National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: AI-Driven Primal-Dual Optimization for Solving European Option Pricing Model
Speaker	: Prof. S. Chakraverty
Supervisor	: Prof. S. Chakraverty
Venue	: Seminar Room (Department of Mathematics)
Date and Time	: 22 Jul 2025 (05:00 pm)
Abstract	: The Black-Scholes model is a cornerstone in financial mathematics for pricing European options, offering closed-form solutions under idealized assumptions. However, these assumptions often fail to capture real-world complexities, limiting their practical applicability. This investigation introduces an innovative optimization-based approach using the AI method viz. Least Squares Support Vector Machine (LS-SVM) to solve the Black-Scholes partial differential equation (PDE). By reformulating the PDE into a constrained optimization problem, the method employs the primal-dual framework to derive the solutions. The optimization objective involves minimizing a regularized least-square cost function and incorporating a kernel-based structure to effectively model the non-linear relationships inherent in option pricing. Further, different Kernels have also been used to obtain comparative results showing the performance of these kernels in solving this problem. Compared to traditional numerical techniques, such as the finite difference method (FDM) and finite element method (FEM), the LS-SVM approach significantly enhances computational performance and accuracy. This study demonstrates the utility of optimization techniques in enhancing derivative pricing models, bridging theoretical and practical aspects of financial engineering. These findings underscore the potential of optimization-driven machine learning methodologies to revolutionize financial modelling, offering precise, adaptable, and computationally efficient solutions for complex market scenarios.