Research Areas of Faculty Members

Dr. Sasi Gopalan – Approximation, Fuzzy Logic & AI

Dr. Sasi Gopalan works at the interface of mathematics and artificial intelligence, using approximation theory, fuzzy logic, and fractional calculus. His research develops methods to improve accuracy and interpretability of AI models in applications like image processing, traffic management, and data analysis. He also designs mathematical tools to manage uncertainty in big data, bridging theory and machine learning practice.

Dr. Aparna Lakshmanan – Graph Theory & Applications

Dr. Aparna specializes in graph theory, particularly algebraic graph theory, where she uses algebra and topology to study graph invariants, symmetries, and structures. Her work in topological data analysis (TDA) provides tools to detect hidden patterns and structures in high-dimensional data. She also explores graph labeling and parameters with applications in scheduling, coding theory, and network optimization.

Dr. Shery Fernandez – Fuzzy Mathematics & Representation Theory

Dr. Shery Fernandez's research lies in fuzzy mathematics and fuzzy graphs, which extend classical graph theory to handle uncertainty and vagueness in connections. He also contributes to representation theory, where abstract algebraic structures are studied through their linear representations. His work finds applications in diverse fields, from physics and chemistry to cryptography, coding theory, and network analysis.

Dr. Noufal A. – Harmonic Analysis & Signal Processing

Dr. Noufal's work in harmonic analysis examines how signals and functions can be represented and reconstructed from wave-like components. His research on subdivision schemes and Gabor frames supports applications in graphics, speech analysis, and image processing. Additionally, he explores coorbit theory to unify frameworks for signal and data analysis, ensuring both mathematical rigor and practical utility.

Dr. V. B. Kiran Kumar – Spectral Theory

Dr. Kiran Kumar's research is centered on spectral theory, including spectral approximation, Borg-type theorems, and preconditioning techniques. His recent focus on symplectic spectral theory explores infinite-dimensional analogues of spectral inequalities. These contributions have applications to Gaussian covariance operators and deepen understanding of symplectic structures in mathematics and physics.

Dr. Ambily A. A. – Algebraic K-Theory & Quadratic Forms

Dr. Ambily's research focuses on algebraic K-theory and its connections to quadratic forms and algebraic topology. She investigates the classification and invariants of algebraic structures like modules, vector bundles, and quadratic forms, which have deep applications in number theory and geometry. Her work also extends to problems in commutative

algebra, such as the Horrocks-Quillen-Suslin theorem, enriching the theoretical foundations of pure mathematics.

Dr. Tanushree Pandit – Stochastic Optimization & Machine Learning

Dr. Tanushree works on stochastic optimization, designing algorithms that handle randomness in large-scale data problems. Her methods improve the stability and efficiency of machine learning models trained on noisy or incomplete data. By combining theory and applications, she advances optimization techniques in fields ranging from finance to engineering.

Dr. Tathagata Banerjee – Functional Analysis & Noncommutative Geometry

Dr. Tathagata studies operator algebras and noncommutative geometry, key mathematical foundations of quantum theory. His work on C*-extreme points and positive operator-valued measures advances the understanding of quantum measurements and channels. He also develops coarse geometric methods for noncommutative spaces like the Moyal plane, linking abstract operator theory with quantum information science.

Dr. Shankar P. – Operator Theory & Functional Analysis

Dr. Shankar's research in operator theory investigates the behavior of transformations in functional spaces. He studies operator systems, hyperrigidity, and boundary representations, deepening the understanding of structure and extreme behaviors in operator algebras. His work on invariant subspaces and composition operators connects operator theory with complex analysis and applications in quantum mechanics and signal processing.

Dr. Linu Pinto – Neural Networks & Optimization

Dr. Linu Pinto studies mathematical optimization in neural networks, focusing on stability, generalization, and robustness. She introduced the R-Gaussian activation function to mitigate vanishing gradients and enhance reliability of deep learning models in critical applications. Her work also applies wavelet embeddings and normalization techniques to improve AI performance on image, signal, and time-series data.