Christy L. Dunlap

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Education

University of Arkansas August 2021 – Present
Ph.D. in Engineering with Mechanical Engineering Concentration *GPA:4.0*

University of Arkansas August 2017-May 2021
B.S. in Mechanical Engineering *GPA:3.8*
Minor in Agricultural Business

University of Arkansas August 2017-May 2021
B.S. in Mathematics with an Applied Concentration *Major GPA: 4.0*

Experience

Graduate Research Assistant Summer 2021 – Present
University of Arkansas *Fayetteville, AR*

Project: Robust Fault Detection of Cooling Systems using Multimodal Fusion, Neocortex
Collaborator: Jeff Pummill (AHPCC)

* Benchmarked wafer-scale engine using a Multi-layer perceptron (MLP) model on CPU and GPU supercomputer Bridges2 to determine speedup.
* Developed a Convolutional Neural Network (CNN) model to run on Neocortex.

Project: Interpretable Multimodal Fusion Networks for Fault Detection and Diagnostics of Two-Phase Cooling Under Transient Heat Loads, Arkansas NSF EPSCoR DART

* Leveraged boiling acoustics and high-speed imaging data to develop regression models for heat flux prediction and classification models for boiling regime prediction
* Created models for predicting heat flux and boiling regimes through the use of various machine learning techniques, such as Gaussian Process Regression (GPR), Random Forest Regression (RFR), Multi-Layer Perceptron (MLP), and Convolutional Neural Network (CNN)

Project: DNA Sequencing Based on Single Molecule Control and Machine Learning-Aided Basecalling
Collaborators: Steve Tung (MEEG), Jin-Woo Kim (Division of Agriculture)

* Trained and tested pre-developed basecalling models.
* Developed Transformer and Recurrent Neural Network (RNN) models with Connectionist Temporal Classification (CTC) loss for basecalling.

Graduate Teaching Assistant August 2021 – May 2022
University of Arkansas *Fayetteville, AR*

- Lead around 2-3 mechanical engineering labs each week
- Guide students on how to successfully complete labs involving: LabVIEW, LJLogUD, heat treating metals, hardness and tensile testing, and creating cooling curves.

Math Grader Fall 2019 – Fall 2020
University of Arkansas *Fayetteville, AR*

- Graded Linear Algebra homework in a timely manner
- Worked with professors to determine best point distribution per assignment
- Graded papers for around 80 students each semester

Intern Summer 2019
Giltner *Fayetteville, AR*

- Called drivers to check on status of loads
- Sold loads and set pick up appointments
- Entered new loads in the Aljex transportaion management system

Awards & Honors

W.R. Thomas Endowed Doctoral Engineering Fellowship	2022
Arkansas Space Grant Consortium (ASGC) Student Intensive Training	2022
Reginald R. Barney & Jameson A. Baxter Graduate Fellowship	2022
David e. Johnson and Wilda S. McMurray Endowed Scholarship	2020-2021
Arkansas Academy of Mechanical Engineering Scholarship	2020-2021
Droke-Dunn Scholarship	2020-2021
Honors College Academy Scholarship	2017-2021
Charles D. Brock Scholarship	2018

Publications

C. Dunlap, H. Pandey, E. Weems, and H. Hu, "Nonintrusive Heat Flux Quantification Using Acoustic Emissions During Pool Boiling," Appl Therm Eng, p. 120558, 4, 2023, doi: 10.1016/j.applthermaleng.2023.120558.

C. Dunlap, H. Pandey, J. Marsh, E. Weems, and H. Hu, "Remote Thermal Measurements with Regression of Acoustic Emissions," in Proceedings of the ASME 2023 Heat Transfer Summer Conference, Jul 2023, Washington, DC, HT2023-106939.

H. Pandey, **C. Dunlap**, A. Williams, J. Marsh, and H. Hu, "Multimodal Characterization of Steady-State and Transient Boiling Heat Transfer," in Proceedings of the ASME 2023 Heat Transfer Summer Conference, Jul 2023, Washington, DC, HT2023-106015

C. Dunlap, S. Featherstone, M. Smith, M. Vu, A. Williams, J. Bailey, and H. Hu, "Design and Fabrication of A Low-Cost and Programmable Dip Coating Machine," HardwareX, 12, 2022, e00364.

J. Marsh, **C. Dunlap**, S. Pierson, and H. Hu, "Introducing LabVIEW and Arduino as Data Acquisition System Alternatives," in 2022 ASEE Midwest Section Conference, 3279.

C. Dunlap, J. Pummill, and H. Hu, "Infusing High-Performance Computing and Machine Learning in Mechanical Engineering Education," in 2022 ASEE Midwest Section Conference, 2944.

C. Dunlap, H. Pandey, and H. Hu, "Supervised and Unsupervised Learning Models for Detection of Critical Heat Flux During Pool Boiling," in Proceedings of the ASME 2022 Heat Transfer Summer Conference, HT2022-85582

Patents

H.Hu, H. Pandey, and **C.Dunlap**, "Detecting or Predicting System Faults in Cooling Systems in a Non-Intrusive Manner Using Deep Learning," Dec 9, 2022, US Patent Application No. 18/078,774.

H. Hu, **C. Dunlap**, H. Pandey, J. Marsh, and E. Weems, "Detecting or Predicting Critical heat Flux in Cooling Systems during Pool Boiling in a Non-Intrusive Manner Using Acoustic Emissions," U.S. Provisional Patent Application, 63/434,137, Dec 21, 2022

Academic Memberships

Tau Beta Pi — Arkansas Alpha
Fall 2019 – Present

Pi Tau Sigma — University of Arkansas
Spring 2020 – Present

Specialized Skills

Programming: Python, MATLAB, C++, Arduino, LaTeX
Machine Learning : Tensorflow, PyTorch, scikit-learn, SciPy
CAD: Certified SolidWorks Associate