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Executive Summary

This report is the second edition of the report on training activities in WindMill, following year 2 of the project.

As a Marie Curie ITN project consortium, the WindMill team fully recognizes the essential role played by the scientific and career training of the young researchers (ESRs) involved in the project.

This document reports on the outcomes of the various training events organized to the benefit of our ESRs, limited to the period of 31/08/2020 to 30/08/2021, as well as some of the ESRs' direct feedback on these events.



1 Introduction

As exposed in the first year version of this report, WindMill's training program is considered an essential part of the project's goals, owing to the specific nature of ITN project.

With young researchers' scientific training in mind, WindMill was conceived as an interdisciplinary and inter-sectoral project bringing the ESRs together with experienced professionals from the fields of communications and machine learning. Beyond the important career preparation aspects, the other key training elements aim at providing the ESRs with a wide palette of integrated interdisciplinary technical skills from the fields of machine learning and communications, giving them a problem based learning (PBL) edge, and making them capable of handling complex challenges arising from the design of future (beyond 5G) mobile networks.

The objectives followed by the project in this workpackage is to give to our ESRs a range of complementary skills training in areas such as business development, patent and intellectual protection, project management and collaborative team-work.

Year 1 particularly focused on career development aspects, and helping to maximize the competitiveness of the ESRs on the job market by helping them enhance career awareness. The program in Year 2 emphasized new aspects of personal training, namely how to develop **competences in terms of creativity** and how to assess and leverage **opportunities for business development and startups** based on ideas freshly harvested from the research lab. These topics came again in complementarity of more technically oriented training sessions of the various research items covered by WindMill in the areas of machine learning and communications systems.

The above activities are detailed in this document, although appear in a summarized form to improve legibility. We described the training sessions which were organized around 3 specific meetings in remote fashion. One meeting was a WindMill specific event organized in October 2020. The second meeting was a shared organized meeting with another relevant ITN project called Painless, in May 2021. Finally, the third training event took the form of a school, entirely dedicated to technical topics of interest to WindMill researchers, yet made open to young researchers from other projects and institutions.

The WindMill team also maintains tools to collect direct feedback from our ESR to evaluate the impact and organizational quality of our events, via questionnaires. Results from such questionnaires are also summarized in this document (details in the appendix only).

It should again be noted like last year that the bulk of planned activities did take place under conditions generally made difficult by the COVID-19 pandemic. As a result, all year 2 activities were organized in online form. The project team went to great length to make the most out of the difficult situation. For instance, we have recorded all technical sessions and the ESR presentations and made them available to both project members as the general population through our website. We also have advertised them through LinkedIn and Twitter in order to maximize the impact.

Following discussions between supervisors and ESRs were also decided to modify some aspects of the program to make it more digestible in online form by reducing direct lecturing hours and increasing interactive and remote work. The feedback on the general organization was overall quite positive as per our discussions with the ESRs and the survey results.



2 Summary of training strategy in WindMill

2.1 Nature of training in WindMill

We give below a reminder on the basic structure and organization of training in WindMill.

The WindMill's training program distinguishes between **technical knowledge (TK)**, **transversal (TV)**, and **career management (CM)** categories of training contributions that are realized through various **training modules**:

- A. knowledge sharing platform (or KSP),
- B. network-wide training,
- C. secondments,
- D. local training whereby ESR are due to follow a set of technical courses made mandatory by the rules of their respective doctoral schools (details on such courses are however not reported in this document),
- E. external training, and (F) training by role-playing.

The interplay between the training modules is schematically illustrated in *Figure 1* below and described in continuation.



Figure 1: Inter-related ESR training actions under WindMill



The KSP

The software tool behind the KSP was developed in last year at AAU. The platform is live since August 2020 and can be seen under <u>https://ksp-windmill-itn.eu/</u>

The ESR are regularly encouraged to post their progress, results, and feedback of various nature, on the KSP. The SB has engaged the ESRs in the design of the above platform by electing four KSP Champions which all ESRs are for a period of time. These champions have the role of engaging the other ESRs in creating content on the website in order for it to really come alive. The ESRs, supervisors and management team support each other in maintaining a platform with diverse and relevant content.

2.2 Training through meetings

In the year 2 of WindMill, two project meetings were organized along with one additional Summer School (Brixen, Italy). All meetings were organized in remote fashion, due to the lingering COVID crisis. The first year 2 meeting was organized by Ericsson in Sweden in October 2020 and the second project meeting was co-organized by the EURECOM team (France), as a joint even with ITN project Painless (AAU team), in May 2021.

The content of these two training events is summarized along with the two meeting agendas which are given below. Both meetings included sessions dedicated to:

- (i) general advice to ESRs given by project's leaders,
- (ii) scientific talks of tutorial nature, often given by external invited speakers,
- (iii) Non technical sessions, to help boost the ESR awareness in the non-scientific domains that directly affect career developments, including creativity and entrepreuneurship.
- (iv) hands-on workshop sessions so ESR can collaborate while getting familiarized with leading machine learning implementation and simulation tools.

3 Overview of year 1 activities (reminder)

As reminder, and for convenience to the reader, we here recall the training events which the year 1 deliverable D2.1 already reported 1.

- 1) Windmill meeting #1: First face to face meeting, Aalborg University (presential mode), November 2019.
- 2) Windmill meeting #2: Second face to face meeting, Paris, organized by Nokia Bell Labs (presential mode), March 2020.



Please see WindMill report D2.1 for details of the events and ESR feedback analysis on these two events.

4 Overview of year 2 activities

WindMill Meeting #3 (Sept/October 2020)

Stockholm Training School_& Mid-Term Check (organized by ERICSSON)

Note that this meeting also included an interaction with REA project officer Sarah-Amalia Aronzhon.

Dates: 28 September – 2 October 2020

Meeting venue: Online using Microsoft Teams

Day 1: Monday 28 September 2020

- For each line below: *Time Topic (Chair Person) Type of attendees*
- 08:45 09:00 Opening and attendance (Hugo Tullberg) ESRs check-in
- 09:00 09:20 Welcome by Magnus Frodigh, Head of Ericsson Research (Hugo Tullberg) All
- 09:20 09:30 Election of ESR representative to the Supervisory Board (Michael Haugaard Pedersen) All
- 09:30 11:00 Project management course (Hugo Tullberg) ESRs
- 11:00 11:30 Coffee-break
- 11:30 13:30 Project management course (Hugo Tullberg) ESRs
- 13:30 14:30 Lunch break
- 14:30 15:30 Project management course (Hugo Tullberg) ESRs
- 15:30 16:00 Coffee break
- 16:00 17:30 Project management course (Hugo Tullberg) ESRs

18:00 – 21:00 Supervisory Board meeting (Elisabeth de Carvalho) Supervisors + ESR Representative

Day 2: 29 September 2020 – MTC



For each line below: Time Topic (Chair Person) Type of attendees

- 09:00 09:30 Introduction by coordinator and tour de table of PIs (Elisabeth de Carvalho) All
- 09:30 09:50 Presentation by REA Project Officer (Sarah-Amalia Aronzhon) All
- 09:50 10:40 Coordinator's Report (Elisabeth de Carvalho) All
- 12:30 13:30 Coffee break
- 11:00 12:30 Fellows' presentations (5-7 minutes each) (Elisabeth de Carvalho) All
- 12:30 13:30 Lunch break
- 13:30 15:00 Restricted Session with fellows (Sarah-Amalia Aronzhon) ESRs + PO
- 15:00 15:45 Coffee break

15:30 – 15:45 Restricted Session with Coordinator (Sarah-Amalia Aronzhon) Elisabeth de Carevalho+ PO (in parallel with end of coffee break)

15:45 – 16:00 Feedback and conclusions (Sarah-Amalia Aronzhon) All

19:00 – 21:00 Social event Michael Haugaard Pedersen, (Vera Dvorakova) All

Day 3: 30 September 2020 – Course on Cloud and distributed computing

For each line below: Time Topic (Chair Person) Type of attendees

- 08:45 09:00 Meeting room open and attendance (Michael Haugaard Pedersen) ESRs Check-in
- 09:00-11:00 Lecture on Cloud fundamentals (Johan Eker, from Ericsson) ESRs
- 11:00 11:30 Coffee break
- 11:30 12:00 Introduction to the lab (Per Persson, form Ericsson) ESRs
- 12:00 13:00 Lunch break
- 13:00 14:00 Lab, Horizon GUI (Per Persson) ESRs
- 14:00 14:30 Introduction to Terraform (Per Persson) ESRs
- 14:30 15:30 Lab, Terraform (Per Persson) ESRs
- 15:30 16:00 Coffee break
- 16:00 17:00 Lab, Terraform (Per Persson) ESRs



Day 4: 1 October 2020 - Course on Cloud and distributed computing + Keynote on URLLC

For each line below: Time Topic (Chair Person) Type of attendees

08:45 - 09:00 Meeting room open and attendance (Michael Haugaard Pedersen) ESRs Check-in

09:00 – 10:30 Feedback from lab, discussion on issues, solutions, how to use in the future (Johan Eker and Per Persson) ESRs

- 10:30 11:00 Coffee break
- 11:00 12:00 Lecture on Trends in distributed computing (Johan Eker) ESRs
- 12:00 13:00 Lunch break
- 13:00 14:00 Keynote on URLLC by prof Petar Popovski (Hugo Tullberg) All
- 14:00 15:00 Keynote discussion ESRs, (Hugo Tullberg, as moderator) ESRs
- 15:00 15:30 Coffee break
- 15:30 16:30 Presentation on the Knowledge Sharing Platform (KSP champions) ESRs
- 16:30 17:00 Election of KSP champions (ESRs) ESRs

Day 5: 2 October 2020 - URLLC Day

For each line below: Time Topic (Chair Person) Type of attendees

- 08:45 09:00 Meeting room open and attendance (Michael Haugaard Pedersen) ESRs Check-in
- 09:00 09:50 URLLC: standardization and use cases (Cedomir Stefanovic) ESRs
- 09:50 10:40 Wireless Access for URLLC (Israel Leyva Mayorga) ESRs
- 10:40 11:00 Coffee-break
- 11:00 11:50 Multi-connectivity for URLLC (Jimmy Nielsen) ESRs
- 11:50 12:40 Satellite URLLC (Beatriz Soret) ESRs
- 12:45 13:15 Wrap-up of the week (Hugo Tullberg, Michael Haugaard Pedersen) All



WindMill Meeting #4 (May 2021) Joint meeting WindMill/Painless (EURECOM, AAU)

This meeting and training event was organized as a joint event with the ITN Painless project. Organizers were from EURECOM (WindMill) and AAU (Painless). The meetings capitalized on the fruitful technical connections between WindMill and Painless's core research topics. In particular, a key topic for Painless is the development of autonomous and flying wireless networks, for which the machine learning methodologies developed under WindMill are relevant. Despite being organized in online form, the joint meeting allowed ESRs from WindMill and Painless to interact and learn from each other. To this end, a special session was organized where ESRs from both projects directly presented their research results to one another as well as presented mini-tutorials covering the core topics of their respective projects.

Session on creativity

The event was also the occasion to promote an essential tool for ESR in their future research career: Creativity. The joint WindMill and Painless teams invited an external speaker and recognized expert on this topic: Dennis Sherwood. His presentation reviewed methodologies to promote a creative mind in a range of situations including research, engineering, organizational, and more. The lecture included several interactive sessions putting the ESRs in active exercise solving situations. More details are shown below on the profile of the speakers.

ESR feed back "Both of the soft skills workshops were very interesting and enlightening. However, the duration of each workshop was a little longer than needed."

Session on From Creativity to Business

The purpose of the 'From Creativity to Business' session in May 2021 was to discuss and exemplify possibilities and obstacles from in turning a research idea into a start-up business. The main focus was to form a realistic approach towards success as even the most excellent idea or scientific discovery can be met by lengthened and at times exhausting processes.

Meeting agenda

DAY 1 – Wednesday 05 May 2021 (TECHNICAL LECTURES)

- 09.00 09.10 Welcome to PAINLESS and WINDMILL summer school
- Leader: Jimmy Jessen Nielsen (Aalborg University)
- 09.10 09.20 Introduction to PAINLESS Project
- Leader: Christos Masouros (University College London)
- 09.20 09.30 Introduction to WINDMILL Project

Leader: Elisabeth de Carvalho (Aalborg University)

09.30 - 10.30



Keynote

Challenges and Possibilities for Wireless Connectivity on the Path Beyond 5G

Leader: Petar Popovski (Aalborg University)

11:00 - 12.30

Lecture

UAV Communication Challenges

Leaders: Christian Raffelsberger and Aymen Fakhreddine

(Lakeside Labs)

13.30 - 15.00

Lecture

Learning from the Sky: Robot Aided Mapping, Radio Access and Localization

Leader: David Gesbert (Eurecom)

15.30 - 17.00 Panel

Machine Learning, Communications and Energy Technologies: Synergies and Opportunities

Leader: Constantinos Papadias (American College of Greece)

DAY 2 - Thursday 06 May 2021 (TECHNICAL LECTURES)

09.00 - 12.30 Non technical session: "Yes, you too can be creative!"

Leader: Dennis Sherwood (Silver Bullet)

Bio: Dennis Sherwood runs his own consulting business, Silver Bullet, specialising in all aspects of creativity and innovation, and working with clients of all types, including many university academic teams Previous roles include being a consultancy partner with Deloitte, an Executive Director at Goldman Sachs, and Managing Director of the UK operations of SRI International (Stanford Research Institute). Dennis has degrees from Cambridge, Yale, the University of California at San Diego, and London Business School, and is the author of many journal articles and 11 books.

Torsten Sherwood read architecture at the University of Bath, and is now a freelance designer of buildings, furniture and children's toys. His work has been exhibited at the Milan Salone Satellite, and he was also appointed Designer in Residence at the London Design Museum.

13.30 - 17.00 From Research to business

Leader: Gert Spender-Andersen (Aalborg University)

Bio: More than 25 years of experience being an entrepreneur, has left me with 3 kids, a few houses, a line of successful and unsuccessful businesses and a great life. I am motivated by working with the innovation,



entrepreneurship and helping people "Bridging the Gap", of transferring research to businesses. My perspective on:

- Life: I pretend to be a hedonist, but I simply enjoy working too much.
- Work: The happiest person in the world is, the one who wakes up in the morning and looks forward to go to work.
- World: Why are we neglecting and destroying the world blind sighted. I believe that we as one world can do better.

DAY 3 – Friday 07 May 2021 (TECHNICAL LECTURES)

09.00 - 10.30 PAINLESS selected ESR presentations

Cost-Efficient Trajectory Design of an Energy-Neutral Aerial Access Point By Marco Virgili (Lyra Electronics) and Nithin Babu (ALBA)

An Overview of Federated Learning: Do UAVs Fit In? by Igor Donevski (Univ. Aalborg)

IRS based Communications by Mohammed Al-Jarrah (Univ. Manchester)

A Markov Chain Approach for Myopic Multi-hop Relaying by Andreas Nicolaides (Univ. Cyprus)

11.00 - 12.30 WINDMILL selected ESR presentations

Emerging a MAC protocol with MA-DRL by Mateus Pontes Mota (NOKIA Bell Labs)

Decentralized learning by Matteo Zecchin (EURECOM)

Future of Massive MIMO: Intelligent Surfaces by Anay Ajit Deshpande (Univ. Padova) and Christian J. Vaca Rubio (Univ. Aalborg)

Open-RAN by Pedro Maia de Sant Ana (BOSCH)

13.30 - 14.30 Lightning presentations

2 min talk per ESR

14.45 - 16.00 Break out sessions

5 min presentation and 5 min discussion per ESR

16.00 - 16.15 Closing of summer school



Training Event #5 (12-16 July 2021) Brixen Summer School

Introduction

The 5th training event organized under WindMill took the form of a technically oriented Summer school dedicated to machine learning topics directly relevant to WindMill researchers and arranged by University of Padova. In the tradition of PhD Summer school, the training event was advertised and made accessible to a wide PhD audience beyond just WindMill ESRs. The Summer school was organized in online fashion.

Contents and relation to WindMill objectives

The 30th edition of the <u>Summer PhD School of Information Engineering "Silvano Pupolin"</u> (SSIE 2021) featured two technical tracks, the first (track no. 1) centred on "Machine learning theory and applications", the second on "Next-generation electronics and photonics: from quantum devices to the internet of energy". Track no. 1 has been jointly organized with the Windmill ITN project and, as such, has been specifically designed around the Windmill technical objectives, putting emphasis on machine learning theory and its application to telecommunication networks and 5G systems.

97 PhD students have participated, from across the Windmill ITN project, from across universities (Bari, Cagliari, Catania, Milano, Napoli, Padova, Roma La Sapienza, Salerno, Torino, Unimore, Università Politecnica delle Marche, Aalborg, Aalto, ETHZ, Cork) and research centres (CTTC, EURECOM, Fraunhofer IAF, Nokia Bell Labs).

The school has been held online from 12 to 16 July 2021, utilizing the Zoom teleconferencing platform. Overall, it featured two plenary sessions, 25 speakers and a student workshop (lasting one full afternoon). 13 PhD students have presented their work at the SSIE student workshop, the best presentation has been selected by the audience and by the SSIE organizers through an online voting process. The winner is Matteo Zecchin from EURECOM (France), who is also a MSCA PhD fellow of the Windmill research network. Matteo has been awarded the best SSIE 2021 Best Presentation Award, presented to him by SSIE and by the IEEE Italy section.

The school program followed:

TRACK 1: Machine learning theory and applications

Monday 12/7	
8:00 - 8:30	Michele Rossi, Matteo Meneghini, Department of Information Engineering, University
	of Padova: <u>Welcome, program and (online) logistics</u>
8:30 - 10:30	Plenary no 1. Antonio Manzalini, Telecom Italia S.p.A (TIM),
	Quantum Optical Communications and Computing
10:30 - 10:45	Break
10:45 – 12:45	Stefano Melacci, Università degli Studi di Siena,
	Continuous Learning from video streams: a virtual agent perspective



Tuesday 13/7		
8:30 - 10:30	Manuel Roveri, Politecnico di Milano, Learning in non-stationary environments	
10:30 - 10:45	Break	
10:45 – 12:45	Manuel Roveri, Politecnico di Milano,	
	Artificial intelligence for embedded and edge computing systems	
12:45 - 14:00	Lunch	
14:00 - 16:00	Claudio Gallicchio, Department of Computer Science, University of Pisa,	
	Reservoir recurrent neural networks	
Wednesday 14/7		
8:30 - 10:30	Juan Jose Alcaraz Espin, University of Cartagena, Spain,	
	Reinforcement learning: a primer	
10:30 - 10:45	Break	
10:45 - 12:45	Giovanni Neglia, NEO Team @INRIA, Sophia Antipolis, France,	
	Distributed Machine Learning Training	
12:45 - 14:00	Lunch break	
14:00 - 16:00	Fabrizio Granelli, University of Trento,	
	Machine-learning, network automation and 5G	
Thursday 15/7		
8:30 - 10:30	Guido Maier, Politecnico di Milano,	
	Machine-learning defined networking: applications for the 5G metro-core	
10:30 - 10:45	Break	
10:45 – 12:45	Stefano Tomasin, Department of Information Engineering, University of	
	Padova, Physical Layer Authentication and Location Verification: a Machine-Learning	
	Perspective	
12:45 - 14:00	Lunch	
14:00 - 18:00	<u>Student workshop</u> : talks from students and best PhD presentation award	
Friday 16/7		
8:30 - 10:30	Plenary no 2. Danilo Pietro Pau, Director of System Research, ST	
	Microelectronics, Artificial Neural Networks and tools for ultra-constrained embedded	
	<u>deployability</u>	
10:30 - 10:45	Break	
10:45 - 12:45	Massimo Walter Rivolta, Dept. of Informatics, University of Milano,	
	At the heart of AI: a short journey on the "explainability" of Machine Learning models	
	in the context of health applications	
12:45 - 14:00	Short break	
14:00 - 16:00	Egidio Falotico, Scuola Superiore Sant'Anna Pisa,	
	Machine learning algorithms for robots: from perception to control	

TRACK 2: Next-generation electronics and photonics: from quantum devices to the internet of energy

Monday 12/7	
8:00 - 8:30	Michele Rossi, Matteo Meneghini, Department of Information Engineering, University
	of Padova: Welcome, program and (online) logistics
8:30 - 10:30	Plenary no 1. Antonio Manzalini, Telecom Italia S.p.A (TIM),
	Quantum Optical Communications and Computing



10:30 - 10:45	Break
10:45 – 12:15	S. Leonori, Università degli Studi di Roma La Sapienza,
	Machine learning for energy systems
12.15-14.00	Break
14.00-15.30	P. Tenti Università degli Studi di Padova,
	Internet of Energy: challenges and perspectives
Tuesday 13/7	
8:30 - 10:00	David Moser, EURAC RESEARCH, Future of renewable energy
10:00 - 10:20	Break
10:20 - 12:00	Nicola Trivellin, Università degli studi di Padova,
	Advanced photovoltaic technologies
12:00 - 14:00	Lunch
14:00 - 15:30	Antonio Agresti, Università di Roma Tor Vergata,
	Ultra high-efficiency energy generation: Perovskites and beyond
Wednesday 14/7	
8:30 - 10:30	Matteo Meneghini, University of Padova, Department of Information Engineering
	Towards 99.9 % efficiency: living in a GaN-based world
10:30 - 10:45	Break
10:45 - 12:30	Alfio Dario Grasso, Università di Catania,
	Energy harvesting and communication for implanted medical devices
12:30 - 14:00	Lunch break
14:00 - 16:00	Ettore Napoli, Università di Napoli, <u>Low power smart circuits</u>
Thursday 15/7	
8:30 - 9:45	G. Vallone , Università di Padova,
	Quantum communications: from theory to experiments
9:45 - 11:00	C. De Santi, M. Buffolo, Department of Information Engineering, University of Padova,
	Silicon photonics: from ultrafast communications to LIDARs
11:00 - 11:15	Break
11:15 - 12.30	Luca Palmieri, Department of Information Engineering, University of Padova,
	Next generation optical communications
12:30 - 14:00	Lunch
14:00 - 18:00	Student workshop: talks from students and best PhD presentation award
Friday 16/7	
8:30 - 10:30	Plenary no 2. Danilo Pietro Pau , Director of System Research, ST
	Microelectronics, Artificial Neural Networks and tools for ultra-constrained embedded
	deployability
10:30 - 11:00	Break
11:00 - 13:00	Giovanni Breglio, University of Naples Federico II,
	Characterization and models for power electronic reliability



5 Surveys and testimonies from the ESRs

As a measure of assessment of effectiveness of WindMill training program, several tools were created to the attention of the ESRs for them to react, comment, and provide suggestions. In this section, we provide two example of surveys that were conducted in Year 2.

5.1 Survey on training events organized in October 2020 and May 2021.

The details of the survey results are provided in appendix A and B.

In the survey, and immediately following the end of the training events, the ESRs were asked a set of specific questions regarding quality of presentation, relevance of the topics, quality of the organization etc. Unfortunately only 4 ESRS provided detailed responses to the October 2020 training survey. The mode of questioning was modified for the second training and a much more comprehensive response was then received the second time, also including the responses from ESRs in the Painless project.

Based on these surveys the following conclusions can be drawn. The majority of ESRs seem to have benefited from the training events and enjoyed it as well.

They saw positively the fact that the number of direct hours of technical lecturing online was somewhat reduced compared with previous training events, in favour of more diverse and more interactive contents.

The ESRs globally understand the need for online mode due to COVID situation but clearly signal that they would prefer physical events, as the both personal and academic outcome is higher. In the context of online-based events, the idea of having interactive coffee breaks where people would be encouraged to stay online and socially interact was suggested by some ESRs. This will be considered in the future program if the need remains for online organization of the events.

The quality of the technical lectures is generally acknowledged by the ESRs.



6 Conclusions

The training program planned under the WindMill DoW went as planned, despite the difficulty imposed by the use of online platforms. The workshops that we organized allowed the ESR to improve in the mastering of the necessary technical skills but also give them the tools to start building up their career or develop their personal development strategy. As in year 1, the feedback obtained from the ESRs was globally positive although we can feel a strong desire to return to on site physical training sessions in order to improve the social aspects.



Annex A: Survey on ESR satisfaction (Stockholm meeting)

ESR feedback from the Stockholm Training School

Only four ESRs responded to the feedback request, but as one can be seen, the responses are quite similar. The goal remains to exploit the responses to improve the next training schools.

1.1 ESR #1

About Event

It was disappointing for all of us not to meet each other personally but despite that I have thoroughly enjoyed the event. Despite the difficult time, I think Michael and Vera had done a good job. Social event was fun, and it was good to interact with everyone.

Technical talks and trainings

Project management course was not something we had anticipated; however, the session about entrepreneurship was became boring for the most of us. The instructor was not very interactive, and one would expect someone who is teaching about entrepreneurship to make the session interactive and interesting.

Technical talks were good. I have enjoyed those sessions even though it was a bit hard to be in front of the computer the whole day. The workshop on Cloud Computing was particularly very interactive and instructors were very helpful and patient with all of us. I have personally learned the most in that workshop. We need to thank them once again J

Suggestions:

About session on entrepreneurship (project management.) There could have been practical things like brainstorming sessions and some exercises because I have personally attended tons of courses and workshops on entrepreneurship and feel like we didn't take much out of this one.

One thing I would like to suggest regarding the overall structure of an online event would be to not make the schedule so tight. Moreover, I would love to have networking during coffee breaks too; everyday one coffee break session with everyone there for 15-20 minutes would be a good addition. Afterall that's the main goal of attending such events to meet people and interact with them. Maybe if instructors are also available during that time, we could also have interaction with them over coffee. What's fun during lockdown to drink coffee alone when you have been doing so for the last 4 months :D

1.2 ESR #2

It is a given that a virtual event is less engaging and tends to leave an ephemeral imprint on the attendees. Nonetheless, the event has been flawlessly organized and the talks had many interesting insights. The virtual format resulted in these being more unilateral while I think that there should be more space for



discussion between participants (in the normal events this was happening during coffee-breaks, I am not sure what would be the virtual equivalent). For what concerns the cloud-computing lab, I did not find it very instructive as it ended up being a long and tedious trouble-shooting session (maybe this is the real essence of cloud computing). For this I suggest to have a more problem-

solving type of labs, the one from Alvaro for the Paris event was just on point. Finally, I want to highlight that the effort put into the social event paid off, it was genuine fun! thanks

1.3 ESR #3

To start with, I will straight forward say that I am not a big fan of online training events. I feel that if I am in watching someone talking, I could also watch it on YouTube and it'd be the same for me. That's my general interpretation of online classes/sessions.

If I were to individually comment on the sessions:

- The first day: it was very long and not interactive at all. I really had the feeling the I was watching a long documentary.

- Session with the PO: I liked it. We had the chance to once more see the progression of our fellow ESRs and to (later on Slack) discuss about some common topics.

- Ericsson session(s): It was one of the best presentations. They managed to provide us with useful content and still make it very much interactive.

- AAU sessions(s): It was also interesting. It's not really 100% related to my research, but still in the general topic. So I enjoyed seen progress in other "related" topics.

Moreover, I think that a week was quite long. We had sweets and all to pass time, but it was quite long... I think that spreading them in a month could help (or not (3)) keep the concentration. Also, making it a full day was quite "exhausting", by the end of the day I was just listening. I'd vote to do it as morning sessions only or do 2 sessions in a day...

For last, I would like to say that the social event was great!! I think the idea of sending us boxes made us all do some work and feel kinda together, we also had the things of making jokes about who had already eaten it all or not.

1.4 ESR #4

Positive aspects: the social event was very creative. The Ericsson training hands-on was also very useful and interactive.

Negative aspects: The first day, where we spent a whole day listening to only one subject. The worse was this one-way information flow, presenter->listener->questions.

My suggestion for improvement is the following: Maybe this format of online presentation with one-way presenter/listener might be a bit boring sometimes.



So, it'd be maybe interesting to try a podcast format (one session only), with some specialist of the AI domain.

Annex B: Survey on ESR satisfaction (EURECOM meeting)

Note that this questionnaire surveyed the satisfaction from the ESRs from both projects WindMill and Painless, hence about 30 ESRs.

What did you like most about this training?

The speakers from the first day.

The invited talks

discussion on ESR projects

Both soft-skills lectures were great. The discussions and the breakout rooms were useful. They would benefit from bigger topic diversity and an ability to hop-in and out of topic.

Creativity workshop

The workshop about creativity

it was short, not boring

Interaction with other ESRs from the PAINLESS project who have been working on topics similar to mine.

It was well organized. Training went smoothly, without any technical issues which is quite common for online events.

the break-out rooms idea

Technical lectures

Find out more about ongoing research in my field

discussion between the participants

new subjects

The interactive session and technical training(1st day)

The breakout room section that gave the facility to discuss the possibility of using ML techniques in my research formulation

contemporary subjects with good speakers



Short presentations by ESRs followed by discussion

Organization, the quality of presentation

the project explanation

Diversity of the presentations

Workshops, discussions in breakout sessions

Some research presentations related with my research topic are excellent.

I liked being exposed to research from other project. This helped break the thematic monotony of previous training events.

The new learning and knowledge

Diversity of subjetcs ...

Arrangements of different sectors people to one platform

technique lectures

I liked the presenters, they were excellent, their research was inspiring.

Meeting new participants from other projects, and the diversity in lectures' topics.

Group discussion in the last day.

I like Petar's talk and session on creativity

The opportunity to interact with members of another European project

DAY 2 "Yes, you too can be creative!"

What aspects of the training could be improved?

More interaction among the ESRs.

The way ESRs presented their projects. It was so intense and somehow frustrating to be honest.

We should have more time in breakout rooms to discuss our projects

the 2 minute presentations were unnecessary, the 20 minute presentations were well organized. It would be nice if they are organized in form of a tutorial/mini-lecture. But of course they should remain among few selected ESRs.

We believe the training school has been a bit biased towards the PAINLESS project. Talks mainly focused on UAVs.



More time allocated for discussion

adding some challenges to make it move collaborative

I didn't like breakout rooms. Joining 2 projects is a brilliant idea, but I didn't see much of a correlation between my topic and the PAINLESS project. Therefore, during presentations I was more interested in knowing what my WINDMILL fellows were working with rather than people from the PAINLES project.

More time could have been allotted to discussions especially for the ESR 5 min presentations.

Topics was biased toward one project. It would be nice to have it more balanced (in case if there will be any two project training in the future).

General topics (such creativity one) could be improved or better presented

Better to share the slides to get more details.

Add referencing

more time for such open discussions

Practical and real examples could be added

I think this training event was too biased towards Painless

Could be extended for one more day

nothing

Length. Too long.

More training sessions with reduced session time

with the efficient way of putting the lecture.

More real applications in industries

More Time for the ESRs, more time for the discussions or breakout sessions

All things are pretty good.

All trainings took the form of lectures/seminars. Some more practical workshops would have been a good idea.

I think it was good.

Real examples in industries

On the way of presenting

group discussion

I would like the presentations to be made available on youtube, due to differences in times, students from other countries have difficulties to participate.

Giving ESRs more time to explain their work and their future directions.



I think everything was good.

Sessions should be engaging and maybe involve ESRs more

The duration of the soft skills workshops could be a little shorter

Nothing comes to my mind

Which topics would you suggest for next school? (Please indicate if you are with PAINLESS or WINDMILL project)

PAINLESS. More talks on AI/ML/DL.

Tactice and vision aided communications

machine learning techniques in wireless communication,

PAINLESS: Distributed systems (ledger, consensus etc.), Multi-Agent machine learning

Examples in which machine learning is suitable in comms. WINDMILL.

A lecture about solving techniques for problems and economics of a project (financing options, what's a realistic discount rate, payback time, and so on).

The previous training event was much more useful, I mean we at least learned how to work with some tools in big-data and...

WINDMILL - Cell free MIMO, trends on current 5G/6G...

WINDMILL - Overall the school was more oriented about UAVs. There could have been more topics related to future wireless networks such as massive MIMO applications and such.

WINDMILL-more theoretical machine leaning(kernel methods, overparametrized models, ...)

Evolution toward 6G

PAINLESS, energy harvesting

Machine learning and UAVs

energy neutrality and economics (PAINLESS)

Energy aspects about a real case study for UAV-based cellular networks in rural and urban areas

Reinforcement learning and optimization for multi-agent systems

PAINLESS: Topics that address how to build a system level simulator or guidelines for prototyping

6g

WindMill: overview of different activities and identification of synergies

[PNL]: How to find a convenient career after PhD, and how to write a grant proposal?



based on lot

Application of ML in wirelsss communications

Drone Mechanics would be an interesting topic to cover.

Some mathematical research topics.

Full-stack learning, neuromorphic computing, meta-controllers

PAINLESS Projects

More applications of Machine learning

IoT in industrial area

technical lectures

Nothing to comment.

More tutorials about energy harvesting with wireless communications background, more extensive lectures about machine learning from physical layer communications background, molecular communications, and finally sensor networks in biomedical applications (also from wireless communications perspective.

Solving optimization problem using machine learning techniques.

You could try and organize it in-person ;) Anyways, the more involvement from ESRs could be helpful for us. (I am a WindMiller)

PAINLESS: 1) Artificial neural networks for 5G communications 2) Semantic communications

PAINLESS "Age of information"

Please share other comments or expand on previous responses here:

Very well prepared training school. Thank you.

Hope the next event is not online! It's is super hard to concentrate when everything is online.

more soft skills, more industry presentations and experience.

Generally, the school was well organized and smooth. The only problem is we expected a bit more balance for lectures regarding the interests of both projects.

I've noticed a general lack of interest towards the individual presentations. I guess by now we all know what each other is doing. This, research updates could be communicated by reading publications, freeing a time slot on the last day of the school, which could be used for more engaging activities. I personally enjoyed the breakout sessions, and would have liked to attend more than one, perhaps addressing different topics.



Overall, the training school personally was very useful. It could have included more parts regarding the other aspects of wireless networks as explained before.

Since my work is mostly theoretical, I wish to have more theory oriented speakers in Statistical Machine Learning.

Invite the CEO/CTO/managers/etc of big tech companies to explain the importance of research from their perspective.

Excellent summer school! Thanks for organising!

NA

nothing to add

explanation of UAV-based cellular networks could be very useful for ESRs and supervisors

Thank you very much for the well organization of the event!

none

The event was fine. Confront with PAINLESS was interesting and useful. However, as all know, online events are not much effective: it would have been great to do such a joint training school in person (just a note for future ITNs)

The non-technical training sessions time was long , I think it's better to have more sessions with a suitable time duration.

none

Thanks for giviing me the oppyrtunity to be part of the summer school. I'd like to know if i can receive a certificate of attendance (virtual).Best regards

Collaborations with other Marie Curie projects.

Nothing.

N/A

No Comment

Thanks for giving me this opportunity to be part of this summer school. I'd like to receive a certificate of attendance(virtual) or participation. THANKS AND REGARDS

The explanation was quite advanced so next time please try to make easy and sweet

hope to see 6G tutorial next time.

Nothing to comment.



I would like to thank Dr. Jimmy for his efforts in organizing this school. It was really great idea to meet different participants from other projects.

Nothing

NA

On question 11: Both of the soft skills workshops were very interesting and enlightening. However, the duration of each workshop was a little longer than needed.

Overall, the school was prefect. Reducing it from one week to 3 days was a major improvement.



1. Please select your association:

•	PAINLESS participant	16
•	WINDMILL participant	12
•	External participant	7



2. Was the training overall useful?

Excellent	11
🔴 Very Good	12
Adequate	11
e Poor	1
Very Poor	0



3. Were the topics covered relevant to your research?

Excellent	9
🔴 Very Good	13
Adequate	10
🔴 Poor	3
🔵 Very Poor	0





1. Were the speakers knowledgeable about the subjects presented?



2. Have the lectures been well prepared?

Excellent	16
🔴 Very Good	11
Adequate	8
🔴 Poor	0
Very Poor	0



3. Was the presented material interesting?

Excellent	13
🔴 very Good	16
Adequate	5
Poor	1
Very Poor	0



4. How would you rate the use of the teaching aids (slides, interactive parts, break-out rooms, ...)?

Excellent	11
🔴 Very Good	17
Adequate	7
🔴 Poor	0
Very Poor	0





1. Was the time allotted for the training sufficient?





2. Were the meeting rooms and facilities adequate? (Was Zoom working well?)

Excellent	19
🔴 Very Good	13
Adeguate	3
🔴 Poor	0
Very Poor	0



