Detecting Unintended Interference Using Channel State Information

Student / Master / Diploma Thesis

Problem Statement

In the trend towards Industry 4.0, wireless connectivity plays a major role. This envisioned use cases like autonomous mobile robots or human-machine-cooperation necessitate to not only design networks towards high performance under ideal conditions, but to consider adverse circumstances as well. Such circumstances can be intended or unintended interference potentially leading to degraded quality of service. Adding the capability to identify interfering signals is therefore a helpful capability when designing resilient communications systems.

Recent research at the chair has investigated a new approach for this problem leveraging the channel state information (CSI) [1]. In initial investigations on an experimental channel measurement dataset and with interfering narrowband noise, the approach demonstrated paramount performance. In this thesis, the approach shall be brought closer to its real-world implementation by evaluating its performance in a hybrid framework of real-world channel measurements and a simulated wireless link on top.

Tasks

- Familiarization with the topic and literature review
- Setup of the wireless link simulation
- Identification of relevant scenarios and parameters for the evaluation and design of a meaningful evaluation campaign
- Depending on the required scope and interest, the topic can flexibly be extended by adding complexity in the link simulation or detection methodology.

Expected Skills

- Good understanding of wireless communications
- Experience with Python or Matlab

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Please include a recent transcript of records when contacting.

Recommended References

[1] A. Schösser, F. Burmeister, P. Schulz and G. Fettweis, “Leveraging the Digital Twin Channel for Spectrum Anomaly Detection: An Experimental Study,” in Proceedings of 2025 IEEE 5th International Symposium on Joint Communications & Sensing (JC&S 2025), Oulu, Finland, Jan 2025. Link