

Autonomous Systems

RQ1-Conceptualization

- Self-awareness (environment and own states)
- Self-decision making
- Actuation of the plan
- Adaptive (to environment and goals)
 - Rule-based
 - Self-evolving
- Level of Autonomy (high or low)
- Appearance
 - Physical (sensors, electronic and mechanical components)
 - Digital (software only)

RQ2-Challenges of testing

- Unpredictable environment
 - Infeasible exhaustive testing
 - Low-frequency errors
 - Hard to replicate failures
- Complexity
 - System of systems
 - Emergence of AI
 - AI testability
 - AI interpretability
 - AI visualizability
 - Modelling
 - Environment
 - System functionalities and constraints
 - Limitation of simulation techniques
- Data accessibility
 - Data collection
 - Data labelling
 - Data Interpretation
 - Data validation
 - Data ownership
 - Data generation
- Missing standards and guidelines
 - Test procedures
 - Safety performance metrics
 - Test automation
 - Tools, frameworks and approaches
 - Regression testing
 - Hard to define test oracle

RQ3-Techniques, approaches and practices of testing

- Practices
 - Industrial tandards
 - ISO-26262
 - ISO/PAS-21448
 - Using simulation techniques
 - Collaboration and knowledge transfer (from other domains and academic researches)
 - Open source (data, toos and frameworks)
 - Combine different test approaches
 - Iterative and continuous testing
 - V-model paradigm
- Techniques and approaches
 - Conventional testing techniques
 - Software testing
 - Unit testing
 - Component testing
 - Integration testing
 - System testing (SIL, HIL, VIL)
 - Proving ground test (test track for vehicles)
 - Road testing (for vehicles)
 - Trail-and-error
 - Formal methods
 - Combinatorial testing
 - Scenario-based testing
 - Statistical learning