Alishba Imran

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EDUCATION_____

UC Berkeley Berkeley, CA BA. in Computer Science & Applied Math

EXPERIENCE_____

Research Intern - Chan Zuckerberg BioHub   May 2024-current
- Developed a self-supervised framework for modeling cell dynamics through contrastive learning of time-lapse images.
- Created dynaCLR, utilizing time-aware contrastive sampling to embed images in a unified way and applied dynaCLR to analyze viral infection kinetics in human cells, detect transient changes in cell morphology due to cell division, and map organelle dynamics during viral infection.
- Achieved > 95% classification accuracy with models trained using dynaCLR, facilitated detection of transient cell state changes, and provided embeddings for unseen experiments. Performed comparative analysis of cell states under perturbations such as infections, gene knockouts, and drugs. Submitted to ICLR 2025, pre-print [link].

Deep Learning Research with Pieter Abbeel, Berkeley AI Research Lab   August 2023-current
- Currently working on projects involving text-conditioning PLMs, sequence-structure models using CLIP-like architectures and interpretability to guide generation of proteins. Advised by Professor Pieter Abbeel.
- Collaborated with a team at Google & AUTOLab on research to explore the benefits of utilizing language semantic information in search, and object tasks. This included combining recent advances in LLMs for semantic rearrangement planning with frameworks for modeling spatial uncertainty. Explored various methods of language model driven scene generation.
- Improved Fleet-DAgger open-source IFL benchmark suite of GPU-accelerated Isaac Gym environments for the evaluation of IFL algorithms. Integrated new RL agents, environments, and allocation strategies into the library + improved codebase for wider community to use.

Machine Learning - Cell Materials Engineering at Tesla   May 2023-August 2023
- Got mentored by Dr. Matthew Murbach and Dr. Yanbo Qi. I worked on physics models / ML methods for battery materials discovery. I managed large-scale data pipelines, developed predictive ML models for discovery & validation (energy prediction models, and defect detection models) of new materials for Tesla's energy products.
- Developed an open-source implementation using an attention-based-CNN-BiLSTM for accurate estimation of lithium-ion batteries state of health (SOH) and remaining useful life (RUL).
- Using density functional theory (DFT) such as GGA functionals, I studied the thermodynamic properties, reaction kinetics, and ion transport paths of electrodes/electrolytes.
- Using dQ/dV, precharge metrics for predicting energy and cell chemistry validation using active learning methods and time-series ML models.

Machine Learning Engineer at Cruise   April 2022-Aug 2022
-Implemented perception ML stack for 3D object detection and segmentation using language models for a fleet of over 70 AVs around San Francisco.
-Worked on trajectory prediction of actors using sequence models like transformers, RNNs and GNN/GCNNs.
-Managed the product direction for a team of 4 engineers and developed new features on the Pick Up Drop Off (PUDO) product with engineers to build/test these new features.

Research Assistant at Vector Institute [Project Slides]   Jan 2022-April 2022
-Worked with Prof. Animesh Garg at the Vector Institute and NVIDIA AI to build a soft body API for soft object manipulation and dynamic cutting, surgical robot simulator using Intuitive's da Vinci system, and RL methods to do sub-tasks on Isaac Sim.
-Evaluated off-policy methods such as deep deterministic policy gradient (DDPG) and on-policy methods proximal policy optimization (PPO) with hindsight experience replay (HER) to improve sample efficiency.
-Used end-end learning to design environments for surgical tasks such as suture, bimanual coordination, and peg transfer.

Co-founder and CTO of Voltx May 2020-Dec 2021
-I co-founded Voltx, a software platform that utilized ML sequence models (transformers, LSTMs, RNNs) and physics models (ordinary differential equations) to accelerate battery testing and materials discovery for electrochemical devices (batteries/supercapacitors).
-We piloted our work with two of the largest supercap. manufacturers, Maxwell Tech (sub. of Tesla) and Skeleton Tech. Our models were able to reduce testing time by 70%+, from 3 months to 3 days, within QA/QC production. Through our pilots, we secured $60K in booked revenue.
-We raised a $1.3 million pre-seed round that was backed by Human Capital, Village Global (backed by Bill Gates, Jeff Bezos, etc), and AIX Ventures (founded by Pieter Abeel).

Machine Learning and Robotics Engineer at Hanson Robotics June 2020-June 2021
-Working alongside PhD David Hanson and lead engineer I developed a generative grasping convolutional neural network (GG-CNN) with 95% accuracy in grasp pose detection, and experimented with reinforcement learning and other computer vision techniques for object detection/tracking using ROS and Pybullet to improve hand manipulation for high-precision use cases on Sophia The Robot.
-Collaborated with the AHAM team at Xprize to develop a toolkit for Sophia The Robot 2020 platform and conduct Neuro-Symbolic AI research on hand manipulation.
-Published two research papers and one poster as lead co-author on Sophia 2020 platform including software and mechanics for AAAI-21 ([Neuro-Symbolic AI Controller](#)), [Open Arms Platform](#) and [AAAS Annual Meeting 2021](#).

Project Lead: Machine Learning Researcher at SJSU/BLINC Lab [[Project Slides](#)] August 2019-June 2020
-Developed multiple computer vision approaches that outperform current CNNs with 90% accuracy for robot path planning and grasp pose detection alongside a masters student and Dr. Fred Barez (Professor and Chair of Mechanical Engineering at San Jose State University).
-Led a team of 4 across SJSU and the BLINC Lab, where we developed a 3D printed material and design to reduce the costs of prosthetics from $10,000 to $700. My work primarily focused on developing an algorithm using generative grasping CNN and GVFs to make grasping and manipulation more personalized and efficient with an amputee's behavior. [[demo](#)]
-Published pre-print research paper for publication as the lead co-author in IMECE 2021 at [arXiv](#) and presented a poster at WiML [NeurIPS 2020](#).

Software Engineer Intern with Kindred.ai May 2019-August 2019
-Worked under the Co-founder and Head of AI Research at Kindred.AI, James Bergstra, to develop imitation learning, behavioural cloning, and RL approaches such as DDPG, QT-OPT, HER, PPO & SAC for simulation and real-life grasping tasks with MX Dynamixels and UR5 robots.
-Developed a multi-modal approach using PPO for learning peg-in-hole tasks in PyBullet and Drake (MIT) on a Kuka LBR iiwa robot arm. This implementation can also be used to understand force-torque (F/T) control for contact-rich manipulation tasks. [[demo](#)]
-Worked with Kindred.Ai's retail customers such as Gap, Inc., Carter's, and other global retailers, to understand their design needs on contact rich manipulation tasks and provided feedback on how we can improve our algorithms and mechanical design to facilitate these tasks in factories for more complex grasping tasks. This system is integrated into Kindred's SORT robots that have picked up more than 140 million units in production.

RESEARCH & PUBLICATIONS

14 Examples of How LLMs Can Transform Materials Science and Chemistry: A Reflection on a Large Language Model Hackathon [[PDF](#)].
From Occlusion to Insight: Object Search in Semantic Shelves using Large Language Models. Satvik Sharma, Kaushik Shivakumar, Huang Huang, Ryan Hoque, **Alishba Imran**, Brian Ichter, Ken Goldberg. Pre-print.
Design of an Affordable Prosthetic Arm Equipped with Deep Learning Vision-Based Manipulation [[PDF](#)].
Alishba Imran, William Escobar, Freidoon Barez. Published in ASME's International Mechanical Engineering Congress & Exposition (IMECE) 2021.
Open Arms: Open-Source Arms, Hands & Control [[PDF](#)]. David Hanson, **Alishba Imran**, Gerardo Morales, Vytas Krisciunas, Aditya Sagi, Aman Malali, Rushali Mohbe, Raviteja Upadrashta. Pre-print. Getting published in ICCAS 2022, IEEE Robotics and Automation Letters.
A Neuro-Symbolic Humanlike Arm Controller for Sophia the Robot [[PDF](#)]. David Hanson, **Alishba Imran**, Abhinandan Vellanki, Sanjeew Kanagaraj. Published in AAAI 2021.
Human Emulation Robotics & AI Framework: Recent Experimental Results [[Link](#)]. AAAS 2021 Annual Meeting poster.

Towards Better Prosthetic Arms with Intelligent Robotics [Link]. WiML NeurIPS 2021 poster.

PROJECTS_____

-Co-author of Book 'ML for Robotics': Published in O'Reilly Media
Publishing my own book "Machine Learning for Robotics" with O'Reilly, alongside co-authors Marco Mascorro (co-founder of Fellow AI) and Keerthana Gopalakrishnan (research engineer at Google AI). We will be publishing chapters on a rolling basis as part of early release. The full book will be published ~December 2024.

-Multi-Modal Approach for Learning Peg-in-Hole Tasks in PyBullet [project demo]
Used self-supervision to learn a compact and multimodal representation of sensory inputs, which can then be used to improve the sample efficiency of our policy learning. We train a policy in PyBullet (on the Kuka LBR iiwa robot arm) using PPO for peg-in-hole tasks. This implementation can also be used to understand force-torque (F/T) control for contact-rich manipulation tasks as at each step the force-torque (F/T) reading is captured at the joint connected with the end-effector.

-**Reinforcement Learning Pick & Place Robotic Arm - Open AI** [project demo]
Using OpenAI's Robotics environment Fetch where I trained a robot to lift, slide, move objects to defined targets using Deep Deterministic Policy Gradients (DDPG) and Hindsight Experience Replay (HER).

-**Vision-Based Robotic Grasping - Pybullet** [project demo]
Using the Kuka Diverse Object Grasping Environment for Vision-Based Robotic Grasping using RL methods such as DDPG. This implementation was widely inspired by this paper: https://arxiv.org/pdf/1802.10264.pdf and the Kuka Diverse Object Grasping Environment on Pybullet.

-Vision-Based Manipulation for Prosthetics [project demo]
Implemented generative grasping convolutional neural network (GG-CNN) and GVFs that was trained and tested on the Cornell Grasping Dataset for improving manipulation on prosthetics.

-**RNN for Predicting Lifetime of Supercapacitors/Batteries** [project demo]
Implemented RNN models such as LSTMs and other autoregressive time-series methods for predicting capacitance and resistance in supercapacitors to reduce testing time for batteries in labs from 4000 hrs to 1000 hrs.

SKILLS_____

Languages: C, Java, Python, CSS, HTML, JS
Technologies: Kubernetes, TPUs, GPUs: CUDA, OpenCL, HPC: MPI, OpenMP, Databases: SQL, Design: AutoCAD, Fusion 360, experience working with robotic simulation environments such as Pybullet, ROS, Gazebo, Unity. Machine Learning frameworks: OpenCV, Keras, TensorFlow, PyTorch, Pandas, Jax.
Hardware: Arduino, Raspberry Pi, 3D Printing, sensors, servo motors and programming embedded systems.
Communication: Presented about machine learning, robotics and blockchain at companies and leading conferences including KPMG, Google, TedxUW, CES to over 40,000 executives and researchers.

Example talks: The Inevitable Future of Machine Intelligence (TEDxUW), Reward Functions in Reinforcement Learning (CAMDEA Digital Forum), Computationally Efficient Learning Methods for Control, and Perception (AI Superstream Series: Scaling AI - O'Reilly Live Events), Machine Learning and Robotics (ODSC Webinar).

AWARDS AND FUNDING _____

Teen Vogue 21 Under 21 - I was named Teen Vogue's 21 under 21 for my startup, Voltx.
Canada's Top 100 Most Powerful Women - National award that I was selected for out of 100 other women in Canada by executives and leaders at companies like WXN, RBC and KPMG.
Inno Under 25 - SF Business Times - named one of Inno's Top 20 Under 25 selected by SF Business Times.
Masason Foundation (Softbank) Member: $10K grant - Masason Foundation was started by Masayoshi Son who is the Founder, CEO of SoftBank Group Corp. Each year they select 30 youth (2% acceptance rate) from around the world, with high aspirations and exceptional talents to provide them with an environment and support to contribute to the future of humankind. I currently have a $10K grant from them to support me on my research in developing lower cost and more efficient prosthetics.
Consumer Electronics Show (CES) Young Innovator to Watch - YIW is a prestigious award (0.5% acceptance rate) at CES, a leading technology conference in the world. I was selected as one of the 5 to win this award in 2020 where I got $1K in funding, and a fully expensed trip to speak at CES (1K+ attendees) in Las Vegas.
Human Capital Delta Fellowship: $50K grant - The Delta Fellowship gives ambitious students the capital, mentorship, and resources they need to create mission-driven companies. I was selected as one of the 16 out of 1000+ applicants who got a $50K grant, and mentorship to grow my startup Voltx.