Sergio Barrachina-Muñoz, Ph.D.　　　　Senior Researcher, CTTC

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	Barcelona (Spain)	

RESEARCH INTERESTS

5G/6G, Wi-Fi, AI/ML, Experiment-as-a-Service, Cloud orchestration

SHORT BIO

Sergio Barrachina-Muñoz (Barcelona, 1991) holds a Ph.D. in Information and Communication Technologies (ICT) from Universitat Pompeu Fabra (UPF), Barcelona, obtained in 2021. He also earned a B.Sc. in Telematics Engineering (2015) and an M.Sc. in Intelligent Interactive Systems (2016), both from UPF. In 2015, he joined the Wireless Networking Research Group under the supervision of Dr. Boris Bellalta. His doctoral research, awarded *cum laude*, focused on developing autonomous learning techniques for efficient spectrum access in next-generation Wi-Fi networks. During his Ph.D., he received the FI grant from the Generalitat de Catalunya.

After a short tenure at Orange as a Wi-Fi Quality Assurance expert, Sergio joined the Services as Networks (SaS) research unit at the Centre Tecnològic de Telecomunicacions de Catalunya (CTTC) in 2021. Since 2022, he has served as Senior Researcher and Technical Coordinator, leading a lab team of more than five engineers and applying MLOps practices to streamline the development of the EXTREME 5G/6G testbed. His research interests include cloud orchestration, MLOps and large language models (LLMs), 5G/6G architectures, and the enablement of state-of-the-art testbeds for experimenting with next-generation (xG) networks that integrate datacenter and radio components, including O-RAN deployments. He has authored over 15 papers in Q1 journals, more than 20 conference papers, and 4 book chapters, and holds an h-index of 18. Since 2015, he has also been teaching undergraduate courses on computer networks. His current work bridges experimental 5G/6G platforms with AI-driven network management.

EDUCATION & ACADEMIC EXPERIENCE

Senior Researcher and technical coordinator at CTTC	Dec 2022 - *currently*
Researcher at CTTC	Mar 2021 - Dec 2022
PhD in the Wireless Networking research group (UPF)	Oct 2016 - Jan 2021

- Thesis (`cum laude`): "Responsive Spectrum Management for WLANs: from Heuristic-based Policies to Model-Free Reinforcement Learning".
- Research stay:
  - Rice Networks Group in Rice University (Houston, United States)
  - Design and development of WACA
- Teaching assistant of computer networks related subjects

MSc, Intelligent and Interactive Systems at UPF	Sep 2015 - Jul 2016

- Research intern in the Network Technologies and Strategies research group (NeTS)

BSc, Telematics Engineering at UPF	Sep 2011 - Jul 2015

- Top of class, 10+ courses with honors

INDUSTRY PROFESSIONAL EXPERIENCE

- Centum Solutions (Orange Labs). QA engineer, Wi-Fi expert	Jan 2021 - Mar 2021
- Ricoh Spain. Software developer engineer intern	Feb 2015 - Oct 2015
- Vendo Services. Quality Assurance (QA) intern	Jun 2014 - Oct 2014

SELECTED JOURNAL PUBLICATIONS

1. Rezazadeh, F., Barrachina-Muñoz, S., Chergui, H., Mangues, J., Bennis, M., Niyato, D., Song. (2024). Toward Explainable Reasoning in 6G: A Proof of Concept Study on Radio Resource Allocation. EEE Open Journal of the Communications Society.

2. Barrachina-Muñoz, S., et al. (2023). Deploying cloud-native experimental platforms for zero-touch management 5G and beyond networks. IET Networks, 12(6), 305-315.

3. Barrachina-Muñoz, S., Chiumento A., & Bellalta, B. (2021). Multi-Armed Bandits for Spectrum Allocation in Multi-Agent Channel Bonding WLANs. IEEE Access.

4. Wilhelmi, F., Barrachina-Muñoz, S., Cano, C., Selinis, I. & Bellalta, B. (2021) Spatial Reuse in IEEE 802.11ax WLANs. Computer Communications, 170, 65-83.

5. Barrachina-Muñoz, S., Bellalta, B., & Knightly, E. (2021). Wi-Fi channel bonding: an all-channel system and experimental study from urban hotspots to a sold-out stadium. IEEE/ACM Transactions on Networking.

6. Wilhelmi, F., Barrachina-Muñoz, S., Bellalta, B., Cano, C., Jonsson, A., & Ram, V. (2020). A Flexible Machine-Learning-Aware Architecture for Future WLANs. IEEE Communications Magazine, 58(3), 25-31.

7. Barrachina-Muñoz, S., Wilhelmi, F., & Bellalta, B. (2019). Online Primary Channel Selection for Dynamic Channel Bonding in High-Density WLANs. IEEE Wireless Communications Letters, 9(2), 258-262.

8. Barrachina-Muñoz, S., Wilhelmi, F., & Bellalta, B. (2019). To overlap or not to overlap: Enabling channel bonding in high-density WLANs. Computer Networks, 152, 40-53.

9. Barrachina-Muñoz, S., Wilhelmi, F., & Bellalta, B. (2019). Dynamic channel bonding in spatially distributed high-density WLANs. IEEE Transactions on Mobile Computing, 19(4), 821-835.

10. Barrachina-Muñoz, S., Bellalta, B., Adame, T., & Bel, A. (2017). Multi-hop communication in the uplink for LPWANs. Computer Networks, 123, 153-168.

SELECTED CONFERENCES & WORKSHOPS

1. Barrachina-Muñoz, S., Zeydan, E., Blanco, L., Vettori, L., Rezazadeh, F., & Mangues-Bafalluy, J. (2023). Cloud Native Federated Learning for Streaming: An Experimental Demonstrator. In 2023 IEEE 24th International Conference on High Performance Switching and Routing (HPSR) (pp. 1-3). IEEE.

2. Rezazadeh, F., Zanzi, L., Devoti, F., Barrachina-Muñoz, S., Zeydan, E., Costa-Pérez, X., & Mangues-Bafalluy, J. (2023). A Multi-Agent Deep Reinforcement Learning Approach for RAN Resource Allocation in O-RAN. 2023-IEEE Conference on Computer Communications Workshops (INFOCOM WKSHPS) (pp. 1-2). IEEE.

3. Barrachina-Muñoz, S., Baranda, J., Payaró, M., & Mangues-Bafalluy, J. (2022). Intent-Based Orchestration for Application Relocation in a 5G Cloud-native Platform. In 2022 IEEE Conference on Network Function Virtualization and Software Defined Networks (NFV-SDN) (pp. 94-95). IEEE.

4. Barrachina-Muñoz, S., Payaró, M., & Mangues-Bafalluy, J (2022). Cloud-native 5G experimental platform with over-the-air transmissions and end-to-end monitoring. In IEEE/IET International Symposium on Communication Systems, Networks and Digital Signal Processing (CSNDSP).

5. Barrachina-Muñoz, S., Chiumento A., & Bellalta, B. (2021). Stateless Reinforcement Learning for Multi-Agent Systems: the Case of Spectrum Allocation in Dynamic Channel Bonding WLANs. In IEEE 2021 Wireless Days (WD).

6. Barrachina-Muñoz, S., Bellalta, B., & Knightly, E. (2020). Wi-Fi All-Channel Analyzer. In Proceedings of the 14th International Workshop on Wireless Network Testbeds, Experimental evaluation & Characterization (ACM WiNTECH) (pp. 72-79). **Runner-up, best paper award**.

7. Wilhelmi, F., Barrachina-Muñoz, S., & Bellalta, B. (2019). On the Performance of the Spatial Reuse Operation in IEEE 802.11ax WLANs. In 2019 IEEE Conference on Standards for Communications and Networking (CSCN) (pp. 1-6). IEEE.

8. Barrachina-Muñoz, S., Wilhelmi, F., Selinis, I., & Bellalta, B. (2019, April). Komondor: a wireless network simulator for next generation high density WLANs. In 2019 Wireless Days (WD) (pp. 1-8). IEEE.

9. Barrachina-Muñoz, S., Adame, T., Bel, A., & Bellalta, B. (2019). Towards energy efficient LPWANs through learning-based multi-hop routing. In 2019 IEEE 5th World Forum on Internet of Things (WF-IoT) (pp. 644-649). IEEE.

10. Barrachina-Muñoz, S., & Bellalta, B. (2017). Learning optimal routing for the uplink in LPWANs using similarity-enhanced e-greedy. In Personal, Indoor, and Mobile Radio Communications (PIMRC), 2017 IEEE 28th Annual International Symposium on (pp. 1-5). IEEE.

TEACHING EXPERIENCE		
	Course Instructor at UOC	
	• Networking fundamentals	2020 - *currently*
	Teaching Assistant	
	• TIC bachelor degrees at UPF: *Networks*	2016 - 2020
	• TIC bachelor degrees at UPF: *Networks Laboratory*	2017
	Teaching Staff	
	• Campus Junior (UPF) - Descobrint l'IoT a través d'Arduino	2017, 2018
	• Yomo (Mobile World Congress) - Taller d'Arduino	2018
	• Girls Hack Day (UPF) - Introducció a l'IoT i Arduino	2018

SERVICE ACTIVITIES		
	Technical program committees	
	• IEEE/IFIP Network Operations and Management Symposium (NOMS)	2024
	• Second international workshop on Data science for Internet of Things (DS-IoT)	2017
	Review of publications	
	• IEEE Communications Letters	
	• Elsevier's Pervasive and Mobile Computing	
	• IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM)	
	• IEEE International Conference on Network and Service Management CSNM	
	• IEEE Transactions on Communications	
	• IEEE Systems Journal	
	• IEEE Transactions on Wireless Communications	
	• MDPI Sensors	

RESEARCH PROJECTS		
	• 5G-HUB. Fifth Generation Services HUB for European Union Governmental Satellite Communications	2024 – 2027
	• 5G-GOVSATCOM	2024 – 2026
	• Plaza6G+. Polo de Innovación y Experimentación 6G Extendido	2023 – 2025
	• Plaza6G. Polo de Innovación y Experimentación 6G	2022 – 2025
	• 6G-BLUR The blurring RAN	2021 – 2024

- 5GMediaHUB. 5G Experimentation Environment for 3rd Party Media   2021 – 2024
- 5G-EPICENTRE. 5G ExPerimentation Infrastructure hosting Cloud-nativE Network applications for public proTection and disaster RElief 5G   2021 – 2024
- MARSAL. Machine Learning-Based, Networking and Computing Infrastructure Resource Management of 5G and Beyond Intelligent Networks   2021 – 2023
- MonB5G. Distributed management of Network Slices in beyond 5G   2019 – 2023
- WINDMAL. ML for wireless networking in highly dynamic scenarios   2020
- Cisco. Performance Evaluation of IEEE 802.11ax WLANs   2017 – 2020
- Maria de Maeztu (MdM). Wireless Networking through Learning   2017 – 2020
- ENTOMATIC. Novel automatic and stand-alone integrated pest management tool for remote count and bioacoustic identification of the Olive Fly (Bactrocera oleae) in the field.   2015 – 2018

SOFTWARE
- **Programming languages**: Python, Java, C/C++, Matlab, LaTex.
- **Libraries**: TensorFlow, PyTorch, Scikit-learn, Keras.
- **Containers**: Docker, Kubernetes - *Preparing for CKA. Cloud-native 5G papers in gScholar.*
- **OS/Engines**: Linux, LXC, virt-manager, PowerShell, NFV.
- **Version control & management**: Git, Jira.
- **Automation**: Ansible, GitLab CI/CD, Jira automation tools.
- **Monitoring**: Prometheus, Grafana, NetData, *Kafka*.
- **5G**: Open5GS, Open Air Interface, Free5GC, Amarisoft, SRS.
- **Methodologies**: Agile, Scrum, Kanban, situational leadership
- **Software projects** (available in GitHub):
  - WACA: Wi-Fi All-Channel Analyzer
  - Komondor IEEE 802.11ax wireless network simulator
  - Spatial-Flexible Continuous Time Markov Network (SFCTM) framework
  - Distance-Ring Exponential STA Generator (DRESG)

GRANTS & AWARDS
- Runner-up, best paper award in WINTECH (@Mobicom) 2020   2020
- FI grant from AGAUR (Generalitat de Catalunya)   2016-2020

LANGUAGES

Spanish (native), Catalan (native), English (advanced), German (beginner)

OTHER COURSES
- Getting Started with AWS Machine Learning *by AWS (Coursera)*   2020
- Deep Learning fundamentals with Keras *by IBM (edX)*   2020
- Fundamentals of Scalable Data Science *by IBM (Coursera)*   2020
- Machine Learning *by Stanford University (Coursera)*   2018