Samvaad in January-February 2020:
Theme of "Models for Computational Thinking"
IIIT Bangalore
Samvaad Talks in R103, IIITB, 2-3:30p on Mondays

Dr. Om Deshmukh, on January 06, 2020 (Monday)
Prof. Janaki Balakrishnan, on January 13, 2020 (Monday)
Prof. Payal Arora, on January 20, 2020 (Monday)
Prof. Amit Chattopadhyay, on January 27, 2020 (Monday)
Prof. Shiva Kumar Malapaka, on February 03, 2020 (Wednesday)
Prof. Balakrishnan Ashok, on February 10, 2020 (Monday)
Prof. Jaya Sreevalsan Nair, on February 17, 2020 (Monday)

Date: January 06, 2020 **Speaker**: Dr. Om Deshmukh, Independent Machine Learning Expert **Title**: **Data Driven Decisioning: How Efficient Computing can make at-scale NLP Applications Practical**	**Date**: January 13, 2020 **Speaker**: Prof. Janaki Balakrishnan, NIAS **Title: Dynamics of complex behaviour in natural systems**
Date: January 20, 2020 **Speaker**: Prof. Payal Arora, Erasmus University Rotterdam, the Netherlands **Title**: **Do the next billion users need more innovation? Rethinking AI for the common good**	
Date: January 27, 2020 **Speaker**: Prof. Amit Chattopadhyay, IIITB **Title: Counting Holes in the Data**	**Date**: February 03, 2020 **Speaker**: Prof. Shiva Kumar Malapaka, IIITB **Title: Turbulent Flow Modeling with Focus on (a) Financial Systems, (b) Invariants and Cascades in MHD**
Date: February 10, 2020 **Speaker**: Prof. Balakrishnan Ashok, IIITB **Title: The physics of things: modelling across length scales**	**Date**: February 17, 2020 **Speaker**: Prof. Jaya Sreevalsan Nair, IIITB **Title: Geometric Signatures of Airborne LiDAR Point Clouds**

Date: January 06, 2020

Speaker: **Dr. Om Deshmukh, Independent Machine Learning Expert**
Title: Data Driven Decisioning: How Efficient Computing can make at-scale NLP Applications Practical

Abstract:
Are you looking to build a successful career in the field of Data Sciences / AI / ML? If so, the first thing you need to know is that to be successful in this field it takes a lot more than just an understanding of the various machine learning models. I will begin the talk by providing a brief overview of how the academic and industrial research in data science has evolved over the last two decades and its implications on the business side, in particular the centrality accorded by businesses to 'data-driven-decisioning'.

This overview will help you understand and appreciate the second part of the talk which presents some of the Natural Language Processing based algorithms that we have built to enrich financial transactions. I will discuss the challenges faced in at-scale-deployment of these algorithms in the real world to process millions of data points on a daily basis while meeting stringent service level commitments on accuracy and efficiency. Finally, I will share some of the best practices to follow at each stage of building and deploying data-driven products.

Speaker Biography:
Dr. Om Deshmukh has a Ph.D. in Machine Learning from University of Maryland, College Park. Om has 50+ international publications (several best paper awards) and 50+ patents (filed/granted). In 2019, his data science team at Yodlee was recognized as one of the top 10 data science teams to work at in India. In 2017, he was recognized as one of the top 10 data scientists in India. His team won the Govt of India's National Award for the Best Accessible Technology (2008).

He spent close to a decade in IBM Research and Xerox Research driving various state-of-the-art Machine Learning initiatives for global technical research, technology strategy and start-up partnerships. Om ran the delivery of data-science driven products at Yodlee Infotech for 3+ years before starting his entrepreneurial journey in Nov-2019.

Om is a well-known Machine Learning and Data Sciences authority in industry and academia, with several collaborations across IISc / IITs. Om is also an adjunct faculty at the International School of Engineering (INSOFE).

https://www.linkedin.com/in/deshmukhom/

Date: January 13, 2020

Speaker: **Prof. Janaki Balakrishnan, National Institute of Advanced Studies, Bangalore**
Title: Dynamics of complex behaviour in natural systems

Abstract:
The diversity of phenomena we observe in all aspects of our lives and in the physical world around us arise because of the different nonlinear interactions among the numerous constituents of the various systems. Natural systems show complex behaviour across multiple scales -- from the cellular scale to large scales involving ecosystems with several species interacting with each other and with the physical environment. Suitable models can be constructed which mimic a natural system's behaviour and which enable prediction of the system's behaviour in time, in certain parameter regimes. This enables one to exercise a certain control over the system and to steer it into a "desirable" dynamical regime. We discuss in this talk some of the recent work done in our group on some topics including an interesting example of an insect infestation cycle which has been known to occur with a regularity of 8-9 years at high altitudes for centuries, destroying vast areas of forest cover very quickly. We show how our model captures the 8-9 year periodicity of the outbreaks, explaining both the sudden cessation of the pest outbreaks after 1981, as well as the complete absence of the cycles in nearby locales.

Speaker Biography:
Prof. Janaki Balakrishnan heads the Complex Systems Programme at NIAS, Bangalore. She obtained her PhD in Theoretical High Energy Physics from the University of Delhi. She has subsequently worked and published in a wide range of areas covering many diverse areas of physics, ranging from quantum field theory in curved space and theoretical high energy physics to dynamical systems theory and biological physics. She was earlier a faculty member of the School of Physics at the Central University of Hyderabad and has held Visiting and other positions at various places including the Institute of Mathematical Sciences, Chennai, Centre for Artificial Intelligence & Robotics (CAIR), Bangalore, CMMACS, Bangalore, JNCASR, Indian Institute of Science, Raman Research Institute, The University of Newcastle-upon-Tyne, U.K., Max-Planck Institute for Mathematics in the Sciences, Leipzig and the Max-Planck Institute for the Physics of Complex Systems, Dresden, Germany, etc. She is also a Guest Faculty at the Indian Institute of Science.

Date: January 20, 2020

Speaker: **Prof. Payal Arora, Erasmus University Rotterdam, the Netherlands**
Title: Do the next billion users need more innovation? Rethinking AI for the common good

Abstract:
The 21st century is marketed as the age of innovation. Sir John Chisholm, an expert on change management, declares that technology will change "the very future of the human race." Ryan Allis - an angel investor in 25 companies including SpaceX, Elon Musk's Mars project— provides a startup guide to ease us into this new era. All we need to do is reimagine "everything," says Allis. With just "a laptop, a smartphone, and the cloud," we can access any service anytime. While traditional institutions such as the educational system in low- income countries is regarded as a "stunning market failure" according to the likes of Matt Keller, former Director of the Global Learning XPRIZE, the market "success" of new technology will step in and take its place. Smart technology will replace not-so-smart people. Humans, it seems, have become obstacles to their own betterment. Technology entrepreneurs today are busy making all- inclusive, self- contained autonomous apps for the next billion users –majority of whom are outside the West and live in countries with less liberal institutions. Centralized reform is being discarded for personalized solutionism. Automation of self-help is the foundation of the innovation age. This talk will argue against this popular narrative and bring to question this laboratory approach of using the next billion users as the guinea pigs for social progress – and why we have become more forgiving of technological failure than of human failure.

Speaker Biography:
Payal Arora is a digital anthropologist and author, consultant, founder, editor, and professor at Erasmus University Rotterdam. She holds the Chair in Technology, Values, and Global Media Cultures. Her expertise lies in digital media experience and user values among low-income communities worldwide and comes with more than a decade of fieldwork experience in such contexts. She is the author of a number of books including the award-winning 'Leisure Commons' and most recently the "The Next Billion Users" with Harvard Press. Engadget (Top 5 in the 'Technorati top 100' and Times endorsed 'best blogs on tech') stated that her Harvard book is "the most interesting, thought provoking books on science and technology we can find." Forbes named her the "next billion champion" and the right kind of person to reform tech. Several international media outlets have covered her work including The BBC, The Economist, Quartz, Tech Crunch, The Boston Globe, F.A.Z, The Nation and CBC. She has consulted on tech innovation for diverse organizations such as UNESCO, KPMG, GE, and HP and has given more than 170 presentations in 109 cities in 54 countries including a TEDx talk on the future of the internet. She is the founder of Catalyst Lab, a digital activism organization and sits on several boards such as Columbia Univ. Earth Institute and World Women Global Council in New York. She has held Fellow positions at GE, ZEMKI, ITSRio, and NYU and is a Section Editor for Global Perspectives, a new University of California Press journal. She has a Masters in International Policy from Harvard University and a PhD in International and Transcultural Studies from Columbia University.

Date: January 27, 2020

Speaker: **Prof. Amit Chattopadhyay, IIIT Bangalore**
Title: Counting Holes in the Data

Abstract:
Topological Data Analysis is an emerging branch of Data Science where one central idea is counting holes in the data. Holes of different dimensions are considered as powerful features in characterising the data. In this talk, I introduce two classical techniques (algorithms) from computational topology for counting holes in all dimensions. Then we briefly see how life-spans (persistence) of different holes can be captured in a diagram - named persistence diagram or bar-code. In the end, I relate this with one of our recent works towards detecting topological features in time-varying multifield data.

Speaker Biography:
Dr. Amit Chattopadhyay is a faculty at IIIT-B since 2016. He received his PhD degree on "Certified Geometric Computation" from Johann Bernoulli Institute of Mathematics and Computer Science at University of Groningen in the Netherlands. After receiving his PhD he worked as a postdoctoral fellow at Universite Catholique de Louvain in Belgium, University of Leeds in UK and at IISc-Bangalore. His primary research interests is in computational topology, geometric computing, optimization, visualization and data analysis.

Date: February 03, 2020

Speaker: **Prof. Shiva Kumar Malapaka, IIIT Bangalore**
Title: Turbulent Flow Modeling with Focus on (a) Financial Systems, (b) Invariants and Cascades in MHD

Abstract:
This Samvaad talk mainly summarizes two important papers I have read last year and would like to share it with you all. They appear complete unrelated on the first glance but are connected by one important concept in turbulent modeling called 'cascades'.

(a) Verma tries to argue that there are similarities between Turbulence and Financial systems [1]. Using these similarities, concepts from Turbulent cascades are used to model money cascades in financial systems. I will summarize this paper which indeed shows the power of Turbulence flow modeling in other completed unrelated areas.

(b) Pouquet et al. discuss dynamics in turbulent flows mainly arising from (i) kinetic helicity (ii) magnetic helicity and (iii) briefly touch upon cross helicity [2]. In this review article, they not only focus on how helicities shape and some times guide turbulent flows and its structures, but also they focus on the latest papers that are using Machine learning and AI as tools in understanding hitherto unexplored aspects of the turbulent cascades and flows in general. I will try to summarize this paper too, while including some of my own results as examples to prove the points the authors are trying to put forward.

[1] In Hierarchical Financial Structures with Money Cascade , Verma, M.K., 2019, New Perspectives and Challenges in Econophysics and Sociophysics, Abergel, F.,Chakrabarti, B.K.,Chakraborti, A.,Deo, N.,Sharma, K. (Eds.), Springer.
[2] In Helicity dynamics, inverse, and bidirectional cascades in fluid and magnetohydrodynamic turbulence: A brief review, Pouquet, A., Rosenberg, D., Stawarz, J. E., & Marino, R. (2019).. Earth and Space Science, 6, 351–369

Speaker biography:
Dr.Shiva Kumar Malapaka worked for his Ph.D at the Max-Planck Institute for Plasma Physics, Garching, München and got his degree from University of Bayreuth, Bayreuth, Germany, in 2009. His thesis is on ' Simulations of Three Dimensional Magnetohydrodynamic Turbulence', wherein he studied a property known as 'inverse cascade of magnetic helicity'. His postdoctoral experience includes work at the University of Colorado, Boulder, USA, UPMC, Paris, France, University of Leeds, Leeds, UK, TIFR-TCIS, Hyderabad, India, and University of Rome 'Tor Vergata', Rome, Italy. His research interests are principally three dimensional simulations of hydrodynamic and magnetohydrodynamic turbulence, simulations of magnetic confinement of Plasma (ITER) and n-body simulations for planetary formation. These research areas fall into an area called Computational Physics and cover problems in the areas of fundamental physics, astrophysics and mechanical engineering.

Date: February 10, 2020

Speaker: **Prof. Balakrishnan Ashok**
Title: The physics of things: modelling across length scales

Abstract: The physics of various systems is crucially determined by interactions occurring at various scales. The consideration of appropriate length scales is a key factor in determining the dynamical effects that might come into play. We will look at several systems, from the nano & micro-scale -- nanotubes, long-chain macromolecules, DNA & polymers and micro-organisms, to macroscopic systems, and discuss how electrostatic, hydrodynamic and other interactions play a dominant role across scales in their behaviour.

Speaker Biography:
Prof. Balakrishnan Ashok is an Associate Professor at the International Institute of InformationTechnology Bangalore. He obtained his Ph.D. at the University of Massachusetts Amherst. His postdoctoral work was at the Lorentz Institute for Theoretical Physics, Leiden, The Netherlands, and at the Materials Research Centre, I.I.Sc., Bangalore, after which he was a faculty member at the Central University of Hyderabad for some years. He has been at IIIT-B since July, 2012.

His research interests focus on the study of complex systems and soft matter physics and problems in nonlinear dynamics. These include nanotubulation, dynamics of coupled neurons, polymeric systems & flows, bubble dynamics & cavitation, instabilities in nonlinear systems, modelling climate systems using a dynamical systems approach & diverse complex systems.

Date: February 17, 2020

Speaker: **Prof. Jaya Sreevalsan Nair, IIIT Bangalore**
Title: Geometric Signatures of Airborne LiDAR Point Clouds

Abstract:
LiDAR point clouds provide rich geometric information, which is particularly useful for complex scenes of urban regions. However, it is cumbersome to compare two different three-dimensional point clouds, say, of the same region but acquired at different time instances, owing to the changes in data capture, e.g., sampling densities, and the orientation of the flight path in the case of airborne LiDAR. To overcome this difficulty of point cloud comparison, we propose an orientation-invariant geometric signature of the point cloud, using the probabilistic geometric classification of the points. We analyze various aspects of the geometric signature, including incorporating semantic classification in the signature. We further explore the different metrics that quantify aspects of the signature as well as differences between signatures. We can now compare point clouds by comparing their signatures. Our geometric signatures can be compared without performing a point-to-point registration.

The visualization of this signature of the point cloud and its semantic classes (buildings, trees, road, low-vegetation) show a characteristic pattern in the tree class. Thus, we use a case study of airborne LiDAR point clouds where the visualization and quantitative comparative analysis of the geometric signatures of point clouds are useful in demonstrating changes during a thematic event, such as progressive deforestation, in the topography of an urban region. Our analysis of the geometric signatures gives us an insight to the uncertainty in the geometric classification of the point clouds.

Speaker Biography:
Jaya Sreevalsan Nair obtained her Ph.D. in Computer Science from University of California, Davis; after a B.Tech in Aerospace Engineering from IIT-Madras and an M.S. in Computational Engineering from Mississippi State University. Prior to joining IIITB, she worked as a scientific programmer at Enthought Inc. Austin and as a research associate at Texas Advanced Computing Center, the University of Texas at Austin. Her areas of interest are visualization, scientific computing, computer graphics, and computational geometry. She has been working on problems in spatial analytics (multivariate/tensor/network data modeling and visual analytics) with a focus on applications in earth observations (LiDAR point clouds, ocean data), biological networks (genomic, brain), survey data pertaining to population health and public health, and chart image processing, in the last five years. She leads the Graphics-Visualization-Computing Lab at IIITB. She is part of the core team of the E-Health Research Center at IIITB. She is a recipient of the Early Career Research Award from the Science and Engineering Research Board (SERB), Government of India.