TENURE AND PROMOTION
RESEARCH STATEMENT
Ananda Mohan Mondal, Ph.D.

Dr. Mondal's research themes, success metrics, and future directions are summarized below.

1. Research Themes

Over the last six years, Dr. Mondal's work has been centered on raising the profile of health informatics research and Florida International University (FIU) through the body of his work at the intersection of computational biology and artificial intelligence, with particular interest in algorithmic cancer biology, explainable AI (XAI), and precision medicine. Cancer is a complex, multifactorial disease. Advances in computational biology and AI have pushed the frontiers of our understanding in this field at a tremendous pace. Dr. Mondal is currently focused on studying the discovery of cancer biomarkers and estimation of intratumor heterogeneity (ITH) with the long-term goal of addressing basic questions in cancer precision medicine: how does a tumor evolve? How can we study drug response? How can we address drug resistance? His research themes can be divided into two dimensions: ***Methodology Development*** based on graph theory, feature selection, XAI, and cooperative game theory; ***Applications to Precision Medicine***, including disease biomarker discovery, estimation of the level of ITH contributing toward tumor evolution, drug response, and drug resistance.

2. Research Success

External Research Funding: Dr. Mondal's research themes have successfully secured one Florida Department of Health (FDOH) grant and five federal grants (three NIH and two NSF), including the prestigious NSF CAREER RUI (Research in Undergraduate Institute) award. Table 1 shows his external research awards, including the project period, total fund amount, and his role and share.

Table 1. Dr. Mondal's External Funded Research Projects at FIU

Project (Duration)	Role	Funding Agency (Award #)	Funding		Mondal's Share at FIU	
			Total Funding	Total Funding to FIU	%	$
Lung Cancer Health Disparity (03/2024 – 02/2026)	PI	NIH (R21CA290324)	$370,600	$370,600	90%	$333,540
Next-Generation Cancer Research (04/2023 – 03/2026)	PI	FDOH (23B16)	$59,521	$59,521	70%	$41,665
Smartphone Diabetic Foot Ulcers (08/2022 – 05/2026)	Co-PI	NIH (R01EB033413)	$2,120,000	$2,120,000	25%	$530,000
Pilot: Deep Learning Health Disparity (07/2021 – 06/2022)	PI (Sole)	NIH (U54MD012393)	$73,250	$73,250	100%	$73,250
RAPID: Bioinformatics SARS-CoV-2 (07/2020 – 06/2022)	Co-PI	NSF (CNS 2037374)	$238,798	$238,798	10%	$23,880
NSF CAREER RUI (06/2017 – 05/2024)	PI (Sole)	NSF (IIS 1651917/1901628)	$550,000	$505,494 ($44,506 at Claflin)	100%	$505,494
		Total	**3,412,169**	**$3,367,663**		**$1,507,829**

Dr. Mondal's research has been recognized with four PI grants (including one FDOH, two NIH, and one NSF) and two Co-PI grants (one NIH and one NSF). These grants have brought in a substantial ~$3.37M in funding to FIU and underscore the importance and potential of his work. Of this funding, ~$1.01M was awarded to Dr. Mondal as the PI, with ~$580K as the sole PI. His total share at FIU is ~$1.51M, a testament to the value of his research.

Publications, Presentations, and Venues: The funding has resulted in 6 peer-reviewed journal publications, 19 peer-reviewed proceedings papers, 5 abstracts, 5 invited talks, 22 conference and workshop presentations, and 9 poster presentations in the discipline. Dr. Mondal's work has been published in good quality journals, including *BMC Bioinformatics*, *MDPI Data*, *MDPI International*

Journa1 of Molecular Sciences, and *MDPI Viruses*, and high-quality conference proceedings, including *ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (ACM BCB)*, *International Conference on Bioinformatics & Computational Biology (BIOCOMP)*, *International Conference on Computational Science and Computational Intelligence (CSCI)*, *IEEE International Conference on Bioinformatics and Bioengineering (IEEE BIBE)*, *IEEE International Conference on Bioinformatics and Biomedicine (IEEE BIBM)*, *International Conference on Image Processing, Computer Vision, & Pattern Recognition (IPCV)*, and *International Conference on Pattern Recognition and Machine Intelligence (PReMI)*.

Students' Support: The NSF CAREER RUI award on graph theory-based analysis of cancer progression at the protein network level has supported 13 K-12, 5 undergraduate, 2 master's, 4 Ph.D. students (2 graduated and 2 current) and produced 17 publications. The NSF RAPID award for developing bioinformatics tools to identify biomarkers for molecular mimicry in the SARS-CoV-2 Virus partially supported one of the graduated Ph.D. students and produced 2 publications. The NIH Pilot project on developing a deep learning-based approach to discover the health disparities in lung cancer between African American and European American males supported a Ph.D. student for one year and produced 2 publications. In the NIH R01 award, Dr. Mondal proposed to develop machine learning-based approaches to extract features from the images of diabetic foot ulcers in predicting different types of ulcers. This grant supported one of the current Ph.D. students and has resulted in 4 publications. The recently awarded NIH R21 supports 2 current Ph.D. students to explore and discover race- and sex-specific health disparity in lung cancer incidence and mortality leveraging explainable AI-based multi-omics analysis. Using the Florida Department of Health award, a new Ph.D. student will be recruited to develop a next-generation biomedical big-data platform for cancer research and collaboration across Florida.

Collaboration: I have developed a successful research collaboration with internal and external researchers. The internal collaboration with Dr. Giri Narsimhan from my home department resulted in an NSF RAPID award as a Co-PI. Another internal collaboration with Dr. Anuradha Godavarty from Biomedical Engineering secured an NIH R01 as a Co-I. Finally, internal collaboration with Dr. Charles Dimitroff, an expert in cancer biology from the College of Medicine at FIU and Dr. Mary Jo Trepka, an expert in health disparity from public health at FIU helped me secure an NIH pilot grant and an R21 grant as PI. In my R21 grant, there is also an external collaborator, Dr. Gregory Holt, a lung cancer specialist from VA Medical Center in Miami. I also successfully collaborated with Prof. Stephan C. Schürer from the Miller School of Medicine, University of Miami, in securing a Florida Department of Health grant as FIU PI.

3. Future Research Plan

My immediate plan is to expand the horizon of my algorithmic cancer biology research to study the impacts of climate change on the cancer control continuum. Toward this direction, I started collaborating with Dr. Byomkesh Talukder, a climate expert from the Global Health Department at FIU. My long-term goal is to develop an AI Institute for Cancer Research in collaboration with a cancer biology expert (Dr. Charles Dimitroff) from the College of Medicine, a health disparity expert (Dr. Mary Jo Trepka) from the College of Public Health, a biostatistics expert (Dr. Xuexia Wang), and a climate expert (Dr. Byomkesh Talukder) at FIU along with the external collaborator, a lung cancer clinical research scientist (Dr. Gregory Holt) from Miami VA Medical Center. To achieve this goal, I need to secure an NIH U-type award. In this direction, first, I need to successfully secure an R01 award as a PI and have some experience in U-type awards. I am working on writing a few R01 grant proposals as PIs and MPIs. I am also involved in an NIH UG3/UH3 grant proposal titled "FIU Diversity Center for Genomic Research (FIU-DCGR)" as a Co-I of "Genomic Workforce Development Core" and a Co-Lead (equivalent to MPI R01) of methodology development project titled "Disease risk prediction and prognosis using multi-omics data for minority populations." The FIU DCGR proposal has received a very competitive score and has the potential to get funded.