

Tutorial Title: Computational Biology – Applications in Omic Sciences

Duration: Half Day (4 Hours)

Tutorial Outline: Omic Science is a field to study and understand the nitty-gritty of life. It is highly interdisciplinary and uses techniques of Biology, Physics, Chemistry, Statistics, and Applied Mathematics to understand biology problems. To understand these complex problems, various experiments are performed that generate large complex data. These data can only be analyzed and interpreted using High Performance Computing and Computational Biology techniques. Main focus of Computational Biology lies on developing mathematical modeling and computational techniques for biology problems to understand genomics, their functions, and how they relate to the dynamics of life through transcriptomics and proteomics. These are simulated in a dry-laboratory (computers) without using any chemical. Computational Biology covers domains like Bioinformatics, Sequence Assembly, Sequence Analysis, Computational Molecular Biology, Computational Transcriptomics, Computational Proteomics, Structural Biology, Systems Biology, Pathway Analysis, Drug Discovery etcetera.

In recent years many path-breaking research in molecular biology and molecular medicine initiatives like the human genome project gave rise to an exponential increase in the volume and diversification of data, including protein and gene data, nucleotide sequence data, and biomedical literature. Research projects in genetics labs around the world such as genome sequencing or transcriptome studies produce an ever-increasing amount of data; therefore, the area of computational biology now poses some of the biggest challenges in computer science and data mining such as data storage, visualization, modelling, and discovering new meaning out of this data.

This tutorial titled “**Computational Biology – Applications in Omic Sciences**” will start with basics of biology followed by the lifecycle of molecular biology. It will discuss the interactions between sub-areas of Biology through the introduction of various components of Omic Science and their relationship. It will discuss where does computational techniques fit in the studies of omic science. It will discuss various molecular biology experiments and Computational Biology applications and tools used in this study. Computational Biology requires supercomputers/HPC (High Performance Computing) facility; and, large supercomputers may not be available to all research labs – therefore, this tutorial will also covers how can Cloud Computing help to leverage the power of shared resource to the need of Computational Biology for small & medium research labs and also help Green Computing.



About the Speaker: Asoke K. Talukder did M.Sc (Physics) and Ph.D in Engineering. He was the DaimlerChrysler Chair Professor at IIIT, Bangalore; currently an Adjunct Professor, Department of Computer Science & Engineering, NIT Warangal and Adjunct Faculty Department of Computer Engineering, NITK, Surathkal. He worked for companies like Fujitsu-ICIM, Microsoft, Oracle, Informix, Digital, Hewlett Packard, ICL, Sequoia, Northern Telecom, NEC, KredietBank, iGate, Cellnext, etc. Asoke authored two textbooks and edited two books; he also published many peer-reviewed research papers. He is recipient of many international awards including All India Radio/Doordarshan award, ICIM Professional Excellence Award, ICL Excellence Award, IBM Solutions Excellence Award, Simagine GSMWorld Award etc. Asoke has been listed in “Who’s Who in the World”, “Who’s Who in Science and Engineering”, and “Outstanding Scientists of 21st Century”. His current affiliation is as Mentor at Geschickten Solutions where he is focusing on building BioCloud – to meet the grand challenges of Computational Biology applications. He is also Corporate Advisor to Sahara Next.