

# Kaustav Aras Gopinathan

Kaustav\_Gopinathan@hms.harvard.edu

## EDUCATION

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**Harvard Medical School** **Boston, MA**

*Harvard/MIT MD-PhD Candidate, Expected graduation 2025*

Harvard-MIT Division of Health Sciences and Technology (HST)  
Medical Scientist Training Program Fellow

**Harvard Graduate School of Arts and Sciences** **Cambridge, MA**

*Doctorate of Philosophy, June 2023*

Harvard Biophysics Graduate Program  
Thesis Advisor: Prof. Mehmet Toner, PhD

**Massachusetts Institute of Technology** **Cambridge, MA**

*Bachelor of Science, June 2016*

S.B., Electrical Engineering and Electrical Sciences, minor in Biomedical Engineering, GPA: 5.0

## HONORS AND AWARDS

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- **MIT Sandbox Innovation Fund, 2017-2018.**
- **Medical Scientist Training Program (MSTP), 2016.**
- **Barry Goldwater Scholar, 2015.**
- **MIT EECS – Outstanding Research Project Award, 2015.**
- **Texas Instruments Research and Innovation Scholar, 2014.**

## RESEARCH EXPERIENCE

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**Massachusetts General Hospital, Cancer Center & Center for Engineering in Medicine** **Charlestown, MA**

*Graduate Student*

*October 2018 – June 2023*

- Graduate student in the laboratory of Prof. Mehmet Toner, developing microfluidic tools for automatic cellular processing and molecular assays.
- Thesis work on designing and developing a novel microfluidic component, the microfluidic transistor, which mimics the behavior of the electronic transistor but processes fluids instead of electricity, thereby enabling the creation of entirely fluidic computers for processing individual cells, drugs, and droplets at speed and scale.
- Developed and tested a high-throughput microfluidic sorting system to isolate and study circulating tumors cells from large-volume leukapheresis products of cancer patients.
- Optimized cryopreservation techniques for zebrafish hearts as a model for whole organ preservation.

**Harvard Medical School and Massachusetts Institute of Technology** **Boston, MA**

*Medical Student*

*May 2017 – June 2018*

- Designed a mechanical heart valve to passively detect and monitor the growth of clot over its leaflet over time, allowing for titration of anticoagulation therapy. Prototype was tested on human blood and patented.
- Accepted into 2017 batch of the MIT Sandbox Innovation fund and the NSF Innovation-Corps program.

**Massachusetts Institute of Technology, Research Laboratory of Electronics (RLE)** **Cambridge, MA**

*Research Assistant – Independent Research*

*June 2013 – July 2016*

- Conducted independent research with Prof. Collin Stultz and Prof. George Verghese, developing a handheld medical device to run complete blood counts on small samples or continuously on IV lines using the technique of dielectric spectroscopy.
- Received the 2015 Barry Goldwater Scholarship and MIT 2015 Outstanding Research Project Award for this work.

*Research Assistant*

*October 2012 – May 2013*

- Research assistant with Prof. Thomas Heldt, leveraging ICU signals to better predict neonatal disease in hospitals.
- Developed signal processing models and algorithms to detect and characterize neonatal apneic episodes using autonomic tone and the morphology of antecedent ECG and SpO<sub>2</sub> signals.

- Research assistant in the laboratory of Prof. Anantha Chandrakasan, working on low-cost biomedical electronics.
- Designed the signal processing filters for a low-power ambulatory ECG monitoring system, detecting morphological abnormalities and arrhythmias using a light-weight feature-detection algorithm.

## TEACHING EXPERIENCE

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### Harvard Medical School

Boston, MA

Graduate Teaching Assistant

Spring 2022 Semester

- Teaching assistant for Respiratory Pathophysiology (HST100), a medical school class taught by Prof. Corey Hardin, Prof. Kathryn Hibbert, and Prof. Ellen Roche for 30 students.
- Responsible for teaching office hours and recitations, holding review sessions, and grading problem sets and exams.

### Massachusetts Institute of Technology

Cambridge, MA

Undergraduate Teaching Assistant

Spring 2015 and Spring 2016 Semesters

- Teaching assistant for two semesters for Quantitative Systems Physiology (6.022/6.522), a graduate and undergraduate-level physiology class taught by Prof. Roger Mark and Prof. Thomas Heldt for 30 students.
- Responsible for teaching office hours and recitations, holding review sessions before exams, preparing surgical labs for the class, and grading problem sets and exams.

## MENTORSHIP AND SERVICE

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- **Research Supervisor, MGH/ATP-Bio Summer Academy, 2022-2023**
- **Harvard Biophysics Graduate Program Admissions, 2022-2023**
- **Clinical Advisor, The Global Alliance for Medical Innovation (GAMI), 2020**
- **Student Representative, EECS Visiting Committee for the MIT Corporation, 2015**
- **Reviewer, MIT Undergraduate Research Journal, 2015**
- **Student Clinician, The Family Van Mobile Health Clinic, 2014**

Research Supervisor/Mentor to Gabrielle Saint-Girons (EPFL Master's student, 2023), Carlie Rein (Research tech, 2023), Jack Austen (2021-2022), and Elio Thadani (2021-2022).

## PUBLICATIONS, POSTERS, AND PATENTS

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- **Gopinathan, K.A.**, Mishra, A., Mutlu, B.R., Edd, J.F. and Toner, M., 2023. A microfluidic transistor for automatic control of liquids. *Nature*, 622(7984), pp.735-741. [doi:10.1038/s41586-023-06517-3](https://doi.org/10.1038/s41586-023-06517-3).
- Da Silveira Cavalcante, L., Lopera Higueta, M., González-Rosa, J.M., Marques, B., To, S., Pendexter, C.A., Cronin, S.E., **Gopinathan, K.A.**, de Vries, R.J., Ellett, F. and Uygun, K., 2023. Zebrafish as a high throughput model for organ preservation and transplantation research. *The FASEB Journal*, 37(10), p.e23187
- **Gopinathan, K.A.**, Toner, M. "Fluidic transistors and uses thereof," PCT International Patent No. PCT/US2022/071859 filed 04/22/2022. Available at [WIPO Patentscope](https://patentscope.wipo.int).
- **Gopinathan, K.A.**, Mishra, A., Mutlu, B.R., Edd, J.F. and Toner, M., 2023. A microfluidic transistor for liquid signal processing. Oral talk at MD-PhD Program Retreat (2023) and poster at Biophysics retreat (2022).
- **Gopinathan, K.A.**, Maury, E.A., and Neel, D.V. "Resonance-Based Physiological Monitoring," PCT International Patent No. PCT/US2018/021203 filed 03/06/2018. Available at [WIPO Patentscope](https://patentscope.wipo.int).
- **Gopinathan, K.A.**, Verghese, G.C. and Stultz, C.M. "Estimating Hematocrit and RBC Count from the Impedance of Blood," (2015) Poster presented MIT Department of Electrical Engineering SuperUROP session.
- **Gopinathan, K.A.**, "The Effects of Vitamins D, E, and Zinc on Lung Development," (2013) Seminar at Indira Gandhi Institute of Child Health, Bangalore.