3rd ONFIRE Symposium Wednesday, 24th February 2021, Online New Link! – Click here to join the meeting	
9:00-10:45	**Session 1** **Chair: Raul Muñoz (CTTC)**
9:00-9:05	**Welcome message** (Raul Muñoz, ONFIRE Coordinator)
9:05-9:30	**Invited Speaker 1:** **Behnam Shariati (HHI, Germany)** **Title:** Collaborative Machine Learning Model Development in Multi-domain Multi-vendor Ecosystems **Abstract:** Optical networks are under disruptive digital transformation where Machine Learning (ML) based solutions are expected to play a significant role. The development of any ML-based solution, which essentially relies on operational data of the telecom infrastructure, requires the different players like telecom operators as well as component and system vendors to share data with each other and possibly third parties. However, telecom data sharing has been the topic of lots of debates due to regulatory issues imposed by the telecom operators and conflict of interests among the involved parties. Due in part to this very limitation, most of the works available in the literature rely on synthetic simulation data or limited measurements collected in lab experiments. In order to address this challenge, we have developed a Distributed Learning Framework (DLFi) that enables shared ownership and governance of ML models in telecom ecosystems. In this talk, we present DLFi and its potential role in the realization of collaborative ML development in multi-domain multi-vendor ecosystems. In addition, we present a proof-of-concept demonstration that was carried out in December 2020 over our smart optical networking test-bed in Berlin in which we used DLFi to develop ML models across distributed data sources belonging to difference domain managers. Finally, we summarize the relevant challenges and open issues.
9:30-9:55	**Invited Speaker 2:** **Marija Furdek (Chalmers University, Sweden)** **Title:** Physical layer security management aided by machine learning **Abstract:** Optical network security management calls for advanced approaches capable of detecting and identifying attacks and supporting automation of remediation tasks. Machine learning (ML) techniques enable an unprecedented toolset for optical network diagnostics by detecting intricate effects of security breaches on the optical performance. However, the practical deployment of these techniques within network management frameworks faces numerous challenges. In this talk, we examine challenges related to accuracy, run-time complexity and interpretability of ML tools for security diagnostics and discuss possible ways of addressing those challenges.
9:55-10:20	**Invited Speaker 3:** **Cen Wang (KDDI Research, Japan)** **Title:** From RMSA to CMS3, Use DRL Method to Solve Multi-Resource Scheduling Problem in Future OTN **Abstract:** As SDM including MDM is seen as a promising technology for evolution of OTN in the future, the dimension of the resources will increase. Multidimensional resource (i.e., core, mode and spectrum) scheduling over OTN will be more complex than the traditional scheduling scheme with an only

	consideration of spectrum. On the other hand, DRL has been proven to be powerful for complex scheduling problems with deep decision space. Therefore, in this study, we explore the specific usage of DRL to optimally solve a core, mode and spectrum sequential scheduling (CMS3) problem. Our results show DRL-based CMS3 outperforms a heuristic CMS3 algorithm in terms of blocking rate and resource utilization.
10:20-10:45	**Invited Speaker 4:** **Yvan Pointurier (Huawei, France)** **Title:** Machine learning-aided Quality of Transmission (QoT) estimation **Abstract:** The estimation of the Quality of Transmission (QoT) in optical systems with machine learning (ML) has recently been the focus of a large body of research. We discuss the sources of inaccuracy in QoT estimation in general, we propose a taxonomy for ML-aided QoT estimation, and we review and compare recently published ML-aided QoT articles.
10:45-11:00	**Coffee Break**
11:00-13:05	**Session 2** **Chair: Konstantinos (Kostas) Christodoulopoulos (NOKIA Bell Labs)**
11:00-11:25	**Invited Speaker 5:** **Paolo Dini (CTTC, Spain)** **Title:** Energy Sustainability in Mobile Networks: a Learning Perspective **Abstract:** We are now living the digital era. Dematerialization is becoming a reality, and everybody and everything, including machines, is globally connected through the Internet. The trend is of a further increase in traffic demand, number of offered services and connected devices, especially mobile. However, the massive use of Information and Communication Technologies (ICT) is also increasing the level of energy consumed by that system and its footprint on the environment. In 2030 ICT is expected to consume 51% of the electricity generated and will be responsible of 23% of the carbon footprint by human activity. Sustainable design of ICT, and specially of mobile networks, is, therefore, a key and challenging sector for societal prosperity. In this talk, we will introduce the main outcomes of the SCAVENGE ITN (www.scavenge.eu). In detail, we will elaborate on the architecture of the future mobile networks (5G) and its interaction with the electricity grid. The integration of the radio access network with a distributed renewable energy system will be discussed, by reporting the main building blocks and methods to achieve the self-sustainability of the integrated system. The focus will be given to the network control architecture and algorithms to ensure efficient deployment and operation of the available spectrum, energy and computational resources. In particular, tools such as Machine Learning (ML) and Dynamic Programming (DP) will be discussed to be incorporated in the control functions of the future RANs to analyze the environment, take the appropriate actions and balance many, often conflicting, goals. In fact, ML and DP may include an end-to-end knowledge of the system to achieve a proactive optimization, able to exploit the huge amount of data available and to even incorporate additional dimensions, such as the characterization of end user experience and behavior, the energy consumed and harvested.
11:25-11:50	**Invited Speaker 6:**

	Víctor López (Telefónica I+D, Spain) **Title:** Optical white boxes design and programmability adopting GNPy **Abstract:** White boxes ecosystem enables to decouple the hardware and operating system that is installed on it. The Telecom Infra Project is the fora where there is a definition of white boxes for optical networks. Even though there are advances in many aspects, there is still a lack of reference implementations with standard interfaces for programmability. There are gaps in devices models (like OpenConfig and OpenROADM) models for enabling physical impairment estimation engines (like GNPhy) as part of optical planning SDN NBI applications. This talk will present different architectural flavors which include TAPI and OC models that propagate upwards relevant information for physical impairment evaluation.
11:50-12:15	**Invited Speaker 7:** **Jelena Pessic (Nokia, France)** **Title:** Missing pieces currently preventing the application of ML to QoT estimation **Abstract:** We discuss how quality of transmission (QoT) estimation is done today and which are the potential machine learning QoT based models. We investigate how a machine learning-based QoT estimator performs, depending on different feature selections, on homogeneity of learned light paths and uncertainty of their span lengths, using a synthetic database for different network topologies. We assess the benefits of transfer learning based on artificial neural networks using unbiased training data sets for QoT-estimation of unestablished light paths. We conclude with a discussion on the missing pieces which are currently preventing the application of ML to QoT estimation.
12:15-12:40	**Invited Speaker 8:** **Nicola Sambo (Scuola Superiore Sant'Anna, Italy)** **Title:** Resilient disaggregated optical networks based on delegation **Abstract:** This talk will present an innovative control plane paradigm for disaggregated optical networks where the central controller can delegate network devices to autonomously perform specific control operations (e.g., restoration). Simulation results will show high scalability at the controller and fast recovery.
12:40-13:05	**Invited Speaker 9:** **Manos Varvarigos (National Technical University of Athens – NTUA, Greece)** **Title:** Joint fiber wireless resource allocation to support efficient cell free operation **Abstract:** Cell-Free (CF) networks can serve demands in a dynamic and scalable manner, introducing a tradeoff between spectral efficiency, backhaul traffic and processing requirements. We examine the problem of joint fiber-wireless resource allocation in a converged infrastructure consisting of CF, mMIMO and optical resources.