

Discrete Structures (Monsoon 2021)

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- Ph.D. in Computer Science and Engineering from the **Indian Institute of Technology, Kharagpur** with **course work CGPA: 9.30/10** from January 2004 to June 2008.
- M.Tech. in Computer Science from the **Indian Institute of Technology, Kharagpur** on January 2000 (**Rank: 2**).
- Qualified in All India IIT GATE examination with percentile score: 99.09 (**All India Rank: 7, Eastern Zone Rank: 2**) in 1998.
- M.Sc. in Mathematics and Computing from the **Indian Institute of Technology, Kharagpur** on July 1998 (**Rank: 1**) [**Recipient of Institute Silver Medal**].

- **Research Interests:** Cryptography, system and network security, blockchain, security in Internet of Things (IoT), Internet of Vehicles (IoV), Internet of Drones (IoD), smart grids, smart city, cloud/fog computing and industrial wireless sensor networks, intrusion detection, AI/ML security
- **Research Highlights [Research Publications (Total: 280)]:**
 - ▶ Number of Journal Papers: 238
 - ▶ Number of Conference Papers: 31
 - ▶ Number of Book Chapters: 9
 - ▶ Number of Edited Books/Volumes: 2
 - ▶ Number of IEEE Transactions/IEEE Journal/IEEE Magazine Papers: 90

Research Contributions (Total publications: 280)

- **Total citations: 10420, h-index: 59, i10-index: 173**
(According to Google Scholar Citations as on November 23, 2021)
- **Published in top venues like**
 - * IEEE Transactions on Information Forensics and Security
 - * IEEE Transactions on Dependable and Secure Computing
 - * IEEE Transactions on Consumer Electronics
 - * IEEE Transactions on Smart Grid
 - * IEEE Transactions on Industrial Informatics
 - * IEEE Transactions on Vehicular Technology
 - * IEEE Internet of Things Journal
 - * IEEE Consumer Electronics Magazine
 - * IEEE Communications Magazine
 - * IEEE Journal of Biomedical and Health Informatics
(Formerly, IEEE Transactions on Information Technology in Biomedicine)
 - * IEEE Transactions on Network Science and Engineering
 - * IEEE Transactions on Intelligent Transportation Systems
 - * IEEE Sensors Journal
 - * IEEE Systems Journal

About me: Conference Program Committee Chairs and Members

- Program Chair: 2nd International Congress on Blockchain and Applications (BLOCKCHAIN 2020), L'Aquila, Italy, 7th-9th October, 2020 (Springer)
- Program Chair: International Conference on Applied Soft Computing and Communication Networks (ACN'20), October 14-17, 2020, Chennai, India (Springer)
- Program Chair: 1st International Congress on Blockchain and Applications (BLOCKCHAIN 2019), Avila, Spain, 26-28 June, 2019 (Springer)
- Program Committee Member: IEEE ICC 2018, 2021; SpaCCS 2017, 2018, 2020; ICISS 2012, 2013, 2018, 2020; ICDCIT 2021; ICISSP 2021, 2022

About me: Journal Editorial Board Members

- Associate Editor: **IEEE Systems Journal** (SCI Impact Factor: 3.987) [Duration: August 2020 onwards]
- Editor: **Journal of Network and Computer Applications (Elsevier)** (SCI Impact Factor: 5.570) [Duration: October 2020 onwards]
- Editor (Technical Committee): **Computer Communications (Elsevier)** journal (SCI Impact Factor: 2.816) [Duration: August 2020 onwards]
- Associate Editor: **Journal of Cloud Computing (Springer)** (SCI Impact Factor: 5.71) [Duration: August 2021 onwards]
- Associate Editor: **IET Communications** journal (SCI Impact Factor: 1.443) [Duration: February 2019 - February 2022]
- Associate Editor: **Cyber Security and Applications (Elsevier)** [Duration: September 2021 onwards]
- Editor: **KSII Transactions on Internet and Information Systems** (SCI Indexed Journal) (2016 -)
- Editor: **International Journal of Internet Technology and Secured Transactions (Inderscience)** (2016 -)
- Guest Editor: **Computers & Electrical Engineering (Elsevier)** (SCI Indexed Journal), Special issue on Big data and IoT in e-healthcare, 2016
- Guest Editor: **ICT Express (Elsevier)** (ESCI Indexed Journal), Special Issue on Blockchain Technologies and Applications for 5G Enabled IoT, 2019
- Guest Editor: **Wireless Communications and Mobile Computing** (SCI Indexed Journal), Special issue on "Security and Privacy for Smart Mobile Devices: Attacks, Challenges, and New Designs" 2020

- Media coverage on **“China way ahead in blockchain, India needs to catch up”** in the **Times of India newspaper on 6 May 2021** (please see at: <https://timesofindia.indiatimes.com/business/india-business/china-way-ahead-in-blockchain-india-needs-to-catch-up/articleshow/82428430.cms>)
- Included in the **top 2% scientists world-wide (all fields) and also in the area of Networking & Telecommunications, with Rank world-wide (by subject area): 321 for the year: 2021.**

The ranking is based on an independent study done by the Stanford University, USA. For detailed information, please visit:

<https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw/3>

- Included in the **subject-wise ranking of top 2% scientists world-wide (all fields) and also in the area of Networking & Telecommunications, with Rank world-wide (by subject area): 580 for the year: 2020.**
- Listed in the **Top H-Index for Scientists in the World for Computer Science and Electronics database maintained by Guide2Research** (<http://www.guide2research.com/>) with **Guide2Research World Ranking: 2600 and Guide2Research National Ranking (India): 15**
- Having **10,420 citations with h-index: 59 and i10-index: 173** (Source: Google scholar citations: <https://scholar.google.com/citations?user=bToAUHMAAAAJ&hl=en>)
- **More detailed information at:**

<https://sites.google.com/view/iitkgpakdas/>

- **Sajal K. Das**, IEEE Fellow, Professor and Daniel St. Clair Endowed Chair, Department of Computer Science, Missouri University of Science and Technology, Rolla, MO 65409, USA
- **Mauro Conti**, Head of SPRITZ Security and Privacy Research Group, Director of UniPD node of CINI Cybersecurity National Lab, EU Marie Curie Fellow Alumni, CEO and co-funder of CHISITO, and Co-funder of DYALOGHI, University of Padua, Italy
- **Willy Susilo**, IEEE Fellow, ARC Future Fellow, Co-Director, Centre for Computer and Information Security Research, University of Wollongong, AUSTRALIA
- **Sherali Zeadally**, Fellow of the British Computer Society and the Institution of Engineering Technology, Stevenage, U.K., University of Kentucky, Lexington, KY 405 06 USA
- **Kim-Kwang Raymond Choo**, Fellow, Australian Computer Society, Department of Information Systems and Cyber Security, The University of Texas at San Antonio, San Antonio, TX 78249 USA
- **Xinyi Huang**, Fujian Provincial Key Laboratory of Network Security and Cryptology, Fujian Normal University, Fuzhou, Fujian, China
- **Alexey Vinel**, Halmstad University, Halmstad, Sweden
- **Muhammad Khurram Khan**, FIET (UK), FBCS (UK), Center of Excellence in Information Assurance, King Saud University, Riyadh, Saudi Arabia

- **Athanasios V. Vasilakos**, Lulea University of Technology, Sweden
- **Minho Jo**, Department of Computer and Information Science, Korea University, Seoul, South Korea
- **Laurence T. Yang**, St. Francis Xavier University, Canada
- **Joel J. P. C. Rodrigues**, IEEE Fellow, National Institute of Telecommunications - Inatel, Brazil
- **Debiao He**, School of Cyber Science and Engineering, Wuhan University, Wuhan 430 072, China
- **Jong-Hyoun Lee**, Sangmyung University, Republic of Korea
- **Kee-Young Yoo**, Kyungpook National University, Daegu, Korea
- **Qi Jiang**, Xidian University, China
- **Sachin Shetty**, Old Dominion University, USA
- **Xiong Li**, Hunan University of Science and Technology, China
- **Mamoun Alazab**, Charles Darwin University, Australia
- **Mohammad S. Obaidat**, IEEE Fellow, University of Sharjah
- **YoungHo Park**, School of Electronics Engineering, Kyungpook National University, South Korea

Why Research?

- **“If we knew what it was we were doing, it would not be called research, would it?” – Albert Einstein**
- **“If I had an hour to solve a problem I’d spend 55 minutes thinking about the problem and 5 minutes thinking about solutions.” – Albert Einstein**
- **“Successful people are not gifted; they just work hard, then succeed on purpose.” – G. K. Nielson**
- **“The three great essentials to achieve anything worthwhile are, first, hard work; second, stick-to-itiveness; third, common sense.” – Thomas A. Edison**

What is Research?

- Research means to carefully analyze the problems or to do the detailed study of the specific problems, by making use of special scientific methods.
- Research can be done on any topic, be it medical, non- medical, IT, or anything else.
- In order to do research, first of all, you need to have a topic or the problem on which you can do research. The topic must have relevant questions to answer.
(**Formulation of Problem Statement**)
- For research, certain steps have to be followed like first observation, then background research then preparing of hypothesis, eventually conducting a simple experiment.
(**Finding Solutions to the Defined Problems**)

- Working on a research project will obviously be a challenging and rewarding experience, provided you put the best of your expertise and skill in it.
- It is an opportunity which helps you to pursue an in-depth or deep original study about any topic which interests you.
- The main aim of the goals is to provide the best of the solution to some of the world problems and also to enhance our knowledge.

How to Measure Impact of Research?

- The **Science Citation Index (SCI)** is a citation index originally produced by the Institute for Scientific Information and created by Eugene Garfield. It was officially launched in 1964. It is now owned by Clarivate Analytics.
- **Impact Factor:** The impact factor (IF) is a measure of the frequency in which the average article in a journal is cited in a particular year. Impact factors measure the impact of a journal, not the impact of individual articles.
- The **h-index** is an index to quantify an individual's scientific research output. The h-index is an index that attempts to measure both the scientific productivity and the apparent scientific impact of a scientist. The index is based on the set of the researcher's most cited papers and the number of citations that they have received in other people's publications. **h-index is the largest number h such that h publications have at least h citations.**
- The **i10-index** is the number of publications with at least 10 citations.

How to Measure Impact of Research?

- **DBLP:** <https://dblp.uni-trier.de/pid/39/871.html>
- **Google Scholar:** <https://scholar.google.com/citations?user=bToAUHMAAAAJ&hl=en>
- **Top H-Index Scientists in the World by Guide2Research:**
<http://www.guide2research.com/>
The Guide2Research website lists only scientists having H-Index ≥ 40 and indexed DBLP papers ≥ 40 within the area of Computer Science and Electronics.
List of top H-Index for Scientists in India is available here:
<http://www.guide2research.com/scientists/IN>

- **QS World University Rankings 2021 | Top Universities**
- `https://www.topuniversities.com/university-rankings/world-university-rankings/2022`

- **Why IIT is not counted in the top 100 institutes in the world?**
- <https://www.youtube.com/watch?v=3k70mKrXlyU>

- Sets, relations and functions. Applications to relations.
- Permutations, combinations.
- Logic, Propositional Equivalences, Predicates and Quantifiers
Sets, Proof Techniques, Contradiction.
- Mathematical induction
- Pigeonhole principle.
- Cardinality of sets, finite and infinite sets, countable and uncountable sets, Cantors numbering.
- Group, subgroup/normal subgroup, homomorphism/
automorphism/isomorphism/ eipmorphism, kernel, cosets,
quotient group, product set ina group, center of a group,
order/conjugate of an element, commutator.

- Ring, Field, Finite field over a prime. Applications to finite fields.
- Recurrence relations, generating functions, numeric functions. Applications to recurrence relations.
- Coding theory (Application to group theory).
- Basics of probability theory, birthday attacks. Applications on hash functions.
- Graphs, Adjacency, Special Graphs, Isomorphic Graphs, Paths, Cycles and Circuits, Connected Graphs, Eulerian Graphs, Hamiltonian Graphs and Planar Graphs.

- Thomas Koshy, “Discrete Mathematics with Applications”, Elsevier Press.
- C. L. Liu and D. P. Mohapatra, “Elements of Discrete Mathematics: A Computer Oriented Approach,” Tata McGraw-Hill Edition.
- D. S. Malik and M. K. Sen, “Discrete Mathematical Structures: Theory and Applications,” Thomson.
- J. P. Tremblay and R. Manohar, “Discrete Mathematical Structures with applications to Computer Science,” Tata McGraw-Hill Publishing Company Pvt. Ltd.

- **Lecture (Section A):**

- ▶ Monday: 9:00 AM - 10:00 AM
- ▶ Wednesday: 9:00 AM - 10:00 AM
- ▶ Friday: 9:00 AM - 10:00 AM
- ▶ Venue: MS Teams (Online) [Section A]

- **Tutorial:**

- ▶ Monday: 2:00 PM - 3:00 PM
[Discrete Structures(T)-B1 (G1 to G4)]
- ▶ Tuesday: 11:00 AM - 12:00 PM
[Discrete Structures(T)-B2 (G5 to G7)]

- **Lecture (Section B):**

- ▶ Monday: 12:00 PM - 1:00 PM
- ▶ Wednesday: 12:00 PM - 1:00 PM
- ▶ Friday: 12:00 PM - 1:00 PM
- ▶ Venue: MS Teams (Online) [Section B]

- **Tutorial:**

- ▶ Monday: 2:00 PM - 3:00 PM
[Discrete Structures(T)-B1 (G1 to G4)]
- ▶ Tuesday: 11:00 AM - 12:00 PM
[Discrete Structures(T)-B2 (G5 to G7)]

- Grading method: Relative

Letter Grade	Value	Description
A	10	Excellent
A-	9	Excellent
B	8	Good
B-	7	Good
C	6	Fair
C-	5	Fair
D	4	Poor
F	0	Fail

Grading Plan (Continued...)

- Home Assignments (10 sets): 30%
- In-class problem solving skills (5 surprised quizzes): 50%
- Open Book Test (1): 20%

Questions?