



Research Engineer Test

ANGELSWING DEVELOPMENT TEST

Description

Due Date: Seven days (168 hours) from the date of assessment received.

Written Response Questions

1. After training a deep learning model for multiple-class object detection, how would you approach fine-tuning to improve its performance? Discuss the strategies you would use for adjusting hyperparameters and optimizing the model's accuracy on a validation set (Max 300 words)
2. You have a dense point cloud from a laser scan. Imagine this as a bunch of points on a 3D surface. Each point would have a normal vector on a smooth surface. Develop a basic algorithm to estimate the normal vector at each point in the point cloud.
3. You are given points that define a complex polygon, such as a detailed coastline. Your task is to simplify this polygon by reducing the number of points while maintaining its general shape and characteristics.

Describe two different algorithms that can accomplish this polygon simplification. Your description should include:

1. The main idea behind each algorithm
2. How each algorithm decides which points to keep or remove
3. The advantages and potential drawbacks of each approach

For example, Consider consider simplifying a coastline polygon with hundreds of points into a simpler representation with fewer points, while still preserving its recognizable shape. (You may include pseudocode, basic implementations of one or both algorithms)

Development Test

Task:

You are given a dataset of aerial images containing six classes: 'car', 'house', 'road', 'swimming pool', 'tree', and 'yard'. Your objectives are as follows:

1. Train a Model: Develop and train a machine learning model to detect and classify objects into the six specified classes.

2. Create an API: Develop an API that can accept an image, detect and classify objects, and return the predictions along with bounding box coordinates for each detected object. This image is a high-quality drone image with geolocation data (EXIF, XMP).

Request

```
curl --request POST 'http://localhost:5000/predict'
--data-raw '{
  "image_path": "<string>"
}'
```

Response:

```
{
  "prediction" : [
    {
      "label": "<string>", // "car", "house", "road", "swimming pool",
                        //"tree", or "yard"
      "confidence" : "<float>", // between 0.0 ~ 1.0
      "bbox": "<list of coords>" // [x_min, y_min, x_max, y_max]
    }
  ]
}
```

Dataset:

<https://drive.google.com/drive/folders/1x3ji-aHef5Oz1kdxUZaEX2mSSADmPp8KI?usp=sharing>

Submission:

Development Test

- Leave git commit to the smallest unit.
- Invite the following reviewers as collaborators to your GitHub Repository
 - GitHub ID: Aayushma2021 (aayushma@angelswing.io)
 - GitHub ID: shrjakdahal (shrjak@angelswing.io)
- If you couldn't complete everything by the given due date, **please submit any progress that you have made up to that point. Partial Submissions are allowed.**

However, you are required to specify that the submission is incomplete in the README of the repository. Please also include what parts of the tests you were not able to complete.

Written Response

- Type up your answers for the Written Response Questions and submit a PDF or txt document. Upload the file to the same GitHub repo as the development test.

If you have any questions, please email aayushma@angelswing.io