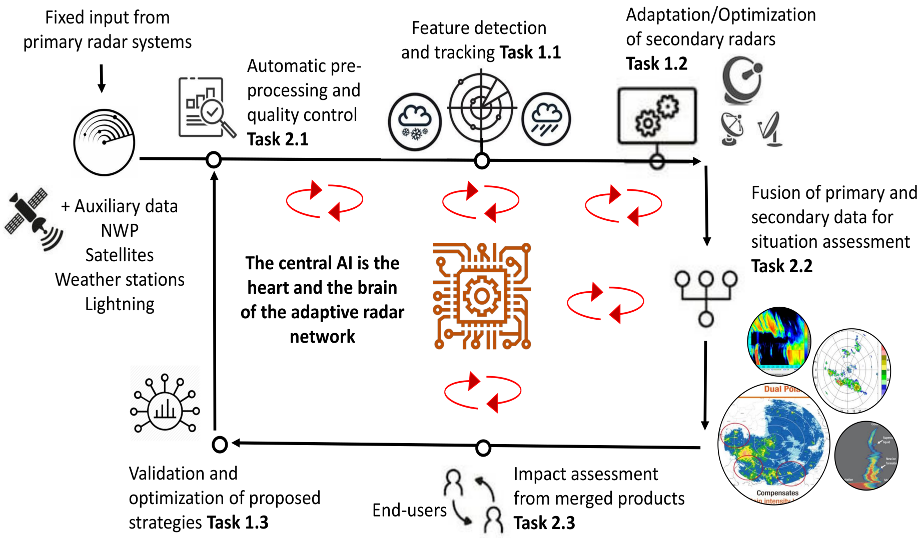
MSc topics 2023-2024

Reinforcement learning techniques for adaptive, collaborative radar networks

Background: Weather radars are essential tools to study the atmosphere, monitor threats, and issue early warnings for high impact events. To maximize coverage while simultaneously gathering lots of details about the small-scale structure and dynamics of local rain events, experts advise combining different types of radars together into larger networks.

State of the art: While promising, the science behind adaptive and collaborative radar networks still remains in its infancy. The crucial piece that is missing is a central control unit for coordinating the efforts of each radar. When setting up these rules, the user is faced with a difficult choice: do I want to achieve good coverage, or do I want to zoom in and gather lots of details? However, if radars had the ability to adapt and coordinate with each other in real-time, both objectives could potentially be achieved at the same time!



Challenge:
The main challenge in building a collaborative radar network is the complexity of the decision space. At any given time, there are thousands of possible adjustments for each radar, and no obvious way of knowing which decisions are best for the network as a whole.

Outcome: In this MSc thesis, you will work on an innovative optimization ("cognitive loop") approach based on reinforcement learning for automatically selecting the most promising configurations, scanning strategies, and data processing steps for a given situation, among a vast number of possible choices. you will use simulated rainfall fields to train a simple model for redirecting the attention of an X-band radar and test the new model on heavy, localized convective events.

For more information about this topic, please contact:
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