Practical assignment: Classification of Wood Species

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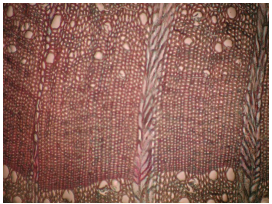
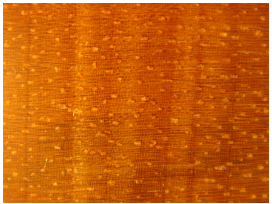
Background

- Image classification problem
- What is the given data? How to utilize the data?
- What architectures are there?
- Considering optimization algorithms
- Evaluating results
- Submitting the assignment
- Computational resources

Data

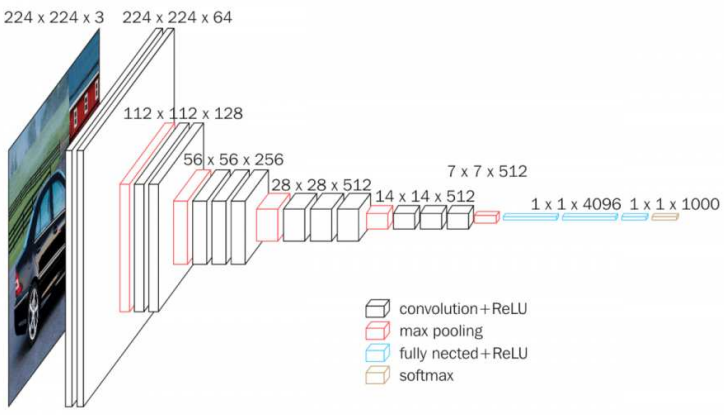
- Two datasets: macrospic and microscopic
- Choose either one
- Consider preprocessing: rescaling, normalization, contrast enhancement, etc
- Try to look at some hacks for image preprocessing
- Remember about data augmentation
- Also check if there is any class imbalance in the dataset





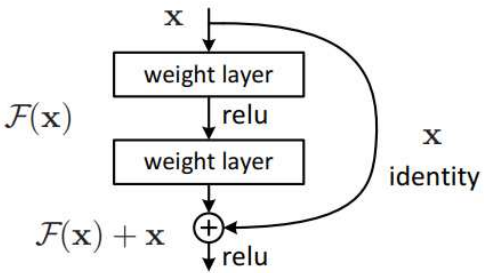
Architectures: VGG-16

- Easiest to understand
- Plain feedforward network

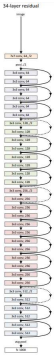


Architectures: ResNet

- Residual mappings with shortcut connections
- Avoiding degradations in very deep networks



(a)

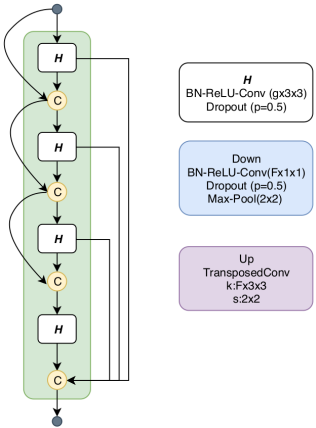


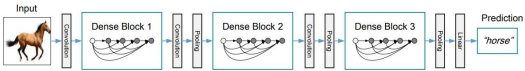
(b)

Figure: ResNet: https://arxiv.org/pdf/1512.03385.pdf

Architectures: DenseNet

- All layers within a block are connected to each other
- Avoiding degradations in very deep networks
- https://arxiv.org/pdf/1608.06993.pdf





Model zoos

Almost no need to suffer with model zoos (things below are clickable):

- MATLAB
- PyTorch
- TensorFlow.Keras

Optimizers

Remember about adaptive optimizers (things below are clickable):

- MATLAB
- PyTorch
- TensorFlow.Keras

Also remember about tricks with learning rate scheduling

Evaluation

The performance must be properly evaludated

- Just accuracy is not enough
- Confusion matrices, Matthews correlation coefficient
- Other metrics you think are relevant here
- Model calibration (optional)

Submission

Submission is a report and code
(+ packages.txt with fixed versions of packages for Python users)
The report must include

- Data description and applied preprocessing
- Description of chosen architectures
- Chosen optimizer
- All relevant hyperparameters and methods used to improve the convergence
- Results evaluation
- Conclusion (effectiveness, encountered challenges, possible improvements)

The report is not supposed to be long. Nevertheless, the content must provide all the necessary information to be able to reproduce the results.

GPUs

A few options

- CVPR GPU server: Instructions

The End