Dimensions of Complexity

- Flat or modular or hierarchical
- Non-planning or finite stage or indefinite stage or infinite stage
- Explicit states or features or individuals and relations
- Perfect rationality or bounded rationality
- Knowledge is given or knowledge is learned from experience
- Fully observable or partially observable
- Deterministic or stochastic dynamics
- Goals or complex preferences (utility)
- Single-agent or multiple agents
- Reason offline or reason while interacting with environment

Some Representations

- Hier. Control Hierarchical control (Chapter 2)
- Search – state-space search (Chapter 3)
- Det. Planning – deterministic planning (Chapter 6)
- Decision Net – decision networks (Chapter 12)
- MDP – Markov decision processes (Chapter 12)
- Dynamic DN – dynamic decision networks (Chapter 12)
- POMDP – partially observable Markov decision processes (Chapter 12)
- Extensive game – extensive form of game (Chapter 14)
- Q-Learning – (Chapter 13)
- Deep RL – deep reinforcement learning (Chapters 13/14)
- Stochastic PI – stochastic policy iteration (Chapter 14)

	Hier. Control	Search	Det. Planning	Decision Net	MDP	Dynamic DN	POMDP	Extensive game	Q-Learning	Deep RL	Stochastic PI
Modularity											
flat	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
modular	✔	✘	✘	✔	✘	✘	✘	✘	✘	✘	✘
hierarchical	✔	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘
Planning Horizon											
non-planning	✔	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘
finite	✘	✔	✔	✔	✘	✘	✘	✔	✘	✘	✔
indefinite	✘	✔	✔	✘	✔	✔	✔	✔	✔	✔	✘
infinite	✘	✘	✘	✘	✔	✔	✔	✘	✔	✔	✘
Representation											
states	✔	✔	✘	✘	✔	✘	✔	✔	✔	✘	✔
features	✔	✘	✔	✔	✘	✔	✘	✘	✘	✔	✘
relational	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘

	Hier. Control	Search	Det. Planning	Decision Net	MDP	Dynamic DN	POMDP	Extensive game	Q-Learning	Deep RL	Stochastic PI
Computational Limits											
perfect	✔	✔	✔	✔	✘	✘	✘	✔	✘	✘	✘
bounded	✘	✘	✘	✘	✔	✔	✔	✘	✔	✔	✔
Learning											
given	✔	✔	✔	✔	✔	✔	✔	✔	✘	✘	✘
learned	✘	✘	✘	✘	✘	✘	✘	✘	✔	✔	✔
Sensing Uncertainty											
fully obs.	✔	✔	✔	✘	✔	✔	✘	✘	✔	✔	✔
partial obs.	✘	✘	✘	✔	✘	✘	✔	✔	✘	✘	✘
Effect Uncertainty											
deterministic	✔	✔	✔	✘	✘	✘	✘	✘	✘	✘	✘
stochastic	✘	✘	✘	✔	✔	✔	✔	✔	✔	✔	✔

	Hier. Control	Search	Det. Planning	Decision Net	MDP	Dynamic DN	POMDP	Extensive game	Q-Learning	Deep RL	Stochastic PI
Preference											
goals	✗	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗
utility	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓
Number of Agents											
single	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✗
adversary	✗	✗	✗	✗	✗	✗	✗	✓	✓	✓	✓
multiple	✓	✗	✗	✗	✗	✗	✗	✓	✗	✗	✓
Interactivity											
offline	✗	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗
online	✓	✗	✗	✗	✗	✗	✗	✗	✓	✓	✓

State-space Search

- flat or modular or hierarchical
- explicit states or features or individuals and relations
- static or finite stage or indefinite stage or infinite stage
- fully observable or partially observable
- deterministic or stochastic dynamics
- goals or complex preferences
- single agent or multiple agents
- knowledge is given or knowledge is learned
- reason offline or reason while interacting with environment
- perfect rationality or bounded rationality

Classical Planning

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Decision Networks

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Markov Decision Processes (MDPs)

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Decision-theoretic Planning

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Reinforcement Learning

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Relational Reinforcement Learning

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- deterministic or stochastic dynamics
- goals or complex preferences
- single agent or multiple agents
- knowledge is given or knowledge is learned
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- perfect rationality or bounded rationality

Classical Game Theory

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- deterministic or stochastic dynamics
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- single agent or multiple agents
- knowledge is given or knowledge is learned
- reason offline or reason while interacting with environment
- perfect rationality or bounded rationality

Humans

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- explicit states or features or individuals and relations
- static or finite stage or indefinite stage or infinite stage
- fully observable or partially observable
- deterministic or stochastic dynamics
- goals or complex preferences
- single agent or multiple agents
- knowledge is given or knowledge is learned
- reason offline or reason while interacting with environment
- perfect rationality or bounded rationality