Shutong (Tony) Zhang

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EDUCATION

University of Toronto Sep 2019 – Jun 2024 (Expected)

Bachelor of Applied Science and Engineering (Honors)
- Major in Computer Engineering, minor in Artificial Intelligence
- CGPA: 3.99/4.00, Major GPA: 4.00/4.00

PUBLICATIONS AND PAPERS

[1] **S. Zhang**, T. Zhang, J. Cheng, S. Zhou. Who to Blame: A Comprehensive Review of Challenges and Opportunities in Designer-Developer Collaboration
Submitted to the 2024 International Conference on the Foundations of Software Engineering (FSE 2024)

[2] **S. Zhang**. NPSim: Nighttime Photorealistic Simulation From Daytime Images With Monocular Inverse Rendering and Ray Tracing
Thesis at ETH Zurich Computer Vision Lab (Paper in preparation for ECCV 2024)

[3] **S. Zhang***, Y. Qiao*, G. Zhu*, E. Heiden, D. Turpin, M. Lin, M. Macklin, A. Garg. HandyPriors: Physically Consistent Perception of Hand-Object Interactions with Differentiable Priors
Short paper accepted by the 2023 Computer Vision and Pattern Recognition Workshop (CVPRW 2023)
Full paper submitted to the 2024 IEEE International Conference on Robotics and Automation (ICRA 2024)

[4] D. Turpin, T. Zhong, **S. Zhang**, G. Zhu, E. Heiden, M. Macklin, S. Tsogkas, S. Dickinson, A. Garg
Fast-Grasp'D: Dexterous Multi-finger Grasp Generation Through Differentiable Simulation
Accepted by the 2023 IEEE International Conference on Robotics and Automation (ICRA 2023)

RESEARCH EXPERIENCE

University of Toronto - Vector Institute/PAIR Lab Aug 2022 – Present

Research Assistant supervised by Prof. Animesh Garg, with Prof. Ming C.Lin

Project: Diffusion-based Grasp Generation (Undergraduate Thesis - Ongoing)
- Designed a contact-conditioned diffusion model for multi-finger robotic affordance grasp generation that achieved 2x desired contact regions and 20x generation speed
- Implemented end-to-end grasp generation pipeline that generates language-guided functional grasps from single view RGB images
- Language-Guided Grasping by Region Conditioned Diffusion (Manuscript in preparation for RSS 2024)

Project: Physics-based Hand-object Pose Estimation
- Designed an integrated differentiable rendering and simulation pipeline to estimate the hand-object interaction, achieved 50% lower object error and 25% lower hand error than the state-of-the-art model
- Generalized the pipeline to robotic hand manipulation and human-object pose estimation in the wild
- Proposed a lightweight filtering-based tracking pipeline that uses differentiable priors and an Extended Kalman Filter that achieved 40fps running speed

Project: Multi-finger Robot Hand Grasp Generation
- Developed a grasp generation pipeline based on differentiable simulation that is 10x faster than the previous grasp generator "Graspit!" with 10x contact area and 2x epsilon quality
- Generated DexGrasp-1M dataset of one million unique grasps with multi-modal visual input for vision-based multi-finger robotic grasping using Nvidia Replicator Composer

University of Toronto - Forcolab Apr 2022 – Sep 2023

Research Assistant supervised by Prof. Shurui Zhou, with Prof. Jinghui Cheng
- Conducted systematic literature review on collaboration between software development engineers (SEDs) and UX designers (UXDs) and identified three collaboration challenges and six potential best practices from 44 papers
- Investigated SDEs and UXDs collaboration challenges by mining four online forums and VScode GitHub project
- Served as sub-reviewer for ASE 2022, ECSE/FSE 2023, and ICSE 2024

ETH Zürich - Computer Vision Lab
Apr 2023 – Aug 2023

Research Assistant supervised by Prof. Luc Van Gool and Dr. Christos Sakaridis
- Designed and implemented NPSim: A data generation pipeline that transforms daytime images into simulated nighttime images for semantic scene understanding tasks.
- Implemented Geometric Mesh Reconstruction part of the pipeline, including normal-guided depth refinement kernel, depth-based mesh reconstruction, and mesh post-processing kernel
- SOLO: Sun Off Light On (Manuscript in preparation for ECCV 2024)

University of Toronto - Computer Engineering Research Group
May 2021 – Sep 2021

Research Assistant supervised by Prof. Paul Chow
- Developed an FPGA-based Intrusion Detection and Prevention System using C++ and System Verilog that achieved 83 Gbps running on a single FPGA-equipped server
- Proposed to combine shift-or filter and hash table that speed up string matching stage by 40%
- Generated TCP and UDP testing traffic with speed up to 100Gbps using Cisco TRex traffic generator

Work Experience

Intel Corporation - Engineering Intern (Full time)
May 2022 – Apr 2023

Quality and Execution Team, User Experience Team, and Complier Team   *Software Engineer & Project Manager*
- Developed an auto-triage tool using Perl and MySQL that analyzes test failures and reduces 90% manual efforts
- Developed a compile statistic visualization tool using ReactJS and redesigned system-viewer: A kernel events visualizer through Gantt charts using a React-based graphics engine
- Implemented Bit Manipulation Pass that performs bit shuffle in integer dot product which reduced execution time by 25%

University of Toronto - Teaching Assistant (Contract part-time)
Sep 2021 – Apr 2023

Supervised by Prof. Natalie Enright Jerger and Prof. Jonathan Rose
- Served as a teaching assistant for ECE243: Computer Organization (Winter 2022, Winter 2023) and ECE253: Digital and Computer Systems (Fall 2021, Fall 2022)
- Supervised 15 student teams during their design projects, led lab sessions for groups with 30 students, held office hours, and graded exams

Selected Projects

Capstone Project - Smart Forks-Insight
Sep 2023 – Present
- Developed a fork management Chrome extension (Forks-Insight) that extracts, summarizes, and clusters fork information using code changes, commit messages, and an external Large Language Model

Geographic Information System Software Program
Jan 2021 – Apr 2021
- Developed large-scale Google Maps-inspired program using C++, HTML, JavaScript and CSS that visualizes 35 major cities over the world
- Implemented Dijkstra, A*, and Simulated-Annealing heuristics for travelling salesman problem that reduced the shortest path by 33% and ranked 1 out of 109 in the competition

Extracurriculars

University of Toronto Association of Engineers
Sep 2020 – Present

Events Department Leader, Student Mentor

Rural Teaching Volunteer Program
May 2020 – Jul 2020

Volunteer High School Teacher

Awards and Honors

International Experience Award ($3000)	May 2023
University of Toronto Summer Research Exchange Fellowship ($3000)	Dec 2022
Edith Grace Buchan Undergraduate Research Fellowship ($5400)	Apr 2022
Department of Electrical and Computer Engineering Top Student Award	Oct 2021
University of Toronto In-Course Scholarship ($1500)	Sep 2021
University of Toronto Scholar	Aug 2021
University of Toronto Summer Research Fellowship ($5000)	May 2021
Dean's Honor List	2019 – 2022
Faculty Of Applied Science & Engineering Admission Scholarship ($5000)	Sep 2019