

# **INDIAN SOCIETY FOR ECOLOGICAL ECONOMICS**

**C/o Institute of Economic Growth, University Enclave, Delhi, India 110007**

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## **Announcement**

### **Training Course on Remote Sensing, GIS and Machine Learning Methods for Environment, Natural Resources and Agriculture**

Venue: Indraprastha Institute of Information Technology, Delhi

Dates: January 4-5, 2019

Applications are invited from research scholars and early career academics for an intensive two day training course on remote sensing, GIS and machine learning methods. The objective of the course is to provide hands-on experience to participants on these topics. A brief description of the course and session plan is enclosed.

#### **How to apply**

Interested candidates must complete an [online form](#), and upload (a) a 500 word Statement of Interest identifying the utility of the workshop towards their professional advancement (b) brief curriculum vitae (maximum 2 pages) including INSEE membership number if applicable. Only pdf files can be uploaded.

#### **Important dates**

Last date of submission: December 10, 2018

Selected candidates will be informed by: December 17, 2018

Last date for payment of fees: December 24, 2018 (seat may be offered to another applicant after the cut-off date).

#### **Maximum number of participants: 25**

**Fees:** (a) INR 4,000 for non-INSEE members; (b) INR 3,000 for [INSEE members](#)

The course fee covers lunch and refreshments on both days and course material. Fees are to be paid only after selection. Applicants are welcome to [join INSEE](#). Membership benefits include free online subscription to the INSEE journal [\*Ecology, Economy and Society\*](#).

For advice on accommodation outstation candidates may write to [gaurav@iitd.ac.in](mailto:gaurav@iitd.ac.in)

For any queries please contact:

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## **Training Course on Remote Sensing, GIS and Machine Learning Methods for Environmental, Natural Resource and Agricultural Economists**

**January 4-5, 2019**

Remote sensing and GIS tools provide access to spatially-delineated satellite imagery-based high-resolution data for research applications in economics. Multi-year satellite imagery provides both space and time dimensions that have potential to enhance our understanding of environmental systems and design policies for promoting efficient management of natural resources and sustainable agricultural practices. In recent years, several authors have utilized satellite data in conjunction with coarse administrative surveys and field surveys for innovative econometric applications, especially in the areas of natural resource economics and agricultural economics.

Machine learning methods, on the other hand, allow for the design of flexible models that allow accurate out-of-sample prediction of the response variable. An active debate in the economics literature concerns itself with similarities and differences of machine learning models from the traditional regressions methods for ‘observational’ data developed by econometricians over the years. Machine learning is not understood as being a ‘better’ substitute for regressions. Regression analyses lead to statistical inference from past social phenomenon or policy interventions, which is often of higher interest to economists than out-of-sample predictions enabled by machine learning. However, economists now argue for using machine learning methods for applications in various policy evaluations situations, especially efficient estimation of heterogeneous treatment effects, etc.

This course will provide basic principles for acquiring, reading and analysing satellite sensor data using specialized spatial image processing software. We will cover techniques for incorporating such data into econometric modelling in conjunctions with survey data and/or administrative data. Further, fundamental concepts of machine learning will be covered including kernelised regression, classification, clustering and representational learning, and their applicability in economics. Instructors will provide hands-on training of spatial modelling and machine learning tools including ERDAS Imagine, ArcMAP, Python and SAS. Short assignments will be given to enhance the working knowledge of participants.

### Course Coordinator

Dr. Shreekant Gupta, Professor of Economics, Delhi School of Economics

### Instructors

Dr. Gaurav Arora, Assistant Professor of Economics, IIIT Delhi

Dr. Saket Anand, Assistant Professor of Computer Science and Engineering, IIIT Delhi

## COURSE STRUCTURE

### **Day 1. GIS and Remote Sensing Methods**

- Introduction to GIS and Remote Sensing
- Interpreting the multispectral satellite imagery
- Using ArcGIS and ERDAS Imagine
- Working with multi-year, multi-spectral, multi-resolution satellite imagery
- Case studies on the application of satellite data in applied economics settings
  - Change detection
  - Field-level analysis using raster and vector image data
  - Combining satellite data with administrative surveys
  - Spatial-temporal econometric modelling with satellite data
  - Potential pitfalls and robustness tests

### **Day 2. Machine Learning Methods**

- A primer on linear regression analysis and kernelised linear regression
- Classification
- Neural Networks for regression analysis
- Support Vector Machines
- Representational Learning
- A case study

**Note:** This is an application oriented course conducted in a computer lab. Participants will be required to complete short assignments provided at the end of each module.