

Daniel Lorenzini

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PhD student with experience in applied research, product thermal/structural design, simulation and validation. Broad knowledge in the analysis and design of cooling solutions (single phase and phase-change), with a focus on microfluidic systems for thermal management of power electronics. Team spirited with effective communication and presentation skills.

Education

- Ph.D. in Mechanical Engineering, Georgia Institute of Technology, Atlanta, Georgia, USA.** Aug 2014–
- Advisor: Dr. Yogendra K. Joshi
 - Currently working on the project “3D stackable evaporative cooling of microelectronics”, funded by DARPA IceCool program.
 - Cumulative GPA: 4.0/4.0.
- M.S. in Mechanical Engineering, University of Guanajuato, Salamanca, Mexico.** May 2012–Apr 2014
- Summa cum laude honors
 - Advisors: Dr. Satish G. Kandlikar (Rochester Institute of Technology) and Dr. Abel Hernandez-Guerrero.
 - “Variable density flow channels for effective cooling and mitigation of temperature non-uniformity in three-dimensional integrated circuits”.
 - Cumulative GPA: 9.75/10.
- B.S. in Mechanical Engineering, University of Guanajuato, Salamanca, Mexico.** Jul 2007–Sep 2011
- Summa cum laude honors.
 - Advisor: Dr. Abel Hernandez-Guerrero.
 - Thesis: “Performance analysis of a proton exchange membrane fuel cell using tree-shaped designs for flow distribution”.
 - Cumulative GPA: 9.48/10.

Research experience

- Graduate research assistant, Georgia Institute of Technology.** Aug 2014 – Present
- Research advisor: Dr. Yogendra Joshi.
 - Development of a 3D phase-change volume-of-fluid model for two-phase cooling of a 3D-stacked FPGA architecture, as a part of the DARPA IceCool Fundamentals program. Model refinement with in-house experimental data.
- Graduate research assistant, University of Guanajuato.** Oct 2013 – Jul 2014
- CFD and experimental investigation of liquid-cooled heat sinks for the thermal management of power electronics (CPUs, GPUs). Product design, optimization and validation completed for the startup company Cooling Tree Systems.
- Graduate research intern, Thermal Analysis, Microfluidics and Fuel Cell Laboratory, Rochester Institute of Technology.** Mar 2013 – Sep 2013
- Research advisor: Dr. Satish G. Kandlikar.
 - Work developed: M. S. Thesis project “Modeling of local water behavior in the gas channel of a PEM fuel cell”. CFD and experimental analysis of two-phase flow in microchannels.
 - Design of variable fin density channels for the effective cooling of 3D ICs.
- Undergraduate research intern, UTD Research Program organized by the University of Texas at Dallas.** Jun 2010 – July 2010
- Research advisor: Dr. Fatemeh Hassanipour.
- Jun 2015

- Work developed: CFD analysis of phase change materials for heat transfer enhancement.

Skills

- Creative thinker and capable to devise solutions to fluid/thermal/structural design problems.
- Deep technical knowledge on fluid dynamics, conduction, and convection heat transfer.
- Numerical modeling using Computational Fluid Dynamics (CFD) and Finite Element Analysis (FEA).
- Experience in the design and fabrication of several types of heat sinks (air-cooled, liquid-cooled).
- Experience in experimental analysis of heat transfer and fluid dynamics.
- Reduced order modeling approaches for fast-solution methods.
- CAD/CAM tools for design and manufacturing.

Software qualifications

- Computational fluid dynamics software (CFD), ANSYS FLUENT and CFX. (5+ years experience)
- Parallel computing using MPI.
- CFD post-processing software CFD-POST.
- Finite element analysis (FEA) software, COMSOL.
- Meshing software, GAMBIT, ICEM, ANSYS Meshing.
- Technical drawing software, AUTOCAD.
- Modeling software, AUTODESK INVENTOR and SOLIDWORKS.
- Programming software, MATLAB.
- Computer machining software, MASTERCAM.
- C and C++ language programming software.
- Statistical software, MINITAB.
- Handling of LabVIEW and data acquisition.

Journal papers

7. **Daniel Lorenzini**, Yogendra Joshi, "Modeling of flow boiling with coupled conduction in silicon microchannels with non-uniform heat flux", Submitted to ASME Journal of Heat Transfer, under review.
6. **Daniel Lorenzini**, Yogendra Joshi, "Effect of surface wettability on flow boiling in a microchannel", Invited/submitted to Computational Thermal Sciences, Begell House.
5. Carlos A. Rubio-Jimenez, Abel Hernandez-Guerrero, Jaime Cervantes de Gortari, **Daniel Lorenzini-Gutierrez** "CFD study of nature-inspired microchannel networks for high power electronics", Submitted to Applied Thermal Engineering, under review.
4. **Daniel Lorenzini-Gutierrez**, Satish Kandlikar, Abel Hernandez-Guerrero, Francisco Elizalde-Blancas, (2015), "Residence time of water film and slug flow features in fuel cell gas channels and their effect on instantaneous area coverage ratio", Journal of Power Sources, 279, pp. 567-580.
3. **Daniel Lorenzini-Gutierrez**, Abel Hernandez-Guerrero, J. Luis Luviano-Ortiz, and J. Carmen Leon-Conejo, (2015) "Numerical and experimental analysis of heat transfer enhancement in a grooved channel with curved flow deflectors", Applied Thermal Engineering, 75, pp. 800-808.
2. **Daniel Lorenzini-Gutierrez**, Satish Kandlikar, (2014), "Variable fin density flow channels for effective cooling and mitigation of temperature non-uniformity in 3D ICs", Journal of Electronic Packaging, 136 (Special Issue), pp. 021007-1.
1. **Daniel Lorenzini-Gutierrez**, Abel Hernandez-Guerrero, Bladimir Ramos-Alvarado, Isaac Perez-Raya, Alejandro Alatorre-Ordaz, (2013), "Performance analysis of a proton exchange membrane fuel cell using tree-shaped designs for flow distribution", International Journal of Hydrogen Energy, 38; 14750-14763.

Conference papers

5. **Daniel Lorenzini** and Yogendra K. Joshi, 2015, "CFD analysis of flow boiling in a silicon microchannel with non-uniform heat flux", Proceedings of the ASME 2015 13th International Conference on Nanochannels, Microchannels, and Minichannels, InterPACK & ICNMM, July 6-9, San Francisco, California, USA.
4. **Daniel Lorenzini** and Yogendra K. Joshi, 2015, "Effect of Surface Wettability on Flow Boiling in a Microchannel", Proceedings of CHT-2015 International Symposium on Advances in Computational Heat Transfer, May 25-29, Piscataway, USA.
3. Carlos Gonzalez-Valle, **Daniel Lorenzini-Gutierrez**, Abel Hernandez-Guerrero. "CFD Analysis of constructal liquid-cooled heat sinks for high-power electronics". Proceedings of the 28th International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems. Pau, France. June 30- July 3, 2015.
2. Isaac Perez-Raya, Abel Hernandez-Guerrero, Francisco Elizalde-Blancas, Bladimir Ramos-Alvarado, **Daniel Lorenzini-Gutierrez**. "Combined flow fields (serpentine-interdigitated) for improvement of a PEMFC performance". Proceedings of the 11th Biennial Conference on Engineering Systems Design and Analysis. Nantes, France. July 2-4, 2012.
1. **Daniel Lorenzini-Gutierrez**, Abel Hernandez-Guerrero, Bladimir Ramos-Alvarado, Cuauhtemoc Rubio-Arana. "Numerical analysis of a PEM fuel cell performance using a tree-shaped vascular design for flow distribution". Proceedings of the 24th International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems. Novi Sad, Serbia. July 4-7, 2011.

Professional service

- Technical reviewer for the ASME Journal of Fuel Cell Science and Technology.
- Technical reviewer for the international conferences ICHMT 2015 (New Jersey, USA) and ECOS 2015 (Pau, France).
- Member of the Mexican entrepreneurial council under the project "Hablan los emprendedores (The entrepreneurs speak)", identifying the principal challenges for entrepreneurship and technological innovation in Mexico. Proposed and devised new solutions for government support and economy acceleration, which have been adopted by the latest government programs in Mexico.

Honors and Awards

- Recipient of the "Outstanding Poster Award" during the 2015 ASME International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Systems (InterPACK) with the Poster/Technical Paper "CFD Analysis of Flow Boiling in a Silicon Microchannel with Non-Uniform Heat Flux". Jul 6-9, San Francisco, CA.
- "Santander Award to Entrepreneurship and Innovation", granted by Bank Santander to young entrepreneurs founders of startup companies in Mexico with the project Cooling Tree Systems, which is currently a startup in the business of liquid cooling kits for high performance PCs. July 2014.
- "Academic Merit Award", granted by the University of Guanajuato to the student with highest GPA in the M.S. program in Mechanical Engineering during the period 2012-2013.
- 1st place in the nationwide contest "3rd Day of the Entrepreneur" with the business/applied technology project "Cooling Tree Systems" (electronics cooling). Event organized by FESE (University-Enterprise Foundation, Mexico), May 2013.
- 1st place in the statewide contest "6th Fair of Technological Innovation" with the business/applied technology project "Cooling Tree Systems" (electronics cooling), event organized by CONCYTEG (State Council of Science and Technology of Guanajuato), 2013.

- Recognized as one of the best B.S. graduates in Mexico in Mechanical Engineering by the National Association of Schools and Colleges of Engineering (ANFEI), May 2012.
- 1st place in the nationwide contest "Scientific Poster Contest", event organized by the University of Guanajuato and the Mexican Society of Mechanical Engineers (SOMIM), 2012.
- Recognized as the student with the highest GPA of the generation 2007-2011 in the Mechanical Engineering program of the University of Guanajuato.