Webinar: Ramanujan Graphs and the Matrix Completion Problem by Prof. Mathukumalli Vidyasagar FRS (IIT Hyderabad)

by Bishal Deb - Tuesday, March 16, 2021

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Gonit Sora is organizing a webinar to be delivered by **Prof. Mathukumalli Vidyasagar FRS**, SERB National Science Chair and Distinguished Professor of the Indian Institute of Technology Hyderabad. The details are given below.

Date: **20 March, 2021 (Saturday)**

Time: **11 am IST**

Title: **Ramanujan Graphs and the Matrix Completion Problem**

Abstract: Graphs consist of vertices, and edges between vertices. A graph is said to be d-regular if every vertex has degree d, that is, exactly d other vertices connected to it. For each graph one can associate an Adjacency matrix A, of size n by n where n is the number of vertices. If the graph is d-regular, then d is always an eigenvalue of A. Such a graph is called a "Ramanujan graph" if the second largest eigenvalue of A is no larger than twice the square root of d-1. In this talk I will explain where this rather strange-looking bound comes from, and show that in fact it is the best one can achieve in any graph as n becomes large. Explicit constructions of Ramanujan graphs are still very few, and I will provide a couple of such procedures. Finally, I will discuss the "matrix completion problem" which has applications in many engineering domains, and show how it can be solved using Ramanujan graphs.

About the Speaker: *Prof. Mathukumalli Vidyasagar is a Distinguished Professor in Electrical Engineering at IIT Hyderabad and the Cecil & Ida Green Chair of Systems Biology Science at the Erik Jonsson School of Engineering & Computer Science, University of Texas at Dallas. He received his B.S., M.S. and Ph.D. degrees in electrical engineering from the University of Wisconsin in Madison, in 1965, 1967 and 1969 respectively. Between 1969 and 1989, he was a Professor of Electrical Engineering at*

Marquette University, Concordia University, and the University of Waterloo. He then returned to India as the Director of the newly created Centre for Artificial Intelligence and Robotics (CAIR) in Bangalore, under the Ministry of Defence, Government of India, where he worked under Dr. APJ Abdul Kalam. In 2000 he moved to the private sector as an Executive Vice President of Tata Consultancy Services where he stayed till 2009 before returning back to academia. Since March 2020, he is a SERB National Science Chair, one of four in India.

Prof. Vidyasagar's research interests are in the broad area of system and control theory, and its applications. In the recent past he has been interested in the area of compressed sensing, that is, finding sparse solutions to large under-determined problems. At present he is exploring whether ideas from statistical learning theory can be applied to problems of reinforcement learning. On the applications front, he is interested in applying ideas from machine learning to problems in computational biology with emphasis on cancer.

Prof. Vidyasagar has received a number of awards in recognition of his research contributions, including Fellowship of The Royal Society, the IEEE Control Systems (Technical Field) Award, the Rufus Oldenburger Medal of ASME, the John R. Ragazzini Education Award from AACC, and others. He is the author of thirteen books and more than 150 papers in peer-reviewed journals which include Nonlinear Systems Analysis, Classics in Applied Mathematics, SIAM. He also has an Erdos number of two and an Einstein number of three.

The talk will be suitable for a general audience (college students are specially welcome), and will be held online via Zoom. It will also be livestreamed on our Facebook page.

This talk will be recorded and the recording is made available on our YouTube channel later.

e-Certificates will be issued to participants who attend the talk on Zoom.

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