IMAGE CLASSIFICATION WITH MINIMAL KNOWLEDGE OF MACHINE LEARNING

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About Author

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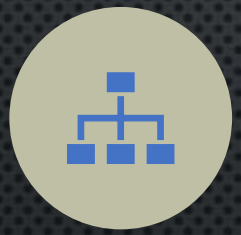
Overview

- Introduction to Image classification
- Convolutional Neural Network
- Custom vision service
- Model design and evaluation

IMAGE CLASSIFICATION FIELD



IMPORTANCE OF IMAGE CLASSIFICATION

FINDING SPECIAL FEATURES

NEURAL NETWORKS

MODEL BUILDING FOR SEVERAL FIELDS

TRAFFIC SIGNS CLASSIFICATION

CUSTOM VISION SERVICE

- COGNITIVE SERVICE HOSTED IN AZURE
- CLOUD BASED API
- TASKS:
  - IMAGE CLASSIFICATION
  - OBJECT DETECTION
- TAGGING IMAGES

Image URL

Enter Image URL

or

Browse local files

File formats accepted: jpg, png, bmp
File size should not exceed: 4mb

Using model trained in

Iteration

Iteration 2

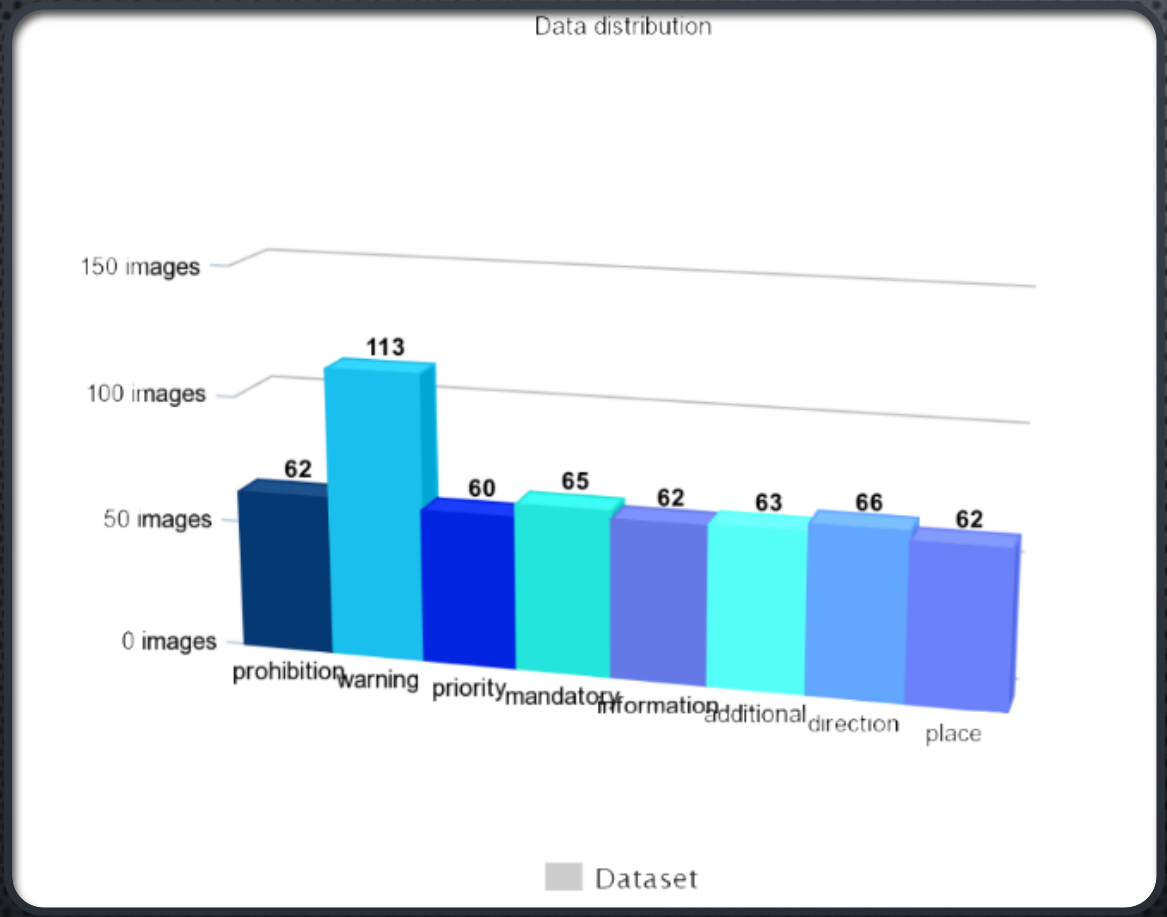
Predictions

Tag	Probability
warning	99.5%
additional	6.9%
priority	1.4%
information	0.3%
direction	0.1%
mandatory	0%

DATASET

- Traffic signs' classification
- A set of 360 images
- Training set : test set = 3 : 1
- Multiple tags per image
  - Additional
  - Direction
  - Information
  - Warning
  - Mandatory...

DATASET



- Several rounds of training
- Making several adjustments for proper balance of images per tag

MODEL EVALUATION

- Precision rate = 92,1%
- Recall rate = 71,9%
- Probability threshold's rate impact

Probability threshold	Precision rate	Recall rate
0 %	15,3 %	100,0 %
10 %	53,3 %	91,2 %
20 %	72,5 %	87,7 %
30 %	80,8 %	85,1 %
40 %	88,3 %	79,8 %
50 %	92,1 %	71,9 %
60 %	97,4 %	64,9 %
70 %	98,6 %	59,6 %
80 %	98,3%	50,0 %
90 %	97,7 %	36,8 %

MODEL EVALUATION

- Precision rate = 92,1%
- Recall rate = 71,9%
- Probability threshold's rate impact

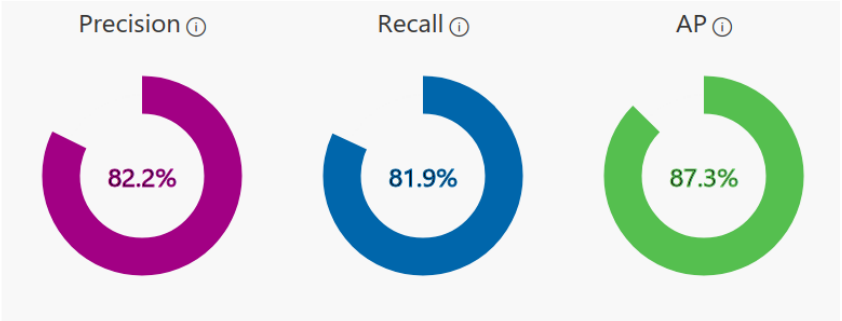
Probability threshold	Precision rate	Recall rate
0 %	15,3 %	100,0 %
10 %	53,3 %	91,2 %
20 %	72,5 %	87,7 %
30 %	80,8 %	85,1 %
40 %	88,3 %	79,8 %
50 %	92,1 %	71,9 %
60 %	97,4 %	64,9 %
70 %	98,6 %	59,6 %
80 %	98,3%	50,0 %
90 %	97,7 %	36,8 %

TEST SET

- SINGLE SIGN PER IMAGE
- MULTIPLE SIGNS PER IMAGE

MODEL EVALUATION ON TEST SET

- ITERATION 1:
  - PRECISION = 82,2%
  - RECALL RATE = 71,9%
- AJUSTMENTS NEEDED – MODEL NOT PROPERLY BUILT
- BALANCING NEEDED

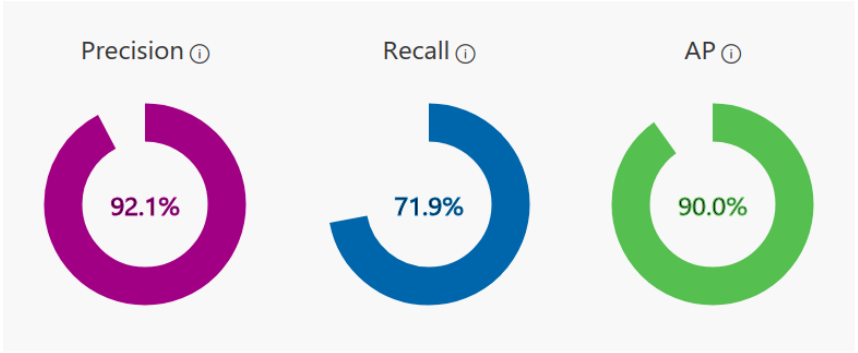


Performance Per Tag

Tag	Precision	Recall	A.P.	Image count
prohibition	93.4%	93.4%	88.8%	62
warning	89.0%	89.3%	95.9%	113
place	88.2%	97.2%	96.8%	29
information	82.6%	72.0%	78.5%	64
direction	81.3%	84.5%	81.8%	37
priority	78.7%	78.8%	87.2%	52
mandatory	72.2%	93.3%	86.0%	19
additional	65.0%	56.9%	58.2%	63

MODEL EVALUATION ON TEST SET

- ITERATION 2:
  - PRECISION = 92,1%
  - RECALL RATE = 71,9%
- GREAT ACCURACY FOR SINGLE TRAFFIC SIGNS
- ANOTHER ITERATION NEEDED FOR SEVERAL SIGNS PER IMAGE AND SEVERAL OBJECTS IN FRONT



Performance Per Tag

Tag	Precision	Recall	A.P.	Image count
warning	100.0%	95.7%	99.7%	113
priority	100.0%	58.3%	84.4%	60
place	100.0%	84.6%	100.0%	62
mandatory	100.0%	84.6%	91.5%	65
prohibition	92.3%	92.3%	96.3%	62
information	83.3%	38.5%	70.5%	62
additional	83.3%	35.7%	82.2%	63
direction	69.2%	69.2%	78.8%	66

REFERENCES

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THANK YOU!