



Aalto University
School of Science
and Technology

Multilabel classification through structured output learning

Hongyu Su

Department of Computer Science
School of Science, Aalto University
hongyu.su@aalto.fi

March 24, 2015

content

- ▶ machine learning
- ▶ single label classification
- ▶ multilabel classification
- ▶ structured output learning
- ▶ future work
- ▶ what can we do



Example: dog vs. cat?

- ▶ We have 5000 pictures of dog and 5000 pictures of cat.



- ▶ Computer digitalize each picture into 100×100 pixels.
- ▶ Given a new picture, we want to answer: is it a dog or a cat?
- ▶ Simple task for human, dog, or cat.
- ▶ Golle (2008) claimed this is a difficult task for machines with only 82.7% accuracy.
- ▶ In 2013, 98.5% accuracy was reported in a Kaggle competition (<https://www.kaggle.com/c/dogs-vs-cats>).

In human verification system

- ▶ Is the human verification system safe from machine learning attack.
 - ▶ CAPTCHA vs. ASSIRA



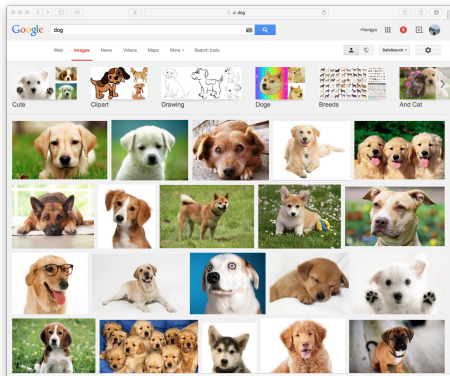
Assira

Assira is a human interactive proof that asks users to identify photos of cats and dogs. It's powered by over **two million photos** from our unique partnership with [flickr.com](https://www.flickr.com/photos/assira/). Protect your web site with Assira - free!



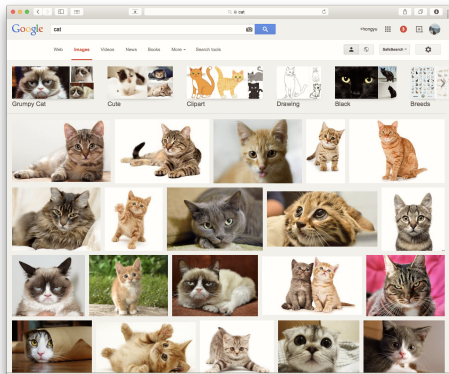
In search engine

- ▶ If machine can assign correct attribute to all pictures, we can search pictures by attributes.
- ▶ Search all cat pictures.



In search engine

- ▶ If machine can assign correct attribute to all pictures, we can search pictures by attributes.
- ▶ Search all dog pictures.



Single label classification



Future work



To get benefit?

- ▶ Fingerprint identification
- ▶ Voice recognition
- ▶ Information assistant

To contribute?

- ▶ SETI@home
- ▶ Rosetta@home
- ▶ Foldit

Bibliography

Golle, P. (2008). Machine learning attacks against the asirra captcha. In *Proceedings of the 15th ACM Conference on Computer and Communications Security, CCS '08*, pages 535–542, New York, NY, USA. ACM.