**UNIT – 1: PROBLEM SOLVING**

**1. What is artificial intelligence?**

The exciting new effort to make computers think machines with minds in the

full and literal sense. Artificial intelligence systemizes and automates intellectual tasks and is

therefore potentially relevant to any sphere of human intellectual activities.

**2. Define Turing test.**

The Turing test proposed by Alan Turing was designed to provide a

satisfactory operational definition of intelligence. Turing defined intelligent behavior as the

ability to achieve human-level performance in all cognitive tasks, sufficient to fool an

interrogator.

**3. List the capabilities that a computer should possess for conducting a Turing Test?**

The capabilities that a computer should possess for conducting a Turing Test are,

Natural Language Processing;

Knowledge Representation;

Automated Reasoning;

Machine Language.

**4. Define an agent.**

An agent is anything that can be viewed as perceiving its environment through

sensors and acting upon the environment through effectors.

**5. Define rational agent.**

A rational agent is one that does the right thing. Here right thing is one that will

cause agent to be more successful. That leaves us with the problem of deciding how and when to

evaluate the agent’s success.

**6. Define an Omniscient agent.**

An omniscient agent knows the actual outcome of its action and can act

accordingly; but omniscience is impossible in reality.

**7. What are the factors that a rational agent should depend on at any given time?**

The factors that a rational agent should depend on at any given time are,

The performance measure that defines criterion of success;

Agent’s prior knowledge of the environment;

Action that the agent can perform;

The agent’s percept sequence to date.

**8. List the measures to determine agent’s behavior.**

The measures to determine agent’s behavior are,

Performance measure,

Rationality,

Omniscience, Learning and Autonomy.

**9. List the various types of agent programs.**

The various types of agent programs are,

Simple reflex agent program;

Agent that keep track of the world;

Goal based agent program;

Utility based agent program.

**10. List the components of a learning agent?**

The components of a learning agent are,

Learning element;

Performance element;

Critic;

Problem generator.

**11. List out some of the applications of Artificial Intelligence.**

Some of the applications of Artificial Intelligence are,

Autonomous planning and scheduling;

Game playing;

Autonomous control;

Diagnosis;

Logistics planning;

Robotics.

**12. What is depth-limited search?**

Depth-limited avoids the pitfalls of DFS by imposing a cut off of the maximum

depth of a path. This cutoff can be implemented by special depth limited search algorithm or by

using the general search algorithm with operators that keep track of the depth.

**13. Define breadth-first search.**

The breadth-first search strategy is a simple strategy in which the root-node is

expanded first, and then all the successors of the root node are expanded, then their successors

and so on. It is implemented using TREE-SEARCH with an empty fringe that is a FIFO queue,

assuring that the nodes that are visited first will be expanded first.

**14. Define problem formulation.**

Problem formulation is the process of deciding what actions and states to consider

for a goal that has been developed in the first step of problem solving.

**15. List the four components of a problem?**

The four components of a problem are,

An initial state;

Actions;

Goal test;

Path cost.

**16. Define iterative deepening search.**

Iterative deepening is a strategy that sidesteps the issue of choosing the best depth

limit by trying all possible depth limits: first depth 0, then depth 1, then depth 2& so on.

**17. Mention the criteria’s for the evaluation of search strategy.**

The criteria’s for the evaluation of search strategy are,

Completeness;

Time complexity;

Space complexity;

Optimality.

**18. Define the term percept.**

The term percept refers to the agents perceptual inputs at any given instant. An

agent’s percept sequence is the complete history of everything that the agent has perceived.

**19. Define Constraint Satisfaction Problem (CSP).**

A constraint satisfaction problem is a special kind of problem satisfies some

additional structural properties beyond the basic requirements for problem in general. In a CSP,

the states are defined by the values of a set of variables and the goal test specifies a set of

constraint that the value must obey.

**20. List some of the uninformed search techniques.**

Some of the uninformed search techniques are,

Breadth-First Search(BFS);

Depth-First Search(DFS);

Uniform Cost Search;

Depth Limited Search;

Iterative Deepening Search;

Bidirectional Search.

**UNIT – 2: LOGICAL REASONING**

**1. What are Logical agents?**

Logical agents apply inference to a knowledge base to derive new information and

make decisions.

2. **What is first-order logic?**

The first-order logic is sufficiently expressive to represent a good deal of our

commonsense knowledge. It also either subsumes or forms the foundation of many other

representation languages.

**3. What is a symbol?**

The basic syntactic elements of first-order logic are the symbols. It stands for

objects, relations and functions.

**4. What are the types of Quantifiers?**

The types of Quantifiers are,

Universal Quantifiers;

Existential Quantifiers.

5. **What are the three kinds of symbols?**

The three kinds of symbols are,

Constant symbols standing for objects;

Predicate symbols standing for relations;

Function symbols standing for functions.

6. **What is Logic?**

Logic is one which consist of

A formal system for describing states of affairs, consisting of a)

Syntax b) Semantics;

Proof Theory – a set of rules for deducing the entailment of set

sentences.

**7. Define a Sentence?**

Each individual representation of facts is called a sentence. The sentences are

expressed in a language called as knowledge representation language.

**8. Define a Proof.**

A sequence of application of inference rules is called a proof. Finding proof is

exactly finding solution to search problems. If the successor function is defined to generate all

possible applications of inference rules then the search algorithms can be applied to find proofs.

**9. Define Interpretation**

Interpretation specifies exactly which objects, relations and functions are referred

to by the constant predicate, and function symbols.

**10. What are the three levels in describing knowledge based agent?**

The three levels in describing knowledge based agent

Logical level;

Implementation level;

Knowledge level or epistemological level.

**11. Define Syntax?**

Syntax is the arrangement of words. Syntax of a knowledge describes the possible

configurations that can constitute sentences. Syntax of the language describes how to make

sentences.

**12. Define Semantics**

The semantics of the language defines the truth of each sentence with respect to

each possible world. With this semantics, when a particular configuration exists within an agent,

the agent believes the corresponding sentence.

**13. Define Modus Ponen’s rule in Propositional logic?**

The standard patterns of inference that can be applied to derive chains of

conclusions that lead to the desired goal is said to be Modus Ponen’s rule.

**14. Define a knowledge Base.**

Knowledge base is the central component of knowledge base agent and it is

described as a set of representations of facts about the world.

**15. Define an inference procedure.**

An inference procedure reports whether or not a sentence

is entitled by

knowledge base provided a knowledge base and a sentence

described by the sentences that it can derive.

. An inference procedure ‘i’ can be

If i can derive

from knowledge base, we can write, KB

Alpha is derived from

KB or i derives alpha from KB

**16. What are the basic Components of propositional logic?**

The basic Components of propositional logic

Logical Constants (True, False)

Propositional symbols (P, Q)

Logical Connectives (^,=,

, )

**17. Define AND –Elimination rule in propositional logic.**

AND elimination rule states that from a given conjunction it is possible to inference

any of the conjuncts.

1 ^ 2------^ n

i

**18. Define AND-Introduction rule in propositional logic.**

AND-Introduction rule states that from a list of sentences we can infer their

conjunctions.

1, 2,…….. n

1^ 2^…….^ n

**19. What is forward chaining?**

A deduction to reach a conclusion from a set of antecedents is called forward

chaining. In other words, the system starts from a set of facts, and a set of rules, and tries to find

the way of using these rules and facts to deduce a conclusion or come up with a suitable course

of action.

**20. What is backward chaining?**

In backward chaining, we start from a conclusion, which is the hypothesis we wish

to prove, and we aim to show how that conclusion can be reached from the rules and facts in the

data base.

**UNIT – 3: PLANNING**

**1. Define state-space search.**

The most straightforward approach is to use state-space search. Because the

descriptions of actions in a planning problem specify both preconditions and effects, it is

possible to search in either direction: either forward from the initial state or backward from the

goal

**2. What are the types of state-space search?**

The types of state-space search are,

Forward state space search;

Backward state space search.

**3. What is Partial-Order Planning?**

A set of actions that make up the steps of the plan. These are taken from the set of

actions in the planning problem. The “empty” plan contains just the Start and Finish actions.

Start has no preconditions and has as its effect all the literals in the initial state of the planning

problem. Finish has no effects and has as its preconditions the goal literals of the planning

problem.

**4. What are the advantages and disadvantages of Partial-Order Planning?**

Advantage: Partial-order planning has a clear advantage in being

able to decompose problems into sub problems.

Disadvantage: Disadvantage is that it does not represent states

directly, so it is harder to estimate how far a partial-order plan is

from achieving a goal.

**5. What is a Planning graph?**

A Planning graph consists of a sequence of levels that correspond to time steps in

the plan where level 0 is the initial state. Each level contains a set of literals and a set of actions.

**6. What is Conditional planning?**

Conditional planning is also known as contingency planning, conditional planning

deals with incomplete information by constructing a conditional plan that accounts for each

possible situation or contingency that could arise

**7. What is action monitoring?**

The process of checking the preconditions of each action as it is executed, rather

than checking the preconditions of the entire remaining plan. This is called action monitoring.

**8. Define planning.**

Planning can be viewed as a type of problem solving in which the agent uses

beliefs about actions and their consequences to search for a solution.

**9. List the features of an ideal planner?**

The features of an ideal planner are,

The planner should be able to represent the states, goals and

actions;

The planner should be able to add new actions at any time;

The planner should be able to use Divide and Conquer method for

solving very big problems.

**10. What are the components that are needed for representing an action?**

The components that are needed for representing an action are,

Action description;

Precondition;

Effect.

**11. What are the components that are needed for representing a plan?**

The components that are needed for representing a plan are,

A set of plans steps;

A set of ordering constraints;

A set of variable binding constraints;

A set of casual link protection.

**12. What are the different types of planning?**

The different types of planning are,

Situation space planning;

Progressive planning;

Regressive planning;

Partial order planning;

Fully instantiated planning.

**13. Define a solution.**

A solution is defined as a plan that an agent can execute and that guarantees the

achievement of goal.

**14. Define complete plan and consistent plan.**

A complete plan is one in which every precondition of every step is achieved by

some other step.

A consistent plan is one in which there are no contradictions in the ordering or

binding constraints.

**15. What are Forward state-space search and Backward state-space search?**

Forward state-space search: It searches forward from the initial

situation to the goal situation.

Backward state-space search: It searches backward from the goal

situation to the initial situation.

**16. What is Induction heuristics? What are the different types of induction heuristics?**

Induction heuristics is a method, which enable procedures to learn descriptions

from positive and negative examples.

There are two different types of induction heuristics. They are:

Require-link heuristics.

Forbid-link heuristics.

**17. Define Reification.**

The process of treating something abstract and difficult to talk about as though it

were concrete and easy to talk about is called as reification.

**18. What is reified link?**

The elevation of a link to the status of a describable node is a kind of reification.

When a link is so elevated then it is said to be a reified link.

**19. Define action monitoring.**

The process of checking the preconditions of each action as it is executed, rather

than checking the preconditions of the entire remaining plan. This is called action monitoring.

**20. What is meant by Execution monitoring?**

Execution monitoring is related to conditional planning in the following way. An

agent that builds a plan and then executes it while watching for errors is, in a sense, taking into

account the possible conditions that constitute execution errors.

**UNIT – 4: UNCERTAIN KNOWLEDGE AND REASONING**

**1. Define Uncertainty.**

Uncertainty means that many of the simplifications that are possible with deductive

inference are no longer valid.

**2. State the reason why first order, logic fails to cope with that the mind like medical**

**diagnosis.**

Three reasons:

Laziness: It is hard to lift complete set of antecedents of consequence,

needed to ensure and exception less rule.

Theoretical Ignorance: Medical science has no complete theory for the

domain.

Practical ignorance: Even if we know all the rules, we may be uncertain

about a particular item needed.

**3. What is the need for probability theory in uncertainty?**

Probability provides the way of summarizing the uncertainty that comes from our

laziness and ignorance. Probability statements do not have quite the same kind of semantics

known as evidences.

**4. What is the need for utility theory in uncertainty?**

Utility theory says that every state has a degree of usefulness, or utility to In agent,

and that the agent will prefer states with higher utility. The use utility theory to represent and

reason with preferences.

**5. What Is Called As Decision Theory?**

Preferences As Expressed by Utilities Are Combined with Probabilities in the

General Theory of Rational Decisions Called Decision Theory. Decision Theory = Probability

Theory + Utility Theory.

**6. Define conditional probability?**

Once the agents has obtained some evidence concerning the previously unknown

propositions making up the domain conditional or posterior probabilities with the notation

p(A/B) is used. This is important that p(A/B) can only be used when all be is known.

**7. When probability distribution is used?**

If we want to have probabilities of all the possible values of a random variable

probability distribution is used.

Eg:

P(weather) = (0.7,0.2,0.08,0.02). This type of notations simplifies many equations.

**8. What is an atomic event?**

An atomic event is an assignment of particular values to all variables, in other

words, the complete specifications of the state of domain.

**9. Define joint probability distribution**.

Joint probability distribution completely specifies an agent's probability

assignments to all propositions in the domain. The joint probability distribution p(x1,x2,--------

xn) assigns probabilities to all possible atomic events; where x1,x2------xn=variables.

**10. What is meant by belief network?**

A belief network is a graph in which the following holds

A set of random variables

A set of directive links or arrows connects pairs of nodes.

The conditional probability table for each node

The graph has no directed cycles.

**11. What are called as Poly trees?**

The algorithm that works only on singly connected networks known as

Poly trees. Here at most one undirected path between any two nodes is present.

**12. What is a multiple connected graph?**

A multiple connected graph is one in which two nodes are connected by more than

one path.

**13. List the three basic classes of algorithms for evaluating multiply connected graphs.**

The three basic classes of algorithms for evaluating multiply connected graphs

Clustering methods;

Conditioning methods;

Stochastic simulation methods.

**14. What is called as principle of Maximum Expected Utility (MEU)?**

The basic idea is that an agent is rational if and only if it chooses the action that

yields the highest expected utility, averaged over all the possible outcomes of the action. This is

known as MEU

**15. What is meant by deterministic nodes?**

A deterministic node has its value specified exactly by the values of its parents, with

no uncertainty.

**16. What are all the uses of a belief network?**

The uses of a belief network are,

Making decisions based on probabilities in the network and on the

agent's utilities;

Deciding which additional evidence variables should be observed in

order to gain useful information;

Performing sensitivity analysis to understand which aspects of the

model have the greatest impact on the probabilities of the query

variables (and therefore must be accurate);

Explaining the results of probabilistic inference to the user.

**17. Give the Baye's rule equation**

W.K.T P(A ^ B) = P(A/B) P(B)

P(A ^ B) = P(B/A) P(A)

-------------------------- 1

-------------------------- 2

DIVIDING BYE P(A) ; WE GET

P(B/A) = P(A/B) P(B)

--------------------

P(A)

**18. What is called as Markov Decision problem?**

The problem of calculating an optimal policy in an accessible, stochastic

environment with a known transition model is called a Markov Decision Problem(MDP).

**19. Define Dynamic Belief Network.**

A Belief network with one node for each state and sensor variable for each time

step is called a Dynamic Belief Network.(DBN).

**20. Define Dynamic Decision Network?**

A decision network is obtained by adding utility nodes, decision nodes for action in

DBN. DDN calculates the expected utility of each decision sequence.

**UNIT – 5: LEARNING**

**1. What is meant by learning?**

Learning is a goal-directed process of a system that improves the knowledge or the

knowledge representation of the system by exploring experience and prior knowledge.

**2. Define informational equivalence and computational equivalence.**

A transformation from on representation to another causes no loss of information;

they can be constructed from each other.

The same information and the same inferences are achieved with the same amount

of effort.

**3. Define knowledge acquisition and skill refinement.**

knowledge acquisition (example: learning physics) — learning new

symbolic information coupled with the ability to apply that information in

an effective manner

skill refinement (example: riding a bicycle, playing the piano) — occurs at

a subconscious level by virtue of repeated practice

**4. What is Explanation-Based Learning?**

The background knowledge is sufficient to explain the hypothesis of Explanation-

Based Learning. The agent does not learn anything factually new from the instance. It extracts

general rules from single examples by explaining the examples and generalizing the explanation.

**5. Define Knowledge-Based Inductive Learning.**

Knowledge-Based Inductive Learning finds inductive hypotheses that explain set

of observations with the help of background knowledge.

**6. What is truth preserving?**

An inference algorithm that derives only entailed sentences is called sound or truth

preserving.

**7. Define Inductive learning. How the performance of inductive learning algorithms can be**

**measured?**

Learning a function from examples of its inputs and outputs is called inductive

learning.

It is measured by their learning curve, which shows the prediction accuracy as a

function of the number of observed examples.

**8. List the advantages of Decision Trees**

The advantages of Decision Trees are,

It is one of the simplest and successful forms of learning algorithm.

It serves as a good introduction to the area of inductive learning and is

easy to implement.

**9. What is the function of Decision Trees?**

A decision tree takes as input an object or situation by a set of properties, and

outputs a yes/no decision. Decision tree represents Boolean functions.

**10. List some of the practical uses of decision tree learning.**

Some of the practical uses of decision tree learning are,

Designing oil platform equipment

Learning to fly

**11. What is the task of reinforcement learning?**

The task of reinforcement learning is to use rewards to learn a successful agent

function.

**12. Define Passive learner and Active learner.**

A passive learner watches the world going by, and tries to learn the utility of being

in various states.

An active learner acts using the learned information, and can use its problem

generator to suggest explorations of unknown portions of the environment.

**13. State the factors that play a role in the design of a learning system.**

The factors that play a role in the design of a learning system are,

Learning element

Performance element

Critic

Problem generator

**14. What is memorization?**

Memorization is used to speed up programs by saving the results of computation.

The basic idea is to accumulate a database of input/output pairs; when the function is called, it

first checks the database to see if it can avoid solving the problem from scratch.

**15. Define Q-Learning.**

The agent learns an action-value function giving the expected utility of taking a

given action in a given state. This is called Q-Learning.

**16. Define supervised learning & unsupervised learning.**

Any situation in which both inputs and outputs of a component can be perceived is

called supervised learning.

Learning when there is no hint at all about the correct outputs is called

unsupervised learning.

**17. Define Bayesian learning.**

Bayesian learning simply calculates the probability of each hypothesis, given the

data, and makes predictions on that basis. That is, the predictions are made by using all the

hypotheses, weighted by their probabilities, rather than by using just a single “best” hypothesis.

**18. What is utility-based agent?**

A utility-based agent learns a utility function on states and uses it to select actions

that maximize the expected outcome utility.

**19. What is reinforcement learning?**

Reinforcement learning refers to a class of problems in machine learning which

postulate an agent exploring an environment in which the agent perceives its current state and

takes actions. The environment, in return, provides a reward (which can be positive or negative).

Reinforcement learning algorithms attempt to find a policy for maximizing cumulative reward

for the agent over the curse of the problem.

**20. What is the important task of reinforcement learning?**

The important task of reinforcement learning is to use rewards to learn a successful

agent function.

**UNIT – 1: PROBLEM SOLVING**

**1. Explain Agents in detail.**

An agent is anything that can be viewed as perceiving its environment through

sensors and SENSOR acting upon that environment through actuators.

**Percept**

We use the term percept to refer to the agent's perceptual inputs at any given instant.

**Percept Sequence**

An agent’s percept sequence is the complete history of everything the agent has ever

perceived.

**Agent function**

Mathematically speaking, we say that an agent's behavior is described by the agent

function

**Properties of task environments**

Fully observable vs partially observable;

Deterministic vs stochastic;

Episodic vs sequential;

Static vs dynamic;

Discrete vs continuous;

Single agent vs multi agent.

**2. Explain uninformed search strategies.**

Uninformed Search Strategies have no additional information about states beyond

that provided in the problem that knows whether one non goal state is “more promising” than

another are called informed search or heuristic search strategies.

There are five uninformed search strategies as given below.

Breadth-first search;

Uniform-cost search;

Depth-first search;

Depth-limited search;

Iterative deepening search.

**3. Explain informed search strategies.**

Informed search strategy is one that uses problem-specific knowledge beyond the

definition of the problem itself. It can find solutions more efficiently than uninformed strategy.

Best-first search;

Heuristic function;

Greedy-Best First Search(GBFS);

A\* search;

Memory Bounded Heuristic Search.

**4. Explain CSP in detail.**

A constraint satisfaction problem is a special kind of problem satisfies some

additional structural properties beyond the basic requirements for problem in general. In a CSP,

the states are defined by the values of a set of variables and the goal test specifies a set of

constraint that the value must obey.

CSP can be viewed as a standard search problem as follows:

**Initial state**: the empty assignment {}, in which all variables are

unassigned.

**Successor function:** a value can be assigned to any unassigned variable,

provided that it does not conflict with previously assigned variables.

**Goal test:** the current assignment is complete.

**Path cost:** a constant cost for every step.

**Varieties of CSP’s:**

Discrete variables.

CSPs with continuous domains.

**Varieties of constraints :**

Unary constraints involve a single variable.

Binary constraints involve pairs of variables.

Higher order constraints involve 3 or more variables.

**UNIT – 2: LOGICAL REASONING**

**1. Explain Reasoning patterns in propositional logic with example.**

Modus ponens;

AND elimination;

OR elimination;

AND introduction;

Resolution;

Unit resolution;

Double negation.

**2. Explain in detail about knowledge engineering process in FOL.**

Identify the task;

Assemble the relevant knowledge;

Decide on a vocabulary of predicates, constraints and functions;

Encode general knowledge about the domain;

Encode a description of a specific problem;

Pose queries;

Debug the knowledgebase.

**3. Discuss in detail about unification and lifting.**

Unification;

Generalized modus ponens;

Lifting.

**4. Explain in detail about forward and backward chaining with example.**

Example;

Efficient forward chaining;

Incremental forward chaining;

Backward chaining;

Logic programming.

**5. What is resolution? Explain it in detail.**

Definition;

Conjunctive Normal Form;

Resolution interference rule.

**UNIT – 3: PLANNING**

**1. Explain partial order planning.**

Partial-Order Planning;

A partial-order planning example;

Heuristics for partial-order planning.

**2. Discuss about planning graphs in detail.**

Planning graphs for heuristic estimation;

The GRAPHPLAN algorithm;

Termination of GRAPHPLAN.

**3. Explain planning with State-Space Search in detail.**

Forward State-Space Search;

Backward State-Space Search;

Heuristics for State-Space Search.

**4. Describe Hierarchical Task Network Planning in detail.**

Representing action decomposition;

Modifying the planner for decompositions.

**5. Explain conditional planning in detail.**

Conditional planning in fully observable environment;

Conditional planning in partially observable environment.

**UNIT – 4: UNCERTAIN KNOWLEDGE AND REASONING**

**1. Explain Bayesian Network in detail.**

Semantics of Bayesian network;

Representing the full joint distribution,

Conditional independence relation in Bayesian networks.

Exact interference in Bayesian network;

Interference by enumeration,

The variable elimination algorithm,

The complexity of exact inference,

Clustering algorithm.

Approximate interference in Bayesian network;

Direct sampling methods,

Interference by Markov chain simulation.

**2. Discuss about Hidden Markov Model in detail.**

The Hidden Markov Model or HMM is a temporal probabilistic model in which

the state of the process is described by a single discrete random variable. The possible value of

the variable is the possible states. The HMM is used in speech recognition.

Simplified matrix algorithms.

**3. Explain inference in Temporal Model.**

Filtering and prediction;

Smoothing;

Finding the most likely sequence.

**4. Discuss in detail about uncertainty.**

Acting under uncertainty;

Basic probability notation;

The axioms of probability;

Inference using Full Joint Distribution;

Independence;

Bayes Rule and its use;

The Wumpus World Revisited.

**5. Explain Basic Probability Notation and Axioms of Probability in detail.**

Basic Probability Notation;

Propositions,

Atomic events,

Prior probability,

Conditional probability.

Axioms of probability;

Using the axioms of probability,

Why the axioms of probability are reasonable.

**UNIT – 5: LEARNING**

**1. Explain about Learning Decision Trees in detail.**

Decision tree as performance elements;

Expressiveness of decision trees;

Inducing decision trees from examples;

Choosing attribute tests;

Assessing the performance of the learning algorithm;

Noise and overfitting;

Broadening the applicability of decision trees.

**2. Explain Explanation Based Learning in detail.**

The background knowledge is sufficient to explain the hypothesis of Explanation-

Based Learning. The agent does not learn anything factually new from the instance. It extracts

general rules from single examples by explaining the examples and generalizing the explanation.

Extracting general rules from examples;

Improving efficiency.

**3. Explain Learning with complete data in detail.**

Discrete model;

Naive Bayes models;

Continuous model;

Bayesian parameter learning;

Learning Bayes net structures.

**4. Explain neural networks in detail.**

Units in neural networks;

Network structures;

Single layer feed-forward neural networks;

Multilayer feed-forward neural networks;

Learning neural network structures.

**5. Explain Reinforcement Learning in detail.**

Reinforcement learning refers to a class of problems in machine learning which

postulate an agent exploring an environment in which the agent perceives its current state and

takes actions. The environment, in return, provides a reward (which can be positive or negative).

Reinforcement learning algorithms attempt to find a policy for maximizing cumulative reward

for the agent over the curse of the problem.

Passive reinforcement learning;

Active reinforcement learning;

Generalization in reinforcement learning;

Policy search.