CS1: Contributed Session I

The Discrete Agglomeration Model: The Moment Problem for the Autonomous Quadratic Kernel

James L. Moseley, *West Virginia University*

Agglomeration of particles in a fluid environment is an integral part of many industrial processes and has been the subject of scientific investigation. One model of the fundamental mathematical problem of determining the number of particles of each particle-size as a function of time for a system of particles that may agglutinate during two particle collisions uses the coagulation or Smoluchowski's equation. With initial conditions, it is called the Discrete Agglomeration Model. Several problems have been associated with this model allowing progress to proceed separately. To facilitate this progress, in this paper we develop and solve the Moment Problem (MP) for the autonomous quadratic kernel.

Stability in a Distributed Delay Differential Equation

Israel Ncube, *Alabama A & M University*

The subject of the presentation is the asymptotic stability analysis of the trivial equilibrium of a scalar and linear delay differential equation with two (infinite) distributed delays characterised by general delay kernels. The goal is to determine conditions on the parameters of the equation guaranteeing stability. The results are based on the exact analysis of the characteristic equation of the delay differential equation.

Metastable Decay of Nearest-Neighbor Ising Ferromagnets in the Hyperbolic Plane

Howard Richards, *Marshall University*

Monte Carlo simulations of the nearest-neighbor Ising ferromagnet and calculations show that metastable decay occurs very differently in the hyperbolic plane than in the Euclidean plane. In the hyperbolic plane there is true metastability, though that can perhaps be destroyed by open boundary conditions, and there is no distinction between single-droplet and multi-droplet decay. This research was supported by NSF grant OCI-1005117.

Multi-Target Shrinkage Estimation for Covariance Matrices

Tomer Lancewicki, *University of Tennessee*

Covariance matrix estimation becomes problematic when the number of samples is relatively small compared with the number of variables. We present a novel shrinkage estimator for covariance matrices that find a compromise between the sample covariance matrix and well-conditioned matrices with the aim of minimizing the mean-squared error (MSE). Numerical simulations demonstrate the effectiveness of the estimator. We also demonstrate the efficacy of the estimator by applying it to classification tasks.