

# THE DON P. GIDDENS INAUGURAL PROFESSORIAL LECTURE

**AMITABH BASU**

January 26, 2023

4:30 p.m.



JOHNS HOPKINS

WHITING SCHOOL  
*of* ENGINEERING

# THE INFORMATION COMPLEXITY OF COMPUTATIONAL PROBLEMS

Many scientific, engineering, and logistical problems require the acquisition of data to determine the parameters of a problem and solve it to a desired accuracy. For instance, the problem of routing Amazon delivery trucks to minimize CO<sub>2</sub> emissions requires, amongst other things, knowing transit times and traffic conditions on relevant roads. Due to various technological considerations, a critical question in a problem such as this is: how much data does one need to solve the problem to a given desired accuracy? In our example, one may not need to know the conditions on every road and street of the DC–Baltimore metropolitan area; a relevant subset of roads may suffice. This question has many factors depending on the context and is referred to, in general, as the *information complexity* of the computational problem at hand. This presentation will survey recent work on this fundamental question, focusing on optimization problems that can be modeled using a certain structure.

# AMITABH BASU

Amitabh Basu, professor of applied mathematics and statistics with a secondary appointment in computer science, is an expert in the field of mathematical optimization with an emphasis on problems with a combinatorial or discrete nature. His work aims to provide methods for solving large-scale, decision-making problems where a combination of discrete choices and non-discrete choices must be made to optimize a given objective. He incorporates techniques from convex geometry, the geometry of numbers, functional analysis, algebraic topology, and real algebraic geometry to reach technical breakthroughs in such optimization problems. Basu's research has practical applications in operations research, astronomy, and data science.

Basu serves on the editorial boards of *Mathematics of Operations Research*, *Discrete Optimization*, *MOS-SIAM Series on Optimization*, *Mathematical Programming*, and *SIAM Journal on Optimization*. His work has been recognized by the NSF CAREER award and the Egon Balas Prize from the INFORMS Optimization Society. He received a bachelor's degree in computer science and engineering from the Indian Institute of Technology, Delhi, in 2004 and a master's degree in computer science from Stony Brook University in 2006. In 2010, he earned his PhD from Carnegie Mellon University, where he studied algorithms, combinatorics, and optimization.

# PROGRAM

## **Opening Remarks and Welcome**

### **Edward Scheinerman**

*Vice Dean for Faculty*

*Professor, Applied Mathematics and Statistics  
Whiting School of Engineering*

## **Introduction of Guest**

### **Fadil Santosa**

*Yu Wu and Chaomei Chen Department Head*

*Professor, Applied Mathematics and Statistics  
Whiting School of Engineering*

## **Introduction of Lecturer**

### **G rard P. Cornu jols**

*IBM University Professor of Operations Research, Emeritus  
Carnegie Mellon University*

## **Don P. Giddens**

### **Inaugural Professorial Lecture**

#### **Amitabh Basu**

*Professor, Applied Mathematics and Statistics  
Whiting School of Engineering*

## **Closing Remarks and Presentation of Gift**

### **Edward Scheinerman**

# ABOUT THE LECTURE SERIES

The Whiting School of Engineering continues its tradition begun in 1993 to honor newly promoted full professors through this special lecture series. In 2022, the lecture series was expanded to include recently promoted emeritus professors. Professor Giddens, originator of the series, served from 1992 to 1997 as the fifth dean of Engineering at Johns Hopkins University.

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