

Tsung-Yu Yang

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RESEARCH INTERESTS

Computational Fluid Dynamics, Numerical Method, Machine Learning, Optimization, Reduced-Order Modeling

EDUCATION

Massachusetts Institute of Technology *Cambridge, MA, USA* *Sep. 2021 – Current*

Doctor of Philosophy in Mechanical Engineering and Computation

National Taiwan University *Taipei, Taiwan* *Sep. 2014 – Aug. 2016*

Master of Science in Applied Mechanics (GPA: 3.69/4.00)

Thesis: “A New Stochastic Solver for Multi Metal-Dielectric Interconnect Capacitance Extraction”

Tamkang University *New Taipei City, Taiwan* *Sep. 2010 – Aug. 2014*

Bachelor of Engineering in Aerospace Engineering (GPA: 3.48/4.00, Ranking: 2/57)

PROFESSIONAL AND RESEARCH EXPERIENCE

Massachusetts Institute of Technology *Cambridge, MA, USA* *Sep 2021 – Current*

Research Assistant (Sloan Automotive Lab)

- Implemented Neural Network-Genetic Algorithm multi-objective optimization framework for piston skirt profile, showcasing substantial reductions in both friction force and piston lateral motion, with successful application on two distinct engines.
- Applied Bayesian optimization with Gaussian process regression to optimize the arrangement of piston drain holes, reducing the number of simulations required to achieve optimal design.
- Established surrogate models for gas flow in the oil control ring employing convolutional neural network trained with 3D CFD simulation data, enabling rapid flow field reconstruction under varying boundary conditions.
- Developed a vibration-induced cavitation predictor using polynomial regression, trained with 2D transient CFD simulation data, providing an efficient guidance for piston design.
- Innovated a high-speed oil transport model by conducting and analyzing 3D two-phase flow simulations for oil transport in the oil control ring groove, showing good agreement with experiment results.

Corning Display Technologies *Taichung, Taiwan* *Jan 2017 – Sep 2020*

Development Engineer (Modeling & Analysis team)

- Evaluated the flow pattern in high-temperature environment and the extent of fluid-structure interaction (FSI) between high velocity air flow and a hanging hot glass sheet by conducting two ways FSI simulation.
- Invented a high-performance air flow management system that significantly reduced airborne particles in the environment by 50% and prevented glass surface contamination.
- Designed an innovative ventilation system using CFD, and minimized airborne bacteria in the washing chamber and successfully demonstrated a 67% reduction in the number of bacteria stains.
- Developed a graphical user interface platform for manufacturing data analysis using Python; significantly streamlined data/image manipulation and visualization process, which reduced the processing time from 4-5 hours to less than 10 minutes.

National Taiwan University *Taipei, Taiwan*

Jul. 2014 – Aug. 2016

Research Assistant (*Mechanics for Biomedical & Opto-electrical Engineering Lab*)

- Developed a new stochastic solver for extracting 2D and 3D multi metal-dielectric interconnect capacitances based on random walk. Built programs using C++ and MATLAB to effectively manage pre- and post-processing of the numerical data generated by the solver.
- Researched using different machine learning algorithms to investigate the gene expression of vascular endothelial growth factor (VEGF). Won Best Performance Team award at the Computational Biology in Big Data 2015 (CBiG15) - Dream challenge competition.
- Developed and implemented a prototype of snoring mitigation system by integrating Arduino, sound sensor, air pump and air pillow. Awarded the 1st place based on the proven result that the snoring detecting algorithm can effectively capture and record snoring and activate air pump to fill up air pillow after snoring is detected more than 3 times.

Tamkang University *New Taipei City, Taiwan*

Jul. 2012 – Aug. 2014

Research Assistant (*Mechanics for Biomedical & Opto-electrical Engineering Lab*)

- Developed a less-dissipative two-phase flow solver using MUSCL+THINC type HLLC scheme that successfully simulated complex compressible multiphase flow, and achieved sharp resolution of the material interface. (Shock Waves 2019)
- Programmed a MATLAB code that optimized UAV shape design with high lift-to-drag ratio using genetic algorithm. Conducted comprehensive UAVs structural analysis and experimental design. Coordinated the design, fabrication and testing of UAVs. Awarded the 1st place in Aerodynamic Design in 2014 Taiwan Unmanned Aerial Vehicle Competition.

SKILLS

- Software: Fluent, ANSYS, OpenFOAM, SolidWorks, ImageJ
- Programming Skills: Python, MATLAB, C/C++, Fortran, SQL, LaTeX, Parallel computing
- Machine Learning: PyTorch, Scikit-learn, TensorFlow

PUBLICATION

- Y. Y. Niu, Y. C. Chen, T. Y. Yang, F. Xiao, Development of a less-dissipative hybrid AUSMD scheme for multi-component flow simulations, Shock Waves 29, 691-704 (2019).

CERTIFICATIONS

- Coursera, Deep Learning Specialization, 2020.
- Coursera, Generative Adversarial Networks (GANs) Specialization, 2020.
- Corning Display Technologies, Project Management Skills Training, 2019.
- Corning Display Technologies, KT Training & Workshops, 2018.