

# JUNCHEN LIU

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## EDUCATION

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- Mohamed Bin Zayed University of Artificial Intelligence** *Aug. 2023 - Present*  
Master student in Machine Learning, advised by Dr. Samuel Horváth and Dr. Tongliang Liu  
– GPA: 3.77/4.0
- University of Southern Denmark** *Sept. 2022 - Jan. 2023*  
Exchange Student in School of Engineering  
– Major courses: Robotics and Computer Vision, Reinforcement Learning, Introduction to Drone Technology
- South China University of Technology** *Sept. 2019 - July 2023*  
Bachelor of Engineering in Intelligent Science and Technology  
– GPA: 3.72/4.0

## RESEARCH EXPERIENCE

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- Master Thesis, MBZUAI** *Oct. 2024 - Present*  
– Deep Neural Networks are constrained of deployment on edge devices due to feats like considerable memory and computation occupation.  
– Learned representation is the core part in ML system. Previous methods prefer to independently prune each layer, which incurs undesired dependencies.  
– Also, channel configuration means a lot and FLOPs increases linearly by the output channels. Our method plan to adopt novel method to prune neurons and channels at the same time find Pareto Front Models.  
– We take a step further in pruning the width of neural networks dynamically during training and introduce DPOD, a training framework that finds the optimal dropout ratio profile under efficiency constraints.
- Visual Inetlligence Lab, Nanyang Technical University** *Aug. 2023 - Oct. 2024*  
– Due to domain shift, source data and target data do not follow i.i.d. assumption, which is the basic over-simplified assumption for the most learning algorithms.  
– My method proposed multi-source domain generalization on several point cloud datasets to allow the model to discover stable patterns across source domains, which is far under-explored.  
– With the help of more training domains and final loss weight modulation based on gradient similarity, the cooperative performance of our method is **10%** better compared with baseline result.
- Undergraduate Thesis, South China University of Technology** *Jan. 2023 - May 2023*  
– Recently, the requirements of tracking problem focusing on non-linear systems are becoming demanding. While traditional control methods suffer from high computation complexity and larger consumption of computation resources.  
– Thus, the need of methods utilizing end-to-end training policy is becoming urgent critically. In this paper, my work wants to use deep reinforcement learning to tackle non-linear tracking control problems.  
– More specifically, my work originally proposes X-SARSA algorithm which is based on Deep SARSA algorithm. At the same time, it compares the effect with traditional control algorithms like Linear Quadratic Regulator (LQR) and Model Predictive Control (MPC) algorithms. My method is proved to outperform regularly mentioned algorithms in Carla environment.
- Intelligent Aerospace Systems Lab, George Washington University** *Jan. 2022 - Aug. 2022*  
Research Intern  
– Traditional methods for pricing are based on historic passenger data and forecast model, which considers self inventory only.

- We aim to use Multi-agent Deep Deterministic Policy Gradient Algorithm to observe competitors' states and actions in order to make better decisions.
- I act as the role of reviewing the mathematical part of environment to ensure its robustness, and trying to find other possible algorithms to help learning process converge.
- The problem we found is that it is really hard for learning process to converge.

### **Cai Research Group, South China University of Technology**

*July 2021 - Apr. 2022*

#### Research Assistant

- Did research on Quadruped Bionic Robot. Collaborating with group members to design 8 DOFs and 12 DOFs robot dogs by ourself.
- Focus on algorithm part. Use both Forward and Inverse Kinematics and CPG(Central Pattern Generator) methods to design gaits of robot dog.
- Plot phase graph of every joint on MATLAB and run simulation on V-rep. Prove reliability and robust of designed algorithm.
- Cooperate with group members to execute algorithm on Raspberry Pi to control motion of steering engine at every joint. Let robot dog walk in different gaits smoothly.

## **WORK EXPERIENCE**

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### **R&D Team, Yalla Group Limited**

*July 2024 - Aug. 2024*

#### Research and Development Intern

- Working closely with large language models implemented in multimodal data feature extraction tasks to design an auto-labelling system.

### **Business - SMB Marketing, e&**

*May - July 2024*

#### Artificial Intelligence Intern

- Build automation models for email automation management. After implementing this technique, company can save more than one hour per employee per day.
- Analyze classification problems in customer "churn" or not with self-built and automatic tools.

## **PROJECTS**

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### **Enhanced Vision Transformer for Robustness against adversarial attacks on Medical Image**

#### Classification

*Nov. 2023 - Dec. 2023*

Vision Transformers (ViTs) have become powerful tools in the field of medicine. At the same time, doubts about medical ViTs and their vulnerability to adversarial attacks have raised the public's concern. Moreover, the significant performance degradation inspired us we need to improve the robustness of ViTs. In our project, we introduce Self-Ensembling Vision Transformer with EfficientB0 network (SEViT\_B0) and prove its superior performance on adversarial attacks. We evaluated our model on three datasets and achieve state of art results on recent attack methods benchmark, demonstrating the outstanding performance of our model.

Code is available at <https://github.com/thaondc-mbzuai/SEViT>.

### **Neural Episodic Control for Chess**

*Oct. 2022 - Jan. 2023*

Our group intend to adapt key generation, memory design, cost-to-go calculation components of the NEC algorithm to chess environment. Let agent learn by playing against itself.

### **Biomedical Signals Denoising(Wavelet Transform Approach)**

*Apr. 2022 - May 2022*

I focused on discrete one dimensional signal wavelet transform to denoise given biomedical signal. At the same time, optimized the result in former project about electromyographic signals, which can reduce the error detection rate.

### **Comprehensive application on manipulator with five DOFs**

*Nov. 2021 - Dec. 2021*

Our team realized visual controlled grabbing and trajectory planning functions. Also, I designed a GUI for better interaction and sending instructions to manipulator.

I took the role of team leader and was responsible for trajectory planning, forward and inverse kinematics.

**Classical Game Design with Innovative Interaction***Nov. 2021 - Dec. 2021*

The team where I act as leader designed the Plane War game coding by C++ and Assembly languages with the interaction of parallel appliances collecting Electromyographic Signals, Joysticks and Bluetooth Devices.

**Comprehensive Application on Digital Image Processing***Nov. 2021 - Jan. 2022*

Realized the technology of Halftone which is widely used in print industry and designed functions widely used in Beauty Camera. Also, a corresponding GUI was made by designing logic between buttons in MATLAB to present these designed functions.

**Image Recognition***May 2021*

Independently implemented supervised image based on Deep Convolutional Neural Network algorithm.

**AWARDS, GRANTS & HONORS**

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2023 MBZUAI Full Scholarship

2020 Scholarship of South China University of Technology

2020 National English Reading Competition First Prize

**TECHNICAL SKILLS**

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**Programming Languages:** C, C++, Python, SQL, MATLAB, L<sup>A</sup>T<sub>E</sub>X

**Other Frameworks:** PyTorch, OpenCV, QT