Dongdong Liu

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🎓 Education

New York University (NYU)   2018 – 2022

Ph.D. Candidate in Mechanical Engineering(Robotics Track)
Dissertation Committee:Vikram Kapila, Chen Feng, Joo H. Kim, Ludovic Righetti, Zhongping Jiang

Zhejiang University (ZJU), China   2013 – 2016

M.S. in Mechatronics Engineering

Yanshan University (YSU), China   2009 – 2013

B.E. in Mechatronics Engineering

👥 Work Experience

New York University (NYU)   2018 – 2022

Research Assistant

Nanyang Technological University (NTU), Singapore   2016 – 2017

Research Assistant

👥 Academic Service

- IEEE Student Member
- IEEE Robotics and Automation Socity(IEEE RAS) Young Reviewer Program(YRP) Member
- IEEE RAS Robotics and Automation Letters(RA-L) Journal Reviewer
- IEEE/RSJ International Conference on Intelligent Robotics System(IROS) Reviewer

♡ Research Interests

Humanoid robotics, optimal control, reinforcement learning, machine learning

🛈 Publication

- **Dongdong Liu**, Hoon Jeong, Aoxue Wei, and Vikram Kapila, Bidirectional LSTM-based Network for Fall Prediction in a Humanoid, IEEE-RAS International Symposium on Safety, Security, and Rescue Robotics (SSRR), 2020, pp. 129–135, DOI: 10.1109/SSRR50563.2020.9292620.
- **Dongdong Liu**, Yang Liu, Yifan Xing, Shramana Ghosh, and Vikram Kapila, DDP-based Parachute Landing Optimization for a Humanoid, IEEE-RAS International Symposium on Safety, Security, and Rescue Robotics (SSRR), 2020, pp. 122-128, DOI: 10.1109SSRR50563.2020.9292623.
- **Dongdong Liu**, Yuhang Lin, and Vikram Kapila, A Rollover Strategy for Wrist Damage Reduction in a Forward Falling Humanoid, IEEE International Conference on Mechatronics and Automation (ICMA), 2021, pp. 293–300, DOI: 10.1109/ICMA52036.2021.9512722.
- **Dongdong Liu**, Yuhang Lin, Alexander Koldy, and Vikram Kapila, Whole-Body Optimization of Long-Distance Throw for a Humanoid in Double Support, IEEE-RAS International Conference on Robotics and Automation (ICRA), 2022.(Under review)
- Wenyu Han, Chen Feng, Haoran Wu, Alexander Gao, Armand Jordana, **Dongdong Liu**, Lerrel Pinto, and Ludovic Righetti, Simultaneous Navigation and Construction Benchmarking Environments, NeurIPS, 2021.(Under review)

i Scholarship

National Science Foundation STEM PhD Scholarship, NSF	2018-2022
National Scholarship, Ministry of Education (MOE) of China	2011
International "Internet+" Innovation and Entrepreneurship Competition, Gold, MOE	2021
IEEE ICMA Best Paper Award Finalist, Japan	2021
University Principal Level Scholarship (Thrice), YSU	2010, 2011, 2012
Province First prize of Mechanical Design Contest, Mechanical Design Department of Hebei Province	2012
University First Excellent Scholarship, YSU	2012
BDI Scholarship, Tianjin BDI Inc.	2012
University Second Excellent Scholarship, YSU	2009
1st prize of Mechanical Design Contest in School of Mechanical Engineering, YSU	2012
3rd prize of Mechanical Innovation Contest in School of Mechanical Engineering (Robot Contest), YSU	2012

i Mentorship

Alex Koldy	ME, The Cooper Union
Aoxue Wei	EE, Columbia University
Hoon Jeong	Math, NYU
Julian Tang	ME, NTU, Singapore
Kunal Sheth	CS, Cornell University
Michael Loughnane	CS, NYU
Yifan Xing	ME, Boston University
Yang Liu, Yuhang Lin, Jui-Yu Tseng	Robotics, NYU
Fan Bo, Haocheng Zhai	ME, NYU

i Teaching and Speech

NYU Tandon Robotics Summer Program, Instructor   2018, 2019

K12 course, NSF ITEST DRL:1614085

- Design course curriculum and assist to purchase the experimental utilities
- Give lectures and assist students to complete assigned hands-on experiments
- Mentor students' team members to obtain the first prize in 2018 and 2019 among 10 high schools
- Participate the evaluation survey and collect feedback from students and teachers

Invited Speech at Young Scholar Forum in Beijing Institute of Technology, Beijing, China 2021

Keynote Speech at Internal Conference on Robotics, Intelligent Automation and Control Technologies (RIACT), Vellore, India   2021

i Curriculum

- **Undergraduate**:

  Core curriculum: Advanced Mathematics(99/100), Linear Algebra(93/100), Probability & Mathematical Statistics(94/100), Complex Variable Analytic Method(93/100), Theoretical Mechanics(99/100), Material Mechanics(99/100), Fluid Mechanics(96/100), Engineering Graphics(92/100), Mechanical Principles(95/100), Engineering Materials(92/100), Measuring Technique A(96/100), Electrotechnology(99/100), Electronic Technology(96/100), Mathematical Modeling(100/100), Applied Fundamentals of Computer (98/100), College Physics(100/100)

  Major curriculum: Microcomputer Principle and Application(93/100), Foundations of Control Engineering(90/100), Hydraulic & Pneumatic Transmission(96/100), PLC Control Technology(92/100), Robotics, Machinery Manufacturing Technology, Interface Technology of Mechatronics System, Mechatronics System Design, Fundamentals of Single Chip Computer, Engineering Testing Technology, Micro Electromechanical System(95/100), Solidworks Computer Aided Design(96/100), Graduate Thesis: 6-URS Parallel Reconfigurable Robot System Design(95/100)

- **Master:** Modern Control Theory, Fluid Power Technology Application, Measurement and Modern Instrumentation, Fundamentals of Electro-Hydraulic Proportional Technology, Applied Mathematical Method, Flow Visualization Technology, Finite Element Methods and its Engineering Application, Mechatronics, The Design & Theory of Electro-hydraulic Servo Controls

- **PhD:** Advanced Dynamics(A-), Advanced Mechatronics(A-), Fundamentals of Robot Mobility(A), Design & Analysis of Algorithms, Machine Learning, Robot Perception(A-), Optimal Control & Reinforcement Learning for Robotics(A), Mathematics of Deep Learning(A)

ℹ Projects

Humanoid Research Project at MCRL Lab of NYU Tandon, leader   2018-2021

Funded by NSF RET Site EEC: 1542286; NSF DRK-12 DRL: 1417769; NASA NY Space Grant Consortium: 76156-10488

- Start the humanoid program from scratch in MCRL. Lead a 10-person team in NYU for the mechanical design and manufacturing with external suppliers
- Design a real-time (Preempt RT Linux kernel) embedded controller based on ROS using C++ for whole-body motion control
- Use Bidirectional LSTM to predict fall in walking routine and use differential dynamic programming(DDP) for whole-body motion planning. Implement an efficient motion planning framework combining with task space inverse dynamics (TSID)
- Integrated state estimation module and system identification for highly dynamic whole-body manipulation task (e.g., rapid throwing task)

Accurate and Efficient Collective Additive Manufacturing by Mobile Robots, collaborator   2020-2021

Funded by NSF CPS-Cyber-Physical Systems: 1932187

- Participate and discuss the benchmark project initiated by Automation and Intelligence for Civil Engineering Lab and Machines in Motion Lab of NYU Tandon
- Use soft actor critic (SAC) reinforcement learning approach to solve the problem and prepare the manuscript

Aluminum-Matrix Syntactic Foam Complex Material, leader   2021

NYU Collaboration Project

- Managed a team of four students to develop a new hollow microsphere metal matrix syntax foams with gravity infiltration casting process to replace the traditional aluminum foaming method with foaming agent such as titanium hydride(TiH_2)
- The proposed method can reduce the manufacturing cost from 9400 \$/ton to 6200 \$/ton while improving the compressive strength to 3 times that of the material prepared by traditional method. The proposed manufacturing process can reduce the weight of vehicle and harmful gases
- The proposed material improve the safety in the manufacture process and can be widely used in automobile, railway, aerospace and construction
- Lead our team to win the Gold prize in the International "Internet+" Innovation and Entrepreneurship Competition

UMC(Singapore) Semiconductor Manufacturer Smart Spare Part System, leader   2016-2017

NTU Project

- Programmed 30,000+ lines of codes with C# and tested the program on site
- Programmed 20,000+ lines of codes with ASP.NET to complete GUI in Web
- Led a team of three students in NTU to design, construct and modify the software
- Proposed a divide-and-conquer strategy and reduced the complexity to $O(nlogn)$ from $O(n^2)$
- Applied parallel computation to realize the strategy; the calculation time reduced from 8 hours to 40 minutes
- Saved 15 senior engineers for maintenance, increased hit rate from 55% to 100% for the inventory system

Structural Design and Experiment with Fuzzy-PID for Rear Shaft Seal Test Platform, leader 2014-2015

ZJU Project

- Designed and assembled the pressure controlling machine and its electric schematic
- Programmed 30,000+ lines of codes with C# and built a communication system between GUI and Real-time xPC target in Matlab

- Performed pressure controlling simulation with MATLAB in both static and dynamic state; compared traditional PID and PID-Fuzzy strategies in two conditions; Established PID-Fuzzy as the control strategy, which has better dynamic control quality and can reduce the overshoot
- Verified the control strategy on the prototype, maximum error is limited to 2.5%FS in the dynamic condition, 0.4bar in the stable condition
- Complete onsite debug in Kunming and Hangzhou. Lead team to complete the onsite acceptance assessment

Towing winch hydraulic program, onsite engineer   2014
ZJU Collaboration Project

- Bridge the cooperation between ZJU hydrualic lab and vendor, and participate plan discussion of program
- Handle emergency onsite equipment debugging and acceptance

Automatically Reconfigurable Parallel Walking Robot Design with Manipulators, leader   2013
YSU Final Year Project

- Designed a model of a 6 degree-of-freedom parallel robot with manipulators
- Performed strength check with ANSYS and simulated velocity analysis with ADAMS
- Won the highest score 95/100 among 155 students in the undergraduate thesis evaluation

Hard Ware Development and Programming of Smart Fruit Picking Robot Car, leader   2012
Undergraduate Integrated Project

- Managed a team of four students to write programs for a model car which could follow traces drawn on the floor, dodge barriers, control robot arms to pick fruits
- Drew the circuit and PCB for the chip microcomputer MCS-51
- Designed and manufactured the robot arms for Fruit Picking System
- Wrote programs on both microcomputer and PC to establish USB connection
- Entered the annnual Smart-Car Contest and won 3rd prize(4/25)

ⓘ LANGUAGE, SKILLS & INTERESTS

Language
English - Fluent, Mandarin - Native

Skills
Language: C++/C, Python, C#, Latex and Embedded Linux
Software: Robot Operating System(ROS), Visual Studio, VS Code, Solidworks, Pro/E(Creo), ANSYS, AMESim, After Effects, Photoshop, Illustrator, Eagle, AutoCAD

Interests
Swimming(member of Zhejiang University Swimming Team), Basketball, and Judo