MAY 2021 | VOLUME 2

अनुसंधान
IIITD IRD Newsletter

INDRAPRASTHA INSTITUTE of INFORMATION TECHNOLOGY DELHI

IIIT-D IRD NEWSLETTER

DIRECTOR'S MESSAGE

Dear readers,

This is a really difficult and challenging time for all of us, and I hope you are doing fine. While the pandemic has forced us to change how we do things, we're extremely proud of the way our faculty members, students and staff have adapted to these adverse circumstances.

Let me begin by sharing that IIIT-D has recently set up a new 'Center of Sustainable Mobility' with initial funding from the Delhi Knowledge Development Foundation (DKDF). The Center will catalyze research, development, and entrepreneurial activities in the area of smart/ sustainable mobility, with a focus on mobility-related problems of Delhi/ NCR. On a different note, some of our faculty colleagues have been chasing certain 'out-of-this-world' problems and have procured a project related to 'Space Situational Awareness'. The outcome of this project is likely to support the Indian space sector and provide scalable indigenous collision probability solutions. I am also pleased to share that IIIT-D is actively contributing to the Delhi Research Implementation and Innovation (DRIIV) program sanctioned by the Office of the Principal Scientific Adviser, Govt. of India. These are just some of the highlights and you will find more information about our current activities related to research, development, and innovation in this issue. Please continue to share your feedback and suggestions. Stay safe!

Best wishes,
Ranjan

DEAN IRD'S MESSAGE

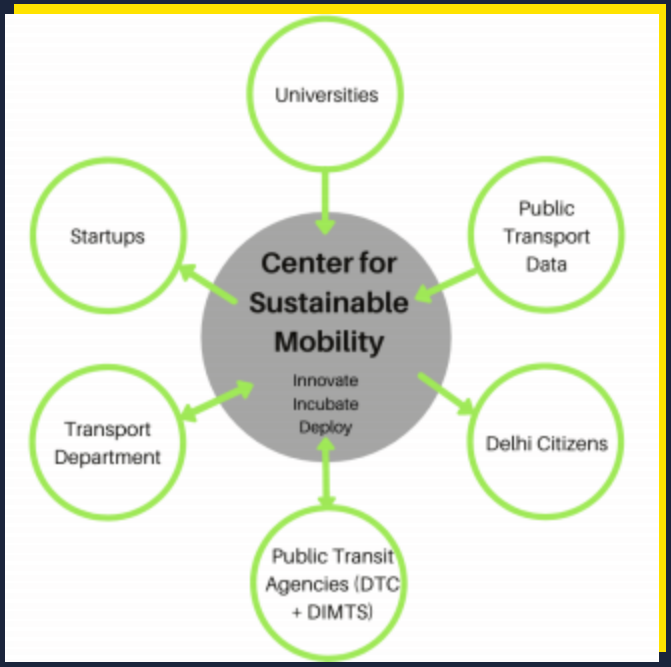
PROF. MUKESH MOHANIA

We are happy to bring out the second edition of IIIT-Delhi IRD Newsletter. We started this year with several good news such as receiving new research grants from various Government organizations and Industry. In the January-March 2021 quarter, our faculty members have published 19 quality research papers in top Transactions and Conferences, signed 11 MoUs with Industry, and transferred research technologies to Industry. You will find the details about these accomplishments in this newsletter. We have just launched a Research Information Management System (RIMS), developed internally by our own students, which captures all research and services related data and caters the needs of different stakeholders to analyze and visualize the information at different granularities. Enjoy reading this newsletter and stay safe.

RESEARCH HIGHLIGHTS

IIITD CENTRE FOR SUSTAINABLE MOBILITY:

The key objective of the center for mobility is to develop solutions for problems in mobility for Delhi/NCR and its transit companies. The solutions may be in the form of software that may be directly deployed at various depots or at command centers of the agencies. It can also be in the form of algorithms/methods that the transit agencies may use to develop software solutions on their own. To define the problems, the researchers would require a "buy-in" from the user agencies so that there is a synergy between what is required and what is developed. The center would work on solutions that impact the general area of transportation which may also be applied outside of Delhi/NCR.



FY 2020-21

34

Sponsored Research and Faculty Award Projects with a total sanctioned value of approx Rs. 29 Cr.

Consultancy Projects with a total sanctioned value of approx 2 Cr.

7

8

Fellowship Projects with a total sanctioned value of approx 1.2 Cr

MOU's were signed during the year

19

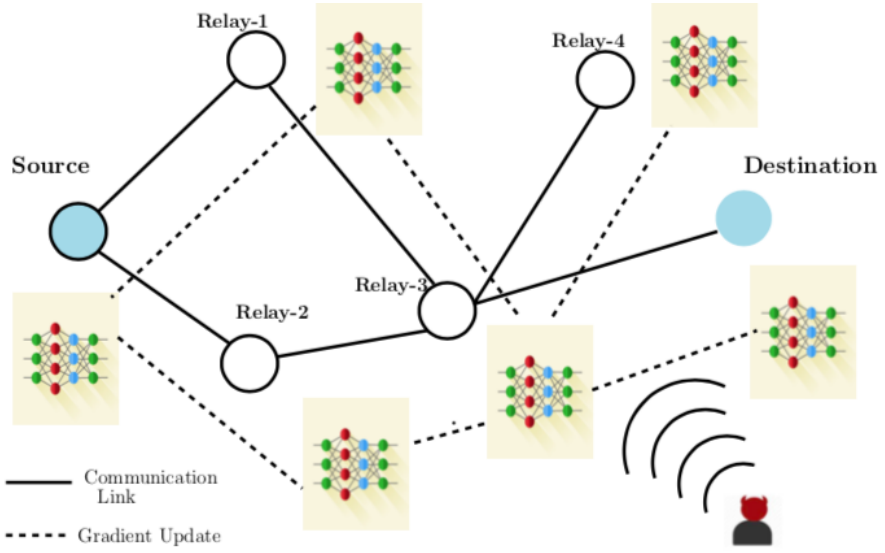
IHUB - Anubhuti has received the sanctioned value of Rs. 100 Cr.

KEY RESEARCH PROJECT

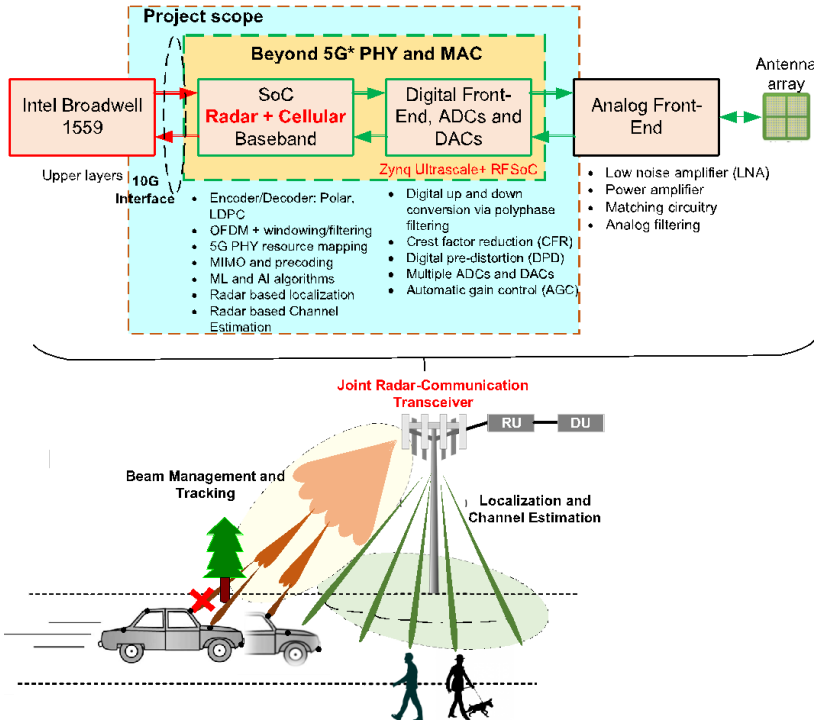
A DATA CENTRIC APPROACH TO STUDY FUNDAMENTAL LIMITS OF COMMUNICATION IN ADVERSIRIAL WIRELESS NETWORKS

The focus of this work is to use data-centric machine learning techniques for both, centralized as well as decentralized networks in order to detect adversarial attacks on wireless networks, as depicted in the figure. The main objectives of the project is to look beyond existing threat models for wireless security and employ data-centric methods to detect adversarial attacks. To idea is to study the fundamental limits of communication when employing data-centric attack detection methods and to demonstrate the efficacy of the proposed detection methods in various channel conditions.

We plan to implement data-centric detection methods on a test bed of wireless devices and test the efficacy of the proposed detection methods in various channel conditions. This project is funded by MEITY and led by Dr. Ranjitha Prasad.



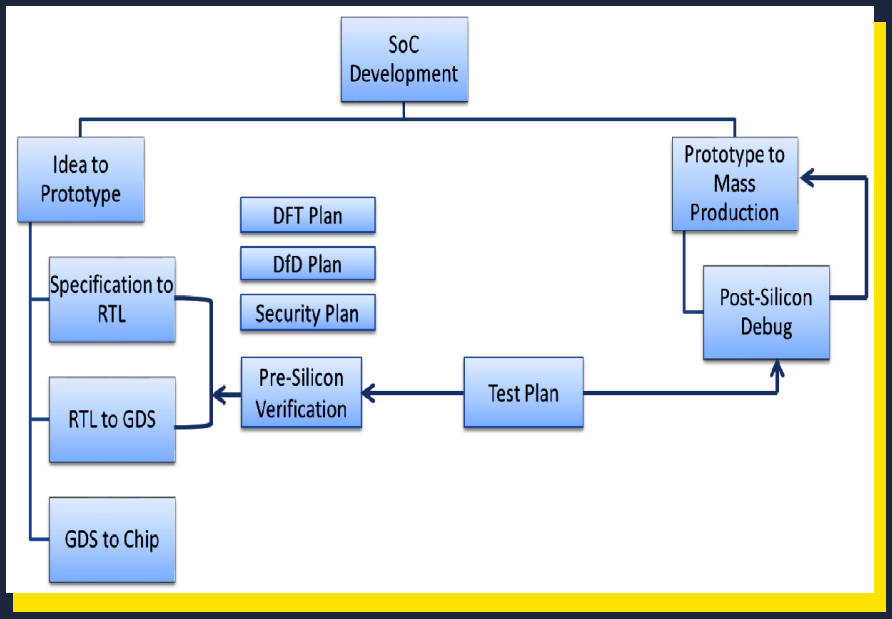
INTELLIGENT JOINT RADAR - COMMUNICATION TRANSCEIVER DESIGN AND PROTOTYPE FOR BEYOND 5G



The objective of this project is to innovate a joint radar-communication (JRC) framework for beyond 5G* that maintains complete compatibility with 3GPP specifications. We propose to augment the PHY and MAC layers of the cellular protocols with radar functionality without increasing the communication protocol's overhead. The proposed 5G-JRC framework will be efficiently mapped to reconfigurable architecture for implementation on the heterogeneous system-on-chip and experimental validation. Since a common spectrum is used, there will be no interference between the radar and communication systems and only marginal increase in the overall system cost and complexity. This project is funded by MEITY and led by Dr. Shobha Sundar Ram (PI) and Dr. Sumit J Darak (Co-PI).

CHALLENGES AND TRENDS IN SYSTEM-ON-CHIPS (SoC) DESIGN AND VERIFICATION - A CASE STUDY

Modern system-on-chips (SoC) are so complex that they cannot be designed and verified manually. Many sophisticated electronic design automations (EDA) Modern system-on-chips (SoC) are so complex that they cannot be designed and verified manually. Numerous sophisticated electronic design automations (EDA) tools are evolved to make the system-on-chips (SoC) design and verification process reliable and hassle free. Intelligent use of these tools along with the designer's optimization skill leads to efficient system-on-chips (SoC) design. There are several steps involved in system-on-chips (SoC) design and verification flow. We are developing a framework to design and verify state-of-the-art SoCs. This framework will be useful in making our country self-reliant in several domains. This project is funded by DRDO and led by Dr.Sujay Deb.



ORBIT COMPUTATION OF RESIDENT SPACE OBJECTS FOR SPACE SITUATIONAL AWARENESS

There are more than 20000 man-made objects of more than 10 cm in size floating around in near-earth space which pose collision threats to functional satellites. Predicting collision probability from these space objects is crucial from the national security perspective as well as for the protection of public and private space assets of Indian origin. The outcome of this project will directly support the Indian Space sector by providing an operationally flexible, scalable, transparent and indigenous collision probability solution. This project is funded by the National SuperComputing Mission HPC Applications, implemented by Department of Science and Technology (DST) and led by Dr. Sanat K Biswas.

EFFICIENT COMMUNICATION INFRASTRUCTURE FOR FUTURE HETEROGENEOUS SYSTEM ARCHITECTURES

Shrinking CMOS transistor feature sizes has allowed integration of many cores on a single chip. This helps in realizing high performance computing systems required for emerging applications like IoT, cloud computing, machine learning and scientific research. But, with diminishing returns from increasing number of complex superscalar processors, Heterogeneous System Architectures (HSA) are emerging as feasible way to improve performance. This project is focused on addressing the issues related to resource contention for HSA so that optimal performance can be achieved. This project is funded by the National Super Computing Mission HPC Applications, implemented by Department of Science and Technology (DST) and is led by Dr. Sujay Deb.

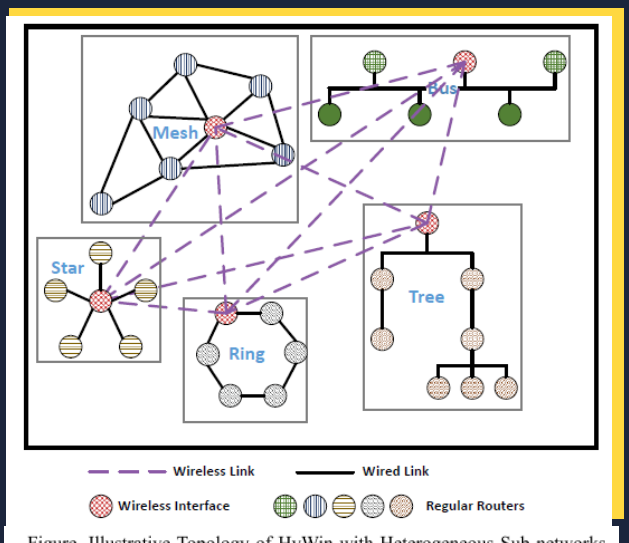


Figure. Illustrative Topology of HyWin with Heterogeneous Sub-networks Interconnected by mm-wave WIs

INDUSTRY COLLABORATION

IIITD has made various collaborations with many industrial and academic organizations, few of them are:

- STMicroelectronics Pvt Ltd
- Tata Consultancy Services Ltd
- CareOnco Biotech Pvt Ltd
- Germithm Solutions
- Cvision.AI Analytics Pvt Ltd
- Delhi Development Authority
- WUDI Datatech Pvt Ltd
- Population Council

For more details:
https://ird.iiitd.edu.in/industrymou.html

MoUs Signed

For more information:
https://ird.iiitd.edu.in/acadmou.html
https://ird.iiitd.edu.in/industrymou.html

IIITD has signed 11 MoUs with various Industries and Government Bodies in the following categories

- DEVELOPMENT OF COLLABORATIVE PROJECT
- JOINT ACADEMIC AND SCIENTIFIC ACTIVITIES
- CONSULTANCY ASSIGNMENTS

INTERNATIONAL COLLABORATION

A collaboration was made with University of Glasgow Educational Assessment Network (UGEAN) to set up a Cooperation for innovation and exchange of good practices capacity building in the field of Higher Education

Publications:
The list of papers can be found at
https://www.iiitd.ac.in/research/publications

Patents:
The details of patents can be found at
https://ird.iiitd.edu.in/filedpatents.html

Awards, Honors, and Recognition

Dr. Ranjini Ray (RA- Econometrics Lab; Mentor: Dr. Gaurav Arora) has won the Women Scientist Scheme-B (S&T interventions for societal benefit) fellowship under their Agriculture, Food and Environmental Challenges of DST.

Visit the following link:
https://iiitd.ac.in/research/rsnews

Other Activities

IIITD CENTRE EXCELLENCE FOR LIFI/VLC:

The IIITD Center of Excellence on LiFi supported by India-EU ICT Standardization Cooperation Project conducted a 2-day workshop (25th and 26th March 2021) on 'Visible Light for Broadband Communications: Current Research & Standardization' organized by Prof. Anand Srivastava, Dr. Vivek Bohara, and Dr. Gourab Ghatak, all from IIIT Delhi. The workshop was sponsored by ETSI and TSDSI. It has helped students, researchers, and faculty to get knowledge in the domain of Light Fidelity (Li-Fi) technologies and applications.

Li-Fi is a visible light communication (VLC) system, where LEDs used for illumination are used for optical wireless data communication at the same time. The workshop featured invited speakers from academia, industry, start-ups, and Government organizations (University of Edinburgh (UK), Northumbria University (UK), CEA-LETI(France), Signify (Netherlands), HHI(Germany), Wipro, Velmenni, Reliance Jio, TSDSI, and IIITD). There was huge participations from students, faculty, and other professionals who registered for the workshop. This workshop helped in increasing the visibility of our Center of Excellence on LiFi to external organizations and institutes, and has opened up a possibility of research collaboration with EU and Indian partners. The event received tremendous feedback from all the participants.

- Virtual Workshop conducted on the Prime Minister's Fellowship for Doctoral Research scheme on Mar 18, 2021 by Federation of Indian Chambers of Commerce & Industry, New Delhi

FACULTY FOCUS

DR. TAVPRITESH SETHI

Dr. Tavpritesh Sethi is a physician-scientist and Assistant Professor of Computational Biology at Indraprastha Institute of Information Technology Delhi, India and a fellow of the Wellcome Trust/DBT India Alliance at All India Institute of Medical Sciences, New Delhi, India. Over the past two years, he has been a visiting faculty member at Stanford University, School of Medicine from February 2017 to January 2019. He received his M.B.B.S from Government Medical College, Amritsar and PhD from CSIR-Institute of Genomics and Integrative Biology, New Delhi, India.

Dr. Sethi specializes in improving outcomes in neonatal, child and maternal health by bridging medicine and artificial intelligence. His research is focused on development and deployment of machine-learning based solutions to enable decisions and policy in pressing healthcare questions such as antimicrobial resistance, sepsis and health inequalities in intensive care, and public health settings. He has authored over 20 research articles and has been a recipient of MIT-TR35 India Innovators under 35, Wellcome Trust/DBT India Alliance Early Career Award. He is an editorial board member of PLOS One, Systems Medicine and Journal of Genetics. Dr. Sethi is a member of the European Association of Systems Medicine and leads the Australasia region for International Association of Systems and Networks Medicine (IASyM).

http://tavlab.iiitd.edu.in/team.html

DR. DEBARKA SENGUPTA

Dr. Debarka Sengupta received his Ph.D. in Computer Sc. and Engineering from Jadavpur University. Thereafter, he spent about three years as a postdoctoral research fellow at the prestigious Genome Institute of Singapore. Before joining IIIT-D he worked as an INSPIRE Faculty at the Machine Intelligence Unit of Indian Statistical Institute. Debarka started his professional career as a software engineer working for Infosys and then IBM. He consulted and advised a number of technology and service-based firms including IPsoft, Datanomers, CoreCompete and Applied Research Works on various data science and business analytics projects. He received the 2007 spot award by Infosys while working there as a software engineer. His U.S. patent on applied social choice theory was awarded by the patent monetization giant Intellectual Ventures. He has twice been nominated for the prestigious INSPIRE Faculty award - in 2014 and 2016. Dr. Debarka currently mentors the data science team at Circle of Life healthcare Pvt. Ltd., a prominent, Delhi-based health tech startup. He is the Co-founder/Director in CareOnco.

https://iiitd.ac.in/debarka