Stage 1: Preliminary Research and Working with Existing Models

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GitHub Repository: https://github.com/henryroeth/cpsc386-cv-project

What is Image Classification?

Using computer vision and machine learning algorithms to extract meaning from an image.

Key Concepts

- **Dataset:** A collection of labeled images used to train the model.
- **Semantic Gap:** The difference between how humans see an image and how computers process it.
- **Factors of Variation:** Changes in images such as viewpoint, lighting, and size that affect classification.

Types of Learning

1. **Supervised Learning:** Uses labeled images to train a model. If the model makes a mistake, we correct it until it learns properly.
2. **Unsupervised Learning:** Finds patterns in images without labels. This method is useful when labeling data is too expensive or time-consuming.
3. **Semi-Supervised Learning:** Uses a small amount of labeled data and a large amount of unlabeled data to improve learning.

Code Implementation

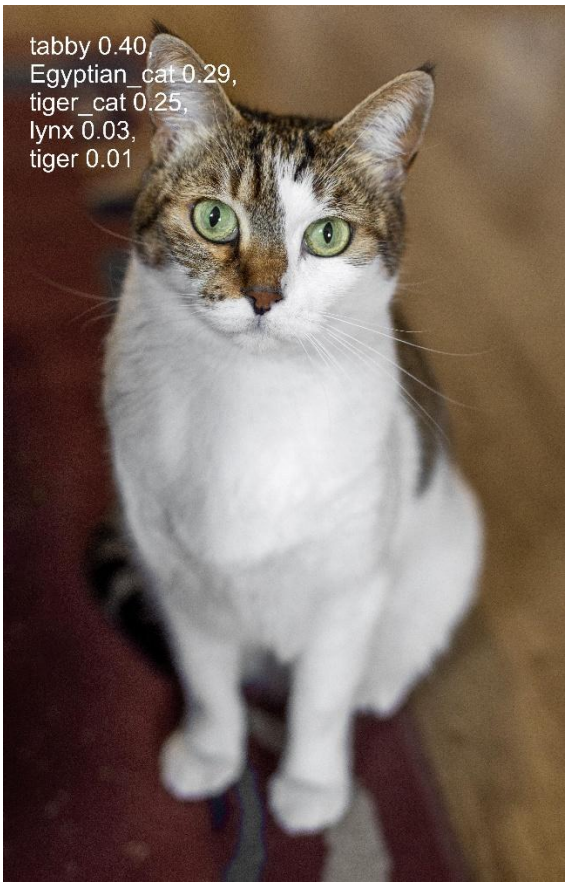
src > phase_1_testing.py > ...

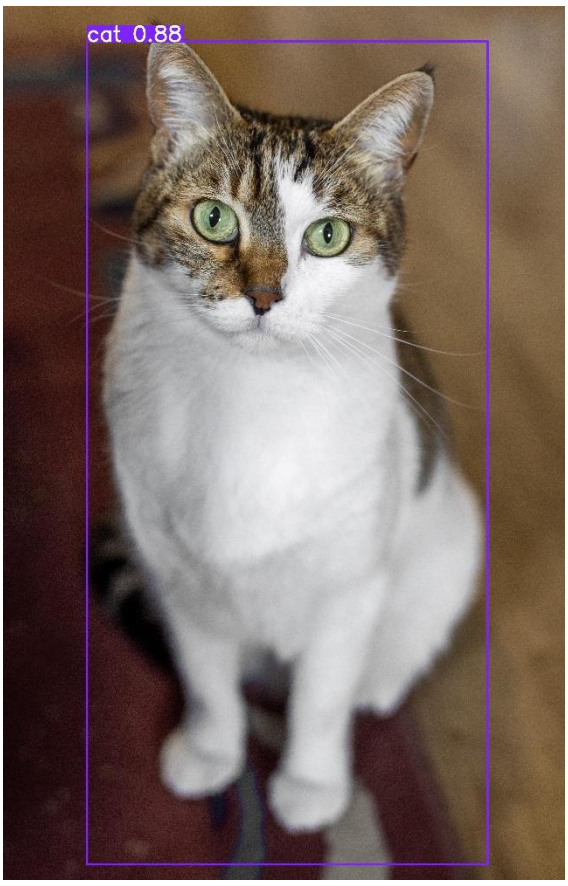
```python
from ultralytics import YOLO
from PyQt5.QtWidgets import QApplication, QFileDialog
import sys

# Choose a pretrained model for either detection or classification
modelChoice = int(input("Choose a type of model (1 for detection, 2 for classification): "))

# Load the chosen model
if(modelChoice == 1):
    model = YOLO("yolov8n.pt") # detection model
elif(modelChoice == 2):
    model = YOLO("yolo11n-cls.pt") # classification model

# Choose the path to the image file
app = QApplication(sys.argv)
source, _ = QFileDialog.getOpenFileName(
    None,
    "Select Image",
    "",
    "Image Files (*.png *.jpg *.jpeg *.bmp *.gif)"
)

# Run inference on the source
results = model(source, show=True) # list of Results objects

# Show the results of the first element
results[0].show()
```

Results


Labrador_retriever 0.71,
flat-coated_retriever 0.12,
Rottweiler 0.10,
Brabancon_griffon 0.01,
tennis_ball 0.01


dog 0.77


tabby 0.40,
Egyptian_cat 0.29,
tiger_cat 0.25,
lynx 0.03,
tiger 0.01


cat 0.88

References

1. **Image classification basics:** https://pyimagesearch.com/2021/04/17/image-classification-basics/#:~:text=Image%20classification%2C%20at%20its%20very,predefined%20set%20of%20possible%20categories
2. **Ultralytics code documentation (classification):** https://www.ultralytics.com/blog/how-to-use-ultralytics-yolo11-for-image-classification
3. **Ultralytics code documentation (detection):** https://www.ultralytics.com/blog/how-to-use-ultralytics-yolo11-for-obb-object-detection