# AI HW3

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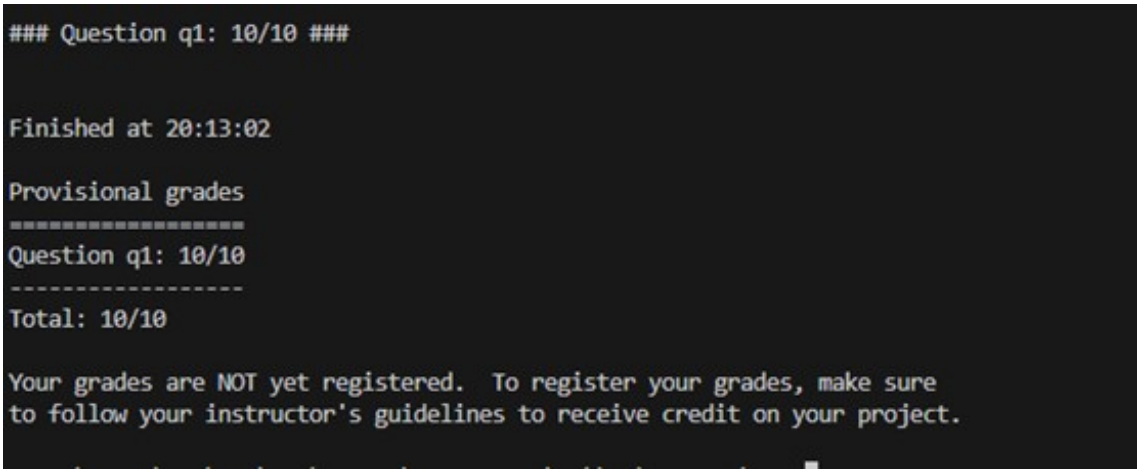
## Q1




Logic Warm-up 部分前兩題主要是練習使用定義好的 class 去實作一些 propositional logic，還有了解需要使用 conjoin 及 disjoin 來聯集或是交集 logics。後面四題主要圍繞在練習使用 pacman 上如何使用 Expr class，主要也是根據需求去制定能夠表示 pacman state 的 logic，還有了解到如何使用 findModel 及 pltrue。

# Q2

```
### Question q2: 10/10 ###


Finished at 20:13:36

Provisional grades
==================
Question q2: 10/10
------------------
Total: 10/10

Your grades are NOT yet registered.  To register your grades, make sure
to follow your instructor's guidelines to receive credit on your project.
```

實作 atLeastOne atMostOne exactOne 三種情形。

atLeastOne 可以透過 disjoin 所有條件完成。

atMostOne 代表最多一為真，可以透過兩兩找組合，對組合取 not 並 disjoin，如果有兩個以上 Expr 為真，就會有一個組合為 False。最後將取完 not 並 disjoin 的結果保存然後 conjoin，就能驗證是否最多一個。

exactOne 代表剛好一個為真，它也是 atLeastOne 與 atMostOne 的交集。對他們倆個取 conjoin 即可。

# Q3

```
### Question q3: 10/10 ###


Finished at 20:14:03

Provisional grades
==================
Question q3: 10/10
------------------
Total: 10/10

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```

第三題是實作 pacman 遊戲中的一些物理行為對應到 logic 的關係，都會透過記錄 knowledge Base(KB) 來完成。分別為 pacmanSuccessorAxiomSingle、pacphysicsAxioms、checkLocationSatisfiability。

pacmanSuccessorAxiomSingle 是實作 pacman 走到 (x,y) 在 t 的邏輯表達，可以透過 pacman 的位置 (x,y) at time=t if and only if possible causes 完成。

pacphysicsAxioms 是實作 pacman 的 physic axioms 可以透過以下 Algorithm 完成。

Algorithm:

1.For all (x,y) in all coords, append the following implication (if-then form): if a wall is at (x,y), then Pacman is not at (x,y) at t.

2.Pacman is at exactly one of the non outer wall coords at timestep t.

3.Pacman takes exactly one of the four actions in DIRECTIONS at timestep t.

4.Sensors: append the result of sensorAxioms. All callers except for checkLocationSatisfiability make use of this; how to handle the case where we don’ t want any sensor axioms added is up to you.

5.transitions: append the result of successorAxioms. All callers will use this.

6.Add each of the sentences above to pacphysics sentences. As you can see in the return statement, these will be conjoined and returned.

checkLocationSatisfiability 是用來實作確認 Pacman 是否能到達 (x,y) 在 time=t。在 KB 中會記錄以下資訊:

1.pacphysics axioms(...) with the appropriate timesteps. There is no sensorModel because we know everything about the world. Where needed, use allLegalSuccessorAxioms for transitions since this is for regular Pacman transition rules.

2.Pacman current location (x0,y0)

3.Pacman takes action0

4.Pacman takes action1

透過 KB 與 pacmanlocation 的 expr 代表 pacman is guaranteed to not be there 及 pacman is guaranteed to be there 的兩個模型。

# Q4

```
### Question q4: 10/10 ###


Finished at 20:16:59

Provisional grades
==================
Question q4: 10/10
------------------
Total: 10/10

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to follow your instructor's guidelines to receive credit on your project.
```

Path Planning 可以透過以下 Algorithm 完成 KB。

1.Add to KB: Initial knowledge: Pacman’ s initial location at timestep 0

2.for t in range(50) (because Autograder will not test on layouts requiring ≥50 timesteps)

2.1 Print time step; this is to see that the code is running and how far it is.

2.2 Add to KB: Initial knowledge: Pacman can only be at exactlyOne of the locations in non wall coords at timestep t. This is similar to pacphysicsAxioms, but don’t use that method since we are using non wall coors when generating the list of possible locations in the first place (and walls grid later).

2.3 Is there a satisfying assignment for the variables given the knowledge base so far? Use findModel and pass in the Goal Assertion and KB.

2.3.1 If there is, return a sequence of actions from start to goal using extractActionSequence.

2.3.2Here, Goal Assertion is the expression asserting that Pacman is at the goal at timestep t.

3. Add to KB: Pacman takes exactly one action per timestep.

4. Add to KB: Transition Model sentences: call pacmanSuccessorAxiomSingle(...) for all possible pacman positions in non wall coords.

完成 KB 後再使用 KB 與 expr(pacmangoal) 的聯集去找到 Model，當找到時就代表找到從 start 到 goal 的 path。

# Q5


Eating Food 與 Path Planning 建造的 KB 大致相同，只要再加上以下資訊:

1.Add food successor axiom: 找到 food 隨著時間變化的關係資訊加入至 KB。

2.Add Food state: 加入不同時間 food state 至 KB。

完成 KB 後再使用 KB 與 expr(foods) 的聯集去找到 Model，當找到時就代表成功吃完食物。

## Q1-Modern

我覺得是因為目前 LLM 使用訓練的方式讓它再使用上有一定的侷限，深度學習透過 backpropagation 去學習的方式並不符合 AGI 的期待，這樣的學習方式我覺得太過片面，學習一件事情時只透過一個觀點或是一個定義好的 function 去學習並不符合人類學習的方式，可想而知 AGI 的表現也很難達到讓人滿意的成果。我認為對於 AGI 應該具備有根據不同情境使用不同標準判定的能力，而不是像 LLM 只有一套評判標準。

## Q2-Modern

在生成 event-centric data 後，將 positive sample 中的資訊做串改當作 negative sample，例如改變 Event 或是對調欄位資訊，也就是做 Role Switching。再將這些 samples 透過 GPT 去生成描述，然後再用 samples 與敘述進行學習。

## Q3-Modern

當遇到不清楚的 category 時，會導致在在基於 visual concept make accurate judgement 時得到較差的表現。

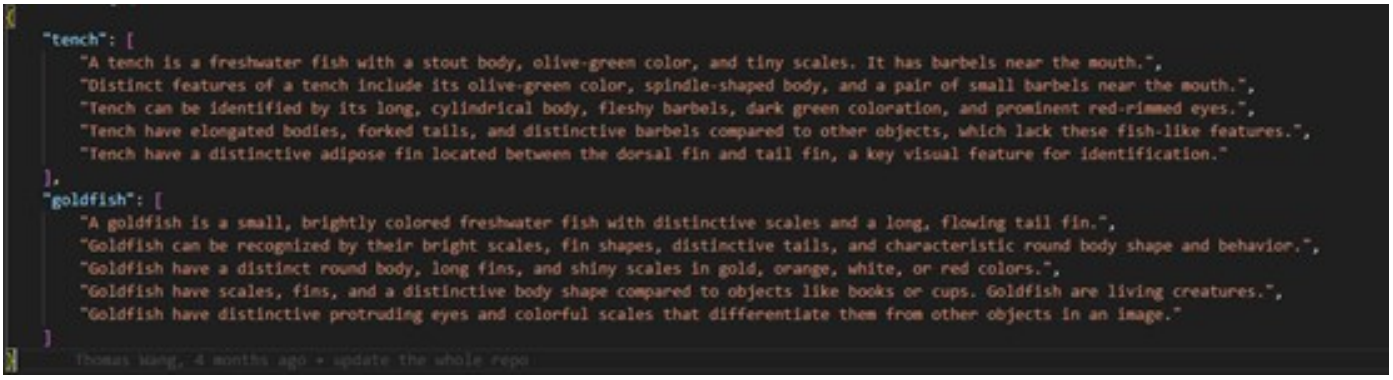
論文透過以下步驟去得到 structured graph-based data:

1. 使用語言模型（LLM）生成與類別相關的描述，以及相應的結構化關係。這些描述包含了與特定類別相關的實體、屬性和關係的信息。

2. 提取實體、屬性和關係：從生成的描述中提取實體、屬性及其相關性。實體代表與該類別相關的關鍵元素，屬性描述特徵或特點，而關係捕捉實體和屬性之間的連接。

3. 形成結構化知識（R）：從描述中生成的結構化知識被表示為 R，其中包括實體集、屬性集、實體-實體關係和實體-屬性關係。這種結構化知識提供了對與該類別相關的文本信息的全面表示。

## Q4-Modern


{
"tench": [
"A tench is a freshwater fish with a stout body, olive-green color, and tiny scales. It has barbels near the mouth.",
"Distinct features of a tench include its olive-green color, spindle-shaped body, and a pair of small barbels near the mouth.",
"Tench can be identified by its long, cylindrical body, fleshy barbels, dark green coloration, and prominent red-rimmed eyes.",
"Tench have elongated bodies, forked tails, and distinctive barbels compared to other objects, which lack these fish-like features.",
"Tench have a distinctive adipose fin located between the dorsal fin and tail fin, a key visual feature for identification."
],
"goldfish": [
"A goldfish is a small, brightly colored freshwater fish with distinctive scales and a long, flowing tail fin.",
"Goldfish can be recognized by their bright scales, fin shapes, distinctive tails, and characteristic round body shape and behavior.",
"Goldfish have a distinct round body, long fins, and shiny scales in gold, orange, white, or red colors.",
"Goldfish have scales, fins, and a distinctive body shape compared to objects like books or cups. Goldfish are living creatures.",
"Goldfish have distinctive protruding eyes and colorful scales that differentiate them from other objects in an image."
]
}
Thomas Wang, 4 months ago • update the whole repo

```
"tench": [
    {
        "Entities": [
            "Tench"
        ],
        "Attributes": [
            "freshwater",
            "long",
            "slimy body",
            "dark green color",
            "small scales",
            "pointed head",
            "fins on its sides"
        ],
        "Entity-to-Entity Relationships": [],
        "Entity-to-Attribute Relationships": [
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                "entity": "Tench",
                "relationship": "is a",
                "attribute": "freshwater"
            },
            {
                "entity": "Tench",
                "relationship": "has",
                "attribute": "long"
            },
            {
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                "relationship": "has",
                "attribute": "slimy body"
            },
            {
                "entity": "Tench",
                "relationship": "has",
                "attribute": "dark green color"
            },
            {
                "entity": "Tench",
                "relationship": "has",
                "attribute": "small scales"
            },
```


"goldfish": [
{
"Entities": [
"goldfish",
"fish",
"body",
"fins",
"tail"
],
"Attributes": [
"small",
"orange",
"round",
"long",
"flowing"
],
"Entity-to-Entity Relationships": [
{
"entity1": "goldfish",
"relationship": "is a",
"entity2": "fish"
}
],
"Entity-to-Attribute Relationships": [
{
"entity": "goldfish",
"relationship": "has",
"attribute": "small"
},
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"entity": "goldfish",
"relationship": "has",
"attribute": "orange"
},
{
"entity": "goldfish",
"relationship": "has",
"attribute": "round"
},

以上是兩個 ImageNet 的 category 的 description 及 graph-based structured data in json.

## Q5-Modern

我覺得可以嘗試加入人文資訊在 data 中給 VLM 做學習，可以讓 VLM 在相同的情境下根據學習到的人文資訊給出不同的回答，這樣能讓 VLM 不再只是根據 object 與 event 來回答問題，而是加上人文資訊給出更相符情境的答案，讓 VLM 的回答更符合人類切入的觀點。