Departmental Brochure

M.Sc. (Integrated)

Mathematics and Scientific Computing
Department of Mathematics and Statistics
Indian Institute of Technology Kanpur

Contacts:

Faculty Advisor : Dr. Amit Mitra
Email: amitra@iitk.ac.in
Mobile: +91-9899858916

Department Placement Coordinator
Abhishek Dhandaria
Email: abhidhan@iitk.ac.in
Mobile: 8960370701

Indian Institute of Technology, Kanpur

Why Recruit us ?

The M.Sc. (Integrated) programme in Mathematics and Scientific Computing is an exciting inter-disciplinary endeavor pioneered by the Department of Mathematics and Statistics. With admissions via the Joint Entrance Examination (JEE), this programme envisions to produce mathematicians well-versed with the modern computational tools and techniques. The rigor of pure mathematics and computationally intense courses in applied mathematics coupled with the most flexible elective driven structure in the institute gives the student an ample opportunity to hone his skills in varied fields of interest ranging from data analytics, computational mathematics, optimization, parallel computing to statistics, finance and other applied fields. Students have qualified finance related exams like CFA and NCFM.

Over the summers, students undertake internships, either in the industry or in leading academic institutions. This takes education outside the classroom, into the offices of corporate or the rooms of the research labs.With a strong focus on undergraduate research, specially via M.Sc. Project, the students are encouraged to tackle theoretical as well as industrial problems transforming them into motivated individuals who can be great asset for any organization, be it educational, R&D, software or finance.

STATISTICS
- Time Series Analysis
- Applied Stochastic Process
- Regression Analysis
- Probability and Statistics
- Analysis of Variance
- Statistical Inference
- Statistical Decision Theory
- Sampling Theory
- Approximation Theory
- Statistical Pattern Recognition

FINANCE
- Mathematics of Finance
- Econometrics
- International Economics
- Microeconomics
- Macroeconomics
- Money and Banking
- Financial Economics
- Industrial Economics

APPLIED MATHEMATICS
- Optimization
- Mathematical Modelling
- Linear Programming
- Matrix Theory
- Numerical Computation
- Measure Theory
- Mathematical Methods
- Finite Element Methods
- Graph Theory

INTERDISCIPLINARY COURSES
- Data Structure and Algorithms
- Machine Learning
- Data Mining
- Computational Complexity
- Randomized Algorithms
- Digital Image Processing
- Algorithms and Logic in Game theory
- Neural Networks
- Artificial Intelligence Techniques
- Computational Fluid Dynamics

Projects

Finance & Economics

- An algorithmic trading application on Ptolemy framework.
- A game theoretic approach to limit pricing models.
- An extension of ETF arbitrage to sector trading using ANNs.
- Risk Management of Business models and Database oriented simulations.
- Option Pricing
- Using Bellman Ford algorithms to detect currency arbitrage.
- Finding correlation between returns and imbalance of buyer-seller initiated trades using S&P 500 stocks trading data.

Algorithmic Programming

- Context sensitive tag recommendation system for images using data from facebook, flickr and wikipedia.
- Solving Tetravex and K-Queen problems (NP complete) using Douglas Rachford algorithm.
- Numerical integration on higher dimensions in infinite domain using spacegrids.
- Parallel algorithm for large unconstrained convex minimax problems on Nvidia CUDA.
- Parallel implementation of Ant colony optimization technique for solving Travelling Salesman problem using MPI.
- Sentimental classification of movie reviews based on machine learning techniques.
- An approximate algorithm for the Unit Disc Graph Overlapping Problem.
- Construction of multiple block secure hash functions based on error-correcting codes.
- Plastic card fraud-detection using ANN & SVM machine learning method.

Projects
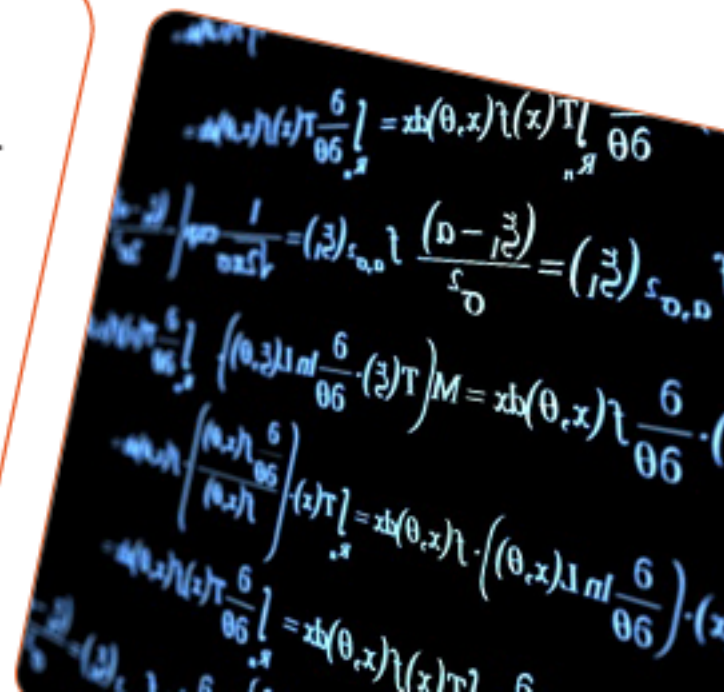
Statistics

- Numerical solution to recursive stochastic equations for inertial navigation system.
- Implementing an editor for large networks of Markow decision process.
- Multiple sequence alignment of URLs using Hidden Markov Models.
- A greedy algorithm for clustering of web shingles.
- Sequential Sampling Designing.
- Model identification of time series data using Box-Jenkins method

Applied Mathematics

- Markowitz portfolio optimization.
- Cryptography: Encryption and decryption of Data using Linear shift register and primitive polynomials.
- Natural language Proof Checking (NAPROCHE).
  Image Processing:
- Biometric Authentication and Pattern Recognition.
- Implementation of Clustering and Thresholding algorithms.
- Implementation of algorithms for MRS, NMR and perfusion data
- Improvement in algorithm for solving Arrow-Debreu Nash Bargaining game.

Internships

Corporate: Siemens AG Munich, Yahoo! Research, Adobe, Goldman Sachs, Deutsche Bank GMC, Deloitte, India Bulls, Fractal Analytics, DLF, TCS, ICICI Lombard, Schlumberger

Academic: MIT Sloan school of management, UCB (Berkeley), ETH(Zurich), IILC(Amsterdam),Max Plank University, NTU (Singapore),University of British Columbia , TIFR, ISI, IISc, University of East Finland, Universite Paris XI, Gulbenkian Science Institute