

# 2025 USA-NA-AIO Round 2, Problem 3, Part 1

USAAIO 

May 2025

## Problem 3 (100 points)

In this problem, you are asked to study **Contrastive Language-Image Pre-Training (CLIP)**, a powerful tool in multimodal AI.

```
# Run code in this cell
```

```
"""
```

```
DO NOT MAKE ANY CHANGE IN THIS CELL.
```

```
HINT: If something is not corrected installed, simply run this cell for few more  
"""
```

```
!pip install datasets transformers
```



### WARNING !!!

- Beyond importing libraries/modules/classes/functions in the following cell, you are **NOT allowed to import anything else for the following purposes**:
  - **As a part of your final solution.** For instance, if a problem asks you to build a model without using sklearn but you use it, then you will not earn points.
  - **Temporarily import something to assist you to get a solution.** For instance, if a problem asks you to manually compute eigenvalues but you temporarily use `np.linalg.eig` to get an answer and then delete your code, then you violate the rule.

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**Rule of thumb:** Each part has its particular purpose to intentionally test you something. Do not attempt to find a shortcut to circumvent the rule.

*# Run code in this cell*

"""

DO NOT MAKE ANY CHANGE IN THIS CELL.

"""

```
from PIL import Image
import numpy as np
import matplotlib.pyplot as plt
from tqdm import tqdm
```

```
import torch
import torch.nn as nn
import torch.optim as optim
from torch.utils.data import DataLoader, Dataset
```

```
from transformers import BertTokenizer, BertModel, ViTModel
```

**We will use flickr30k dataset to do image-language matching.**

*# Run code in this cell*

"""

DO NOT MAKE ANY CHANGE IN THIS CELL.

"""

```
from datasets import load_dataset
```

```
dataset_train = load_dataset("USAAIO/2025-Round2-Problem3", split='train')
```

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## Part 1 (5 points, coding task)

**Do the following tasks to explore the properties of `dataset_train` :**

1. `dataset_train` is a list-like object. Print the number of elements in it.
2. Consider index `idx = 2025` . Print the type of `dataset_train[idx]` .
3. Print all keys in `dataset_train[idx]` .
4. Name the value associated with the key `image` as `image_PIL` . Print it.
5. Convert `image_PIL` to a NumPy array object, called `image_np` . Print `image_np` and its shape.
6. Display this image by using `plt.imshow` .
7. Print the value associated with the key `alt_text` . Print its type.

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### WRITE YOUR SOLUTION HERE ###

```
print(len(dataset_train))

idx = 2025
print(type(dataset_train[idx]))
print(dataset_train[idx].keys())

image_PIL = dataset_train[idx]['image']
print(image_PIL)

image_np = np.array(image_PIL)
print(image_np)
print(image_np.shape)

plt.imshow(image_np)
plt.show()
```

[Skip to main content](#)

```
print(dataset_train[idx]['alt_text'])
print(type(dataset_train[idx]['alt_text']))

""" END OF THIS PART """
```

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