Resource Persons:

- Dr. A.K. Nandakumaran, IISc,
- Dr. M.T. Nair (Retired professor, IIT Madras, Professor, BITS Pilani, Goa),
- Dr. Phaneendra K. Yalavarthy, IISc,
- Dr. Mahesh R. Panicker, IIT Palakkad,
- Dr. Deepesh,
- among others.

Tentative topics to be covered:

- Introduction to inverse problems
- Iterative regularization methods
- Applications in imaging and image processing and Data Science.

Registration Details

Participants can register using the following google form link.

https://forms.gle/FY03sMD7AC52tHn4A

There is NO registration fee for the workshop.
The participants are advised to make necessary arrangements for their travel, accommodation and food during the workshop.
Refreshments will a provided during the workshop.

For further details contact Coordinators

Dr. Santhosh George and Dr. Jidesh P.,
The SERB Project Investigators,
Department of MACS,
NITK Surathkal, Mangalore-575025.
Email: {sgeorge/jidesh}@nitk.edu.in

Workshop on Inverse Problems and Applications

06th – 08th MARCH – 2023

Organized By:

Department of Mathematical and Computational Sciences

National Institute of Technology Karnataka, Surathkal, Mangaluru, 575025

Sponsored by:

Under SSR Scheme

About the Institute

Since its inception in 1960, the National Institute of Technology Karnataka (NITK), Surathkal has established itself as a premier Institution engaged in imparting quality technological education and providing support to research and development activities. NITK is conferred the status of an Institution of National Importance vide NIT Act No.29 of 2007 by Govt. of India and is consistently ranked as one of the top ten technical institutions in India. Presently, NITK offers 9 Bachelors, 28 Master's and Doctoral Degree programmes. The institute is located 22 kilometres north of Mangalore City along the Kanyakumari-Mumbai National Highway-66, amid 300 acres of sylvan surrounding with the picturesque Western Ghats on the east and sun-kissed sands of the Arabian Sea to the west. NITK is committed to enhance capabilities and potential of our human resources with the objective of transforming them into leaders in their chosen areas of interest. Our vision is to strive for excellence, be globally competitive in technical education and focus on knowledge assimilation, generation and dissemination. The year-long activities during the occasion show cased the glorious contributions of NITK in various fields of its activities and projected new initiatives for the coming years.

About the Department

The Department of Mathematics (today called, the Department of Mathematical and Computational Sciences) started along with the institute(1960). The Department initially catered to the needs of the UG and PG programmes of other Departments in the Institute, and subsequently, in 1988-89 Department started two PG Programmes and further, in the year 2022, the department started a new UG programme as well. The department currently offers one UG programme namely B.Tech. in Computational and Data Science and two PG programmes, namely, the Master of Computer Applications (MCA) and Master of Technology (M.Tech.).

Overview of the Workshop

Inverse problems are concerned with determining causes for a desired or an observed effect or calibrating the parameters of a mathematical model to reproduce observations. Inverse problems generally do not fulfill Hadamard's postulates of well-posedness: they might not have a solutionin the strict sense, solutions might not be unique and/or might not depend continuously on the data. Hence their mathematical analysis is subtle due to their ill-posed nature. However, they have many applications in engineering, physics and other fields. From the very basic nature of the problem it is obvious that a closed form solution to such problems is difficult to design. Hence, one has to seek for an iterative one. Regularization of the solution is a trivial requirement as the solution might not depend on the data continuously.

Iterative regularization models are changing the face of the world by offering the scientists and mathematicians the opportunity to examine many real life problems which are inverse and ill-posed in nature, with a far greater generality and precision. To make use of the full power of the iterative methods, they must have a firm grip on numerical techniques developed for various mathematical models and their analysis. Application of the iterative schemes is found in any scientific field where real world problems are modeled into mathematical equations.

Iterative schemes/methods are general terminology used for certain class of numerical schemes where the solution procedure start with an approximate value/function and then apply the method repeatedly to obtain a better approximation. Mathematical models for inverse problems are normally in the form of an operator equation involving a linear or non-linear operator between suitable functions spaces. Such system of equations can be linear or nonlinear in nature and there are various iterative schemes to obtain the solution.

Also, these iterative schemes are useful in solving many optimization problems from different disciplines. Many of these methods are firmly based on various calculus and functional analysis concepts and they can be effectively implemented by taking the advantage of the speed and power of modern computer technologies

This workshop is aimed at a fairly broad audience, viz.: students/ academicians/ researchers from various Institutions or Organizations from various disciplines such as Mathematics, Computer Science, Electrical and Electronics Engineering. Some of the imaging and image processing problems are to be discussed in this deliberation. Experts from imaging and image processing domains are expected to deliver lectures on relevant topics. Moreover, the course covers some of the problems from data science applications as well. Further, this is a forum to share the knowledge and expertise in solving inverse problems using iterative methods and their diverse applications in science and engineering disciplines. This deliberation also serves as a platform to interact with the experts and seek the possibilities of future collaborative research.

About the Workshop

This workshop is financially sponsored by the Science and Engineering Research board under the Social Scientific Responsibility Scheme of the Project titled "A study on non-linear ill-posed equations under weak conditions with emphasis on Parameter Identification Problem and Applications to Imaging". This workshop is intended to disseminate the significance of the problem being investigated as a part of this project and provide insightful introduction to various theoretical aspects and their practical implications to the audience.