A-WEAR project (813278)
A network for dynamic WEarable Applications with pRivacy constraints

A-WEAR PROJECT

A network for dynamic WEarable Applications with pRivacy constraints

Project no. 813278

H2020-MSCA-ITN-2018 – Marie Skłodowska-Curie Innovative Training Networks

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D7.2 PCDPs established and approved for each ESR

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PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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Version	Date	Author	Notes
1.0	01.07.2019	Aleksandr Ometov	Initial version
1.1	10.10.2019	Simona Lohan	Revision
1.2	21.11.2019	Aleksandr Ometov	Complete version with PCDPs

Disclaimer

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

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1. Executive Summary

This document comprises deliverable D7.1 Plan of training activities of WP7 Training working package within A-WEAR project. It contains a collection of the initial PCDPs established and approved for each ESR.

2. List of DCDPs

The complete set of PCDPs signed by each fellow and main supervisors.

Name of fellow:

Waleed Bin Qaim

Department and university at Beneficiary side:

Faculty of Information Technology and Communication Sciences, Tampere University (TAU), Finland.

Department and university at the academic secondment side:

Universita Mediterranea di Reggio Calabria (URC), Italy; 12 cumulated secondment months.

Planned industrial secondment:

T6 ECosystems, Italy; 2 secondment months.

Name of the Main Supervisor:

Prof. Jari Nurmi (TAU)

Name of the additional academic supervisors:

Assoc. Prof. Elena Simona Lohan (TAU)
Assoc. Prof. Antonella Molinaro (URC)
Assistant Prof. Claudia Campolo (URC)

Industrial mentors:

Ilaria Lener (T6ECO)
Andrea Nicolai (T6ECO)
Dr. Antonella Passani (T6ECO)

Date: November 5, 2019

BRIEF OVERVIEW OF RESEARCH PROJECT AND MAJOR ACCOMPLISHMENTS EXPECTED

A-WEAR is a four-year (2019-2022) H2020 Marie Sklodowska-Curie Innovative Training Network (ITN)/European Joint Doctorate (EJD) in the field of smart wearables and wireless computing.

The advent of small, inexpensive, and battery-powered electronic equipment such as microprocessors and microcontrollers have paved the way for the development of different sensors and actuators. Embedding these sensors and actuators into conventional electronic devices has resulted in the production of various standalone smart devices such as smartwatches, clothes, eyeglasses, and so on. Most of these smart devices have processing and communication capabilities, thanks to the sensor networks technology. Thus, such sensors are enabling users to remotely access these devices through the internet and perform the desired task. Similarly, multiple wearable smart electronic devices have been developed for different purposes such as physical health monitoring, observing child activities, as well as various fun gadgets. These wearable devices often connect to form a network of devices that can share resources and help achieve the overall goal. In contrast to the conventional centralized computation architecture, these devices are capable of carrying out basic data processing and computation thus reducing the burden on gateway nodes and central base stations.

The mission of A-WEAR action is to cross-disciplinarily create new architectures, open-source software and frameworks for dynamic wearable ecosystems, with distributed localization and privacy constraints. The impact of A-WEAR will be to enhance the future social well-being, to contribute to easy living, effective and enjoyable work, and to offer new solutions to the challenges of violation of privacy by communication and positioning through wearables and to the need of applying the right of the ownership to one's data.

As part of the A-WEAR team, my research topic as **ESR1** is **"Energy efficient edge computing based gateways for wearable networks"**.

ESR1 research objectives are as follows:

1) To reduce the energy of individual communications system blocks in wearable networks by up to 90-95% by applying approximate computing.
2) To highly optimize the edge-based wearable network gateways.
3) To improve edge/fog computing capabilities, security features and energy-efficiency.
4) To implement a proof-of-concept on a programmable/ reconfigurable communications platform such as NI URSPs.

Long-term career objectives (over 5 years):

My long term career objectives are to gain the required skills and knowledge to become a researcher in the field of Communications Engineering. I believe after getting this opportunity to be part of this project, I will get a chance to work with the experts in this field which will highly benefit me both as a researcher as well as an individual. I plan to join academia after completing my Ph.D. and to continue working as a researcher in this field for enhancing my skill set and knowledge sharing with other young fellows. This a very good opportunity to establish links with foreign professors and professionals in the field which will be highly beneficial to carry out collaborative research projects in the future. The planned graduation date is October 2022.

Short-term objectives (1-2 years):

The expected research results include providing proof-of-concept for edge computing with high energy efficiency by reducing the energy of individual communications system blocks in wearable networks by up to 90-95% by applying approximate computing. The anticipated publications include minimum of 5 conference papers and at least 1 journal paper during the 3 years in A-WEAR. Presentation of the papers at the conferences, attending the related workshops, and networking events will be highly beneficial to foster networking with peers in related fields of research.

Planned courses for ESR1

In addition to the A-WEAR networking events, the following local courses are aimed at:

Unit	Technical course title	Training Outcomes
TAU	TST-90006 Orientation to doctoral studies	Lectures diary, literature reviews and research plan writing in order to acquire technical writing clarity and fluency and to be able to present results in a coherent and compact manner. Risk assessment procedures and assessment of ethical issues
TAU	ELT-43356 IoT wireless Communications	Technologies, use cases and applications of the different wireless communications mechanisms for IoT, IoWT, and Internet of Everything
TAU	KIE-39006 Research Presentation	Training of skills necessary for perfecting the research outcome presentation
TAU	KIE-39106 Research Writing	Improving skills related to scientific writing and preparing scientific manuscripts
TAU	ELT-43406 5G Mobile Communications	Requirements, enabling technologies, use cases and applications of future fifth generation (5G) mobile communication networks.
URC	Multicast in 5G	Potential, requirements, protocols, use cases and core enabling technologies of future 5G mobile communication networks
URC	Vehicle-to-X networks	Understanding of Vehicle-to-Vehicle, Vehicle-to-Infrastructure and Vehicle-to-Everything communications and networking protocols
URC	Network programmability and softwarization in 5G systems	The course will present the main technologies proposed as key enablers for the programmability and softwarization of IoT and 5G systems. (i.e., software-defined networking, network function virtualization, mobile edge computing and information-centric networking).
URC	Fundamentals of Internet of Things	The course aims to give the fundamental knowledge about the Internet of Things: main enabling technologies at layer-2; IPv6 internetworking solution at layer-3 and above; major architectural solutions; applications and use case scenarios, "Cloud of Things" and "Social Internet of Things" paradigms

The planned 2 months secondment at T6E in Italy will provide complementary skill training on fundraising, project raising, social innovation, and project management. This industrial venture will be an excellent opportunity to learn project management by working alongside industry professionals in the field.

Tentative secondment plan for ESR1

Secondment #	Place	Activity	Duration
1(a)	URC, Italy	Analysis and design of edge/fog computing and networking schemes and to attend lectures	Sept 2020 – Feb 2021
1(b)	URC, Italy	Work on edge network parameter optimization and to attend lectures	Sept 2021 – Feb 2022
2	T6E, Italy	Complementary skill training on fundraising, project raising, social innovation, and project management	Sept 2022 – Oct 2022

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Signature of fellow

Waleed Bin Qaim (TAU)

Date: 07 - 11 - 2019

Name and signature of main supervisor

Prof. Jari Nurmi (TAU)

Date: 7. 11, 2019

Name and signature of co-supervisor

Assoc. Prof. Elena Simona Lohan (TAU)

Date: 8. 11. 2019

Name and signature of co-supervisor

Assoc. Prof. Antonella Molinaro (URC)

Date: 8 /11 / 2019

Name and signature of co-supervisor

Assistant Prof. Claudia Campolo (URC)

Date: 11 / 11 / 2019

Name and signature of co-supervisor

Ilaria Lener (T6ECO)

Date: 11/11/2019

Name and signature of co-supervisor

Andrea Nicolai (T6ECO)

Date: 11/11/2019

Name and signature of co-supervisor

Dr. Antonella Passani (T6ECO)

Date: 11/11/2019

Name of fellow:
Ing. Lucie Klus

Department and university at Beneficiary side:
Tampere University, ITC, Electrical engineering

Department and university at the academic secondment side:
Jaume I University, Institute of New Imaging Technologies

Planned industrial secondment:
3 months in IDOM, Spain

Name of the Main Supervisor:
Prof. Jari Nurmi (TAU)

Name of the additional academic and industrial supervisors:
Assoc. Prof. Elena-Simona Lohan (TAU)
Dr. Carlos Granell Canut (UJI)
M.Sc. Jesús de Diego Alarcon (IDOM)
Jelena Stosic (IDOM)
Date: 28.10.2019

BRIEF OVERVIEW OF RESEARCH PROJECT AND MAJOR ACCOMPLISHMENTS EXPECTED:

Large-scale crowdsourcing-based wearables data gathering and processing
- Create novel robust approaches for location databases storage, compression and transfer of wearables-based crowdsensed data
- Detect outliers and model statistically spurious interferences in crowdsourcing-based wearables data
- Study the vulnerabilities of crowdsourced wearables data for public safety and methods to increase the safety
- Increase crowdsensing efficiency in terms of data storage and transfer data rates by 40%

Long-term career objectives (over 5 years):

My current priority objective is to successfully finish the PhD studies under A-WEAR program in three years. During this time, I would like to deepen my knowledge and become a specialist in my field with defined set of skills and knowledge base. Currently, I find myself a well-informed graduate with very broad knowledge and technical skills, which I would like to further extend in the narrow sense. Also, I would like to focus on deepening my language skills including English and Spanish.

After finally defending my dissertation thesis and graduating, I see myself choosing one of two possible directions. The first one is to continue my career in research as post-doctoral researcher at the university. This would allow me to further extend my background in technical studies and to pursue my dream of research hand in hand with educating the next generations and sharing my knowledge. The second option is to get a job in an industrial company, which would allow me to obtain more practical skills in the industry. Anyway, this choice would probably be only temporary, as in 20 years I certainly see myself in an academic area again.

The decision toward which I will decide in three years will be made on my current mindset, as well as on the opportunities that I will be presented with (and which I present myself with). Also, I would like to use the next three years to gain as much experience and skills (as described below) as possible, to help me with my decision.

In my opinion, the most important aspects of my success will be continuously obtaining deeper and broader knowledge of the topic of my current research, improving my language and communications skills and getting more visible within the community by
- Studying and reading state-of-art literature
- Attending viable courses at both universities
- Completing various web seminars
- Attending conferences and expert lectures
- Creating own approaches and experimenting with obtained information
- Being in active contact with other researchers
- Creating my personal network
- Giving lectures (teaching experience) and presentations
- Improving my language skills
- Sharing important discoveries with public via mass media and social networks
- Creating videos promoting the program, as well as educating the public

Short-term objectives (1-2 years):

The first set of objectives, that I encountered at the start of my doctoral studies, is oriented around getting to know my topic, new community and fulfilling the requirements from primary and secondary university and the program itself. Those include:

- Creating a study plan and other supporting documents (first months)
- Deepening my understanding and knowledge of the topic (emphasis on the first year, viable throughout the study period)
- Identifying the possibilities and open research questions within the topic (first months)
- Improving my programming skills (MATLAB, Python – first year) and possibly learning new ones (Java – second year)
- Creating a personal network within university and research community in regard to my field (first year)
- Learning the basics of the Spanish language (before starting the secondment in September 2020)

As the further short-term objectives, I intend to:

- Write a minimum of 2 publications per year throughout the course of the project as the first author and several others as the secondary author
- Obtain viable practical skills in industry during my secondment in the IDOM company, Spain
- Advance through the milestones of my project

Anticipated publications:

- URSI 2019, Tampere, Finland – presented paper on the topic of "Crowdsourcing solutions for data gathering from wearables" with focus on division of data types most commonly gathered from wearable, big data repositories and open research questions; The topic of open research questions and further identifying of the research possibilities within the topic will be studied in more detail during the course "Orientation to the doctoral studies" while writing a literature review.
- ICL-GNSS 2020 – I intend to participate at the conference by presenting a paper focused on my newest findings and progress
- Further, I intend to write a minimum of 6 publications throughout the course of the project as the first author (2 publications per year) and several others as the secondary author. I would like to present several of them in the scope of prestigious conferences.

Anticipated conference, workshop attendance, courses, and / or seminar presentations:

- 1-week orientation camp and Fall school, Tampere, December 2019
- Ruka DELTA winter school, 10-13 Fen 2019
- ICL-GNSS 2020, Tampere, 2-4 June 2020
- Half-day A-WEAR workshop at AGILE 2020, TBD, probably 2nd or 3rd week of June 2020
- 4-day Summer school at UJI, Castellon, 23-26 June 2020
- 4-days, Fall school at UPB, Bucharest, 12-16 October 2020
- ICUMT 2020 conference, probably October/November 2020

Desired training in specific new areas, or technical expertise within the scope of the project:

- First aid training for employees of Tampere University
- Complementary skills training on languages, communications, business, fundraising and entrepreneurship skills
- A course on ethics within a university

Planned courses:

TAU

TST-90007 Orientation to Doctoral Studies, 3-5 ECTs
- This subject consists of three parts: lecture diary essays, literature review and preliminary research scheme
- Serves as a backbone to support new doctoral students

ELT-49506- Graduate Research Seminar in Communications Engineering, 3-6 ECTs
- Course consists of presentations by other doctoral students, own presentation and acting as an opponent to a fellow PhD student

SGN-22006 Signal Compression, 5 ECTs (period 4)
- Course provides a deep understanding of traditional, as well as off-the-shelf signal compression techniques

SGN-43006 Knowledge Mining and Big Data, 5 ECTs (period 4)
- Advanced course on techniques extracting information from data, as well as on data processing and storage efficiency

UJI

Course on localization

Reproducible Research Practices
- Explains concepts, tools and best practices to do reproducible research projects.
- The course consists of lectures and final project

Intensive Spanish Courses B1/B2/C1 (or A1/A2), 3 ECTs

Desired communication skills to be acquired include:
- Presentation skills and on-stage confidence
- Working group organization and task management
- Clear information sharing by giving lectures
- Technical and creative writing skills in journal papers and media

Desired training in other skills:
- Teaching experience – as a part of my doctoral studies, I would like to lead lectures or exercises from a technical-based subject at Tampere University to improve my information sharing skills, leading skills, crowd organization and management and other communication skills. This opportunity may also indicate, whether I should focus more on technical research in industry or education.

Other activities with professional relevance:
- Promoting the A-WEAR program, European Union's Horizon 2020, the Marie Curie Actions and the research results of our team by giving a presentation at a high-school Gimnazjum im. Juliusza Slowackiego w Czeskim Cieszynie in Czech Republic (and other schools e.g. my alma mater). The school is highly active with regard to various EU-funded projects and is the only Polish-speaking high school in Czech Republic. The presentation will encourage the students to be more proactive regarding their future studies and professional decisions.
- Attempt to contact local mass-media (most probably targeting mostly Czech media due to language relevance) to spread the activities of the consortium, the Marie Curie Actions and of the individual activities of the researches.
- Support an educational and entertaining YouTube channel, on which I will present my project, its findings and other relevant information.

LUCIE KLUS

Lucie Klus

Signature of fellow

Date: **31. 10. 2019**

Jari Nurmi

31.10.2019

Name and signature of main supervisor

Date:

SIMONA LOHAN

Lohan

Name and signature of co-supervisor

Date: 31.10.2019

Name and signature of co-supervisor

Date: 31st October 2019.

CARLOS GRANELL

BRIEF OVERVIEW OF THE RESEARCH PROJECT AND THE EXPECTED MAJOR ACCOMPLISHMENTS:

Long-term career objectives (5 years) and overall project landscape:

1) Goals:

My main long-term goals within the A-WEAR project are focused on accumulating scientific knowledge and learning major methodologies and technologies in the Internet of Wearable Things (IoWT) field. Ultimately, I am looking forward to developing new models and to promote my results' adoption for worldwide utilization. Moreover, I am willing to spread the ideas and achievements of the project in order to enhance the value of results for further benefits of society. During the whole period, I will exchange experience with other researchers and become acquainted with projects and teams working in my research field.

Taking into account my background, the summary of expected achievements and the number of developed skills, at the end of the A-WEAR project, it all might compose the basis for an own business project or for finding an academic position related to the area of my professional interests.

2) What further research activity or other training is needed to attain these goals?

I intend to learn and gain my expertise in the wearable localization methods at TAU and UPB, level-up my leadership and communication skills by attending Doctoral studies' courses and supporting workshops and other activities organization within A-WEAR network.

The following planned A-WEAR workshops and short courses will help to acquire new knowledge in the field of IoWT and related topics:

- Half-day A-WEAR workshop at AGILE 2020 conference on wearables in smart cities, June 2020. Training outcomes: presentation, networking and communication skills.
- 4-day summer school on "Machine Learning, Spatial analysis, and cybersecurity in wearables", June 2020. Training outcomes: machine learning and AI techniques; cybersecurity and cryptography methods; public safety; business and leadership.
- 4-day Winter school on "Consumer and healthcare applications of wearables", Oct 2020. Training outcomes: wearables usage in AAL and eHealth; platforms requirements for consumer and eHealth applications; how to build a successful start-up.
- Half-day A-WEAR workshop at ICUMT 2020 conference on green communication and networking with wearables. Training outcomes: presentation, networking and communication skills.
- 4-day summer school on "Critical Industrial Applications in 5G-Internet of Things (IoT) Ecosystem", 2021. Training outcomes: 5G and mmWave architectures; privacy laws and digital privacy solutions; IPR protection.
- Half-day A-WEAR workshop 2 at IPIN 2021 conference on indoor location privacy of wearables (UJI). Training outcomes: Presentation, networking and communication skills.

- 2.5-day workshop, including one-day fellow presentations and team building activities and complementary skills training on languages, communications, business, fundraising, entrepreneurship skills & success stories in 2022. Training outcomes: fundraising and entrepreneurship skills for a successful career.

Participating in activities provided by the TAU:
- Orientation camp/winter school on "Localization and communication enablers for wearables" 2-5 December 2019 (TAU). Training outcomes: an overview of the training and research; IoWT communication and positioning challenges; harmonization of training methodologies; orientation to PhD studies and ethical behavior.
- Joint virtual research seminar via Moodle2 and Echo tools covering edge and fog computing, physical layer parameter optimization and MAC protocols in wearables, and wearable applications and services (TAU). Training outcomes: 7-layer OSI model of wearables: from physical layer to application layer – challenges and solutions.
- Half-day A-WEAR workshop at ICL-GNSS 2021 conference on Location-Based Services through wearables (TAU). Training outcomes: Presentation, networking and communication skills.
- 2.5-day workshop, including one-day fellow presentations and team building activities and complementary skills training on multi-cultural environments, R&D project management & legal aspects and IPR (TAU). Training outcomes: project management cycle.

In order to acquire new expertise within my double-degree doctoral programs, I am planning to attend the following courses:
- Orientation to doctoral studies (TAU): 5 ECTS.
- Network Analysis and Dimensioning (TAU): 5 ECTS.
- Graduate Research Seminar in Communications Engineering (TAU): 3 ECTS.
- GNSS Technologies (TAU): 5 ECTS.
- Independent study (UPB).
- Research reports (UPB).
- Other workshops and conferences, to be discussed later on with the supervisory team.

Short-term objectives (1-2 years):

1) Expected research results:
- Derivation of privacy and security metrics in localization, simulation-based performance analysis;
- Focus on new privacy-aware positioning methods and algorithms; new robust privacy-based IoWT positioning methods;
- Comparative performance analysis in dynamic wearables localization vulnerabilities from a network and user's point of view;
- Implementation of the algorithms into a digital platform for further data management.

2) Research skills and techniques:
   MATLAB and Python technical expertise for received signal strength (RSS) analysis and application of Bayesian and non-Bayesian estimation techniques; IoWT positioning methods, location data privacy protection approaches; scientific writing skills.

3) Short-term goals:
- To identify the privacy and security related challenges in the IoT positioning on wearable devices, from both the network-side and the user point of view;
- To define the key performance indicators of privacy, robustness, and security of localization algorithms on a wearable device;
- To develop passive localization methods for future wireless networks and cellular IoT standards, such as 802.11az, LP-WPANs, etc.; (privacy preserving)
- To test the methods in an industrial partners' infrastructure, focused on digitalized society.

4) Expected results:
   Step 1 (September – October 2019)
   - Literature search on privacy-preserving positioning – partially completed.
   - Writing a short survey paper for the URSI workshop, Tampere – completed.
   - Attending the Prisma workshop at TAU in September 2019. http://www.tut.fi/prisma/. – completed.
   - Participating as a guest in the DELTA doctoral training network workshop and providing a diary of ideas, connected with own research (1 ECTS), 16-17 October 2019. http://www.delta-network.fi/. – completed.
   - Presenting the URSI accepted survey paper (4 pages long) to URSI workshop and writing workshop diaries survey, 18 October 2019 (2 ECTS). http://www.ursi.fi/english/. – completed.

   Step 2 (November 2019 – March 2020)
   - Possible Extension of the 802.11az MATLAB Simulator with Kalman or Particle Filtering or non-Bayesian combining (e.g., based on Dempster-Shafer theory) for the enhanced tradeoff between positioning and privacy, and, if possible, supporting also hybrid

positioning techniques: angle of arrival (AOA) / received signal strength (RSS) / round-trip time (RTT).

- Initial testing, performance analysis and submitting results to Paper 1 (JUFO-level/ISI-indexed open-access forum with a more detailed survey).

Step 3 (April 2020 – August 2020)

- Further development of the simulator for the tradeoff solution between privacy and positioning accuracy, in the framework of the remote-control privacy-centric delegation of tasks in an environment formed by wearables, humans, and robots (wearables have no personal ID, but a distributed ID, remotely controlled, whose association and disassociation to the user is made based on target service). Also, cooperative aspects between wearable devices to be considered.
- Including extra privacy metrics in addition to entropy-based privacy metric and looking for optimized solutions of privacy versus accuracy tradeoff.
- Testing, performance analysis and submitting 2nd paper for a JUFO-2/3 level journal.

Step 4 (September 2020 – February 2021)

- 6 months of secondment research visit at UPB.
- Extension of the privacy-centric positioning to other IoT/Wireless Sensor Networks scenarios, such as Ultra-Wide Band (UWB) based.
- Paper 3 writing on results on a JUFO-level conference.

Step 5 (Mar 2021 – Sep 2021)

- Possible extensions of AOA/RSS/RTT private localization methods in a wearable-centric/private approach for long-range wearable technologies existing at that point in the research community (e.g., NB-IoT, LoRa, other long-range IoT solutions).
- Developing new ideas on privacy-aware and privacy-preserving solutions.
- Writing of paper 4 (journal) and paper 5 (conference) based on delivered results.

Step 6 (Oct 2021 – Dec 2021)

- 3 months secondment research visit at UPB – some measurement campaigns to test developed algorithms with field-test data.
- Starting to write the PhD thesis.

Step 7 (Jan 2022 – Mar 2022)

- 3 months secondment research visit at Digital Living, most likely related to works on ethics and privacy; topic to be refined after discussions with the industrial supervisor.
- Paper 6 (conference) writing with industrial collaboration.

Step 8 (Apr 2022 – Sep 2022)
- Implementation and proof of concept of developed ideas.
- Paper 7 (conference or journal) writing.
- Completion of PhD thesis writing, submission to pre-examiners and Dissertation.

5) Communication skills and anticipated networking opportunities:
In order to collaborate with colleagues, supervisors and other people, several essential communication skills are required. Thus, upcoming networking activities will facilitate the development of communication skills. For example, listening is the major ability to hold a conversation, which is closely connected with open-mindedness, giving feedback and asking for questions or help to spread the knowledge and expertise within the society. Interactions with the other ESR fellows, many with different cultural backgrounds, as well as with the cross-disciplinary team of supervisors will also enrich the communication experience.

Signature of fellow
Viktoriia Shubina   Date: 23.10.2019

Name and signature of main supervisor
Elena Simona Lohan   Date: 23.10.2019

Name and signature of academic co-supervisor
Sergey Andreev   Date: 23.10.2019

Name and signature of academic co-supervisor
Dragos Niculescu   Date: 23.10.2019

Name and signature of industrial co-supervisor
Henna Suomi   Date: 28.10.2019

Name of fellow: Asad Ali

Department and university at Beneficiary side: Faculty of Information Technology and Communication Sciences, Tampere University

Department and university at the academic secondment side: Department of Telecommunications, Brno University of Technology

Planned industrial secondment: Ericsson, Finland

Name of the Main Supervisor: Assistant Prof. Sergey Andreev

Name of the additional academic and industrial supervisors: Prof. Yevgeni Koucheryavy (Tampere University, Finland), Assoc. Prof. Jiri Hosek and Prof. Jiri Misurec (Brno University of Technology, Czech Republic), and industrial mentor Johan Torsner (Ericsson, Finland)

Date:
30.10.2019

BRIEF OVERVIEW OF RESEARCH PROJECT AND MAJOR ACCOMPLISHMENTS EXPECTED:

Long-term career objectives (over 5 years):

1) Goals:

My key goal would be to strengthen my technical knowledge and to improve communication technology for wearables such as AR/VR and get familiar with best research practices and apply them in my own research. My research will focus on applications and challenges associated with mmWave frequency band communication for wearables. During my time as ESR, I plan on forming a network with researchers associated with fields of research akin to mine. I would spread my own research as openly as possible to promote collaboration with other researchers doing similar research like mine. I plan on finishing my Ph.D. on time and receive a joint Doctoral degree from Tampere University and the Brno University of Technology. Author multiple research publications.

After finishing the Ph.D., my goal will be to start career in industrial research and development, where I can utilize my knowledge and experience gained while doing research in the A-WEAR project.

2) What further research activity or other training is needed to attain these goals?

I intend to improve my skills in performing simulation and mathematical analysis relating to mmWave communication for wearables. For this purpose, I would need training in the following:
- 5G and mmWave architectures
- Stochastic Geometry
- Markov processes
- Multi-connectivity
- Mobility models
- Machine learning and AI techniques

For this purpose, I am planning to enroll in relevant courses and participate in workshops. They are listed below.

I plan on attending the following courses at TAU:
- Network Analysis and Dimensioning
- 5G Mobile Communications
- Pattern Recognition and Machine Learning
- Artificial Intelligence
- 3D and Virtual Reality

I am also planning to participate in most of the events organized in the A-WEAR network:
- 2-5 December 2019: orientation camp and Fall school on "Localization and communication enablers for wearables", including half-day fellow presentations and team building activities collocated with mid term check. It will include introductions, logistics and team building for the A-WEAR team, technical training on seamless localization and low-energy communications in IoWT, and complementary skills on ethics in research, strategy & business planning and MyData.
- Half-day A-WEAR workshop at AGILE 2020 conference on wearables in smart cities
- 4-day summer school on "Machine Learning, Spatial analysis, and cybersecurity in wearables", including half-day fellow presentations and team building. Topics: machine learning, AI, cryptography and cybersecurity, web and context-aware systems, public safety; complementary skills on multi-cultural business communication and leadership.

- Joint virtual research seminar via Moodle2 and Echo tools covering edge and fog computing, physical layer parameter optimization and MAC protocols in wearables, and wearable applications and services. Lectures: all academic scientists-in-charge of A-WEAR.
- 4-day summer school on "Critical Industrial Applications in 5G-Internet of Things (IoT) Ecosystem", including half-day fellow presentations and team building activities. Technical topics: privacy, precise indoor positioning for industrial applications, low-latency communication architectures. Complementary skills: legal aspects of security and privacy protection and from idea to commercial product.
- 2.5-Workshop, including one-day fellow presentations and team building activities and complementary skills training on languages, communications, business, fundraising, entrepreneurship skills & success stories.
- 2.5-day workshop, including one-day fellow presentations and team building activities and complementary skills training on multi-cultural environments, R&D project management & legal aspects and IPR

Short-term objectives (1-2 years):

1) Expected Research results
   - Develop a spatial and time-based framework for system-level mmWave communication.
   - Extend this framework for a scenario where the user is mobile.
   - Apply this framework to the multi-users multi-connectivity scenario.
   - Validate the results by performing measurement tests.

2) Anticipated networking opportunities
   - I plan on working closely with supervisors and their team at Tampere University, Brno University of Technology and Ericson, Finland.
   - There is also an opportunity to collaborate with a team of researchers at the University of Oulu.
   - International conferences will also serve as great opportunities for networking with fellow researchers working on similar topics.

3) Short-term goals
   - To understand deeply the networking constraints of emerging wearables in mmWave bands.
   - To ensure that wearable-centric information is produced and consumed appropriately by a multitude of devices and users of future 5G networks.
   - To study mmWave interference in commuters equipped with AR/VR glasses.
   - To develop a proof-of-concept demonstrator for mmWave wearable communications and networking.

4) Tentative plan
Step 1: (Sep 2019 – Oct 2019)
   - Synchronize with the supervisors at TAU by literature study of directional deafness in mmWave communication and performing simulation in MATLAB.
   - Attending the PRISMA conference.
   - Participating in the DELTA doctoral training network workshop.
   - Submitting an extended abstract based on future work based on directional deafness in mmWave communication in URSI workshop. Presenting said extended abstract at the URSI workshop.

Step 2: (Nov 2019 – Jun 2020)
   - Extending the work on directional deafness in mmWave communication by performing spatial and time-based system-level simulation and analysis.
   - Publish the results in a **conference paper** and later extend that to be published in a **journal paper**.
   - Start collaboration with researchers at the University of Oulu on short-range mmWave communication.

Step 3: (Jul 2020– Dec 2020)
   - The first phase of the secondment at BUT for 6 months.
   - Learn to perform measurements and use them to validate simulation and analysis results.
   - Publish the results in **Journal paper**.

- Publish the results from the collaboration with the Oulu team in a **conference paper**.

Step 4: (Jan 2021– Jun 2021)
- Possibly extend the work on system-level simulation and analysis for mmWave communication for wearables.
- 3 months of industrial secondment with Ericsson, Finland. Use their equipment to perform measurements. Use the measurement results to improve the system-level simulation and analysis framework.
- Publish the results in **Journal paper**.

Step 5: (Jul 2021– Dec 2021)
- Start the second phase of secondment at BUT for 6 months.
- During this time at BUT publish a **conference paper** and later extend it to a **journal paper**.

Step 6: (Jan 2022– Aug 2022)
- Complete writing the Ph.D. thesis.

Signature of fellow

Asad Ali

Date: 30.10.2019

Name and signature of supervisors

Assistant Prof. Sergey Andreev

Date: 30.10.2019

Prof. Yevgeni Koucheryavy

Date: 30.10.2019

Assoc. Prof. Jiri Hosek

Date: 30.10.2019

Prof. Jiri Misurec

Date: 30.10.2019

Name of fellow: Darwin Patricio Quezada Gaibor

Department and university at Beneficiary side: Institute of New Imaging Technologies - Universitat Jaume I

Department and university at the academic secondment side: Faculty of Information Technology and Communication Sciences - Tampere University

Planned industrial secondment: S2 Grupo

Name of the Main Supervisor: Prof. Joaquín Huerta Guijarro

Name of the additional academic and industrial supervisors: Dr. Joaquín Torres-Sospedra, Prof. Jari Nurmi, Prof. Evgeny Kucheryavy, Dr. Stefan Beyer and Antonio Villalon-Huerta

Date: October 14th 2019

BRIEF OVERVIEW OF RESEARCH PROJECT AND MAJOR ACCOMPLISHMENTS EXPECTED (half page should be sufficient):

The research project has the title "Cloud Platform for context-adaptive positioning and location on wearables devices" and it has the main objective to identify and analyse the target GNSS-denied scenarios for location using wearable devices and develop a cloud platform to support positioning and location on them. In order to achieve this objective, a subset of heterogeneous methods and techniques can be used. Some of them are based on deep learning, convolutional neural networks, cloud computing, and others. They will be necessary to reinforce the interoperability between devices and localization algorithms. Furthermore, as part of this project, it is required to define protocols for storing positioning data, ensure security and privacy, and reduce power consumption in wearables devices. The main goal is developing an efficient open platform support indoor positioning.

Additionally, this project must share a common framework to ensure the usage of standards for localization such as ISO18305 for evaluation and IndoorGML for map integration.

Long-term career objectives (over 5 years): *(target 1/4-1/2 page)*

1) Goals:
   The main goals after this training/research action are:
   - Get a Post-Doctoral position in Europe (Marie Sklodowska-Curie Actions Individual Fellowship) or America.
   - To research new methods or algorithms of Artificial Intelligence for Indoor and Outdoor positioning in order to provide services or software for positioning and localization.
   - To research methods to optimize Cloud Computing Services to provide business consulting in IT.
   - To become a reputed specialist in the following areas: Big Data, Software Architecture, Cybersecurity and Cryptography to provide specialized support for private and public companies.

2) What further research activity or other training is needed to attain these goals?
   The additional training activities include enrolling on-line courses and additional formation on:
   - Artificial intelligence: This is required to develop new and efficient methods or algorithms for neural networks.
   - Big Data Analysis: It allows to researchers, analysts and business users to make better and fast decisions using the data provided. Big data analysis will be useful for business consultancy.
   - Software architecture: It is necessary to develop software with high-level design and technique standards.
   - Cybersecurity and Cryptography: It is needed to protect the user and company information which is highly recommended for networking, software development and cloud computing.
   - Cloud Computing and Networking. The new cutting-edge technology is processing all the information in the Cloud with convergent networks allowing to access the data and resources everywhere.

Short-term objectives (1-2 years): *(target ½-1 page)*

1) Research results
   a) **Anticipated publications:**
      We plan to publish the results derived from my research project in reputed conferences and journals with high impact.

i) Analysis GNSS-denied scenarios for indoor positioning using wearable devices and deep learning techniques.
   Intended to be published in the ICL-GNSS or IPIN.

ii) Cloud Computing for data analysis (GNSS-denied scenarios).
   To be published in the IEEE Cloud Computing or ICL-GNSS.

iii) Positioning data compression and storage got from wearables devices.
   To be published in the IEEE Effective computing or Pervasive and Mobile Computing.

iv) Cloud architecture for indoor positioning and interoperability with wearable devices.
   To be published in the IPIN.

v) Analysis energy-efficiency in wearable devices using Cloud Data Processing (Parallel Programming CUDA).
   To be presented and published in the IPIN.

b) Anticipated conference, workshop attendance, courses, and /or seminar presentations:

Conferences provide a good experience for early and experimented researchers where they can learn more about new technology and methods applied in different areas. All of the conferences have topics related to the main research project (Cloud Platform for context-adaptive positioning and location on wearables) with new and innovative ideas. Moreover, some of the conferences publish the papers in the IEEE Xplore and submit for indexing at major abstracting and indexing databases such as SCOPUS and ISI.

i) International Conference on Indoor Positioning and Indoor Navigation (IPIN)
ii) The European Navigation Conference 2020 (ENC 2020)
iii) AI & Big Data Expo Global
iv) The 10th International Conference on Cloud Computing and Services Science, CLOSER 2020
v) ICL-GNSS
vi) ION-GNSS+

2) Research Skills and techniques:
a) Desired training in specific new areas, or technical expertise etc
In order to achieve the goals mentioned before is required a specific training in different areas such as 5G Technology, CUDA, DSP and others subjects, they will provide a better understanding of new methods used by each one. In addition, some of the following training courses are highly demanded in the research area.

i) Digital Signal Processing (DSP): DSP is one of the most powerful technologies that will shape science and engineering. DSP takes part in outdoor and indoor position computation due to both of them require signals to work such as GPS signals, Wireless signals or LIFI, UWB and others.

ii) Big Data analysis: In the current years more and more companies are taking better and fast decisions using Big Data Analysis in order to identify new opportunities and reduce the operation cost.

iii) 5G Technology: 5G Networks are the next generation of mobile Internet connectivity offering speed and more reliable connections on smartphones and wearables devices. 5G includes new concepts and different parts to be improved.

iv) CUDA programming (Compute Unified Device Architecture): CUDA is a parallel computing platform and programming model which permit to speed up computing applications by harnessing the power of GPUs

b) **Planned courses**
The following courses are selected to achieve the objectives mentioned above. Furthermore, to take part into the new researches done by Universities and private companies.

i) Big Data – Data Science – Data mining
ii) Cybersecurity and Cryptography
iii) Software Architecture
iv) Advanced Method in Scientific Programming
v) Parallelism, Clusters, Computing GRID and Cloud Computing
vi) Artificial Intelligence and Neural Networks
vii) Advanced Architectures for Signal Processing and Intelligent Systems
viii) Applied Mathematics and Statistic

2) **Communication skills:**
   a) **Desired communication skills to be acquired**
      i) Leadership and effective communication: Effective communication and effective leadership are closely intertwined. Researchers need to think with clarity, express ideas and share information with a multitude of audiences. It is required to handle the rapid flows of information within the organization, partners stakeholders and holders.
      ii) Oratory: Required for conferences and project expositions.
      iii) Composition and Rhetoric: To help the process of writing papers.

3) **Other professional training**
   a) Desired training in other skills (entrepreneurial, management, etc)
      i) Business management and entrepreneurial: To manage personal business, projects or to search new business opportunities according to our activities.

4) **Anticipated networking opportunities**
In order to create new business opportunities is required to know people interested in different areas such as indoor positioning, cloud computing, IT and others. The next site is one of the sites available for networking opportunities. Participating in Networking events with social activities (networking lunch/dinner).

5) **Other activities (community, etc) with professional relevance:**
There are many websites used for many people and companies to search for employees with different skills and knowledge. These websites allow have a big professional community. The following is one of these sites.

   a) Community careers linkedIn

Signature of fellow

Date: 29-10-2019

Name and signature of main supervisor

Date: 31/10/2019

Name and signature of co-supervisor

Date: 29/oct/2019

JOAQU'N TORRES SOSPEDRA

Name and signature of co-supervisor

Date:

29.11.2019

EVGENY KUCHERYAVY

Name and signature of co-supervisor

Date:

Jari Nurmi

31/10/2019

Name of fellow: Pável Pascacio De Los Santos

Department and university at Beneficiary side: Universitat Jaume I, Spain

Department and university at the academic secondment side: Tampere University, Finland

Planned industrial secondment: Wirepas, Finland

Name of the Main Supervisor: Dr. Sven Casteleyn

Name of the additional academic and industrial supervisors:
Dr. Joaquín Torres Sospedra (Universitat Jaume I, Spain)
Assoc. Prof. Simona Lohan (Tampere University, Finland)
Prof. Jari Nurmi (Tampere University, Finland)
Dr. Florean Curticapean (Wirepas, Finland)

Date: 17 /October/2019

BRIEF OVERVIEW OF RESEARCH PROJECT AND MAJOR ACCOMPLISHMENTS EXPECTED

The collaborative techniques for infrastructure free Indoor Positioning Systems (IPS) ESR6 project has as a main target to develop and validate a Baseline Collaborative infrastructure-less-IPS. The development of the collaborative baseline system consists of diverse phases and targets. The first phase includes the collection, classification and analysis of the technologies, communications protocols and methods to use as a starting point of the research work. Then a design phase, based on the previously information, is performed in order to establish the experimental and validation process to follow. Such process consists of testing diverse kinds of IPS Fingerprinting technologies, peer-to-peer communication protocols and algorithms in order to compare the advantages and drawbacks of each combination realized and identify the improved features (e.g., range, energy efficiency, data security, etc). Additionally, in the subsequent phases, the results are compared with the existent non-collaborative techniques and a proof of concept and overall validation of system is made. The main expected results are: An Indoor Positioning system that collaborates with nearby users/devices sharing information through peer-to-peer communication and a proof of concept of the collaborative infrastructure-less system in an industrial environment.

Long-term career objectives (over 5 years):

1) Goals:
   My long-term goal is to become a specialist in Machine Learning and Pattern Recognition applied to the design and development of innovative solutions for positioning and autonomous navigation systems, and contribute through research and experimentation to the international scientific body of knowledge. Additionally, with the expertise acquired over time, I aspire to lead a small research consulting group to provide research and expert assistance services in indoor positioning for warehouses and logistic companies, as well as, conduct collaborative project with academic institutions.

2) What further research activity or other training is needed to attain these goals?
   To achieve the above objectives, I consider it essential to be actively involved in a multidisciplinary team which develops research projects in fields related with the Geospatial Technologies, Indoor Positioning, Positioning Technologies, Geographical Information Systems, Wireless Communication Technologies and Inertial Navigation Systems in order to enrich my knowledge in these areas and define my own research path while I am developing the ESR6 project. On the other hand, the PhD Program, through the courses and seminaries in advanced topics linked with the Machine Learning and Navigation Systems, must provide the academic background needed to support part of the research topics, also I do not exclude the possibility to continue with postdoctoral studies after finishing PhD to reach the goals mentioned. Moreover, to participate actively in the scientific diffusion and promotion of project's activities, collaborate in the organization of conferences, workshops and project activities, and work with the multidisciplinary and multicultural research group at GEOTEC will provide me the communicative, leadership and team-working skills needed to grow personally and professionally.

3) Planned graduation date
   The planned date for graduation is October 2022

Short-term objectives (1-2 years):

1) Research results
   a) Anticipated publications:

In accordance with expected progress in the development of the project, it is considered to publish each of the relevant results obtained in some of the following International Journals and Conferences:

Group 1: IEEE Transactions on Mobiles Computing, IEEE Access, Sensors (MDPI), Expert Systems with Applications (Elsevier) and The Journal of Navigation (Cambridge).

Group 2: International Conference on Indoor Positioning and Indoor Navigation, ION GNSS+, International Conference on Localization and GNSS and International Conference on Location Based Services.

I expect to publish one paper the first year, and 2 every next year. In specific, I plan to submit 3 papers into the group 2; and 2 papers into the group 1. The first paper will be related to the systematic review of the collaborative techniques for indoor positioning system. The other articles will be related to the results of the test and experimentation of: 1) various fingerprinting technologies; 2) algorithms to improve accuracy and power consumption, 3) inertial navigation system, 4) Description of the developed Collaborative Indoor Positioning System and Comparison with other Collaborative and Non-Collaborative Systems.

b) Anticipated conference, workshop attendance, courses, and /or seminar presentations:
I plan to attend the most relevant conferences and workshops involving Indoor and Collaborative Positioning. At the beginning of each academic year, I will agree with my supervisors which ones I will attend. The considered conferences include, but are not limited to:
- International Conference on Indoor Positioning and Indoor Navigation
- International Conference on Ad hoc, Sensor & Ubiquitous Computing
- International Conference on Computed Science
- IEEE workshop on Positioning, Navigation and Communications

2) Research Skills and techniques:
a) Desired training in specific new areas, or technical expertise etc.
- Scientific paper writing
- Machine learning and IA techniques
- Wireless mesh sensor networks
- Protocols for Mobile Telephony
- Systematic literature review

b) Planned courses
- TST-90006 Orientation to doctoral studies (TUT), 3 ECTS
- ELT-43356 IoT wireless communications (TUT), 3 ECTS
- BMT-47626 Wireless solutions in intelligent environments (TUT) 8 ECTS
- Reproducible research (UJI), 2 ECTS
- Test and evaluation of positioning, localization and tracking systems ensuring data diversity (UJI) 2 ECTS
- English for Research: Articles and presentations of research results (UJI)

3) Communication skills:
a) Desired communication skills to be acquired
The desired communication skills to be acquired are the following:
- Presentation Skills, in order to present, with natural eloquence, adequate terms and language, our work in international conferences and workshops to disseminate the results to the scientific community.

- Writing communication skills, to produce scientific papers and reports with proper standards.
- Social media Skills, that permit to communicate the results of the A-WEAR project to society and interested partners in an effective way using the social media platforms (e.g., Youtube, Linkedin,...)

4) Other professional training
   a) Desired training in other skills (entrepreneurial, management, etc.)
      I would like to acquire the following skills:
      - Management skills, to manage projects and coordinate multidisciplinary work groups from both administrative and research point of view and help me to complete the leadership skills needed to reach my long terms goals.
      - Organizing and Planning skills, to organize and planning conferences, seminars and workshops with the members of A-WEAR a GEOTEC group and allow me to conduct researches in systematic way and help me to become an internationally recognized researcher.

5) Anticipated networking opportunities
   I aspire to expand my networking opportunities through the following actions:
   - Presenting our works in International forums (e.g., IPIN, IEEE workshops on Position, Navigation and Communications) to disseminate the results to the scientific community.
   - Organizing workshops related with Indoor Positioning Systems and the A-WEAR project to share our results and experiences obtained through the development of our research activities.
   - Using social networking sites (e,g., ResearchGate, Linkedin, Youtube) to promote the A-wear network and encourage young people's interest in scientific activities.

6) Other activities (community, etc.) with professional relevance:
   I plan to be involved in the following activities:
   - Participate in the events of the A-WEAR project, to share our outcomes and learn from the experiences of the others ESR's and courses provided.
   - Creation of Datasets for indoor positioning systems and donate it to the Indoor Positioning Community as a way to provide free useful data set for future studies.
   - Be member and participate in the activities of the IPIN (International Conference on Indoor Positioning and Indoor Navigation) with the purpose to stablish personal contact with the main experts in indoor position.

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DE LOS SANTOS
Fecha: 2019.10.18
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Signature of fellow

Date:

SVEN|
CASTELEYN

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SVEN|CASTELEYN
Date: 2019.10.18
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Name and signature of main supervisor

Date: 17/10/2019

Firmado digitalmente por
JOAQUIN|TORRES|SOSPEDRA
Fecha: 2019.10.17 18:37:16
+02'00'

Name and signature of co-supervisor

Date:

Jari Nurmi

Oct 22, 2019

Name and signature of co-supervisor

Date:

SIMONA LOHAN

22.10. 2019

Name and signature of co-supervisor

Date:

FLOREAN CURTICAPEAN

22.10. 2019

Name of fellow: Sylvia Holcer

Department and university at Beneficiary side: Universitat Jaume I, Spain

Department and university at the academic secondment side: Brno University of Technology, Czech Republic

Planned industrial secondment: Castellon Police Department, Spain, S2 Grupo, Spain

Name of the Main Supervisor: Michael Gould Carlson

Name of the additional academic and industrial supervisors: Prof. Inmaculada Remolar (Universitat Jaume I, Spain), Assoc. Prof. Jan Hajny (Brno University of Technology, Czech republic) and industrial mentors: Jose Luis Carque and Jorge Verchili Andreu (Castellon Police Department, Spain) and Stefan Beyer (S2 Grupo, Spain)

Date

BRIEF OVERVIEW OF RESEARCH PROJECT AND MAJOR ACCOMPLISHMENTS EXPECTED:

The ESR-7 research project will focus on aspects of location privacy, paying specific attention to wearables and 5G networks. Location privacy affects and is affected by law, ethics, human-computer interaction, psychology, marketing, advances in technology, and more. Researchers, developers, decision-makers and the general public would be better informed from research covering all crucial areas of location privacy. Major accomplishments will include a total of five publications and a Thesis addressing the privacy paradox and privacy preservation methods along with their risks and implications in a chosen area such as Smart Cities.

Long-term career objectives (over 5 years):

Smart technology is being developed and implemented by a variety of sectors such as education, health, transportation, and security. Each sector has different uses for these devices, but they will all have some degree of issue with privacy. My goal is to be able to identify these issues and be able to resolve them, as a part of the development or implementation stage. After graduation this could be done through either educational roles through research, workshops, and lectures, or through consultation roles. The A-WEAR project will provide me with the opportunity to research and learn about all aspects of privacy, to see specific applications of new 5G wearables, to understand their market, to gain professional experience from the collaboration with the police and a cybersecurity firm, and ultimately help me choose which roles I will want to take up in my career.

Expected date of graduation: September 2022

Short-term objectives (1-2 years):

The first short-term objective is to write a review of all literature relating to location privacy in indoor positioning systems, as a measure to capture the sentiments, issues, solutions, and research developments in this field. To assist with this task, conferences and workshops based on urban mobility, privacy, and 5G networks will be sought out and attended where possible and relevant.

The second short-term objective is to learn about cryptography and cybersecurity in more detail because it plays an important role in privacy.

The third short-term objective is to improve academic communication skills by actively reading literature, working on my own writing to present ideas clearly and effectively, and seeking feedback and advice from colleagues and supervisors.

Finally, the fourth short-term objective is to network with the different project fellows and researchers in other institutions through e-mails, workshops and conferences. This will provide the opportunity to find out what others are doing in their work, to receive feedback, to co-operate on similar goals, and gain new insights into the field.

Signature of fellow   SYLVIA| HOLCER   Digitally signed by SYLVIA| HOLCER Date: 2019.10.11 14:54:38 +02'00'   Date:

Name and signature of main supervisor   MICHAEL| GOULD| CARLSON   Digitally signed by MICHAEL|GOULD| CARLSON DN: cn=MICHAEL|GOULD|CARLSON, serialNumber=24398146E, givenName=MICHAEL, sn=GOULD CARLSON, ou=Ciudadanos, o=ACCV, c=ES Date: 2019.10.11 06:34:30 -07'00'   Date:

Name and signature of co-supervisor   Firmado digitalmente por INMACULADA| REMOLAR|QUINTANA Fecha: 2019.10.14 11:27:59 +02'00'   Date:

Name and signature of co-supervisor   Date:

Jan Hajny 89784@vutbr.cz   Digitálně podepsal Jan Hajny 89784@vutbr.cz Datum: 2019.10.14 12:14:33 +02'00'

Name of fellow:
Laura-Ştefania Fluerătoru

Department and university at Beneficiary side:
University Politehnica of Bucharest (UPB)
Computer Science Department, Faculty of Automatic Control and Computers

Department and university at the academic secondment side:
Tampere University (TAU)

Planned industrial secondment:
NXP Semiconductors (Bucharest, Romania)

Name of the Main Supervisor:
Prof. Dragoş Niculescu

Name of the additional academic and industrial supervisors:
Assoc. Prof. Elena-Simona Lohan (TAU)
Assis. Prof. Sergey Andreev (TAU)
Radu Preda (NXP)
Iosif Antochi (NXP)

Date:
31 October 2019

BRIEF OVERVIEW OF RESEARCH PROJECT AND MAJOR ACCOMPLISHMENTS EXPECTED:

The main topic of my thesis is the development of algorithms and methods towards device tracking with centimeter-level accuracy in the Internet of Things (IoT). There are already systems capable of achieving a tracking accuracy of up to 10 cm, but this task is particularly challenging in indoor locations. Moreover, using such indoor localization systems in the IoT poses additional power and energy constraints, as well as privacy issues. I plan to research techniques for achieving high-accuracy localization while taking into account the aforementioned constraints. In addition, in the IoT, localization greatly enhances the context awareness of devices, so it would be interesting to investigate methods through which this task can be performed in a non-intrusive manner.

I can have a smooth start into my PhD degree by continuing the work performed during my Master's thesis in which I investigated the use of a state-of-the-art UWB chip developed by 3db Access, an ETH Zürich spin-off. Their chip has an average power consumption at least 10 times lower than the one of the best systems on the market (Decawave), thus very suitable for wearable devices. Even though the devices perform worse in terms of measurement accuracy, through signal processing techniques I obtained an average tracking error of approximately 14 cm, which is in line with the best results obtained by UWB devices. During the first part of the PhD degree, I will perform a literature survey on various indoor IoT localization solutions, with a focus on UWB-based solutions. Existing technologies and chipsets on the market need to be evaluated and a performance matrix will be thus derived. One possible research direction might be investigating the use of time-difference of arrival techniques for highly accurate localization with wireless clock synchronization, which is a current gap in research. There is plenty of room for innovation in suitable synchronization mechanisms, signaling methods, energy-efficient data collection and more.

Long-term career objectives (over 5 years):

1) **Goals**:
Devices in the Internet of Things already have a huge impact on the way we live and it is expected that the trend will only amplify in the future. Location awareness capabilities greatly augment the range of applications that these devices can perform, and high-accuracy localization, in particular, is a largely unresolved topic. My goal for the next five years is to expand my knowledge on indoor localization solutions from at least two perspectives. The PhD degree will allow me to obtain in-depth knowledge about the techniques and algorithms that enable the development of such solutions and to enrich the field myself through scientific contributions. I would also like to obtain a complementary perspective on the field regarding its business applications, in order to see the technology fulfilling its potential in our day-to-day lives. Towards this goal, I would ideally found my own startup after the completion of the PhD degree in which I will apply the specialized knowledge obtained in my research.

2) **What further research activity or other training is needed to attain these goals?**
I believe the A-WEAR network will offer plenty of opportunities for meeting like-minded people that are equally passionate about innovation. Conversations can often lead to unexpected ideas for future research, shaping the course of my PhD degree. These kinds of connections are also paramount for starting a technology startup. Given that the network is committed to foster a fruitful

relationship between academia and industry, the internal events will be perfect to gather more knowledge on the topic of entrepreneurship.

3) **Planned graduation date**
    The planned completion of my PhD degree is at the end of 2023.

Short-term objectives (1-2 years):

1) **Research results**
    a) **Anticipated publications:**
        i) A minimum of three conference papers in high-quality venues to be commonly agreed with the supervisory team.
        ii) Minimum one journal paper in an open-access peer-reviewed journal relevant to the research topics.
    b) **Anticipated conference, workshop attendance, courses, and /or seminar presentations:**
        ∘ The targeted conferences and journal are to be discussed, but we aim for top tier ones in the field of localization technologies, networking, and wireless communications.
        ∘ Orientation camp/winter school on "Localization and communication enablers for wearables" 2-5 December 2019 (TAU).
        ∘ Summer school at UJI, Spain, June 2020.
        ∘ Fall school at UPB, Bucharest, Oct 2020.
        ∘ Half-day A-WEAR workshop 2 at IPIN 2021 conference on indoor location privacy of wearables (UJI).

2) **Research Skills and techniques:**
    a) **Desired training in specific new areas, or technical expertise etc**
        ∘ Theoretical knowledge in developing and characterizing new algorithms for high-accuracy indoor localization.
        ∘ Applying network communication knowledge from the field of wireless sensor networks to the localization task in order to render the system flexible to a high device density.
        ∘ Optimize the power and energy efficiency of the localization system, which is a crucial characteristic of devices in the IoT. This can be done by means of optimizing the algorithms, the communication between the devices, or the device operation itself.
        ∘ Implementation skills needed to develop, test, and evaluate the algorithms. It might include developing firmware in a low-level programming language (C) or application-level software in a higher-level programming language (Python, C++), as well as scripting, prototyping etc.

    b) **Planned courses**
        ∘ Seminar in which selected papers relevant to the research topic are studied and discussed (UPB): 3 ECTS
        ∘ Wireless Sensor Networks and the Internet of Things (UPB): 5 ECTS
        ∘ 5G Mobile Communications (TAU): 5 ECTS
        ∘ Radar and Professional Radio Communication System (TAU): 5 ECTS
        ∘ Additional courses and seminars are to be discussed with the team of supervisors.

    c) **Planned secondments**
        ∘ 6-month secondment at TAU, Finland, Sep 2020 – Feb 2021

○ 3-month secondment at TAU, Finland, March 2022 – May 2022

3) **Communication skills:**

One of the main challenges in research is being able to clearly explain advanced technical concepts to both specialized and non-expert audiences. I will practice this skill during the conferences I will attend and the A-WEAR workshops. Moreover, the A-WEAR workshops will be an excellent opportunity to exchange ideas in fields adjacent to my own, possibly leading to fruitful collaborations and novel research directions.

4) **Other professional training**

Given that one of my long-term goals is to bring research results into people's lives through a startup, I would like to acquire entrepreneurship-related skills. These include developing a feasible business idea, management skills, and knowledge transfer from academia to industry.

5) **Anticipated networking opportunities**

I expect plenty of interactions with people from the same field during the A-WEAR events, which will help me stay up to date with innovations in adjacent topics. The conferences I will attend will also enable me to interact with researchers working on similar topics and exchange ideas.

6) **Other activities (community, etc) with professional relevance:**

Because sometimes location tracking is frowned upon by the general public due to privacy or even health concerns, I would like to write informative articles or blog posts in which to educate people with respect to this issue. I can include results from my own research presented in a manner easy to understand by people with a non-technical background, hoping to raise awareness on this topic.

Signature of fellow   Date: 19.11.2019

Name and signature of main supervisor   Date: 19.11.2019
Prof. Dragoş Niculescu

Name and signature of co-supervisor   Date:
Assoc. Prof. Elena-Simona Lohan   19.11.2019

Name and signature of co-supervisor   Date: 19.11.2019
Assis. Prof. Sergey Andreev

Name and signature of co-supervisor
Radu Preda

Date: 19/11/ 2019

Name and signature of co-supervisor
Iosif Antochi

Date:

19/11/2019

Name of fellow: EKATERINA SVERTOKA

Department and university at Beneficiary side:
Faculty of Electronics, Telecommunications and Information Technology, University Politehnica of Bucharest (UPB, Romania)

Department and university at the academic secondment side:
Department of Telecommunications (Wireless System Laboratory of Brno, Cryptology Research Group and Signal Processing Group), Brno University of Technology (BUT, Czech Republic)

Planned industrial secondment:
Beia Consult International, Bucharest, Romania

Name of the Main Supervisor: Prof. Ion Marghescu(UPB)

Name of the additional academic and industrial supervisors: Dr. Alexandru Rusu-Casandra (UPB), Prof. Radim Burget (BUT), Dr. George Suciu (BEIA), *Dr. Alexandr Ometov (TAU), Dr. Alexandru Vulpe (UPB), Dr. Razvan Craciunescu (UPB)*

Date:
28.10.2019

BRIEF OVERVIEW OF RESEARCH PROJECT AND MAJOR ACCOMPLISHMENTS EXPECTED (half page should be sufficient):

Today, people use great amount of different wearable devices to be always in touch, to be ready to join work/study process at any time, to monitor physical activity, to find their way toward the destination not only in the map, but in the life as well. Wearables can facilitate life in many of its aspects, but in some cases, these devices are able even to help to save it.

One of the directions considering wearables as necessity in such cases is work safety in manufacture, factories, industries, etc. Timely evacuation, identification of danger situations, precise ranging and position detection - such things provided by wearables allow to reduce the likelihood of accidents at work in the above places.

As was written in the description, within the topic «Industrial wearables for work safety» it is necessary**:**

1. To reduce the work place injuries in industrial environments by at least 85%, through the use of accurate person tracking through wearable devices, such as bracelets and wearables weaved in overalls and head-helmets;
2. To detect unsafe postures and high-risk motions through wireless-based motion detectors;
3. To optimize the interoperability of IoT wearables sensors used in real-time complex event processing;
4. To test the developed algorithms in an industrial underground environment, such as buildings, mines and tunnels while in the industrial secondment.

Long-term career objectives (over 5 years): *(target 1/4-1/2 page)*

1) Goals:
   1.1) Get into the process during the PhD stage:
      1.1.1)   Acquire information necessary for completing tasks and presentation of future results.
      1.1.2)   Perform the tasks set for this period and mentioned above.
      1.1.3)   Attain international connections.
   1.2) Finish PhD and become an independent researcher.
   1.3) Continue research activity in this or adjacent fields.
   1.4) Try myself as a lecturer.
   1.5) Obtain Post-doctoral grant.

2) What further research activity or other training is needed to attain these goals?
   2.1) Machine learning course.
   2.2) Networking course.
   2.3) Improvement of presentation and communication skills.
3) Planned graduation date: October 2022

Short-term objectives (1-2 years): *(target ½-1 page)*

   • Search and study of comprehensive information about state of the art in using wearables/industrial wearables for work safety applications.

   • Search and study the main solutions in different issues associated with the work safety applications: gathering data from sensors, transmitting the data to servers, processing the data, ensuring the security of the data;

     • Study by simulation of a couple of work safety wearables.

     • Investigation/creation of a prototype for a work safety platform. Testing and optimization.

• Dissemination of the resullts in technical journals and international conferences.

1) Research results

Anticipated publications

    a) Journals: Sensors, IEEE Access, MDPI etc.
    b) Anticipated conference, workshop attendance, courses, and /or seminar presentations: Communications 2020, Communications 2022, ICL-GNSS 2020, ICL GNSS 2022, Wearable Technologies Conferences on Wearables in Germany, etc.

2) Research Skills and techniques:

    a) Desired training in specific new areas, or technical expertise etc:
        a.1) Machine learning.
        a.2) Networking.
        a.3) IoT security.

    b) Planned courses
        b.1) Python.
        b.2) MATLAB.
        b.3) Signal processing.
        b.4) Machine learning.
        b.5) Networking.

3) Communication skills:

    a) Desired communication skills to be acquired:
        a.1) Presentation skills.
        a.2) Speaking in front of large audiences.

4) Other professional training

    a) Desired training in other skills (entrepreneurial, management, etc): entrepreneurial skills.

5) Anticipated networking opportunities:

    5.1) Conferences, workshops, seasonal schools.
        5.1.1) A-Wear Winter Shop, Tampere, 2-5 December, 2019;
        5.1.2) Half-day A-WEAR workshop at AGILE 2020 conference , 16 June, Crete;
        5.1.3) 4-days Summer school at UJI , Castellon, 23-26 June 2020;
        5.1.4) 4 days, Fall school at UPB, Bucharest, 12-16 October 2020

    5.2) Researchers in social media.
Creating accounts and being active on Facebook, Research gate, Webropol, etc.

6) Other activities (community, etc.) with professional relevance:

    • Identifying and staying in touch with people working in work safety area, in developing and using sensors and all types of industrial wearables;
    • Identifying and participating in seminars, symposiums related to any topic related to using wearables in work safety applications;
    • Visiting expositions, fairs and demos related to my area of research;

Signature of fellow   Date: 28.10.2019
Svertoka Ekaterina

Name and signature of main supervisor   Date: 28.10.2019
Ion Marghescu

 Name and signature of co-supervisor   Date: 28.10.2019
Radim Burget

Name and signature of co-supervisor   Date: 28.10.2019
Alexandru Rusu-Casandra

Name and signature of co-supervisor   Date: 28.10.2019
George Suciu

Name and signature of co-supervisor   Date: 28.10.2019
Aleksandr Ometov

Name and signature of co-supervisor   Date: 28.10.2019
Alexandru Vulpe

Name and signature of co-supervisor   Date: 28.10.2019
Răzvan Crăciunescu

Name of fellow: ASMA CHANNA

Department and university at Beneficiary side:
Computer Science Department, University Politehnica of Bucharest (UPB)

Department and university at the academic secondment side:
Department DIIES, Università degli Studi Mediterranea di Reggio Calabria (URC)

Planned industrial secondment: CITST-IT Center for Science and Technology,Romania

Name of the Main Supervisor: Nirvana Popescu

Name of the additional academic and industrial supervisors: Antonio Iera (URC), Giuseppe Ruggeri (URC), Oana Cramariuc (CITST), Bogdan Cramariuc (CITST)

Date:
14.10.2019
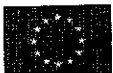
BRIEF OVERVIEW OF RESEARCH PROJECT AND MAJOR ACCOMPLISHMENTS EXPECTED (half page should be sufficient):

According to Europeans Parkinson's Disease Association (www.epda.eu.com), 10 million people in the worldwide are affected by Parkinson's Disease (PD) and they suffer from different symptoms but the most common are tremor (i.e. involuntary shaking of different body parts) and bradykinesia (i.e. slowness of motion). In addition, fall related injuries are devastating consequence of PD that fritter away of independence due to postural instability and low muscle strength of the patients. Within the scope of revolutionizing health care and increasing the autonomy of PD patients, new approaches are needed to monitor PD patients remotely in their home, quantify their motor disability and evaluate how motor disability impact on quality of life. Current practices on diagnosis and evaluation of PD patients rely on single time, observer rated clinical measures (e.g. Unified Parkinson's Disease Rating Scale) consisting of a series of qualitative motor and cognitive tests performed in clinical settings (e.g. hospitals and general practitioner's clinic), and the score of a patient may vary with the observer's experience.

In this context, this research project **_will bring contributions to eHealth application development based on wearable materials,wireless communication modules and devices in the case of patients suffering of Parkinson's disease_**. The project will deliver a smart, instrumented gait monitoring system for PD patients, capable of processing medical data, extract, classify and diagnose different stages of this disease, monitoring the recovery in response to rehabilitation exercises. Several techniques will be investigated: machine learning, fractal theory, fuzzy logic classification and a performance evaluation comparison will be also realized.

A mobile application will be developed that runs on a wrist band, which is equipped with reliable motion sensors including accelerometer, gyroscope and magnetometer or body worn activity monitors. The proposed architecture will be tested using Arduino boards and Raspberry Pi-s Their app communicates with the sensors to record high-resolution data which is then stored in a secure, online server. Real time data processing algorithms will be developed to _automatically and objectively 1) quantify gait impairments of patients, 2) monitor their recovery and fitness in response to exercise rehabilitation, and 3) investigate how improvements in gait and fitness impact their quality of life._

Long-term career objectives (over 5 years): _(target 1/4-1/2 page)_

My long-term career goal is to be an independent researcher, to start an interdisciplinary lab in my university or to seek a teaching or research position in a research or any academic institution where I can share my experience and knowledge with others excited about multidisciplinary research projects and where I can research, identify and provide new challenges and perspective. As in my country young students do not pay more attention to research, I want to create awareness among them that how one's research can bring a revolution in our society. My other objective is to meet new people in international conferences and achieve international collaborations. During my research period I will try to give session to undergrad student to take part in research projects especially in EU projects and specifically about E-health innovations.

- Goals:

- Postdoctoral studies
- Develop patents from my research.
- Academic career
- Working in industry
- Open a business on wearable devices
- What further research activity or other training is needed to attain these goals?
  - Machine learning intensive course
  - Signal processing on medical data

- Planned graduation date: September 2022

Short-term objectives (1-2 years): *(target ½-1 page)*

October 2019- December 2020:
- Literature review (critical analyze on the already existing applications for PD patients, classification algorithms, data acquisition techniques).
- Analyze of sensors and data acquisition systems for PD patients appropriate for diagnose
- Machine learning approach for data classification. Experiments on data sets
- Exploring the fractal theory (waveforms in sensorial system specific to PD patients, identification of fractal coefficients, development of associated mathematical models)

January 2021- December 2021:
- Development of fuzzy classification algorithm for diagnose
- Performance evaluation of the developed algorithms
- Algorithms development for monitoring the recovery and fitness in response to rehabilitation exercises.
- Modules implementation and experiments
- Development of the whole system based on Arduino and raspberry Pi.

1. Research results
- Anticipated publications: Journals - Sensors, Machine Learning, IEEE Transactions on Biomedical Engineering, Soft Computing
- Anticipated conference, workshop attendance, courses, and /or seminar presentations:
Machine Learning Conference, International Symposium on Parkinson Disease, IEEE International Conference on E-health Networking, Application & Services

2. Research Skills and techniques:
a) Desired training in specific new areas, or technical expertise:
- Machine learning
- Fuzzy logic and control
- Data acquisition

b) Planned courses:
- Android Wear App development

- Python
- Matlab
- Machine and Deep learning
- Develop advance communication Protocols

3. Communication skills
Desired communication skills to be acquired:
- Interpersonal and Leadership Skills.
- Publicly speaking
- Presentation Skills

4. Other professional training
Desired training in other skills (entrepreneurial, management, etc):
- Research and Information management

5. Anticipated networking opportunities
- Events that professionally challenge us
- Research attendees on social media
- International conferences and workshops

6. Other activities (community, etc) with professional relevance:
   This is a multidisciplinary project and it needs collaborative working between
- Computer scientists
- Physicians
- Physiotherapists
- Neuroscientists and
- also support from National Health Services to monitor recovery of stroke patients using wearable sensors during intensive exercise rehabilitation.

Signature of fellow   Date: 14.10.2019
Asma Channa

Name and signature of main supervisor   Date: 14.10.2019
Nirvana Popescu

Name and signature of co-supervisor   Date: 14. 10. 2019
Giuseppe Ruggeri

Name and signature of co-supervisor   Date: 14.10.2019
Oana Cramariuc

Name of fellow: Justyna Skibińska

Department and university at Beneficiary side: Department of Telecommunications, Faculty of Electrical Engineering, Brno University of Technology

Department and university at the academic secondment side: the Unit of Electrical Engineering, Tampere University

Planned industrial secondment:
Sewio Networks

Name of the Main Supervisor:
Assoc. Prof. Radim Burget

Name of the additional academic and industrial supervisors:
Prof. Zdenek Smekal,
Prof. Evgeny Koucheryavy,
Assistant Prof. Sergey Andreev
industrial mentors: Dr Milan Simek and Dr. Lubomir Mraz

Date:
30.10.2019

BRIEF OVERVIEW OF RESEARCH PROJECT AND MAJOR ACCOMPLISHMENTS EXPECTED (half page should be sufficient):

Long-term career objectives (over 5 years): *(target 1/4-1/2 page)*

1) Goals:
The main objective of the PhD study is the research of machine learning methods with a focus on wearable technologies and low latency methods with good generalization capability. The aim is to achieve improvements in machine learning models that will offer low latency at the same time thanks to the use of the new mathematical methods and machine learning algorithms. Part of the PhD study will be to attend the world recognized workshops, conferences in order to gather state of the art knowledge from all over the world. Selected parts of the research are also to publish the results in the front tier journals. One of the focus of the work is to cooperate with the clinic the physicians in order to identify innovative ways of patients monitoring and evaluation of their state. Thanks to the internship in the industry it will be possible to gather the experience of the latest commercial products and demand of the market for new kinds of technologies. In order to achieve high quality data for the analysis, we already started cooperation with Faculty Hospital in Olomouc (Czech Republic) and their Telemedicine center. One of the possible topics could be analysis of data from wearable sensors monitoring heart function of patients.

2) What further research activity or other training is needed to attain these goals?
For this research is the most important to keep up to date with the latest front tier conferences like CVPR, NeurIPS, ICML, ECCV, ICCV, ISBI and others. The most important part is to get familiar with the latest progress and challenges in the area of artificial intelligence and to identify potential bottlenecks of the current technologies with the potential to be improved with the latest technologies.

3) Planned graduation date September 2022

Short-term objectives (1-2 years): *(target ½-1 page)*

1) Research results
a) Anticipated publications:
It is expected to participate in A-WEAR workshops and discuss further development of new methods. ESR will focus on cheap wearable devices that can detect diseases such as Alzheimer's disease, Parkinson's disease, thanks to the analysis of electroencephalography (EEG). Machine learning algorithms will be used for this purpose. For this aim, I would like to submit a paper to a conference ICML and also to an open-access journal connected with the engineering in medicine like IEEE Open Journal of Engineering in Medicine and Biology (OJEMB).
I have been working so far at:

- literature search on the deep learning approach in the EEG analysis
- writing an accepted paper for the conference XXXV Finnish URSI Convention on Radio Science at Tampere and presenting it during the conference,

The name of the paper was: 'The Application of Deep Learning Techniques in the Electroencephalogram (EEG) Analysis',

- writing a diary paper from the conference URSI at Tampere (18th October).

b) Anticipated conference, workshop attendance, courses, and /or seminar presentations:
Obligatory workshops and part of other workshops from A-WEAR project and DELTA project like:
- 4-day summer school on "Machine Learning, Spatial analysis, and cybersecurity in wearables",
- 4 days, winter school on "Consumer and healthcare applications of wearables",
- Half-day A-WEAR workshop at AGILE 2020,
- Half-day A-WEAR workshop at ICUMT 2020 conference on green communication and networking with wearables,
- 4-day summer school on "Critical Industrial Applications in 5G- Internet of Things (IoT) Ecosystem", the topic will be about 5G and mmWave architectures;

2) Research Skills and techniques:
a) Desired training in specific new areas, or technical expertise etc.: It is vital to catch the most important information from the state-of-the-art and use them to innovate the technologies with newer better approaches. In the area of machine learning, it is crucial to obtain data collection to work with them. According to this, it is necessary to identify appropriate datasets or plan how to collect them.
I will learn how to evaluate the best model in the field of machine learning and be aware of which solution is the most appropriate to different kinds of data. I should also be conscious of how to transfer the obtained model to be adequate as the wireless solution.
Additionally, during workshops, I can increase my knowledge in the field of wireless technology.

b) Planned courses: optimization methods (this course could be useful in the field of machine learning), wireless communication, advanced machine learning approach

3) Communication skills:
a) Desired communication skills to be acquired
It is vital to practice the use of English thanks to attending workshops, meeting with other scientists, practice language during normal working days, attending a meeting for foreigners. ESR is attending an English course at university this semester and I am planning to find in the next semester course focus on conversational English.

4) Other professional training
a) Desired training in other skills (entrepreneurial, management, etc.) I will have the possibility to learn these skills during A-WEAR workshops:
- 2.5-day workshop about complementary skills training on languages, communications and entrepreneurship skills

5) Anticipated networking opportunities: A-WEAR project is a great opportunity to find interdisciplinary knowledge from various teams that is present at Brno

University of Technology and Tampere University. It is also good opportunity to keep in touch with other ESRs in the scope of A-WEAR project. The possibility to brainstorm together will be very beneficial, also to know what other people from their university are dealing with and where they see potential for further improvements of the state-of-the-art. Secondly, taking part in conferences create new contacts to know experts who are dealing with similar problems and it is great opportunity to catch the new ideas and implement them in future research. Taking part in machine learning networking will be very crucial thanks to attending the conference, meetings, and forums.

6) Other activities (community, etc) with professional relevance:

Justyna Skibińska
Early Stage Researcher

Date: 30.10.2019

Radim Burget,
Main supervisor

Date: 30.10.2019

Zdenek Smekal
Co-supervisor

Date: 11.11.2019

Evgeny Koucheryavy
Co-supervisor

Date:

30.10.2019

Sergey Andreev
Co-supervisor

Date: 30.10.2019

Name of fellow:

Salwa Saafi

Department and university at Beneficiary side:

Brno University of Technology (BUT), Faculty of Electrical Engineering and Communication (FEEC), Department of Telecommunications

Department and university at the academic secondment side:

Tampere University (TAU), Faculty of Information Technology and Communication Sciences

Planned industrial secondment: Netcope Technologies

Name of the Main Supervisor: Assoc. Prof. Jiri Hosek (BUT)

Name of the additional academic and industrial supervisors:

Prof. Jiri Misurec (BUT), Assoc. Prof. Simona Lohan (TAU), Assist. Prof. Sergey Andreev (TAU), Dr. Viktor Pus (Netcope Technologies), and Denis Matousek (Netcope Technologies)

Date: 29/10/2019

BRIEF OVERVIEW OF RESEARCH PROJECT AND MAJOR ACCOMPLISHMENTS EXPECTED:

ESR12 project title:

Reliable and low-latency communication technologies for industrial wearable applications.

ESR12 research objectives:

- Identification of most critical performance metrics of emerging industrial wearable applications.

- Research and advanced theoretical/simulation-based analysis of novel wireless communication technologies fulfilling the observed KPIs.

- Design of universal communication architecture suitable for emerging industrial wearable applications.

- Development of analytical model of the selected wireless technology to analyse its performance in various industrial scenarios.

- Development of proof-of-concept demonstrator implementing the "winning" wireless technology in the selected industrial wearable application.

Long-term career objectives (over 5 years):

1) Goals:

- Building a strong basis for my research career in telecommunications (mainly in wireless networking) through fulfilling my ESR objectives and obtaining my joint PhD degree from BUT and TAU.

- Strengthening my academic skills and acquiring new skills in wireless networking that can be applied in different fields (besides the wearables field).

- Building connections with professionals from both academia and industry.

- Pursuing the research path with a Post-Doc position that involves industrial partners to guarantee the application of the research proposals in real life scenarios.

2) What further research activity or other training is needed to attain these goals?

- Pursuing the evolution of wireless networks (applications, technologies, protocols, etc.).

- Using the new emerging IT capabilities in wireless networks design and optimization (virtualization, machine learning, etc.).

- Programming skills and simulation tools (Python, C/C++, MATLAB, NS-3, etc.).

3) Planned graduation date: 11/2022

Short-term objectives (1-2 years):

1) Research results:

   a) Anticipated publications:

   The goal is to publish the achieved research results in the premier international venues and scientific Open Access journals with impact factor.

   b) Anticipated conference, workshop attendance, courses, and /or seminar presentations:

   Active participation at the A-WEAR winter/summer schools and seminars, premier international conferences and workshops in the area of wireless communications and wearables (e.g. IEEE ICC, IEEE GLOBECOM, IEEE WCNC, IEEE VTC, etc.).

2) Research Skills and techniques:

   a) Desired training in specific new areas, or technical expertise etc:

   - Training in AR/VR/MR technologies.
   - Training in mathematical modeling and optimization.
   - Training in the implementation of complex algorithms on MATLAB and on NS-3.
   - C/C++ and Python trainings.

   b) Planned courses:

   - Information Representation and Machine Learning (BUT)
   - Optimization Methods and Queuing Theory (BUT)
   - Orientation to PhD course (TAU)
   - Courses and lectures within the A-WEAR Summer and Winter Ph.D. schools.

3) Communication skills:

   a) Desired communication skills to be acquired:

   A desired communication skill to be acquired is the presentation skill:

   - The presentation skill is required in both research and academia (workshops, conferences, meetings, teaching classes, etc.).
   - It is important to learn how to prepare a presentation support (powerpoint slides, videos, flyers, posters, etc.) and how to present it with a well structured speech.
   - If it is not well presented, a research proposal can lose its value.

4) Other professional training:

   a) Desired training in other skills (entrepreneurial, management, etc.):
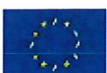
Project management training: learning how to manage time, stress, tasks and resources in order to guarantee the smooth progress of the project.

5) Anticipated networking opportunities:

- Active networking with other ESRs as well as supervisors within the A-WEAR network.
- Building a professional network through new contacts gained from academia as well as industry during the active participation at the international conferences and workshops.

6) Other activities (community, etc.) with professional relevance:

- Membership in IEEE society - the world's largest technical professional organization for the advancement of technology.
- Active involvement in the organization of the international conferences and workshops.

Signature of fellow   Date: 29/10/2019

Name and signature of main supervisor   Date: 30. 10. 2019
Assoc. Prof. Jiri Hosek

Name and signature of co-supervisor   Date: 30. 10. 2019
Prof. Jiri Misurec

Name and signature of co-supervisor   Date:
Assoc. Prof. Simona Lohan

Name and signature of co-supervisor   Date: 30. 10. 2019
Assist. Prof. Sergey Andreev

Name of fellow: *Raúl Casanova Marqués*

Department and university at Beneficiary side: *Department of Telecommunications, Brno University of Technology*.

Department and university at the academic secondment side: *Institute of New Imaging Technologies, Universitat Jaume I*.

Planned industrial secondment: *2 months at Netcope Technologies*.

Name of the Main Supervisor: *Jan Hajný* (Brno University of Technology).

Name of the additional academic and industrial supervisors: *Michael Gould* (Universitat Jaume I, Spain); *Viktor Puš* and *Denis Matoušek* (Netcope Technologies, Czech Republic).

Date: *October 25th, 2019*

BRIEF OVERVIEW OF RESEARCH PROJECT AND MAJOR ACCOMPLISHMENTS EXPECTED (half page should be enough):

Long-term career objectives (over 5 years): *(target 1/4-1/2 page)*

1) **Goals**: *My long-term goal is to participate in projects related to the areas of cybersecurity, whether in the academic or industrial research environment. My bachelor's and master's degrees have provided me with a solid base to tackle research projects in these areas. However, progress towards my professional goals requires me to develop experience in the field of research. Doing my PhD by participating in the A-WEAR project will provide me with this transdisciplinary experience and the opportunity to broaden my knowledge of cybersecurity in wearable devices.*

2) **What further research activity or other training is needed to attain these goals?** *Participating in the European project A-WEAR will provide me with very important knowledge in order to achieve my objectives. However, I want to take advantage of the transversal training of this project to attend the conferences and workshops planned with the aim of strengthening my research skills and my knowledge in this field.*

3) **Planned graduation date**: *In 2022*.

Short-term objectives (1-2 years): (*target ½-1 page)*

1) **Research results**:
   a) **Anticipated publications**: *I presented at the conference "XXXV Finnish URSI Convention on Radio Science (URSI 2019)" the paper "Anonymous Communication Using Wearables and Constrained Devices". However, the objective of my PhD is to design and evaluate new cryptographic technologies for the protection of the privacy and digital identity of electronic users, provide attribute-based authentication, guarantee user authenticity and find solutions to resolve the ineffective revocation of invalid users, as well as test and compare existing algorithms. Therefore, my future publications will focus on these topics.*

   b) **Anticipated conference, workshop attendance, courses, and /or seminar presentations**: *During my doctorate I hope to attend some conferences such as SECRYPT or ACM CCS WPES. In addition to attending the workshops, conferences and courses planned in the A-WEAR project*

   - *1-week orientation camp and Fall school on "Localization and communication enablers for wearables", including half-day fellow presentations and team building activities.*
   - *Half-day A-WEAR workshop at AGILE 2020 conference on wearables in smart cities.*
   - *4-day summer school on "Machine Learning, Spatial analysis, and cybersecurity in wearables", including half-day fellow presentations and team building.*
   - *Joint virtual research seminar via Moodle2 and Echo tools covering edge and fog computing, physical layer parameter optimization and MAC protocols in wearables, and wearable applications and services.*
   - *Half-day A-WEAR workshop 2 at IPIN 2021 conference on indoor location privacy of wearables.*

2) **Research Skills and techniques**:
   a) **Desired training in specific new areas, or technical expertise, etc**. *I would like to broaden my training in areas such as cryptography, biometrics and communication protocols such as RFID, NFC and BLE.*

   b) **Planned courses**: *I am currently taking a Foundations of Cryptology course. I will also attend other courses that I consider important and interesting during my PhD.*

3) **Communication skills**:
   a) **Desired communication skills to be acquired**: *I would like to obtain at least level C1 of English and then try to reach level C2. Taking advantage of my doctorate in the Czech Republic, I would like to learn the local language and get some basic notions of the Czech language.*

4) **Other professional training**:
   a) **Desired training in other skills (entrepreneurial, management, etc.)**. *To be able to investigate with devices such as personal labels or smart cards I will need training in Smart card programming, FPGA programming and the different communication protocols used by these devices*.

5) **Anticipated networking opportunities**: *During my PhD I hope to be able to expand my network with people with whom I can collaborate and share knowledge. Attending conferences and workshops of the A-WEAR project will give me that opportunity.*

6) **Other activities (community, etc.) with professional relevance**:

Signature of fellow   **Date**: *October 30th, 2019*

   Raúl Casanova Marqués

Name and signature of main supervisor   **Date**:

Name and signature of co-supervisor   **Date**:

Name and signature of co-supervisor   **Date**:

Name of fellow: OLGA CHUKHNO

Department and university at Beneficiary side: Laboratory for Advanced Research into Telecommunication Systems, Universita Mediterranea di Reggio Calabria (URC)

Department and university at the academic secondment side: Laboratory of Electronics and Communications Engineering, Tampere University of Technology (TUT)

Planned industrial secondment: Ericsson (ERI), Finland

Name of the Main Supervisor: Prof. Antonio Iera (URC)

Name of the additional academic and industrial supervisors: Assoc. Prof. Antonella Molinaro (URC), Prof. Jari Nurmi (TUT), Prof. Evgeny Koucheryavy (TUT), Johan Torsner (ERI).

Date:
28.10.2019

BRIEF OVERVIEW OF RESEARCH PROJECT AND MAJOR ACCOMPLISHMENTS EXPECTED (half page should be sufficient):

According to the International Data Corporation (IDC) (https://www.idc.com/), the market of smart wearable devices is growing rapidly and the value of the world wearables market is anticipated to reach 279 million units by the end of 2023.

Wearable things open a new paradigm where devices are always multitasking (e.g. social networking, gaming, transferring multimedia data, exchanging general-interest files, medicine functions such as monitoring the physical condition of the user, providing valuable health information, etc.).

The development of wearables from fitness trackers and smart watches to smart clothing with sensors that teach robots how to reproduce people's actions has been accelerated by a great desire of scientists to make technology easier to implement in our daily lives and non-stop customer expectations. Not long ago devices were limited to hours, headsets of virtual reality, but the development of innovative solutions are evolving, and the scale of usage are expanding.

Therefore, widespread adoption of the internet of things (IoT) paradigm is unlikely without embracing the concepts of Large-scale Smart Environments where devices will co-operate in a decentralized manner with each other and will be able to reach diverse interconnected software and applications.

In order to enhance the quality of service (QoS) and the overall system performance in LSE scenarios edge/fog/cloud computing architectures are supposed to be implemented. Edge/fog/cloud architectures oblige proper models with a high device autonomy and management level.

Due to the fact that LSE comprise a large number of connected wearable devices, detection, trust and reputation evaluation of wearables and other characteristics should be under the control of intelligent management.

In order to enable the above and similar scenarios based on Social-aware discovery and data exchange among IoT devices over Edge Computing platforms, A-WEAR project **will bring new edge/fog architectures to improve the energy efficiency in wearables and to support massive, heterogeneous, and multi-connectivity devices**.

Objectives:
- Create novel interaction paradigms also taking into account the social and opportunistic relationships and interactions between entities involved in the Large-scale Smart Environments
- Evaluate the role of social networks of objects in enabling the uprising paradigm of IoWT
- Offer suitable architecture for properly exploiting Cloud and Fog computing paradigms in a joint way to support effective data exchange among IoT and IoWT devices moving across LSEs
- Investigate the virtualization of IoT devices in fog/edge infrastructures

Expected Results:
- Smart techniques for IoT objects discovery leveraging the Social IoT paradigm
- Definition of cognitive and social objects to support applications in smart environments with IoWT devices
- Fog/Edge-based platforms supporting the migration of virtual images of IoT devices by also using the container technology
- Orchestration mechanisms for resources in the envisaged platforms
- Definition and validation of algorithms for social based crowdsourcing

Long-term career objectives (over 5 years): (target 1/4-1/2 page)

My long-term career goal is to be highly skilled researcher. After my PhD studies at the Mediterranea University of Reggio Calabria and the Tampere University of Technology, working and training at Ericsson, I

would like to continue career within the Higher Education sector as a lecturer and a researcher in the area of IoT and IoWT. Moreover, I would like to keep research and publishing as a researcher working in a lab for an industry company, or in a government department.

1) Goals:

- Double PhD degree from URC and TUT
- Professional experience and training at Ericsson
- Postdoctoral studies
- Research career and industial career (research, publishing and consultancy)
- International collaboration in Science Research

2) What further research activity or other training is needed to attain these goals?

- Intensive courses in Internet of Things, 5G, Edge/Fog

3) Planned graduation date: End of PhD Course in November 2022-Final graduation exams around April 2023

Short-term objectives (1-2 years): (target ½-1 page)
November 2019-December 2020

- Literature review
- Background in the fields of communication and navigation architectures in wearables, Internet of Things and 5G technologies
- Background in the fields of edge/fog and cloud computing
- Communications protocols in IoWT
- Specification of use cases for the edge computing in wearable network case studies

January 2021-December 2021

- Use cases and applications of the different wireless communications mechanisms for IoT, IoWT, and Internet of Everything
- Analysis and modelling of the main characteristics and of the dynamics of the social network of objects and of defining the cognitive and social objects to support applications in smart environments with IoWT devices

January 2022-November 2022

- Understanding the effects of multi-connectivity
- Heterogeneous radio access technologies
- Mobility influence on the communications performance in terms of availability, reliability, data rate and latency
- PhD thesis preparation and internal defense

1) Research results

a) Anticipated publications:

- IEEE Journals, Transactions, Letters, and Magazines
- Springer/Elsevier/Wiley journals

b) Anticipated conference, workshop attendance, courses, and /or seminar presentations:

- A–WEAR training schools, workshops and seminars
- PhD schools on relevant topics for my research
- Joint virtual research seminar via Moodle2 and Echo tools
- Conferences on relevant topics for my research (preferably IEEE/ACM)

2) Research Skills and techniques:
   a) Desired training in specific new areas, or technical expertise etc
   - Cloud/edge/fog computing
   - Internet of things
   - Mesh sensor networks
   - Mobile computing
   - Software design

   b) Planned courses
   - Edge/fog and cloud computing and oriented–platforms in wearable Network
   - Internet of Things applications
   - IoT wireless communications
   - Multicast in 5G
   - Vehicle–to–X networks and networking protocols

3) Communication skills:
   a) Desired communication skills to be acquired
   - Written communication skills
   - Presentation skills
   - Negotiation skills
   - Public speaking skills
   - Cross–cultural communication skills

4) Other professional training
   a) Desired training in other skills (entrepreneurial, management, etc)
   - Scientific paper writing skills
   - Management skills
   - Reporting skills
   - Business practice skills
   - Marketing skills
   - Reserch management skills
   - Start–up skills

5) Anticipated networking opportunities
   - Network events
   - Research and development meetings
   - Schools
   - Conferences
   - Workshops
   - Seminars
   - Trainings

6) Other activities (community, etc) with professional relevance:

- Dissemination activitiesin socia media (Webropol, Facebook,LinkedIn, Zenodo, GitHub, Bitbucket,Youtube,Twitter,ResearchGate, etc.)

Signature of fellow
Olga Chukhno

Date: 30/10/2019

Name and signature of main supervisor
Antonio Iera

Date:
30/10/2019

Name and signature of co-supervisor
Antonella Molinaro

Date:
30/10/2019

Name and signature of co-supervisor
Jari Nurmi

Date:
31/10/2019

Name and signature of co-supervisor
Evgeny Koucheryavy

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31/10/2019

Name of fellow: NADEZDA CHUKHNO

Department and university at Beneficiary side: Laboratory for Advanced Research into Telecommunication Systems, Università Mediterranea di Reggio Calabria (URC)

Department and university at the academic secondment side: Institute of New Imaging Technologies, Universitat Jaume I de Castellon (UJI)

Planned industrial secondment: IDOM Consulting, Engineering, Architecture S.A.U., Spain

Name of the Main Supervisor: Assis. Prof. Giuseppe Araniti (URC)

Name of the additional academic and industrial supervisors: Supervisory team: Prof. Antonio Iera (URC), Dr. Sergio Trilles Oliver (UJI), Dr. Joaquin Torres-Sospedra (UJI), Jesús de Diego Alarcon (IDOM), Jelena Stosic (IDOM)

Date:
28.10.2019

BRIEF OVERVIEW OF RESEARCH PROJECT AND MAJOR ACCOMPLISHMENTS EXPECTED (half page should be sufficient):

Wearable computing becomes an integral part of our everyday outfit, which is always operational and equipped to assist us in dealing with a variety of situations (e.g., in the case of entertainment, work activities, travelling, medicine, education, etc.). Unlike a laptop or a palmtop, wearable computer is constantly turned on and interacts with the real-world tasks. Since wearables are always ready and accessible, this fact leads to a new form of synergy between a person and a computer. This will bring forward a new set of technical, scientific and social needs that will have to be addressed. In addition, the interaction between a human and a machine will become more natural as user input to the computer is mostly voice driven or sensed from gestures or body motion.

Today's smart wearables need to be inter-connected in a heterogeneous manner (to be compatible with different services and appliances), battery-operated, and may gather energy. They also need for decentralized, low-cost, and low-power architectures, hence, developing efficient D2D-based capabilities is one of the key challenges in wearable communications.

The raise of amount of online devices and their worldwide penetration gave occasion to increasing user expectations on characteristics and longevity of wearable devices. Therefore, it is necessary to take into account power and/or time perspectives tackling with performance optimization and energy consumption problems.

In order to enable the above and similar scenarios based on wearables, A-WEAR project **will bring enhanced D2D architectures to improve the energy efficiency in wearables and to support massive, heterogeneous, and multi-connectivity devices.**

Objectives of the project:
- Explore the enhancements offered by a set of innovative 5G technologies in practical IoWT contexts
- Study the multi-connectivity heterogeneous radio access technologies and mobility in IoWT
- Investigate WiFi-Direct and 3GPP LTE with Proximity Services approaches for D2D communications

The following results are expected to be gained:
- Innovative algorithms for wearable devices, proximity services, and machine type communications
- A complete set of models, frameworks, schemes, and algorithms useful for a complete characterization of the wearable services and applications in the converged 5G-IoT ecosystem
- Analytical and simulation-based validation methods

Long-term career objectives (over 5 years): *(target 1/4-1/2 page)*

After completing high-level education at the Mediterranea University of Reggio Calabria and the Jaume I University, obtaining proper learning, innovative research and communication skills, trying myself in industrial world at IDOM, I would like to continue research and development in the field of 5G-IoT wearable devices either at the university or at the company.

Another long-term goal is to share acquired professional skills and knowledge with the youngest generation.

1) Goals:
- Double PhD degree from URC and UJI
- Work experience and training at IDOM
- Promotion in research career (especially academic career)
- Successful industrial career

- International cooperation in the research field

2) What further research activity or other training is needed to attain these goals:
Intensive specific-oriented courses:
- Heterogeneous radio access technologies
- D2D communications technologies
- 5G technologies in practical IoWT contexts

3) Planned graduation date: End of PhD Course in November 2022 – Final graduation exams around April 2023

Short-term objectives (1-2 years): *(target ½-1 page)*
November 2019-December 2020:
- Literature review
- Background in the fields of communication and navigation architectures in wearables, Internet of Things and 5G technologies
- State-of-the-art and multi-connectivity novel solutions in IoWT
- Specification of use cases for D2D communications in wearable networks
- Communication protocols

January 2021-December 2021:
- Functionality of D2D communications
- Actual Cloud computing services to be used in the measurements and analysis

December 2022- November 2022:
- Understanding the effects of multi-connectivity
- Heterogeneous radio access technologies and mobility influence the communications performance in terms of availability, reliability, data rate and latency
- PhD thesis preparation and internal defense

1) Research results
   a) Anticipated publications:
   - IEEE Journals, Transactions, Letters, and Magazines
   - Springer/Elsevier/Wiley journals

   b) Anticipated conference, workshop attendance, courses, and /or seminar presentations:
   - PhD schools on relevant topics for my research
   - Schools for ESRs organized by A-WEAR
   - Joint virtual research seminar via Moodle2 and Echo tools
   - Conferences on relevant topics for my research (preferably IEEE/ACM)

2) Research Skills and techniques:
   a) Desired training in specific new areas, or technical expertise etc:
   - D2D communications
   - Internet of things (IoT)
   - Artificial intelligence
   - Mobile computing
   - Software design

b) Planned courses
- D2D communications and protocols
- Multicast in 5G
- Internet of Things and 5G technologies
- Vehicle-to-X networks
- Communication and navigation architectures in wearables
- Privacy and security in wireless networks

3) Communication skills:
   a) Desired communication skills to be acquired
- Persuasive presentation skills
- Verbal communication skills
- Written communication skills
- Teamwork skills

4) Other professional training
   a) Desired training in other skills (entrepreneurial, management, etc)
- Negotiation skills
- Selling skills
- Doctoral studies practices and orientation
- Scientific paper writing skills
- Presentation skills
- Critical thinking and entrepreneurship skills
- Technology management skills
- Ethical training
- Business practice skills
- Marketing skills, etc.

5) Anticipated networking opportunities
- Training events such as seasonal schools, workshops, conferences, seminars
- Technical and non-technical training
- Research and development meetings

6) Other activities (community, etc) with professional relevance:
- Social media promotion of the network, such as Webropol surveys, Facebook and LinkedIn groups, ResearchGate discussions, Youtube video channels, local mass-media activities, Twitter and blogging, presentations in local schools, universities and local councils, distribution terms for the open repositories, organization a A-WEAR Open Day.

Signature of fellow
Nadezda Chukhno

Date: 30.10.2019

Name and signature of main supervisor
Giuseppe Araniti

Date: 30.10 2019

Name and signature of co-supervisor
Antonio Iera

Date:

30.10.2019

Name and signature of co-supervisor

Sergio Trilles Oliver

Date:

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