Sergio Barrachina-Muñoz, Ph.D.

Research Engineer, AI/ML Specialist & Technical Lead

CONTACT INFORMATION

Email: barrachina.sergio@gmail.com
Website: https://sergiobarra.github.io/
Barcelona (Spain)
Tel:

PROFESSIONAL SUMMARY

Leveraging my background as a Telco/AI PhD and research scientist (h-index 19, 1000+ citations), I specialize in the convergence of 5G/6G, Wi-Fi, and AI/ML. As head of a research lab/datacenter with a team of 5, I also lead the infrastructure that supports our work. I develop and deploy production LLM applications for both research project solutions and intelligent lab operations. Additionally, I bring over a decade of experience teaching undergraduate engineering students.

SKILLS

- **Programming**: Python, Java, C/C++, Matlab, SQL/NoSQL, APIs, Full-stack
- **AI & MLOps**: Ollama/vLLM, RAG (LlamaIndex), multi-agent frameworks (LangGraph), fine-tuning (LoRA), Gradio, CI/CD pipelines, NVIDIA CUDA, PyTorch, MCP, Weights & Biases (wandb), n8n, MLFlow, Deep Learning, Federated Learning, Reinforcement Learning.
- **Cloud & DevOps**: Linux, LXD, TCP/IP, Docker, Kubernetes, OpenStack, OpenTofu (Terraform), Ansible, Puppet, Prometheus, Grafana, Kafka
- **Telecom & 5G**: Open5GS, Free5GC, OpenAirInterface, Amarisoft, SRS
- **Collaboration & Workflow**: GitHub, GitLab, Jira, Confluence, Agile, Kanban
- **Other**: Finance/Investing, Latex, Blockchain, Obsidian, Chess

PROFESSIONAL EXPERIENCE

Senior AI Research Engineer at CTTC — Mar 2021 - *currently*

- Architected and administered a large-scale, cloud-native datacenter (3,000+ CPU cores, 15 TB RAM, 1 PB storage, 20+ GPUs) to support AI/ML workloads and network research. Leading a team of 5 researchers and engineers.
- Spearheaded the design and development of an Experiment-as-a-Service (ExaS) platform, letting external stakeholders set up and perform 5G/6G experiments remotely.
- Led the end-to-end development and orchestration of multiple proofs-of-concept (PoCs), including O-RAN, 5G cores, satellite, and AI/LLM-based frameworks across edge and cloud.
- Managed the experimental part of 10+ EU/Spanish research projects, from planning to technical delivery and reporting.

Course Instructor at UOC — Feb 2021 - *currently*

- Teach networking courses, mentoring 150+ students annually in telecom concepts.

Lead QA engineer, Wi-Fi expert at Orange Labs (Centum) — Jan 2021 - Mar 2021

- Defined standards and procedures for automated testing infrastructure.

Software developer engineer intern at Ricoh Spain — Feb 2015 - Oct 2015

- Java ME development and service/project support.

QA intern at Vendo Services — Jun 2014 - Oct 2014

- Wrote and executed test scripts and plans in development, staging, and production.

EDUCATION

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 at Rice Networks Group in Rice University (Houston, United States).

MSc, Intelligent and Interactive Systems at UPF — Sep 2015 - Jul 2016
BSc, Telematics Engineering at UPF (***Top of class***) — Sep 2011 - Jul 2015

SELECTED PUBLICATIONS

- **Barrachina-Muñoz, S.**, et al. (2024). *Empowering Beyond 5G Networks: An Experimental Assessment of Zero-Touch Management and Orchestration.* IEEE Access.

- **Barrachina-Muñoz, S.**, Payaró, M., & Mangues-Bafalluy, J. (2022, July). *Cloud-native 5G experimental platform with over-the-air transmissions and end-to-end monitoring.* In CSNDSP.
- **Barrachina-Munoz, S.**, Chiumento, A., & Bellalta, B. (2021). *Multi-armed bandits for spectrum allocation in multi-agent channel bonding WLANs.* IEEE Access.
- Rezazadeh, F., **Barrachina-Muñoz, S.**, Chergui, H., Mangues, J., Bennis, M., Niyato, D., Liu, L. (2024). *Toward explainable reasoning in 6g: A proof of concept study on radio resource allocation.* IEEE Open Journal of the Communications Society.
- Soumplis, P., Kontos, G., Kokkinos, P., Kretsis, A., **Barrachina-Muñoz, S.**, Nikbakht, R. (2024). *Performance optimization across the edge-cloud continuum: A multi-agent rollout approach for cloud-native application workload placement.* SN Computer Science.
- Rezazadeh, F., **Barrachina-Muñoz, S.**, Zeydan, E., Song, H., Subbalakshmi, K. P., % Mangues-Bafalluy, J. (2023, November). *X-GRL: An empirical assessment of explainable GNN-DRL in B5G/6G networks.* In NFV-SDN.
- **Barrachina-Muñoz, S.**, et al. (2023, June). *Cloud native federated learning for streaming: An experimental demonstrator.* In HPSR.
- Rezazadeh, F., Zanzi, L., Devoti, F., **Barrachina-Muñoz, S.**, Zeydan, E., Costa-Pérez, X., & Mangues-Bafalluy, J. (2023, May). *A multi-agent deep reinforcement learning approach for RAN resource allocation in O-RAN.* In INFOCOM.
- **Barrachina-Muñoz, S.**, Chiumento, A., & Bellalta, B. (2021, June). *Stateless reinforcement learning for multi-agent systems: The case of spectrum allocation in dynamic channel bonding WLANs.* In 2021 Wireless Days (WD).
- Wilhelmi, F., Bellalta, B., Szott, S., Kosek-Szott, K., & **Barrachina-Muñoz, S.** (2025, May). *Coordinated Multi-Armed Bandits for Improved Spatial Reuse in Wi-Fi.* In ICMLCN.

Selected Projects

Plaza6G Experiment-as-a-Service

- Leading Plaza6G, an "Experiment-as-a-Service" platform using GenAI to automate 5G/6G experiments. I designed a local LLM-based interface, fine-tuned with LoRA and employing RAG for novel information, that translates natural language intents into executable workflows. This system enables automated, remote network acceptance testing for integration into CI/CD pipelines, ensuring reproducible and safe orchestration.
- **Key Technologies**: *PyTorch, MCP, Python, CI/CD, Ollama, wandb, Terraform, OpenStack*

Data-Driven O-RAN Optimization

- Engineered a closed-loop, intelligent automation framework for O-RAN featuring a multi-agent workflow that leverages LLMs and RAG to centralize and analyze network logs, automatically diagnose issues, generate documentation, and coordinate optimization tasks. I developed and deployed this framework as a set of cloud-native xApps (on Kubernetes/Docker) that monitor network KPMs and automatically actuate control decisions, such as dynamically reallocating resources to manage network congestion.
- **Key Technologies**: *LLMs, Multi-Agent Frameworks, RAG, O-RAN, xApps, API/REST*

Komondor Wi-Fi Simulator (`https://github.com/wn-upf/Komondor`)

- Led the development of Komondor, an open-source C++ simulator for next-gen Wi-Fi (IEEE 802.11ax) networks. The platform was specifically architected for simple integration with ML frameworks, serving as a high-fidelity environment for generating realistic network datasets.
- **Key Technologies**: *C++, Python, Reinforcement Learning, Wi-Fi, logging*

Languages

English (C1 - Fluent), Spanish (C2 - Native), Catalan (C2 - Native), German (A1)

References

- Rasoul Nikbakht, *Senior ML Engineer at Keysight Tech.* `rasoul.nikbakht@keysight.com`
- Luis Sanabria-Russo, *DevOps Engineer at O(1)* `luis@o1labs.org.com`
- Edward Knightly, *Head of Networks at Rice University* `knightly@rice.edu`