

Kalyan S Boyina

boyina2@illinois.edu | +1 (918)-493-0512 | 1306 North Lincoln Ave. APT 204, Urbana, Illinois 61801 | www.linkedin.com/in/kalyan-boyina

Education

- **University of Illinois – Urbana, Illinois** August 2021 (expected)
Doctor of Philosophy in Mechanical Engineering GPA: 3.69/4.00
- **Oklahoma State University – Stillwater, Oklahoma** May 2014
Bachelor of Science in Mechanical Engineering with a minor in Mathematics GPA: 3.98/4.00

Technical Experience

- **Graduate Research – University of Illinois** Urbana, IL
Advisor: Dr. Nenad Miljkovic
Investigation of condensation and delayed frosting on superhydrophobic heat exchangers August 2015 – Present
 - Investigated frost reduction capabilities of *bioinspired lotus-leaf* like surfaces
 - Developed and patented an affordable system to manufacture durable, large-scale superhydrophobic aluminum heat exchangers
 - Designed and built a *climate-controlled wind tunnel* to quantify the performance of *residential and automotive HVAC heat exchangers*
 - Characterized the *condensation and frost growth dynamics* between two aluminum heat exchanger fins
 - Conducted *systematic studies* to determine the *optimal process flow* required to create robust superhydrophobic surfaces from various grades of Aluminum
- **Improvement of commercial State of the Art braze joints** August 2016 – December 2018
 - Explored innovative solutions to *reduce refrigerant leak rates and material usage* in HVAC equipment
 - Collaborated with an industry partner and DOE to produce a highly scalable surface modification to *improve braze-joint strength*
- **Dynamic defrosting using biphilic surfaces and interfacial heating** August 2016 – August 2018
 - Optimized wettability gradients on a representative metal surface to *increase defrosting efficiency*
 - Experimentally demonstrated an ultra-efficient pulse defrosting system that promotes *instantaneous defrosting*
- **Enhanced condensation of water and low surface tension fluids** January 2017 – Present
 - Built and operated a *vacuum chamber* to evaluate the performance of next-gen coatings that promoted the *dropwise condensation of low surface tension fluids* such as ethanol, hexane, and xylene
 - Studied the *water harvesting* potential of various *structured and coated surfaces* under controlled ambient conditions
- **Engineering Intern at Lloyd’s Register, North America** Aurora, IL
Third-party quality assurance of boilers and pressure vessels May 2014 – August 2014 & June 2015 – July 2015
 - Inspected and certified the quality of components used in the construction of *boilers and pressure vessels*
 - Drafted a *business plan* to increase the number of work opportunities for the company in the North American Midwest
 - Prepared a course guide to train company personnel for the *ASME Authorized Inspector Exam*
- **Undergraduate Research – Oklahoma State University** Stillwater, IL
Advisor: Dr. Daniel Fisher
Senior design capstone project January 2014 – May 2014
 - Designed and built a *UAV launcher* for the senior capstone project
 - Utilized *SolidWorks* to design the system and analyze its *structural soundness*
- **Undergraduate research assistant** June 2013 - May 2014
 - Drafted an *applications guide* for plant loop systems in the *EnergyPlus* simulation program
 - Designed an *airflow measurement chamber* in an HVAC lab according to ASHRAE specifications

Mentorship and Volunteer Experience

- **Graduate student mentor – University of Illinois** January 2016 – Present
 - Mentored over 20 undergraduate and graduate students through graduate-level research and other academic and professional activities
- **POETS young scholars program – University of Illinois** June 2018 – August 2018
 - Guided two high school students through a graduate-level project
- **Graduate teaching assistant – University of Illinois** August 2015 – December 2015
 - Organized and conducted fundamentals of fluid dynamics labs for twenty-four students

Leadership Experience and Campus Involvement

- President of the American Society of Mechanical Engineers – OSU chapter August 2013 – May 2014
- Design for America – Solved the urban flooding issue in Urbana-Champaign, IL. August 2014 – May 2015
- Mercury robotics club – Interacted with a diverse group of students to design a robot August 2011 – May 2013
- Active student in the Oklahoma State University Honors College August 2011 – May 2014

Technical Skills

- **Software and programming:** Matlab, Solidworks, Labview, Fluent, Comsol, Engineering Equation Solver, MS Office, MS Visio, Pro-Engineer, MathCad, and Visual Basic for Applications
- **Lab Equipment:** Cleanroom, SEM, Photolithography, Micro-goniometer, Optical Microscopy, and Brazing

Journal and Conference Publications

Peer-Reviewed Journals

- [Boyina, K. S.](#), Mahvi, A. J., Chavan, S., Park, D., Kumar, K., Lira, M., ... & Miljkovic, N. (2019). Condensation frosting on meter-scale superhydrophobic and superhydrophilic heat exchangers. *International Journal of Heat and Mass Transfer*, 145, 118694
- Rabbi, K. F., [Boyina, K. S.](#), Su, W., Sett, S., Thamban, A., Shahane, S., ... & Miljkovic, N. (2021). Wettability-defined frosting dynamics between plane fins in quiescent air. *International Journal of Heat and Mass Transfer*, 164, 120563
- Mahvi, A. J., [Boyina, K. S.](#), Musser, A., Elbel, S., & Miljkovic, N. (2021). Superhydrophobic heat exchangers delay frosting and enhance efficiency of electrical vehicle heat pumps. *International Journal of Heat and Mass Transfer*, IN REVIEW
- Moon, H., [Boyina, K. S.](#), Miljkovic, N., & King, W. P. (2021). Additive manufacturing enabled internal flow heat transfer augmentation. *International Journal of Heat and Mass Transfer*, IN REVIEW
- Sett, S., Sokalski, P., [Boyina, K.](#), Li, L., Rabbi, K., Auby, H., ... & Miljkovic, N. (2019). Stable Dropwise Condensation of Ethanol and Hexane on Rationally-Designed Ultra-Scalable Nanostructured Lubricant-Infused Surfaces. *Nano Letters*
- Chavan, S., Foulkes, T., Gurumukhi, Y., [Boyina, K.](#), Rabbi, K. F., & Miljkovic, N. (2019). Pulse interfacial defrosting. *Applied Physics Letters*, 115(7), 071601
- Chavan, S., Park, D., Singla, N., Sokalski, P., [Boyina, K.](#), & Miljkovic, N. (2018). Effect of Latent Heat Released by Freezing Droplets during Frost Wave Propagation. *Langmuir*, 34(22), 6636-6644
- Gurumukhi, Y., Chavan, S., Sett, S., [Boyina, K.](#), Ramesh, S., Sokalski, P., ... & Miljkovic, N. (2020). Dynamic Defrosting on Superhydrophobic and Biphilic Surfaces. *Matter*, 3(4), 1178-1195

Notable International Conferences

- G. Popovic, S. Sett, [K. Boyina](#), K. F. Rabbi, S. Bosch, M. Linjawi, N. Miljkovic, "Micro-Nanoengineered Surfaces for Enhanced Water Harvesting", Proceedings of the ASME International Mechanical Engineering Congress & Exposition, IMECE2019, Salt Lake City, UT, November 8 – 14, 2019
- K. F. Rabbi, S. Sett, [K. Boyina](#), M. Wu, A. Nallathighall, N. Miljkovic, "Electrolytically Etched Durable Superhydrophobic Surfaces", To be presented at the ASME International Mechanical Engineering Congress & Exposition, IMECE2019, Salt Lake City, UT, November 8 – 14, 2019
- K. F. Rabbi, S. Sett, [K. Boyina](#), B. A. Jabal, N. Miljkovic, "On the Evaporation Rate of Liquids on Structured Surfaces", Proceedings of the ASME 2019 Summer Heat Transfer Conference, HT2019, Bellevue, WA, July 15-18, 2019
- [K. Boyina](#), A. Patel, H. Gunnam, S. Chen, Y. Yu, S. Bhutada, M. Rowe, R. Cosby, B. Westfall, N. Miljkovic, "Brazophilic and Brazophobic Surfaces", Proceedings of the Micro and Nanoscale Phase Change Heat Transfer Gordon Research Conference – The Effects of Hydrodynamic, Interfacial and Intermolecular Forces on Phase Change Processes, Lucca, Italy, February 3-8, 2019
- A. Mahvi, [K. Boyina](#), S. Chavan, K. Kumar, D. Park, Y. Yu, N. Miljkovic, "Condensation Frosting on Superhydrophobic Heat Exchangers", Proceedings of the Micro and Nanoscale Phase Change Heat Transfer Gordon Research Conference – The Effects of Hydrodynamic, Interfacial and Intermolecular Forces on Phase Change Processes, Lucca, Italy, February 3-8, 2019
- S. Sett, P. Sokalski, [K. Boyina](#), L. Li, A. Mahvi, N. Miljkovic, "Dropwise Condensation of Ethanol and Hexane on Lubricant-Infused Surfaces", Proceedings of the Micro and Nanoscale Phase Change Heat Transfer Gordon Research Conference – The Effects of Hydrodynamic, Interfacial and Intermolecular Forces on Phase Change Processes, Lucca, Italy, February 3-8, 2019
- S. Sett, [K. Boyina](#), K.F. Rabbi, L. Li, B.A. Jabal, J. Olson, N. Miljkovic, "Etched Metal Superhydrophobic Surfaces for Enhanced Condensation", Proceedings of the 2018 MRS Fall Meeting, Boston, MA, November 25-30, 2018
- S. Sett, P. Sokalski, L. Li, [K. Boyina](#), G. Barac, L.W. Bolton, N. Miljkovic, "Dropwise Condensation of Ethanol on Lubricant-Infused Surfaces", Proceedings of the 2018 ASME International Mechanical Engineering Congress & Exposition, IMECE2018, Pittsburgh, PA, November 9-15, 2018
- S. Chavan, K. F. Rabbi, T. Foulkes, [K. Boyina](#), K. Fortelka, R. Pilawa, N. Miljkovic, "Interfacial Defrosting", Proceedings of the 2018 ASME International Mechanical Engineering Congress & Exposition, IMECE2018, Pittsburgh, PA, November 9-15, 2018
- S. Chavan, [K. Boyina](#), K. Fortelka, M. Lira, D. Park, P. Sokalski, N. Miljkovic, "Dynamic Defrosting on Superhydrophobic and Bi-Philic Surfaces", Proceedings of the 2018 ASME International Mechanical Engineering Congress & Exposition, IMECE2018, Pittsburgh, PA, November 9-15, 2018
- [K. S. Boyina](#), N. V. Upot, J. Mayer, S. Chavan, K. F. Rabbi, T. Foulkes, X. Wang, N. Miljkovic, "Anti-Icing Meter Scale Superhydrophobic Heat Exchangers", Proceedings of the 6th Micro and Nano Flows Conference, MNF2018, Atlanta, GA, September 9-12, 2018
- [K. Boyina](#), K. F. Rabbi, W. Su, A. Thamban, N. Miljkovic, X. Wang, "Dynamics of Frost Growth on Vertical Superhydrophobic Surfaces", Proceedings of the 17th International Refrigeration and Air Conditioning Conference at Purdue, West Lafayette, IN, July 9-12, 2018
- [K. S. Boyina](#), S. Chavan, K. Kumar, D. Park, Y. Yu, J. Carpenter, N. Miljkovic, Condensation Frosting on Meter Scale Superhydrophobic Heat Exchangers, Proceedings of the ASME Summer Heat Transfer Conference, HT2017, Bellevue, WA, July 9-14, 2017
- [K.S. Boyina](#), S. Chavan, K. Kumar, D. Park, Y. Yu, J. Carpenter, N. Miljkovic, Fundamental Studies of Condensation Frosting on Meter Scale Superhydrophobic Heat Exchangers, Proceedings of the Micro and Nanoscale Phase Change Heat Transfer, Gordon Research Conference - The Role of Surface Structures, Galveston, TX, January 8-13, 2017

Patents

- Miljkovic, N., [Boyina, K.](#), Chavan S., Method for Delaying Frost Growth on Heat Exchangers, USPTO (62662354), 2018

Certifications

- Certified LabVIEW Associate Developer (CLAD)
- Engineer-In-Training in the state of Illinois (passed the Fundamentals of Engineering exam

August 2015 - Present