Topic 4: Advances in Immunological Computation.

The biological immune system is a robust, complex, adaptive system that defends the body from foreign pathogens. It is able to categorize all cells (or molecules) within the body as self or non-self substances. It does this with the help of a distributed task force (immune cells) that has the intelligence to take action from a local and also a global perspective using its network of chemical messengers for communication. Immunological Computation (or Artificial Immune Systems) works are spanning from theoretical modeling and simulation to wide variety of applications. Some of the studies are of synthetic approaches to understand and simulate the biological immune system, and others that develop computational methodologies inspired by the immune system to solve real-world problems.

In this talk, I will discuss different Immunological Computation (IC) models including immune network model, negative selection algorithm (NSA), clonal selection, and danger theory, etc. Also summarize progresses made in IC to solve problems in different domain. I will then highlight variations of NSA, provide comparative analysis, their scope and limitations in different application domains. Studies show that NSA performs better for nonlinear representation than most of the other computation methods, and it can outperform neural-based models in computation time. I will summarize NSAs development over the years and highlight challenges in solving real-world problems.

References:

- *Negative Selection Algorithm Research and Applications in the last decade: A Review.* K Dattagupta and D. Dasgupta. In.IEEE transaction of Artificial Intelligence, September 2021.
- *Immunological Computation: Theory and Applications*. Dipankar Dasgupta and Fernando Nino, (authors), CRC press, September 2008.