مسابقة الإمارات للتكنولوجيا والابتكار
EMIRATES TECHNOLOGY & INNOVATION COMPETITION

مهارات الإمارات
EmiratesSkills

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Technical Description

Artificial Intelligence

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1. INTRODUCTION

During this contest, students are required to utilize machine learning algorithms to construct usable models to identify and classify objects from real image datasets. Students are expected to be able to handle image datasets and extract relevant images and features to appropriately train their constructed models. In addition, they are expected to use and fine-tune existing machine learning algorithms such as Support Vector Machine (SVM), decision trees (Random Forest), K-nearest neighbor algorithm, deep neural networks and others. The constructed models should hold high classification accuracy, precision, recall, sensitivity, and specificity for mass deployment.

1.1. Theme

Determine images with trees in them


2. Contest Environment

2.1. OpenImage Dataset:

The contestants will be provided with a real dataset, which they can choose images from to train their models and extract features. The dataset is used Google's AI competition for object detection.

2.2. MATLAB

The contestants will use MATLAB 2017b during the competition to process the given datasets, run and train machine learning models, and analyse the performance of constructed models. MATLAB's classification learner application can be used in addition to existing examples to run the algorithms.

3. COMPETENCY SPECIFICATION

The contest will run for three days, each with two sessions and a lunch break:

- 9:00 to 1 pm - First session
- 1:00 to 2:00 - Lunch
- 2:00 to 5 pm - Second session

3.1. Day 1:

1. Introductory Day (Object Detection)

The students will get familiar to different machine learning algorithms namely Random Forest (RF), Support Vector Machine (SVM), and Convolutional Neural Networks. They will utilize these algorithms to train models using real datasets and predetermined parameters and analyze their performance.

3.2. Day 2:

1. Generate the Dataset and Build Models:

The students are expected to create their own datasets according to given requirements and extract the required features to be able to generate a model that meets given time and performance specifications.

3.3. Day 3:

1. Deep Learning for Detection:

The students are required to play with the features used in the model training and run a deep learning algorithm to be able to detect and identify multiple objects. The students are encouraged to use images collected from the competition venue

4. RULES & REGULATIONS

4.1. Judging Criteria

The submitted models will be evaluated based on some of the below metrics:

- **Classification accuracy:**
  - The ratio of number of correct predictions to the total number of input samples. Affected by how correct is the training set selected.

$$Accuracy = \frac{Number\ of\ Correct\ predictions}{Total\ number\ of\ predictions\ made}$$

- **Confusion matrix:**
  - A matrix as output that describes the complete performance of the model.

- **True Positives** : The cases in which we predicted YES and the actual output was also YES.
- **True Negatives** : The cases in which we predicted NO and the actual output was NO.
- **False Positives** : The cases in which we predicted YES and the actual output was NO.
- **False Negatives** : The cases in which we predicted NO and the actual output was YES.
- **Matrix accuracy:**

$$Accuracy = \frac{TruePositives + FalseNegatives}{TotalNumberofSamples}$$

- **Sensitivity:**
  - True Positive Rate corresponds to the proportion of positive data points that are correctly considered as positive, with respect to all positive data points.

$$TruePositiveRate = \frac{TruePositive}{FalseNegative + TruePositive}$$

- **Specificity:**
  - False Positive Rate corresponds to the proportion of negative data points that are mistakenly considered as positive, with respect to all negative data points.

$$FalsePositiveRate = \frac{FalsePositive}{FalsePositive + TrueNegative}$$

- **Precision:**
  - It is the number of correct positive results divided by the number of positive results predicted by the classifier.

$$Precision = \frac{TruePositives}{TruePositives + FalsePositives}$$

- **Recall:**
  - It is the number of correct positive results divided by the number of *all* relevant samples (all samples that should have been identified as positive).

$$Precision = \frac{TruePositives}{TruePositives + FalseNegatives}$$

4.2. General Rules

- Any team attempting to communicate with another team, to tamper with the machines, or disrupt the contest environment in any way will be disqualified.
- The participants shall agree to allow the organisers to publish their names as well as photos and videos in which they appear.
- No visitors will be allowed in the competition room.
- The main language of the contest is English and all the provided systems and materials are in English.
- The use of Internet is allowed.
- Teams are ranked according to points earned during their model assessment and task completion time and judged based on the highest score
- Contestants requiring any kind of help should remain seated while being assisted by a contest staff.