Akademia Górniczo-Hutnicza
im. Stanisława Staszica w Krakowie
AGH University of Science
and Technology

AGH Beamer Theme

Stanisław Polak[1,2]

[1]Institute of Computer Science
ul. Kawiory 21
30-055 Kraków
Poland
http://www.icsr.agh.edu.pl/~polak/

[2]Second affiliation

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Part I

Why Transfer Learning is fun and profit?

What will be talking about?

Transfer learning (Inductive transfer) for Convolutional Neural Networks (ConvNets).

Process where structure or knowledge from a learning problem is used to enhance learning on a related problem[1].

Example:
Take an image classification model that is capable to correctly label common objects (a dog, a tree or an airplane)
Retrain it to label types of yoghurt on a production lane.

[1] West, Jeremy; Ventura, Dan; Warnick, Sean (2007), "A Theoretical Foundation for Inductive Transfer", http://cpms.byu.edu/springresearch/abstract-entry?id=861

First of all - why do we need Transfer Learning?

There is a lot of to be designed to build an image classification model:

- first layer:
  - data preprocessing,
  - feature extraction,
- middle layers:
  - what shall be in the middle layers
  - btw, what kind of a network shall it be?
- the last layer:
  - actual classification and labels.

But there is a problem...

We usually don't really know what is the best solution to our specific case scenario.

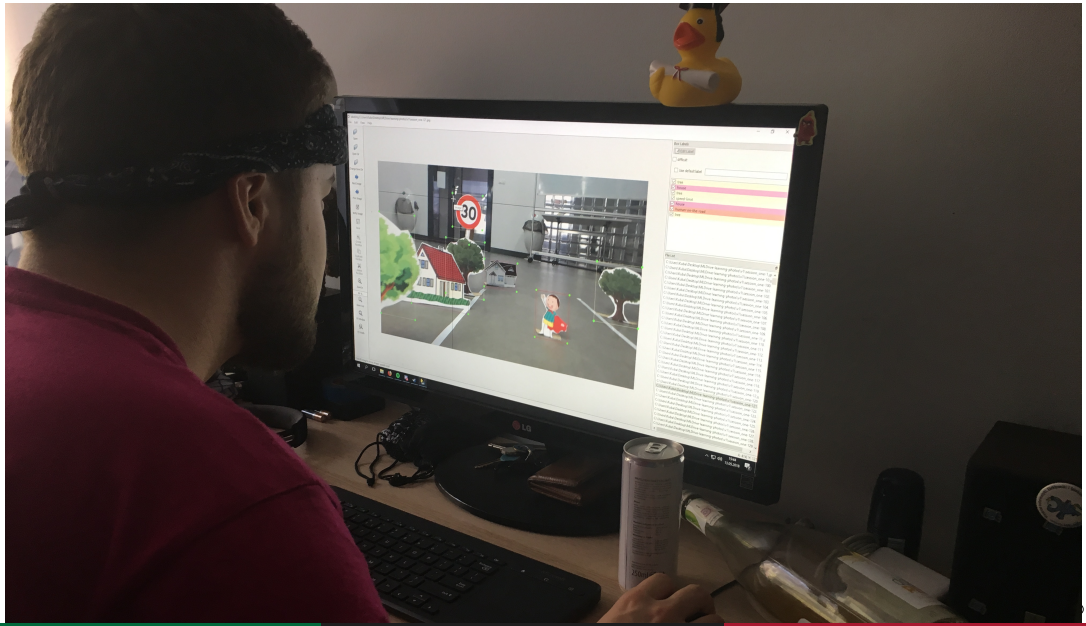
Usual methods consist of trial and error, blind luck, and intuition.

Big minds have done it better (probably)

Huge research centers and companies have the knowledge and resources to design and train good models:

- they have huge amounts of data (image net is around 14 million of labeled images!)
- these models have been already trained (training on GPU can take weeks)

Labeling the images takes time and patience...



Can we just take a pretrained model and use it?

Of course we can, but:

- it will not exactly work,
- there is difference between butterflies, airplanes and printed circuit boards.

Can we train the defined model on our dataset?

We can take some shortcuts:

- let's say that we have a huge amount of labeled data - that's cool,
- we're no researchers - we can take already designed neural network scheme,
- after training it on our dataset - we might expect good results.

But what if I don't have a huge dataset?

If we have a significantly smaller dataset, we could try:

- take the weights from the model as it is already trained,
- retrain it from this point on our dataset,
- depending on how similar our problem is to the original one - that good results.

How does transfer learning work?

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Let's sum this up!

We have three approaches possible to transfer learning:

- take the model as it is - and use it,
- take the model structure and train it on our (huge) dataset,
- take the model and it's weights and train it on our smaller dataset.

Examples

Example time!

Examples

Example time!

Part II

Time for you to build your own *teslas*!

How to get started easily

Follow the instructions here:
`https://github.com/pkazimierowicz/AI_TransferLearning_exercise`