

Seminar

Investigating biomolecular recognition through an interdisciplinary lens: Lessons from proteins of the immune system

Mahita J

LJI, California

A central theme of my research is biomolecular recognition, a vital component of every biological process. I am interested in how we can apply fundamental concepts in chemistry, aided by computational and statistical tools, to understand biomolecular recognition, specifically protein-protein interactions, and the factors driving their specificity. My doctoral research done at NCBS focused on using molecular dynamics simulations to investigate the structure and dynamics of Toll-like receptor (TLR) proteins, an important component of immune signalling. During my postdoctoral research, I moved on to study reprobodies, protein-based scaffolds comprised of leucine-rich repeats, that specifically bind to different regions (epitopes) on the interleukin-6 (IL-6) protein. We developed a computational method, Epibin, to group these reprobodies into bins based on their epitopes. Our work on this led us to form a hypothesis about the residues driving their specificity, which was confirmed using in vitro experiments. This study was extended to antigen-antibody interactions, which are a type of protein-protein interactions. Antibodies serve as a valuable model system for investigating binding specificity due to their high variability and diverse specificities. As part of the team behind the Immune Epitope Database (IEDB), I attempted to investigate the contributions of various sequence-based and 3D structure-based features in correctly predicting which antibodies are likely to bind to the same epitope. Using different combinations of these features, we tested the performance of machine learning classifiers on different datasets of antigen-antibody complexes to accurately predict pairs of antibodies targeting the same epitope. In addition to the IEDB, I have also been involved with the Coronavirus Immunotherapeutic Consortium, a global consortium, to systematically analyze anti-SARS-CoV-2 antibodies for identifying relationships between different types of functional properties and to understand which antibody features best correlate with, and in turn, predict their protection. In this presentation, I will discuss about the projects I have worked on and what we can learn from these findings. Apart from my research, I will also discuss about my experiences as a person with profound hearing loss and explain the crucial importance of early identification of hearing loss and its role in developing spoken language skills.

Monday, Jan 16th 2023

4:00 PM (Tea/Coffee at 3:45 PM)

Auditorium, TIFR-H