🡪**Introdução à Inteligência Artificial**: O que é a Inteligência Artificial e como difere da informática tradicional;  
🡪**A história da Inteligência Artificial**.  
🡪**Agentes inteligentes:** o conceito de racionalidade, ambientes, tipos de agentes.  
🡪**Resolução de problemas por procura em espaços de estados**: métodos de procura não-informados e informados; estudo de heurísticas.   
🡪**Procura com adversários**: jogos.  
🡪**Problemas de satisfação de restrições**: procura com retrocesso, procura local, estrutura de problemas.  
🡪**Representação de Conhecimento**: engenharia de ontologias; categorias e objetos; ações, situações e eventos.  
🡪**Planeamento de ações**: procura em espaço de estados, planeamento de ordem parcial, grafos de planeamento, planeamento com lógica proposicional.  
🡪**Aprendizagem**: aprendizagem indutiva, árvores de decisão, "ensemble learning", teoria da aprendizagem computacional.   
🡪**Comunicação**: gramáticas e "parsing". Linguagens de programação usadas em Inteligência Artificial: introdução ao LISP, uma linguagem funcional.

**CS 662; Artificial Intelligence Programming, University of San Francisco  
What is covered in the course?**  
xAn overview of AI, including search, xknowledge representation, xprobabilistic reasoning and decision making under uncertainty, machine learning, and topics from NLP, information retrieval, knowledge engineering and multi-agent systems.

🡪 Fundamental Issues *2*

🡪 Basic Search Strategies - A\*, BFS, DFS, IDA\*, problem spaces, constraints 8

🡪 Basic Knowledge Rep. - Predicate logic, forward chaining, backward chaining, resolution, 8

x🡪 Basic Machine Learning - Decision trees, rule learning, Naïve Bayes, precision and accuracy, cross-fold validation 6

🡪 Adv. KR FOL, inference, ontologies, planning 6

🡪 Advanced Search - Genetic algorithms, simulated annealing 3

🡪 Reasoning Under Uncertainty - Probability, Bayes nets, MDPs, decision theory 8

x🡪 NLP - Parsing, chunking, n-grams, information retrieval 4

**Intelligenza Artificiale (Artificial Intelligence), Politecnico di Milano**

Intelligent Systems/Fundamental Issues

Intelligent Systems/Basic 1Search Strategies

Intelligent Systems/Basic Knowledge Representation and Reasoning

Intelligent Systems/Advanced Search

Intelligent Systems/Advanced Representation and Reasoning

**What is covered in the course?**

**🡪INTRODUCTION TO AI.** Historical outline of the discipline. Fundamental concepts. Main research areas and application fields.

🡪**PROBLEM SOLVING AND SEARCH**. State spaces and search methods. Non-informed and informed

search strategies. Constraint satisfaction problems. Games and adversarial search.

🡪**LOGIC AND REASONING**. The use of propositional and first order logic for the representation of knowledge. Knowledge-based reasoning as logical deduction. Inference procedures (forward chaining,

backward chaining, resolution).

• **PLANNING.** Plan formation and execution. The STRIPS model. Search in plan spaces.

• **FOUNDATIONS OF AI**. Some critical concepts and philosophical problems of AI.

🡪 IS/Fundamental Issues • Overview of AI problems, Examples of successful recent AI applications

• What is intelligent behavior?

• Nature of environments

• Nature of agents

• Philosophical and ethical issues

🡪IS IS/Basic Search Strategies   
• Problem spaces (states, goals and operators), problem solving by search

• Factored representation (factoring state into variables)

• Uninformed search (breadth-first, depth-first, depthfirst with iterative deepening)

• Heuristics and informed search (hill-climbing, generic best-first, A\*)

• Space and time efficiency of search

• Constraint satisfaction (backtracking methods)

🡪 IS/Basic Knowledge Representation and Reasoning

• Review of propositional and predicate logic

• Resolution and theorem proving (propositional logic only)

• Forward chaining, backward chaining

🡪 IS/Advanced Search

• Minimax Search, Alpha-beta pruning 6

🡪 IS/Advanced Representation and Reasoning

• Planning: Partial and totally ordered planning

**CMSC 471, Introduction to Artificial Intelligence, U. of Maryland, Baltimore County**

**What is covered in the course?**

Course description: “This course will serve as an introduction to artificial intelligence concepts and techniques. We will use the Lisp programming language as a computational vehicle for exploring the techniques and their application. Specific topics we will cover include the history and philosophy of AI, Lisp and functional programming, the agent paradigm in AI systems, search, game playing, knowledge representation and reasoning, logical reasoning, uncertain reasoning and Bayes nets, planning, and machine learning. If time permits, we may also briefly touch on multi-agent systems, robotics, perception, and/or natural language processing.”

**Body of Knowledge coverage**

**KA Knowledge Unit Topics Covered Hours**

🡪IS Fundamental Issues Intelligence, agents, environments, philosophical issues 4

🡪IS Basic Search Strategies Problem spaces, uninformed/informed/local search, minimax, constraint satisfaction

🡪IS Basic Knowledge Representation and Reasoning - Propositional and first-order logic, resolution theorem proving 5.5

🡪IS Basic Machine Learning Learning tasks, inductive learning, naive Bayes, decision trees 1.5

🡪IS Advanced Search A\* search, genetic algorithms, alpha-beta pruning, expectiminimax

🡪IS Advanced Representation and Reasoning Ontologies, nonmonotonic reasoning, situation calculus, STRIPS and partial-order planning, GraphPlan

🡪IS Reasoning Under Uncertainty Probability theory, independence, Bayesian networks, exact

inference, decision theory

🡪IS Agents Game theory, multi-agent systems

🡪IS Advanced Machine Learning Nearest-neighbor methods, SVMs, K-means clustering, learning Bayes nets, reinforcement learning

🡪PL Functional Programming Lisp programming

**Introduction to Artificial Intelligence, Case Western Reserve University**

**What is covered in the course?**

• **Problem solving with search**: uninformed, informed search, search for optimization (hill climbing, simulated annealing, genetic algorithms), adversarial search (minimax, game trees)

• **Logic and Planning:** Propositional Logic, syntactic and model-based inference, first order logic (FOL), FOL inference complexity, unification and resolution, planning as FOL inference, STRIPS encoding, state space and plan space planning, partial order planning.

• **Probability and Machine Learning:** Axioms of probability, basic statistics (expectation and variance),

inference by enumeration, Bayesian networks, inference through variable elimination and Monte Carlo, intro to supervised machine learning, probabilistic classification with naive Bayes, parameter estimation with maximum likelihood, Perceptrons, parameter estimation with gradient descent, evaluating algorithms with cross validation, confusion matrices and hypothesis testing.

• **Decision making under uncertainty:** Intro to sequential decision making, Markov decision processes, Bellman equation/optimality, value and policy iteration, model-based and model free reinforcement learning, temporal difference methods, Q learning, Function approximation.

• I also have one lecture on natural language processing with a very brief introduction to language models, information retrieval and question answering (Watson), but students are not evaluated on this material.

**KA Knowledge Unit Topics Covered Hours**

IS Fundamental Issues Overview of AI problems, Examples of successful recent AI applications; What is intelligent behavior? The Turing test Rational versus non-rational reasoning Nature of environments Fully versus partially observable Single versus multi-agent Deterministic versus stochasticStatic versus dynamic Discrete versus continuous Nature of agents Autonomous versus semi-autonomous Reflexive, goal-based, and utility-based The importance of perception and environmental interactions

🡪IS Basic Search Strategies Problem spaces (states, goals and operators), problem solving by

Search Uninformed search (breadth-first, depth-first, depth-first with iterative deepening) Heuristics and informed search (hill-climbing, generic best-first, A\*) Space and time efficiency of search Two-player games (Introduction to minimax search)

🡪IS Basic Knowledge Representation and Reasoning Review of propositional and predicate logic (cross-reference DS/Basic Logic) Resolution and theorem proving (propositional logic only) DPLL, GSAT/WalkSAT First Order Logic resolution Review of probabilistic reasoning, Bayes theorem, inference by enumeration Review of basic probability (cross-reference DS/Discrete Probability) Random variables and probability distributions Axioms of probability Probabilistic inference Bayes’ Rule

🡪 IS Basic Machine Learning Definition and examples of broad variety of machine learning tasks,

including classification Inductive learning Statistical learning with Naive Bayes and Perceptrons Maximum likelihood and gradient descent parameter estimation Cross validation Measuring classifier accuracy, Confusion Matrices

🡪 IS Advanced Search Constructing search trees Stochastic search Simulated annealing

Genetic algorithms Implementation of A\* search, Beam search Minimax Search, Alpha-beta pruning Expectimax search and chance nodes

🡪 IS Advanced Representation and Reasoning Totally-ordered and partially-ordered Planning 1.75

🡪 IS Reasoning Under Uncertainty Conditional Independence Bayesian networks Exact inference (Variable elimination) Approximate Inference (basic Monte Carlo)

🡪IS Agents Markov Decision Processes, Bellman Equation/Optimality, Value and Policy Iteration

🡪IS Natural Language Processing Language models, n-grams, vector space models, bag of words, text

classification, information retrieval, pagerank, information extraction, question-answering (Watson). [Overview, students are not evaluated on NLP]

🡪IS Advanced Machine Learning Model based and model free reinforcement learning, temporal difference learning, Q learning, function approximation

**CS188: Artificial Intelligence, University of California Berkeley**

**Course topics**

• Introduction to AI

• Search

• Constraint Satisfaction

• Game Playing

• Markov Decision Processes

• Reinforcement Learning

• Bayes Nets

• Hidden Markov Modeling

• Speech

• Neural Nets

• Robotics

• Computer Vision

**KA Knowledge Unit Topics Covered Hours**

IS Fundamental Issues All 1

IS Basic Search Strategies All 2.5

IS Basic Knowledge Representation and Reasoning Probability, Bayes Theorem 2.5

IS Basic Machine Learning All 1

IS Advanced Search Except Genetic Algorithms 3

IS Reasoning Under Uncertainty 6

IS Agents 0.5

IS Natural Language Processing 0.5

IS Advanced Machine Learning 4

IS Robotics 1

IS Perception and Computer Vision 0.5

HCI Design for non-mouse interfaces 1

Computadores, algoritmos e programas Características de um computador Programas e algoritmos Linguagens de programação Sintaxe e semântica Elementos básicos de programação Expressões Tipos elementares de informação Nomes e atribuição Comunicação com o exterior Programas, instruções e sequenciação Selecção Repetição Funções Abstracção procedimental Módulos Tuplos e ciclos contados Cadeias de caracteres revisitadas Listas Métodos de passagem de parâmetros Algoritmos de procura Algoritmos de ordenação Considerações sobre eficiência Funções revisitadas Funções recursivas Funções de ordem superior Programação funcional Recursão e iteração Recursão linear Iteração linear Recursão em processos e em função Recursão em árvore Ficheiros Leitura de ficheiros Escrita em ficheiros Dicionários Dicionários de dicionários Caminhos mais curtos em grafos Abstracção de dados Abstracção em programação Tipos abstractos de informação Barreiras de abstracção Objectos Programação com objectos Classes subclasses e herança Objectos em Python Polimorfismo O desenvolvimento de programas Estruturas lineares Pilhas Filas