Junyu Zhang

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Education

- **Huazhong University of Science and Technology (HUST)** Hubei, China
  *Undergraduate student majoring in **Artificial Intelligence*** *Sept 2020 - Present*
  - A Top-10 University in China
  - **Experimental Class** of Artificial Intelligence, having the top 29 students in the School of Artificial Intelligence and Automation
  - **GPA: 3.88**/4; **Rank: 1**/29 (selected from 360 students in the school)
  - **Relevant Coursework:** Linear Algebra (92), Data Structure and Algorithmic Analysis (93), Foundations of Data Science (97), Python Programming (98), Complex Function and Integral Transform (97), Database Technology (98), Computer Networks (97), Principle of Automatic Control(I) (98), Machine Learning (97), Intelligent Control (98)
  - **Research Interest:** Reinforcement Learning, Robotics+Language, Cognitive Science
  - **English Proficiency:** TOEFL 105 (Speaking 24); GRE 325+3.5 (Verbal 156, Quantitative 169, Writing 3.5)

Publications and Preprints

- Heng Dong, **Junyu Zhang**, Tonghan Wang, Chongjie Zhang, "Symmetry-Aware Robot Design with Structured Subgroups", in **ICML 2023** [PDF] [Website]
- Jianhao Wang*, Jin Zhang*, Haozhe Jiang, **Junyu Zhang**, Liwei Wang, Chongjie Zhang, "Offline Meta Reinforcement Learning with In-Distribution Online Adaptation", in **ICML 2023** [PDF]
- Heng Dong*, **Junyu Zhang***, Chongjie Zhang, "Leveraging Hyperbolic Embeddings for Coarse-to-Fine Robot Design", submitted to **ICLR 2024** (current ratings: 8666) [PDF] [Website] [OpenReview]

Research Experience

- **Research Intern - MIT-IBM Watson AI Lab** Massachusetts, US (remote)
  Supervisor: Prof. Chuang Gan *April 2023 - Present*

  Sequential Decision Making for Robotic Manipulation
  - Proposed a novel framework that enabled efficient policy generalization in the offline multi-task and imitation learning settings.
  - Incorporated mixture of experts layers into the transformer model that effectively harnesses the commonalities and discriminations of multimodal data.
  - Evaluated our method on the RLBench benchmark that demonstrated great generalization ability.
  - The project is still in progress.

- **Research Intern - IIIS, Tsinghua University** Beijing, China
  Supervisor: Prof. Chongjie Zhang *July 2022 - Present*

  Offline Meta Reinforcement Learning
  - Revealed theoretical insights for offline meta-RL with online adaptation.
  - Generated in-distribution context using a given uncertainty quantification and performed effective task belief inference to address new tasks.

- Evaluated the proposed method that achieved state-of-the-art performance on Meta-World, and modified and implemented popular algorithms such as FOCAL, MACAW, BOReL, etc.
- Our work is accepted by ICML 2023.

Robot Design via Reinforcement Learning

- Designed robots with various functionalities in simulated environments by using symmetry to exploit the structure of the robot design space with symmetry.
- Proposed a novel plug-and-play transformation module to map any robot design into a learned symmetry space and provided theoretical analysis to verify its rationality.
- Evaluated our framework on six MuJoCo tasks, which outperformed previous algorithms in terms of both sample efficiency and final performance.
- Our work is accepted by ICML 2023.

Multi-cellular Soft Robot Design

- Inspired from real multi-cellular organisms and developed a novel algorithm to co-design soft robots in behavior and morphology.
- Introduced coarse-to-fine robot design strategy and conducted a comprehensive analysis of its benefits in the evolution of intelligent collectives
- Achieved efficiency and produced high-performing morphologies on various benchmarks.
- Our project is submitted to ICLR 2024 (under review).

- **Research Assistant - School of AI, HUST** Hubei, China
  Supervisor: Prof. Dongrui Wu *May 2021 - May 2022*

Epilepsy Seizure Detection and Automatic Classification Project

- Cooperated with Wuhan Children's Hospital Affiliated to Tongji Medical College.
- Integrated transfer learning to deal with the lack of epileptic seizure data.
- Utilized manually extracted features to regularize and initialize neural network.

World Robot Contest - BCI Brain Control Robot Contest

- Completed Event-Related Potential experiments to figure out the position of target images in the sequence and determine their categories by analyzing the EEG signals.
- Introduced Euclidean-Space Alignment to deal with the differences of EEG signals between users and XDawn spatial filter to maximize the signal-to-noise ratio.
- Mapped the covariance matrix from the Riemannian manifold to a certain tangent space for better use of machine learning models.
- Our project won the Second Prize.

- **Innovation Project Member - School of AI, HUST** Hubei, China
  Supervisor: Prof. Wenbing Tao *Mar 2022 - July 2022*

Innovation and Entrepreneurship Training Program

- Aimed to build a complete football analysis system from football player detection, player identification to real-time position tracking and action recognition.
- Applied TinaFace based on RetinaNet to achieve face recognition due to the high degree of blurriness in facial images and the difficulty in capturing faces in videos.

Honors and Awards

- Outstanding Undergraduate Student Award (top 1%) - *2022*
- Freshman Self-improvement Scholarship - *2021*

- Excellent Academic Scholarship - *2021*
- The Second Prize of the World Robot Contest-BCI Brain Control Robot Contest - *2021*
- The First Prize for Individual Events in the School Spring Sports Meeting - *2021*
- Science and Technology Innovation Scholarship - *2022*
- Honorable Mention in Mathematical Contest in Modeling - *2022*
- Third Prize of the Seventeenth C Programming Language Contest - *2022*
- The Second Prize in the Badminton event at the Fourth Sports Teaching Class Student Sports Skills Competition - *2022*
- Science and Technology Innovation Scholarship - *2023*

SKILLS SUMMARY

- **Programming Languages** Python, C/C++, Matlab, SQL, Bash
- **Languages** Chinese, English
- **Frameworks** PyTorch, TensorFlow, Keras, OpenCV, Scikit, etc.
- **Tools** PyCharm, VS Code, Markdown, Jupyter Notebook, Mobaxterm, Kubernetes, Git