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SCHOOL OF ENGINEERING

DL Exercise 4: PyTorch and Classification Challenge

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Goal of this exercise

- Get to know a widely used deep learning framework: PyTorch
- Implement & train a variation of a widely used architecture: ResNet
- Classification on **real** data: Images from solar panels
- **Challenge yourself & your colleagues!**

Organizational

Part I: Classification with PyTorch - Mandatory

- Implementation & training of a PyTorch architecture
- Submission of trained models in submission system (later more)
- Code upload to StudOn
- Goal: reach a mean F1 score > 0.60
- **Deadline: TBA**

Organizational

Part II: Challenge - Optional, but highly encouraged

- Try to find & train the best architecture & model for this task!
- Compete with your colleagues!
- **Deadline: TBA**



Source: Designed by Freepik

Data set: Identification of defects in solar panels

- Solar modules are composed of cells
- Are subject to degradation (transport, wind, hail, ...)
- Different defects, e.g., cracks or inactive regions
- **Task:** Automatically determine which defect(s) a module has
- Panel can have no or multiple defects → **multi-label problem!**

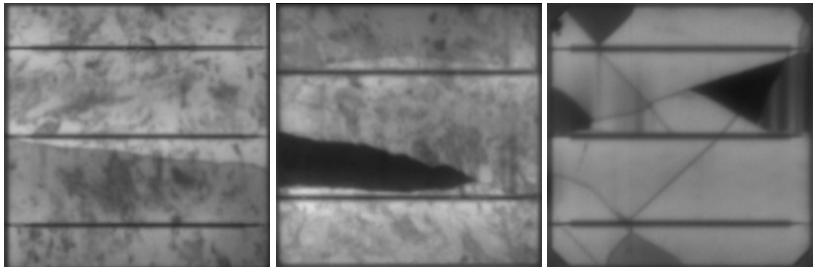


Figure: Left: Crack on a polycrystalline module; Middle: Inactive region; Right: Cracks and inactive regions on a monocrystalline module

Normalization

- The normalization of your implementation has to match the normalization of our test server
- Mean μ and standard deviation σ of the intensity over all test samples are known
- We normalize every pixel x by $x^* = \frac{x - \mu}{\sigma}$
- Please make sure that you implement the normalization accordingly

Deep Learning in PyTorch

We will use **PyTorch** to define and train neural network architectures.

- Developed by Facebook's AI Research lab
 - Open-source
 - Extensive Python interface
- Allows to easily define computational graphs
 - Operations based on **tensors**
 - Closely resembles NumPy API
 - Automatic differentiation to support efficient gradient computations (**Autograd**)
 - Various optimization algorithms to help training neural networks
- + GPU acceleration!



Deep Learning in PyTorch

- PyTorch layer API resembles structure of our framework
- Extensive documentation and “getting started” guides
- Short Hands-On will follow after Ex. 3 submission
- Sources online e.g.:
 - 60-min blitz with Jupyter notebooks
 - PyTorch with examples
 - Overview of all tutorials

Submission to online tool

- After training, make sure to save a checkpoint of your best performing model
- Online submission tool will be made available on **TBD**
- Website: <http://lme156.informatik.uni-erlangen.de/dl-challenge>
- **Only available from within the university network**
- Same teams (max. 2) as before allowed

Submission to online tool: Registration

Register with your email and student id.

Deep learning challenge

Login Register

Register

username

password

email address

student id

Register

Submission to online tool: Team

If you work in a team: One of you has to create a new team, the other has to join.

Deep learning challenge

Logged in as katharina

View

Logout

Create a team

team name

Create

Join a team

team id

Join

Overview

Team

Submission to online tool: Submit model

Submit trained models (zip-file generated by train.py) by uploading them. You may submit multiple models.

Deep learning challenge
 Logged in as katharina
 View
 Logout

Jobs

Team	Status
New job	

Toplist

Team	Submission date	F1 crack AB	F1 crack C	F1 mean
supermania	Jan 19, 2019, 1:41:53 AM	0.51	0.7555555555555556	0.6327777777777779

THE CHALLENGE

Improve on the baseline of ResNet:

- Adapt architecture/try out new architectures
- Pretraining?
- Regularization?
- Data augmentation?
- Use your creativity!
- Best model from each team will be tested on independent data after the challenge deadline
- **Best participants will receive a winner's certificate!**
- **May the best machine learners win!**