

Yuheng Zhang (Frank)

Champaign, IL | Cell: (310) 890-3324 | zhang367@illinois.edu

SUMMARY

Ph.D. candidate, proficient with thermal testing, pool boiling and flow boiling tests, high speed flow visualization; scaling analysis based on first principles, physics; 1D FEA two-phase heat exchanger modeling, parametric sweep, Python, MATLAB.

SKILLS

- Thermal testing, Design of experiments, Automated data acquisition, Sensor calibration, Thermocouple, Flowmeter
- High pressure system, Vacuum system, Heat exchangers, Refrigerants, System debugging, Signal Processing
- Coding and Modeling, Python (Scipy, NumPy, Pandas, OpenCV, nidaqmx), MATLAB, LabVIEW
- CAD, Solidworks, CREO, Autodesk
- CFD, FLUENT, SOLIDWORKS Simulation

EXPERIENCE

Graduate Research Assistant, University of Illinois at Urbana-Champaign - Urbana, IL

September 2015 - Present

Pool Boiling Enhancement

- Designed and implemented 3D printable, passive devices to enhance the heat transfer and critical heat flux in pool boiling.
- Optimized spacing and achieved more than 80% increase in the CHF and 120% increase in HTC using the 3D printed devices.
- Authored a technical paper on novelty and physics involved in this work.
- Conducted high-speed visualization of the flow structure inside vapor bubbles correlating to the enhancement.
- Conducted scaling analysis to explain the nonlinear response of CHF to structural spacing.
- Designed and built the testing bench, developed testing protocols with micro-meter accuracy positioning fixtures.
- Conducted thermocouple calibration and automated data acquisition through Python interface with DAQ devices.

Flow Boiling Enhancement

- Conducted Design of Experiments with vapor quality, mass flux, and saturation temperature for flow boiling tests in evaporators.
- Achieved more than 30% enhancement in in-tube flow boiling heat transfer using active flow pulsation.
- Conducted 1D FEA of the heat transfer and pressure drop in a two-phase heat exchanger based on flow regime correlations.
- Developed correlations for the pressure drop and heat transfer in two-phase heat exchangers with pulsating flow.
- Conducted statistical analysis on data, such as regression, main effect, interaction, using Minitab.
- Authored papers, delivered technical reports and presentations to sponsors, such as Carrier, Daikin, Ford, Sanhua.

Anti-scaling Surfaces

- Developed robust surface morphology patterns and reduced scaling by 50% without chemical retreatments.
- Designed (Solidworks) and built a closed-loop vacuum setup to test the heat transfer in falling-film evaporation on tubes.
- Conducted surface characterization, such as surface morphology, roughness, and thickness using SEM and Laser confocal microscope.
- Routinely submitted reports and delivered presentations to the Department of Energy for project updates.
- Collaboration with Oak Ridge National Lab in the development of high thermal conductivity 3-D printable polymer tubes.

Consulting

- Conducted FEA (Python) of natural convection heat transfer in an enclosed cylinder filled with high viscosity fluids.
- Solved conjugate heat transfer problems in a wall with condensation and natural convection on either side (Python).
- Optimized heating loop design using automated parametric sweep (Python), such as pipe diameter, spacing, number of passes.

Mechanical Engineering Co-op, Cooper Tire & Rubber Company - Findlay, OH

January 2015 - May 2015

- Developed new protocols for sample preparation and analysis using SEM and EDX.
- Programmed Excel Macros and deployed them in all US plants for hundreds of times faster data analysis and executions.
- Programmed (VBA) for batch data analysis for the rheological properties of the rubber vulcanization process.
- Delivered CAD design (CREO) of a lab-scale, pressurized rubber vulcanization mold using CREO.

Mechatronics Engineer, Senior Design Project, University of California Los Angeles – Los Angeles, CA

January 2014 - June 2014

- Designed (Solidworks), FEA, and fabricated structural components of a robot.
- Designed (Solidworks) and fabricated an object detection-capture subsystem with electromechanical components.
- Programmed (Labview) autonomous ball-searching, loading, and path-finding algorithms on an FPGA board.

Data Team Lead, Mini Baja SAE, University of California Los Angeles – Los Angeles, CA

September 2013 - June 2014

- Led the development of a Hall-effect speedometer and data logging setup for the 2013 vehicle.
- Led and developed data-based tuning procedures for the continuous-variable transmission unit.
- Conducted design (Solidworks) and machining of onboard fixtures for test equipment.

EDUCATION

Ph.D. in Mechanical Science and Engineering, University of Illinois at Urbana-Champaign

Jan 2018 - Dec 2021

MS in Mechanical Science and Engineering, University of Illinois at Urbana-Champaign

Aug 2014 - Dec 2017

BS in Mechanical Engineering, University of California Los Angeles

Sep 2010 - Jun 2014

PUBLICATIONS

Zhang, Y., Wang, S., (In progress). Enhanced critical heat flux by vapor management.

Zhang, Y., Wang, S., (In progress). Enhanced nucleate boiling heat transfer by 3D printed curved confinement.

Zhang, Y., Wang, S., (In progress). Modeling of pressure drop and heat transfer of pulsating two-phase flow in a heated tube.

Dai, Z., Zhang, Y., Wang, S., Nawaz, K., Jacobi, A. (In progress) Falling-film heat exchangers used in desalination systems: A review.

Yang, P., Zhang, Y., Wang, X., & Liu, Y. (2018). Heat transfer measurement and flow regime visualization of two-phase pulsating flow in an evaporator. *International journal of heat and mass transfer*.

Yang, P., Zhang, Y., Wang, S., & Liu, Y. (2020). Experimental study on liquid-vapor two-phase pressure drop of pulsating flow in an evaporator. *International journal of heat and mass transfer*.

Jin, H., Shahane, S., Zhang, Y., Nawaz, K., Wang, S. Modeling of crystallization fouling on a horizontal-tube falling-film evaporator for thermal desalination. *International Journal of Heat and Mass Transfer*.

STUDENT ORGANIZATION

President of ASHRAE Student Branch, University of Illinois Urbana-Champaign

2019-Present

Treasurer of ASHRAE Student Branch, University of Illinois Urbana-Champaign

2018-2019

Team Lead, Data Team of Mini-Baja SAE, University of California Los Angeles

2013-2014

LANGUAGE SKILLS

English - Fluent in speaking and writing

Chinese - Native speaker