
Non-intrusive AI-enabled wireless monitoring of human activity

TSR_{Lab} - Data Analytics in Wireless Networks

University of the Basque Country (Spain)

Faculty of Engineering Bilbao



- 4 Professors
- 3 PhD students
- 1 Collaborator (UNAM, Mexico)
- 5 MSc & BSc students

Wireless ML-based sensing

- Device-free people counting through RF measurements (Wi-Fi, Ad-hoc)
- Gesture recognition through Wi-Fi Channel State Information
- Electric machine identification through impulsive noise classification

Our proposal:

Non-intrusive AI-enabled wireless monitoring of human activity

The detection of people's presence and activities are essential to multiple digital applications

Retail



Transportation



Tourism



Care Economy

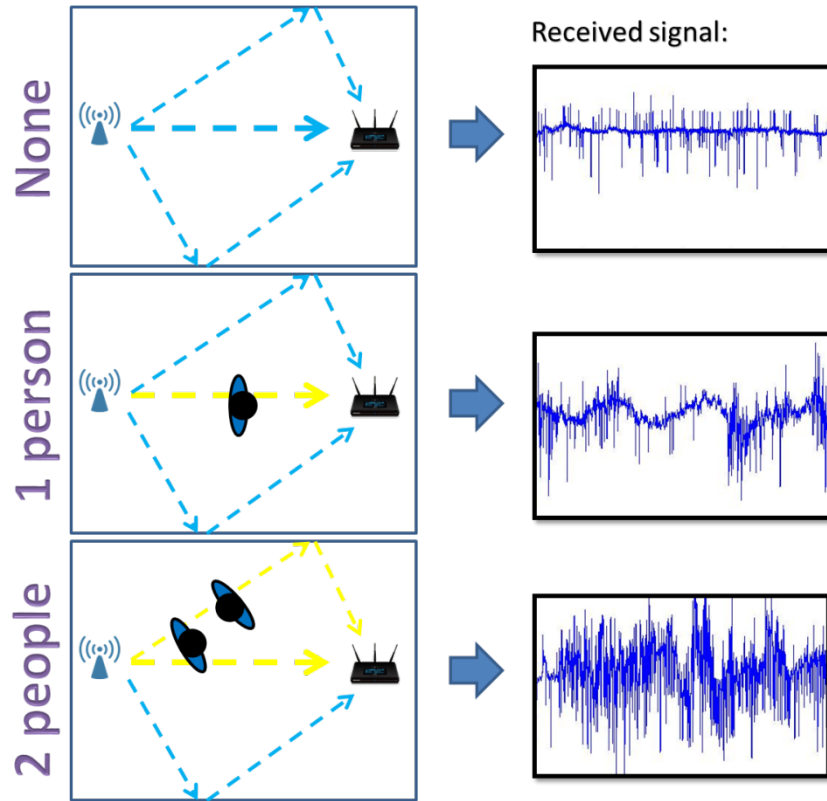
Pros of the proposal:

Non-intrusive AI-enabled wireless monitoring of human activity

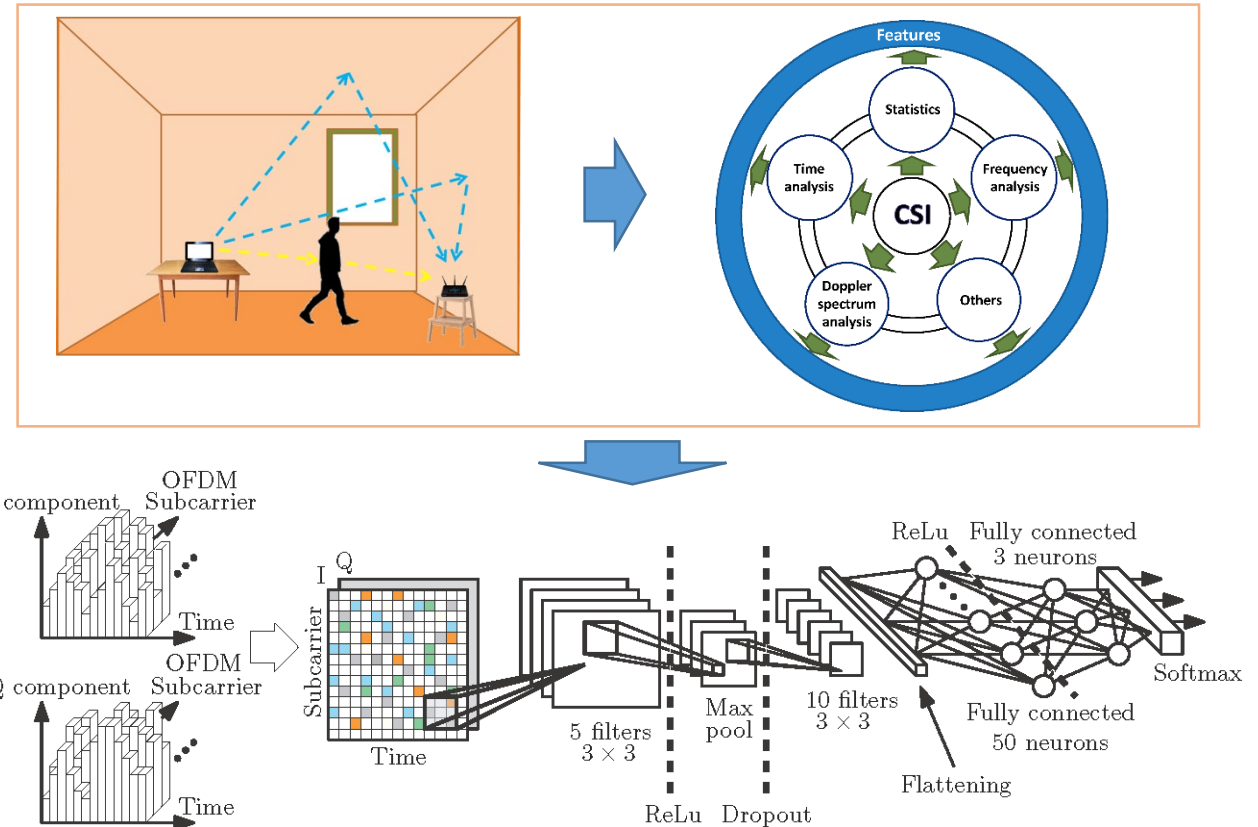
Unlike other alternatives such as video surveillance or wearables, this solution:

- Preserves the anonymity of the people without violating their privacy and digital rights.
- Does not require the active participation of the monitored people through personal devices.

The presence of people produces alterations in the propagation of the wireless signals:

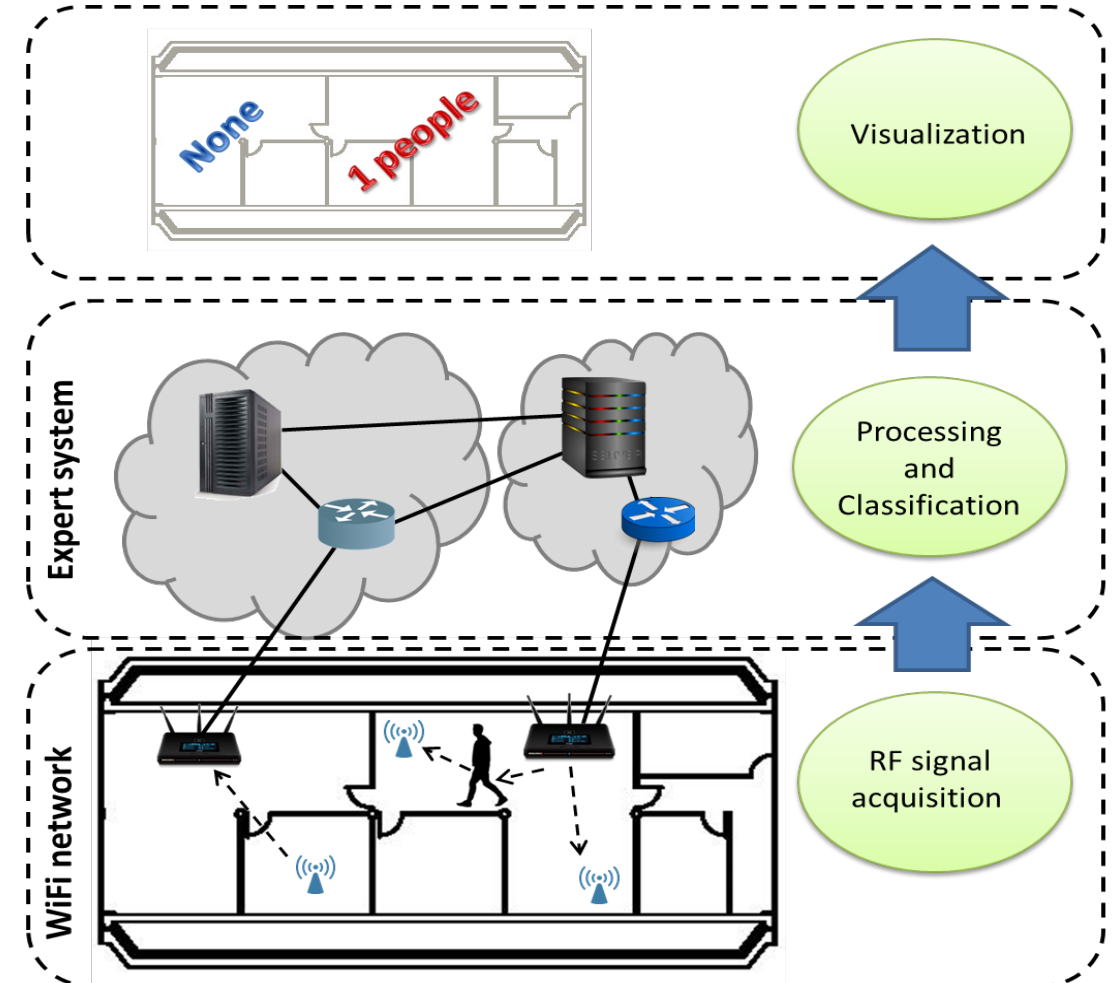


Artificial intelligence algorithms can extract information about the number of people present and their movement:



The wireless AI-based sensing system:

- Expert-knowledge-guided feature selection
- Centralized or distributed computing
- Transferable AI models for different scenarios
- Self-learning AI models



Relevant publications:

- "WIP: Impulsive Noise Source Recognition with OFDM-WiFi Signals Based on Channel State Information Using Machine Learning". (**IEEE WoWMoM Symposium - June 2022**).
- "Ensemble Learning for Seated People Counting using WiFi Signals: Performance Study and Transferability Assessment". (**IEEE Globecom Conference - December 2021**).
- "A Deep Learning Approach to Device-Free People Counting from WiFi Signals". (**IDC 2018 Symposium – October 2018**).
- "Device-Free People Counting in IoT Environments: New Insights, Results, and Open Challenges". (**IEEE Internet of Things Journal – December 2018**).

Open dataset:

- EHUCOUNT dataset (2017). Available online at:
www.ehu.eus/tsr_radio/index.php/research-areas/data-analytics-in-wireless-networks

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Thank you for your attention



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