

Topological Data Analysis

Overview

The growth of Big Data has expanded the traditional data science approaches to address the multiple challenges associated with this field. Moreover, the wealth of data available nowadays from a wide range of sources has fundamentally changed the needs for theoretical methods, and thereafter challenged theoreticians to provide insight into this area. One of the recently emerged and increasingly popular trends in Data Analysis is to apply tools based on the algebraic topology. The underlying idea is to free the data scientists from the necessity to pre-define a model, but rather to derive the underlying space parameterizing the data from the data itself. The literature in this new area known as *Topological Data Analysis* is growing quickly, interacting with nascent, emerging, and classical topics such as machine learning, biological networks, pattern recognition, control theory, communication, and signal processing among many others others.

The goal of the minicourse is to give engineering students with little or no background in algebraic topology a quick introduction to the tools of the discipline, and to several modern applications with special emphasis on control theory. About 40% of the time will be spent on developing background in algebraic topology, and about 60% of the time will be devoted to applications. The prerequisites would assume basics of multivariable calculus and linear algebra.

Logistics	<ul style="list-style-type: none">○ Dates: 12-24 Feb 2018○ Number of participants will be limited to 50
Intended audience	<ul style="list-style-type: none">○ Students at all levels (BTech/MSc/MTech/PhD) and Faculty Members from academic and technical institutions across the world○ Engineers working in service and government organizations including R&D laboratories across the world
Fees	<ul style="list-style-type: none">○ Participants from India:<ul style="list-style-type: none">▷ Academic institutions: ₹10,000 per person▷ Students: ₹3,000 per person▷ Industry: ₹20,000 per person○ Participants from beyond Indian borders: US\$500 per person○ The above fees include all instructional material, computer use for tutorials and assignments, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

The Faculty

Yuliy Baryshnikov is a Professor of Mathematics and Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, Illinois, USA. Yuliy's research straddles the



vast domains of geometry, analysis, and probability. His research interests in engineering center around control theory, networks, operations research, mathematical economics, applications in physics and biology, and his interests in mathematics center around applied topology, dynamical systems and singularities, probability theory and stochastic processes. His expertise in a bewildering variety of mathematical disciplines is the central element behind his unusual solutions to crucial problems that have remained open for long.

Debasish Chatterjee is an Associate Professor with Systems & Control Engineering, IIT Bombay, India. His research interests lie in constrained control, the interface of machine learning and control theory,



and stochastic and optimal control.

Course coordinator:

Debasish Chatterjee

Phone number: +91 22 2576 7879

Email: dchatter@iitb.ac.in

GIAN Short Term Course on
Topological Data Analysis

12 – 24 Feb 2018

Registration Form

Name(in block letters): _____

Qualification:

Designation: _____

Organization: _____

Mailing Address: _____

Mobile: _____

Fax: _____

Email: _____

Payment: Rs: _____

DD No.: _____ Dt: _____

(DD in favour of "Registrar, IIT
Bombay – CEP a/c")

Or NEFT/ RTGS

(Please furnish the foll. details if NEFT/RTGS)

Name of A/c Holder

UTR NO./Transaction ID

Name of Bank & Branch

Date of Payment

Amount

IIT Guest House/ Hostel accommodation
required: YES / NO

Signature of Applicant: _____

Date:

Venue for Classes

Classes will be held in the Victor Menezes Convention
Centre, IIT Bombay.

Lecture Notes

To fully realize the objectives of the course, lecture
notes will be made available at the time of
registration at IIT Bombay.

Date & Time of Registration:

12th Feb 2018, 9.00 AM at Victor Menezes Convention
Centre, IIT Bombay.

COURSE FEE

Participants from abroad: US \$500/-

Industry/ Research Organizations: INR: 20000/-

Academic Institutions/ Faculty/ NGO: INR: 10000/-

Students & Research Scholars: INR: 3000/-

The above fees include all instructional materials,
computer use for tutorials and assignments,
laboratory usage charges, free internet facility.
Subject to availability, the participants will be
provided with accommodation on payment basis.

The fees may be paid by demand draft drawn in
favour of "The Registrar, IIT Bombay - CEP
Account".

Or through NEFT/RTGS:

Name of beneficiary: Registrar, IIT Bombay

Account name: IIT Main Account

Name of Bank: State Bank of India, IIT Powai

Beneficiary A/C No: 00000010725729128

Bank MICR Code: 400002034

IFSC Code: SBIN0001109

SWIFT Code: SBININBB519

Send the completed forms (only) by post to:

Debasish Chatterjee

Systems & Control Engineering

IIT Bombay, Powai

Mumbai 400076, India