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ERLANGEN-NÜRNBERG
SCHOOL OF ENGINEERING

Numpy Tutorial

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Who are we? - Lab Members



Andreas
Maier



Katharina
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Sulaiman
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Florian
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Chang
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Vincent
Christlein



Christian
Bergler



Sebastian
Gündel



Srikrishna
Jaganathan



Felix
Meister

Who are we? - Student Members



Benjamin
Geissler



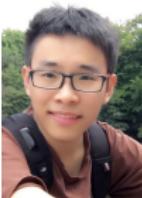
Noah Maul



Luca Reeb



Marc
Vornehm



Zijin
Yang

Contact us ...

- in StudOn
- via the tutors mailing list: cs5-deep-tutors@lists.fau.de
- in MS Teams

Important: Don't hesitate to ask questions/give comments!



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Organisation



Semester plan

- Five exercises:
 0. Python + Numpy Recap and Data Generation
 1. Fully Connected Networks
 2. CNNs and Optimization
 3. Regularization and Recurrent Neural Networks
 4. Image Classification with PyTorch

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 0. Python + Numpy Recap and Data Generation
 1. Fully Connected Networks
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- Materials available in StudOn
- Each exercise takes 2-4 weeks, overlap between assignments
→ start early, submit early

Submission

- Group submission possible - pairs of two
- Personal submission only
- Unit tests must pass
- Explain your code
- Upload your code to StudOn
 - please use the provided script (*dispatch.py*) to prepare your upload

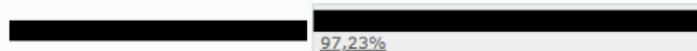
No Plagiarism!

- Plagiarism is strictly forbidden
- We will check that with plagiarism software!

Verteilung - Exercise 4: AlexNet and ResNet in TF / AlexNet and ResNet

90% - 100%	1	#
80% - 90%	2	#
70% - 80%	13	##
60% - 70%	61	=====
50% - 60%	172	#####
40% - 50%	245	=====
30% - 40%	421	=====
20% - 30%	314	=====
10% - 20%	46	=====
0% - 10%	0	.

Gruppierte Übereinstimmungen (90% - 100%)





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Exercise Setup



First part:

Build a neural network from scratch using test based development

- Implementation task is defined by **description** and **unit tests**
- No skeletons
- Every function and structure is built as a layer
 - As a class in its own file
 - Mandatory functions `__init__()`, `forward()`, `backward()`
- Unit tests help to expose bugs and errors
 - Tested and debugged with python3

Second part:

Build some common neural networks with PyTorch

- Some functionality provided
- No unit tests





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Python Overview



About Python...

- Programming language with good readability
- Interpreted scripting language
 - Relies on the call of libraries written in lower-level programming languages
 - Basic programming semantics exist but are very inefficient
- Huge amount of libraries for all sorts of applications



About Numpy...

- Essential python package
- Central object: Numpy array
 - Acts like a matrix/vector
 - Enables all sorts of mathematical operations
 - Optimised for speed
- A cheat sheet with handy functions for this exercise can be found in the StudOn group



About Scipy...

- Python package closely linked to numpy
- Provides additional functionality
 - Signal processing
 - Statistical operations





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Recommendations



Package Manager (not needed in CIPs)

We recommend **Anaconda** (Windows)

- Open source
- One click installation
- Also installs python
- Easy handling of virtual environments



IDE

We recommend **PyCharm**

- Open source
- Easy package handling
- Debugging possibilities
- Free licenses for professional version for students



One alternative: Visual Studio Code with Live Share
Plugin (allows remote pair programming)

Version Control

We recommend using GitLab!

- Please use the university's gitlab server: <https://gitlab.cs.fau.de/>
- Perfect for co-working
- Compare your code with old versions
- Please use **private projects**! You can add your study partner as additional developer.



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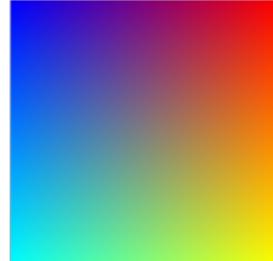
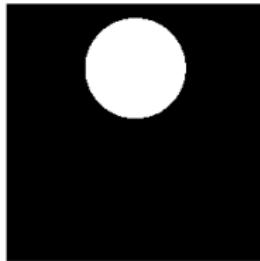
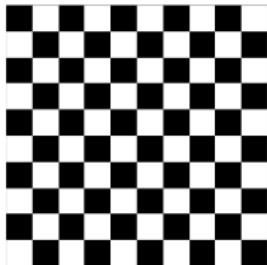
Today's Exercise



Tasks

Use basic numpy functions to create:

- A binary checkerboard pattern
- A binary circle
- An RGB color spectrum (optional)
- Image generator class that enables data augmentation



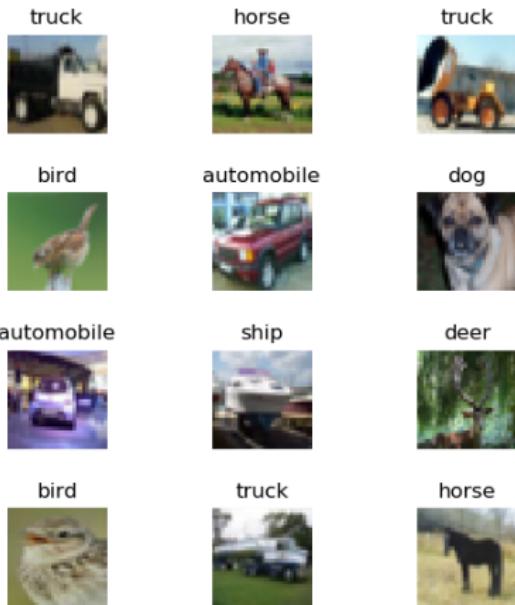


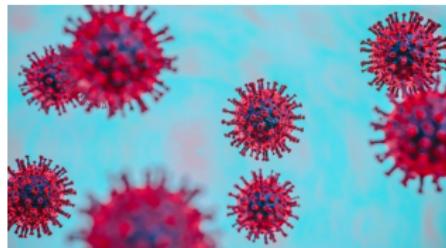
Figure: Example image generator output.

Get Started

- Open the IDE of your choice
- If you want to use PyCharm in the CIP:
type **module load pycharm-community** into the console and open it by
typing **pycharm**
- Follow the instructions of the exercise sheet
- Implement the tasks

Covid-19 - Online teaching

- Exercise will be online until further notice
- Guide in StudOn → **READ IT!**
- We will use MS Teams (caution: link in German)
 - Team activation in IDM required!
 - "General" channel for general questions and comments
 - "Private" channel for each exercise day
 - Direct support during exercise hours can be requested in resp. channel



Important: Feedback and suggestions very welcome!
Even more important: Stay healthy!

Cipmap

This is only relevant as soon as exercises in the CIP pools are possible again.

Additional information regarding the procedure for online exercises due to Covid-19 will be provided via StudOn.

- Go to <https://cipmap.cs.fau.de/huber>
- On the left side click lecturemode - the hand
→ Colored computers represent open requests
- Click **Request Tutor** to open a request
- Click the button again to pull back the request as soon as you get served by a tutor
- More information: <https://cipmap.cs.fau.de/media/howto/>

Thanks for listening.
Any questions?