computer Science and Finance — Aug 2017 - Jun 2022

- GPA: 3.96/4.0 - ranked 1 out of 150 in the top engineering program in Norway
- *Thesis: 'Exploration of Forecasting Paradigms and a Generalized Forecasting Framework,'* advised by Prof. Westgaard (application of deep learning to multimodal time series forecasting and econometrics) [1, 2]
- *Coursework:* Calculus, Algorithms, Databases, Deep Learning, Physics, Statistics, Software Engineering
- *Foreign Exchange:* Visiting Undergraduate Student at Harvard University (2019-2020); GPA 4.0/4.0

PUBLICATIONS AND PREPRINTS

[10] Park, Y., Bhatia, J. S., **Ankile, L. L.**, Agrawal, P., 2024. DexHub: Infrastructure for Internet Scale Robotics Data Collection. *Under review; Pre-print in preparation.*

[9] Ren, A. Z., Lidard, J., **Ankile, L. L.**, Simeonov, A., Agrawal, P., Majumdar, A., & Simchowitz, M., 2024. Diffusion Policy Policy Optimization. *Under review; arXiv preprint arXiv:2409.00588.*

[8] Villasevil, M. T., Jain, A., Macha, V., Yuan, J., **Ankile, L. L.**, Simeonov, A., & Gupta, A. Scaling Robot-Learning by Crowdsourcing Simulation Environments. *Under review; presented at Data Generation for Robotics Workshop at RSS 2024.*

[7] **Ankile, L.L.,** Simeonov, A., Shenfeld, I., Torne, M., Agrawal, P., 2024. From Imitation to Refinement, Residual RL for Precise Visual Assembly. *Under review; presented at Data Generation for Robotics Workshop at RSS 2024.*

[6] **Ankile, L.L.,** Simeonov, A., Shenfeld, I., Agrawal, P., 2024. JUICER: Data-Efficient Imitation Learning for Robotic Assembly. *IROS 2024.*

[5] Nitschke, P.M., **Ankile, L.L.,** Shin, E., Swaroop, S., Doshi-Velez, F. and Pan, W., 2024. AMBER: An Entropy Maximizing Environment Design Algorithm for Inverse Reinforcement Learning. *ICML 2024 Workshop on Models of Human Feedback for AI Alignment.*

[4] **Ankile, L.L.,** Ferreira V.X.M., Parkes, D.C., 2023. I See You! Robust Measurement of Adversarial Behavior. *Conference paper at TLDR '24 at Columbia University (18% acceptance rate)*; *Workshop on Multi-Agent Security at NeurIPS 2023 (accepted as oral), submitted to NeurIPS 2024.*

[3] **Ankile, L.L.,** Ham, B.S., Mao, K., Shin, E., Swaroop, S., Doshi-Velez, F. and Pan, W., 2023. Discovering User Types: Mapping User Traits by Task-Specific Behaviors in Reinforcement Learning. *Interactive Learning with Implicit Human Feedback Workshop at ICML 2023 (best paper, runner-up).*

[2] **Ankile, L.L.** and Krange, K., 2022. Exploration of Forecasting Paradigms and a Generalized Forecasting Framework *(Master's thesis, NTNU, grade A).*

[1] **Ankile, L.L.** and Krange, K., 2022. Deep Learning and Linear Programming for Automated Ensemble Forecasting and Interpretation. *arXiv preprint arXiv:2201.00426.*

RESEARCH EXPERIENCE

Massachusetts Institute of Technology | Research Fellow, Improbable AI Lab | *Cambridge, MA* — Aug 2023 - Present

- Leading projects in Prof. Agrawal's Improbable AI lab aimed at improving robots' ability to perform long-horizon manipulation tasks by developing BC+RL methods for generative models to develop robust end-to-end robotic control policies from RGB sensors and scaling up environment, task, and data collection efforts.
- In [6], to be presented at IROS'24, we show that we can successfully solve assembly tasks requiring grasping, reorientation, precise insertion, and screwing of up to 5 parts lasting up to ~2500 time steps learned only from imitation learning of 10-50 humans demos.
- In [7], we show that for tasks requiring precision, IL alone saturates at suboptimal levels and devise a system leveraging residual models and large-scale RL to imbue action-chunked diffusion models with closed-loop control required for learning corrective and precise action online. The learned behaviors are distilled to RGB-based policies and transferred to the real robot system with

co-training and domain randomization.

- Contributed to a collaboration with Princeton and TRI on directly fine-tuning action-chunked diffusion policies by modeling the problem as a two-level MDP, where I was responsible for implementation and tuning of long-horizon tasks and sim-to-real experiments
- In a soon-to-be released project [10], we built a cloud-based central hub for crowdsourcing tasks, demonstrations and environments across robot morphologies that could enable vast scaling of robot learning datasets and autonomous self-improvement through simulation-based multi-task RL (as shown promising in [9]), where I led the sim-to-real part of the upcoming study
- Advising undergraduate research student on a project involving a new robotic hand with tactile sensing developed in the lab for learning more agile grasping behaviors through real-world RL

Harvard University | Research Intern, EconCS Lab | *Cambridge, MA* Jun 2023 - Sep 2023

- Theoretical and empirical measurement and mitigation of adversarial behavior in decentralized markets, using the blockchain as an open space for a case study supervised by Prof. David Parkes at the Harvard EconCS lab.
- Defined a mathematical formulation for a novel way of measuring manipulative behavior, and upon realizing computation of which is NP-hard, developed a heuristic algorithm to approximate the measure (with both empirical and theoretical justification).
- Engineered an extensive system of blockchain nodes, databases, and cloud computing to record and process data as it streams in (much of it is ephemeral and needs to be recorded as it happens) and performed empirical analysis on terabytes of data to validate theoretical results.
- I presented the paper "I See You!" [3] as an oral presentation and poster at the Multi-Agent Security Workshop at NeurIPS 2023 and the 2024 TLDR conference at Columbia University.
- An extension of [3] with more theoretical results is currently under review at NeurIPS 2024.

Harvard University | Student Researcher, DtAK Lab | *Cambridge, MA* Jan 2023 - Dec 2023

- Researching how we can use Reinforcement Learning (RL) methods to model human decision-making to rapidly and data-efficiently personalize health interventions in mHealth applications for cost-effective treatments at scale at Prof. Doshi Velez's Data to Actionable Knowledge lab.
- Synthesized and formalized a definition of an MDP equivalence class that initially crystallized in empirical experiments on modeling suboptimal behavior in a wide array of well-studied grid-world environments.
- Best paper runner-up at the AI & HCI workshop at ICML 2023 for "Discovering User Types" [2]. The paper was also accepted and presented at the workshops for the Theory of Mind and Interactive Learning from Implicit Human Feedback workshops at ICML.
- We leveraged the concept of behavior maps and equivalence classes presented in [2] to define a new IRL algorithm called AMBER [5]. This algorithm uses a Bayesian regret-based environment design optimization to speed up learning and decrease unidentifiability, and we prove convergence.

Norwegian University of Science and Technology (NTNU) | M.Sc. Thesis Student | *Trondheim, Norway* Aug 2021 - Jun 2022

- Researched applications of deep learning techniques for time-series forecasting, supervised by Prof. Sjur Westgaard. In our first project, we improved upon a SOTA ensemble forecasting entry in the M4 forecasting competition by introducing learned time-series features by an Autoencoder and weighing the ensemble with an MLP. We analyzed the theoretical limits of ensemble methods with LP optimization [4].
- The second project scaled up the same ideas to a much larger and self-collected dataset of data on thousands of companies, commodities, and macro variables and then systematically evaluated methods and problems [3]. We showed the adaptability of deep learning methods in several different forecasting tasks on this multivariate dataset.

PROFESSIONAL EXPERIENCE

Kukula Capital | Volunteer Data Analyst **|** *Lusaka, Zambia* Jun 2022 - Aug 2022

- Developed a Pandas-based program to analyze shipment data, identify theft patterns, and enhance loss prevention.
- Conducted data-driven analysis of the Zambian Tax code, proposing to the government a change in the tax code to reduce EV taxes to boost domestic economic activity and improve energy independence.
- Produced a comprehensive job creation impact report through clear and concise data visualization, requiring creativity and ingenuity in data engineering because of data sparsity. The report is used to inform how loan disbursements lead to job creation.
- Analyzed electric vehicle (EV) adoption potential in Zambia by evaluating market conditions and infrastructure needs, leading to the first EV in Zambia (a Nissan Leaf) and the first equitable EV lease-to-own program from Taxi drivers

Explore Equity | Data Engineer Intern | *Oslo, Norway* Jul 2021 - Aug 2021

- Developed an automated public equity screening tool using Python, financial APIs, and GCP Functions, drastically increasing analysis throughput and rapid design of experiments, hypothesis testing, and data sampling.
- Leveraged Python and various APIs to build bespoke analysis tools, enabling faster decision-making for the firm, e.g., automatic mapping and geographic density estimation of competitors' location using public company registries and map APIs

McKinsey & Co. | Data Scientist Intern | *Amsterdam, Netherlands* Jun 2021 - Jul 2021

- Analyzed the economic viability of renewable energy projects in remote parts of Norway in combination with portable Bitcoin miners as an 'economic battery' to help one of Norway's 10 largest companies build more sustainability into the power supply.
- Optimized the global supply chain by cleaning and consolidating datasets from tens of international offices, mapping out the nodes and edges in the network by reverse lookup in maps APIs, and optimizing routes for a multinational consumer brand.

Boston Consulting Group | Project Management Intern | *Oslo, Norway* Jun 2020 - Sept 2020

- Designed and built automated sales pricing software as a Flask API, improving pricing accuracy and efficiency for the client and a vastly better customer experience for the end consumer.
- Managed project development of a full-stack system, collaborating with developers, designers, and users to create the ideal solution.
- Conducted code reviews of Java applications developed by external teams, leading to a team change and improved code quality.
- Interviewed, hired, and trained an employee at the client's to ensure they had the competence to own the project long-term.

Ignite Procurement | Software Engineer / Machine Learning Intern | *Oslo, Norway* Jun 2018 - Sept 2019

- Developed an automated spend analytics platform that enhanced client procurement processes through automated pipelines for data cleaning, augmentation (with several external data sources), wide analyses, and cost-saving recommendations.
- Led the Trondheim student office, developing the platform, overseeing projects, recruiting student talent, and helping growth.

Mathema | App Entrepreneur | *Drammen, Norway* Apr 2014 - May 2017

- Co-developed a cross-platform flipped classroom app for the Norwegian math and science curriculum with 2 friends.
- The app structured the curriculum for teachers to use in conjunction with teaching in middle and high school, enabling them to focus more on interaction and problem-solving and less on lecturing in the classroom.
- We initially funded development out of pocket but secured financial support from a foundation and two companies, which allowed us to offer the application entirely cost- and ad-free.
- The app hit a nerve, as it was downloaded more than 50k times in the first two months. We were invited to the office of the Minister of Education to discuss STEM education in Norway, and newspapers wrote articles (VG.no, TB.no, DT.no, CW.no).

TEACHING

Harvard University | Teaching Fellow | *Cambridge, MA* Aug 2022 - Dec 2022

- CS 207—Systems Development for Computational Science. Held sections and office hours, gave feedback on homework assignments, and helped with the quiz evaluation questions.

Norwegian University of Science and Technology (NTNU) | Teaching Assistant | *Trondheim, Norway* Aug 2020 - Jun 2022

After returning from Harvard as a visiting student, I took delight in serving as a teaching assistant in several technical courses, both through the rewarding process of seeing a concept land with a student who came in confused but also because it is a great way to learn:

- TMA4140—Discrete Mathematics
- TTM4100—Communication - Services and Networks
- TIØ4164—Marketing Management for Technology Companies
- IT2805—AI Programming
- TMA4105—Multivariable calculus and vector analysis
- TMA4110—Linear algebra

TALKS

I See You! | Multi-Agent Security Workshop @ NeurIPS 2023, New Orleans Dec 2023

- The paper "I See You!" [4] was selected as an oral presentation at the Multi-Agent Workshop and presented during the workshop in New Orleans. Slides and recording.

Harvard MS Data Science Orientation Research Panel | NTNU Sep 2023

- Participated on a panel with Prof. Weiwei Pan on student research opportunities as part of the orientation for first-year students. Discussed my experiences with how to find research topics, finding and contacting advisors and labs, what I learned as a student researcher that I would not have in the classroom, and what I would do differently.

Ensemble forecasting and the M4 competition | NTNU Jan 2022

- Presentation on current applications of deep learning methods in economics forecasting in Prof. Westgaard's Ph.D. course, Economic and Financial Forecasting, based on the work in [1]. Slides: Ensemble_forecasting_and_M4_pres.pdf

SERVICE AND COMMUNITY

High school student research mentor Jun 2024 - Present

- Advising and mentoring two projects for high school students
- The first project is about using foundation models for pose estimation of real-world objects to create a framework for data collection with reduced cognitive load for the human demonstrator and more reproducible and repeatable evaluations of robotics policies
- The second project is a study of the available pre-trained vision encoders and their potential for allowing for transfer of RGB-based robot policies trained in simulation to the real-world

Multi-Agent Security Workshop at NeurIPS 2023 | Reviewer Jun 2024

- Reviewed papers broadly focused on multi-agent learning at the Agentic Markets workshop at ICML'24.

Multi-Agent Security Workshop at NeurIPS 2023 | Reviewer Oct 2023

- Reviewed papers broadly focused on multi-agent perspectives in game theory and federated learning in a bandit setting.

Melior Mundi Charity Fund | Co-founder & Chair **|** *Oslo, Norway* Jun 2021 - Present

- Started a charity fund with four fellow students. Raised funds from founders and outside donors. Donate yearly to a small, overlooked organization sustainably to balance charity and grow the fund for increasing future donations.

Student Body at Ind. Economics and Tech. Management, NTNU | President | *Trondheim, Norway* Jul 2020 - Jul 2021

- President of my student association at NTNU. Organized the biannual general assembly, prepared the overall budget of ~$600k, and coordinated the activities of ~25 sub-organizations.
- Established a confidential, student-run whistleblowing organization to provide a low-bar effort for any student to report any unacceptable behavior to ensure an inclusive social environment
- Improved financial health and infrastructure by investing liquid assets in a low-cost, diversified fund (in the low-interest, high-inflation at the time) and led a major renovation of the foundation and wet rooms in the program's cabins.

Røbber.døk Web Development Group, NTNU | Founder | *Trondheim, Norway* Jul 2020 - Jul 2021

- Conceived the idea and project plan for a new web portal (indokntnu.no) for organizing a wide array of activities in the student body (cabin booking, charity night, case competitions, social events, etc.).
- Recruited a team of ~10 volunteer contributors to the project from across class levels and genders to ensure student body representation in the development team.
- Decided the technology stack and built the initial framework for frontend/backend communication, database connection, and authentication

Ntention | Volunteer Business Developer | *Cambridge, MA* Jul 2017 - May 2019

- Extracurricular work with strategy, raising funds, share issuing, pitching the startup at various events, etc., to learn about the development and commercialization of innovative technology. Ntention creates an intuitive interface between humans and machines.

Hobbies and Interests Ongoing

- In my spare time, I enjoy reading anything from classics, biographies, sci-fi, and non-fiction, and I have also enjoyed organizing book clubs. I enjoy and benefit tremendously from running and convincing as many people as possible to join me for low-stakes races in the area (sometimes successfully). I started dabbling in Japanese a couple of years ago out of curiosity and have surprisingly learned a lot about my native Norwegian language in the process. Coffee might be the love of my life.

ACHIEVEMENTS AND AWARDS

Aker Scholarship | Norwegian Top Talent Educational Grant Program 2021

- Full Scholarship, covering tuition and living costs, for graduate studies at Harvard. ~20 candidates are chosen each year through an application and 4 interviews with top Norwegian academics and a psychologist.

Correlation One, 1st place | Harvard v. MIT AI Hackathon 2019

- Hackathon organized by Citadel as a competition between Harvard and MIT in creating autonomous agents to battle against each other, with ~50 teams competing. Harvard won the team competition, and our team won the best Harvard team.

Tess Foundation | Grant for Foreign Exchange 2019

- A foundation based in my hometown of Lier in support of activities meant to have a positive impact on the wider community. One out of 18 recipients and the only individual recipient.

Jansons Legat | Grant for Foreign Exchange 2019

- Norwegian foundation established to support educational experiences abroad for people who have "shown initiative or aptitude beyond the ordinary," preferably in cases where such education can positively affect Norway.

Equinor AI TECHathon, 2nd place | Computer Vision Autonomous Drone Navigation Hackathon 2018

- Hackathon hosted by Norway's largest company, Equinor, during our first year at NTNU; ~20 teams competed from all programs and class years.

DNV-GL Case Competition, 1st place | Future of Aquaculture Industry Case Competition 2017

- Hackathon hosted by the international assurance company DNV to create a concept for new industries in the marine sector in a

post-oil world, hosted at NTNU, open to any program and class year.

Akademiet High School | STEM Student of the Year 2015

- One out of ~300 students chosen each year for academic performance in the STEM subjects, enthusiasm and curiosity in learning, and service and support of increased STEM competency in the community.

Office of the Minister of Education | Official Invitation 2014

- Invitation to the Office of the Minister of Education to discuss the state of STEM education in Norway we received in the wake of releasing our flipped classroom application, Mathema