

FY23 Dean's Basic Science Grant Report

Harvard Medical School (HMS) is taking the lead in exploring how artificial intelligence (AI) technologies can enhance health care. In particular, the Department of Biomedical Informatics and the Center for Computational Biomedicine are developing the methods, tools, and infrastructure required for a new generation of biomedical investigators and care providers to improve access to high-quality care and treatments for everyone.

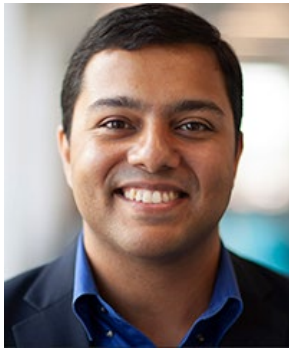
The School aims to incorporate generative AI—AI systems capable of creating text, images, video, audio, code, and other media in response to queries—into all of its activities, including the training of the next generation of doctors through its MD curriculum. Dean George Q. Daley has said that to remain at the cutting edge of medical education, we must envision the physician of the future, who will practice in an environment rich with cognitive support resources powered by artificial intelligence tools. He believes that HMS needs to respond proactively and systemically to the advent of advanced AI—especially generative AI.

HMS is making comprehensive and thoughtful adjustments to its curricular offerings in medical education, graduate education, and external education to equip its students and learners with the ability to use AI models wisely and ethically. These adjustments will place a high premium on curating and verifying AI-generated knowledge. That is, students will become proficient in employing AI algorithms to optimize their ability to enhance diagnosis and treatment strategies—while maintaining vigilance to curate and corroborate the information. In the area of scientific research, HMS has already begun injecting computational proficiencies throughout its campus—an important prerequisite to the widespread adoption of AI. Within the Department of Biomedical Informatics (DBMI), department leaders have developed a PhD track for AI in Medicine as part of the Biomedical Informatics PhD program. In addition, DBMI Chair Isaac Kohane was recently appointed editor-in-chief of the new journal *NEJM AI*, bolstering HMS's position as a prominent leader in the AI space. Also, a team led by HMS assistant professor of biomedical informatics Marinka Zitnik published a fascinating paper last year in *Nature* titled “Scientific Discovery in the Age of Artificial Intelligence,” describing how natural intelligence algorithms can sift through mountains of scientific literature and analyze diverse data modalities—including images and sequences—in a way that humans can't, connecting and synthesizing ideas to yield novel discoveries.

HMS recognizes that change often begins with the younger generation. To truly lead in this evolving AI landscape and to bring to the surface the best ideas in its intellectual communities, the School strives to make critical investments in its junior faculty members who demonstrate enormous promise, similar to the investment the Foundation makes with its Junior Faculty and Mid-Career Grants. Start-up packages provide faculty members with discretionary funds that they can direct toward their research, graduate students, data and technology, as well as space and equipment needs. Importantly, these packages enable junior faculty members to focus on fostering their research rather than grant-writing, and advancing the research they believe will have the most impact. This support propels extraordinary up-and-coming scientists and provides them with the flexible resources necessary to make more immediate discoveries.

The three DBMI-based researchers listed below—two of them junior faculty members whose work focuses on AI, and the other a professor whose lab focuses on computational genomics—required lab setup and/or salary support in FY23, which the Armenise-Harvard Dean’s Basic Science Grant helped to provide.

Faculty Supported by Dean’s Basic Science Grant in FY 2023



Arjun (Raj) Manrai, PhD

Assistant Professor of Biomedical Informatics, Harvard Medical School
Deputy Editor, New England Journal of Medicine (NEJM) AI

[Arjun \(Raj\) Manrai, PhD](#), is an assistant professor in the Department of Biomedical Informatics at Harvard Medical School, where he leads a research lab that works broadly on applying machine learning and statistical modeling to improve medical decision-making. Dr. Manrai is also a founding deputy editor of [NEJM AI](#), the new artificial intelligence-focused journal from the publishers of the *New England Journal of Medicine*, and co-host of the [NEJM AI Grand Rounds podcast](#).

Focus areas for Dr. Manrai’s research group include the role of artificial intelligence in medical diagnosis, the clinical use of genomic data and blood laboratory biomarkers, inherited heart disease and kidney disease, decision-making across populations, and reproducibility and safety challenges for medical artificial intelligence. His work has been published in the [New England Journal of Medicine](#) and [JAMA](#), presented at the National Academy of Sciences, and featured in *The New York Times*, *The Wall Street Journal*, and *NPR*.

Dr. Manrai earned an AB in physics from Harvard College, followed by a PhD in bioinformatics and integrative genomics from the Harvard-MIT Division of Health Sciences and Technology (HST).



Pranav Rajpurkar, PhD

Assistant Professor of Biomedical Informatics

[Pranav Rajpurkar, PhD](#), is driven by a fundamental passion for building reliable artificial intelligence (AI) technologies for biomedical decision-making. His lab approaches biomedical problems with a computational lens, developing AI algorithms, datasets, and interfaces that cut across computer vision, natural language processing, and structured health data. He has collaborated with clinicians across medical specialties, including radiology, cardiology, and pathology, to make some of the first demonstrations of expert-level deep learning algorithms and their effects on clinician decision-making. Dr.

Rajpurkar received his BS, MS, and PhD degrees, all in computer science, from Stanford University.

The Rajpurkar Lab's current research directions include algorithm development for limited labeled data settings, high-quality dataset curation at scale, and the design of effective clinician-AI collaboration setups.



Shamil Sunyaev, PhD

Professor of Biomedical Informatics, Harvard Medical School
Professor of Medicine, Brigham and Women's Hospital

[Shamil Sunyaev, PhD](#), is a computational genomicist and geneticist. Research in his lab encompasses many aspects of population genetic variation, including the origin of mutations, the effect of allelic variants on molecular function, population and evolutionary genetics, and genetics of human complex and Mendelian traits. He developed several computational and statistical methods widely adopted by the community. He is an associate member of the Broad Institute of MIT and Harvard. He co-leads the National Human Genome Research Institute (NHGRI)-funded Genome Sequencing Program Analysis Center and is actively involved in the Undiagnosed Diseases Network (UDN) and the Brigham Genomic Medicine program. He also co-organizes the Boston Evolutionary Genomics Group.

Dr. Sunyaev obtained a PhD in molecular biophysics from the Moscow Institute of Physics and Technology and completed his postdoctoral training in bioinformatics at the European Molecular Biology Laboratory (EMBL).