

# Data Analytics for Operations Research

## Overview

Data Analytics is the scientific process of transforming data so that we can develop insights for making enhanced and prudent decisions. Operations Research (OR) is concerned with developing modeling and analysis tools to help make better decisions. OR modeling was always informed by statistical methodologies, and the new data analytics techniques are having a similar impact. This advanced course on Data Analytics for Operations Research is focused on exploring the synergy between these two domains of knowledge: tools for efficiently solving optimization problems that arise in data analytics, and understanding how to use insights from modern data analytics to design improved decision making models. We will survey a range of data analytics techniques including regression, classification, clustering, and Bayesian models, and a range of optimization techniques, including linear, integer and non-linear optimization, large scale optimization, and optimization under uncertainty

## Objectives

Today, the data underlying many practical decision making problems is in tera and peta bytes, and in order to develop good decision making methodologies, one needs an excellent background in three different areas: modern statistical and machine learning techniques for data analysis, optimization modeling and methods, and large scale computing and data base management. This course titled Data Analytics for Operations Research is envisioned to give the students an in-depth and rigorous grounding in modern methods in large-scale optimization and data analytics. Participants of this course will be given the theoretical rigour and practical experience necessary for solving data-driven decision problems in a wide variety of application areas, e.g. business analytics, data science, project management, and portfolio management


## Necessary Details

<b>Dates</b>	<b>14-November-2018 to 18-November-2018</b>
<b>Modules</b>	<ol style="list-style-type: none"><li>1: Regression (OLS, MAD, etc.), Non-linear Regression, Logit, Probit, etc.: 14<sup>th</sup> November 2018.</li><li>2: Support Vector Mechanism and related topics: 15<sup>th</sup> November 2018</li><li>3: Sampling Methods, Re-sampling Methods, Different Bootstrapping Concepts, Clustering Algorithms: 16<sup>th</sup> November 2018.</li><li>4: Dimension Reduction Methods, EM Algorithm, Empirical Likelihood Methods: 17<sup>th</sup> November 2018.</li><li>5: LP/NLP Methods, Reliability Optimization Methods, Robust Optimization Methods, Parametric Optimization Methods, Optimal Transportation Methods, etc.: 18<sup>th</sup></li></ol>

	<p>November 2018.</p> <p><b>Note</b></p> <p>Number of participants for the course will be limited to approximately sixty (60).</p>
<p><b>You Should Attend If...</b></p>	<ul style="list-style-type: none"> <li>• You are (i) post graduate &amp; doctoral students who is academically oriented, (ii) faculty members who is well trained in his/her subject areas and (iii) industry experts who has the domain experience, such that all of them may utilize the concepts in the areas related to Data Analytics, Operations Research, Clustering methods, Re-sampling and Bootstrap Methods, Optimization methods, etc., for better analysis and decision making using data.</li> <li>• You come from fields as diverse as Social Science, Quantitative and Operations Research, Data Sciences, Engineering, Public Policy makers, Government Official, etc., and are keen to utilize the advanced topics of optimization and data analysis (with their applications) to further your knowledge in your respective academic and professional fields.</li> <li>• Are a professional from government organization, private sectors, related industries, and who is dynamic and is willing to pick up the nuances in different fields by using variety of such decision making using data and optimization tools along with a repertoire of different Operations Research methods.</li> <li>• You are in academia and industry (e.g., health, logistics, social networking, government organization, airline, computing, ICT firms, etc.) or someone who is keen to gain expertise in areas related to concepts of optimization and Data Analysis such that the concepts learned can be successfully used in their respective sphere of functioning in order to contribute more fruitfully.</li> </ul>
<p><b>Fees</b></p>	<p>The participation fees for participating in this workshop/programme/GIAN course is as follows:</p> <ul style="list-style-type: none"> <li>• <b>Participants from abroad US \$500 (inclusive of GST)</b></li> <li>• <b>Industry/ Research Organizations: Rs. 15,000 (inclusive of GST*)</b></li> <li>• <b>Academic Institutions (Faculty, etc.): Rs. 10,000 (inclusive of GST*)</b></li> <li>• <b>Academic Institutions (Students): Rs. 5,000 + (inclusive of GST*)</b></li> </ul> <p><b>Note</b></p> <ul style="list-style-type: none"> <li>• The above fees include all instructional materials, course book/notes, computer/laboratory equipment usage for tutorials and assignments, 24 hr free internet facility, lunch for all the five (05) days, snacks during the course of the programme.</li> <li>• The participants will be provided with accommodation for which they have to pay.</li> <li>• Expenses for food (breakfast and dinner (which are very nominal and reasonable) has to be taken care by the participants themselves.</li> </ul>

\*: The GST rate is as per Government of India (GoI)

## The Faculty

	<p>Garud Iyengar is a Professor in the IEOR Department at Columbia University, USA. He completed his B.Tech from IIT Kanpur, INDIA in 1993. He has an M.S. (1995) and PhD (1998) from Stanford University. His research interests are broadly in information theory, control and optimization. His published works span a diverse range of fields, including information theory, applied mathematics, computer science, operations research, economics and financing engineering. His current projects focus on the areas of large scale portfolio selection, systemic risk management, quantitative marketing, smart grids, sports analytics, and systems biology.</p>	<p><b>Course Co-ordinator</b></p> <p><b>Prof. Raghu Nandan Sengupta</b></p> <p><b>Phone: +91-512-259-6607 (O)</b></p> <p><b>Cell: +91-99843-86557</b></p> <p><b>E-mail: raghus@iitk.ac.in</b></p> <p><a href="http://home.iitk.ac.in/~raghus/GIAN_DAOR/">http://home.iitk.ac.in/~raghus/GIAN_DAOR/</a></p>
	<p>Raghu Nandan Sengupta is a faculty in the IME department, IIT Kanpur. His research interests are in Sequential Analysis, Statistical &amp; Mathematical Reliability, Optimization and its use in Finance. His research work has been published in Metrika, EJOR, Sequential Analysis, CSDA, Communications in Statistics: Simulation &amp; Computation, Quantitative Finance, FCDS. He has been awarded IUSSTF Fellowship 2008, EMEA-ERASMUS MUNDUS Fellowship 2011, EU-NAMASTE-ERASMUS MUNDUS Fellowship 2014 and DAAD Research Fellowship 2015 &amp; 2017.</p>	