Roundabout Detection In Satellite Images

Machine Learning

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Introduction

- Problem Definition
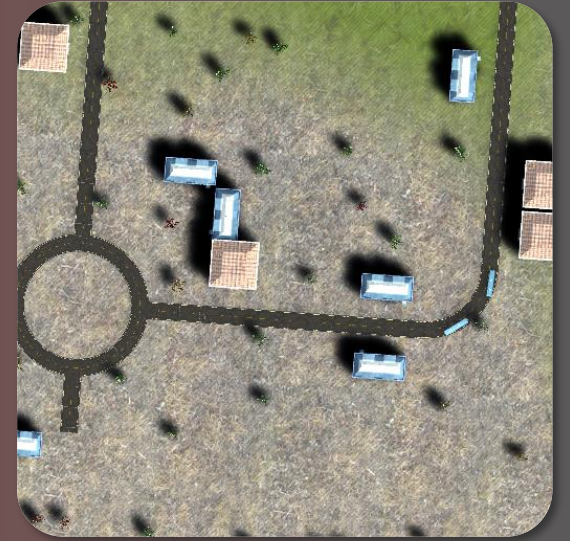- Objective
- Research question

Previous methods

- Circular Hough Transform

- CNN (Convolutional Neural Network)

- Faster R-CNN (Region based Convolutional Neural Network)

- SSD (Single Shot Multi-Box Detector)

Dataset generation

- Generated images (30,000) →
  Train: 80%, Validation 10%, test 10%

- Real images (400) →
  Train: 304, Validation: 76, Test: 20

Architecture- and algorithm selection

- Convolutional neural network

- Histogram of oriented gradients with NN
  - Preprocessing: 512x512, greyscale, HoG
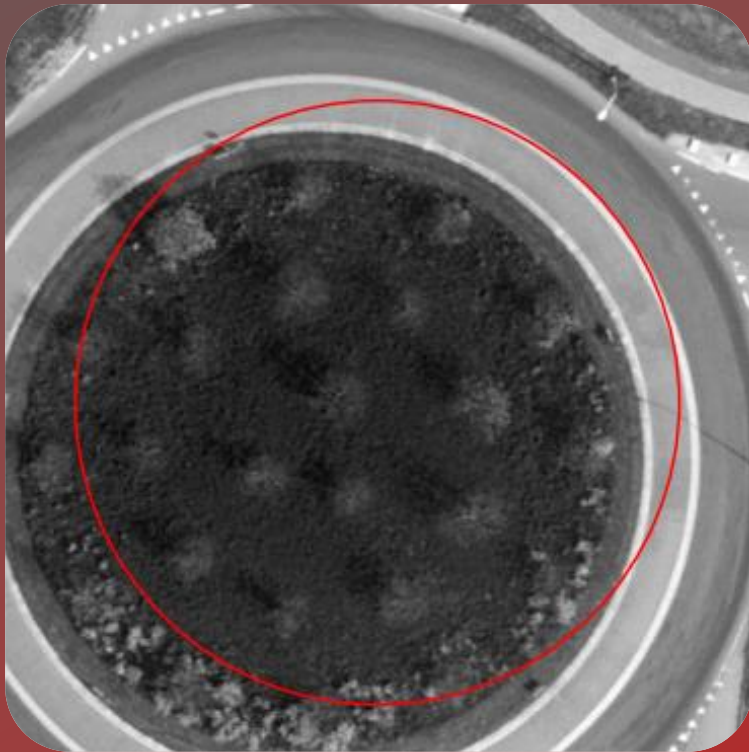 - 5 layers: Input,128,64,32,output
  - ReLU, Adam, no regularization
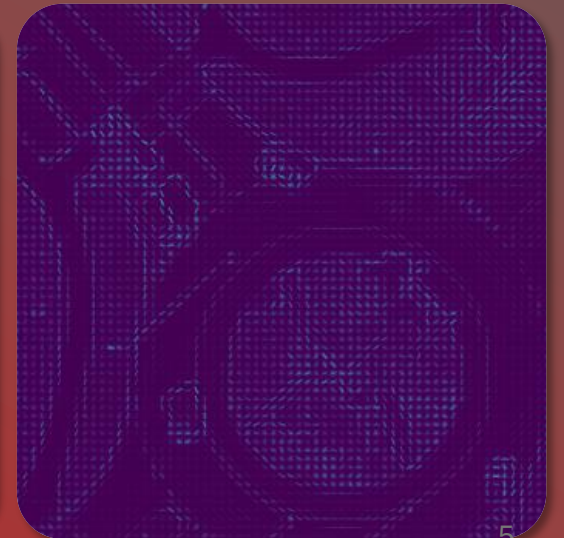
Model assessment

- RMSE
- Visual check-up criteria

Results

- RMSE of 21.39 pixels on test set
- Worse for artificial images

Discussion

- Input image size limitation 512x512
- Reliability final performance

New foundings

- Matlab CNN
- VGG-16
- Separate radius estimation
- RMSE: 19,95 → 12,54
- 75% accurate, ±10% tolerance

Conclusion and recommendation

- RMSE of 19,95 pixels

- Expand real images dataset

- Not sufficient yet to be used in application