

12.04.21

# Machine Learning With TensorFlow

## INTRODUCTION TO NEURAL NETS AND TOOLS

# VORSTELLUNG



<https://forms.office.com/r/dnKAqCva92>

- **Organizational Matters**
- **Introductory Discussion on AI**
- **Coursera Registration**
- **Using Google Colab**
- **Neural Net Basics**
- **TensorFlow**
- **Course Projects**

# EDU.OPENCAMPUS.SH

## Machine Learning With TensorFlow

Tuesday 4 - 5:45 pm // Get hands-on experience in applying machine learning techniques with TensorFlow.

EINGESCHRIEBEN

[Zum Kurs-Chat](#)

[Zum Zoom-Call](#)

[Spezielle Kursinfos](#)

[Zum Online-Kurs](#)

# CHAT

**sose21**  
@steffen

**C\_Machine Learning With TensorFlow** ☆

📅 1 Tuesday, 4-6 p.m.: Zoom; Course Handbook

Find channel

← → +

**CHANNELS**

- 00 - Announcements
- 01 - Questions
- C\_Advanced Machine Lear...
- C\_Deep Learning from Scr...
- C\_Einführung in Data Scie...
- C\_Machine Learning für di...
- C\_Machine Learning With ...**
- Kursleitungen

**Beginning of C\_Machine Learning With TensorFlow**

This is the start of the C\_Machine Learning With TensorFlow channel, created by Steffen Brandt on March 02, 2021. Any member can join and read this channel.

[👤 Invite others to this channel](#) [✎ Set a Header](#)

**March 25**

**Pinned**

**Steffen Brandt** 23:10  
Welcome to the course "Machine Learning With TensorFlow"!


**Pinned Posts** | C\_Machine Learning With ...

**March 25**

**C\_Machine Learning With TensorFlow**

**Steffen Brandt** 23:10  
Welcome to the course "Machine Learning With TensorFlow"!  
In this course we will try to provide you with hands-on knowledge about how to train machine learning models with TensorFlow.  
An important part when working in the field of machine learning is networking and working together in a team. An important goal of the course is therefore that you get to know each other and work in a team on a project. I would therefore like to ask you to introduce yourself quickly here in the channel already. Maybe

# KURSHANDBUCH

 **opencampus.sh Machine Learning Program**

EDU-Platform   Chat

🔍 Search...

opencampus.sh Machine Learning Program

Course Kick-Off

How do I choose a course?

FAQ

COURSES

Einführung in Data Science und maschinelles Lernen >

Machine Learning With TensorFlow v

Requirements for a Certificate of Achievement or ECTS

Preparation

**Week 1 - Introduction to Neural Nets**


## Week 1 - Introduction to Neural Nets

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### This week you will...

- get a basic introduction to neural nets in order to get an intuition for the technical terms used in training them
- get an introduction to the tools that we use during the course and that you will need for your practical project

### Learning Resources

 **Course Presentation** 201110\_Introduction to Neural Nets and Tools.pdf - 4MB

- Video [Neural Networks Explained](#) (12 minutes)

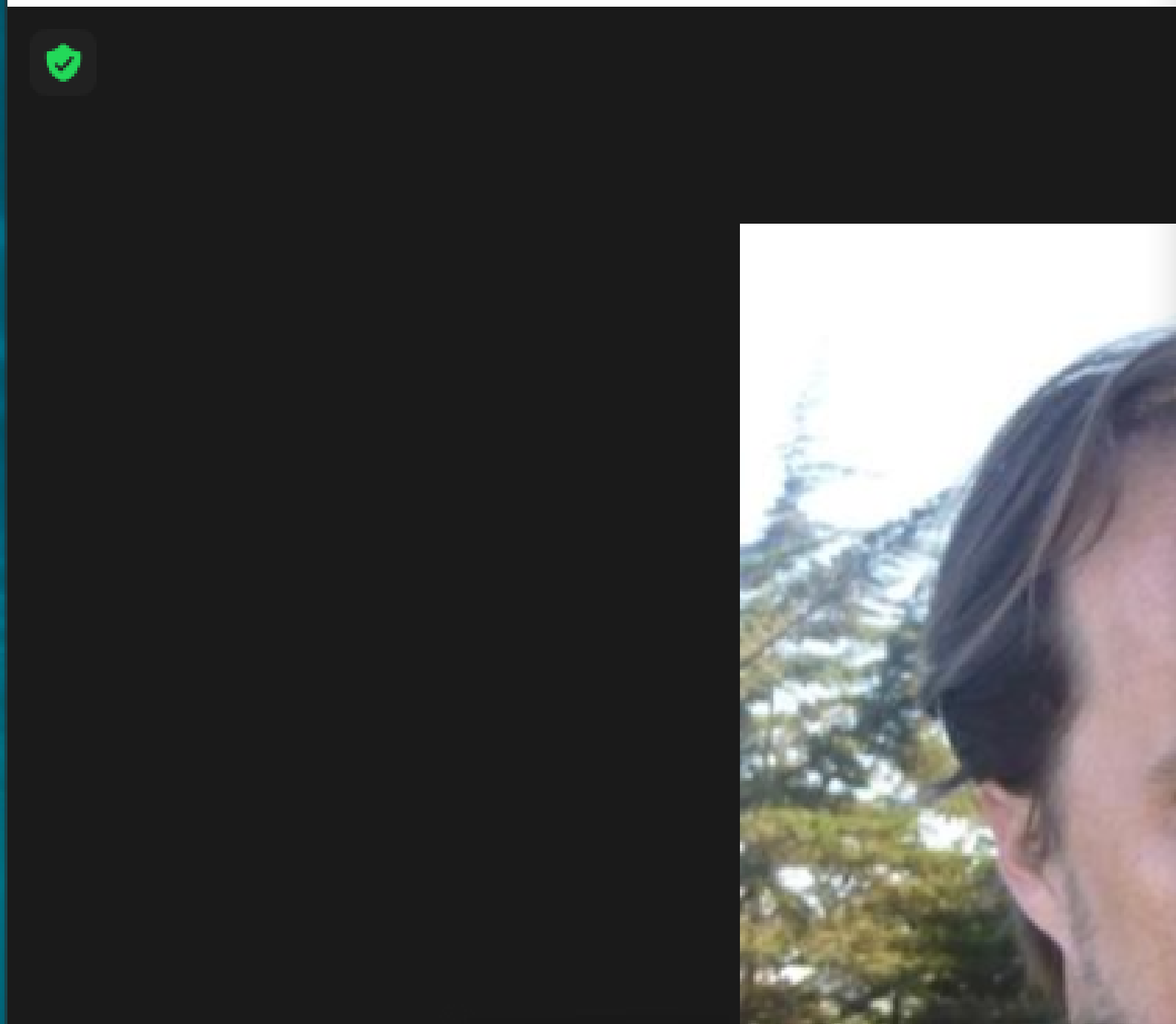
 **CONTENTS**  
This week you will...  
Learning Resources  
Until next week you should...



# ZOOM

- **Try the different viewing modes:**
  - **Gallery View/ Active Speaker**
  - **Split Screen/ Full Screen Mode**
- **Maybe watch this video to get an idea:**  
<https://www.youtube.com/watch?v=v3IPAbpVjd4>

Zoom Meeting



Select a Camera (Alt+N to switch)

NewTek NDI Video

✓ Integrated Camera

Choose Virtual Background...

Choose Video Filter...

Video Settings...

Steffen Brandt



Mute



Start Video



Security



Participants 1

Settings

General

Video

Audio

Share Screen

Chat

Background & Filters

Recording

Profile

Statistics

Keyboard Shortcuts

Accessibility

Window size when screen sharing:

☐ Fullscreen mode

☐ Maximize window

☒ Maintain current size

☒ Scale to fit shared content to Zoom window

☐ Show my Zoom Windows to other participants when I am screen sharing

☐ Enable the remote control of all applications

☒ Side-by-side mode

☒ Silence system notifications when sharing desktop

When I share my screen in a meeting

☐ Automatically share desktop

☒ Show all sharing options

When I share directly to a Zoom Room

☒ Automatically share desktop

☐ Show all sharing options

Advanced



# **ORGANIZATIONAL**

- **Use your full names in the zoom meetings!**
- **Complete your profile in the mattermost chat with your full name and a foto.**
- **Please write me if you will not go on with the course!**

## Deine Teilnahme

Du darfst an maximal 2 Terminen gefehlt haben.

05.11.20	10.11.20	17.11.20	24.11.20	01.12.20	08.12.20
15.12.20	22.12.20	05.01.21	12.01.21	19.01.21	26.01.21

## Leistungsnachweis

Um ein Leistungszertifikat für diesen Kurs zu erwerben, musst Du zusätzlich zur ausreichenden Teilnahme einen der angebotenen Leistungsnachweise erbringen. Diesen musst Du bis spätestens 05.03.2021 über das entsprechende Feld unten hochgeladen haben.

Dein Projekt für den Leistungsnachweis:

Wähle hier ein Projekt als Leistungsnachweis aus

Nachweis hochladen

*Bisher wurde noch keine Datei hochgeladen.*

## Dein Leistungszertifikat

Die Leistungszertifikate werden frühestens zwei Wochen nach dem letzten Kurstermin ausgestellt und dann hier per Download zur Verfügung gestellt.

**ECTS kannst Du nur erhalten, wenn Du ein Leistungszertifikat erwirbst.**

<b>08. 04.</b> <b>18: 00- 20: 00</b>	SEMESTER OPENING (PARTICIPATION RECOMMENDED)
<b>13. 04.</b> <b>16: 00- 17: 45</b>	INTRODUCTION TO NEURAL NETS AND TOOLS USED DURING THE COURSE
<b>20. 04.</b> <b>16: 00- 17: 45</b>	INTRODUCTION TO TENSORFLOW FOR AI, MACHINE LEARNING, AND DEEP LEARNING, PART I
<b>27. 04.</b> <b>16: 00- 17: 45</b>	INTRODUCTION TO TENSORFLOW FOR AI, MACHINE LEARNING, AND DEEP LEARNING, PART II
<b>04. 05.</b> <b>16: 00- 17: 45</b>	CONVOLUTIONAL NEURAL NETWORKS, PART I
<b>11. 05.</b> <b>16: 00- 17: 45</b>	CONVOLUTIONAL NEURAL NETWORKS, PART II
<b>18. 05.</b> <b>16: 00- 17: 45</b>	NATURAL LANGUAGE PROCESSING, PART I

**25. 05.** NATURAL LANGUAGE PROCESSING, PART II  
**16: 00- 17: 45**

**01. 06.** SEQUENCES, TIME SERIES AND PREDICTION, PART I  
**16: 00- 17: 45**



**08. 06.** SEQUENCES, TIME SERIES AND PREDICTION, PART II  
**16: 00- 17: 45**

**15. 06.** SPECIAL ISSUES CONSIDERING YOUR FINAL PROJECTS  
**16: 00- 17: 45**

**22. 06.** PRESENTATION OF THE FINAL PROJECTS, PART I  
**16: 00- 17: 45**

**29. 06.** PRESENTATION OF THE FINAL PROJECTS, PART II  
**16: 00- 16: 45**

# FIRST BREAKOUT

- **15 Minutes**
- **Present yourself**
- **Question: What is Artificial Intelligence?**
  - **Get to a common definition**
  - **Write it down**

**“What's the difference between data science, machine learning, and artificial intelligence?”**

<http://varianceexplained.org/r/ds-ml-ai>

**Data science produces insights.**

**Machine learning produces predictions.**

**Artificial intelligence produces actions.**

# ARTIFICIAL INTELLIGENCE

**„an autonomous agent executes or recommends actions“**

**(Poole, Mackworth, & Goebel, 1998)**

**„Systems with 'intelligent' behavior that analyze their environment and act with a certain degree of autonomy to achieve certain goals. “**

**(European Commission, 2018)**

**„By artificial intelligence we mean highly developed software systems that are capable of learning and training to master complex tasks.“**

**(AI-Strategy of the State Schleswig-Holstein, 2019)**

# COURSERA REGISTRATION

The screenshot displays the Coursera website interface. At the top, the Coursera logo is on the left, followed by navigation icons and a search bar containing the text "What do you want to learn?". On the right, a user profile for "Steffen Brandt" is visible. A dropdown menu is open on the left side, titled "Switch to", listing four options: "My Coursera All Courses", "opencampus.sh unlimited OPENCAMPUS Sponsored Courses", "opencampus.sh explore Coursera Sponsored Courses", and "Coursera Admin Training Coursera, Inc. Sponsored Courses". A yellow arrow points to the "opencampus.sh unlimited" option. The main banner area features a teal background with the text "Welcome to opencampus.sh unlimited Start Hacking Your Life". Below the banner, a navigation bar includes links for "Business", "Computer Science", "Data Science", "Information Technology", "Health", and "Math and Logic". A "How it works" link is also present. At the bottom, a personalized message reads: "Hello Steffen Brandt! Browse content from the **opencampus.sh unlimited** learning program. Your organization has sponsored this program. Discover the [content types](#) we offer."





Hello Steffen Brandt:

Browse content from the **opencampus.sh unlimited** learning program.

Your organization has sponsored this program. Discover the [content types](#) we offer.

## Recommendations from your organization

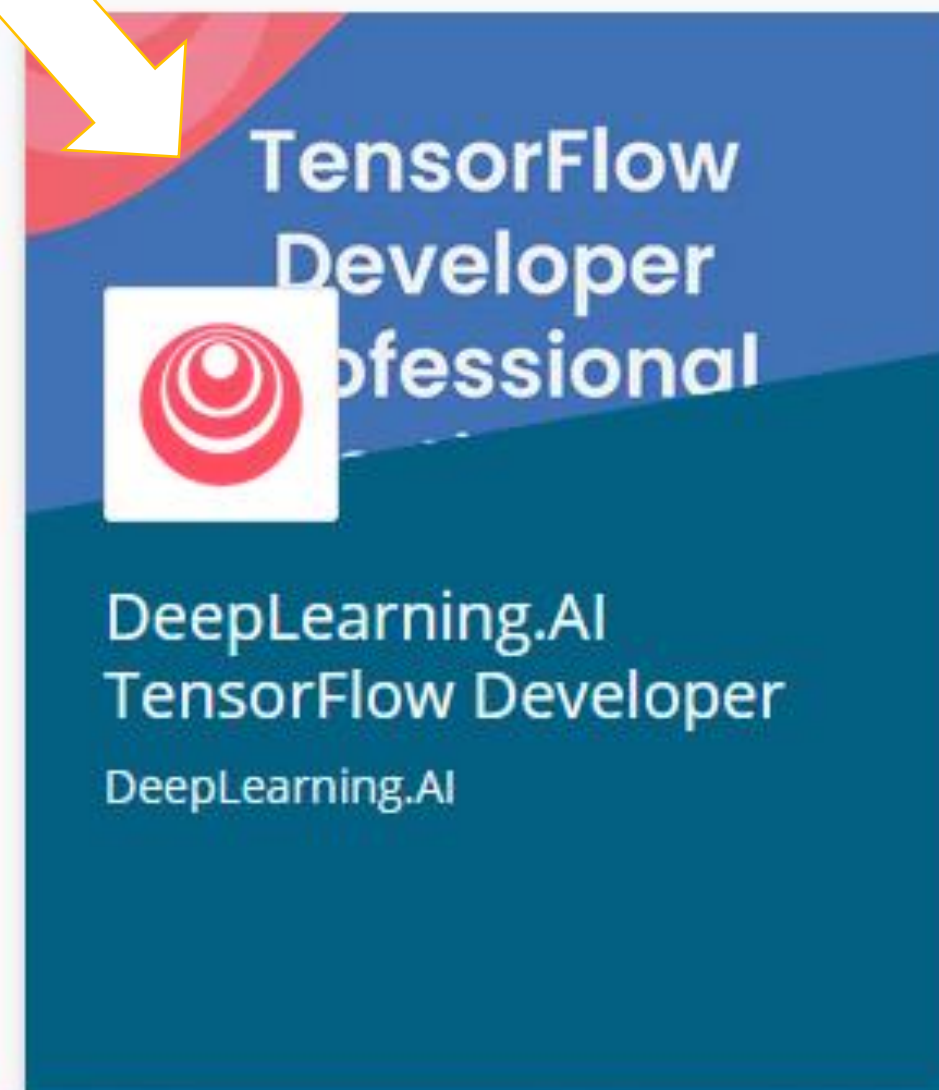
Choose from hand-picked content from this program to advance your career!

### Machine Learning



AI For Everyone

DeepLearning.AI



DeepLearning.AI  
TensorFlow Developer

DeepLearning.AI



Deep Learning

DeepLearning.AI



AI for Medicine

DeepLearning.AI



COUR

PROFESSIONAL CERTIFICATE

# DeepLearning.AI TensorFlow Developer

Offered by



Enrolled

Go to Course



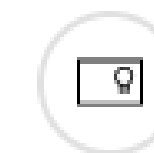
Save for Later

Sponsored by OPENCAMPUS

## About this Professional Certificate

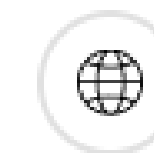
TensorFlow is one of the most in-demand and popular open-source deep learning frameworks available today. The DeepLearning.AI TensorFlow Developer Professional Certificate program teaches you applied machine learning skills with TensorFlow so you can build and train powerful models.

In this hands-on, four-course Professional Certificate program, you'll learn the necessary tools to build scalable AI-powered applications with TensorFlow. After finishing this program, you'll be able to apply your new TensorFlow skills to a wide range of problems and projects. This program can help you prepare for the [Google TensorFlow Certificate exam](#) and bring you one step closer to achieving the Google TensorFlow Certificate.



### Shareable Certificate

Earn a Certificate upon completion



### 100% online courses

Start instantly and learn at your own schedule.



### Flexible Schedule

Set and maintain flexible deadlines.



[About](#) [How It Works](#) [Courses](#) [Instructors](#) [Enrollment Options](#) [FAQ](#)

## COURSE

1

**Introduction to TensorFlow for Artificial Intelligence, Machine Learning, and Deep Learning**★★★★★ **4.7** 12.904 ratings • 2.739 reviews

If you are a software developer who wants to build scalable AI-powered algorithms, you need to understand how to use the tools to build them. This course is part of the upcoming Machine Learning in Tensorflow Specialization and will teach you best practices for using TensorFlow, a popular open-source framework for machine learning.

[SHOW ALL](#)

## COURSE

2

**Convolutional Neural Networks in TensorFlow**★★★★★ **4.7** 5.658 ratings • 858 reviews

If you are a software developer who wants to build scalable AI-powered algorithms, you need to understand how to use the tools to build them. This course is part of the upcoming Machine Learning in Tensorflow Specialization and will teach you best practices for using TensorFlow, a popular open-source framework for machine learning.

[SHOW ALL](#)

## COURSE

3

**Natural Language Processing in TensorFlow**★★★★★ **4.6** 4.631 ratings • 711 reviews

If you are a software developer who wants to build scalable AI-powered algorithms, you need to understand how to use the tools to build them. This Specialization will teach you best practices for using TensorFlow, a popular open-source framework for machine learning.

[SHOW ALL](#)

## COURSE

4

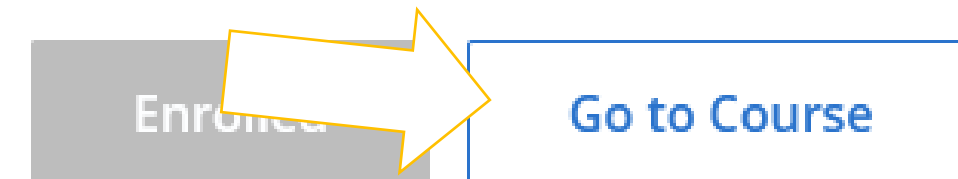
**Sequences, Time Series and Prediction**★★★★★ **4.6** 3.279 ratings • 526 reviews

If you are a software developer who wants to build scalable AI-powered algorithms, you need to understand how to use the tools to build them. This Specialization will teach you best practices for using TensorFlow, a popular open-source framework for machine learning.

[← Back to DeepLearning.AI TensorFlow Developer](#)

# Introduction to TensorFlow for Artificial Intelligence, Machine Learning, and Deep Learning

★★★★☆ 4.7 14,803 ratings • 3,104 reviews



Sponsored by OPENCAMPUS

## About this Course

If you are a software developer who wants to build scalable AI-powered algorithms, you need to understand how to use the tools to build them. This course is part of the upcoming Machine Learning in Tensorflow Specialization and will teach you best practices for using TensorFlow, a popular open-source framework for machine learning.

[SHOW ALL](#)

Offered by



### Shareable Certificate

Earn a Certificate upon completion



### 100% online

Start instantly and learn at your own schedule.



### Flexible deadlines

Reset deadlines in accordance to your schedule.



### Intermediate Level





[Browse](#) > [Data Science](#) > [Machine Learning](#)

Offered By

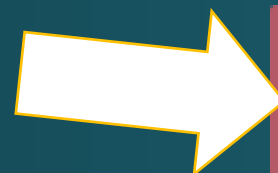


# DeepLearning.AI TensorFlow Developer Professional Certificate

★★★★☆ 4.7 15,626 ratings



Laurence Moroney



**Enrolled**

Already enrolled

**115,497** already enrolled

[About](#) [How It Works](#) [Courses](#) [Instructors](#) [Enrollment Options](#) [FAQ](#)

## WHAT YOU WILL LEARN

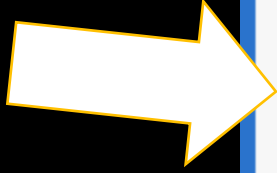
✓ Best practices for TensorFlow, a popular

✓ Handle real-world image data and explore



**LEARNER CAREER OUTCOMES**

# EXERCISES (LABS)



The screenshot displays the Coursera interface for the course 'Introduction to TensorFlow for Artificial Intelligence, N > Woche 1 > Exercise 1 (Housing Prices)'. The left sidebar contains a list of items:

- A new programming paradigm**
- Weekly Exercise - Your First Neural Network**
- Lesevorgang:** Introduction to Google Colaboratory (10 min)
- Get started with Google Colaboratory (Coding TensorFlow)** (4 min)
- Labor: Exercise 1 (Housing Prices)** (1 h) - *Highlighted with a yellow arrow*
- Programmierungsaufgabe:** Exercise 1 (Housing Prices) (3 S)
- Lesevorgang:** Week 1 Resources (10 min)
- Optional: Ungraded Google Colaboratory environment**

The main content area is titled 'Exercise 1 (Housing Prices)' and features a button labeled 'Labor öffnen' with an upward arrow icon. Below this is a section titled 'Anweisungen' (Instructions) with the following text:

Starting September 2020, notebook items in course shells will become Ungraded Labs. Paid learners will be able to access their notebooks in the new Coursera lab environment; Auditors will lose access. We strongly encourage you to download your notebooks if you are auditing this course. You can also upgrade or applying for financial aid to access premium Lab items in your course. For more information, please see this [forum link](#).

Great! You've come a long way already! Now it's time to do an exercise in programming. Earlier this week you saw a 'Hello World' in Machine Learning that predicted a relationship between X and Y values. These were purely arbitrary, but it did give you the template for how you can solve more difficult problems. So, for this exercise you will write code that does a similar task -- in this case predicting house prices based on a simple, linear equation.

**NOTE:** Please do not modify any of the code already provided in the Exercise question, and please only add your additional code in the indicated areas marked by the comments. Once you have completed your notebook assignment and received a final score, please save your notebook, run the final cell, and close your Jupyter Workspace. This will help optimize your Jupyter workspace performance for future assessments. Please note that this step will shut down your kernel, so it is important to save your work in advance of completing this step

# **EXERCISES**

- **Each week two to four of you will present the exercises**
- **Each of you presents at least once**



# GOOGLE COLAB

Coding.Waterkant Hackathon

Prototyping Week

## PROJECTS

Requirements

Possible Projects

Past Projects

## ADDITIONAL RESOURCES

Glossary

Coursera

Selecting the Optimizer

Choosing the Learning Rate

Learning Linear Algebra

Learning Python

## TOOLS

Git

RStudio

Google Colab

Zoom

## Google Colab

Programming Environment to develop and train Neural Networks in the Google Cloud

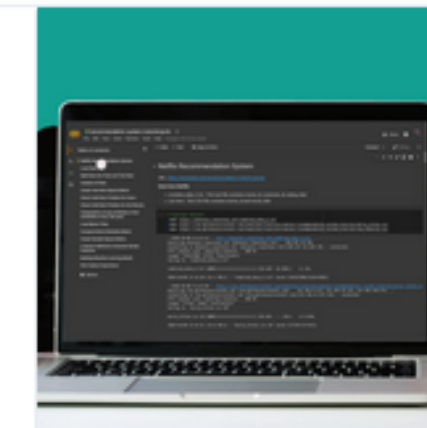
**Colab** is an online **programming environment** for Python including a free runtime with a GPU and is the standard programming environment for our machine learning projects.

The following blog article provides you with a great written introduction to Google Colab:

### Google Colab 101 Tutorial with Python – Tips, Tricks, and FAQ

An in-depth tutorial on how to use Google Colab with Python, along with Colab's tips, tricks, and FAQ

medium.com



If you want to get a little bit deeper into using Colab, make sure to also read this blog article:

### Configuring Google Colab Like A Pro

How to Do Research Quality Machine Learning on a Budget

medium.com





## Getting Started

The document you are reading is a [Jupyter notebook](#), hosted in Colaboratory. It is not a static page, but an interactive environment that lets you write and execute code in Python and other languages.

For example, here is a **code cell** with a short Python script that computes a value, stores it in a variable, and prints the result:

```
[ ] seconds_in_a_day = 24 * 60 * 60
    seconds_in_a_day
```



86400

To execute the code in the above cell, select it with a click and then either press the play button to the left of the code, or use the keyboard shortcut "Command/Ctrl+Enter".

All cells modify the same global state, so variables that you define by executing a cell can be used in other cells:

```
[ ] seconds_in_a_week = 7 * seconds_in_a_day
    seconds_in_a_week
```



604800

For more information about working with Colaboratory notebooks, see [Overview of Colaboratory](#).

## Setup Hardware Accelerator GPU in Colab

Steps to setup GPU:

- Go to Runtime → Change runtime type.
- Select “GPU” from the popup

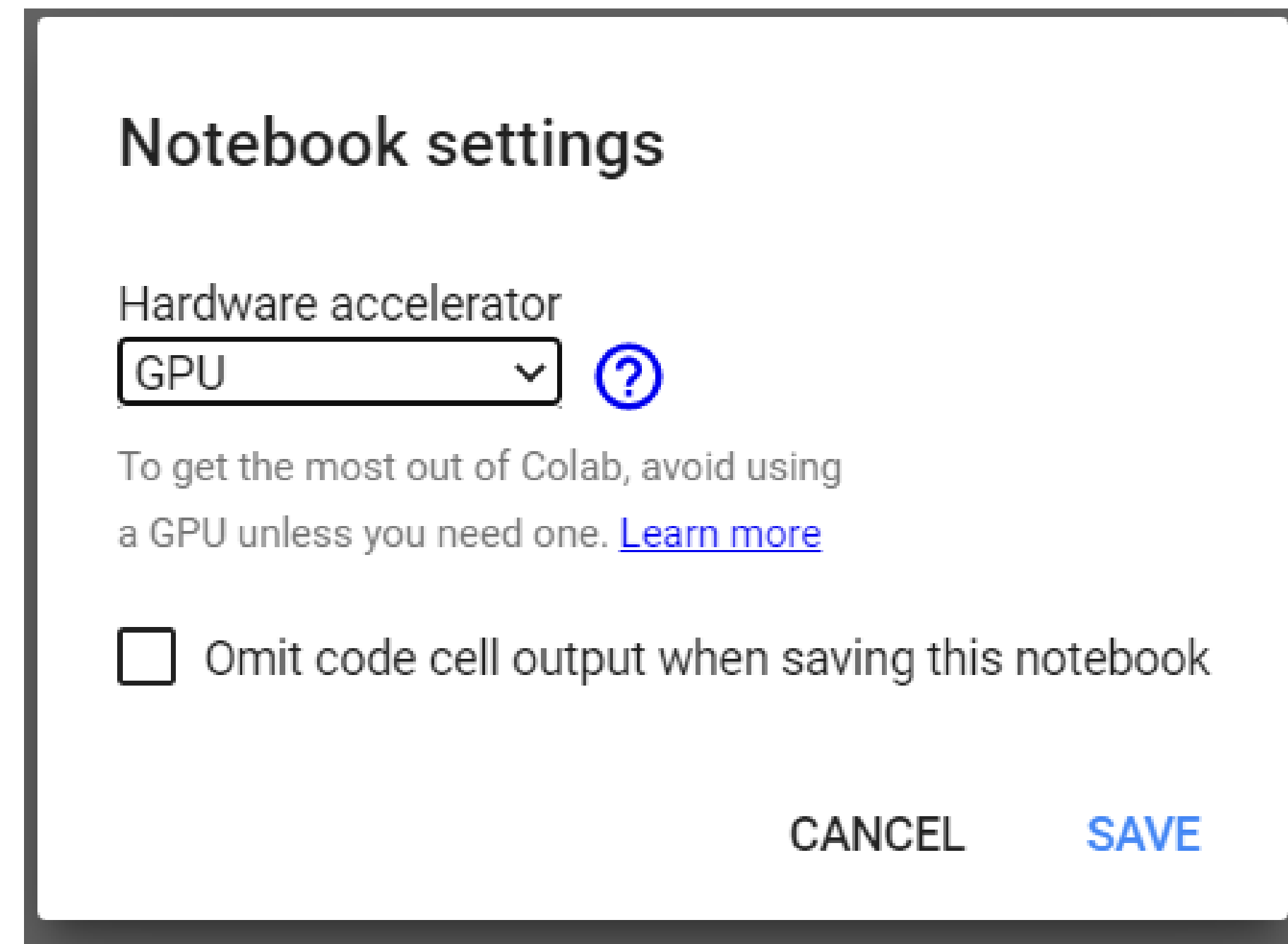
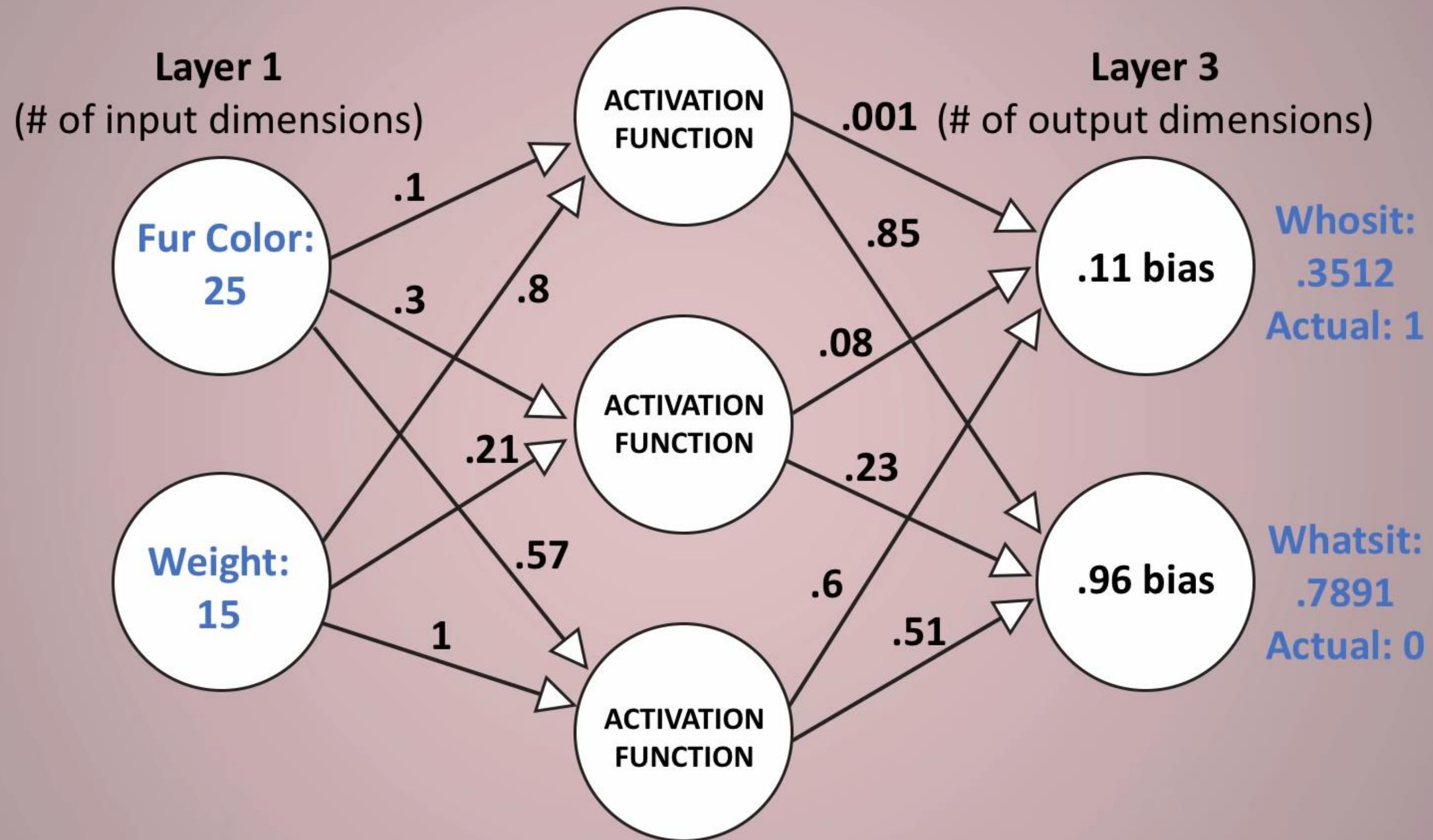


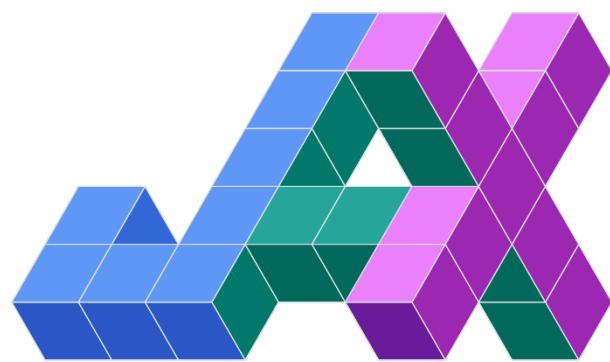
Figure 14: Screenshot of GPU's accelerator selection.

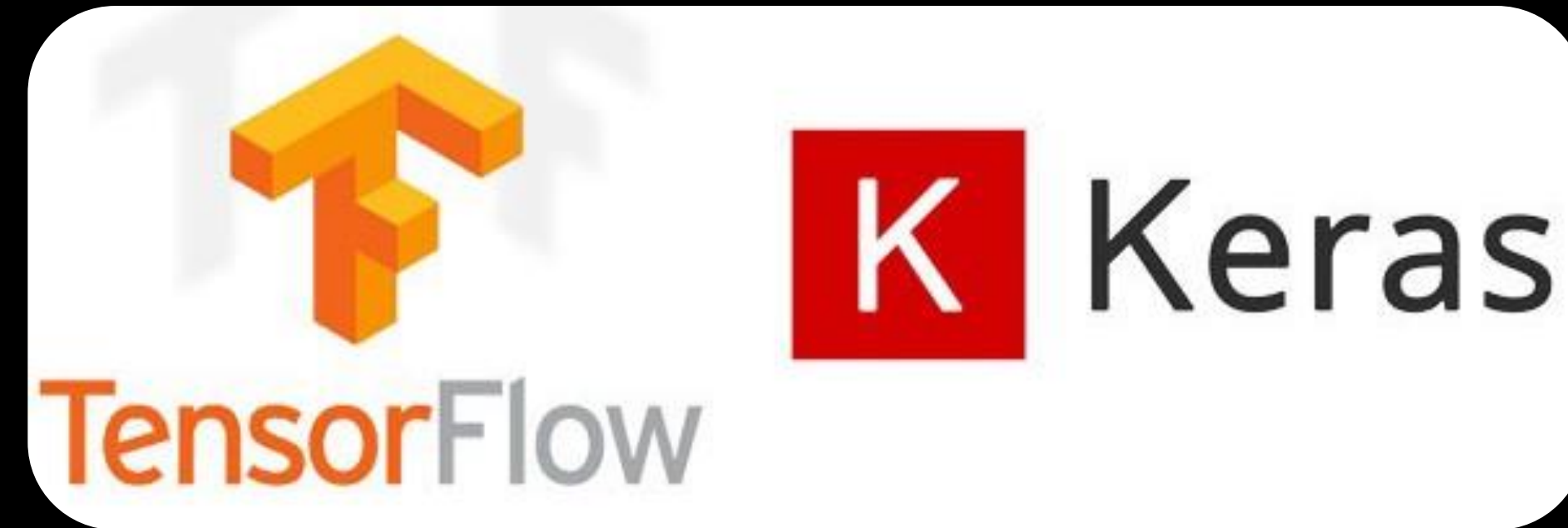


## HOW DID WE DO?



PYTORCH





- **Feb 2017:**      **TensorFlow 1.0 (Estimator API)**
- **Nov 2017:**      **TensorFlow 1.4 (Estimator API, Keras API)**
- **Jan 2019:**      **TensorFlow 2.0 (Estimator API, Keras API)**

# COURSE PROJECTS

There are different options:

- **Your own data and project**
- **Pick a challenge from the [list in the course handbook](#)**
- **Talk to a company or a chair at your local higher education institutions for possible projects**
- **Look for a dataset on the Internet and define a challenge**





RStudio

Machine Learning With TensorFlow



Deep Learning



Natural Language Processing



Advanced Machine Learning

#### EVENTS

Waterkant Coding Hackathon

Prototyping Week

#### PROJECTS

Requirements

Possible Projects

Past Projects

#### ADDITIONAL RESOURCES

Glossary

Tools



Optimizer

Linear Algebra

Python



Powered by GitBook

## Possible Projects

You are very welcome to bring your own data and project idea to a course. Simply talk to your course lead about your idea and the goal of the project until the end of the semester.

Further, we are offering a list of possible projects with corresponding datasets, you can use as project (see table below). Please, also talk to your course lead if you want to work on one of these challenges as your course project.

A further option is that you talk to local companies or chairs at your local higher education institutions if they are interested in a machine learning prototype for some of their production or research tasks and would like to share the corresponding data. If you find a partner that would be interested in such a project, we will be happy to support you in the definition of the project together with the partner and also, for example, with setting up a non-disclosure agreement for the provided data.

A final option is that you look for an interesting dataset on the Internet and define yourself a project based on this dataset. However, we would very much recommend you to choose one of the before mentioned options. With datasets from the Internet (e.g. from Kaggle competitions) your main challenge is typically limited to optimizing the model with an already prepared dataset. However, in practice the challenge is more often to construct the right training and validation datasets and construct the right features.

Title	Description	Dataset
	On a good surfing day for a particular surf spot, the number of pageviews on the site with the forecasts for that spot usually increases. The number of pageviews shall be used as a proxy for the quality of the surfing day in order to improve the forecast of a	Weather station data of 7 popular surf spots (Kiel Lighthouse, Skt. Peter-Ording, Wismersünde, Rost-Geid Airport



RStudio

Machine Learning With  
TensorFlow



Deep Learning



Natural Language Processing



Advanced Machine Learning

#### EVENTS

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Tools



Optimizer

Linear Algebra

# Requirements

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In order to receive ECTS for a course you have to complete a machine learning project by yourself or preferably in a team with a maximum of 4 participants.

Typically the project work starts in the middle of the course.

The requirement for this semester are:

1. Presentation of a detailed Jupyter Notebook with code and comment
  - including the definition of the environment
  - including required sections (Introduction, Data and Methods, Results, Baseline)
2. A small video, accompanying, for example, a screen recording of the notebook with an explanation of the challenge of the project, the used approach, and the results.
3. A statement that the code is released as open source software.  
The data you use in your project can remain private if you wish.

Details about the requirements of the project will additionally be discussed in the course.

Please ask about whatever may be unclear, preferably before you start the project.

# TASKS UNTIL NEXT WEEK

- **Completion of the learning material of week 1 and 2 of the course "introduction to TensorFlow"**
- **Complete Exercises 1 and 2 of the above course**
- **Bring questions!**