



WEEK	TOPIC
Th 8/31	Syllabus / Background / Introductions / Project Logistics
Week 9/5	Embodied cognitive systems: Intersection between control systems theory and cognitive agents. What is cognition? Increasing system productivity with cognition and embodiment. Review of UT Austin Villa RoboCup@Home 2017 robotics cognitive software. Review of ACT-R cognitive architecture.
Week 9/12	Intelligent agents: Rationality. Computational goal of cognitive systems. Vacuum cleaner world - STRIPS language. Engineering intelligence.
Week 9/19	Rational robotic agent. Morality issues in interventional agents. Examples of rational agents using the humanoid robot Dreamer and the mobile robot Trikey.
Week 9/26	Paradigms of cognitive science. Cybernetics. Cognitivism. The birth of AI. The physical symbol system hypothesis. The heuristic search hypothesis. Turing complete machines. Church-Turing test.
Week 10/3	Learning agents. Types of agents: model-based, goal-based, utility-based, learning-based. Overview of reinforcement learning. Markov decision process. Value iteration. Actor-critic learning process.
Week 10/10	Knowledge-based agents. Logic inference. Propositional logic. First order logic. Example, Wumpus World.
Week 10/17	Knowledge representation. Introduction to ProLog. Defeasible reasoning. Non-monotonic logics. Negation as failure. Review of SOAR cognitive architecture.
Week 10/24	Knowledge engineering. Ontologies. Web Ontology Language. Knowledge classification. Taxonomies. Historical perspective. Description logic. RDF schema. Architecture of a knowledge base.
Week 10/31	Semantic Reasoning. Review of KnowRob architecture. Case study: IBM Watson.
Week 11/7	Midterm Project Presentations
Week 11/14	Embodiment and mission specifications. Safety controllers. Barrier certificates. Control barrier functions. Control lawas for CBF. Quadratic barrier pair. Linear matrix inequality. Signal temporal logic. Mixed integer programming. LTLC syntax.
Week 11/28	Synthesis of symbolic controllers. Symbolic regression. Achieving parsimonious hybrid dynamical models. Hybrid automata. Closing remarks.
Week 12/5	Final Project Presentations