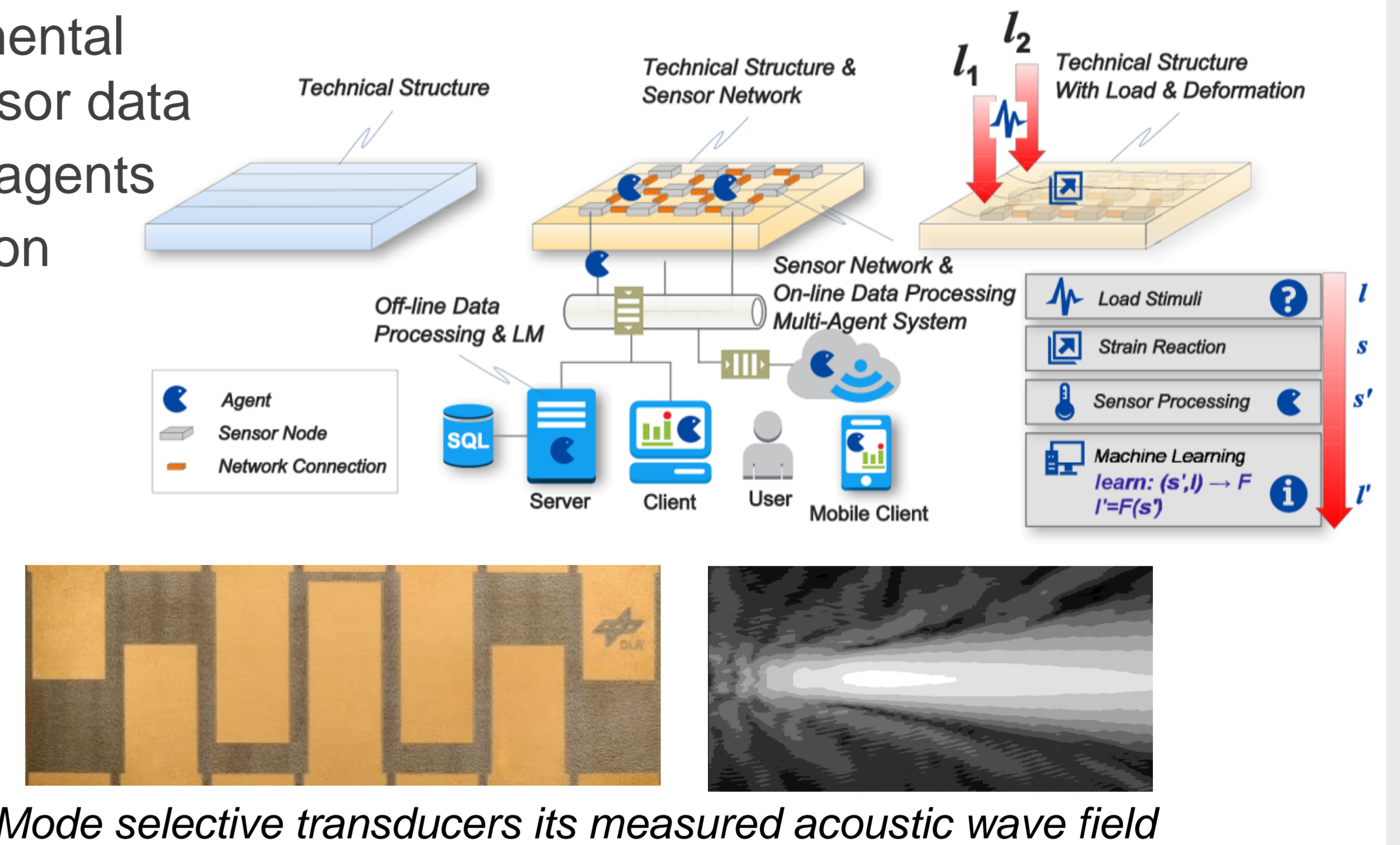


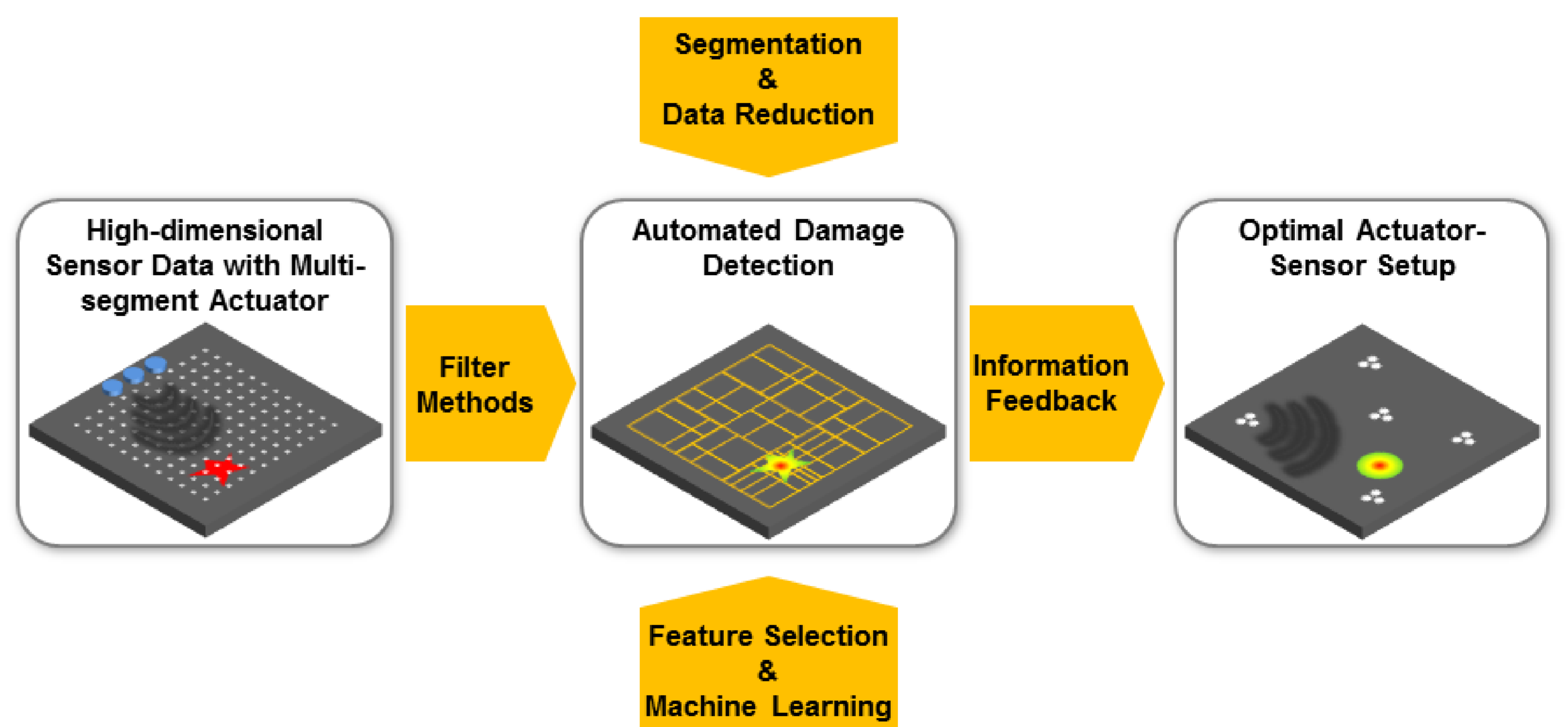
Most Important Preparatory Work

- Various distributed, non-distributed, incremental and non-incremental **machine learning techniques** applied to high-dimensional sensor data
- Distributed sensor networks** and processing in real time with agents
- Self-organising **multi-agent** systems for automated ROI detection and **feature selection** in ultrasonic sensor data
- Mode selective transducers** for guided waves in composites
- Air-coupled ultrasonic techniques** for analysis of guided waves and their individual modes
- Analytical models** for dispersion, damping properties and excitation of guided waves in composites
- SHM systems** for composite structures in aviation, wind energy and automotive industry



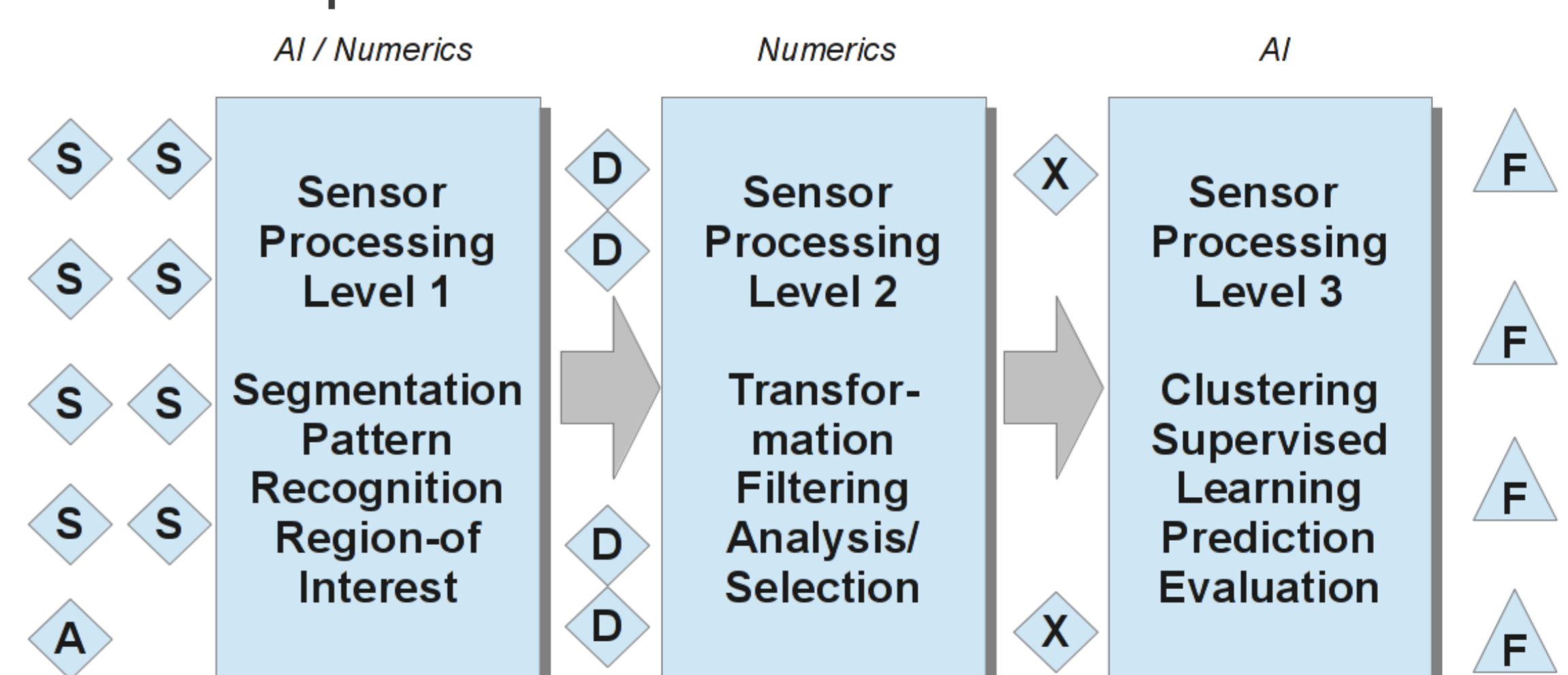
Objectives of the first funding period

- Amplification of wave interactions with damages by **adapted actuator configuration** and **wave number filter**
- Reduction of high-dimensional sensor data** by automated and segmented feature selection
- Automated extraction** of robust damage features by machine learning, agent-based and data mining methods
- Design rules** of optimal actuator-sensor setup by information feedback of damage features



Methods

- Air-coupled ultrasonic technique** for high amount of data sets with pseudo damages
- Multi-segment actuators** with phase shifted control for directional, mode selective or almost plane wave fields
- Wave number and direction selective filters** to identify wave interactions at damages
- Development of **automated segmentation** based on self-organised and self-adaptive pattern recognition
- Hybrid architectures** of unsupervised and supervised **machine learning** for damage feature extraction
- Sensitivity analysis** for feedback of damage features to wave interactions and derivation of optimal actuator-sensor setups



Ultrasonic Monitoring of Fibre Metal Laminates Using Integrated Sensors

