

Duan Jiafei

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RESEARCH INTERESTS

My research interests lie in **Computer vision** and **Cognitive Science** for **Embodied AI**. In particular, I am interested in reverse-engineering the human mind to build embodied machines that can see, learn, and interact with human-level cognition and social intelligence.

EDUCATION

- **Nanyang Technological University (NTU)** Singapore
Bachelor of Engineering (Electrical and Electronic Engineering) Aug 2018 - Jun 2021
CGPA: 4.75/5.00 (Highest Distinction)
- **Georgia Institute of Technology (GaTech)** Atlanta, GA, USA
Exchange Student in the School of Electrical and Computer Engineering Jan 2020 - May 2020
- **Ngee Ann Polytechnic (NP)** Singapore
Diploma with Merit in Engineering Science Apr 2013 - May 2016
CGPA: 3.97/4.00

PUBLICATIONS AND MANUSCRIPTS

*See my [google scholar](#) for an always up-to-date list.

[1]: **Jiafei Duan**, Samson Yu, Hui Li Tan, Cheston Tan, “*ActioNet: An Interactive End-to-End Platform for Tasked-Based Data Collection and Augmentation in 3D Environment*”, IEEE International Conference for Image Processing (ICIP) 2020.

[2]: **Jiafei Duan**, Samson Yu, Hui Li Tan, Zhu Hongyu, Cheston Tan, “*A Survey of Embodied AI: From Simulator to Research Tasks*”, IEEE Transactions on Emerging Topics in Computational Intelligence (TETCI), 2021.

[3]: **Jiafei Duan**, Samson Yu, Cheston Tan, “*SPACE: A Simulator for Physical Interactions and Causal Learning in 3D Environments*”, IEEE International Conference for Computer Vision (ICCV) 2021, 1st Simulation Technology for Embodied AI workshop.

[4]: **Jiafei Duan***, Samson Yu*, Soujanya Poria, Bihan Wen, Cheston Tan, “*PIP: Physical Interaction Prediction via Mental Simulation with Span Selection*”, under review for CVPR 2022.
(*equal contributions)

[5]: Arijit Dasgupta, **Jiafei Duan**, Marcelo H. Ang Jr, Cheston Tan, “*AVoE: A Synthetic 3D Dataset on Understanding Violation of Expectation for Artificial Cognition*”, Conference on Neural Information Processing Systems (NeurIPS) 2021, Physical Reasoning and Inductive Biases for the Real World workshop.

[6]: Arijit Dasgupta, **Jiafei Duan**, Marcelo H. Ang Jr, Yi Lin, Su-hua Wang, Renee Baillargeon, Cheston Tan, “*A Benchmark for Modeling Violation-of-Expectation in Physical Reasoning Across Event Categories*”, under review for CVPR 2022.

[7]: **Jiafei Duan***, Arijit Dasgupta*, Jason Fischer, Cheston Tan, “*A Survey on Machine Learning Approaches for Modelling Intuitive Physics*”, under review for IJCAI Survey Track 2022.
(*equal contributions)

RESEARCH EXPERIENCES

- **Institute for Infocomm Research, A*STAR** Jul 2021 - Present
AI Research Engineer (Full-time) Supervisor: Dr Cheston Tan Yin Chet
 - **Project 1: PIP: Physical Interaction Prediction via Mental Simulation with Span Selection**
 - Developed a novel deep intuitive physics model for predicting the outcome of physical interactions between objects.
 - Designed experimental protocols for human data collection trials and institutional review board (IRB).
 - Evaluated the model through ablation tests and compared it with vision baseline (ResNet50) and state-of-the-art deep physics model (PhyDNet)
 - Submitted to CVPR 2022.
 - **Project 2: A benchmark for Modeling Violation-of-Expectation for Physical Reasoning**
 - Developed a synthetic video dataset of violation-of-expectation across event categories in a 3D environment.
 - Designed physical reasoning model for predicting violation-of-expectation via the heuristic rules from the dataset.
 - Evaluated the model through ablation tests and with other vision baseline and human performance.
 - The dataset was accepted as a short paper to NeurIPS 2021 workshop, while full paper submitted to CVPR 2022.
 - **Roles: Co-supervising**
 - Co-supervised two undergraduate students on their final year projects by providing weekly guidance on their projects and technical training.
- **Nanyang Technological University, Final Year Project** Sep 2020 - May 2021
Final year undergraduate student Advisor: Asst Professor Wen Bihan
 - **Project 1: A survey of embodied AI: From Simulator to Research Tasks**
 - Conducted insightful research and analysis into the field of embodied AI
 - Benchmark the various embodied AI simulators and research tasks by a proposed metrics and provided novel insights into the field's challenges.
 - Submitted to IEEE TETCI Journal.

- **Project 2: SPACE: simulator for physical interaction**
 - Developed a physics-based simulator for synthesising SPACE dataset, a synthetic video dataset with fundamental physical interactions in a 3D environment.
 - Conducted experiments to show the advantages of SPACE dataset via curriculum-based learning for state-of-the-art deep physics model (PhyDNet) with SPACE and CIFAR-100 dataset.
 - SPACE was accepted to ICCV 2021 workshop.
- **Georgia Institute of Technology, Undergraduate Research Project** Jan 2020 - May 2020
Visiting research scholar *Advisor: Dr Ayanna Howard*
 - **Project 1: Virtual Reality Robot Therapists**
 - Developed a virtual reality environment for sim2real in robotic therapists.
 - Deployed Oculus Quest's hand tracking feature and Unity game engine to construct the simulator.
 - Contributed to a journal publication.
- **A*STAR Artificial Intelligence Initiative** Jun 2019 - Dec 2019
Research Intern *Advisor: Dr Cheston Tan Yin Chet*
 - **Project 1: ActioNet: An Interactive End-to-End Platform for Task-Based Data Collection and Augmentation in 3D environment**
 - Develop an end-to-end interactive GUI for task-based data collection in AI2THOR, an embodied AI simulator.
 - Curated the ActioNet task-based dataset for research in embodied AI.
 - ActioNet was accepted for the ICIIP 2020.

HONORS AND AWARDS

- **2021:** Koh Boon Hwee Scholars Award (Top university award, 1/1392)
- **2021:** National Science (PhD) Scholarship, Agency for Science, Technology and Research of Singapore (A*STAR)
- **2021:** NTU Class of 1985 Book Prize
- **2021:** Nanyang Award for Teamwork (Highest recognition given by the university to a student club)
- **2021:** NTU EEE Excellence Award
- **2021:** NTU EEE Final Year Project Challenge, 3rd Prize
- **2020:** MakeMIT Hackathon, Most Innovative 5G/IoT/Sensors Design Award
- **2020:** Singapore Airline APP Challenge, Superlative Award
- **2020:** AI Singapore Summer School, Best Poster Award
- **2019:** Singapore India Hackathon, 1st Runner-up
- **2019:** 6th ASPIRE Undergraduate Research Academy Conference, Excellent Undergraduate Research Award
- **2019:** Dean List's Academic Year 2018/2019
- **2019:** NTU EEE Silicon Valley Study Trip Award
- **2019:** A*STAR Undergraduate Scholarship
- **2016:** Tan Kah Kee Young Inventor's Award (Defence Science)
- **2016:** Ngee Ann Polytechnic Outstanding Technology Team Award
- **2015:** Ngee Ann Polytechnic Character Award (The highest honor students with exceptional character, 1 recipient per year)

ACADEMIC SERVICE

- **2021:** Reviewer for CVPR 2022, ECCV 2022, IEEE T-CSVT
- **2021:** General Chair for AI Student Research Conference (ARSC) 2021
- **2021:** Chief Judge for MLDA@EEE Deep Learning Week Hackathon 2020

LEADERSHIP AND CO-CURRICULAR ACTIVITIES

- **NTU Machine Learning and Data Analytics Lab (MLDA@EEE)** May 2020 - May 2021
President
 - In charge of the overall operations and endeavours of a 1 million dollar AI lab at the School of Electrical and Electronics Engineering, Nanyang Technological University.
 - Led a team of 7 executive committee members and 60 technical subcommittee members in organizing AI workshops, hackathons, and events with the goal of empowering students in their learning journey of Machine Learning (ML), Data Analytics (DA), and Artificial Intelligence (AI).
 - Fostered new industrial partnerships with companies such as Shopee, NVIDIA, Microsoft, Micron, and QuantumBlack.
 - Initiated and organised two nationwide AI events; Deep Learning week and AI Research Student Conference.
- **A*STAR Scholars' Network Studying Committee** Jul 2021 - Present
Chairperson (Studying Committee)
 - Oversee all budget and events organized under the A*STAR Scholars Network for all A*STAR studying committee Scholars. Worked closely with the management of A*STAR for the greater interest of all scholars and aid in the organizing of major A*STAR scholars' events.
- **NTU EEE Open House Organising Committee** Jan 2019 - Mar 2019
President
 - Organized and plan for the NTU EEE Open House to accommodate over 3,000 attendants. Managed and oversaw the operation of 250 student ambassador and resources given by the faculty

TECHNICAL SKILLS

- **Languages:** Python, C, C++, JavaScript, SQL, Bash, Flutter
- **Frameworks:** Scikit, NLTK, SpaCy, TensorFlow, Keras, Django, Flask, Pytorch, OpenCV
- **Tools:** LabVIEW, Unity, Blender, Meshroom, Autodesk Fusion, EAGLE PCB, GitHub, Firebase, LaTeX
- **Platforms:** Linux, Oculus Quest SDK, Windows, Arduino, Raspberry, AWS, Nvidia Jetson
- **Soft Skills:** Leadership, Event Management, Writing, Public Speaking, Video Editing