



## Master Thesis Idea

### **Title: Trustworthiness Assessment and Recovery for Relative Localization in Multi-Agent Systems**

This thesis focuses on relative localization in a small multi-robot system and, in particular, on how the system can decide whether its current localization result should be trusted. A representative setup involves two or three robots moving indoors while relying on lightweight localization sources such as UWB, odometry, IMU, and occasional visual observations.

Rather than assuming that all measurements are always correct, the thesis explicitly considers drift, inconsistent sensor readings, temporary observation loss, and UWB outliers caused by occlusion or multipath effects. The goal is to detect when the state estimate becomes unreliable and to trigger suitable correction or re-alignment actions.

- Build or extend a relative localization pipeline based on lightweight sensing sources such as UWB, odometry, IMU, and optional visual observations.
- Develop methods to assess the trustworthiness of the current localization estimate and detect abnormal estimation behavior.
- Evaluate anomaly detection, correction or reset strategies, estimation stability, and long-duration robustness on a real multi-robot platform.

**Relevant references:** Behnam Safaei et al., “Exploiting Redundancy for UWB Anomaly Detection in Infrastructure-Free Multi-Robot Relative Localization”; Xianjia Yu et al., “Loosely Coupled Odometry, UWB Ranging, and Cooperative Spatial Detection for Relative Monte-Carlo Multi-Robot Localization”.

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