Arth Shukla

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EDUCATION

University of California, San Diego September 2021 – June 2025
Bachelor of Science in Mathematics-Computer Science GPA – 4.0
Relevant Coursework
Completed: Deep Learning for 3D Data (Graduate Level), Rec Systems and Web Mining, Supervised Machine Learning, Optimization Methods for Machine Learning I and II, Design and Analysis of Algorithms, Data Science in Practice, Theory of Computation, Advanced Data Structures, Computer Organization and Systems Programming, Data Structures and Object-Oriented Design, Computer Science and Object-Oriented Programming - Java, Networks and Digital Communications, Data Warehousing to Big Data, Statistical Methods and Probability, Enumerative Combinatorics, Abstract Algebra I and II, Linear Algebra, Multivariable Calculus, Vector Calculus, Differential Equations
Currently Enrolled: Machine Learning for Robotics (Graduate Level)

EXPERIENCE

AI Research @ Hao Su Lab June 2023 – Present
Technologies Used: Development: Jax, Pytorch, OpenAI Gymnasium, D4RL, ManiSkill, Mujoco, Adroit; Tools: WandB, Docker, Nautilus, Kubernetes (kubectl, PVCs, etc), Mamba/Conda
Current Projects
- Use multimodal sensor data (depth images, joint q-positions/velocities) and metadata (target object coordinates relative to the robot) to train embodied agents which control articulated mobile manipulators (e.g. Fetch Robot)
- Develop scalable method for skill-chaining dexterous manipulation skills for long-horizon scene-level manipulation tasks base on Multi-Skill Mobile Manipulation (Gu et al.)
- Create and design environments and task definitions for scalable, efficient scene-level GPU simulation on SAPIEN and ManiSkill simulator team

Accepted Publications (Citations below)
- **Reverse Forward Curriculum Learning (ICLR 2024):** Leverage human and expert-made demonstrations and curriculum learning to train embodied agents with extreme online sample efficiency. Tested on dexterous manipulation tasks using a variety of articulated robots (Franka Emika Panda Arm, Shadow Dexterous Hand, Sawyer Robot)

AI Projects: https://github.com/arth-shukla; https://wandb.ai/arth-shukla/projects
Technologies Used: Development: Pytorch (Torch, TorchVision, Datasets, Dataloaders, Cuda), OpenAI Gym, HuggingFace Transformers Library, TensorFlow, Keras, Gensim; Concepts: 3D CV (DenseFusion, PointNet), Reinforcement Learning (PPO, DDQN, DQN), NLP (Transfer Learning, Embeddings, Attention); Tools/Technologies: WandB, BERT/DistilBERT Pretrained, Conda
3D Computer Vision
- Win **1st place** in 6D Pose Estimation competition in graduate-level course *Deep Learning for 3D Data* by implementing DenseFusion with altered loss + ICP Refinement: https://github.com/arth-shukla/densefusion
- Implement *PointNet: Deep learning on point sets for 3d classification and segmentation* (Qi et al. 2017) for part segmentation on chair point clouds: https://github.com/arth-shukla/pointnet-part-segmentation

Reinforcement Learning
- Create PPO Agent to consistently beat Mario level 1-1 and 1-4 in under 1600-2000 episodes of training: https://github.com/arth-shukla/ppo-mario
- Implement DDQN from *Human-level control through deep reinforcement learning* (Deep Mind 2015) in Gymnasium to beat Mario level 1-1 in 13000 episodes of training: https://github.com/arth-shukla/ddqn-mario
- Train PPO Agent to consistently beat CartPole in under 140 episodes of: https://github.com/arth-shukla/ppo-gym-cartpole

Natural Language Processing
- Use HuggingFace Transformers library to fine-tune DistilBERT model (transfer learning) trained on Stanford Question-Answer 2.0 (SQuAD 2.0) to answer a question given some context (article, paragraph, etc): https://github.com/arth-shukla/squad2.0-bert-question-answer
- Fine-tune DistilBERT model (transfer learning) to classify and approximate sentiment for Stanford Sentiment140 1.4-million Tweet Dataset: https://github.com/arth-shukla/sentiment140-bert-transfer-learning
- Use TensorFlow Keras to build LSTM and CNN and use Gensim to refit GLoVE word embeddings for IMDB Review Sentiment Classification: https://github.com/arth-shukla/gensim-embedding-training-imdb

ACM AI's Element.AI Competition https://github.com/acmucsd/Element.AI
I led development and organization of Element.AI, an $8000 RL competition at UCSD with over 200 participants.

Technologies Used: Python, Conda, Java, Maven, OpenAI Gym, PettingZoo, PyGame, Jackson, Squid, Bash

Lead Developer July 2022 – Feb 2023

- Build multi-agent Gym environment using LuxAI runner and PettngZoo to run participant bots at scale
- Create Java sdk for 45 participants (~22.5% of all participants) using Java with Maven
- In coordination with UCSD ITS, use Squid proxy, IPTables and bash scripts to create instructor tools, allowing us to enable/revoke access to wifi, whitelist sites, enable/revoke access to files, and in general control the competition accounts with granularity, both targeted and en masse
- Write proposals and attend meetings to obtain $10,000 in sponsorships, attracting 200 participants (limited primarily by the number of UCSD Linux lab machines) with over 100 submissions

Nefeli Networks (now under Cloudflare)

Technologies Used: Backend: Go, Docker, Kubernetes, etcd; Frontend: Angular, Less; DevOps: Git, Coder, Agile

Software Engineering Intern June 2023 – August 2023

- Integrate Infracost API in backend for Terraform cloud object cost and diff calculation
- Code used in production (23.09 release)

ACM AI UCSD

ACM AI is UCSD's largest AI student org which fosters a community for those interested in AI and research.

Technologies Used: AI/ML Workshops and Projects: Python, PyTorch, TensorFlow; Web Development: TypeScript, React

President May 2023 – Present

- Build AI competitions (100-200 submissions on average), run events (technical workshops, seminars, socials), lead AI board
- Previously Director of Operations 2022-23, Event Lead 2021-22, ACM AI Projects participant 2021

Bittner Development Group

Technologies Used: Web Development: React, SCSS, Node.js; DevOps: GitLab, Git, WSL; Scripting and Automation: TypeScript, JavaScript, Java; Development Standards: WCAG 2.1 AAA, Aria APG, Norton Design System; Processes: Agile Methodology

Software Engineering Intern November 2019 – June 2023

- Develop React component library and enterprise web application 'Interactive Builder'
- Web development, QA, and devops of over 10 education interactive projects in React to WCAG accessibility standards
- Manage and train two interns to complete projects using React and SCSS, GitLab, Git, and WSL
- Propose, lead, and develop internal and for-client automation projects using Node and native JavaScript

Web Development Projects: https://github.com/arth-shukla

Technologies Used: Web Development: TypeScript, React, Rollup, Jest, Webpack, Storybook, SCSS; DevOps: Netlify, Git, GitHub Pages, GitHub Packages; Development Standards: WCAG 2.1 AAA, Aria Authoring Practices Guide (APG)

Independent Developer

- Personal website using React Typescript, SCSS, and Material UI, accessible by WCAG 2.1 AA standard: https://arth.website
- Icon Library with React TypeScript and SCSS, publish to GitHub packages: https://github.com/arth-shukla/arth-components; code demos and documentation: https://arth-shukla.github.io/my-icons-documentation
- Code mobile-compatible Dice Roller web app on React: https://arth-shukla.github.io/dice-roller

CONFERENCES AND PUBLICATIONS

RFCL: Reverse Forward Curriculum Learning for Extreme Sample and Demonstration Efficiency in RL

International Conference on Learning Representations (ICLR) 2024 | May 2024, Vienna, Austria (Accepted)

Stone Tao, **Arth Shukla**, Kevin Chan, Hao Su.

arXiv | Project Page

SKILLS

- **Programming Languages** – Python, C++, Go, TypeScript, JavaScript, Node, React, Java, Ruby, Bash, SCSS, LESS, CSS, C, R
- **Packages and Libraries** – Pytorch, TorchVision, Jax, Keras, HuggingFace, OpenAI Gym, PettingZoo, Rollup, Jest, Webpack
- **Programs and Software** – Nautilus, Docker, WandB, Tensorboard, Git, GitHub, GitLab, Mamba/Conda, Maven, Visual Studio Code, WSL, Netlify, Storybook, Android Studio, Matlab, Microsoft Office, Microsoft Excel, Microsoft Powerpoint
- **Development Standards** – Web Content Accessibility Guidelines (WCAG) 2.1 AAA, Aria Authoring Practices Guide (APG)
- **Languages** – Fluent in English and French, Spoken Hindi