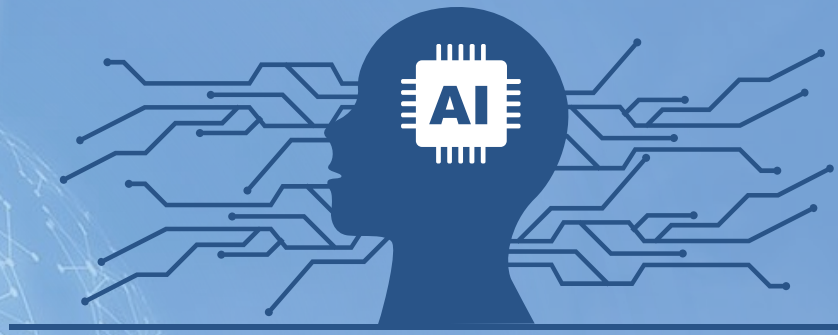
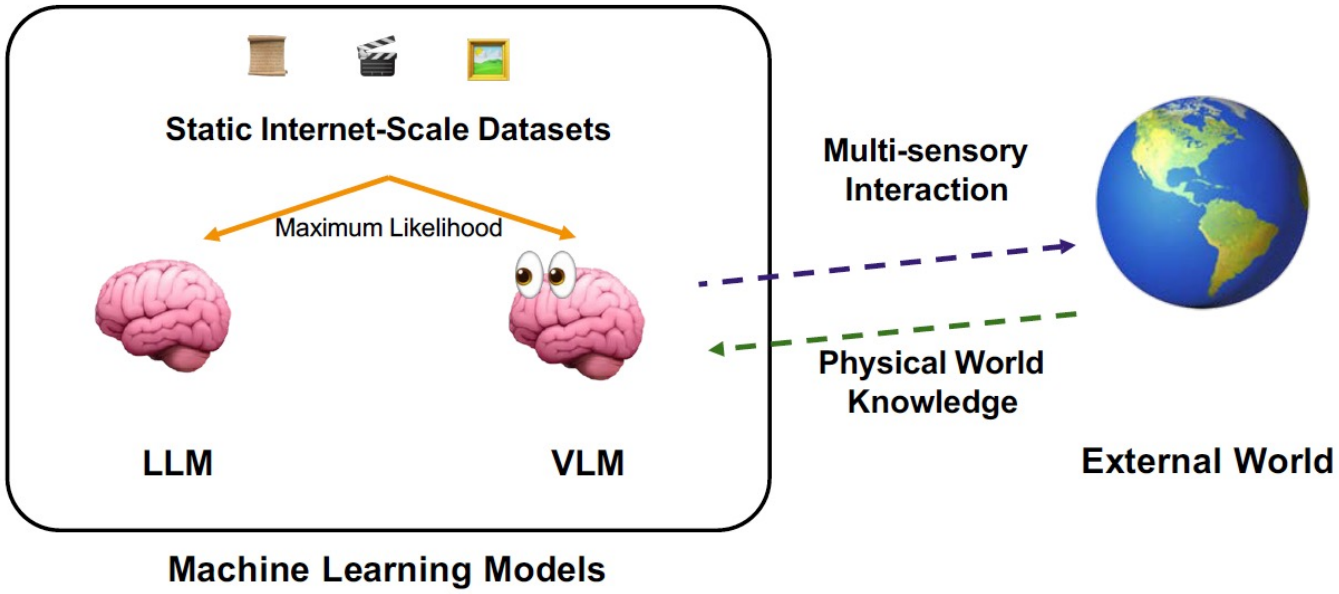
Artificial Intelligence

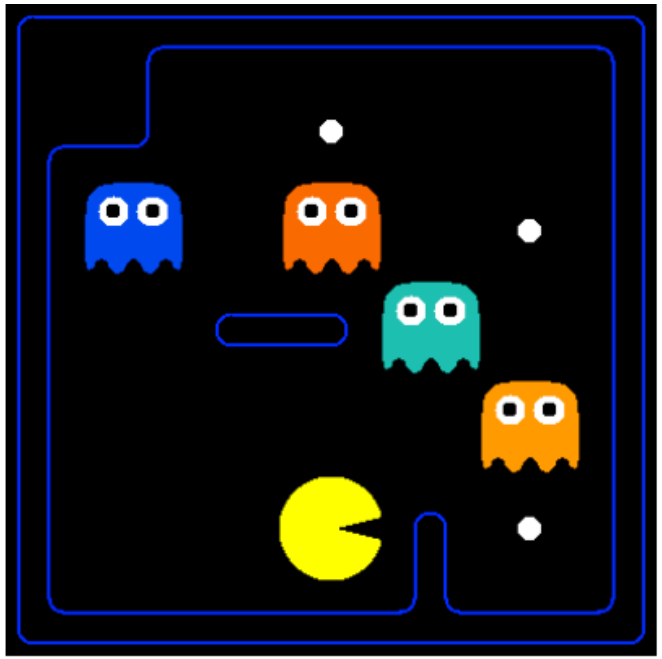


Homework #3
Knowledge

Homework Outline

- Canonical Knowledge (60%)
- Modern Knowledge (40%)

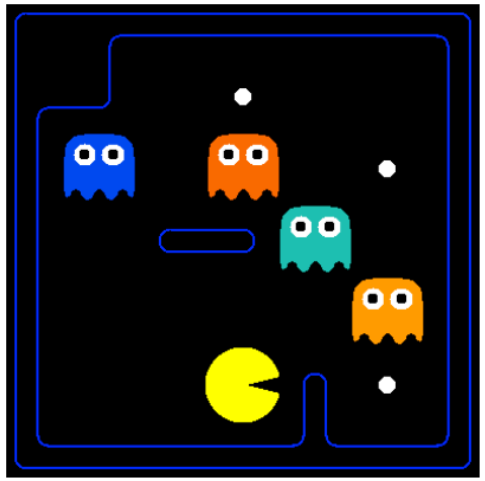




Logical Pacman,
Food is good AND ghosts are bad,
Spock would be so proud

Canonical Knowledge

- Q1 – Logic Warm-up (10%)
- Q2 – Logic Workout (10%)
- Q3 – Pacphysics and Satisfiability (10%)
- Q4 – Path Planning with Logic (10%)
- Q5 – Eating All the Food (10%)



Logical Pacman,
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Details for problems are in Readme.md file!

Files you'll edit:	
`logicPlan.py`	Where you will put your code for the various logical agents.
Files you might want to look at:	
`logic.py`	Propsitional logic code originally from aima-python with modifications functions for working with logic in here.
`logicAgents.py`	The file that defines in logical planning form the two specific problem
`pycosat_test.py`	Quick test main function that checks that the pycosat module is insta
`game.py`	The internal simulator code for the Pacman world. The only thing you
`test_cases/`	Directory containing the test cases for each question.
Supporting files you can ignore:	
`pacman.py`	The main file that runs Pacman games.
`logic_util.py`	Utility functions for `logic.py`.
`util.py`	Utility functions primarily for other projects.
`logic_planTestClasses.py`	Project specific autograding test classes.
`graphicsDisplay.py`	Graphics for Pacman.
`graphicsUtils.py`	Support for Pacman graphics.
`textDisplay.py`	ASCII graphics for Pacman.

Source: https://inst.eecs.berkeley.edu/~cs188/sp24/projects/proj3/#q4-3-points-path-planning-with-logic

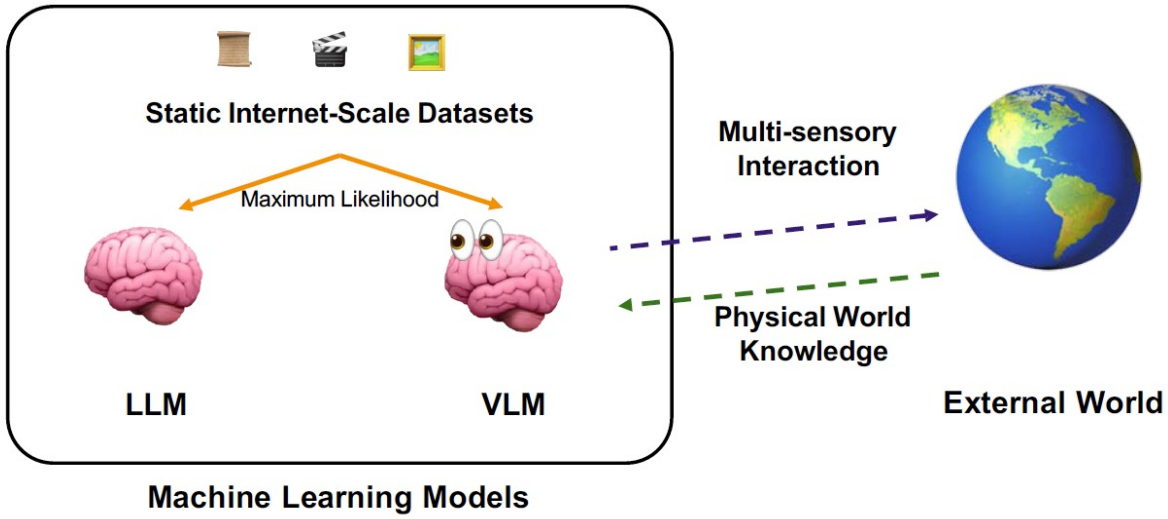
Report – Canonical Knowledge

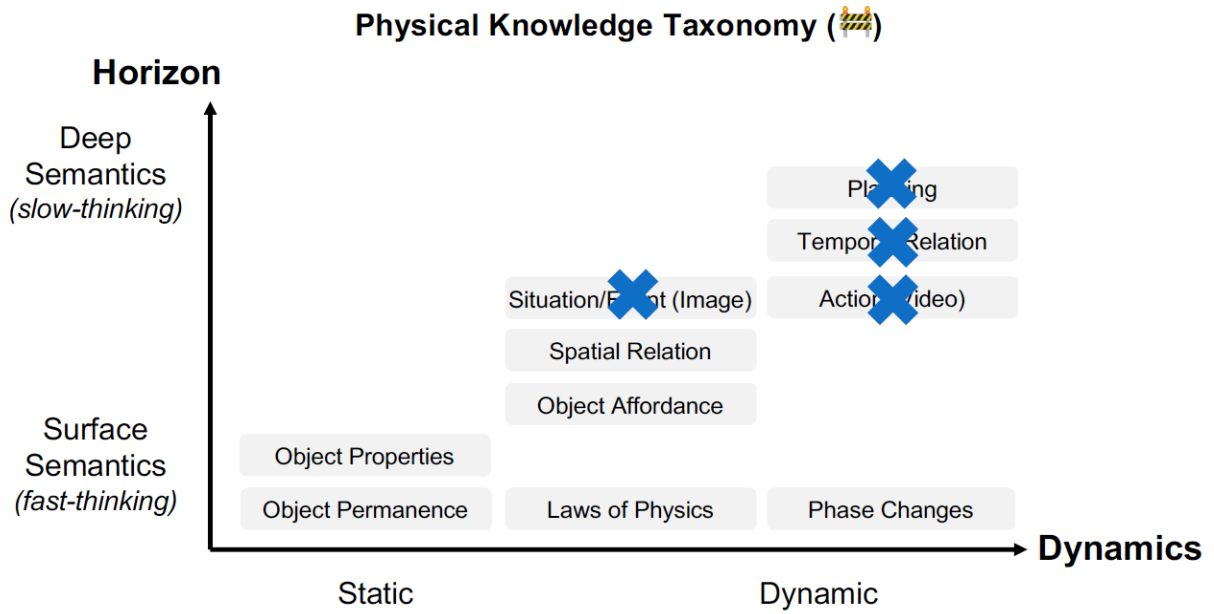
- Show your autograder result for each question in the report.
- Describe your algorithm for each question in the report.
  - Q1 – Logic Warm-up (2%)
  - Q2 – Logic Workout (2%)
  - Q3 – Pacphysics and Satisfiability (2%)
  - Q4 – Path Planning with Logic (2%)
  - Q5 – Eating All the Food (2%)

Source: https://inst.eecs.berkeley.edu/~cs188/sp24/projects/proj3/#q4-3-points-path-planning-with-logic

Modern Knowledge

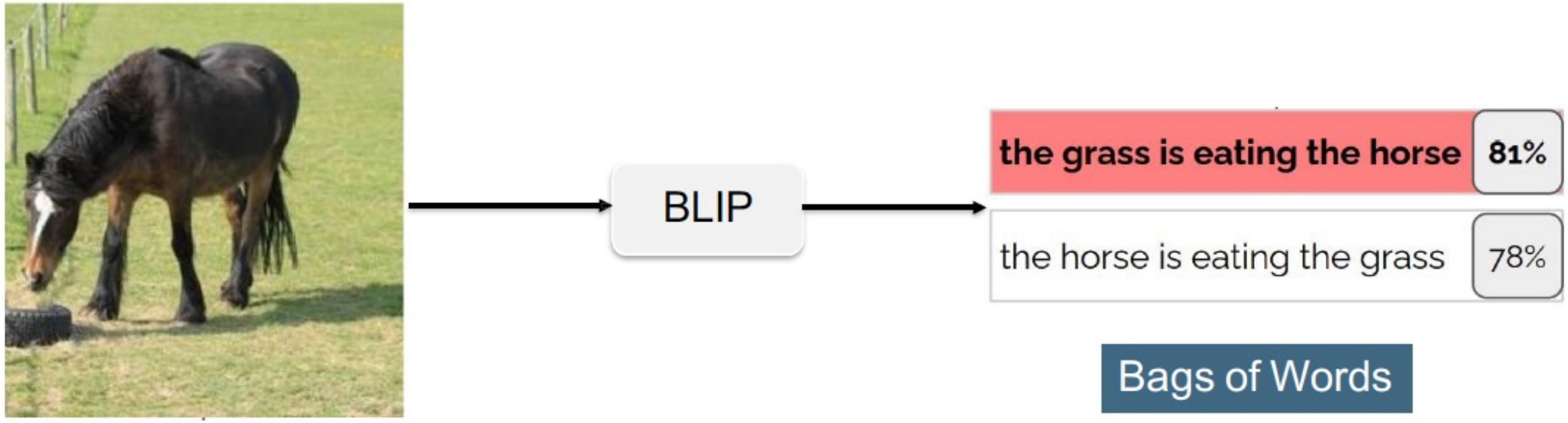
- Knowledge of modern large Vision-Language Models (VLMs).
- The machine still lacks ”Deep Semantics.”





Problems in Modern VLM models

- The machine still lacks ”Deep Semantics.”



Source: “When and why vision-language models behave like bags-of-words, and what to do about it” Mert Yuksekgonul, et al. (ICLR 2023)

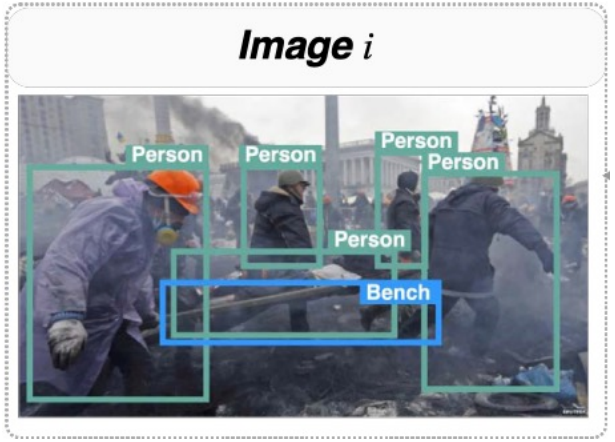
Questions According to Lecture

- Q1(8%). According to AI Weekly in the lecture, some experts and scholars such as Karl Friston and Yann LeCun believe: "You can't get to AGI with LLMs ." Nowadays, the prospects of LLM are so optimistic. Why do you think these experts have such ideas? Please elaborate on your views.
- Q2(8%). According to the paper "CLIP-Event: Connecting Text and Images with Event Structures," in CVPR 2022, after the process of generating the event-centric structured data, how does this work implement contrastive learning? Specifically, how does this work choose the positive and negative samples for contrastive learning?

"Deep Learning is Rubbish" — Karl Friston & Yann LeCun Face Off at Davos 2024 World Economic Forum

Denise Holt · Follow

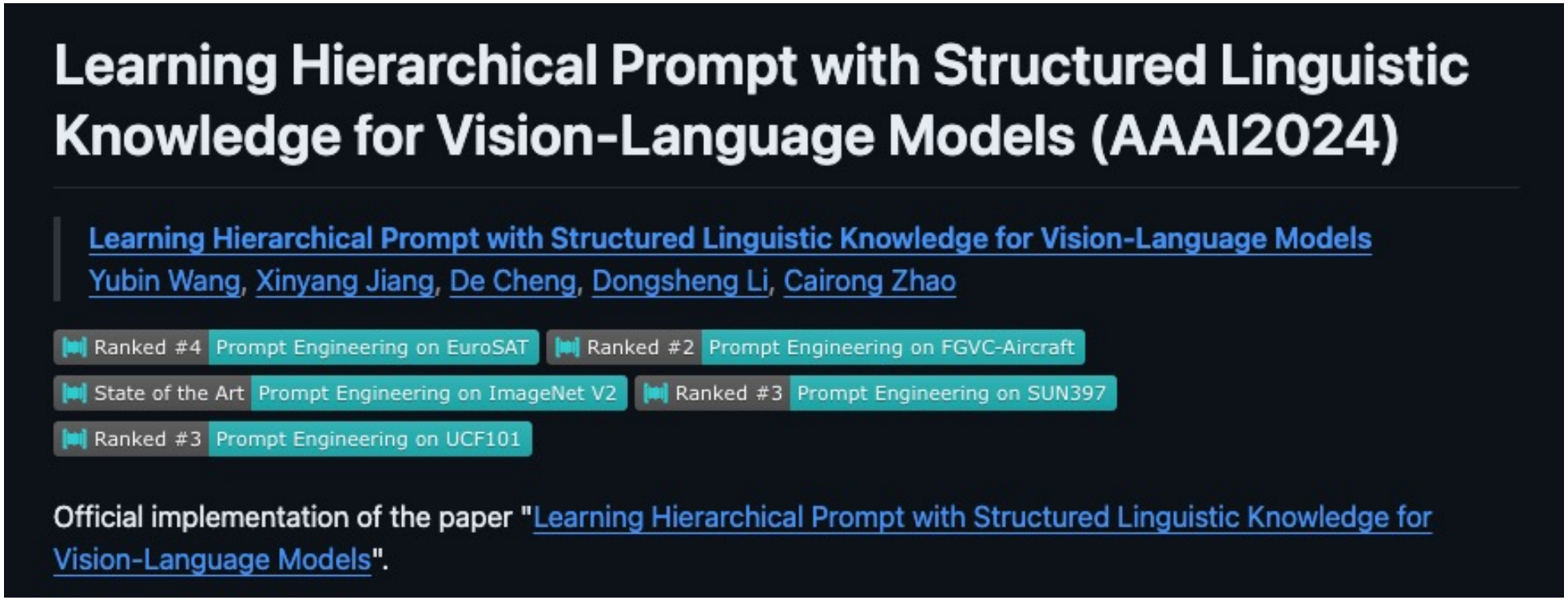
Published in *AI monks.io* · 14 min read · Jan 29, 2024



Event Type	Transport (carry)
Agent	protesters
Target	injured man
Instrument	stretcher

Structured Linguistic Knowledge

Paper: https://arxiv.org/abs/2312.06323
Repo: https://github.com/Vill-Lab/2024-AAAI-HPT/tree/main



Source: “Learning Hierarchical Prompt with Structured Linguistic Knowledge for Vision-Language Models” YuBin Wang, et al. (AAAI 2024)

Structured Linguistic Knowledge

- Steps for generating structured data for each class by using LLMs.

1. Class Names

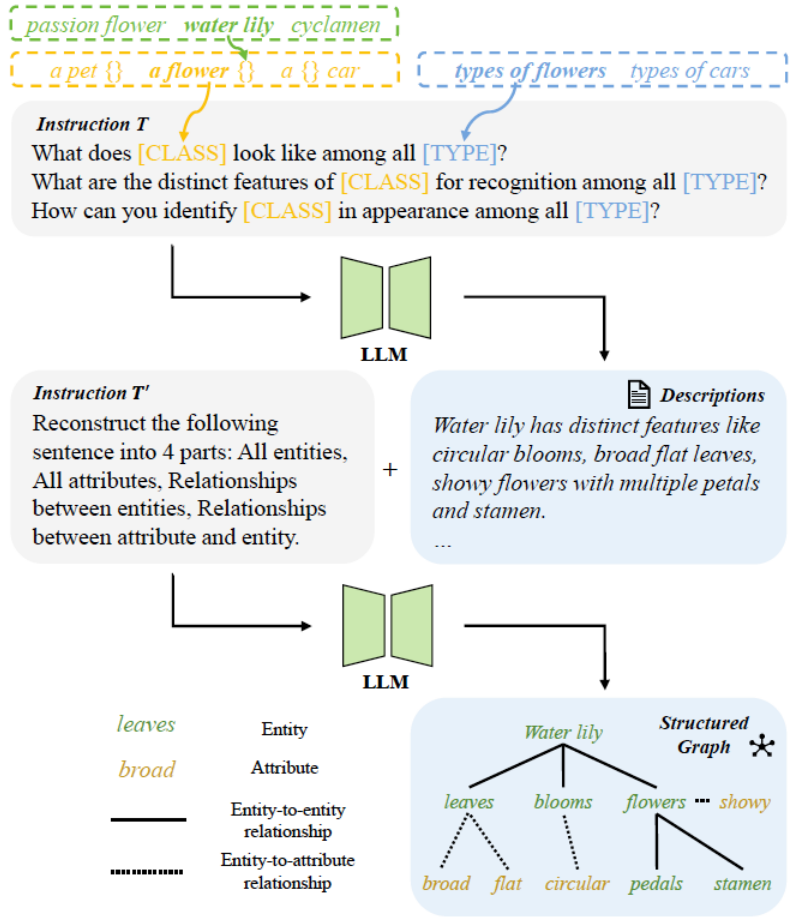
```
tench
goldfish
great white shark
tiger shark
hammerhead shark
electric ray
stingray
```

2. Descriptions

```
"tench": [
    "Tench is a freshwater fish with a long, slimy body, dark green color, and small sca
    "Distinct features of tench include long, slender body, dorsal fin reaching to the t
    "Tench can be identified by their cylindrical shape, olive green color, dark spots o
    "Tench have a dark green or brownish color with small, spiky fins and a rounded nose
    "The unique visual cue of tench fish is its dark green skin color with gold and brow
```

3. Structured data

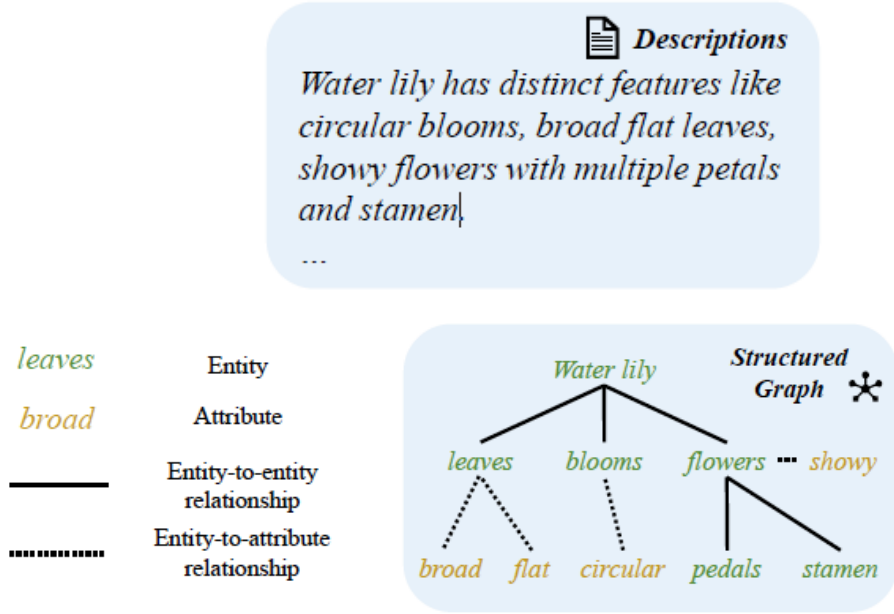
```
{
    "Entities": [
        "Tench"
    ],
    "Attributes": [
        "cylindrical shape",
        "olive green color",
        "dark spots on their sides",
        "barbels near their mouth"
    ],
    "Entity-to-Entity Relationships": [],
    "Entity-to-Attribute Relationships": [
        {
            "entity": "Tench",
            "relationship": "can be identified by",
            "attribute": "cylindrical shape"
        },
        {
```



Source: "Learning Hierarchical Prompt with Structured Linguistic Knowledge for Vision-Language Models" YuBin Wang, et al. (AAAI 2024)

Questions for Structured Linguistic Knowledge

- Q3(8%). Referring to the paper, what is the main problem with the current description of the VLM pre-training process? Please describe the steps to generate the structured graph-based data in this work.
- Q4(8%). Please select one of the datasets provided in this work and visualize **two categories**.
  - Path to the gpt-generated data: ./data/gpt_data
  - You must show the **corresponding description** and **two graph-based structured data components** for each category as shown on the right.
- Q5(8%). Based on current VLM auxiliary data improvement methods, such as the event-centric structure data in the lecture and the structured linguistic knowledge in this paper, what other deep semantic knowledge do you think humans possess that can be provided to VLM for learning?



Source: "Learning Hierarchical Prompt with Structured Linguistic Knowledge for Vision-Language Models" YuBin Wang, et al. (AAAI 2024)

Submission

- Deadline – 2024/04/24 (Wed.) 23:59
- Zip all files as **hw3_<student_ID>.zip**
- Submit to NTU COOL
- Your submission zip file should include the following files:
  - **hw3_<student_ID>.pdf**
  - **Your codes**


Any
Question
ai.ta.2024.spring@gmail.com