

# Schedule for the Symposium in Mathematics and Computer Science, SMCS (IACS) on 4<sup>th</sup> March 2022

Venue: C.V. Raman Hall (IACS), Online Link: <https://zoom.us/j/98519234213> (Passcode: 842587)

## Morning Session: 10:00 a.m. - 12:45 p.m.

10:00 a.m. - 10:30 a.m.

*Inaugural Speech by Prof. Tapas Chakraborty, Director, IACS Kolkata.*

10:30 a.m. - 11:30 a.m.

*Speaker: Dr. Sourav Chakraborty, Advanced Computing and Microelectronics Unit, ISI Kolkata.*

*Title:* On the power of conditional sampling: a special case of property testing.

*Abstract:* We define a new way of accessing a data distribution using "conditional-sampling oracle". This oracle can be used to design much faster algorithms for testing properties of distribution and thus makes the algorithm useful in practical scenarios. In fact we can show that any label-invariant property of distribution can be tested using a constant number of conditional samples.

11:45 a.m. - 12:45 p.m.

*Speaker: Dr. Swagatam Das, Electronics and Communication Sciences Unit, ISI Kolkata.*

*Title:* Generative Adversarial Networks - one of the most happening developments in Machine Learning through the lens of Mathematics.

*Abstract:* Generative Adversarial Networks (GANs) mark one of the most important developments in deep learning over the last decade. These models comprise of two neural networks involved in a two-player zero-sum game. In a competitive setting, they attempt to estimate the underlying probability distribution of high-dimensional objects (e.g., images), a classical problem for which conventional statistical methods usually do not have a ready answer! In this endeavor, GANs can generate very realistic but artificial pieces of multimedia data including images, text, speech signals, and so on, based on the training examples they are exposed to. This talk will start with a high level introduction of GANs and continue to unravel their underlying theoretical framework. The talk will finally discuss a few open problems related to the mathematical analysis of the GAN-based machine learning models.

## Afternoon Session: 3:00 p.m. - 6:30 p.m.

3:00 p.m. - 4:00 p.m.

*Speaker: Dr. Alok Goswami, School of Mathematical and Computational Sciences, IACS Kolkata.*

*Title:* Understanding an Old Theorem of Young.

*Abstract:* In an attempt to unravel the mystery behind an old, not so well-known and somewhat surprising theorem of W.H.Young, I will present a simple fact on two families of subsets of a separable metric space. Several other interesting consequences will follow suit.

4:15 p.m. - 5:15 p.m.

*Speaker: Dr. Mahesh Kakde, Department of Mathematics, IISc Bangalore.*

*Title:* Star Conjectures and Hilbert's 12th problem.

*Abstract:* I will start the talk with classical results of Stickelberger and Kronecker-Weber. I will then discuss generalizations of these results to a more general case. Some of these general statements are now a theorem proved in joint work with Dr. Samit Dasgupta. If time permits, I will talk about our methods.

5:30 p.m. - 6:30 p.m.

*Speaker: Dr. Debraj Chakrabarti, Department of Mathematics, Central Michigan University.*

*Title:* The Flat Earth Society: conformal mapping through the ages.

*Abstract:* We discuss how the problem of constructing accurate maps of the surface of the earth leads naturally to the notion of conformal mapping. After discussing some famous conformal maps such as the stereographic projection, we relate conformal mapping with holomorphic functions and discuss some famous results of complex analysis related to conformal mapping. The talk will be non-technical and accessible to students with an undergraduate background in mathematics.