

Brooklyn Ballard

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Madison, WI 53703

SUMMARY

Graduate mechanical engineering researcher focused on advanced thermal management for power electronics and **power conversion systems**. Graduate research since September 2025 connects thermodynamics, heat transfer, fluid dynamics, thermal networks, FEA, and CFD with practical cooling concepts. Work includes Ansys Fluent simulation, SolidWorks design, liquid cooling, heat exchangers, pumps, fluid connections, heat sinks, material compatibility, BOM development, prototype testing, and model validation. Research compares predicted behavior with measured temperature, pressure, and flow data, creating repeatable methods and traceable engineering records. Academic projects address single phase and **two phase cooling, micro channel liquid cooling**, immersion cooling, **advanced thermal materials**, electromagnetics, and electric drives. Clear presentations and thoughtful collaboration support productive technical reviews, sound decisions, and useful research outcomes for multidisciplinary teams.

EDUCATION

PhD in Mechanical Engineering

2028

University of Wisconsin Madison GPA: 4.0

Madison, WI

Coursework: Thermodynamics, heat transfer, fluid dynamics, power electronics

TECHNICAL SKILLS

- Thermal Sciences:** Thermodynamics, Heat transfer, Fluid dynamics
- Thermal Analysis:** Thermal networks, FEA, CFD
- Simulation Software:** Ansys Fluent, Ansys, Comsol
- Mechanical Design:** SolidWorks, Creo, Inventor
- Cooling Systems:** Single phase cooling, Two phase cooling, Immersion cooling
- Liquid Cooling:** Micro channel cooling, Pumps, Fluid connections
- Thermal Hardware:** Heat exchangers, Heat sinks, Fans
- Power Systems:** Power electronics, Power conversion, Electric drives
- Materials Engineering:** Advanced thermal materials, Material compatibility, Materials selection
- Engineering Delivery:** BOMs, Prototype testing, Technical reviews

SKILLS

- Thermodynamics
- Thermal networks
- SolidWorks
- Prototype testing
- Heat transfer
- FEA
- Liquid cooling
- Technical presentations
- Fluid dynamics
- CFD
- Heat exchangers
- BOM development
- Power electronics
- Ansys Fluent
- Material compatibility

EXPERIENCE

Graduate Thermal Research Assistant, Advanced Cooling Research

September 2025 - Present

University Research Lab

Madison, WI

Graduate research role supporting advanced cooling studies for power electronics through simulation, prototype development, laboratory testing, technical documentation, and review preparation. Work connects analytical models with physical evidence, supporting **traceable engineering decisions** and repeatable methods.

- Defined **liquid cooling** requirements and test methods for a **power electronics** prototype.
- Built Ansys Fluent models for flow behavior and compared results with laboratory measurements.
- Created SolidWorks components, heat exchanger layouts, pumps, **fluid connections**, and heat sinks.
- Recorded temperature, pressure, and flow data for repeatable **model validation** studies.
- Prepared BOMs and technical summaries supporting design reviews and **project planning**.
- Presented findings to research stakeholders and incorporated feedback into later prototype iterations.

Power Electronics Cooling Researcher, Prototype Development

January 2025 - August 2025

Capstone Project

Madison, WI

Student research role centered on a power conversion cooling prototype, combining thermal analysis, mechanical design, controlled testing, documentation, and **technical presentation**. Project work translated requirements into a practical design and assessed tradeoffs across performance, materials, and implementation.

- Designed a student scale cooling prototype for **power conversion** equipment and testing.
- Applied thermal network methods to estimate component temperatures before physical evaluation.

- Modeled prototype geometry in **SolidWorks** and documented interfaces, materials, and BOM details.
- Tested pump flow and **fluid connections** under controlled laboratory conditions for repeatability.
- Compared measured **temperature** and pressure data with analytical and **CFD** results.
- Presented design choices, limitations, and next steps during a technical project review.

Thermal Fluid Engineering Lab Researcher, Experimental Analysis

September 2024 - December 2024

Student Lab

Madison, WI

Supervised laboratory research covering conduction, convection, radiation, fluid flow, and phase change. Investigations built practical skill with measurement, engineering records, review discussions, and evidence based evaluation of thermal fluid behavior.

- Investigated conduction, convection, radiation, fluid flow, and phase change in supervised labs.
- Used measured flow and temperature data to evaluate basic thermal fluid models.
- Documented assumptions, procedures, observations, and results in traceable laboratory records.
- Reviewed experimental uncertainty and linked findings with physical principles and requirements.
- Explained thermal results during peer discussions using clear engineering evidence.
- Applied review feedback to improve test setup, analysis, and final **technical documentation**.

PROJECTS

Micro Channel Cooling Study 📅 2026

Explored micro channel liquid cooling for power electronics, connecting thermal networks, fluid behavior, material compatibility, and measured performance. Findings supported a clear comparison of cooling paths for future prototype decisions.

Two Phase Immersion Cooling Analysis 📅 2025

Compared single phase, two phase, and immersion cooling concepts through thermal modeling, material review, and technical presentation. Analysis clarified tradeoffs involving heat removal, fluid compatibility, packaging, and practical test planning.

LEADERSHIP & AWARDS

- Graduate Research Fellowship, University of Wisconsin Madison, 2025
- Department Research Poster Recognition, University of Wisconsin Madison, 2026
- Graduate Thermal Sciences Seminar Coordinator, University of Wisconsin Madison, 2026

CERTIFICATIONS

- Ansys Fluent Basics 📅 2025
- University Graduate Laboratory Safety Certification 📅 2024

PROFESSIONAL AFFILIATIONS

- Graduate Thermal Sciences Seminar Coordinator, University of Wisconsin Madison, 2026
- Peer Mentor, Mechanical Engineering Graduate Program, 2025 to Present

LANGUAGES

- English (Native)
- Spanish (Intermediate)

ADDITIONAL INFORMATION

Work Status : Authorized to work in United States. No sponsorship required.

REFERENCES

AVAILABLE ON REQUEST