HAOTIAN HANG

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CONTACT INFOMATION

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EDUCATION

2020 - **University of Southern California**, Los Angeles, CA
Ph.D. Candidate, Mechanical Engineering, (2022/8 passed qualifying exam, 2024 winter anticipated)
Master of Science, Computer Science, Dec 2023

2015 - 2019 **Shanghai Jiao Tong University**, Shanghai, China
B.S. Aeronautics and Astronautics Engineering, June 2019 (Average Score: 89.22/100)

EMPLOYMENT

2023/6 - 8 **Quantitative Analyst Intern**, Corporate Model Risk, Wells Fargo, Manager: *Dr. Nengfeng Zhou*
Evaluate robustness of machine learning models
- Discover the contribution of each feature on robustness metrics and overfitting
- Compare different perturbation schemes in robustness testing
- Develop nonlinear variance inflation factor (VIF) to evaluate the nonlinear correlation in dataset

2020 - **Research Assistant**, Bio-Inspired Motion Lab at USC, PI: *Prof. Eva Kanso*

2019/9 - 12 **Intern Algorithmic Engineer**, Shanghai Hongpu Information Technology Co., Ltd.
Conduct flaw detection on images of photovoltaic cell using Faster R-CNN and yolov3

2016 - 2019 **Research Assistant**, J.C.Wu Center for Aerodynamics, PI: *Prof. Hong Liu*

PUBLICATIONS

2023
8. **Hang, H.**, Heydari, S. & Kanso, E. (under review at ACC 2024) Feedback control of uncoordinated flapping swimmers to maintain school cohesion
7. Jiao, Y., **Hang, H.**, Merel, J., & Kanso, E. (in preparation). Evaluating egocentric and geocentric sensing for efficient underwater navigation using deep reinforcement learning
6. **Hang, H.**, Jiao, Y., Heydari, S., Ling, F., Merel, J. & Kanso, E. (in preparation). Learning to track flows
5. Heydari, S., **Hang, H.**, & Kanso, E. (submitted). Flow-coupled swimmers self-organize into cooperative and selfish spatial patterns
4. Qin, S., **Hang, H.**, Xiang, Y. & Liu, H. (2023).*Reynolds-number scaling analysis on lift generation of a flapping and passive rotating wing with an inhomogeneous mass distribution.* Chinese Journal of Aeronautics

2022
3. **Hang, H.**, Heydari, S., Costello, J., & Kanso, E. (2022). *Active tail flexion in concert with passive hydrodynamic forces improves swimming speed and efficiency.* Journal of Fluid Mechanics, 932, A35.

2021
2. Xiang, Y., **Hang, H.**, Qin, S., and Liu, H. (2021). *Scaling analysis of the circulation growth of leading-edge vortex in flapping flight.* Acta Mech. Sin, 37(10), 1530-1543.

2020
1. **Hang, H.**, Yu, B., Xiang, Y., Zhang, B., and Liu, H. (2020). *An objective-adaptive refinement criterion based on modified ridge extraction method for finite-time Lyapunov exponent (FTLE) calculation.* Journal of Visualization, 23(1), 81-95.

TALKS/PRESENTATIONS

2023 **So Cal Fluids XVI**, Active tail flexion in concert with passive hydrodynamic forces improves swimming speed and efficiency

2022 **APS Division of Fluid Dynamics Meeting**, Learning to blindly follow hydrodynamic trails
So Cal Fluids XV, Learning to blindly follow hydrodynamic trails

2021 **APS Division of Fluid Dynamics Meeting**, Active tail flexion in concert with passive hydrodynamic forces improves swimming speed and efficiency

2020 **APS Division of Fluid Dynamics Meeting**, Flowtaxis in the wakes of oscillating airfoils

2018 **APS Division of Fluid Dynamics Meeting**, Passive rotation of a flapping wing with an inhomogeneous mass distribution

RESEARCH INTERESTS/EXPERIENCE

2021 - **Stability and energy saving of fish schools**, supervised by *Prof. Eva Kanso*, *Prof. Matt McHenry*
Develop efficient parallelized code using fast multipole method (FMM) to simulate emergent formation of fish schools composed of up to 10 fishes
Evaluate the energetic benefit and stability of fish schools of different different spatial patterns
Design control laws to stabilize fish schools which are passively unstable
Study the dynamically-changing real fish schools using graph theory

2020 - **Tracking hydrodynamic trails using deep reinforcement learning**, supervised by *Prof. Eva Kanso*, *Dr. Josh Merel*
Employ reinforcement learning to follow vortical wakes based on local flow sensory
Find the importance of the wake's periodicity and traveling wave characteristic in source seeking
Analyze the controller in a simplified signal field and prove that stability of the controller depends on the location of sensor
Compare performance among different sensory cues, especially between mechano- and chemo- sensing

2020 - **Flexion in fish swimming**, supervised by *Prof. Eva Kanso*, *Prof. John H. Costello*
Analyze the role of active and passive flexion on swimming speed and efficiency of a self-propelling pitching plate using vortex sheet method
Parametric study on effects of flexion phase, flexion angle and flexion ratio on swimming performance
Find overlap between biological data and the region we proposed to have hydrodynamic benefits in parameter space

2016 - 2019 **High lift generation mechanisms of insects' flight**, supervised by *Prof. Hong Liu*, *Prof. Yang Xiang* and *Dr. Suyang Qin*
Conduct experimental study using robotic flapping wing models in glycerin with Reynolds number similar to insects
Measure flow field using particle image velocimetry (PIV) and measure force and torque using 6-axis force sensor, analogue filter and NI data acquisition system
Study formation of leading edge vortex(LEV) for different kinematic modes, and find advanced rotation can generate a lager LEV because of wake capture
Find a scaling law between passive rotation and active translation in flapping wing model

2016 - 2019 **AMR for FTLE calculation**, supervised by *Prof. Hong Liu*, *Prof. Bin Zhang*, *Bin Yu* and *Prof. Yang Xiang*
Develop a physics-based adaptive refinement method for finite-time Lyapunov exponent calculation

2015 - 2016 **VTOL pitch-changed quadrotor** , supported by National Students' Platform for Innovation and Entrepreneurship Training , supervised by *Prof. Junqi Wu*
Lead a team to make a quadrotor and implement pitch-changed technique and VTOL technique in terms of both mechanical and control

TEACHING EXPERIENCE

at University of Southern California

2021 Spring **Teaching Assistant**, AME-526, Introduction to mathematical methods in engineering II, *Prof. Niema Pahlevan*

2020 Fall **Teaching Assistant**, AME-404, Computational Solutions to Engineering Problems, *Prof. Takahiro Sakai*

OPEN SOURCE PROJECTS

2021 - 2022 Parallel C++ Implementation of Proximal Policy Optimization (PPO) Github Link

2021- DeepONet physics inferring for unknown parameters of partially-observable system Github Link

2023- Field-Oriented Control (FOC) on STM32 Github Link

GRADUATE COURSEWORK

at University of Southern California

2023 CSCI-575, Quantum Computing and Quantum Cryptography, *Prof. Ming-Deh Huang*

2022 EE-587, Nonlinear Control Systems, *Prof. Mihailo Jovanovic*
CSCI-561, Foundations of Artificial Intelligence, *Prof. Wei-Min Shen*
CSCI-567, Machine Learning, *Prof. Victor Adamchik*
CSCI-653, High Performance Computing and Simulations, *Prof. Aiichiro Nakano*

2021 PHYS-516, Methods of Computational Physics, *Prof. Aiichiro Nakano*
EE-556, Stochastic Systems and Reinforcement Learning, *Prof. Rahul Jain*

	CSCI-570, Analysis of Algorithms, *Prof. Victor Adamchik*
	AME-508, Machine Learning and Computational Physics, *Prof. Assad Oberai*
	CSCI-596, Scientific Computing and Visualization, *Prof. Aiichiro Nakano*
2020	AME-525, Engineering Analysis, *Prof. Eva Kanso*
	AME-526, Introduction to Mathematical Methods in Engineering II, *Prof. Niema Pahlevan*
	AME-511, Compressible Gas Dynamics, *Prof. Iván Bermejo-Moreno*
	PHYS-760, Selected Topics in Computational Physics, *Prof. Satish Kumar Thittamaranahalli*
	AME-451, Linear Control Systems I, *Prof. Henryk Flashner*
	AME-541, Linear Control Systems II, *Prof. Néstor O. Pérez-Arancibia*
	AME-535A, Introduction to Computational Fluid Mechanics, *Prof. Alejandra Uranga*
	AME-530A, Dynamics of Incompressible Fluids, *Prof. Carlos Pantano*

HONOR/AWARDS

2022	USC Three Minute Thesis (3MT) competition Finalist Link
2020	USC Viterbi felloship
2017-2018	Hui-Chun Chin and Tsung-Dao Lee Chinese Undergraduate Research Endowment of SJTU
2016	Honeywell Star Project
	Second Place , Parts of the National College Students Physics Competition
	Third Place , Chinese College Students' Mathematics Competition
2014	**First Place**, Chinese Chemistry Olympiad
	First Place, Shanghai Adolescents Science and Technology Innovation Contest

SERVICE

2023	Reviewer, American Control Conference (ACC) 2024
	Judge, Undergraduate Symposium for Scholarly and Creative Work
Fall 2022	AME 441 project mentor, Robotic fish with airtificial lateral line
2022	Judge, Undergraduate Symposium for Scholarly and Creative Work

ONLINE COURSEWORK

2022	C++ Nanodegree, Udacity
	Qiskit Global Summer School 2022 , IBM
2021	Build a Modern Computer from First Principles: From Nand to Tetris (Project-Centered Course), Coursera
2019	**Specialization**, DeepLearning.AI TensorFlow Developer , Coursera (containing 4 courses)
	Specialization, Deep Learning, Coursera (containing 5 courses)
	Machine Learning, Coursera
2014	General Chemistry, Coursera

TECHNICAL SKILLS

Programming Language:	Python, C/C++, Matlab, Fortran
Machine learning framework:	Pytorch, Tensorflow
Micro controller:	Arduino, Raspberry Pi, Pixhawk, stm32
Other softwares/ tools:	Solidworks, Fusion 360, ROS/ROS2, Gazebo, github, LaTeX, Docker, Ansys Fluent, Linux, MPI, OpenMP, cuda