

**CMSC 4200 - Artificial Intelligence**  
**Spring 2026, Group Assignment 1**

Due – Wednesday, February 11, 2026, at 11:59 p.m. EST

<b>Group: 1</b>	
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Use this document to provide your answers. This assignment will be graded out of 20 points. Submit your answer file to the right D2L Dropbox named “Assignment 1 Dropbox” by the due date and time.

**Question 1. (8 points)** For each of the following activities, characterize the properties of the task environment in terms of Fully observable or partially observable, single agent or multiagent, deterministic or nondeterministic, episodic or sequential, static or dynamic, and discrete or continuous:

- a) Solving 8-puzzle  
Fully observable, single agent, deterministic, sequential, static, discrete
- b) Playing football  
Partially observable, multi agent, nondeterministic, sequential, dynamic, continuous

**Question 2. (8 points)** In the vacuum cleaner world that is described in the textbook, with one vacuum cleaner and some dirty cells, there are 8 different states in the simple two-cell version and  $n \cdot 2^n$  different states for the  $n$ -cell version. How many different states in the following cases where some of the cells may be dirty:

- a) One vacuum cleaner in an area with  $n$  by  $m$  cells.

Since there is an area of  $n$  by  $m$  cells, the total number of cells is  $(n * m)$ .

In the equation,  $n$  is the total number of cells.

Therefore, substituting  $(n * m)$  for  $n$ :

There are  $(n * m) * 2^{(n * m)}$  different states.

- b) Two identical vacuum cleaners in an area with  $n$  by  $n$  cells such that each cell can have a maximum of one vacuum cleaner at any given time.

There are  $n^2$  total cells.

Since the vacuum cleaners are identical, we need to find the total number of pairs of cells.

The formula to do so is:  $n(n-1)/2$

Substituting the number of cells:  $(n^2)((n^2)-1)/2$

Each cell can be dirty or clean, so total options are  $2^{(n^2)}$ .

Putting it all together:

There are  $((n^2)((n^2)-1)/2)*2^{(n^2)}$  different states.

**Question 3. (4 points)** What are the differences between simple reflex agents and model-based reflex agents?

Simple and model-based reflex are two types of AI agents that can be turned into learning agents. They both interact with their environments through Sensors and Actuators. While these types share similar characteristics, they differ in process. Simple reflex agents select actions based on the current percept and ignore the rest of the percept history. Whereas model-based agents maintain an internal state that depends on this percept history. This allows a model-based agent to keep track of the environment that cannot see it, or partial observability. The key difference between these AI agents therefore is the visibility. While simple reflex agents process based on condition-action rules, the model-based reflex agent considers state, how the world evolves, what actions do, and finally the condition-action rules.