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Bangalore Chapter

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About IEEE ComSoc Chapter Bangalore Newsletter

The IEEE ComSoc Chapter Bangalore Newsletter includes news useful to its members, non-member and highlights most important technology development. It also highlights important concluded and upcoming events. Links for few important topics from current issue of *IEEE Communication Magazine are also embedded.*

Editor Message

Dear readers,

I am really happy to be editor for another consecutive year of IEEE ComSoc newsletter. We are glad to launch the 5th issue of IEEE ComSoc news letter Bangalore section. I would like to thank the chair and ExCom for giving me this opportunity in bringing the fifth issue of the news letter. The news letter highlights the activities achievements carried out in the past six months. We also have included the articles of current trends, non-technical article in communication community, job opportunity, higher education information in both national and international. In this issue, we have received more articles from various streams in the field of communication, technical research, social awareness, etc. to be published in coming next issues. I extend my thanks to all ComSoc members for the support in bringing this newsletter.

We look forward for more volunteers for Comsoc

With warm regards

Triveni.C.L
News letter Editor, IEEE ComSoc Bangalore Chapter
trivenicl@ieee.org

Chairman Message

Dear IEEE Members

It has been a great start to the year for the IEEE Communications Society Bangalore Chapter.

IEEE Comsoc chapter members participated active ly participating in the organizing committee and also giving invited talks at the International Conference on Distributed Computing and Networking (ICDCN) in January 2019, and at the National Communications Conference in February 2019, at the Indian Institute of Science, Bangalore.

Dr. Ashutosh Dutta and Dr. Stefano Galli from the IEEE 5G and Future Networks committee have suggested that Bangalore could host the IEEE 5G World Forum in Bangalore in the summer of 2020. In addition, they have suggested having 3 5G Summits in Bangalore. We started with a first IEEE 5G Summit at Accenture co-chaired by Prof Navin Kumar which was well attended. We are planning for a second IEEE 5G Summit on August 17th, with a final one at Samsung later this year.

The IEEE Communications Society has recognized the Bangalore chapter with an award in recognition for its efforts in the Asia Pacific Region. Sincere thanks to Prof Navin Kumar who was the chapter chair in 2018 for all of his efforts in making this happen.

Chairman Message

Sincere thanks also to Ravindra Barlingay who worked earnestly to obtain approval at Schneider Electric for IEEE base membership for 68 employees (aka "Edisons") with one IEEE society membership, on a rolling basis annualy. An informational session was held on June 21st at Schneider premises. A significant group of IEEE Comsoc Bangalore chapter volunteers participated in that session.

Finally, we are starting a new gig with a regular IEEE Communications Society Bangalore Chapter Study Group that was proposed by Anand M who is the secretary of the chapter. The first two study group sessions are dedicated to discussing MIMO/5G MIMO led by Dr. Ganesan, followed by additional study group session on Quantum Communications and Networking led by Anand. The study group is expected to meet once every two weeks on Saturdays at 2:30 pm.

Chapter members are actively participating in volunteering activities including providing educational sessions at different educational institutions and conferences. To increase engagement across chapter members, the "T-TIME Charcha" event has been started in the past year, to enable discussions related to technology, innovation, management and entrepreneurship. We would like to request chapter members who might be interested in hosting or participating to reach out to us.

Students are being encouraged to engage in technical research and development activities in emerging topics, and educational events such as Research Methodology workshops are being conducted regularly with the last one held in April 2019 cohosted at CMRIT. In addition, Prof Navin organized a Graduate Congress competition (GraTE7) competition in March 2019 at Amrita University campus for Masters and PhD students to encourage their research and to provide visibility to their research. Students from both the Bangalore and Kerala chapters participated in the event. Sincere congratulations to all the winners, all of whom happened to be women engineers. We hope to organize this event again in subsequent years.

Sincere thanks to all the volunteers who have contributed articles and to companies who have kindly offered to sponsor this newsletter, and a special thanks to Ms. Triveni for her outstanding help in the collation of content to create this edition of the newsletter. We are in the second year of this newsletter now, and collectively we hope to continue the tradition to publish the newsletter along with our humble volunteering contributions to the community in the coming years.

Sincerely,

Dilip Krishnaswamy

Inside this issue

About IEEE ComSoc and ComSoc Bangalore Chapter

IEEE ComSoc members stay on top of the world of communications technology by accessing up-to-the-minute technical information, networking with other experts in the field, and leveraging many other exclusive benefits.

ComSoc Bangalore chapter is one of the most vibrant and dynamic chapters with a large number of expert volunteers performing diverse tasks for the growth of the society and lives of the people. ComSoc Bangalore Chapter is known for the quality event. A huge support is extended to ComSoc chapter and volunteers by industry around.

Important Events (Jan 2019 –June 2019):

Event Name	Date and Month	Venue
GRADUATE CONGRESS: GraTE'7′	30 March 2019	Amrita School of Engineering, Kasavanahalli, (Off Sarjapur Road), Central Jail Road -Bangalore, 560035.
CMT Industry COLLABORATION – IEEE 5G Summit 2019	12th April 2019	Accenture BDC7 Tower A No 7, Pritech Park SEZ, Varthur Hobli, Marathahalli - Sarjapur Outer Ring Road, Bellandur, Bengaluru, Karnataka, -560103
A two-Day Workshop on"Research Methodology and IEEE AuthorshipLab"	13-14 April, 2019	CMRIT, ITPL Road, Bangalore
Upcoming Event (please look for ComSoc Webpage)		
ComSoc Study Group	6 July 2019	Jio Reliance office, AVANA Building, Sarjapur Jn
PhD EDITS-2019 : IEEE PhD Colloquium on Ethically Driven Innovation And Technology For Society – 2019	18 August 2019.	Amrita School of Engineering, Bangalore
5G Summit: 5G and Future Networks	17 August 2019	Max Sterling Hotel, Old Madras Road

NEW INITIATIVE BY COMSOC BANGALORE

RESEARCH METHODOLOGY WORKSHOP SERIES

Research Methodology Workshop Series is an initiative by IEEE ComSoc, Bangalore. Targeting to provide an intense training to understand the concepts of research, research methodology and scientific writing, a two-day workshop on 'Research Methodology' jointly organized by IEEE ComSoc and CMRIT student branch held during April 13-14, 2019 at CMR Institute of Technology, Bengaluru. The workshop was open to all students and faculty across Karnataka. Faculties were encouraged to attend. Out of 114 registration from various colleges, 54 participants attended this workshop. At the end of workshop, faculty from different colleges expressed their gratitude to organizers and speaker for creating awareness on research methodology. Feedback from participants was excellent.

GRADUATE CONGRESS: GRATE'7

IEEE ComSoc Bangalore chapter with ComSoc Kerala Section has launched an annual event for graduates (PG and PhD) students/scholars who have just submitted the thesis. In this congress, graduated students in year 2018 were invited to submit the synopsis and other required details for preliminary screening. Few selected submitters were invited to present their work **in 7 minutes** to the audience and panelists. Based on the work quality and other details, **4 best ME/MTech/MS/MCA** thesis and **3 best PhD** thesis has been awarded. The award carries 20K INR plus a merit certificate for PhD thesis each and 15K INR plus certificate for master thesis each. The corresponding supervisors were also given appreciation and recognition certificate for guiding the best thesis. The first event was organized at Amrita School of Engineering, Bangalore during 30th March 2019. This event has been highly appreciated by all the research scholars/participants.

Dear Reader, we plan to dedicate this page for 5G Tutorial Series. Starting from the basic, I would like to continue discussing about 5G Cellular System and Technologies in sequence (starting from Part 1, Part 2, ...). The tutorial will be in continuation from the previous issue. I hope, we will go in parallel with ongoing 5G research and development. It is believed that the reader will gain better understanding of 5G Cellular System if they follow the tutorial. In the last part (IV), we discussed briefly about Device to Device communication as enabling technology. In this issue we focus on cloud RAN. I would welcome any suggestion from you.

Navin Kumar, PhD, Associate Professor, Amrita School of Engineering Bangalore

5G Technology and Cellular System Tutorial Series: Part V – Enabling Technologies (Cloud RAN)

Cloud-RAN (cloud radio access network) is a centralized, cloud computing-based architecture for radio access networks (RAN) that enables large -scale deployment, collaborative radio technology support, and real-time virtualization capabilities. It is an evolution of the current wireless communication system and uses the latest common public radio interface (CPRI) standard, coarse or dense wavelength division multiplexing (CWDM / DWDM) technology and millimeter wave (MM wave) transmission for long distance signals. The "C" in C-RAN can alternatively stand for centralized or collaborative.

A RAN establishes a connection or communication between base stations and end users. In the C-RAN architecture, baseband units (BBU) are relocated from individual base stations to a centralized control and processing station, often referred to as a BBU hotel or pool. The BBU hotel connects to the network using high-speed optical fiber and maximizes the distance between cells. This type of cloud computing environment is built on open hardware and interface cards that dynamically handle fiber links and interconnections within the station.

It is estimated that the requirements for high speed mobile networking including high quality video streams, social networking and machine to machine communication will increase by hundreds times by 2020. This can be due to the increase of mobile users besides the high expectation to get higher quality of services. In addition, such growth will come in parallel with the promising 5G cellular networks to handle all network traffic and provide high quality services. In order to reflect such growth, operators and Telcoms will need to modify their infrastructure to handle such increase in the number of users and services expected. This can cost operators a lot in terms of capital and operating expenses which is expected to grow exponentially in such cases. On the other hand, the revenue of such operators is decreasing as they are mostly experiencing low growth in their incomes.

The part of the cellular networks that needs to be modified to handle such growth is called RAN. RAN includes base stations and users' connections wirelessly to the system besides handling user signaling and managements. This is considerably taking the highest costs in such systems as base stations deployment and management get really complex and cost a lot. Furthermore, to solve users increase and requirement, more than one base station will need to be deployed in the same area so that a base station does not get overloaded. However, having more than one base station will introduce the problem of base stations coordination so that they do not affect each other. The system will become more and more complex in terms of geographical deployment and coordination. Moreover, the cost of such system will be much more such that no operator will be able to handle such cost and hence a better cost effective solution needed to be proposed.

Thus, the following advantages can be envisioned by C-RAN

- Produces higher spectrum efficiency.
- Is more cost and footprint effective due to less hardware.
- Has lower heating, cooling and power requirements.
- Creates a more simplified, scalable and flexible network.
- Supports a larger number of mobile users and wireless standards.
- Allows for more efficient network upgrades, enhancements, testing, monitoring, and maintenance.
- Has the ability to pool resources or reuse infrastructure.
- Achieves faster speeds than distributed RANs.
- Uses cloud computing open platforms and real-time virtualization to allocate shared resources between BBUs dynamically.

C-RAN Architecture Components

A C-RAN architecture consists of three main components: Base -Band Unit (BBU) pool, Remote Radio Unit (RRU) networks, and transport network or what is normally called Fronthaul. Figure 1 shows the overview of C-RAN architecture while the following summarizes the main functions of each component:

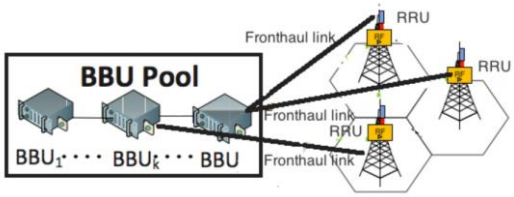


Figure 1: C-RAN architecture components

- BBU pool: a BBU pool is located at a centralized site like a cloud or a data centers. It comprises of multiple BBU nodes that have high computational and storage capabilities. Those BBUs are responsible for processing resources and dynamically allocating them to RRUs based on the current network needs.
- RRU network: a RRU network is a wireless network that connects wireless devices just like access points or towers in traditional cellular networks.
- Fronthaul or transport network: Fronthaul is the connection layer between a BBU and a set of RRUs that provides high bandwidth links to handle the requirements of multiple RRUs. Fronthauls can be realized using different technologies that include optical fiber communication, cellular communication or millimeter wave communication. Optical fiber communication is considered to be ideal in C-RAN as it provides the highest bandwidth requirement. However, it comes with high costs and not flexible implementation. On the other hand, cellular communication or millimeter wave communication is cheaper and easy to deploy. However, it comes with the cost of less bandwidth and more latency than optical fiber.

Sheeba Kumari M, PhD Scholar
Navin Kumar, PhD

Important Links

http://www.comsoc.org/
http://www.comsoc.org/whitepapers
http://www.comsoc.org/tech-focus
http://www.comsoc.org/comstandardsmag
http://www.comsoc.org/free-tutorials
http://www.comsoc.org/training/training-calendar/road-5g
http://www.comsoc.org/ctn/death-and-possible-rebirth-dsp
http://www.ieee.org/about/volunteers/volunteer_index.html?WT.mc_id=dhtml_vol_see

Convolutional Neural Networks

Pranav Raikote
Chair, IEEE Computer Society,
BMSIT&M, Member of Computational Intelligence Society.

Convolution Neural Network (CNN) is a class of Deep Neural Networks which is mainly deployed for Computer Vision tasks. It is arguably the most widely used and popular architecture in deep learning. The specialty of CNN's is that the network requires minimum pre-processing compared to other network architectures and algorithms. It mainly works on data which has a grid pattern – Image data and, it is designed in a way to learn the spatial set of features and patterns. Now, let's see in detail how it actually works.

A CNN is a mathematical model consisting of 3 types of layers – Convolution, Pooling and Fully Connected Layers. Convolution and Pooling are for feature extraction and the Fully Connected Layer maps the extracted features into outputs, for example, classification. CNN's are data hungry and need massive data for learning parameters and hence are computationally very expensive but deliver the best and most accurate results among other neural network architectures. It is a go-to model for every image related problem.

Convolutional Layer

Convolutional Layer consists of a set of learnable filters called as Kernels which has a small receptive field. It defines what exactly the things in operation is going to filter for and will produce a response. The entire kernel window which is a grid will slide across the input searching for the parameters/features defined. At every location, matrix multiplication is performed and summed into a feature map. A stack of kernels is used for extraction of multiple features. The parameters that define the convolution are the size of the kernel and no. of kernels. Below image shows basic convolution.

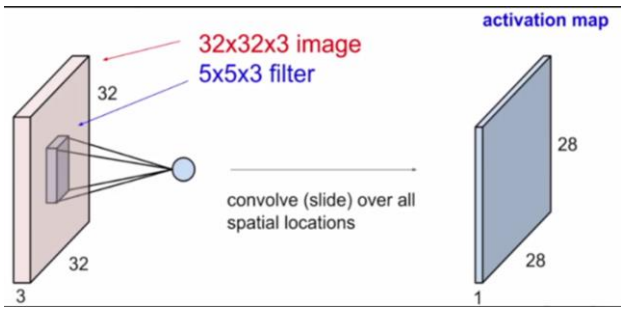


Image Source: http://www.medium.com

Pooling Layer

Pooling Layer is used to reduce the spatial size of the representation to reduce the number of learnable parameters and computations. It operates on each and every feature map independently. The most frequent type of pooling is maximum pooling, which takes the maximum value in each window. The below image show Convolution and Pooling workings.

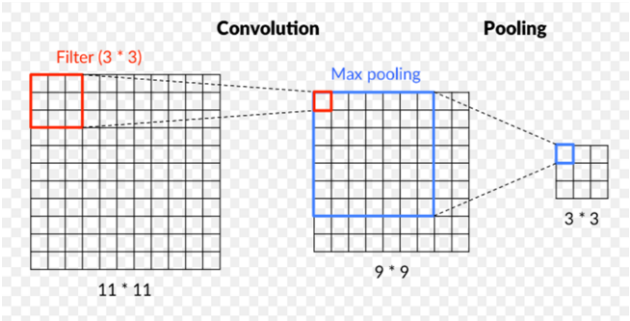
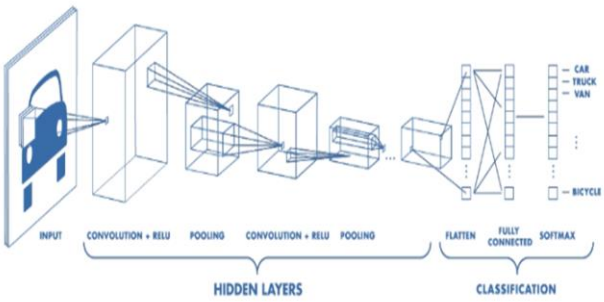


Image Source: -https://saitoxu.io/

Fully Connected Layer

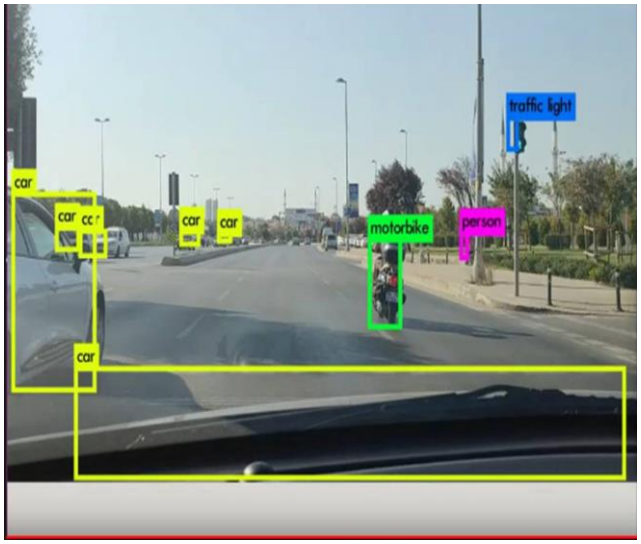
Fully Connected (FC) layer consists of the same number of output nodes as the number of classes. The reasoning is done in this layer. It expects a 1-D Vectors as input, so we need to flatten the output of final pooling layer. Flattening is arranging 3-D volume of numbers into a 1-D Vector. Each FC Layer has an activation function. This last layer activation is used for normalizing the output real values to the target class probabilities. Drop out function is added to prevent over fitting of data – which results in reduced accuracy and a loss function, and defined for learning about how well the network is performing with respect to weights and biases.



This image shows the complete working of a CNN (It is an image classifier). Here ReLu is an activation function used to make sense from non-linear complex functional mappings. Softmax function calculates the probabilities distribution of the event over 'n' different events. It will calculate the probabilities of each target class over the complete set of all target classes. This wiill be used in final classification/prediction.

Object Classification and Detection

This task requires the classification of objects within a photograph as one of a set of previously known objects. A more complex task would be to identify multiple objects of different classes in a single frame or in a live video stream. Extensively used in Autonomous Cars, Biometrics, Surveillance.



Medical Applications

CNN's are used to predict a popular neurodegenerative disease-Alzheimer's disease, which claims millions of lives across the world every year. Medical Researchers used MRI data for training a CNN and it resulted in an accuracy of more than 93% which was far better than75-80% achieved by an ANN. Now slowly, many other disease prediction networks are being developed. Lives can be saved if a disease can be predicted very early, shows how important neural networks and artificial intelligence are to the world.

Game playing

You must have heard of news like "A Computer beats human in a game". A hand down to CNN's again. Google's Deep Mind developed Alpha Go which beat a professional Go Player. Go is a game for 2 players and the aim is to capture more territory than the opponent. It has very large branching probability and is specifically hard for a computer to play this due to a very large branching factor. Another example is IBM's Deep Blue which beat Chess Champion Gary Kasparov. Nowadays all type of software games can be played without user intervention. A CNN can be trained to play a Road Rash game and the user won't even have to press a single button!

As we see, CNN's are very widely used and are deployed successfully over the Computer Vision domain -which is one of the most challenging domains in AI.

Any problem of this domain will surely use a CNN in one or the other step. This shows how effective it is. It is literally giving eyes and brain to a machine or robot which acts like a human. They are changing and improving the world constantly over the years and will continue improving in the future.

ComSoc T-TIME CHARCHA

A unique and innovative idea Tea/Coffee –Technology Innovation, Management and Entrepreneurship Charcha (event) is conceived. A FREE half day event to discuss on the above topics by Experts. Host organization, preferably from Industry if willing to host, kindly contact us.

Dr Navin Kumar, navinkumar@ieee.org

Mr Anand.M (anand.m@ieee.org)

How safe is your DATA FROM privacy breaches?

Veena Gadad. Dr. Sowmyarani C N, Dr. Ramakanth Kumar P

R V College of Engineering, Bengaluru.

We often go to hospitals, government offices, educational centres or other commercial organizations and give away our personal information. We do not actually think about the actual utilization of the data. The collected data may include your salary information, your health conditions or any personal or sensitive matter that you do not want others to know.

Most of such organizations publish or give away the collected data to the public at the cost of the money or for some advertisement purpose. Since the data contains individual's sensitive information, it just gets leaked out to the public and anyone can use this data for any purposes. Although, there are privacy laws across the globe to protect such breaches, there is less awareness about privacy threats among the people. Lot of research initiatives are taken to understand various types of privacy attacks and design appropriate privacy models against such attacks. The general overview of Privacy preserving Data Publishing (PPDP) models is shown in Figure 1.

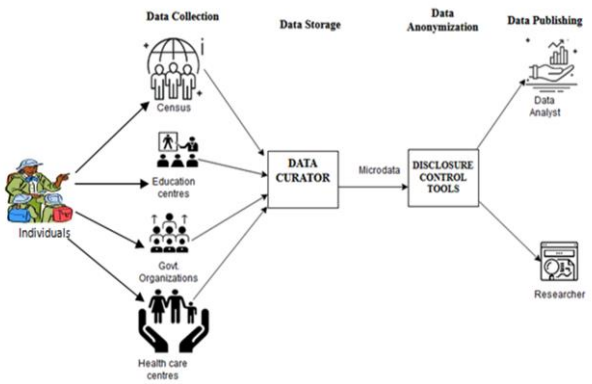


Figure 1. General overview of Privacy Preserving Data Publishing models.

The individual's sensitive data may be collected at various sources during the process of data collection. This data is stored and the person who stores the data is called as data curator. Typically, any researcher or an analyst is interested in a microdata which is a data of some organization or of a city or a specific locality, and so on to perform some analysis. Since the microdata contain sensitive information, the data is passed through the process of data anonymization and then published. Various anonymization algorithms/methods are developed to protect the data from privacy breaches. Since the published data may be used by the researcher or the data analyst as shown in the figure 1, the method should also take care of providing sufficient utility of the data otherwise the collected data just becomes liability. Therefore, any anonymization algorithm aims at two things: 1). to preserve the privacy of the individual and, 2). to provide high utility for the data published.

Many researchers are working on this area to come up with an efficient privacy preserving data publishing models that can overcome many attacks and at the same time provide high utility of the data to be published.

References

1. Domingo-Ferrer, J., Farràs, O., Ribes-González, J., & Sánchez, D. (2019). Privacy-preserving cloud computing on sensitive data: A survey of methods, products and challenges. *Computer Communications*, *140*, 38-60.
2. Gadad, V., & Sowmyarani, C. N. (2018, February). Understanding Microaggregation-A technique of Statistical Disclosure Control for Privacy Preserving and Data Publishing in Inter-Cloud. In *2018 Second* IEEE *International Conference on Advances in Electronics, Computers and Communications (ICAECC)* (pp. 1-4).
3. Sowmyarani, C. N., & Dayananda, P. (2017). Analytical Study on Privacy Attack Models in Privacy Preserving Data Publishing. In *Security Solutions and Applied Cryptography in Smart Grid Communications* (pp. 98-116). IGI Global.

REMOTE LIGHTING CONTROL USING LORA TECHNOLOGY

Tulasi R. Haritsa, Veeresh Kumar,Yashu B. M. Dr. Suma M N

Dept of ECE, BMS College of Engineering, Bangalore.

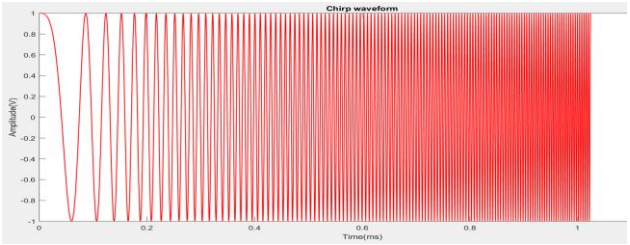
LoRa technology is the first low cost implementation of chirp spread spectrum modulation for commercial purposes. The advantage of LoRa is in the technology's long range capability, its low power consumption and low noise floor characteristics. By implementing a smart lighting solution comprised of sensors and gateways embedded with LoRa technology, and an intelligent low power wide area network based on the LoRaWAN protocol, we can cut energy and maintenance costs. Smart lighting provides remote lighting control that can better adjust the amount of time the lights are turned ON without sacrificing public safety and exerts control to reduce energy expense.

Block Diagram:

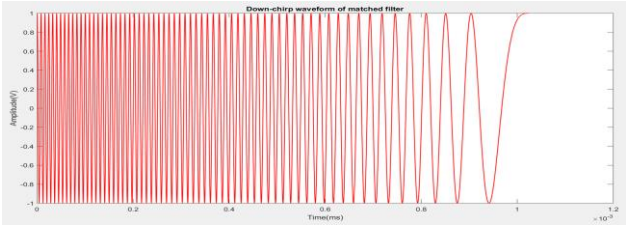
LoRa is a physical layer wireless modulation technique. It is based on chirp spread spectrum modulation. It is utilized to create a long range communications to implement a Smart Street Lighting system. In manually controlled light systems, people's safety maybe compromised due to the negligence in timely turning ON of street lights.

Also, due to inattention, the lights may remain ON during the day, causing large power wastages. These problems have been alleviated in places where smart lighting is implemented. But, the replacement of worn out bulbs is largely neglected which compromises the safety of citizens. Thus, we aim to implement a smart street lighting system that not only performs automatic turning ON and OFF of the street lights, but also, gives maintenance alerts to the relevant authorities in case of malfunctioning of any street light.

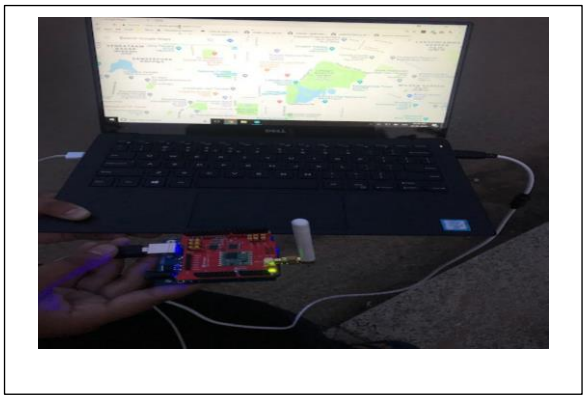
Transmitter chirp



Receiver chirp



SER PLOT for RSSI under LOS



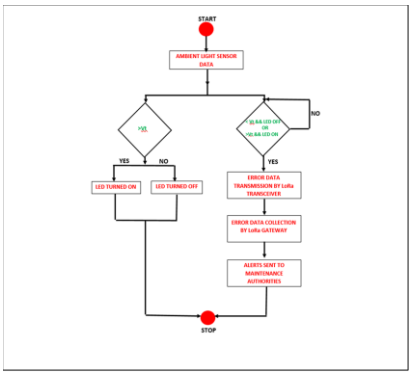
Transmitted chirp signal is

$$s(t) = \begin{cases} \exp(j\emptyset(t)), & 0 \le t \le T \\ 0, & \text{otherwise} \end{cases}$$

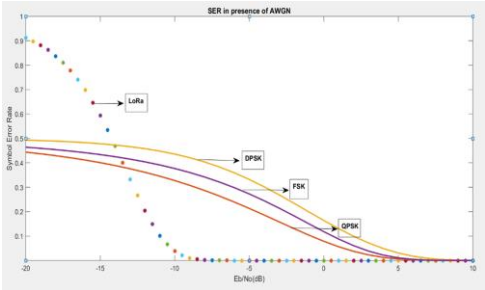
Advantages

	Wi-Fi	GSM	LoRa
Range (Indoor)	92m	-	**2km**
Range (Outdoor)	-	35km	22km
Battery Lifetime	1 week	1 day	**105 months**

Flow Graph



A Symbol Error Rate plot for LoRa was created by sending 10000 batches of 10 randomly generated symbols, and mixing Additive White Gaussian Noise (AWGN) before reception. The decoded output was matched with the original symbols and the error was recorded. This exercise was performed for SNRs between −20 dB and −6 dB, varied in steps of 0.5 dB. To serve as a yardstick for comparison, we also computed the same statistic for legacy modulation schemes FSK, DPSK and QPSK. The outcome of this experiment is shown in Figure where we observe that LoRa performs significantly better than the legacy schemes. For instance, the SER drops to nearly 0 beyond −7 dB for LoRa, while it drops to 0 only beyond 0 dB for the legacy schemes. Thus, LoRa can receive and decode symbols even when the noise level is 5 times the received signal strength



Conclusions

LoRa is an excellent choice for IoT applications by virtue of its long range, low power consumption and low noise floor characteristics.. Since LoRa has a very low noise floor, the receiver sensitivity and transmitted power constraints are minute, resulting in long communication range and long battery life. Moreover, LoRa's already low SER can be further improved using techniques such as data whitening, interleaving and forward error correction coding. The mathematical descriptions and simulations incorporating these techniques are interesting avenues for future research.

Will AI Surpass Human Beings in Intelligence?

Dr Virendra Gupta,

Global Vice President Engineering - Business Collaboration, Mobility and IOT Solutions, Tata Communications Ltd

Will AI surpass human beings in intelligence – it is a question of continued debate. As per Mitchell (2019), AI is quite far from reaching to human intelligence level. In fact, in her paper, she questions and provides references and evidence on inability of some of the AI programs to do specific jobs under different conditions than initially trained for. Strong AI and Machine Reasoning are two emerging technology areas in AI space that will bring AI capability close to human being capability

This paper will discuss these 2 technologies and recent developments. in these areas.

Strong AI is also referred as AGI – Artificial General Intelligence. Current AI systems focus on a very small niche area such as face recognition, speech processing etc. Each AI system is trained to perform one task very well and in general cannot handle multiple types of tasks. Strong AI systems, like human beings, try to learn and adapt across large sets of areas in absence of human supervision. One of the key focuses in Strong AI systems is ability to learn how to learn and ability to generalize and apply learning to new situations.

Currently, AI is more about looking at the world and then making predictions that what is going to happen. AI needs to mature in the area of using the environment and context to do reasoning and make decisions and conclusions. This is the scope of machine reasoning.

In machine reasoning, AI system should be able to suggest solutions based on some reasoning. This way, machine reasoning systems can be used for problem solving.

There is progress being made in these two areas. Deep Mind has developed neural network based relational reasoning model which can be used for relational reasoning (Santoro et al., 2017). It can reason about relations among objects in a scene. It can answer questions about a set of objects in a scene if an object is inside another object or an object is bigger than other object. This way, given a scene, it can draw inference on several attributes about objects.

Vicarious is working on several areas related to strong AI including data efficiency, task generality, conceptual understanding etc. Task generality here refers to learning of the models, which can be applied in many other areas. Data efficiency refers to learning from few sets of examples. In conceptual understanding, a concept is learnt from one context and then it be applied in another context.

Vicarious reported a generative vision model that trains with high data efficiency and has broken captcha based security (George et al., 2017). They have also reported a model called schema network which can generalize its learning to new situations (Kansky et al., 2017). They have demonstrated capability of the model on playing many other variations in breakout game when the model was trained only on the base game.

Building common sense knowledge and ability to apply to novel situations or new situations is one ability which today AI programs lack. Hopefully research will pick up in this area and production systems will be available to bring AI closer to this vision of being human like.

References:

1. Mitchell, M. (2019). Artificial Intelligence Hits the Barrier of Meaning. Information, 10(2), 51.
2. Santoro, A., Raposo, D., Barrett, D. G., Malinowski, M., Pascanu, R., Battaglia, P., & Lillicrap, T. (2017). A simple neural network module for relational reasoning. In Advances in neural information processing systems (pp. 4967-4976).
3. George, D., Lehrach, W., Kansky, K., Lázaro-Gredilla, M., Laan, C., Marthi, B., ... & Lavin, A. (2017). A generative vision model that trains with high data efficiency and breaks text-based CAPTCHAs. Science, 358(6368), eaag2612.

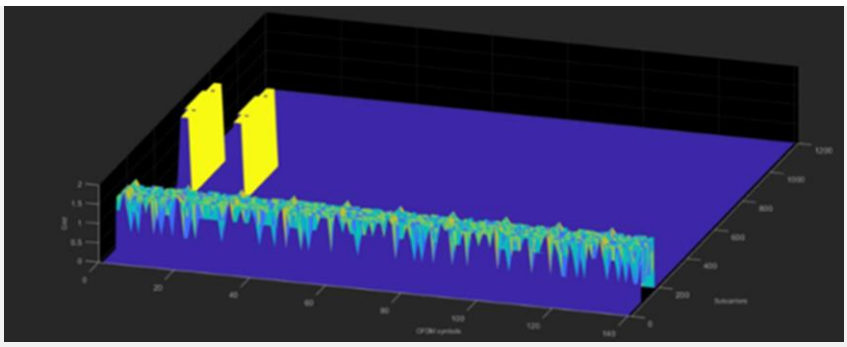
5G Toolbox from Math Works

Extends wireless standards capabilities by helping to simulate, analyze, and test the physical layer of 5G communications systems

The new 5G Toolbox for MATLAB provides standard-compliant functions and reference examples for the modeling, simulation, and verification of 5G communications systems. The toolbox supports link-level simulation, golden reference verification and conformance testing, and test waveform generation.

With the toolbox you can configure, simulate, measure, and analyze end-to-end communications links. You can modify or customize the toolbox functions and use them as reference models for implementing 5G systems and devices.

The toolbox provides reference examples to help you explore baseband specifications and simulate the effects of RF designs and interference sources on system performance. You can generate waveforms and customize test benches to verify that your designs, prototypes, and implementations comply with the 3GPP 5G New Radio (NR) standard.



Key Features

- OFDM waveform generation with NR subcarrier spacings and frame numerologies
- Standard-compliant models for 3GPP 5G NR Release 15
- Link-level simulation with reference examples, including 5G NR PDSCH throughput simulation
- TR 38.901 propagation channel models, including clustered delay line (CDL) and tapped delay line (TDL) and
- Downlink transport and physical channels (shared, control, broadcast); synchronization and demodulation reference signals
- Signal processing functions, including channel coding (LDPC and polar codes), channel estimation, synchronization, and equalization
- Open MATLAB Code and C and C++ code generation support

Learn more about 5G Toolbox: mathworks.com/products/5G.html

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PERSONALISED LEARNING ENVIRONMENT (PLE) - CONCEPT AND TECHNOLOGY BEHIND THE NEW WAY OF LEARNING

Pragyan Parimita Barik - https://www.linkedin.com/in/parimita/
Nishant Krishna - https://www.linkedin.com/in/nishantkrishna/

Article repurposed from the originally published article from NumberNagar® Blog at https://blog.numbernagar.com/2019/02/09/the-era-of-personalised-learning/

Introduction

A Personalised Learning Environment (PLE) can use the best of technology to personalise the learning by focusing on individual learner's pace, need, and interests. The concept of PLE can be applied to people of all age groups, from children to adults alike.

Moreover, this can help people with all type of learning and comprehension speed and ability to reach to a common level.

Personalised Learning can play an important role in continuing education, re-skilling, and keeping oneself relevant to the demands of the industry. In this article, we introduce Personalised Learning as a concept and look at the enabling technologies.

Personalised Learning' is one of the most discussed educational trends today.

With the combination of pedagogic insight and technologies like AI (Artificial Intelligence) and ML (Machine Learning), learning has become personal, multi-faceted, contextual, and dynamic. Many schools are now adopting the personalized learning approach. Educators are trying to bring everyone to the "right level" of challenge in the learning process.

This "right level" is the level unique to every student. Since a teacher knows his/her students the best, this level needs to be calibrated by the teachers. However, a teacher can only look at a certain number of parameters in this process. On the other hand, a PLE can use the best of technology to do this automatically.

Education is going digital.

Personalised learning, aided by technology can improve student engagement, increase attendance and bring out better behaviour. This can also take care of the constraints related to one-size-fits-all education system or one-to-many teaching.

So, what exactly is Personalised Learning?

Personalised learning, by definition, is learning anywhere anytime, based on one's ability, preference, and learning speed. In personalised learning, we give emphasis on personalising the content to suit the needs of a student.

While personalised learning does not necessarily require technology, one needs to focus on individual learner's pace, need, and interests. Hence, learners' profile and evidence of competency-based progression are the two key aspects to create tailored and more impactful learning content.

Factors in Personalised Learning

Let's look at the factors in personalised learning that can drive an education transformation. Let's also look at the reasons behind the adoption of personalised learning approach. Following are the main factors:

- Customised learning pace as per each student's needs
- Tailored content, learning objectives, and tools to optimise student learning
- Learning decisions centred on learner interests, i.e., individualised learning
- Learning flexibility in terms of students get to choose what, how, when, and where they learn
- Supported by technology and influenced by the individuals' learning data
- Helps students with a sense of control
- Fulfilling the learning objectives in small groups
- Assisting and reinforcing the learning by blended learning and online learning

Making personalised learning work for your institution

These are some of the ways one can make personalised learning work, be it for a classroom, a school, a college, a small team, or for the entire enterprise.

Being on the same page:

We need to share similar belief systems for clear communication about personalised learning. We can develop a framework for the entire school/college/education ecosystem to help students succeed. This is because the future of PL may depend on how much extended support teachers offer.

Learning at their full potential:

PL plays an active role in student's learning with a range of techniques and flexibility of being allowed to complete their assignments at their own pace. The outcomes have already impressed many teachers and schools. This means the educational institution needs to be flexible in terms of outcomes.

Success measures:

Becoming more competitive takes an improved assessment system. This is powered by an individual's learning data and accountability system that assures constructivism and resource-based learning. Several factors may be obstacles to success or in tracking progress. For instance, the socioeconomic background is one such factor. Here is where a learning intervention can maximise non-cognitive skills and learner engagement.

Adoption rate:

R&D in personalised learning is a costly affair. Private schools and franchise centres can be avenues to implement personalised learning. However, there is a need to simplify the replicability to an extent that even government funded institutions can afford it. We can look at CSR (Corporate Social Responsibility) based assistance and funding for better adoption.

Technology behind Personalised Learning Environment

From a generic technology standpoint PLE has Machine Learning in its core. However, from a design and implementation perspective, "Learning Paths" are in the centre of PLE. It uses the power of Machine Learning to create personalised Learning Paths.

What are Learning Paths?

Learning paths are the multi-level path a student takes to reach a goal. Students can take a different learning path to reach the same goal.

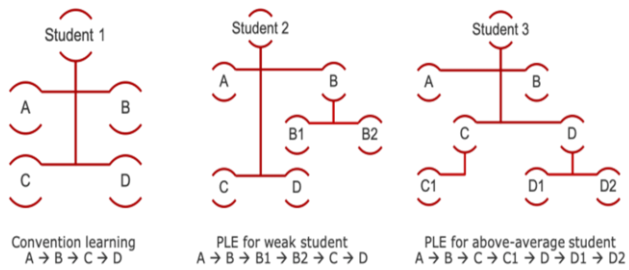
- A learning path can be created dynamically based on the various things – the topics a student/parent/teacher choose to deal with, the current level of the student, etc.
- Each node in the learning paths is independent
- . Each node has various properties to denote what it is for and where it fits.
- There may be an insertion of new nodes/milestones in the
- learning paths based on the assessment results at a previous node/milestone. This is transparent to the students and strengthens their knowledge without showing a discouraging result.

Learning Paths as the Enabling Technology

Learning Paths are used to create a 'Personalised Learning' environment where:

- Every student is treated differently
- Weak students get extra attention and reinforcement
- Strong students get extra content to keep them curious and engaged
- Machine Learning based algorithms automatically decide the Learning Paths
- The facilitator/ administrator/ teacher can decide the path one has to take in advance too

The example below shows how Learning Paths result into personalisation of content for different students.



Conclusion

Technology is already playing an important role in the education and learning. However, the convention way of learning is not very efficient for everyone. The main reason behind it is that every child is different in terms of learning and grasping speed.

Introduction of Personalised Learning Environment using Machine Learning techniques helps a child learn at his/her own pace using the content and the path which is personalised to him/her.

Moreover, since it is a generic technology, this can be applied to the learning and re-skilling of people of any age groups including adults.

PhD Scholars and Master Scholars (GraTE'7)

Like, pitching PhD thesis in 180 Seconds; we bring to you – PhD/Master Thesis in 420 Seconds (7 Min).

Practice your thesis presentation in 7 minutes and compete to win the best thesis award through ComSoc event Graduate Congress: GraTE'7 (graduate thesis evaluation in 7 minutes). GraTE'7 selects 7 best theses through various stages of screening. In the final stage, candidates need to orally present their thesis to panellist in 7 minutes. It is challenging and much practice is needed.

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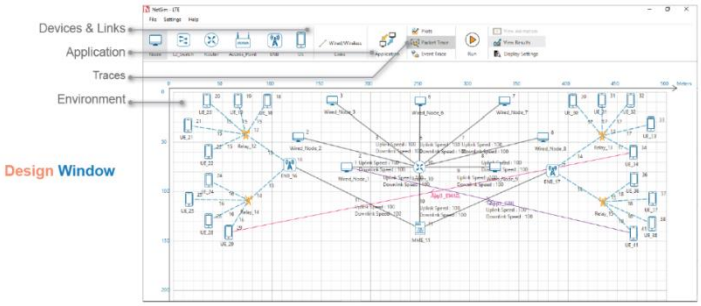
Accelerate your network R&D

with NetSim's new 5G NR mmWave library !!

Do you want to set up a 5G lab?
Are the hardware options way too expensive?
Do you want to do R&D in 5G?
Are you stuck with open source simulators with no UI and millions of lines of complex code?

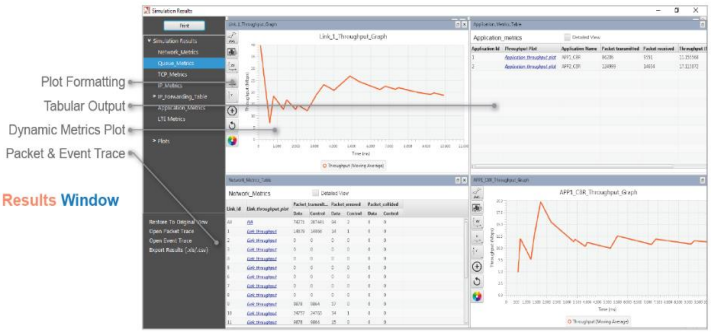
The industry's leading network simulation tool used by 400+ universities across 25+ countries.

NetSim is an end-to-end, full stack, packet level simulator and comes with an easy to use GUI with simple drag and drop functionality, and simulation output available as formatted tables and graphs.



NetSim's new 5G library is based on 3GPP 38 series standards and covers:

- SDAP, RRC, PDCP, RLC: TM / UM / AM, MAC
- PHY: FR1 (2 – 5 GHz) and FR2 (26 – 28 GHz)
- mmWave propagation: Rural Macro, Urban Macro, Urban micro, Indoor Office with LOS/NLOS conditions
- Devices: gNB, mmWave UE, EPC (comprising of PGW, SGW and MME)



- Protocol source C code is provided alongwith which users can modify to write their own algorithms

The typical workflow in NetSim is:

- Design the Network
- Set device and application properties
- Run the Simulation
- Visualize with the animator
- Analyze the results
- Write your own algorithm/protocol

Emulation Capability: NetSim 5G library can be interfaced with NetSim emulator for connecting NetSim to real devices running live applications.

Please contact us for more information or to discuss an evaluation

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All in Three: How to Pitch Your PhD in 180 Seconds

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@ ThingTronics, B Tech (>65%), (ECE/CSE –04); MBA -02, contact - rk.arvapally@thingtronics.com .

@ Terminus Circuits, M Tech VLSI (03); (gsjaved@ieee.org)

@WoW Studio, Acct Manager 02[contact (lopa@worldofwowstudeio.com

Latest Job Listings - June 2019

https://jobs.physicstoday.org/

***PhD position in the area of** « PhD student in Artificial Intelligence for 6G Mobile Networks. It is connected with a project called "AI4Green: Artificial Intelligence for Green Mobile Networks". AI4Green focuses autonomous management of both radio access and core networks, together with processing and storage resources at data centers while keeping in mind the emergence of new architectures and the development of smart grids. Position is with communication system department, School of EECS at KTH Royal Institute of Technology,University in Sweden

https://www.kth.se/en/om/work-at-kth/lediga-jobb/what:job/jobID:253269/where:4/

POST DOC

Postdoctoral Research Association position in Embedded Wireless systems-Northeastern University,Boston,USA preferred starting date September/October 2019.The Instituteis looking in the area of Wireless Internet of Things at Northeastern University, Boston,.

18 PhD and PostDoc required

https://jobs.ieee.org/jobs/18-ph-d-and-postdoctoral-scholarships-113917853-d

Student Branch Chapter Information

Amrita School of Engineering, Bangalore Campus

ASE ComSoc Student Branch Chapter is formed in April 2016. The student branch has largest number of student members over 120 and perhaps the largest Student ComSoc Members. They conduct lot many activities and are very active.

https://ieee-amrita.firebaseapp.com/

Demystifying 5G and IoT - Seminar

Indian Institute of Science

Faculty Advisor – Prof T Srinivas, ECE Dept

CMRIT – Joint SBC inaugurated.

Branch Counselor – Prof Mahesh K Jha

RVCE Student Branch Chapter

RVCE ComSoc Student Branch Chapter is formed in the month of July 2016 with faculty advisor as Dr S Ravishankar, Professor in the Dept. of ECE.

Faculty Coordinator: K S Shushrutha Asst. Professor, Dept. of ECE, RVCE
Student Chair: Prakhar Jain, Student, Dept. of ECE, RVCE

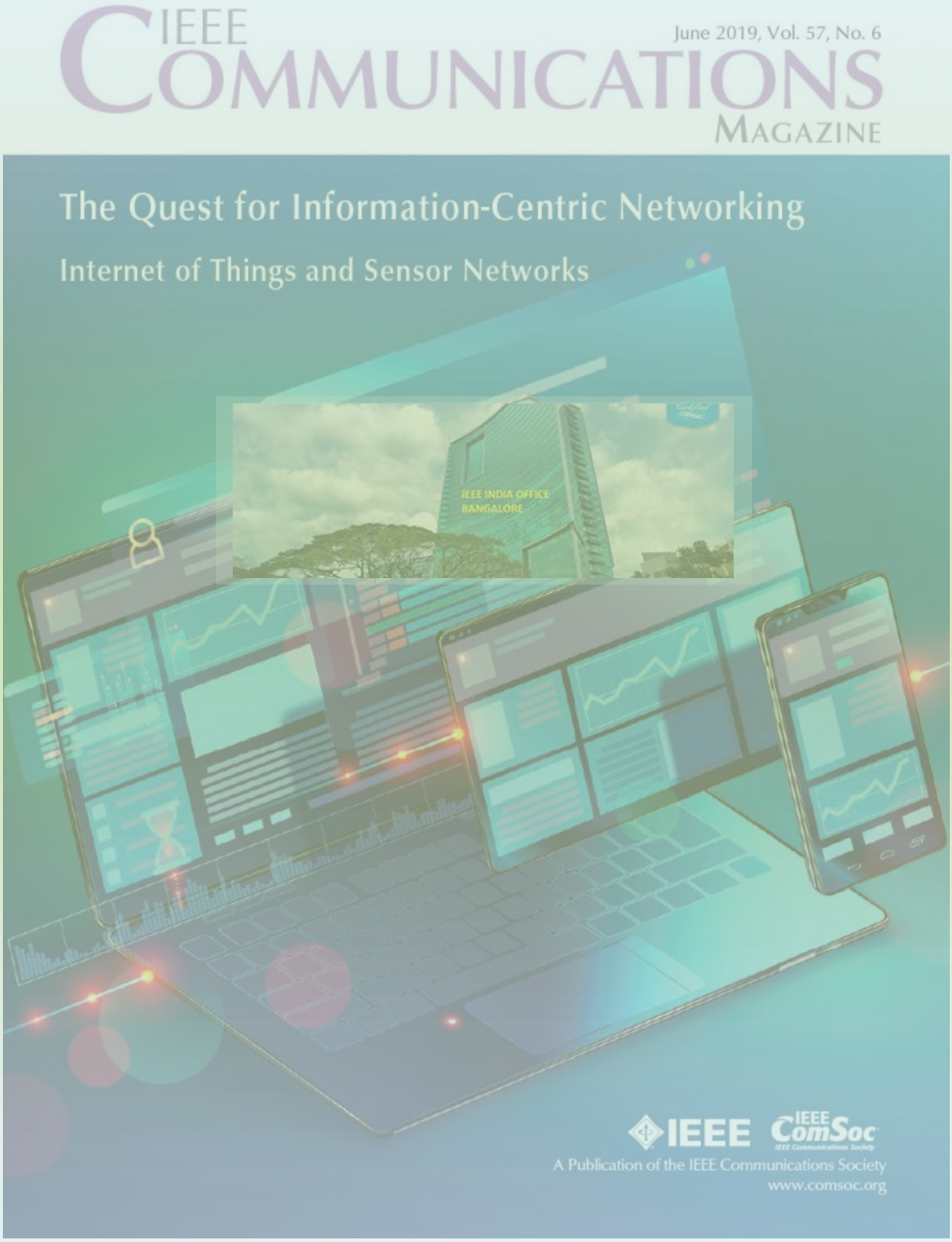
Start ComSoc Student Branch Chapter in your Organization/Institution

If you would like to start ComSoc Student Branch Chapter, please get in touch with us (Chair/Secretary). We will help you to establish.

THANK YOU NOTE FOR THE CONTRIBUTORS

We would like to thank every author who showed interest and submitted their works. We could not include all of them mainly because of scope and relevance.

IEEE 5G Summit-2019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