A Reflection Report for Attendance at 6th Training School on Machine and Deep Learning Techniques for (Beyond) 5G Wireless Communication Systems, Barcelona, Spain

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6th Training School on Machine and Deep Learning Techniques for (Beyond) 5G Wireless Communication Systems

This is a summary of my recent training school - 6th Training School on Machine and Deep Learning Techniques for (Beyond) 5G Wireless Communication Systems which was held in Centre Tecnologic de Telecomunicacions de Catalunya (CTTC), Barcelona, Spain from April 8 to April 11 2019.

This training school focused on the application of Machine and Deep Learning techniques to the design of (beyond) 5G communication systems, with particular emphasis on physical and lower layers. Several keynote and tutorial lectures by renowned researchers from academia and industry on recent advances in this research field with practical hands-on sessions were the agenda on this training school. Young PhDs and early-stage researchers in electrical engineering, computer science or related fields were particularly invited to attend and participate in this training school. However, only 75 PhD students, Post-docs, and young Professors from several universities all around the world got the chance to participate in this unique training school.

The main objectives of the 6th Training School on Machine and Deep Learning Techniques for (Beyond) 5G Wireless Communication Systems was:

- While the prime examples of disruptive progress of Machine Learning, Artificial Intelligence, Deep Learning Algorithms have occurred in fields such as computer vision or natural language processing, there is still a huge potential for these improvements to carry over to other disciplines such as communications engineering. The training school demonstrated the benefits of machine learning for the lower layers of the communication stack, including coding, modulation, equalization, detection, resource allocation etc.

- Provide a venue for sharing and discussing cutting-edge technological advances in Machine Learning and Deep Learning and its applications to the wireless communication field.

- Inspire early stage PhD students and researchers to take on challenging high impact AI problems in wireless communication field to tackle energy efficiency issues, resource allocation, power allocation issues and so on.

As part of the training school, the school was opened with the keynote talk from Osvaldo Simeone who is a Professor at King's College London. Prof. Simeone delivered an interesting talk on **"When Can Machine Learning Be Useful for Communication Systems?"**. The general notion is that Machine Learning and Deep Learning can be applied to any field, but the talk especially provided insight on when to use Machine Learning and Deep Learning algorithms to have an useful results. The next interesting keynote talk was from Mérouane Debbah who is the vice president of Huawei Paris, France. Debbah provided the general overview on **"Artificial Intelligence (AI) Architectures for Beyond 5G Networks"** from the industry perspective. Debbah has an immense experience in academia as well before he completely moved to industry. He has also published lots of scientific publication on AI Architectures for Beyond 5G Networks and discuss some of his papers during the presentation. Debbah also shared his personal experience, how he was skeptical of using Machine Learning and Deep Learning algorithms at the beginning and what made him to jump into this hot field. It was an interesting discussion and presentation which i found very useful for my PhD research. **There was an interesting panel discussion as well during the training school where the participants got the chance to interact and ask questions directly to the panel members. The vivid discussion during the panel discussion cleared my understandings in many ways. Panel discussed that it is relatively easy now to publish paper when you are using Machine Learning and Deep Learning as it is very hot topic in academia and industry these days. But, being a PhD student, we all need to come up with the novel idea and solution to the problem. Publishing papers should be the secondary thing. Having clear grasp on the fundamentals of the wireless communication should be the main goal of every wireless communication researcher. Machine Learning and Deep Learning are merely a tool for solving the problem specified. The idea or algorithm of wireless communication itself should be new so that we can test and verify it through several Machine Learning and Deep Learning approach.**

There was also an interesting talk from Deniz Gunduz who is a professor at Imperial College London, UK and Mehdi Bennis who is a professor at University of Oulu, Finland. They both discussed the applications of using Machine Learning and Deep Learning algorithms for the intelligence at the edge of the device which could be very useful for the Internet of Things.

It was an amazing experience to attend this training school in Barcelona, Spain as i had an opportunity to learn and interact with eminent speakers

and distinguished researchers who are working in the same research field as mine. I also had an opportunity to take part in poster session where i presented my poster on **"A New Distributed Localization Algorithm Using Social Learning based Particle Swarm Optimization for Internet of Things".** I also had an opportunity to take part in the machine learning challenge where i got to experience hands on training on solving the wireless communication problems with the Machine Learning and Deep Learning algorithms. I also had a chance to explore Barcelona and taste good food of Spain. This was truly a beautiful and learning experience at the same time. I thanks COINS for supporting me to attend this event.

I took this opportunity to introduce our COINS project to the participants of the 6th Training School on Machine and Deep Learning Techniques for (Beyond) 5G Wireless Communication Systems. I have made networking with the renowned speakers and participants of the training school which i believe will improve the visibility of our COINS project. After introducing what COINS Research School of Computer and Information Security is all about, i have invited some of the researchers to take part in some of our COINS Research School activities. In addition to that, i have also discussed my PhD research ideas with the distinguish speakers from the academia and industry.
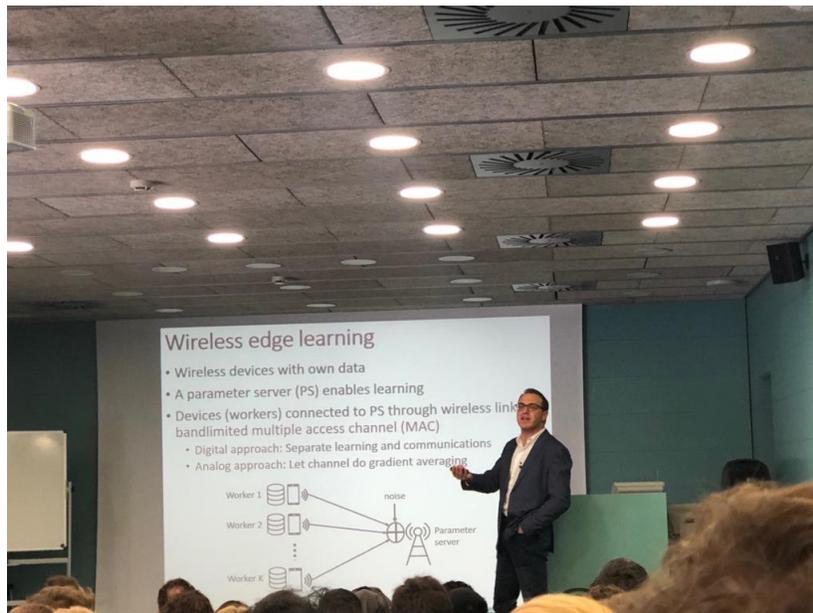

Figure 1: Prof. Deniz Gunduz from Imperial College London Presenting Wireless Edge Learning

For detailed information about the events, please visit this link:
$http://www.iracon.org/training-schools/6th-training-school-on-machine-and-deep-learning-techniques-for-beyond-5g-wireless-$

Figure 2: Ashish Rauniyar at the Training School
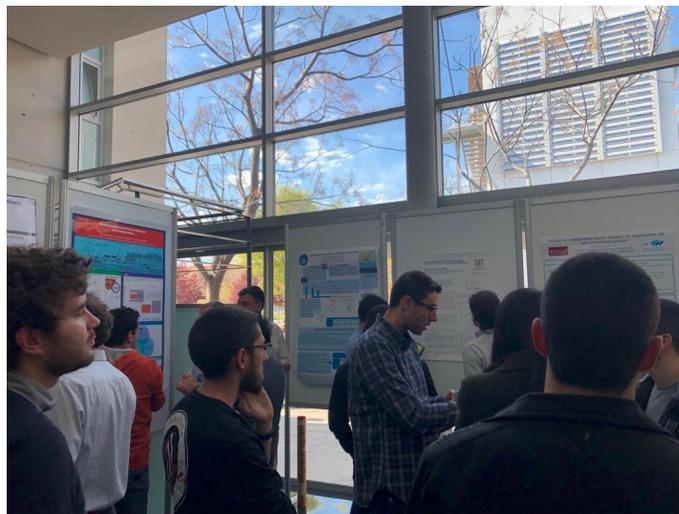
Figure 3: Discussion during the Poster Session at the Training School

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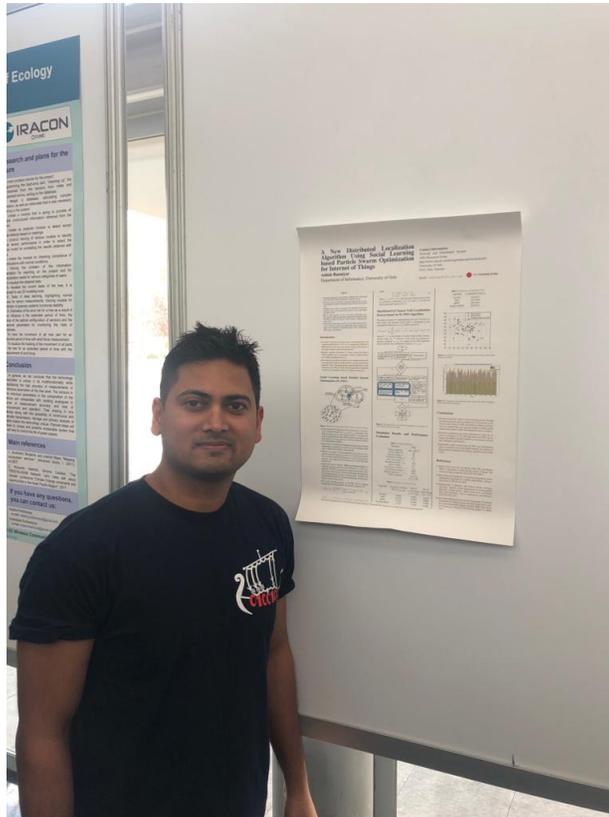
Figure 4: Ashish Rauniyar Presenting his Poster at the Training School

Below are the some pictures which i took during the events.

Concluding Remarks

Attending the 6th Training School on Machine and Deep Learning Techniques for (Beyond) 5G Wireless Communication Systems in Barcelona, Spain has definitely offered me a deep insight to use Machine and Deep Learning Techniques for (Beyond) 5G Wireless Communication Systems which is very relevant for my PhD research. It also gave me an opportunity to explore Barcelona, Spain and learn and do networking with the great researchers at the same time. So, I give my strongest recommendation to attend this kind of training school in future.

Figure 5: Panel Discussion at the Training School

Figure 6: Machine Learning Challenge at the Training School