

# Soil condition measuring using WLAN signals

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<b>Prerequisites:</b>	- Basic knowledge about 802.11 WLAN - Basic Python programming knowledge
<b>Level:</b>	This topic is appropriate for Bachelor and Master Students
<b>Language:</b>	German or English

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## INTRODUCTION

WLAN is in the first place a communication technology, however recent research has shown that it also can be used for sensing purposes. [1] This goal is achieved by evaluating the channel state information, i. e. the RSSI or even the signal levels of the OFDM subcarriers which a WLAN signal is composed of.

## PROJECT DESCRIPTION

In smart farming, the soil conditions are so far measured by dedicated sensors in order to obtain values such as soil moisture or temperature. The objective of this work is to check the feasibility of using WLAN signals to measure the above values. In order to achieve the goal, a node with an ESP32 controller is both equipped with a WLAN interface as well as connected to a physical humidity and temperature sensor. The node is dug into soil where it receives WLAN signals from a second node and also measures values from the physical sensors as a ground truth for comparison.

For the measurements of the channel state information, an ESP32 microcontroller is provided which has a builtin WLAN interface with access to a large number of physical signal parameters. There is a tool available written in Micropython which allows to read out the channel state information from the controller <sup>1</sup>.

## WORK PACKAGES

- Get familiar with the structure of a physical WLAN signal.
- Get familiar with the ESP32 microcontroller board and connect it to the external sensors.
- Install the software tool on the ESP32 and check if the channel state information can be read as expected.
- Extend the software tool to log the channel state information together with the readings from the physical sensors.
- Run measurements with soil samples of different moisture and temperature.
- Documentation and presentation of the work

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<sup>1</sup>[github.com/StevenMHernandez/ESP32-CSITool/tree/master/python\\_utils](https://github.com/StevenMHernandez/ESP32-CSITool/tree/master/python_utils)

## CONTACT

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## REFERENCES

- [1] Ma, Y., Zhou, G. and Wang, S., 2019. WiFi sensing with channel state information: A survey. *ACM Computing Surveys (CSUR)*, 52(3), pp.1-36.