1. AI Introduction:
2. AI Agents Modelling Inferences and Learning paradigm:
   1. Modelling:
      1. Takes the real world which is very complicated and builds a model out of it
      2. Model:
         1. Simplification which is mathematically precise so that you can do something with it on a computer
         2. If you want to find best way to go from point a to point b in city, then we can model it as a graph. Eg: in map which contains locations. locations are nodes/vertices and distance or route to them is edges of the graph

A screenshot of a cell phone

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* 1. Inferencing:
     1. inferencing means asking questions about your model
        1. questions on model: what is the shortest from one to another node in a graph
        2. Since we have modelled a real world problem, we can develop algorithms to solve that problem

A diagram of a model

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* 1. learning:
     1. learning addresses the problem
     2. In any realistic setting, model will have a lot of parameters which can be in millions
     3. It can be tough to have them all
     4. So we will have model without parameters

A screenshot of a computer

Description automatically generated

* + 1. then we will have some data , data like people try to go from x to y and they took 10 minutes or an hour to do so.
    2. from this data, we can learn to fill the parameters of the model , We can assign cost to the edges that represent what the data is telling us
       1. thus by this way, we can create a model without parameters, fill data , apply generic learning algorithm and get a model with parameters

1. COURSE PLAN: 1 machine learning:
   1. Central tenet in machine learning is: you have data and we go to model which is its main driver of successes in ai because it allows you to move the complexity from code to data
   2. Rather than having million lions of code which is unmanageable, we have a lot of data which is collected in kind of natural way and a smaller amount of code that can operate on this data
   3. This paradigm is really powerful

A screenshot of a machine learning

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* 1. MACHINE LEARNING IS FUNDAMENTALLY ABOUT GENERALIZATION:
     1. you have a data, fit a model
     2. you don’t care about how model performs on that data
     3. but you care about how it performs on new experiences
     4. This faith on 3rd point: where we care about how it performs on new experiences – gives machine learning its power

1. COURSE PLAN: 2 SIMPLEST MODEL: REFLEX
   1. reflex model

A screen shot of a white screen

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* 1. what is reflex model:
     1. given a zebra figure, if we ask a human what is that animal, he quickly tells what is that animal
     2. human is able to answer because, it is kind of a reflex where your human visual system is so good at doing these things without thinking

A group of blue images

Description automatically generated with medium confidence

* + 1. reflex models are models which just require a fixed set of computations
    2. examples of reflex models: linear classifiers, deep neural networks
    3. these models are most common models in machine learning
    4. important thing about reflex based models – there is no feed for it. just give input and get the output.. It is fully feed-forward and no backtracking involved.

1. COURSE PLAN3: STATE BASED MODEL
   1. some problems require bit more than reflex based model

A screen shot of a computer

Description automatically generated

* + 1. eg: in Chess game , if white is to move, what is the next move
    2. in these kind of situations, we need something more powerful than reflex
    3. we needs agents that can plan and think ahead
    4. Application of state based models:
       1. Games: chess, go, pac-man, starcraft etc
       2. robotics: motion planning
       3. natural language generation: machine translation, image captioning

A screenshot of a game

Description automatically generated

* 1. 3 types of state based models
     1. SEARCH PROBLEMS: YOU CONTROL EVERYTHING - FINDING AN OPTIMAL PATH

A close up of a sign

Description automatically generated

* + 1. MARCKOV DECION PROCESSES; AGAINST NATURE, WHICH INVOLVES RANDOMNESS EG: BLACK JACK

A diagram of a graph

Description automatically generated with medium confidence

* + - 1. GOING FROM PLACE A TO B, WHERE WE DON’T KNOW ABOUT THE TRAFFIC
      2. ROLLING A DICE
    1. ADVERSARIAL GAMES: AGAINST OPPONENT(EG: CHESS)
       1. PLAYING AN OPPONENT WHO ACTIVELY TRIES TO DESTROY YOU

A diagram of a red devil and black text

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1. COURSE PLAN4: variable BASED MODEL
   1. Some problems are not naturally state based models.
      1. Eg: in SUDOKU we need to fill in these blanks with numbers so that every row and column has the digits 1 through 9
      2. There is no rules that we need to do in certain order like chess where order is important
      3. These type of problems are captured by variable based models

A screenshot of a puzzle

Description automatically generated

* 1. In variable based models, where you think of solution to a problem as assignment to individual variables under some constraints

A diagram of a problem

Description automatically generated

* + 1. Constraint satisfaction problems :
       1. eg: sudoku
       2. scheduling(one person cant be in two places at a time)
    2. bayesian network: soft dependencies
       1. Tracking cars from sensors over time . here h represents position of car and e represents sensor readings . We need to infer where the car based on the sensor readings

A screenshot of a computer

Description automatically generated

1. COURSE PLAN5: logic BASED MODEL
   1. suppose you wanted a little companion like virtual assistant and help you do things .

A close-up of a head

Description automatically generated

* + 1. In that case you will ask it to :
       1. Tell information
       2. ask questions and get reply
    2. by using natural language

A screenshot of a computer

Description automatically generated

* + 1. Logic is needed to
       1. Digest heterogenous information
       2. reason deeply with that information

