



Implementing Artificial Neural Networks (ANNs) with TensorFlow

Session 0: About & Regulations

University of Osnabrück
Institute of Cognitive Science

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Aim of the course



- ✧ Deepen theoretical understanding of ANNs
- ✧ Learn how current state-of-the-art networks work
- ✧ Learn how to design, code and debug ANNs
- ✧ Learn how to use TensorFlow
- ✧ Improve your coding skills
- ✧ Some facts about hardware and underlying processes
- ✧ **Code some amazing and fun applications!**

Structure of the course



Two consecutive blocks on Mondays (32/110 & 93/E06)

- 1) Theoretical introduction (*14:00 to 16:00*)
- 2) Homework coding (from 16:00)

Every second week on Tuesdays (93/E31)

- 3) Theoretical introduction (*8:00 to 10:00*)

Schedule

Unannounced changes might occur!



| Date | Topic | Date | Topic |
|---------------------|--|---------------------|---|
| Monday 23.10.17 | Introduction | Tuesday 12.12.17 | Final Task Topics & Q&A Midterm Exam |
| Monday 30.10.17 | Backpropagation & Gradient Descent (Double Session) | Monday 18.12.17 | Midterm Exam |
| Monday 6.11.17 | TensorFlow | Monday 8.1.18 | Reinforcement Learning 1 |
| Monday 13.11.17 | Convolutional Neural Networks (CNNs) | Tuesday 9.1.18 | Reinforcement Learning 2 |
| Tuesday 14.11.17 | Training ANNs | Monday 15.1.18 | Generative Adversarial Models |
| Monday 20.11.17 | Advanced CNNs & Training ANNs 2 | Monday 22.1.18 | Liquid State Machines 1 |
| Monday 27.11.17 | Word Embeddings | Tuesday 23.1.18 | Liquid State Machines 2 |
| Tuesday 28.11.17 | Data and Training Visualization | Monday 29.1.18 | Spiking Neural Networks 1 |
| Monday 4.12.17 | Recurrent Neural Networks | Monday 5.2.18 | Spiking Neural Networks 2 |
| Monday 11.12.17 | Advanced RNNs | Tuesday 6.2.18 | Review & Final Task Q&A |



- ✧ Enroll into groups on [studip](#) until Monday October 30th, 23:59
- ✧ Groups **must** consist of **3** members
- ✧ You hand in both, your weekly homework assignment and your final task as part of this group

Homework assignments



Weekly homework assignments

- ✧ There are going to be 10 homeworks
- ✧ Upload your solution as **ipython notebook and HTML export** in the public “Homework Submissions” data folder every **Saturday** until 23:59
- ✧ Solutions are going to be uploaded on Sunday mornings
- ✧ Homeworks can be Failed / Passed / Outstanding
- ✧ For each outstanding homework **-0.05** will be granted on your final grade

Homework assignments



Weekly homework assignments

- ✧ Correct an assignment of another group by **Monday 23:59** every week and put your rating into the [public spreadsheet](#)
- ✧ **Do not use names or any other personal data in the spreadsheet, strictly stick to group IDs**
- ✧ Find the [rating guidelines](#) on studip
- ✧ There is time for questions and discussions in the practice sessions on Mondays

About the Final Task

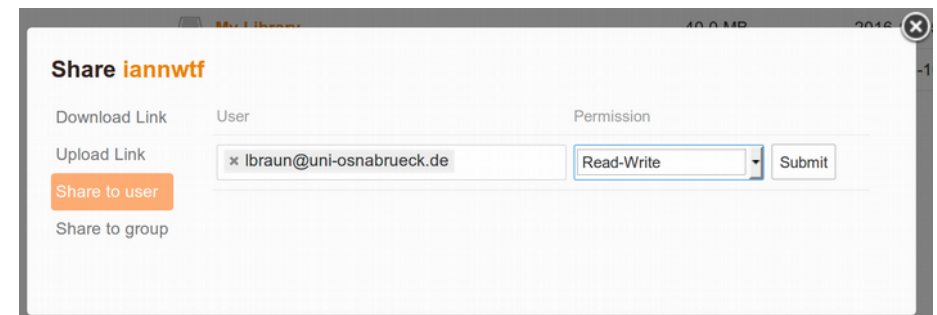
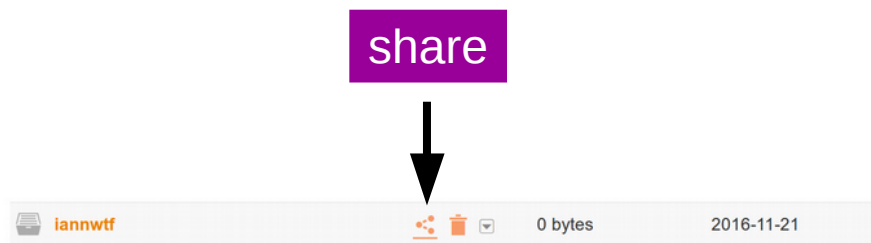


- 1) Come up with an ANN paper (suggestions are going to be presented on 12th December) *or* your own idea
- 2) Implement the ANN described in the paper *or* design an ANN which is capable of solving your problem
- 3) *Optional: Crawl and pre-process data*
- 4) Implement and train the ANN with TensorFlow and extensively comment your code
- 5) Evaluate and discuss the **theoretical basis**, used procedures, the structure and the performance of the ANN in written form on five to six pages (***as .pdf***)

About the Final Task



Upload everything (pre-processing scripts, training data, TensorFlow code, documentation ...) on [myshare](#) and send the sharing link to lbraun@uni-osnabrueck.de



You are invited to discuss your ideas with me, before you start!

Find the [assessment sheet](#) on studip

How to pass



In order to be granted with 8 *ECTS* and your grade:

- 1) Pass 9/10 homeworks, correct one every week
- 2) Write the midterm exam
- 3) Hand in a *Final Task*

Midterm exam: 14:00 – 18:00 on 18th December, 2017

Final Task selection until: 23:59 on 9th January, 2018

Deadline Final Task: 23:59 on 28th February, 2018

No more answers to questions past 15th February

Both, the midterm exam and the final grade will make up for 50% of your final grade each

Questions and Contact



Please visit the following resources first:

- 1) [TensorFlow Python API Documentation](#)
- 2) [Stackoverflow](#)
- 3) Your group and class mates

... then, contact me: lbraun@uos.de

Please use the following prefix for the subject:
[TF] <your_question_or_concern>



Questions?