The course aims at providing PhD Candidates with knowledge of the basic state of the art and advanced theories/techniques for learning from multisensory signals and data Bayesian models for jointly predicting, processing, filtering, and interpreting observed interactions.

Such models will be shown to enhance the functionalities of embodied smart autonomous systems like cars, radios, drones, robots, and buildings. by providing such agents of a self-awareness information layer. Networks of self-aware autonomous systems interacting in smart cognitive environments will be also targeted as examples carried on in the course. From a methodological viewpoint, this module aims at identifying and describing methodologies and techniques for defining a common probabilistic framework suitable for:

- integrating contextual signals synchronously provided by multisensorial exo and proprio receptive sensors of autonomous systems by using Data Fusion paradigms and techniques;

- learning from experiences behavioral and causal self-awareness models allow an autonomous system to describe the world through a vocabulary of normal locally stationary experiences.

- showing how each model learned from experience can describe through probabilistic stationary rules dynamic perception, planning, and actuation by means of collected external and internal observations.

Applications will be targeted by described techniques related to a couple of main case studies together with additional examples:

- self-awareness in the autonomous ground and aerial vehicles and smart infrastructures (e.g. Buildings, dynamic radio spectrum)

- interactions in telecommunications scenarios like cognitive radio and internet of things.