

Learning and Adaptivity

- Assignment 02 -

Evolved Feature Ensemble Learning

Bastian Lang

April 18, 2016

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1 PART I - QUESTIONS ABOUT THE PROJECT

1.1 WHAT DID THEY DO?

- Replication of the work of [1]
- Automatically construct features for image classification using evolutionary techniques
- Perform image transformation on image set
- Use transformed images within weak classifier (perceptron)
- Combine weak classifiers using Adaboost
- Set of image transformations form the single individuals

1.2 WHICH MACHINE LEARNING APPROACHES DID THEY APPLY?

- Perceptron
- Evolutionary Algorithm
- Adaboost (Adaptive Boosting)

1.3 WHAT DATA SET AND WHICH FEATURES DID THEY USE?

256 90X59 pixel images, half of leaves and half of airplanes, both on noisy backgrounds.

1.4 WERE THEY SUCCESSFUL AT WHAT THEY WERE ATTEMPTING?

Yes. In every run a strong classifier with a 100% recognition rate could be found.

2 PART II - QUESTIONS REGARDING YOUR THOUGHTS ON THE PROJECT

2.1 WHY DID YOU CHOOSE TO READ THIS PROJECT REPORT?

The authors are both interested in evolutionary strategies and neural networks and this work itself includes evolutionary strategies. I am very interested in this field myself.

2.2 DID YOU LEARN ANYTHING BY READING THIS PROJECT REPORT? IF YES: WHAT?

The report was not detailed enough and I am familiar with the basics of the used algorithms, so no.

2.3 WHAT WAS THE MOST USEFUL GRAPHIC DISPLAYED IN THE PROJECT REPORT?

See figure 2.1.

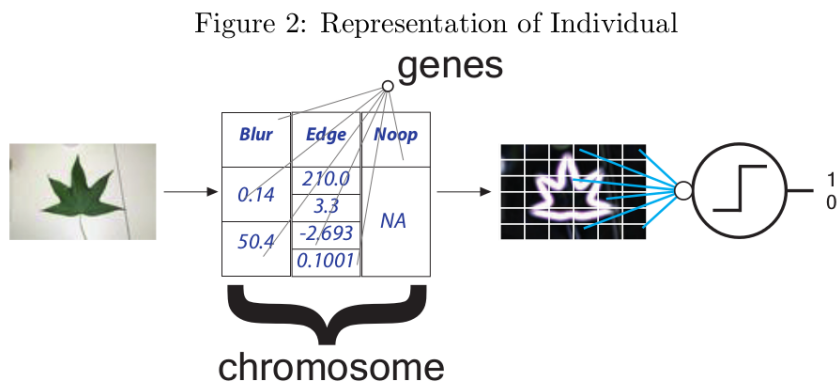


Figure 2.1: Most helpful figure

2.4 WHAT WAS THE MOST EYE CATCHING GRAPHIC DISPLAYED IN THE PROJECT REPORT?

See figure 2.2.

Figure 6: Sample Perceptron Weights

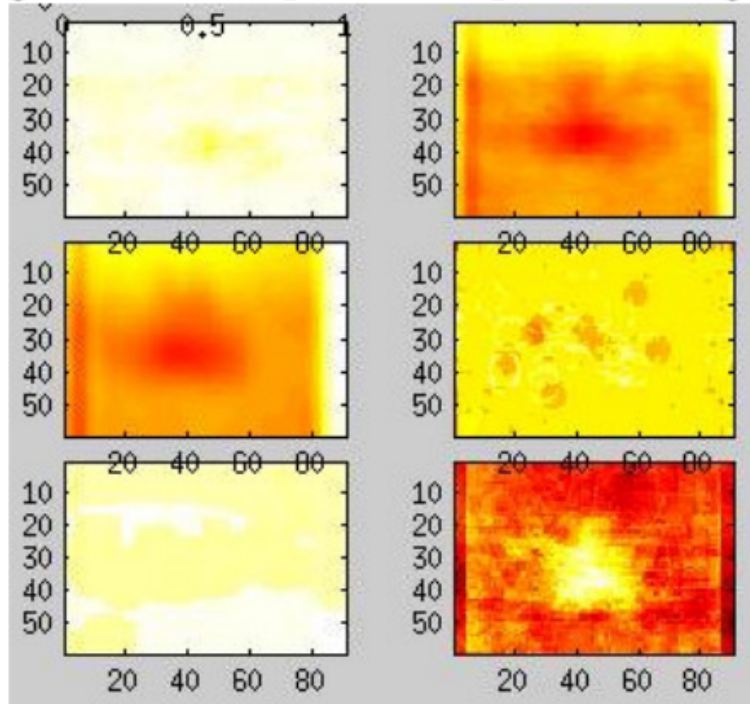


Figure 2.2: Most catching figure

2.5 DID YOU FIND IT INTERESTING? WHY OR WHY NOT?

I haven't seen the combination of EA and Adaboost before, so it was interesting.

3 PART III - WHAT WOULD YOU DO DIFFERENTLY

3.1 WOULD YOU ACCEPT THE TASK (OF IMPROVING THE WORK DONE)?

Yes

3.2 WHAT WOULD YOU DO DIFFERENTLY?

As the authors suggested the EA is not applied as it should have been. It evolves the weak classifiers which then get combined to form a strong one. The strong classifier should be included in the EA as well.

3.3 WHY DO YOU EXPECT BETTER RESULTS?

This approach would focus more on finding weak classifiers that are good in cooperating with other weak classifiers instead of just being evaluated on their own.

3.4 HOW LONG WOULD YOU ESTIMATE IT WOULD TAKE YOU TO IMPROVE UPON THE PREVIOUS RESULTS?

Full time and motivated? 2 weeks?

3.5 HOW MUCH OF AN IMPROVEMENT WOULD YOU ESTIMATE YOU'D BE ABLE TO ACHIEVE?

The authors used a simple data set so the gain would probably be small on this data. On other data I don't know how this algorithm would perform, so I am not able to give an estimate.

3.6 VISUALIZATION OF DATA SET

No data set available.

REFERENCES

- [1] Kirt Lillywhite, Dah-Jye Lee, Beau Tippetts, and James Archibald. A feature construction method for general object recognition. *Pattern Recognition*, 46(12):3300–3314, 2013.