



## **2020 IEEE CIS Summer School on**

Emerging Research Trends in Computational  
Intelligence: Theory and Applications  
**November 26-30, 2020**

**Dr. M. Tanveer**

Indian Institute of Technology Indore, India

# Organizing Committee

## General Chair:

M. Tanveer,

Associate Professor and Ramanujan Fellow

Indian Institute of Technology Indore, India

## Honorary Chairs:

- P.N. Suganthan, IEEE Fellow, School of Electrical and Electronic Engineering, NTU Singapore.
- Chin Teng Lin, IEEE Fellow, University of Technology Sydney, Australia.

## Organizing Committee Members:

- Yu-Dong Zhang, Professor, University of Leicester, UK.
- Kal-Lung Hua, Professor, NTUST, Taiwan.
- Imran Razzak, Senior Lecturer, Deakin University, Australia.
- Md. Aquil Khan, Associate Professor, IIT Indore, India.
- Mohd. Arshad, Assistant Professor, IIT Indore, India.
- Sonali Agarwal, Associate Professor, IIIT Alahabad, India.
- T. Hitendra Sarma, Professor and Principal, SRIT, AP, India.
- Akshansh Gupta, Scientist, CSIR CEERI Pilani, India.
- Deepak Gupta, Assistant Professor, NIT AP, India.
- Chandresh Kumar, Assistant Professor, IIT Indore, India.

## Student Organizing Committee:

- Mr. Bharat Richhariya, IIT Indore, India.
- Mr. Mudasir Ahmad Ganaie, IIT Indore, India.
- Mr. Ashraf Haroon Rashid, IIT Indore, India.
- Mr. Ashwani Kumar Malik, IIT Indore, India.
- Mr. M.Tabish, IIT Indore, India.

## **Objectives:**

Computational intelligence (CI) is set to change the world we live in through widespread application in numerous domains like Medical Imaging, Computer Vision, Anomaly Detection, Sequence and Stream Processing, Big Data Processing and so on. The foundation of CI techniques lies in the intermix of Linear algebra, Probability and Statistics, Signal processing, Natural Language Processing, Image and Video Processing. The objective of this summer school is to provide a unique platform for young researchers, professionals, and students from all around the world to learn the recent developments of computational intelligence (CI) methods and its applications. The ultimate goal is to provide an opportunity for young researchers to interact with eminent experts in CI and exchange ideas. This provides a mechanism for them to pursue their own research with full confidence and produce outstanding contributions. The summer school features a large number of keynote speakers, plenary and invited talks on emerging CI methods. This summer school will bring the young researchers working in the area of computational intelligence and their applications to a common platform for generating new research directions.

# Technical program details

## Keynote/Plenary/Invited Talks:

- “Randomization Based Deep and Shallow Learning Methods for Classification” by P. N. Suganthan, NTU Singapore, Singapore.
- “Deep Learning with Small Visual Data” by Kai-Lung Hua, NTUST Taiwan, Taiwan.
- “Emotion Enriched and Personalized Conversational Artificial Intelligence” by Asif Ekbal, IIT Patna, India.
- “Twin Support Vector Regression (SVR) and Its Variants” by M. Tanveer, IIT Indore, India.
- “Brain Computer Interface in Human-Autonomy Teaming” by CT Lin, UTS Australia, Australia.
- “AI and Brain Science”, by Kenji Doya, OIST, Japan.
- “Applications of Machine/Deep Learning in Vision and Imaging ” by R. Balasubramanian, IIT Roorkee, India.
- “Differential Evolution: Population Topologies, Ensemble Strategies and Adaptation” by P. N .Suganthan, NTU Singapore, Singapore.
- “Handwritten Image Recognition in Low-resource Indic Scripts” by Partha Pratim Roy, IIT Roorkee, India.
- “Decomposition Based Multiobjective Evolutionary Algorithms”, by ZHANG Qingfu, CityU Hong Kong, HongKong.
- “Large Scale Twin SVM”, by M. Tanveer, IIT Indore.
- “Learning From Streaming Data ” by Sonali Agarwal, IIIT Allahabad, India.
- “AI in Wild ” by Santanu Chaudhury, IIT Jodhpur, India.

- “Supervised Learning in Spiking Neural Network” by Suresh Sundaram, IISc Bangalore, India.
- “Generative Adversarial Networks and Their Application To Class Imbalanced Learning ” by Swagatam Das, ISI Kolkata, India.
- “Computational Intelligence Methods For COVID-19 Diagnosis ” by Yu-Dong Zhang, University of Leicester, UK.
- “Social Network Analytics: Characteristics, Challenges and Research Directions ” by M. Abulaish, SAU Delhi, India.
- “One class SVM ” by Aruna Tiwari, IIT Indore, India.
- “Minimizing Model Complexity: From SVMs To The MCM Family ” by Jayadeva, IIT Delhi, India.
- “Overview and Trends on Explainable AI” by Mohamed Reda Bouadjenek, Deakin University, Australia.

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meet.google.com/esi-cpos-vgr

M Tanveer is presenting

Domum Karlo and 4 more

8:43 AM

2020 IEEE CIS Summer School on Emerging Research Trends in Computational Intelligence: Theory and Applications

November 26-30, 2020

Inauguration Ceremony

Partners

IEEE BOMBAY SECTION

IEEE HYDERABAD SECTION

Muhammad Abulaish

Mudasir Ahmad Gan...

M Tanveer

Barenya Hazarika

Head - Discipline of ...

Imran Razzak

Priyanshu Priya

Wasi Yazdani

ashwani (2020-11...html)

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08:43 26-11-2020

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meet.google.com/esi-cpos-vgr

M Tanveer is presenting

Nikhilanand Arya and 22 more

8:58 AM

## Organizing Committee

### Honorary Chairs

P.N. Suganthan, IEEE Fellow  
School of Electrical & Electronic Engineering, NTU Singapore

Chin Teng Lin, IEEE Fellow  
University of Technology Sydney, Australia

Mudasir Ahmad Ga...

M Tanveer

Gajendra Kumar M...

M Tanveer

UMME HONEY S

Priyanshu Priya

Barenya Hazarika

Md. Aquil Khan

Director IIT

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08:58 26-11-2020

# Randomization Based Deep and Shallow Learning Methods for Classification and

## Differential Evolution: Population Topologies, Ensemble Strategies and Adaptation



### **P N. Suganthan, IEEE Fellow**

Associate Professor

Affiliation: School of Electrical and Electronic Engineering,  
Nanyang Technological University, Singapore.

P. N. Suganthan received the B.A degree and M.A degree in Electrical and Information Engineering from the University of Cambridge, UK in 1990 and 1994, respectively. He received an honorary doctorate (i.e. Doctor Honoris Causa) in 2020 from University of Maribor, Slovenia. After completing his PhD research in 1995, he served as a pre-doctoral Research Assistant in the Dept of Electrical Engineering, University of Sydney in 1995–96 and a lecturer in the Dept of Computer Science and Electrical Engineering, University of Queensland in 1996–99. He moved to Singapore in 1999. He is/was an Editorial Board Member of the Evolutionary Computation Journal, MIT Press (2013-2018). He is/was an associate editor of the Applied Soft Computing (Elsevier, 2018-), Neurocomputing (Elsevier, 2018-), IEEE Trans on Cybernetics (2012 - 2018), IEEE Trans on Evolutionary Computation (2005 - ), Information Sciences (Elsevier) (2009 - ), Pattern Recognition (Elsevier) (2001 - ) and Int. J. of Swarm Intelligence Research (2009 - ) Journals. He is a founding co-editor-in-chief of Swarm and Evolutionary Computation (2010 - ), an SCI Indexed Elsevier Journal. He was selected as one of the highly cited researchers by Thomson Reuters yearly from 2015 to 2020 in computer science. He served as the General Chair of the IEEE SSCI 2013. He has been a member of the IEEE (S'90, M'92, SM'00, F'15) since 1991 and an elected AdCom member of the IEEE Computational Intelligence Society (CIS) in 2014-2016. He is an IEEE CIS distinguished lecturer (DLP) in 2018-2021.

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S Suganthan is presenting

Mohammad Tab... and 50 more

9:42 AM

**Randomization Based Shallow and Deep Neural Networks, Oblique Random Forest, and Kernel Ridge Regression**

Dr P. N. Suganthan [epnsugan@ntu.edu.sg](mailto:epnsugan@ntu.edu.sg)  
 School of EEE, NTU, Singapore  
<https://www3.ntu.edu.sg/home/epnsugan/>

Some Software Resources Available from:  
<https://github.com/P-N-Suganthan>

2020 IEEE Computational Intelligence Society Summer School  
 IIT Indore, India  
**26 November 2020**

Suganthan, M Tanveer, Sunitt Shantanu Dig..., Domum Karlo, sanjay kumar, Maryam..., Arshi Zameer, Priyanshu Priya, Arun Kumar

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Search Secure Search

S Suganthan is presenting

Shiwangi Mishra and 45 more

3:42 PM

**Differential Evolution with ensemble and topologies for Numerical Optimization**

Dr. P. N. Suganthan, EEE, NTU, Singapore

Some Software Resources Available from:  
<https://github.com/P-N-Suganthan>  
[epnsugan@ntu.edu.sg](mailto:epnsugan@ntu.edu.sg)

2020 IEEE Computational Intelligence Society Summer School  
 IIT Indore, India  
**27 November 2020**

Suganthan, Aruna Tiwari, M Tanveer, sanjay kumar, M Tanveer, Sonali Agarwal

Bharat Richhariya Visible  
 Shiwangi Mishra visible

Meeting details

Raise hand, Turn on captions, Suganthan is presenting

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## Deep Learning with Small Visual Data



### **Kai-Lung Hua**

Professor

Director, Artificial Intelligence Research Center

Affiliation: Department of Computer Science and Information Engineering, National Taiwan University of Science and Technology, Taiwan.

Kai-Lung Hua received the B.S. degree in electrical engineering from National Tsing Hua University in 2000, and the M.S. degree in communication engineering from National Chiao Tung University in 2002, both in Hsinchu, Taiwan. He received the Ph.D. degree from the School of Electrical and Computer Engineering, Purdue University, West Lafayette, IN, in 2010. Since 2010, Dr. Hua has been with National Taiwan University of Science and Technology, where he is currently a professor in the Department of Computer Science and Information Engineering. He is a member of Eta Kappa Nu and Phi Tau Phi, as well as a recipient of MediaTek Doctoral Fellowship. His current research interests include digital image and video processing, computer vision, and machine learning. He has received several research awards, including 2019 Outstanding Research Award of Taiwan Tech, 2018 Young Scholar Award of Taiwan Tech, Top Performance Award of 2017 ACM Multimedia Grand Challenges, Top 10% Paper Award of 2015 IEEE International Workshop on Multimedia Signal Processing, the Second Award of the 2014 ACM Multimedia Grand Challenge, the Best Paper Award of the 2013 IEEE International Symposium on Consumer Electronics, and the Best Poster Paper Award of the 2012 International Conference on 3D Systems and Applications.

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Kai-Lung Hua is presenting Dr. Deepak Gupta and 27 more

# Deep Learning with Small Visual Data

Kai-Lung Hua  
Vice Dean, College of Electrical Engineering and Computer Science  
Director, Artificial Intelligence Research Center  
Professor, Department of CSIE  
National Taiwan University of Science and Technology

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Kai-Lung Hua is presenting Arun Kumar and 44 more

A global legal standard for Artificial Intelligence? The European Parliament proposes legislation

Macfarlanes LLP

## Egypt: Egypt issues new data protection law

After several years of debate, the Egyptian government has introduced the Republic's first standalone data protection law to regulate and protect citizens' data online. The provisions under the new Law are modeled on the EU General Data Protection Regulation (GDPR) and the Law adopts similar concepts and definitions. It is hoped that the new Law will help Egypt invest by increasing consumer confidence in electronic data processing and setting clear parameters for companies to capitalize on the growth of the digital economy.

**A data disaster is approaching, and most businesses aren't ready for it**

CSO UNITED

NEWS ANALYSIS Data transfers from the EU to the UK might be unlawful in as soon as two months, but legal advisers and business owners are still in limbo when it comes to best practices.

### Passage of California privacy act could spur similar new regulations in other states

Voters approved the California Privacy Rights and Enforcement Act (CPRA), which in part limits how organizations can use personal data. Legal experts expect other states to follow suit.

M Tanveer Kai-Lung Hua  
Gajendra Kumar M... sanjay kumar  
Nikhil Aryan Aruna Tiwari  
M Tanveer SHIRISHA K  
Subhash Oruganti

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## Emotion Enriched and Personalized Conversational Artificial Intelligence



### **Asif Ekbal**

Associate Professor

Affiliation: Department of Computer Science & Engineering  
Indian Institute of Technology Patna, Bihar, India.

Asif Ekbal is currently an Associate Professor in the Department of Computer Science and Engineering, IIT Patna. He has been pursuing research in Natural Language Processing (NLP), Information Extraction, Text Mining and Machine Learning (ML) for the last 12 years. Asif has been involved in several sponsored research projects in the broad areas of Natural Language Processing, Artificial Intelligence and Machine Learning technologies, funded by the different private agencies, such as Elsevier, Accenture, ezDI, LG, Skymap, Samsung Research, Wipro, Flipkart; and Govt. agencies such as MeITY, Govt. of India, MHRD, Govt. of India, and SERB, Govt. of India etc. He has been serving as an Area Chair, PC member and as a Reviewer to several well-known conferences: He is the Associate Editor of Sadhana, Springer; Springer Nature Computer Science, Springer; and Machine Translation, Springer. He is the recipient of "Best Innovative Project Award from the Indian National Academy of Engineering", Govt. of India, "JSPS Invitation Fellowship" from Govt of Japan and "Young Faculty Research Fellowship Award" of the Govt. of India.

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meet.google.com/ory-zvwb-nqs

Asif Ekbal is presenting

PREM SHANKER YA... and 56 more

11:27 AM

## Towards building an Empathetic Conversational System

Asif Ekbal  
 AI-NLP-ML Research Group  
 Department of Computer Science and Engineering  
 IIT Patna, Patna, India  
 Email: [asif.ekbal@gmail.com](mailto:asif.ekbal@gmail.com), [asif@iitp.ac.in](mailto:asif@iitp.ac.in)

IEEE CIS Summer School 2020  
**November 26, 2020**



Acknowledgements: Deeksha

Asif Ekbal, M Tanveer, Suganthan, pravesh bansal, Goldbrunet R, Maryam..., Akshay Anand, Sunitt Shantanu Dig..., md imran

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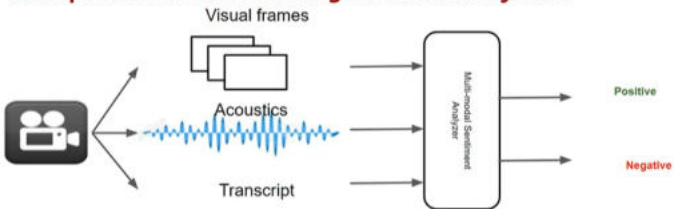
Asif Ekbal is presenting

Gayas Ahmad and 48 more

12:16 PM

## Let us see how multimodal sentiment analysis helps!

- Aims to leverage the varieties of (often distinct) information from multiple sources for building an efficient system



Utterance	Affect	Text	Acoustic	Visual
Thanks for putting me on hold! I have all the time in the world.	Sentiment (Negative)	-	Intensity, Pitch, Tone etc.	Facial expression, eyes movement etc.

Slide 46

Arshi Zameer

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## Twin Support Vector Regression (SVR) and Its Variants



### **M. Tanveer**

Associate Professor and Ramanujan Fellow  
Affiliation: Department of Mathematics,  
Indian Institute of Technology Indore, Indore, India.

M. Tanveer is Associate Professor and Ramanujan Fellow at the Department of Mathematics of the Indian Institute of Technology Indore. Prior to that, he worked as a Postdoctoral Research Fellow at the Rolls-Royce@NTU Corporate Lab of the Nanyang Technological University, Singapore. He received the Ph.D degree in Computer Science from the Jawaharlal Nehru University, New Delhi, India. Prior to that, he received the M.Phil degree in Mathematics from Aligarh Muslim University, Aligarh, India. His research interests include support vector machines, optimization, machine learning, deep learning, applications to Alzheimer's disease and dementias, biomedical signal processing. He has published over 70 refereed journal papers of international repute. His publications have around 1550 citations with h index 23 (Google Scholar, August 2021). Recently, he has been listed in the world's top 2% scientists in the study carried out by Stanford University, USA. He has served on review boards for more than 100 scientific journals and served for scientific committees of various national and international conferences. He is the recipient of the 2017 SERB-Early Career Research Award in Engineering Sciences and the only recipient of 2016 DST-Ramanujan Fellowship in Mathematical Sciences which are the prestigious awards of INDIA at early career level. He is/was an Associate Editor/Guest Editor in several journals including International Journal of Machine Learning and Cybernetics, Springer, ACM Transactions of Multimedia (TOMM), Applied Soft Computing, Elsevier, IEEE Transactions on Emerging Topics in Computational Intelligence, Frontiers in Applied Mathematics and Statistics, Applied Intelligence, Springer, Multimedia Tools and Applications, Springer. He has also co-edited one book in Springer on machine intelligence and signal analysis. He has organized many international/national conferences/symposiums/workshops as General Chair/Organizing Chair/Coordinator, and delivered talks as Keynote/Plenary/invited speaker in many international conferences and Symposiums. He has organized several special sessions in top-ranked conferences including WCCI, IJCNN, IEEE SMC, IEEE SSCI, ICONIP. Amongst other distinguished, international conference chairing roles, he is the General Chair for 29th International Conference on Neural Information Processing (ICONIP2022) (the world's largest and top technical event in Computational Intelligence). Tanveer is currently the Principal Investigator (PI) or Co-PI of 08 major research projects funded by the Government of India including DST, SERB, CSIR, MHRD-SPARC, NSM-IISc.

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M M Tanveer is presenting Akshay Anand... and 20 more 3:41 PM You

Twin SVR and its variants

Dr. M. Tanveer

SVR  
TSVR  
RKNMWTSSVR  
References

## Twin SVR and its variants

Dr. M. Tanveer

Associate Professor and Ramanujan Fellow  
OPTimization for MACHine Learning (OPTIMAL) Research Lab  
Indian Institute of Technology Indore  
Email: mtanveer@iiti.ac.in

26.11.2020

M M Tanveer

M M Tanveer

D Drishti 190089

pravesh bansal

S Subhash Oruganti

Onkar Singh

Subhash Oruganti

Priyanshu Priya

Sahil Bansal

R Ravi Kumar

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M M Tanveer is presenting Sulekh Sharma and 34 more 3:50 PM You

## Support Vector Regression

- Find a function,  $f(x)$ , with at most  $\epsilon$ -deviation from the target  $y$

The problem can be written as a convex optimization problem

$$\min \frac{1}{2} \|w\|^2$$

s.t.  $y_i - w_1 \cdot x_i - b \leq \epsilon;$   
 $w_1 \cdot x_i + b - y_i \leq \epsilon;$

C: trade off the complexity

What if the problem is not feasible?  
 We can introduce slack variables (similar to soft margin loss function).

$w \cdot x_i + b - y_i \leq \epsilon$

$y_i - w_1 \cdot x_i - b \leq \epsilon$

M M Tanveer

M M Tanveer

D Drishti 190089

pravesh bansal

Onkar Singh

kanchan jha

Manohar Reddy

Priyanshu Priya

sanjay kumar

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## Brain Computer Interface in Human-Autonomy Teaming



### **Chin-Teng Lin, IEEE Fellow**

Distinguished Professor and Co-Director

Affiliation: Faculty of Engineering and Information  
Technology, Centre for Artificial Intelligence,  
University of Technology Sydney, Sydney, Australia.

Chin-Teng Lin received a Bachelor's of Science from National Chiao-Tung University (NCTU), Taiwan in 1986, and holds Master's and PhD degrees in Electrical Engineering from Purdue University, USA, received in 1989 and 1992, respectively. He is currently a professor and Co-Director of the Australian Artificial Intelligence Institute within the Faculty of Engineering and Information Technology at the University of Technology Sydney, Australia. He is also an Honorary Chair Professor of Electrical and Computer Engineering at NCTU, a member of the International Faculty of the University of California at San-Diego (UCSD), and an Honorary Professor with the University of Nottingham. For his contributions to biologically inspired information systems, Prof Lin was awarded Fellowship with the IEEE in 2005, and with the International Fuzzy Systems Association (IFSA) in 2012. He received the IEEE Fuzzy Systems Pioneer Award in 2017. He has held notable positions as editor-in-chief of IEEE Transactions on Fuzzy Systems from 2011 to 2016; Chair of the IEEE Taipei Section (2009-2010); Distinguished Lecturer with the IEEE CAS Society (2003-2005) and the CIS Society (2015-2017); Chair of the IEEE CIS Distinguished Lecturer Program Committee (2018-2019); Deputy Editor-in-Chief of IEEE Transactions on Circuits and Systems-II (2006-2008); Program Chair of the IEEE International Conference on Systems, Man, and Cybernetics (2005); and General Chair of the 2011 IEEE International Conference on Fuzzy Systems. Prof Lin is the co-author of *Neural Fuzzy Systems* (Prentice-Hall) and the author of *Neural Fuzzy Control Systems with Structure and Parameter Learning* (World Scientific). He has published more than 356 journal papers including over 160 IEEE journal papers in the areas of neural networks, fuzzy systems, brain-computer interface, multimedia information processing, and cognitive neuro-engineering, that have been cited more than 27,000 times.

Computer and Information Tech... Gentle Reminder | Inaugural Cer... Meet - asj-fjrc-wug Sign in - Google Accounts

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Chin-Teng Lin is presenting Yusra Saeed and 50 more 10:02 AM

### Covert State Transition Diagram (COTSD)

- To understand the **state change**, a state transition diagram is developed, allowing **visualization of connectivity patterns** between every pair of states.
- We compute the **transition probability** between every pair of states to represent **the relationships between the states**.
- This state transition helps the understanding of **machine and human performance** so that we can build a **stable BCI-HAT systems**.

Information  
You just plugged a device into the audio jack.

10:02 AM 11/27/2020

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Chin-Teng Lin is presenting Purushottam Gan... and 53 more 10:53 AM

### Experiment

#### Dual-task Driving

- The experiment was designed in a driving simulator on a dynamic 6-degree-of-freedom motion platform with 360° driving scenes rendered on the seven LCD projectors.
- The experiment includes two tasks: a driving task and a mathematical problem-solving task.
- For the driving task, participants are asked to keep the car on the lane. For the mathematical problem-solving task, the participants need to verify a two-digit addition equation (i.e., whether the equation is correct or incorrect) displayed on the front screen when the event comes on.

Answering buttons [correct/incorrect]

Virtual-reality driving simulator for dual-task driving experiment.

Even on-well during the driving.

Karuna Middha has left the meeting

10:53 AM 11/27/2020



## Artificial Intelligence (AI) and Brain Science



**KENJI DOYA**

Professor

Affiliation: Okinawa Institute of Science and Technology  
Graduate University, Okinawa, Japan

KENJI DOYA is a Professor at Neural Computation Unit, Okinawa Institute of Science and Technology Graduate University. He took BS in 1984, MS in 1986, and Ph.D. in 1991 at U. Tokyo. He became a research associate at U. Tokyo in 1986, U. C. San Diego in 1991, and Salk Institute in 1993. He joined Advanced Telecommunications Research International (ATR) in 1994 and became the head of Computational Neurobiology Department, ATR Computational Neuroscience Laboratories in 2003. In 2004, he was appointed as the Principal Investigator of Neural Computation Unit, Okinawa Institute of Science and Technology (OIST) and started the Okinawa Computational Neuroscience Course (OCNC) as the chief organizer. As OIST established itself as a graduate university in 2011, he became a Professor and served as the Vice Provost for Research till 2014. He serves as the Co-Editor in Chief of Neural Networks since 2008 and a board member of Japanese Neural Network Society (JNNS) and Japan Neuroscience Society (JNSS). He served as the Program Co-Chair of the International Conference on Neural Information Processing (ICONIP) in 2007 and 2016, the Program Chair of the JNSS meeting in 2010, and the General Chair of the JNSS meeting in 2011 and 2018. He received Tsukahara Award and JSPS Award in 2007, MEXT Prize for Science and Technology in 2012, INNS Donald O. Hebb Award in 2018, JNSS Academic Award, APNNS Outstanding Achievement Award, and the age-group 2nd place at Ironman Taiwan in 2019. He is interested in understanding the functions of basal ganglia and the cortical circuit based on the theory of reinforcement learning and Bayesian inference.

Meeting interface showing a presentation slide titled "2020 IEEE CIS Summer School, IIT Indore, Nov. 27, 2020" and "AI and Brain Science". The presenter is Kenji Doya. The slide content includes:

OIST  
 Kenji Doya [doya@oist.jp](mailto:doya@oist.jp)  
 Neural Computation Unit [groups.oist.jp/ncu](http://groups.oist.jp/ncu)  
 Okinawa Institute of Science and Technology Graduate University

Meeting controls: Raise hand, Turn on captions, Kenji Doya is presenting.

Participant list:

- Bharat Richhariya
- M Tanveer
- Durgesh choudhary
- pravesh bansal
- RAM KUMAR
- Sunitt Shantanu Dig...

Meeting interface showing a presentation slide titled "Coevolution in Pattern Recognition". The slide compares Brain Science and Artificial Intelligence.

**Brain Science**

- Feature detectors (Hubel & Wiesel 1959)
- Experience dependence (Blakemore & Cooper 1970)
- Place cell (O'Keefe 1976)
- Face cell (Bruce, Desimone, Gross 1981)

**Artificial Intelligence**

- Perceptron (Rosenblatt 1962)
- Multi-layer learning (Amari, 1967)
- Neocognitron (Fukushima 1980)
- ConvNet (Krizhevsky, Sutskever, Hinton, 2012)
- GoogleBrain (2012)

Meeting controls: Raise hand, Turn on captions, Kenji Doya is presenting.

Participant list:

- Bharat Richhariya
- M Tanveer
- Durgesh choudhary
- pravesh bansal
- RAM KUMAR
- Sunitt Shantanu Dig...

## Applications of Machine/Deep Learning in Vision and Imaging



### **Balasubramanian Raman**

Professor and Joint Faculty

Affiliation: Department of Computer Science and Engineering, Centre for Artificial Intelligence and Data Science, Indian Institute of Technology Roorkee, Roorkee, India

Balasubramanian Raman is a Professor in the Department of Computer Science and Engineering at Indian Institute of Technology Roorkee since December 2018. He was an Associate Professor in the Department of Computer Science and Engineering from September 2013 to December 2018. He had been with the Department of Mathematics, Indian Institute of Technology Roorkee from September 2004 to September 2013, where he was an Associate Professor and head of the Computer Vision, Graphics and Image Processing Laboratory. He was a Visiting Professor and a member of the Computer Vision and Sensing Systems Laboratory in the Department of Electrical and Computer Engineering at University of Windsor, CANADA during May - August 2009. He was a Lecturer of Computer Science and Information Systems at Birla Institute of Technology and Science, Pilani, India in 2003-04. He was a Postdoctoral Associate in the Department of Electrical and Computer Engineering (ECE), and a member of the Visualization Research laboratory (VIZ Lab), at Rutgers, The State University of New Jersey, USA from July 2002 to April 2003. He was also a Post Doctoral fellow in the Department of Computer Engineering and Computer Science (now the Department of Computer Science, CS), and member of the Computational Intelligence Research Laboratory (CIRL), at University of Missouri-Columbia (MU), Missouri, USA, from October 2001 to June 2002. He received his Ph.D. in Mathematics (2001) from Indian Institute of Technology Madras, India. He is the recipient of BOYSCAST fellowship (awarded by DST, India). He is a member of Sakura Science Club, JAPAN. He is a senior member of IEEE Society and acted as a Joint Secretary of the executive committee in the IEEE Uttarakhand Sub-section from July 2011 to March 2013. He was a secretary of the executive committee in the IEEE Uttarakhand Sub-section from April 2013 to January 2018.

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Balasubramanian Raman is presenting Arun Kumar and 28 more 2:10 PM You

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Applications of Machine/Deep Learning in Vision & Imaging

Dr. R. Balasubramanian  
Professor  
Department of Computer Science and Engineering  
Indian Institute of Technology Roorkee  
Roorkee 247 667  
bala@cs.itrac.in

Meeting details

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Balasubramanian Raman is presenting Shiwangi Mishra and 35 more 2:38 PM You

Human Action Recognition

$i^{th}$  frame  
 $f(x, y)$   
 $L \rightarrow (255, 0, 0)$

$(i+1)^{th}$  frame  
 $(0, 255, 0)$

Meeting details

Type here to search

## Handwritten Image Recognition in Low-resource Indic Scripts



### **Partha Pratim Roy**

Associate Professor

Affiliation: Department of Computer Science and Engineering, Indian Institute of Technology Roorkee Roorkee, India

Partha Pratim Roy is an Associate Professor in the Department of Computer Science and Engineering, IIT Roorkee, India. Dr. Roy completed his MS and PhD from Universitat Autònoma de Barcelona, Spain. He was with Synchronmedia Lab, Canada, in 2013 and RFAI Lab, France, during 2011-2012 as a postdoctoral research fellow. Dr. Roy worked in TATA Consultancy Services during 2003-2005 and Advanced Technology Group, Samsung Research Institute Noida, India, during 2013-2014. His research interests are Pattern Recognition, Human Computer Interaction, Bio-Signal Analysis, Multilingual Text Recognition. He has published more than 225 papers in international journals and conferences. Dr. Roy is an Associate Editor of IET Image Processing, IET Biometrics, IEICE Transactions on Information and Systems, Springer Nature Computer Science. He is Regional Editor of The Journal of Multimedia and Information System, and Guest Editor of International Journal of Distributed Sensor Networks.

Computer and Information Te... x Gentle Reminder | Inaugural C... x Meet - ckh-rknx-jqx x IEEE CIS Summer School 2020 x CIS-Summer\_School\_Program x + -

meet.google.com/ckh-rknx-jqx

Partha Pratim Roy is presenting

Sahithi Akshinth... and 12 more

9:54 AM

## Application of Handwriting Recognition Systems

Reading aid for the blind

Bank check processing

Leavers critics

CAPTCHA (Completely automated public Turing test to tell computers and human apart)

Postal mail sorting

Mobile OCR (Translations between scripts)

Online Signature

Meeting details

Partha Pratim Roy is presenting

Type here to search

09:54 28-11-2020

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Partha Pratim Roy is presenting

Bharat Richhariya and 19 more

10:57 AM

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

# Thank You

PARIMAL Lab <http://parimal.iitr.ac.in/>  
email: partha@cs.iitr.ac.in

Meeting details

Partha Pratim Roy is presenting

Type here to search

10:57 28-11-2020

## Decomposition Based Multiobjective Evolutionary Algorithms



**ZHANG Qingfu, IEEE Fellow**

Chair Professor of Computational Intelligence  
Affiliation: Department of Computer Science,  
City University of Hong Kong, Hong kong

Qingfu Zhang is Chair Professor of Computational Intelligence at the Department of Computer Science, City University of Hong Kong. His main research interests include evolutionary computation, optimization, neural networks, data analysis, and their applications. Professor Zhang is an Associate Editor of the IEEE Transactions on Evolutionary Computation and the IEEE Transactions Cybernetics. MOEA/D, a multiobjective optimization algorithm developed by him and his students, is one of the two most used multiobjective optimization framework. He was awarded the 2010 IEEE Transactions on Evolutionary Computation Outstanding Paper Award. He has been in the list of SCI highly cited researchers for five consecutive years, from 2016 to 2020. He is an IEEE fellow.

Computer and Information Te... Gentle Reminder | Inaugural C... Meet - ckh-rknx-jqx IEEE CIS Summer School 2020 CIS-Summer\_School\_Program

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Qingfu Zhang is presenting akshayanand 30... and 14 more 11:12 AM



香港城市大學  
City University of Hong Kong  
專業 創新 國際  
Professional - Creative  
For The World

## Decomposition Based Multiobjective Evolutionary Optimization

Qingfu Zhang  
Chair Professor, FIEEE  
Department of Computer Science  
City University of Hong Kong

Meeting details

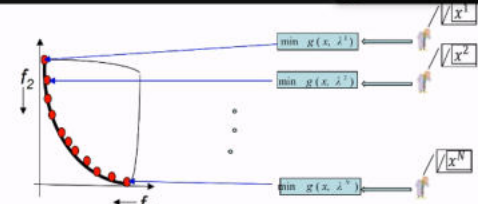
Windows taskbar: Type here to search, 11:12 28-11-2020

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meet.google.com/ckh-rknx-jqx

Qingfu Zhang is presenting M Shahid and 14 more 11:51 AM

*Decomposition, Neighborhood, Memory*



At each generation, each agent does the following:

- Mating selection:** obtain the current solutions of some neighbours (collaboration).
- Reproduction:** generate a new solution by applying *reproduction operators* on its own solution and borrowed solutions.
- Replacement:**

Windows taskbar: Type here to search, 11:51 28-11-2020



## Learning From Streaming Data



### **Sonali Agarwal**

Associate Professor

Affiliation: Department of Information Technology,  
Indian Institute of Information Technology (IIIT), Allahabad,  
India

Sonali Agarwal is working as an Associate Professor in the Information Technology Department of Indian Institute of Information Technology (IIIT), Allahabad, India. She received her Ph. D. Degree at IIIT Allahabad and joined as faculty at IIIT Allahabad, where she is teaching since October 2009. She holds Bachelor of Engineering (B.E.) degree in Electrical Engineering from Bhilai Institute of Technology, Bhilai, (C.G.) India and Masters of Engineering (M.E.) degree in Computer Science from Motilal Nehru National Institute of Technology (MNNIT), Allahabad, India Her main research interests are in the areas of Big Data, Big Data Mining, Complex Event Processing System, Support Vector Machines, Stream Analytics and Software Engineering. She has focused in the last few years on the research issues in Data Mining application especially in Big Data, Stream Computing and smart cities. She has completed her Masters Thesis work at Liverpool John Moores University (LJMU), Liverpool, U.K. during November 1999 to February 2000 under Indo-UK REC Project, a collaboration in between School of Computing & Mathematical Science, LJMU Liverpool UK and Motilal Nehru National Institute of Technology, Allahabad. She has also taken part in Indo Swiss Joint Research Program (ISJRP) and full financial support was awarded to carry out joint research work and to gain knowledge regarding the recent research and experimental facility/work at EPFL, Switzerland, from December 2011 to January 2012. She has also been a member of IEEE, ACM, CSI and Supervising five Ph.D. Scholars and several graduate and undergraduate students in Big Data Mining and Stream Analytics domain.

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meet.google.com/ckh-rknx-jqx

Sonali Agarwal is presenting

DIPANJYOTI PA... and 11 more

2:09 PM

Stop sharing

## Learning from Streaming Data

Speaker  
**Dr. Sonali Agarwal**  
 Associate Professor  
 Department of IT

Meeting details

Raise hand Turn on captions Sonali Agarwal is presenting

Type here to search

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Sonali Agarwal is presenting

DIPANJYOTI PA... and 13 more

2:14 PM

Stop sharing

## Big Data is the next Natural Resource

Big Data is the next Natural Resource

"We have for the first time an economy based on a key resource (Information) that is not only renewable, but self-generating. Running out of it is not a problem, but drowning in it is."  
 — John Naisbit

Cost efficiently processing the growing **Volume**

Responding to the increasing **Velocity**

Collectively analyzing the broadening **Variety**

Establishing the **Veracity** of big data sources

1 in 3 business leaders don't trust the information they use to make decisions

Harvesting any resource requires Mining, Refining and Delivering

Meeting details

Raise hand Turn on captions Sonali Agarwal is presenting

Type here to search

## Artificial Intelligence (AI) in Wild



### **Santanu Chaudhury, FINAE, FNASc**

Professor and Director

Affiliation: Indian Institute of Technology Jodhpur, India

Santanu Chaudhury, Professor, Department of Electrical Engineering, IIT Delhi, has assumed charge as Director, IIT Jodhpur, on 10 December 2018. Professor Chaudhury holds B.Tech. (Electronics and Electrical Communication Engineering) and Ph.D. (Computer Science & Engineering) Degrees from IIT Kharagpur. Professor Chaudhury joined as Faculty Member in the Department of Electrical Engineering, IIT Delhi, in 1992. He was Dean, Under-Graduate Studies at IIT Delhi. He has served as Director of CSIR-CEERI, Pilani, during 2016-18. Professor Chaudhury is a recipient of the Distinguished Alumnus Award from IIT Kharagpur. Professor Chaudhury is a Fellow of the Indian National Academy of Engineers (INAE) and the National Academy of Sciences (NAS). He is a Fellow of the International Association of Pattern Recognition (IAPR). He was awarded the INSA (Indian National Science Academy) Medal for Young Scientists in 1993. He received the ACCS-CDAC award for his research contributions in 2012. A keen researcher and a thorough academic, Professor Chaudhury has about 300 publications in peer-reviewed journals and conference proceedings, 15 patents, and 4 authored/edited books to his credit.

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Santanu Chaudhury is presenting

Sanjay Kumar Sonbh... and 18 more

3:42 PM

Santanu Chaudhury

M Tanveer

Aruna Tiwari

Sunitt Shantanu Dig...

AKSHANSHI GUPTA

Gajendra Kumar M...

Dr. Deepak Gupta

Sreeparna Das

# AI for Real World

Santanu Chaudhury  
IIT Jodhpur

Meeting details ^

Raise hand Turn on captions Santanu Chaudhury is presenting

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15:42 28-11-2020

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meet.google.com/ckh-rknx-jqx

Santanu Chaudhury is presenting

Pritesh Sahani and 26 more

4:46 PM

Santanu Chaudhury

M Tanveer

Aruna Tiwari

Sunitt Shantanu Dig...

M Tanveer

Gajendra Kumar M...

Dr. Deepak Gupta

Preeti Jha

## Classification Problem

Classifier learned can provide wrong classification due to non-stationarity of the data.

Non stationary learning requires dynamic and adaptive way that can track the occurring changes and model is adapted to accommodate those changes accordingly.

$p_t$

$(x_t, y_t)$  are i.i.d.

Concept drift

$x$

$t$

class 1  
class 2

Meeting details ^

Raise hand Turn on captions Santanu Chaudhury is presenting

Type here to search

16:46 28-11-2020

## Supervised Learning in Spiking Neural Network



**Suresh Sundaram**

Associate Professor

Affiliation: Department of Aerospace,  
Indian Institute of Science, Bangalore, India

Suresh Sundaram is currently an Associate Professor with the department of Aerospace, Indian Institute of Science, Bangalore, India. He has been an Associate Professor with the School of Computer Science and Engineering, Nanyang Technological University, Singapore, from Jan 2016-Oct 2018. He has been a visiting professor at Korea University, Seoul, South Korea from Aug 2008- Dec 2008. He has been a postdoctoral fellow in the school of electrical and electronics engineering, Nanyang Technological University, Singapore, from July 2005-July 2007. His research interests are Intelligent flight control system, Autonomous system, Machine learning and AI and many more. He has more than 300 hundred publications in reputed journals such as Information science, Neurocomputing, Neural Network, IEEE transactions on Neural Networks and learning systems and many more.

Meeting - air-esp-cj

meet.google.com/ksr-esp-cj

Suresh Sundaram is presenting

Sunilbhar Jain and 1 more


9:35 AM

1

CIS Winter School - 2020

# SUPERVISED LEARNING IN SPIKING NEURAL NETWORKS

SUNDARAM SURESH  
ASSOCIATE PROFESSOR  
ARTIFICIAL INTELLIGENCE AND ROBOTICS LABORATORY  
HEAD OF WIPRO-IISC RESEARCH NETWORK (WIRIN)  
FELLOW PROFESSOR IN ARTPARK  
DEPARTMENT OF AEROSPACE ENGINEERING  
INDIAN INSTITUTE OF SCIENCE – BANGALORE -12  
EMAIL: vssuresh@iisc.ac.in



Meeting details

Search

9:35 29-11-2020

Meeting - air-esp-cj

meet.google.com/ksr-esp-cj

Suresh Sundaram is presenting

sanjay kumar and 27 more

10:05 AM

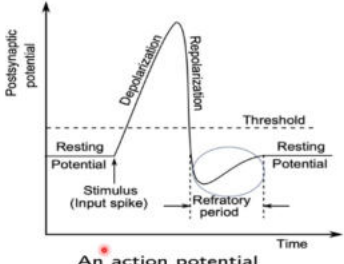
14

## Background – Action Potential

**States of Action Potential**

- ❑ **Resting State:** Post Synaptic Potential (PSP) value in the absence of any stimulus
- ❑ **Depolarization:** PSP increase due to presence of stimulus
- ❑ **Repolarization:** PSP will be reset after a spike
- ❑ **Refractory Period:** Time duration in which the PSP remains lower than the resting potential

**Typical Action Potential**



An action potential

Department of Aerospace Engineering | Spiking Neural Network | Artificial Intelligence and Robotics Laboratory

Search

10:05 29-11-2020

## Generative Adversarial Networks and Their Application To Class Imbalanced Learning



### **Swagatam Das**

Associate Professor

Affiliation: Electronics and Communication Sciences Unit,  
Indian Statistical Institute, Kolkata, India

Swagatam Das received the B. E. Tel. E., M. E. Tel. E (Control Engineering specialization) and Ph. D. degrees, all from Jadavpur University, India, in 2003, 2005, and 2009 respectively. Swagatam Das is currently serving as an associate professor at the Electronics and Communication Sciences Unit of the Indian Statistical Institute, Kolkata, India. His research interests include evolutionary computing, pattern recognition, multi-agent systems, and wireless communication. Dr. Das has published more than 300 research articles in peer-reviewed journals and international conferences. He has also served as or is serving as the associate editors of the IEEE Transactions on Cybernetics, Pattern Recognition (Elsevier), Neurocomputing (Elsevier), Information Sciences (Elsevier), IEEE Trans. on Systems, Man, and Cybernetics: Systems, and so on. He is an editorial board member of Information Fusion (Elsevier), Progress in Artificial Intelligence (Springer), Applied Soft Computing (Elsevier), Engineering Applications of Artificial Intelligence (Elsevier), and Artificial Intelligence Review (Springer). He is the recipient of the 2012 Young Engineer Award from the Indian National Academy of Engineering (INAE). He is also the recipient of the 2015 Thomson Reuters Research Excellence India Citation Award as the highest cited researcher from India in Engineering and Computer Science category between 2010 to 2014.

Swagatam Das is presenting

KBRJ\_GAN\_talk\_2020\_updated2 - PowerPoint (Product Activation failed)

### Training Cycle of GANs:

The method of training involves the following:

- Sample a mini-batch of **training images  $x$**  and **generator codes  $z$** .
- Updating  $G$  and  $D$  using backpropagation

Three situations of the training cycle:

False negative

True negative

False positives

Figure: Matthew Stewart

SLIDE 36 OF 88

Swagatam Das is presenting

Neural Photo Editor: Content based image editing: for example, extend the hairband.

Pix2Pix is an image-to-image translation that get quoted in cross-domain GAN's paper frequently. For example, it converts a satellite image into a map (the bottom left).

Labels to Street Scene	Labels to Facade	BW to Color

Sample Reset Infer Col



## Computational Intelligence Methods For COVID-19 Diagnosis



**Yu-Dong Zhang, IET Fellow**

Professor

Affiliation: School of Computing and Mathematical Sciences  
University of Leicester, Leicester, United Kingdom (UK).

Yu-Dong Zhang is currently a Professor with the department of Schools of Informatics, University of Leicester, United Kingdom. Before that, He was a professor at Nanjing Normal University, China, from 2013-2017. He has been a postdoctoral fellow at Columbia University Medical Center, New York, USA , from 2010-2012. His research interests are in Deep learning, Convolutional Neural Networks, Pattern recognition, Medical sensor and many more. His research works got almost ten thousand citations and an h-index of 53 in ISI Web of knowledge.

Meet - dr-ecsp-qj

meet.google.com/ksr-ecsp-qj

Eugene Yu-Dong Zhang is presenting

PowerPoint Slide Show - Report.pdf - PowerPoint

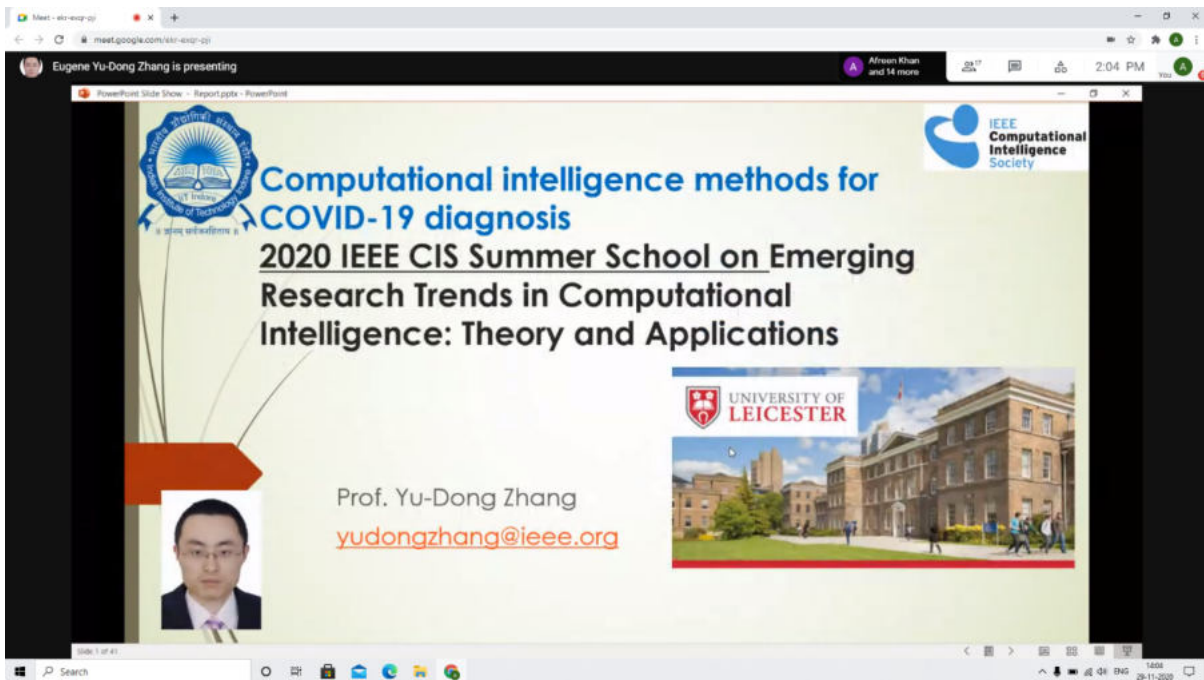
IEEE Computational Intelligence Society

Computational intelligence methods for COVID-19 diagnosis

2020 IEEE CIS Summer School on Emerging Research Trends in Computational Intelligence: Theory and Applications

UNIVERSITY OF LEICESTER

Prof. Yu-Dong Zhang  
[yudongzhang@ieee.org](mailto:yudongzhang@ieee.org)



Meet - dr-ecsp-qj

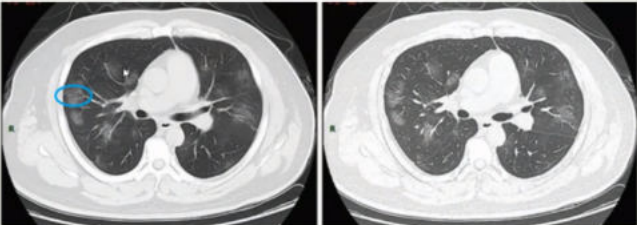
meet.google.com/ksr-ecsp-qj

Eugene Yu-Dong Zhang is presenting

PowerPoint Slide Show - Report.pdf - PowerPoint

Gajendra Kumar Mo... and 19 more

- Bilateral multilobar ground-glass opacities (GGO)
- with a peripheral, asymmetric, and posterior distribution are common in early infection.



Slide 18 of 41

Search

14:17 28-11-2020

A screenshot of a Zoom meeting displaying a PowerPoint slide. The slide contains two bullet points describing COVID-19 symptoms: 'Bilateral multilobar ground-glass opacities (GGO)' and 'with a peripheral, asymmetric, and posterior distribution are common in early infection.' Below the text are two axial CT scan images of the chest. The left image has a blue circle highlighting a region of ground-glass opacity in the peripheral lung. The Zoom interface shows the meeting name 'Eugene Yu-Dong Zhang is presenting' and the time '2:17 PM'." data-bbox="83 513 840 815"/>

## Social Network Analytics: Characteristics, Challenges and Research Directions



### **Muhammad Abulaish**

#### Affiliations:

Professor - Jamia Millia Islamia, New Delhi

Associate Professor -Department of Computer Science,  
South Asian University, New Delhi, India

Muhammad Abulaish is a Professor of Computer Science at Jamia Millia Islamia (A Central University), New Delhi, India with over 20 years of experience in Academic and Research. He has worked as the Head of the Department of Computer Science for a period of 3 years with effect from Jan. 2013. He has also worked as the Head of the Internet Surveillance and Forensics research group at the Centre of Excellence in Information Assurance, King Saud University, Riyadh, KSA. Currently, Abulaish is on deputation from Jamia and working as an Associate Professor of Computer Science at South Asian University, New Delhi, India since 2016. He has also served as Chairperson of the Department of Computer Science during 2016 to 2018. Abulaish received his Ph.D. degree in Computer Science from Indian Institute of Technology Delhi in 2007. His research interests focus on developing novel data analytics and machine learning techniques, especially for applications in text mining, social network analysis, biomedical informatics, data-driven cybersecurity and digital forensics. He has over 108 publications in various international journals and conference proceedings, including five papers in ACM/IEEE Transactions. He has served several reputed international conferences including SDM, CIKM, PAKDD, WI, and BLOKDD as TPC member. He served WI '19 as the publicity co-chair, and worked as workshop co-chair for ASONAM 20. He is also an editorial board member and reviewer of various journals of repute. He is a senior member of IEEE, ACM, and CSI. He is also a life member of ISTE, IETE, and ISCA.

IEEE CS Summer School | Techn... Meet - sk-ecspj

meet.google.com/ski-ecsp-jj

Muhammad Abulaish is presenting

3:43 PM

# SOCIAL NETWORK ANALYTICS: CHARACTERISTICS, CHALLENGES, AND RESEARCH DIRECTIONS

1

SPEAKER

MUHAMMAD ABULAISH, PHD (IIT DELHI)

DEPARTMENT OF COMPUTER SCIENCE  
SOUTH ASIAN UNIVERSITY, NEW DELHI-21  
ABULAISH@SAU.AC.IN



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Muhammad Abulaish is presenting


4:03 PM

## Where are we headed?

Into the mouth of the scalability & complexity beast!

16

- Emergence of “complex” data & graphs
  - Enriched networks
    - Weighted
    - Multi-labeled (nodes & edges)
    - Temporal/spatial attributes
  - Distributed (multi-relational)
  - Uncertain (approximate mining)
  - Dynamic (online, streams)
  - Massive & Unbounded (sampling methods)
  - Networks, Networks & more Networks
    - e.g. Omics in Systems Biology, Semantic Web, Social Networks



## One class SVM



**Aruna Tiwari**

Associate Professor

Affiliation: Computer Science and Engineering, Indian Institute of Technology Indore, Indore, India.

Aruna Tiwari is currently an Associate Professor with the department of Computer Science and Engineering, Indian Institute of Technology Indore, Indore, India. Her research interest is in soft computing techniques, Neural Network Learning Algorithms, and data mining, ensemble learning of classifiers and so on. She has coordinated many programs such as "International Symposium on Computational Mathematics, Optimization, and Computational Intelligence (CMOCI 2017)" a NTU-INDIA Connect Program Jul 17 - Jul 19, 2017 at IIT Indore, India and 10th International Conference on Soft Computing for Problem Solving - SocProS 2020 (Unlocking Optimization Tools) jointly with Soft Computing Research Society, Delhi, India, and many more. She has many publications in reputed journals such as soft computing, IEEE transactions on Big data, Knowledge based systems and so on.

Aruna Tiwari is presenting

Gajendra Kumar Mo... and 5 more

9:32 AM

PowerPoint - File Edit View Insert Format Arrange Tools Slide Show Window Help

Home Insert Draw Design Transitions Animations Slide Show Review View

Design of Kernel based One class classifier

2020 IEEE CIS Summer School on Emerging Research Trends in Computational Intelligence: Theory and Applications

By: Dr. Aruna Tiwari  
Associate Professor  
Discipline of Computer Science & Engineering  
Indian Institute of Technology Indore

Md. Aquil Khan

Aruna Tiwari

M Tanveer

Arpan Phukan

M

S

Umesh Gupta joined

Aruna Tiwari is presenting

CIS-Summer\_Scho...pdf

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09:32 30-11-2020

Aruna Tiwari is presenting

Rituraj IITJ and 19 more

10:41 AM

LUPI Setting: Student-Teacher Learning

Training

Privileged Features

Medical Report by Doctor

Biopsy Images

Input Features

LUPI

Testing

Testing Data

Biopsy Image

Input Features

Trained Model

Predicted Label

Md. Aquil Khan

Aruna Tiwari

Chittabarni Sarkar

Arpan Phukan

M

Y

M Tanveer

Yusra Saeed

Bharat Richhariya

Ashraf Haroon Ras...

Aruna Tiwari is presenting

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10:41 30-11-2020

## Minimizing Model Complexity: From SVMs To The MCM family



### **Jayadeva, FIETE, FNAE**

Professor and Head

Affiliation: Department of Electrical Engineering, Indian Institute of Technology Delhi, Delhi, India.

Jayadeva is an Institute Chair Professor at IIT Delhi and Head of the EE department. Notable work includes the Twin Support Vector Machine, which has over 1100 Google Scholar citations; it is the subject of many survey papers. He received best paper awards for two conferences and one journal paper; one paper was listed on Neurocomputing's Top 25 Hotlist. His group was amongst the first worldwide to design and realize a SVM based A/D converter on chip (2006). Another 2015 chip is, to the best of knowledge, the first ant colony optimization algorithm on silicon. His co-authored rare cell detection algorithm in Nature Communications (2018) discovered a new cell subtype. He was a program chair for VLSI Design 2019, and has been an invited speaker at multiple fora. He has US patents on A/D conversion, a method for assessing pronunciation abilities, and optimization free chromatography. He is a co-author of the books "Numerical Optimization with Applications", and "Twin Support Vector Machines: Models, Extensions, and Applications" (Springer, 2017).

Computer and Information Tech... | Inbox (2,886) - phd1801241003 | CIS-Summer\_School\_Program\_5... | Meet - nih-byfq-tnz

meet.google.com/nih-byfq-tnz

J Jayadeva is presenting Afreen Khan and 14 more 11:32 AM You

## Minimizing Model Complexity From the SVM to the MCM family

**Dr. Jayadeva**  
Institute Chair Professor and Head

Department of Electrical Engineering  
Indian Institute of Technology, Delhi  
Hauz Khas, New Delhi – 110016. INDIA

jayadeva@ee.iitd.ac.in

Meeting details ^

Raise hand Turn on captions Jayadeva is presenting

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ENG 11:32 30-11-2020

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J Jayadeva is presenting Pritesh Sahani and 21 more 11:49 AM You

## Vapnik's Risk Formula

With probability  $(1-\delta)$ ,

$$err_{true} \leq err_{train} + \frac{B\epsilon}{2} \left( 1 + \sqrt{1 + \frac{4err_{train}}{B\epsilon}} \right)$$

$$where \epsilon = \left( \frac{4}{M} \right) \left[ VC \left( \ln \left( \frac{2M}{VC} \right) + 1 \right) - \ln \delta \right]$$

- VC is the VC dimension of a classifier, M is the number of samples.
- Neural Nets: Pruning reduces VC.
- SVMs: Fewer Support Vectors usually leads to better generalization

Meeting details ^

Raise hand Turn on captions Jayadeva is presenting

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ENG 11:49 30-11-2020



## Overview and Trends on Explainable AI



### **Mohamed Reda Bouadjenek**

Lecturer, Applied Artificial Intelligence

Affiliation: School of Information Technology,  
Deakin University, Australia

Mohamed Reda Bouadjenek is currently a Lecturer (Assistant Professor) of Applied Artificial Intelligence in the School of Information Technology at Deakin University, Australia. Previously, he was a Research Fellow at The University of Toronto (2017-2019) and at The University of Melbourne (2015-2017) and before that, he was a postdoc researcher at the French Institute for Research in Computer Science and Automation (INRIA 2014-2015), France. He earned a Ph.D. and an MSc in Computer Science from the University of Paris-Saclay France respectively in 2013 and 2009, and a BSc in Computer Science from the University of Science and Technology Houari Boumediene in 2008. My research spans a broad range of topics related to the data-driven fields of Machine Learning, Deep Learning and Information Retrieval. He has applied analytic and algorithmic tools from these fields to solve real-world problems related to diverse applications such as recommender systems, interactive visual search interfaces, social network analysis, and data quality.

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meet.google.com/nih-byfq-tnz

Mohamed Reda BOUADJENEK is presenting

## 2020 IEEE CIS Summer School on Emerging Research Trends in Computational Intelligence Explainable AI

Dr. Mohamed Reda Bouadjenek  
School of Information Technology, Faculty of Sci Eng & Built Env  
reda.bouadjenek@deakin.edu.au

Slides from: Explainable AI in Industry, in the WWW 2020  
Tutorial: Krishna Gade, Sahin Cem Geyik, Krishnarum Keshthapadi, Varun Mittal, Ankur Taly

Meeting details

(12)

Bharat Richhariya 11:46 AM  
Left one

Jayadeva 12:41 PM  
Twin neural network  
Himanshu pant

Jayadeva 12:44 PM  
<https://www.sciencedirect.com/science/article/pii/S0893608020302026>

Bharat Richhariya 12:44 PM  
Thank you Sir !!

Jayadeva 12:45 PM  
<https://www.sciencedirect.com/science/article/pii/S0925231219301602>

Send a message to everyone

Meeting details... ^

Meeting controls: Mute, Video, Raise hand, Turn on captions, Mohamed Reda BOUADJENEK is presenting

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Mohamed Reda BOUADJENEK is presenting

### Why Explainability: Debug (Mis-)Predictions

Top label: "clog"

Why did the network label this image as "clog"?

Meeting details

(19)

Bharat Richhariya 11:46 AM  
Left one

Jayadeva 12:41 PM  
Twin neural network  
Himanshu pant

Jayadeva 12:44 PM  
<https://www.sciencedirect.com/science/article/pii/S0893608020302026>

Bharat Richhariya 12:44 PM  
Thank you Sir !!

Jayadeva 12:45 PM  
<https://www.sciencedirect.com/science/article/pii/S0925231219301602>

Send a message to everyone

Meeting details... ^

Meeting controls: Mute, Video, Raise hand, Turn on captions, Mohamed Reda BOUADJENEK is presenting

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# Closing Ceremony

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meet.google.com/nih-byfq-tnz

M Tanveer is presenting

Mohammed Wa... and 10 more

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21

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