Affine Transformations Correction

UPC - DLCV Seminar ‘18

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Overview

1. Introduction
2. Model
3. Results with MNIST
4. Results with GTSRB
5. Conclusion

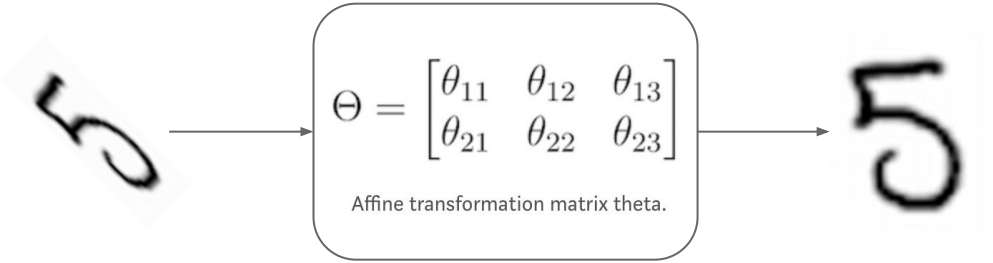
1.
Introduction

Motivations

- Images are normally not perfectly aligned and centered on the region of interest.
- Image correction by affine transformations would ease classification tasks and improve accuracy of the models.

Affine Transformations

- Function between affine spaces which preserves points, straight lines and planes

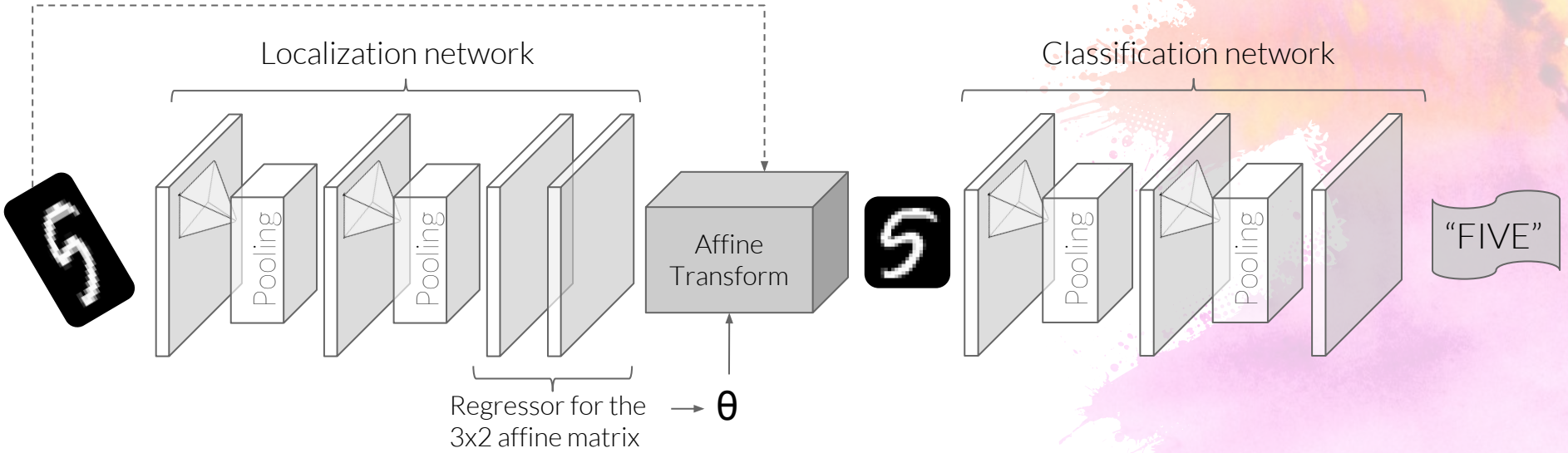


2.
Model

Data preprocessing

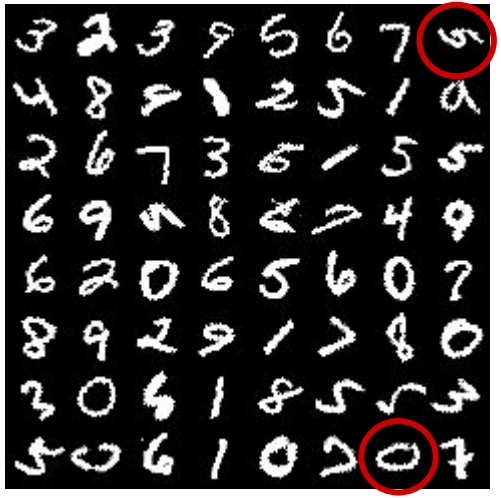
- Perform a random rotation to dataset instances
  - Images in our datasets are in origin slightly distorted → Distortion increased
- Grayscale (if needed)
- Reshape images to 28 x 28 squares (if needed)
  - Different image sizes (from 15x15 to 250x250)
  - Different image shapes (not only squared)

The Spatial Transformers model

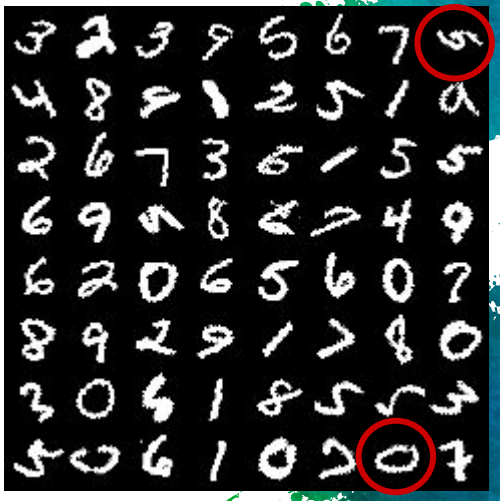


3.
Results with MNIST

Without ST



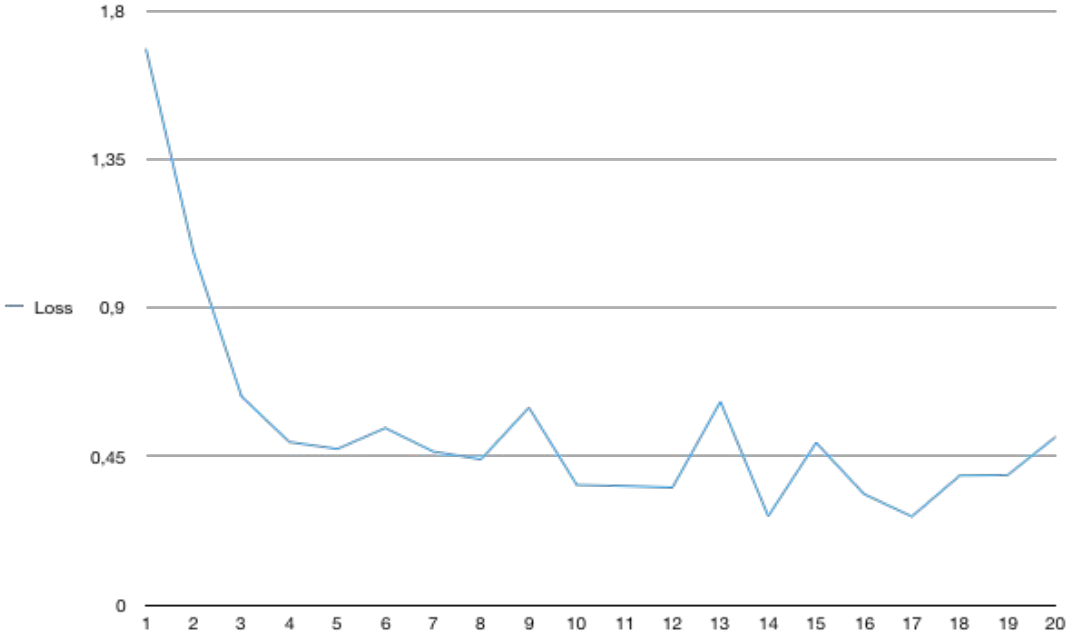
Input: distorted dataset



Output: non-rectified dataset

Without ST

- Accuracy: 96%



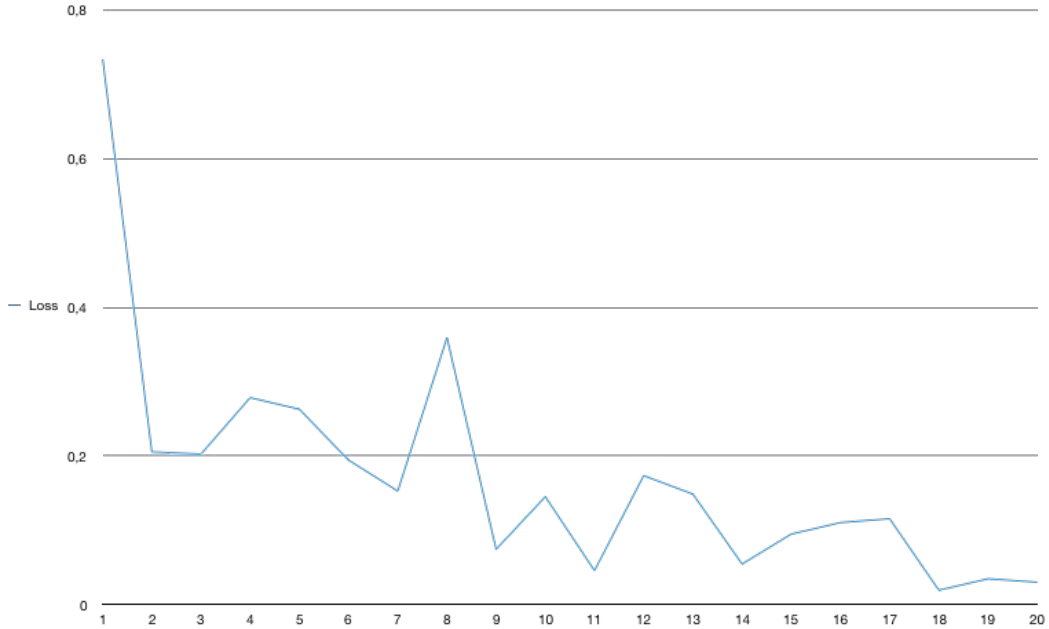
With ST

Input: distorted dataset

Output: rectified dataset

With ST

- Accuracy: 99%



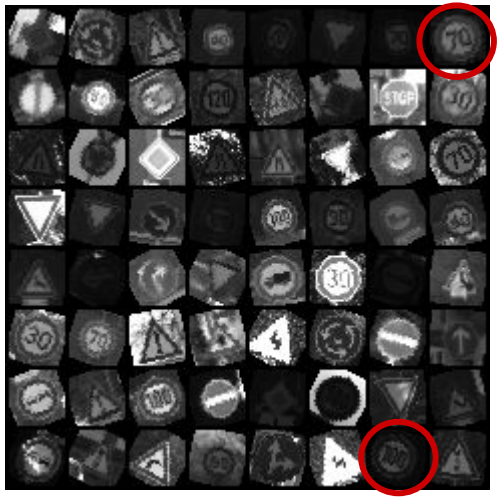
4.

Results with GTSRB

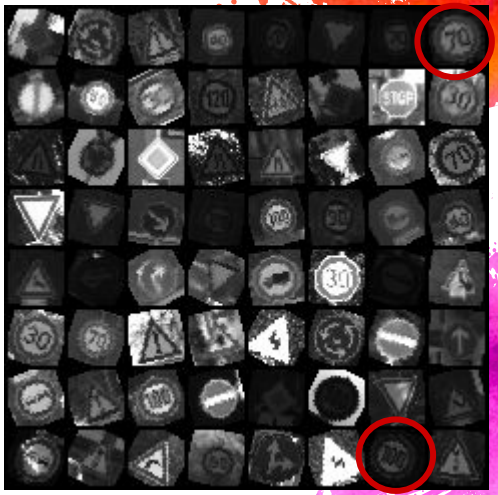
(German Traffic Sign Detection Benchmark)

Without ST

- × Accuracy: 56%



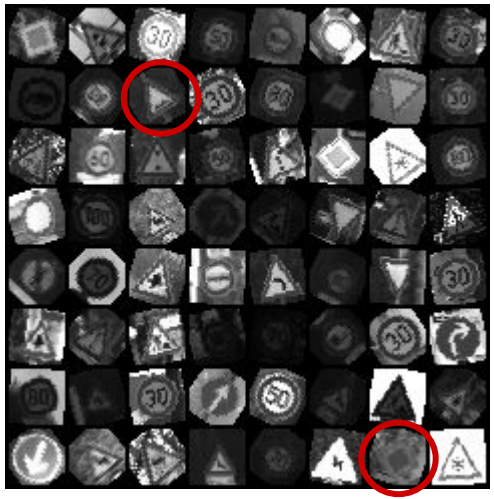
Input: distorted dataset



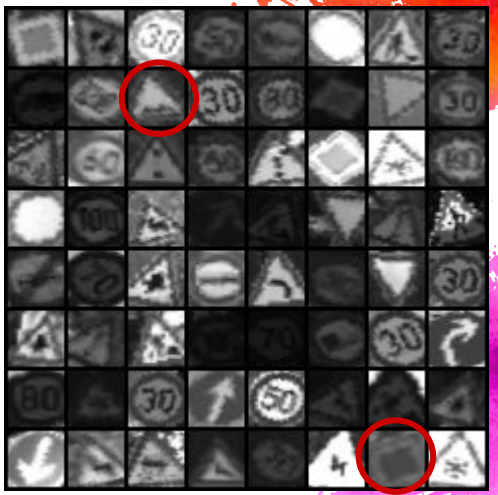
Output: non-rectified dataset

With ST

- Accuracy: 61%

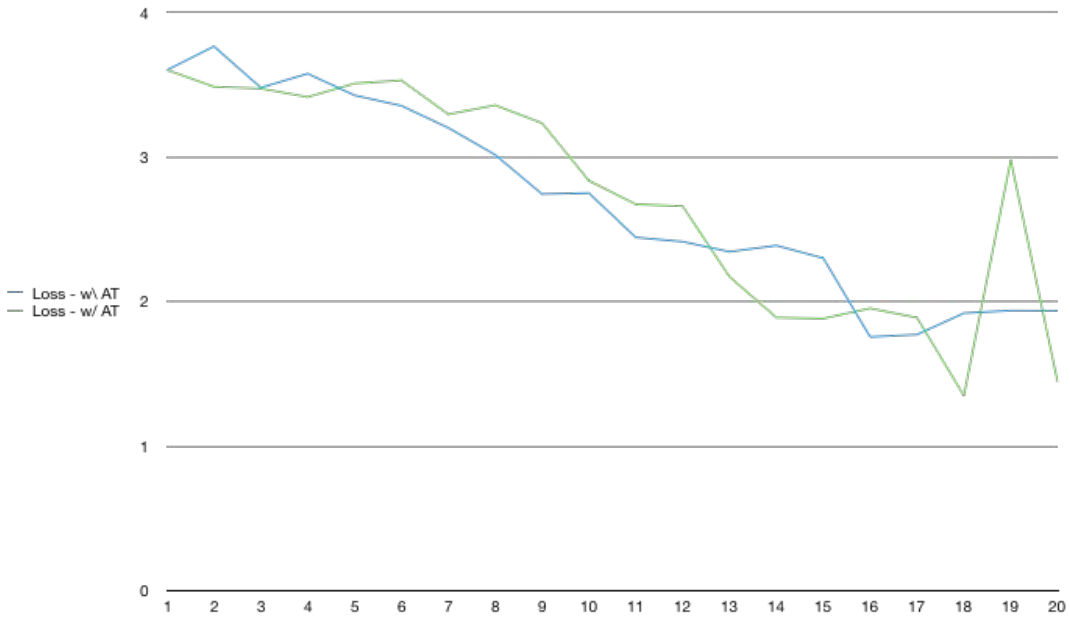


Input: distorted dataset



Output: rectified dataset

Comparison


Loss - w\ AT
Loss - w/ AT
4
3
2
1
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

5.
Conclusions

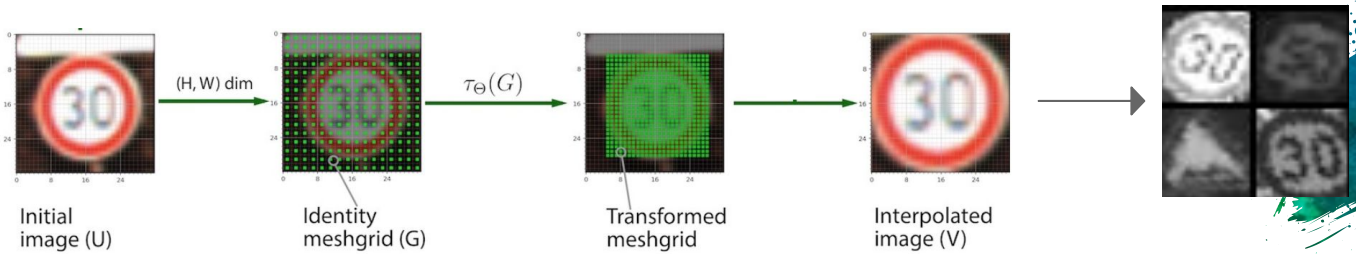
Classification scores

		Without ST	With ST
MNIST	Loss	0.1117	0.0381
	Accuracy	0.96	0.99
GTSRB	Loss	1.6403	1.5792
	Accuracy	0.56	0.61

Conclusions

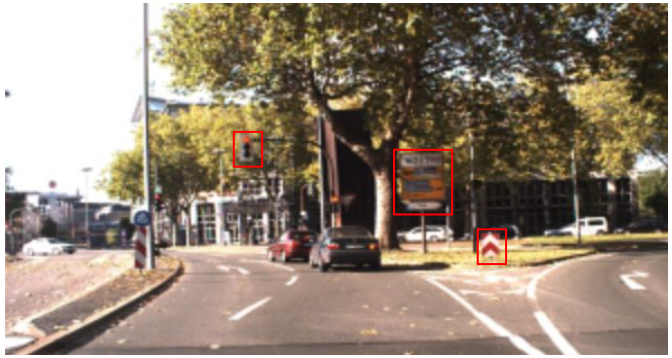
- MNIST → Corrects rotation

- GTSRB → Zooms to interest area (can't understand rotation)



Future research

- More complex features extractor
- Different ground truth: image pairs
- Work with GTSBD Database



Thanks!

Any questions?