DUO ZHANG

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EDUCATION

New York University
Master Candidate in Courant Institute of Mathematical Sciences *2021/1-Now*
Shandong University
B.E. in Computer Science Department *2018/06 - 2020/06*
Undergraduate in Energy and Power Engineering Department *2016/09 - 2018/06*

WORKING EXPERIENCES

Changhe Tu's lab, Interdiscipinary Research Center, Shandong University
Research Assistant *2020/06 - 2020/12*

RESEARCH EXPERIENCES

Daniele Panozzo and Lerrel Pinto's lab, Courant Institute of Mathematical Sciences, NYU
2021/09 - Now
Research Assistant *New York, NY, USA*

- **Teach Robots How to Screw a Screw in Simulation**
  All the current simulation systems like Mujoco or GraspIt can not deal with some scenarios with a lot of contacts and frictions, for example, screwing a bolt into its corresponding nuts. But a recent research Incremental Potential Contact(IPC) has provided an approach to handle numerous contacts and frictions. With IPC, I am able to build a simulation system for some robots, and train the robot to learn some policies about how to do a certain job with this system. This project is still in progress.

Changhe Tu's lab, Interdiscipinary Research Center, Shandong University *2020/01 - 2020/12*
Research Assistant *Qingdao, Shandong, China*

- **Grasp Planning as Infinite Programming Under Complementary Constraints**
  I was supervised by Prof. Xifeng Gao and Dr. Zherong Pan, and we propose an optimization-based approach to plan power grasps. Central to our method is a reformulation of grasp planning as an infinite program under complementary constraints (IPCC), which allows contacts to happen between arbitrary pairs of points on the object and the robot gripper. We show that IPCC can be reduced to a conventional finite-dimensional nonlinear program (NLP) using a kernel-integral relaxation. Moreover, the values and Jacobian matrices of the kernel-integral can be evaluated efficiently using a modified Fast Multipole Method (FMM). We further guarantee that the planned grasps are collision-free using primal barrier penalties. We demonstrate the effectiveness, robustness, and efficiency of our grasp planner on a row of challenging 3D objects and high-DOF grippers, such as Barrett Hand and Shadow Hand, where our method achieves superior grasp qualities over competitors.
- **Human-like Trajectories Generation for Robot Arms Given Certain Properties**
  I designed a model using VAE + LSGAN which can generate human-like trajectories for some scenarios involving human robot interactions with certain given properties like smoothness and length etc. The main purpose of this project is to make the robot behavior more understandable and legible for human partners.

Sriram Sankararaman's lab, Computer Sciense Department, UCLA *2019/07 - 2019/09*
Research Assistant, Cross-disciplinary Scholars in Science and Technology Program *LA, CA, USA*

- **Identification of Cell-type-specific Genetic Regulation of Gene Expression for Transcriptome-wide Association Studies**
  We developed a new approach leveraging Tensor Component Analysis (TCA) to estimate cell-specific expression levels from bulk tissue measurements using single nucleotide polymorphisms (SNPs) as predictors. We show that this model performs well in simulations and applied it to a cohort of around 1,500 individuals with expression measured in blood, identifying SNPs that predict a significant proportion of variation in expression levels in four major white blood cells. These SNPs and their estimated effects can be used for cell-specific TWAS in large cohorts with genetic data such as the UK Biobank, which includes over 500,000 samples. I also built and published a R package named TWAS for our project. Here is our project's Poster. (Our Poster Link)

Youjun Lu's lab, National Astronomical Observatories, CAS *2018/04 - 2018-05*
Undergraduate Researcher *Beijing, China*

- **Determination of Physical Parameters of Binary Black Holes and the Origin of Binary Black Holes with Gravitational Wave Data**
  I simulated various gravitational wave signals with different parameters in a wide range and set them as templates. Given the templates I trained a Bayesian Classifier determine the likelihood for a signal to be a gravitational wave and matching the parameters with the templates.

Guochao Gu's Lab, Material Science Department, Shandong University *2017/07 - 2018/07*
Undergraduate Researcher *Jinan, Shandong, China*

- **Solid-Liquid Coordinated Deformation Mechanism and Defect Control in the Process of Deformation Forging of Deformed Aluminum Alloy**
  I was taking charge of metal grain modeling and grain edge recognition. The grain modeling part was intended to build the 3D grain voronoi cells to simulate the shape of grain cells when the cells are worn and the gap between cells are filled with liquid. Then the simulated grain cells are exported to ABAQUS for analyzing the mechanic performance.

PRESENTATION

Identification of cell-type-specific genetic regulation of gene expression for transcriptome-wide association studies
Poster presentation at UCLA CSST program

HONORS AND REWARDS

National Scholarship
Sponsored by Ministry of Education of the People's Republic of China
Excellent Cadre Scholarship
Sponsored by Shandong University
Excellent Student Scholarship
Sponsored by Shandong University
Provincial Third Prize of China Undergraduate Mathematical Contest in Modeling
Sponsored by China Society for Industrial and Applied Mathematics
Provincial Third Prize of The Chinese Mathematics Competitions
Sponsored by China Mathematics Society
Honorable Mention of Mathematical Contest in Modelling (MCM)
Sponsored by Mathematical Association of America
Provincal Third Prize of Internet+ Innovation and Entrepreneurship Competition
Sponsored by Ministry of Education of the People's Republic of China
Shandong University Basketball Game Advanced Individual
Sponsored by ANTA sports

SKILLS

Programming Languages
C++, Python, JavaScript, Java, Matlab, R
Other Skills
Metal Material Processing (including turning, milling, planing, forging, casting, molding, 3D printing and some CNC technologies)

PERSONAL TRAITS

Highly motivated and eager to learn new things
Strong leadership and cooperation skills
Ability to work as an individual as well as in group
Enthusiast for basketball and power lifting (newbie in power lifting)
Skilled calligrapher in Chinese