COMS 4701 - Homework 1 - Conceptual

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Question 1

b → a → e → d → c
McCulloch and Pitts → "Computing Machinery and Intelligence" → Perceptron → AI Winter → Deep Learning takeover

Question 2

Differences between McColluch/Pitts and Perceptron models:

- Inputs to the MP are boolean (0 / 1), whereas inputs to the Perceptron can be any real value.
- Inputs are equally weighted (no weights) in MP, whereas Perceptron can weigh inputs differently.

Question 3

Importance of interpretability in developing an ethical AI:

- Understand AI predictions
- Ensure AI is fair
- Advance science and our knowledge in general; I thought intepretability could pertain to this because it allows people to really understand how AI works and also allows the AI scientist to create more accurate models.
- With transparent models, AI is more trusted and hence more used

Question 4

1. AI Applications used in DishMe:
    - Robotics
    - Computer Vision
    - Planning
2. PEAS analysis of DishMe:
    - Performance: how well it cleans the dishes; not breaking dishes; organizing; efficiency; safety; how well it avoids other obstacles; dishes perception; variety of dishes it can handle; battery life
    - Environment: furniture; dishwasher; stove; kitchen appliances; kitchen counter; kitchen sink; any other obstacles on the counter or floor; how slick the floor is; rugs
    - Actuators: motors for the arm linkages and grippers to pick up the dishes; (if on wheels) motors for the wheels to get around; speaker to play the songs; wheels
    - Sensors: camera; Lidar or sonar; IMU; encoders; battery sensor; buttons; force sensors; speedometer; bump sensors
3. The Environment:
    - Observability: Partially
    - Number of Agents: Single
    - Deterministic or Stochastic: Stochastic (people could be moving things or moving around the kitchen)
    - Discrete/Continuous: Continuous
4. One of the functionalities that could be implemented is SLAM. DishMe could use a Lidar and SLAM to develop a localized map of the area. The area may change due to dishes, but it can still develop a reasonable map of the kitchen area with constant counters and furniture. Overtime, if anything changes, DishMe can update the map; overall, this map can help improve efficiency. Furthermore, before picking up all the dishes, the robot can survey the environment and come up with an optimal path and procedure to minimize the amount of time to load and start the dishwasher. The robot can have redundant kinematics (more DOF necessary than what is needed to complete the task) when picking up the dishes. This makes the robot more dexterous during these tasks and will make it easier to pick up the dishes without breaking them. The robot can have multiple arms with different end effectors. Paired with this, you can implement an ML algorithm that helps the robot distinguish between different dishes. As a result, when DishMe detects a particular dish, it can use a specific end effector that is best at picking up that dish and loading it.