Project McNulty

Parking Lot Image Classification with OpenCV

Introduction

Growing interest in analyzing satellite imagery

Parking lot imagery is highly beneficial for:

Retail Consumers: Knowledge of parking density

Real Estate Companies: Understanding parking time series and lost revenues

Image classification conducted using OpenCV package in Python

A reasonable accuracy score and scalable app can create innumerable benefits to consumers.

Data Understanding

12,000 images (1280x720) of the same parking lot at Safeway (Chicago, IL)
3 Weather Conditions: Sunny, Rainy and Cloudy

Sift Points and OpenCV

Scale Invariant Feature Transform to find car edges within a parking lot.

Adjust radius, edge and contrast threshold to re-engineer SIFT points for vehicle identification.

Each image generated approximately 2000 SIFT points with coordinates

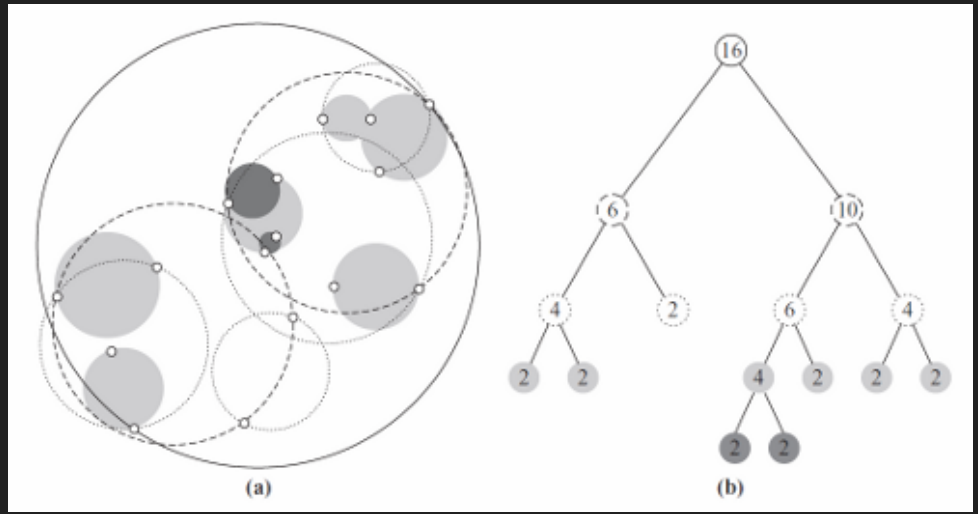
Spatial Classification Algorithm Selection

Both **KD-Tree** and **Ball Tree** implement k-neighbor and bounded neighbor searches

Trees implement fast kernel density (KDE) to count SIFT point density

Ball tree has the additional option of setting a radius around the car for KDE selection

Ball Tree Example



Model Classification & Overfitting

Accuracy Score: **95.3%** **(TP + TN) / Total**

Recall Score: **93.4%** **TP / (TP + FN)**

Precision Score: **72.2%** **TP / (TP + FP)**

High number of False Positives and **Low** False Negatives is actually **beneficial**

Average over prediction at 19.7%

Final Product

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localhost:5000