Mobile robots, be it autonomous or teleoperated, require a stable wireless communication with the base station to exchange valuable information. Field robots operating in hostile environments typically experience poor connection quality. In addition to this, due to stochastic elements in radio signal propagation such as shadowing and fading, and due to environmental conditions (e.g. ionizing radiations), there are high chances of encountering hardware failures and communication loss, compromising field robotic missions. Therefore, resilient wireless communications is crucial to ensuring a successful mission, and avoid losing robots owing to communication failures.

In this talk, we propose several integrative solutions to tackle the problem of communication loss, at various levels in a robot’s architecture. First, we talk about how to enable robustness and redundancy in the robot communication hardware design. Second, we focus on equipping the robot with accurate connectivity predictions in the direction of travel using a Discrete Kalman Filter, and in 2D using Gaussian Random Fields (GRF). We extend this GRF framework and propose a Resilient Communication-Aware Motion Planner (RCAMP) that considers environment and physical constraints of the robot based on the available sensory information. Further, we also discuss how to autonomously re-establishment wireless connection in the event of a communication loss using RCAMP. Finally, we will quickly cover the topic of devising the Human-Robot Interface to enable network connectivity awareness, thus aiding the teleoperator in making wise decisions.