# **KOH** Boon Xiong Ariq

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## EDUCATION

**Nanyang Technological University, Singapore** Aug 2024 – May 2028
*Bachelor of Computing (Computer Science)*

- Expected Honours (Distinction), Current CGPA: 4.78/5.00 · Turing AI Scholars Programme (TAISP)

**Victoria Junior College, Singapore** Jan 2020 – Dec 2021
*Singapore-Cambridge GCE Advanced Level* – Rank points: 88.75/90.00

## EXPERIENCE

**NTU Undergraduate Research Experience on Campus (URECA)** Aug 2025 – Present
*Research Apprentice – Quality-Diversity AI for Generative Design*

- Developing a generative AI design agent combining LLMs with quality-diversity (QD) optimization using pyribs.
- Implemented custom emitters (MutEmitter, RandomGenEmitter) that use LLM-driven prompt evolution with sparse-region sampling to explore under-populated regions of the behavioral archive.
- Built multi-objective evaluation pipeline with Shap-E for 3D mesh generation, CFD surrogate models for drag estimation, and CLIP/BLIP-2 for domain alignment scoring.

**Alibaba-NTU Global e-Sustainability CorpLab (ANGEL)** Jun 2025 – Dec 2025
*Research Intern – LLM Prompt Optimization*

- Developed black-box automatic prompt optimization (APO) frameworks for LLM chatbot systems.
- Designed multi-agent framework using evolutionary algorithms with LLM-agents to iteratively refine and optimize chatbot system prompts without access to model gradients.

## PROJECTS

**QD-Design-Agent** · *Quality-Diversity Optimization for 3D Design* Jun 2025 – Present

- Built end-to-end QD optimization pipeline: LLM prompt generation → Shap-E 3D mesh synthesis → multi-objective evaluation (drag coefficient, domain score) → GridArchive storage with behavioral descriptors.
- Implemented token budget tracking, checkpoint/resume functionality, and visualization tools for archive heatmaps.

**MAEPOC** · *Multi-Agent Evolutionary Prompt Optimization for Chatbots* Jun 2025 – Dec 2025

- Built a multi-agent framework for black-box LLM prompt optimization: User Simulator → Chatbot → Assessor evaluation loop with rubric-based scoring and fitness tracking.
- Implemented evolutionary operators (crossover, mutation) with LLM-driven prompt evolution, tournament selection, and adaptive reseeding based on population similarity (cosine similarity) and stagnation detection.
- Parallelized evaluation pipeline using Dask distributed computing for concurrent conversation simulation.

**Lunar Lander QD Agent** · *pyribs, OpenAI Gymnasium* Jun 2025

- Applied MAP-Elites QD optimization to discover diverse high-performing policies for LunarLander-v3 using behavioral descriptors (impact velocity, landing position) with the RIBS library.

**Cartpole DQN Agent** · *PyTorch, Reinforcement Learning* Jun 2025

- Implemented Deep Q-Network with experience replay and target network for CartPole-v1 environment.

**Physics Tutor Bot** · *Telegram Bot, OpenAI API, Flask* Aug 2024

- Built a Telegram chatbot powered by GPT-4o-mini to assist students with physics questions, deployed on Heroku with webhook integration.

## AWARDS

**TAISP Hackathon 2025** · 3rd Place Dec 2025

- Built real-time ASL recognition backend: MediaPipe hand landmark detection → TensorFlow/Keras neural network classifier (A-Z letters) → FastAPI WebSocket server streaming predictions at 30 FPS.
- Implemented GestureBuffer for temporal smoothing, pose analysis feedback, and word-completion detection mode for educational Visual Novel game integration.

## SKILLS

**Languages:** Python, C, C++, C#, Java, English, Chinese
**ML/AI:** PyTorch, TensorFlow/Keras, pyribs (QD optimization), OpenAI API, LangChain, MediaPipe
**Backend:** FastAPI, Django REST Framework, Flask, WebSocket
**Tools:** Git, NumPy, OpenCV

## LEADERSHIP

**NTU TAISP Club** · Recreation & Welfare Director Nov 2024 – Sep 2025

- Led planning and execution of recreational/welfare events and 2-day freshmen orientation for TAISP Scholars.