

CSCI-UA 9472. AI

Material for the Midterm

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1 Material covered

1. You must be able to define the notions of [intelligent agent](#), [environment](#) and [action selection](#), and explain the various ways an agent can interact with its environment including the notions of [Reflex](#) and [model based agent](#) as well as [goal based](#) and [utility based agent](#)
2. You must be able to understand and explain the different search methods, in particular the difference between [Informed](#) and [Uninformed](#) search, and between those two approaches and [Hill Climbing](#)
3. You must be able to give the pseudo code for the Uninformed Search Methods ([Breadth First](#) and [Depth First Search](#)) as well as the [Informed A* Search](#).
4. You must be able to explain the [notion of completeness](#) in the framework of search methods.
5. You must be able to describe the [syntax and semantics](#) of [Propositional Logic](#) and give the [Truth table](#) of [each of the logical connectives](#).
6. You must be able to [translate](#) a simple logical expression from Propositional Logic into a [conjunctive normal Form](#)
7. You must be able to define [Horn](#) and [definite clauses](#)
8. You must be able to explain the interest of Horn clauses and definite clauses for inference and you must be able to turn such clauses into [implications](#)
9. You must be able to give the pseudo code for the [forward](#) and [backward](#) search algorithms in PL
10. You must be able to give the [PL resolution](#) rule and use it on simple examples
11. You must be able to give the [pseudo code](#) for the [resolution](#) algorithm in PL.
12. You must be able to define the notions of [entailment](#), [inference](#), [completeness](#) and [soundness](#)
13. You must be able to [compare](#) the [Resolution](#), [Forward](#) and [Backward Chaining](#) in terms of their respective [complexity](#) and vis a vis the notion of [completeness](#).
14. You must be able to explain the [syntax](#) and [semantics](#) of [First Order Logic](#) (in particular what changes with respect to Propositional Logic)
15. You must be able to use and explain the notions of [existential](#) and [universal quantifiers](#)

16. You must be able to explain and use the [universal](#) and [existential instantiation](#) rules (i.e quantifier elimination).
17. You must be able to use and explain the [Generalized Modus Ponens](#) rule in the framework of FOL inference.
18. You must be able to explain the result of [Herbrand](#) and the notion of [semidecidability](#) from [Turing](#) and [Church](#)
19. You must be able to explain the concept of [Unification](#) and give the corresponding pseudo code.
20. You must be able to give the [pseudo code for the FOL forward chaining](#) algorithm
21. You must be able to explain how to turn a FOL sentence into a [conjunctive normal form](#) (in particular the [Skolemization](#) and [Standardization](#) steps)
22. You must be able to state the [FOL resolution rule](#) and apply it on very simple examples
23. You must be able to explain the [frame](#) and [qualification](#) problems.
24. You must be able to explain the difference between [reasoning agents](#) and [learning agents](#)
25. You must be able to define the concepts of [supervised](#), [unsupervised](#), [semi-supervised](#) and [reinforcement](#) learning and give an illustration for each.
26. You must be able to discuss the [test training split](#) and explain why such a split is important in learning.
27. You must be able to explain how to [build a decision tree](#) from a set of examples $\{\mathbf{x}^{(i)}, t^{(i)}\}$ where $t^{(i)}$ encodes a binary decision (Yes/No or True/False).
28. You must be able to explain how one can use the [entropy](#) to order the features when learning a decision tree