

Micropsi
Internship
31st January
2022 - 11th
February 2022



How I got my internship:

I originally applied to Micropsi for an internship in 6th grade. However, I never carried out my internship, and instead went to McNeel.

But, I decided this year that I wanted to do something special and Micropsi immediately popped up in my mind, because it has been my lifelong dream to work with robots, and recently I narrowed this down to machine learning and AI.

My email conversations from 2019, when I first applied:

My cover letter (I cut off the top!)

Currently, I am a student in grade 7 and go to the Berlin Cosmopolitan School. Berlin Cosmopolitan School is an international school, so I learned a lot of languages there including English, German, Polish and I am learning French. In school, I joined a club where we eventually built a car which senses a wall and turns around not to crash into it. Through my short life, I have already learned a lot about computer science. I have completed a Python course on the 4th November 2018, and have some basic knowledge about creating websites; also I have recently started to learn JavaScript. I own a GitHub account and understand how to use GitBash command line for version control. Here is the link to my website: <https://michalinadengusiak.github.io/>

I was involved in an open-source project, Ladybug Tools, where I helped to make an introduction video for the gbXML viewer. gbXML viewer allows users to examine and validate gbXML files in 3D in their browsers, without the need to load the file directly into simulation software, saving many hours across a project lifespan. Here is a link to the video: <https://www.youtube.com/watch?v=2QHrbuKlkdy&feature=youtu.be>

[Ladybug Spider gbXMLviewer Introduction Video - YouTube](#)

Ladybug Tools
Spider
gbXML Viewer
User Guide

<http://www.ladybug.tools/spider/gbxml-viewer>

Main tool: <http://www.ladybug.tools/spider/gbxml...> open and use it :)
Forum: <http://discourse.ladybug.tools/c/spider> ask question how to use it GitHub: <https...>

www.youtube.com

I want to do my internship with Micropsi Industries because I want to see how it is to be a computer programmer in industry, and hopefully learn how artificial intelligence works, and understand and learn how algorithms are written.

DW Dominik Welland <dominik@micropsi-industries.com>

Mon 21/10/2019 15:16

To: Michalina Maria Dengusiak

Hi Michalina,

Thank you for your interest in micropsi industries. I'm impressed by your ambition and your progress in learning about computer programming!

We don't usually do internships - and might not be well prepared - but we'll try and make this work. There are a few things we'd have to find out and talk about beforehand - most importantly: Is this internship part of your school's program, and does the school have requirements for the internship or for us as a company?

I would suggest that you visit us in our office in Neukölln for a first meeting. We can get to know each other, and we can talk a bit about these basic parameters. You can take a look around and get a first overview of the technical things we're working on, and the people working on them.

If everything fits, we should have enough time to prepare, exchange ideas, and agree on a project that matches your interests.

Does this sound good to you?

All the best,
Dominik



Michalina Maria Dengusiak

Mon 21/10/2019 20:54

To: Dominik Welland <dominik@micropsi-industries.com>

↳ ↙ ↖ ↘ ↛ ⋮



Internship_Form.pdf

6 MB



Dear Mr Welland,

I am delighted with your response. I would be pleased to visit and meet you in Micropsi. I would be content to do an internship there. I will be free to come to your office on the 1st of November 2019, so we could get to know each other and the company as well as talk about my internship.

The requirement for the school internship are:

- I should work at least 6 hours a day in the company.
- It will also be required to provide feedback about my performance at the internship (see attached form).

I am looking forward to your response and confirmation about our appointment.

Kind regards,
Michalina

...



Dominik Welland <dominik@micropsi-industries.com>

Thu 24/10/2019 20:52

↳ ↙ ↖ ↘ ↛ ⋮

To: Michalina Maria Dengusiak

Dear Michalina,

November 1st is a bit packed, since this is the week where our SCRUM sprint ends. The only slots I can offer would be between 11am and 1pm or between 3pm and 4pm. (also, anything after 6pm works nearly every day)

On the following Friday, November 8th, anything from 11am to 4pm is free.
Tuesday 5th and Thursday 7th are completely free as of now.

I've taken a look at the form you have attached, and the "Ausführungsvereinbarungen über duales Lernen an integrierten Sekundarschulen" (what a term). I don't sense any issues there.

Looking forward!
/Dominik



Michalina Maria Dengusiak

Sun 27/10/2019 20:53

To: Dominik Welland <dominik@micropsi-industries.com>

↳ ↙ ↖ ↘ ↛ ⋮

Dear Mr.Welland,

Thanks for your email.

I am free every Tuesday and I could arrive at your office around 17:45 - 18:15.

Alternatively, any Friday except for the 8th of November, I am also free and could be there about 16:30 - 17:00.

Please let me know what day suits you most.

If you have any further questions please contact me,
Michalina

...

ⓘ You forwarded this message on Tue 05/11/2019 13:40

DW Dominik Welland <dominik@micropsi-industries.com>

Mon 28/10/2019 19:28

To: Michalina Maria Dengusiak

Hi Michalina.

Ok, then I'd suggest we meet Tuesday, November 5th at 18:00 - does that work?

Best,
Dominik

...



Michalina Maria Dengusiak

Thu 31/10/2019 14:12

To: Dominik Welland <dominik@micropsi-industries.com>

↳ ↙ ↖ ↘ ↛ ⋮

Dear Mr.Welland,

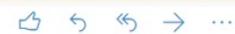
Thank you for answering, November 5th at 18:00 will be perfect.

Kind Regards,
Michalina

...

DW

Dominik Welland <dominik@micropsi-industries.com>
Sun 24/11/2019 18:39



To: Michalina Maria Dengusiak

Dear Michalina.

Thank you for your visit at micropsi industries. It was nice to meet you.

I had promised to send you some links to online python courses, so I looked a bit around and asked some friends:

<https://cscircles.cemc.uwaterloo.ca/using-this-website/>

This starts at the very fundamentals, and you can probably skip the first lessons. It also has a "Resources" section where it gathers links to other tutorials, books, courses and coding challenges. It's free, and you don't need to signup

<https://www.learnpython.org/>

This site also starts with basics, but moves quicker and includes more advanced sections about e.g. numpy and pandas, or regular expressions.

The way you interactively enter your code is not super intuitive, so it probably helps to start with a section you already know about. It's also free, and you don't need to signup

<https://www.hackerrank.com/>

This site offers all kinds of coding challenges. It needs you to signup but is otherwise free of charge.

How are you, and how have your plans for the internship developed?

All the best,
/Dominik



Michalina Maria Dengusiak

Sun 01/12/2019 19:55



To: Dominik Welland <dominik@micropsi-industries.com>

Dear Mr.Welland,

Thanks for your email and your response.

I would like to thank you for the amazing opportunity of me visiting your office. It was simply magnificent!

I will check out the link you sent me!

However, this year I received an outstanding offer at McNeel in Barcelona.

With my deepest regret, I have to inform you that I will be performing my internship there because maybe it will give me a future idea of what I could do at Micropsi in the upcoming years.

I think that I need to explore all the areas of computer programming because I don't know yet which one interests me most so, for now, I want to go there.

Let's stay in touch and I would like to keep this contact going since it could give me even further opportunities in my next coding steps.

Kind regards,
Michalina

...

DW

Dominik Welland <dominik@micropsi-industries.com>

Sun 22/12/2019 12:41



To: Michalina Maria Dengusiak

Hi Michalina,

Congratulations on your offer from McNeel - this sounds fantastic!

I wish you all the best for your internship there, and will of course be happy to stay in touch. Contact me anytime, and let's keep our eyes open for opportunities where we can work together.

Take care, happy holidays, and enjoy Barcelona!

Best, Dominik



Michalina Maria Dengusiak

Sun 22/12/2019 22:04



To: Dominik Welland <dominik@micropsi-industries.com>

Dear Mr.Welland,

Merry Christmas!

Thank you very much!

I will be delighted with our future collaboration whatever it might be.

If I will have any questions regarding machine-learning I will surely contact you.

All the best,
Michalina

...

And before I show you the emails from this internship – I just wanted to add that for every email I waited impatiently and always stressed that I would get the worst response, but felt elated upon reading what the email contained!

Internship at Micropsi from 31.01 - 11.02 2021

2 □

To: Dominik Welland <dominik@micropsi-industries.com>

Dear Mr. Welland,

Hello! It's Michalina Dengusiak again, and I am now a grade 9 student at the Berlin Cosmopolitan School. I would like to kindly ask if there is still a possibility to undertake an internship at Micropsi Industries over the course of 2 weeks, from the 31st of January to the 11th of February 2022. The reason I am applying to Micropsi Industries is because I am really interested in AI and am now regarding it as a possible career path (as I would like to study computer science, ideally in ETH). Therefore, this internship could show me the practical implementation of this technology.

Also, I would like to prepare for my internship, so I would like to ask if there is anything I should complete in advance to it? Would you like me to stop by again, and discuss some of the details about it? For any information, please see my updated website: <https://michalinadengusiak.github.io/>

Michalina Dengusiak

My father is a computational engineer, so I was exposed to computers at a very young age. It all started out when I was 4 years old. My father was at the Grasshopper Forum searching for new updates, whilst I was sitting next to him watching his screen intently.

michalinadengusiak.github.io

Kind regards and looking forward to hearing from you at your earliest convenience,
Michalina

P.S. I saw the progress you have done with the latest robot and cannot wait to hear about your journey in the past 2 years.

DW

Dominik Welland <dominik@micropsi-industries.com>

Tue 05/10/2021 11:30



To: Michalina Maria Dengusiak

Hi Michalina!

Good to hear from you again! I hope you're well and you and your family managed to stay healthy throughout this pandemic.

Things for us have changed since we've last talked. We also had to switch to remote-first for non-essential personnel, and recently moved towards a hybrid working model, with flexible home/office hours. So the office is far less buzzing than it was, although we've grown quite a lot during that time.

I'm very happy to learn that you seem to be following our progress, and are still interested in what we're doing! I will not have the capacity to supervise an internship myself, but I've asked in the software and machine-learning team, and we have enough people interested in doing this.

So from our side, this will work.

I will speak individually with the team members that voiced interest, and will connect you with someone who will take the lead on this. If you already have some ideas on what you want to work on, or what topics you want to touch, let me know.

I'll be in touch.
All the best,
/Dominik



Michalina Maria Dengusiak

Wed 06/10/2021 22:04

◀ ▶ ↺ ↻ → ⋮

To: Dominik Welland <dominik.welland@micropsi-industries.com>

Dear Mr Welland,

Thank you so much for this phenomenal possibility!

You are making my day and week with this wonderful response, I will now be counting the days until the internship, because I am so excited! I can't wait to see you all again.

I can't show you enough gratitude for all the time and effort that you put in to organize this, and I really hope that, at the end, it will successfully work out.

I will let you know as soon as I will have a planned project idea, so that we can discuss this in more detail, and I will then start preparing as well.

Kind regards,

Michalina

...



Michalina Maria Dengusiak

Tue 09/11/2021 21:10

◀ ▶ ↺ ↻ → ⋮

To: Dominik Welland <dominik@micropsi-industries.com>



Grade 9 Internship Cont...

33 KB



Dear Mr. Welland,

I have thought about a project idea and concluded that I want to start with something simple, and not too difficult, as this will be my first time working with machine learning. Therefore, I was thinking of perhaps creating a program that recognises different 2D shapes. So, if the user inputs a picture of a triangle, square and circle, the program will return what shapes there are/there is. Once this is completed, it works, and I understand the process I would build on this idea and many projects could start from there.

For the internship, we need a contract, so could you be so kind as to read, sign and send back the attached document?

Kind regards,

Michalina

P.s. Are there any resources, that you recommend for this type of project? I have started with revising the basics of Python again.

Also, are there any specific software's I will be needing?

...



Michalina Maria Dengusiak

Sun 28/11/2021 10:33

◀ ▶ ↺ ↻ → ⋮

To: Dominik Welland <dominik@micropsi-industries.com>

Dear Mr. Welland,

I hope you had a relaxing weekend and that all is going well.

I, on the other hand, am writing a lot of class test, and lately I have been quite busy revising for them. Yet just the promise of Christmas break keeps me going.

Could you please be so kind and reply to the latest email regarding the internship contract? We are expected to have it signed soon.

Kind regards and waiting for your reply at your earliest convenience,
Michalina

...



Dominik Welland <dominik@micropsi-industries.com>

Mon 29/11/2021 15:40

To: Michalina Maria Dengusiak

Cc: Orhan Can Görür <can.gorur@micropsi-industries.com>



Grade 9 Internship Cont...

155 KB



Hi Michalina,

First of all, let me apologise for the belated reply. I hope you're doing well, and preparations for your exams are going smoothly.

Your idea to train a classifier sounds reasonable to me, and might even tie in with a product idea we're pursuing in the ML team.

CC'ed in this email is Can Görür - he recently completed his PhD in collaborative robotics and is working in the software team, with strong ties to product and ML. He offered to supervise the internship and support you - in choosing a task, and during the internship.

Attached you will also find the contract for the internship. I'm not sure if I can sign as "Leiter des Betriebes" - let me know if you really need the signature of our CEO, or in case I missed anything else.

All the best for your tests, and so long
/Dominik



Orhan Can Görür <can.gorur@micropsi-industries.com>

Wed 15/12/2021 12:05

To: Michalina Maria Dengusiak

Cc: Dominik Welland <dominik.welland@micropsi-industries.com>



Hi Michalina,

First of all, nice to meet you.
If you are available sometime next week on Monday or Tuesday, we can briefly chat about possible projects we can work on in the direction of simple classifications.
I can also recommend you some basic sources you can start with.

Please let me know,

Best Regards,
Can



Michalina Maria Dengusiak

Thu 16/12/2021 19:52



To: Orhan Can Görür <can.gorur@micropsi-industries.com>

Cc: Dominik Welland <dominik.welland@micropsi-industries.com>

Dear Dr. Orhan Can Görür,

Thank you for your email! I can't believe that I will be collaborating with you on a project, this sounds phenomenal! I saw some of your latest projects, and, I must say I'm not even close to your level, I am still a beginner, but I am determined to learn. I can't wait to meet you in person and the best time for me is in the morning on Monday.

Looking forward to hearing from you,
Michalina

...



Orhan Can Görür <can.gorur@micropsi-industries.com>

Fri 17/12/2021 11:31

To: Michalina Maria Dengusiak

Dear Michalina,

Sounds good. Lets meet on Monday morning. How about 08:30? If that's too early, I can also make it at 9am.

Bests,
Can



Michalina Maria Dengusiak

Sun 19/12/2021 21:17

To: Orhan Can Görür <can.gorur@micropsi-industries.com>

Dear Dr. Orhan Can Görür,

Sorry for the late response, I'll be there around 8:30.

Kind regards,
Michalina

...



Orhan Can Görür <can.gorur@micropsi-industries.com>

Mon 20/12/2021 07:51

To: Michalina Maria Dengusiak

Great. Lets connect here: <https://us05web.zoom.us/j/81978654410?pwd=SFZSQkIHSDFXdnd3TGErck9HZExRUT09>



Michalina Maria Dengusiak

Mon 20/12/2021 07:53

To: Orhan Can Görür <can.gorur@micropsi-industries.com>

Sounds good. See you then.

Get [Outlook for iOS](#)

...

OG Orhan Can Görür <can.gorur@micropsi-industries.com>
Mon 20/12/2021 09:06

To: Michalina Maria Dengusiak

Tasks:

1. Deep Learning basics
2. Install Keras Tensorflow2: https://keras.io/getting_started/
3. Data processing and steps top ML with Keras: https://keras.io/getting_started/intro_to_keras_for_engineers/
4. Image classification from scratch with cats and dogs: https://keras.io/examples/vision/image_classification_from_scratch/

OG Have fun!
Best Regards,
Can

OG Orhan Can Görür <can.gorur@micropsi-industries.com>
Wed 26/01/2022 09:35

To: Michalina Maria Dengusiak

Dear Michalina,

I hope you are doing well.

I noticed that you are starting your internship the next week. Time flies 😊

As you know the situation with Covid, I wanted to ask you a couple of questions to confirm your arrival and see for the possibility of visiting the office. We are working mostly remotely these days; however, we can go to the office couple of days to see how the robots do cool stuff 😊. Can you please respond to these below:

1. Can you confirm again your internship dates? (starting from 31st and for 2 weeks, right?)
2. Would you like to visit the office couple of days to see the robots?
3. Are you vaccinated (1, 2, or 3 times with booster)? -> Note: you do not have to respond to this question or show your vaccination status if you prefer not to.
 - a. In case you are not vaccinated or you don't prefer to inform, please note that you need to get tested and show us every day you visit the office. Is that ok for you?
4. In case you would like to visit the office under these conditions, which days next week would be suitable for you? (we can also do half days).

PS: How did it go with the TensorFlow 😊?

Looking forward to hearing from you,

Bests,
Can

Dear Dr. Orhan Can Görür,

Time really does go by quickly, doesn't it? However, my enthusiasm hasn't faltered, and I am still counting the days until the internship! To answer your questions, yes, I will have my internship from the 31st of January to the 11th of February. And I am vaccinated twice, and hopefully will be receiving my booster shot this week.

I would love to take your offer to go to the office and see the robots, since it is a totally different experience to see your code working on the robot, than just in theory. Please choose the dates, as I am flexible, so whatever is best for you.

I am understanding TensorFlow more each day! At the beginning, the installation was quite tricky, but at the end I managed to accomplish it! By understanding PyCharm more clearly, it was easier to set everything up. I went through some tutorials on machine learning in general, and currently I'm following a series dedicated to neural networks, and it is phenomenal to be able to train your own model and it actually working properly. It took some time to understand how it worked, but slowly I'm getting the hang of it!

Looking forward to hearing from you,
Kind regards,
Michalina

P.S. This is the series with which I started: [Python Machine Learning Tutorial #1 - Introduction - YouTube](#)



OG Orhan Can Görür <can.gorur@micropsi-industries.com>
Thu 27/01/2022 17:00

To: Michalina Maria Dengusiak

Hi Michalina,

You can call me Can (I will tell you how to pronounce 😊).

Glad to hear that you are in and that you are already progressing with Tensorflow. That sounds really good because your task will be exactly with it, Tensorflow.

I made a plan that we will mostly work remotely (as we, as a company, are also doing). But, I already planned two visits for you next week. We can meet at the office on **Wednesday** and possibly on **Friday** next week at **09:30**, and please do not forget to get a Schnelltest in the morning before coming.

We can talk about the details of your task on Monday, your first day. **Let's have a remote meeting on Monday at 11:30 am** as I have a private appointment in the morning (and I hope it won't be delayed). **Link for the meeting: <https://us05web.zoom.us/j/86477787419?pwd=Z3h0YmRVZVNUEhPbG16YWeyRG8wdz09>**

Below is the task details, you can have a look at till our meeting:

- Task: Classifying an object for different orientations. For example, your classifier will output, this object looks to the right, or looks to the left (more on the images on Monday)
- You will use TensorFlow. The installation seems to be already done (well done 😊!)
- You will do transfer learning (it sounds scary, but simple): You will follow this tutorial: https://www.tensorflow.org/tutorials/images/transfer_learning
 - This is just like the examples you did, you will use an existing model and train it again with our own dataset (I will share it with you)
 - If we can follow the tutorial successfully, that means our classifier will be ready !
- Then, we can go and try at the office at the end 😊

And, always, do not hesitate to ask me anything! It is not easy to understand and follow the depths of machine learning. Especially the deeper one, Deep Learning 😊.

31.01.2022

Today is my first internship day! I cannot describe how excited I am!!! Unfortunately or fortunately, one can look at it both ways, I am going to do most of my internship remotely because of COVID... However, to be honest, I don't mind at all, in fact its fun. This is how Micropsi is working right now, as well as a lot of different programmers right now. Also, at the beginning, its even better to work on it at home, because I am just following a tutorial (https://www.tensorflow.org/tutorials/images/transfer_learning)

I worked a bit on the tutorial in the morning, but it takes a long time. Now, you might be confused, but because this is one of my first projects with tensorflow, I really want to understand it. Therefore I am researching every function, so that I, myself, am informed.

Then, at 11:30, I had a meeting with Dr. Orhan Can Görür, he told me in more detail what I would be working on, which is deciding in which orientation an object is from a video. But the best part is, that they got this as a project. So, I am going to be working on a real life example!

Going back to the meeting, which was held on zoom by the way, he said I would follow a tutorial and then we would tweak that code and do it that way. Then he said we would meet on Wednesday, so that I get to see the robots, and therefore, ideally I should be finished with the tutorial before then. Also, I forgot to mention, that I also asked him a few questions about the code, because, although I haven't been working on it for a long time, I already had my fair share of questions. And, during my meeting, my computer gave up on the sound, so I reconnected on my dad's computer (however I think I am going to take it over, I have been using it for the internship because its faster, and I have grown quite fond of it)

And so I worked on the tutorial.

Until it didn't work... And these are the emails that followed:
(However I kept on writing the rest of the code)

One error arose, so I substituted validation-data with test-data, but then another error came up. The struggle!

Speaking of struggles, now I understand the need for powerful computers for programmers, because it takes so long to train the model.



Michalina Maria Dengusiak

Mon 31/01/2022 15:51

◀ ▶ ⏪ ⏩ ⏴ ⏵

To: Orhan Can Görür <can.gorur@micropsi-industries.com>

I am running the code, and it works, but at the end, this error is displayed:

```
Run: main.py
Epoch 9/10
65/65 [=====] - 18s 289ms/step - loss: 0.2247 - accuracy: 0.9005
Epoch 10/10
63/63 [=====] - 18s 290ms/step - loss: 0.2110 - accuracy: 0.9160
C:\Users\micha\Downloads\anaconda\envs\Internship_31.1.2022\lib\site-packages\keras\utils\generic_utils.py:921: RuntimeWarning: divide by zero encountered in log10
    numdigits = int(np.log10(self.target)) + 1
Traceback (most recent call last):
  File "C:\Users\micha\Documents\Python\machineLearning\Internship_31.1.2022\main.py", line 115, in <module>
    loss0, accuracy0 = model.evaluate(validation_dataset)
  File "C:\Users\micha\Downloads\anaconda\envs\Internship_31.1.2022\lib\site-packages\keras\utils\generic_utils.py", line 67, in error_handler
    raise e.with_traceback(filtered_tb) from None
  File "C:\Users\micha\Downloads\anaconda\envs\Internship_31.1.2022\lib\site-packages\keras\utils\generic_utils.py", line 921, in update
    numdigits = int(np.log10(self.target)) + 1
OverflowError: cannot convert float infinity to integer

Process finished with exit code 1
```

I don't know what is wrong... I cannot find anything wrong with the code, this is what I added when the error appeared:

```
main.py
87     feature_batch_average = global_average_layer(feature_batch)
88     #print(feature_batch_average.shape)
89
90     prediction_layer = tf.keras.layers.Dense(1)
91     prediction_batch = prediction_layer(feature_batch_average)
92     #print(prediction_batch)
```



Orhan Can Görür <can.gorur@micropsi-industries.com>

Mon 31/01/2022 16:03

◀ ▶ ⏪ ⏩ ⏴ ⏵

To: Michalina Maria Dengusiak

I cannot dive into details right now, but looking at the error, I suspect that the validation_dataset has some empty arrays. (that is why it mentions float infinity in the error message because probably within keras functions, this `log10(self.target)` returns infinity only if self.target is 0.

Can you print the validation_dataset and examine if there are any empty arrays? You can also share the print here to inspect together.

...



Michalina Maria Dengusiak

Mon 31/01/2022 16:28

◀ ▶ ⏪ ⏩ ⏴ ⏵

To: Orhan Can Görür <can.gorur@micropsi-industries.com>

So, this is what it is printing(, 2nd line in console, <Prefetch:

You are right, but now I am completely lost... Could we perhaps call?

```
Project: Internship_31.1.2022 C:\Users\micha\Documents\Python\main.py
  main.py
  External Libraries
  Scratches and Consoles

  86     global_average_layer = tf.keras.layers.GlobalAveragePooling2D()#converts features to a single 1280 elements vector
  87     feature_batch_average = global_average_layer(feature_batch)
  88     #print(feature_batch_average.shape)
  89
  90     prediction_layer = tf.keras.layers.Dense(1)
  91     prediction_batch = prediction_layer(feature_batch_average)
  92     #print(prediction_batch)
  93
  94     print(validation_dataset)
  95     #creating a model, using the Keras functional API instead of keras.Sequential, as this is more flexible
  96     inputs = tf.keras.Input(shape=(160, 160, 3))
  97     vgg16 = VGG16(include_top=False, input_tensor=inputs)

Run: main.py
Found 1099 files belonging to 2 classes.
<PrefetchDataset shapes: ((None, 160, 160, 3), (None,)), types: (tf.float32, tf.int32)>
C:\Users\micha\Downloads\anaconda\envs\Internship_31.1.2022\lib\site-packages\keras\utils\generic_utils.py:921: RuntimeWarning: divide by zero encountered in log10
    numdigits = int(np.log10(self.target)) + 1
Traceback (most recent call last):
  File "C:\Users\micha\Documents\Python\machineLearning\Internship_31.1.2022\main.py", line 115, in <module>
    loss0, accuracy0 = model.evaluate(validation_dataset)
  File "C:\Users\micha\Downloads\anaconda\envs\Internship_31.1.2022\lib\site-packages\keras\utils\generic_utils.py", line 67, in error_handler
    raise e.with_traceback(filtered_tb) from None
  File "C:\Users\micha\Downloads\anaconda\envs\Internship_31.1.2022\lib\site-packages\keras\utils\generic_utils.py", line 921, in update
    numdigits = int(np.log10(self.target)) + 1
OverflowError: cannot convert float infinity to integer

Process finished with exit code 1
```

OG

Orhan Can Görür <can.gorur@micropsi-industries.com>

Mon 31/01/2022 16:45



To: Michalina Maria Dengusiak

Hey,

Unfortunately, I have a meeting now. Here are some more suggestions to try:

1. Can you replace validation_dataset with test_dataset (don't remember the exact name) and run again?
2. If it also fails, maybe you are running the evaluation wrong somehow. Can you share your script and I inspect hopefully today till the end of the day 😊
3. If it doesn't fail, we would know that validation_dataset is configured wrong. We can have a look at it tomorrow morning, in the meantime, you can continue the tutorial with fine-tuning part as the model seems to be trained well.

Bests,

Can

...

OG

Orhan Can Görür <can.gorur@micropsi-industries.com>

Mon 31/01/2022 17:18



To: Michalina Maria Dengusiak

Hey Michalina,

Lets meet tomorrow at 10 am for 30 mins to catch up. Is that ok?

Here is the link: https://us05web.zoom.us/j/*****478?pwd=WWp6WjBaVEE0Z0g2V0owT3JqK3d3Zz09

Bests,

Can

To: Orhan Can Görür <can.gorur@micropsi-industries.com>



Tutorial.py

7 KB



Thank you for helping me, and the validation problem is now fixed! I replaced it with the train data. Unfortunately, now there is another error. When the data is training, it should print the variables loss, accuracy, val_loss, and val_accuracy. But now, it is only printing loss and accuracy, so when I want to access it later, I can't...

Also, to your other question regarding the meeting at 10, that will be good.

Here is the error it displays to me:

```
148     fine_tune_at = 100 #fine tuning from this layer onwards
149     #fine tuning is used in transfer learning to tweak or tune an existing model
150     #Here we are freezing all the layers before the fine_tune_at layer
151
Run: Tutorial
Epoch 7/10
63/63 [=====] - 19s 295ms/step - loss: 0.2462 - accuracy: 0.8880
Epoch 8/10
63/63 [=====] - 18s 285ms/step - loss: 0.2253 - accuracy: 0.9060
Epoch 9/10
63/63 [=====] - 18s 284ms/step - loss: 0.2239 - accuracy: 0.8995
Epoch 10/10
63/63 [=====] - 18s 288ms/step - loss: 0.2103 - accuracy: 0.9140
Traceback (most recent call last):
  File "C:/Users/micha/Documents/Python/machinelearning/Internship_31.1.2022/Tutorial.py", line 120, in <module>
    val_acc = history.history['val_accuracy']
KeyError: 'val_accuracy'

Process finished with exit code 1
```

My task on which I will be working on during the internship:
 ↪ to write a program, which can detect the object's orientation, which in this case is up or down

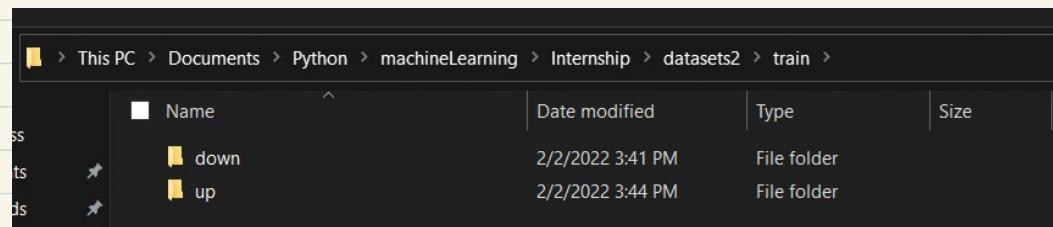
1. First I follow the tutorial, in order to have a model. (This tutorial is actually about transfer-flow, so its basing its' model on the mobilenetV2 model from Google)

The screenshot shows the TensorFlow website with the URL <https://github.com/tensorflow/docs/tree/master/site/en/>. The page is titled 'Transfer learning and fine-tuning'. It features a sidebar with categories like 'ADVANCED', 'Customization', 'Distributed training', 'Images', 'Text', 'Audio', and 'Structured data'. Under 'Images', 'Transfer learning and fine-tuning' is selected. The main content area includes sections on running the tutorial in Google Colab, viewing the source on GitHub, and downloading the notebook. A summary of the tutorial's purpose and steps is provided.

2. Extract images from the videos, so write a function to do that.



3. Organise the data into appropriate folders, which the computer can access



4. Change the code from the tutorial into functions:

```

5
6     # TODO: Define a class with the class variables and functions
7     class globalVariables:
8         train_dataset=None
9         validation_dataset=None
10        test_dataset=None
11        data_augmentation=keras.Sequential()
12        preprocess_input = tf.keras.applications.mobilenet_v2.preprocess_input
13
14
15    def data(path_to_zip, img_size):
16        path = os.path.join(os.path.dirname(path_to_zip), 'datasets')
17

```

5. increase the accuracy to min. 95%:

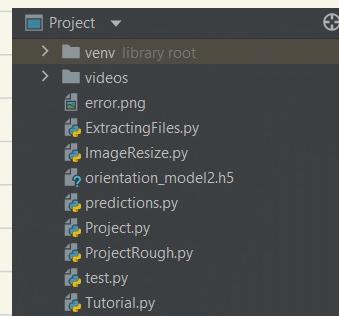


(shows 100,
is actually
98)

6 save the model, so that you can access it later

7. use the model for predictions

```
def predict(model_filepath, img_dir):
    loaded_model = load_model(model_filepath)
    for i, img in enumerate(os.listdir(img_dir)):
        img = image.load_img(os.path.join(img_dir, img), target_size=(320, 256))
        plt.imshow(img)
        img = np.expand_dims(img, axis=0)
        result = loaded_model.predict(img)
        plt.title(np.argmax(result, axis=1))
        plt.show()
predict(model_filepath="orientation_model.h5", img_dir=r"imagesdownremoved/")
```



8. use the model for predictions on images from a folder



9. make predictions in real-time, so that when a camera is connected via USB, it makes predictions on the object's orientation, when it is shown.

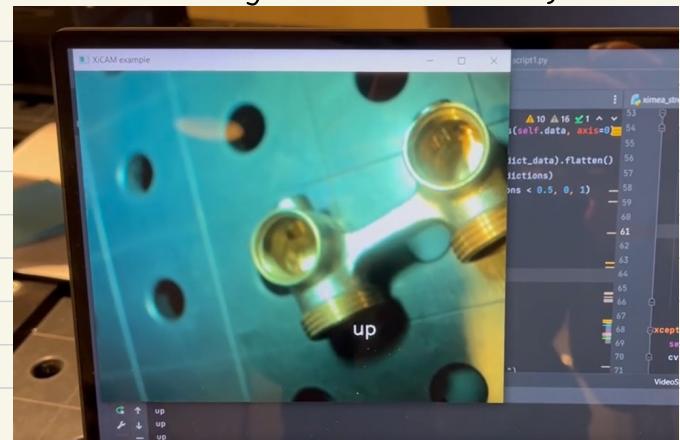
Also Labelling these images:

```
XiCAM example - File Edit Run Tools VCS Window
test2.py
video_clip

main(video_file)

__name__ == "__main__":
img_class = ImageClass()
vid = VideoStream(width=320, height=256)
vid.loaded_model = img_class.model
vid.prep_and_connect()
vid.stream_and_predict()

Project.py 241
ProjectRough.py 242
saved_model.h5 243
saved_model_2.h5 244
test.py
```



1.02.2022

Today after waking up, I went back to the battlefield, the code, and try to resolve the errors before the meeting. So, as it turned out, the error that was no present, was only used for plotting data, so I just deleted it and the problem was "fixed". At that moment Can wrote an email to me:

Orhan Can Görür <can.gorur@micropsi-industries.com>
Tue 01/02/2022 09:42
To: Michalina Maria Dengusiak

Can you send me your python script (to this email cangorur88@gmail.com, cause microsoft outlook somehow blocks me from opening it)

Also, here is the zoom link to meet: <https://us05web.zoom.us/j/2204032478?pwd=WWp6WjBaVEE0Z0g2V0owT3JqK3d3Zz09>
...

Michalina Maria Dengusiak
Tue 01/02/2022 09:47
To: Orhan Can Görür <can.gorur@micropsi-industries.com>

I managed to solve the error! I deleted the variables, which were causing the error since in the end, it turned out they were used only for plotting the data. But I will still send you the code! I am so happy, that it finally works!

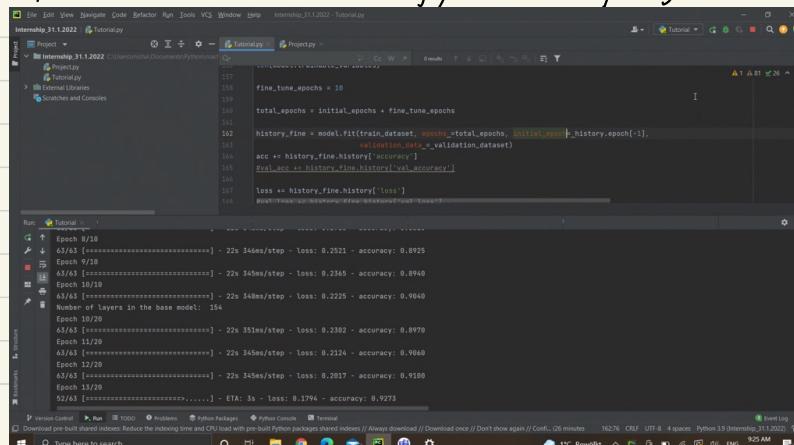
Also, I forgot to do so yesterday, but from now on, if I will be contacting you by email, I will do so through my Gmail account (michalina.dengusiak@gmail.com). The reason behind it is that I am switching schools, and they will probably close my account...
...

Reply | Forward

Then, at 10, we met in a Zoom call, and he asked me to explain the code, so I shared my screen, and explained it to him, how I understood it, when I didn't understand something, just said so and he explained it to me. Oh! In the middle, my dad kicked the internet, so I was disconnected, but just in the right moment, because he had a meeting. And after his meeting (15 min), we continued.

At one point he asked me how long the code took to run, and I didn't know then, but now I know: 9 minutes.

After the meeting, I finally got to run the code!



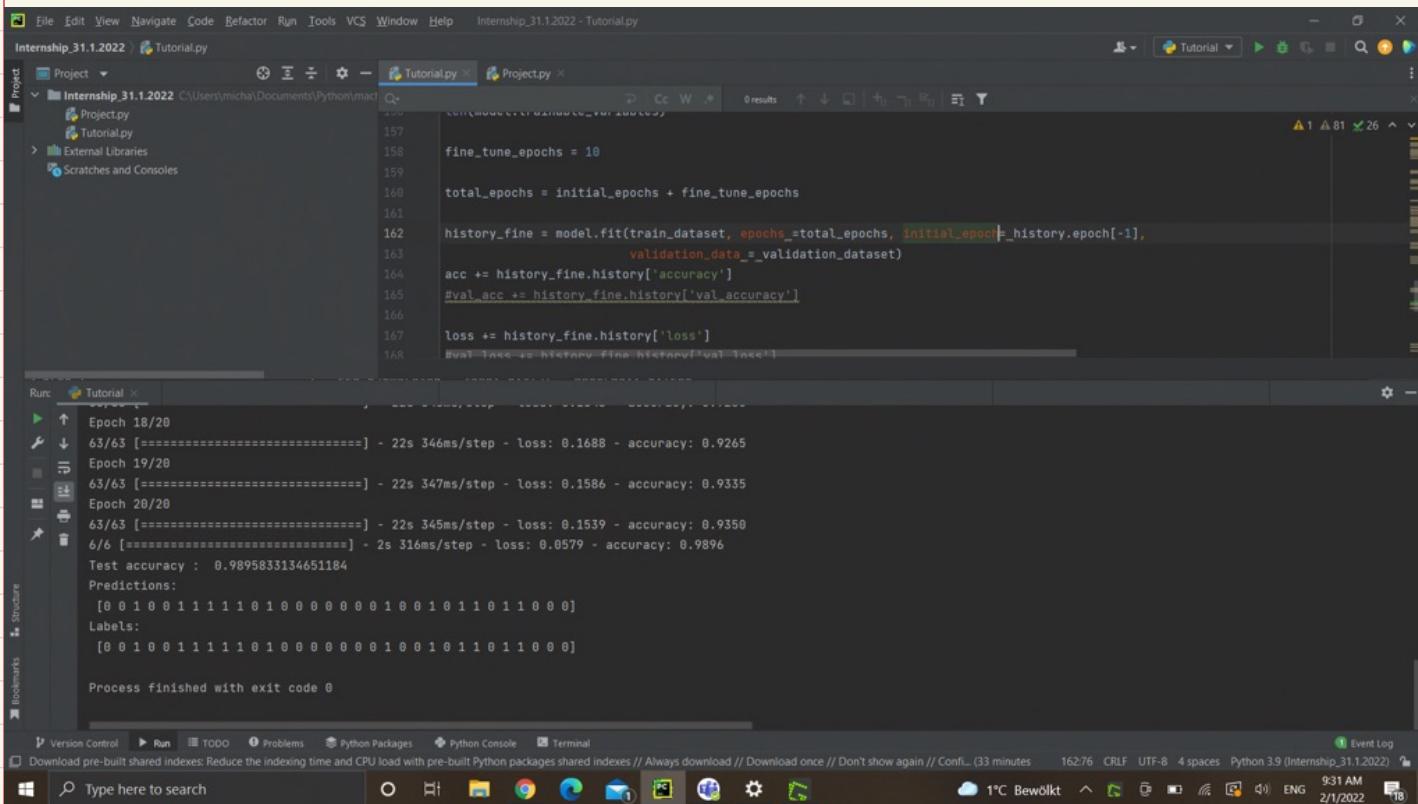
The screenshot shows a code editor with Python code running. The code is related to training a neural network model. The output window displays the progress of the training process, showing epochs from 8/10 to 13/20, step times, loss values, and accuracy percentages. The final output shows an ETA of 5s and an accuracy of 0.9275.

```
File_time_epochs = 10
total_epochs = initial_epochs + fine_tune_epochs
history_fine = model.fit(train_dataset, epochs=total_epochs, validation_data=validation_dataset)
acc += history_fine.history['accuracy']
val_acc += history_fine.history['val_accuracy']

loss += history_fine.history['loss']
loss += history_fine.history['val_loss']
loss += history_fine.history['accuracy']
loss += history_fine.history['val_accuracy']

Epoch 8/10
65/65 [=====] - 22s 340ms/step - loss: 0.2921 - accuracy: 0.8925
Epoch 9/10
65/65 [=====] - 22s 340ms/step - loss: 0.2365 - accuracy: 0.9140
Epoch 10/10
65/65 [=====] - 22s 340ms/step - loss: 0.2225 - accuracy: 0.9040
Number of layers in the base model: 154
Epoch 10/20
65/65 [=====] - 22s 351ms/step - loss: 0.2382 - accuracy: 0.8970
Epoch 11/20
65/65 [=====] - 22s 345ms/step - loss: 0.2214 - accuracy: 0.9060
Epoch 12/20
65/65 [=====] - 22s 345ms/step - loss: 0.2017 - accuracy: 0.9100
Epoch 13/20
65/65 [=====] - ETA: 5s - loss: 0.1794 - accuracy: 0.9275
```

And it worked!

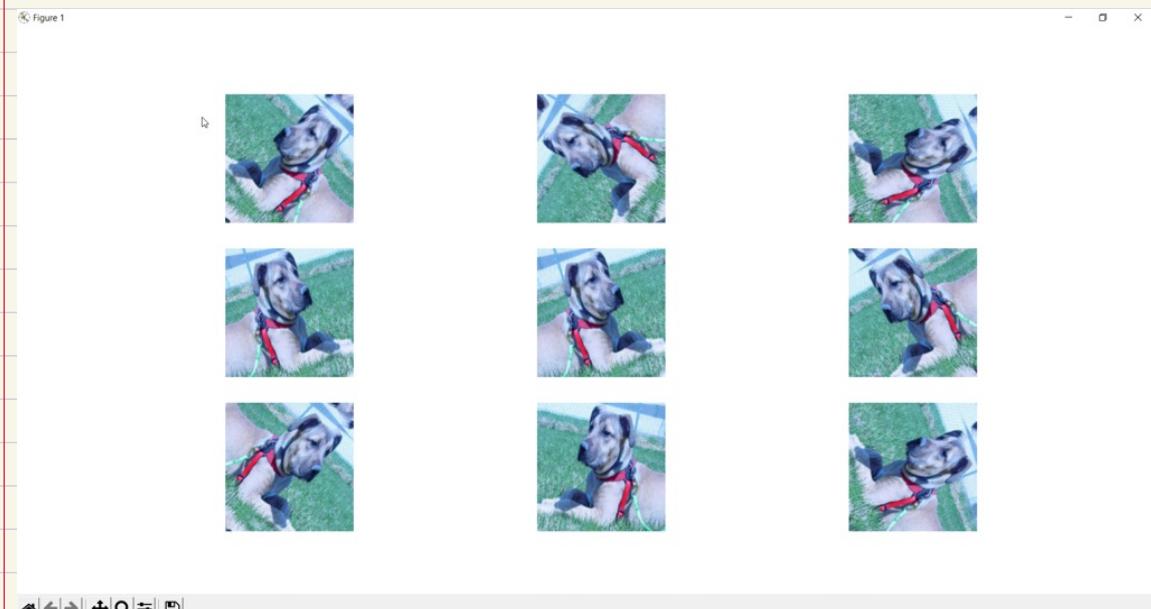


The screenshot shows a PyCharm IDE window. The top part displays the code for `Tutorial.py`, which includes a loop for fine-tuning a model. The bottom part shows the terminal output of the script's execution. The output shows training progress from epoch 18 to 20, validation accuracy, test accuracy, predictions, and labels. The process finished with an exit code 0.

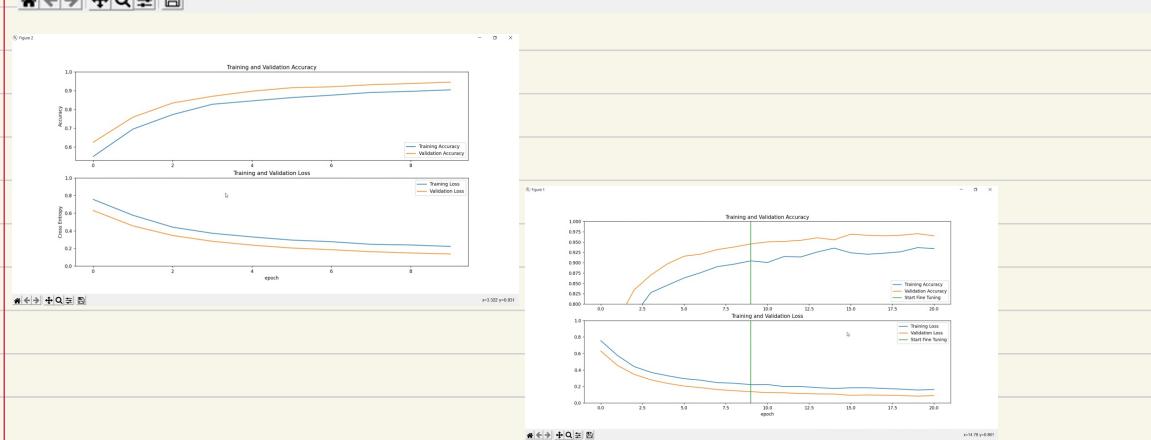
```
fine_tune_epochs = 10
total_epochs = initial_epochs + fine_tune_epochs
history_fine = model.fit(train_dataset, epochs=total_epochs, initial_epoch=_history.epoch[-1],
                           validation_data=_validation_dataset)
acc += history_fine.history['accuracy']
#val_acc += history_fine.history['val_accuracy']
loss += history_fine.history['loss']
#val_loss += history_fine.history['val_loss']

Epoch 18/20
63/63 [=====] - 22s 346ms/step - loss: 0.1688 - accuracy: 0.9265
Epoch 19/20
63/63 [=====] - 22s 347ms/step - loss: 0.1586 - accuracy: 0.9335
Epoch 20/20
63/63 [=====] - 22s 345ms/step - loss: 0.1539 - accuracy: 0.9350
6/6 [=====] - 2s 316ms/step - loss: 0.0579 - accuracy: 0.9896
Test accuracy : 0.9895833134651184
Predictions:
[0 0 1 0 0 1 1 1 1 0 1 0 0 0 0 0 0 0 1 0 0 1 0 1 1 0 1 1 0 0 0]
Labels:
[0 0 1 0 0 1 1 1 1 0 1 0 0 0 0 0 0 0 1 0 0 1 0 1 1 0 1 1 0 0 0]
Process finished with exit code 0
```

And also, when following the tutorial, my code plots some images:



data augmentation rotates and flips data to randomize it and to create more of it



Here are graphs to display how the model got increasingly more accurate :

Figure 1

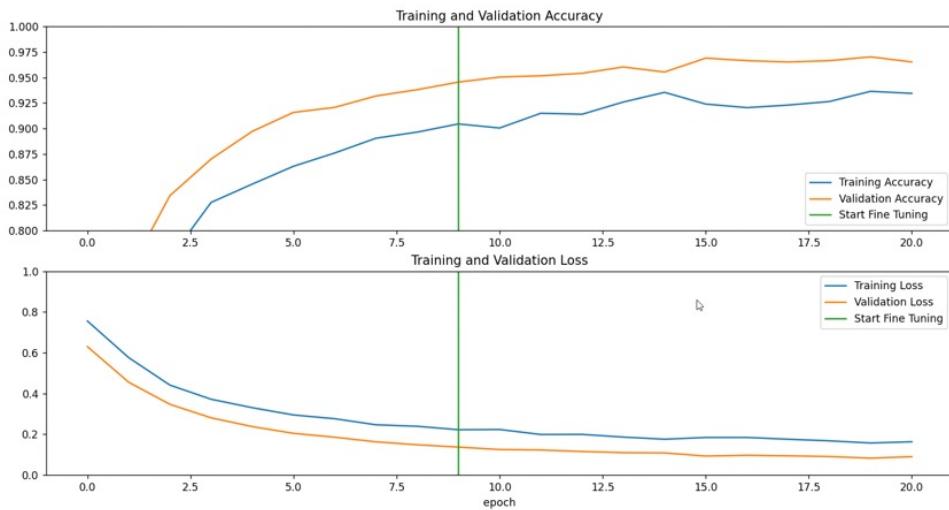


Figure 2

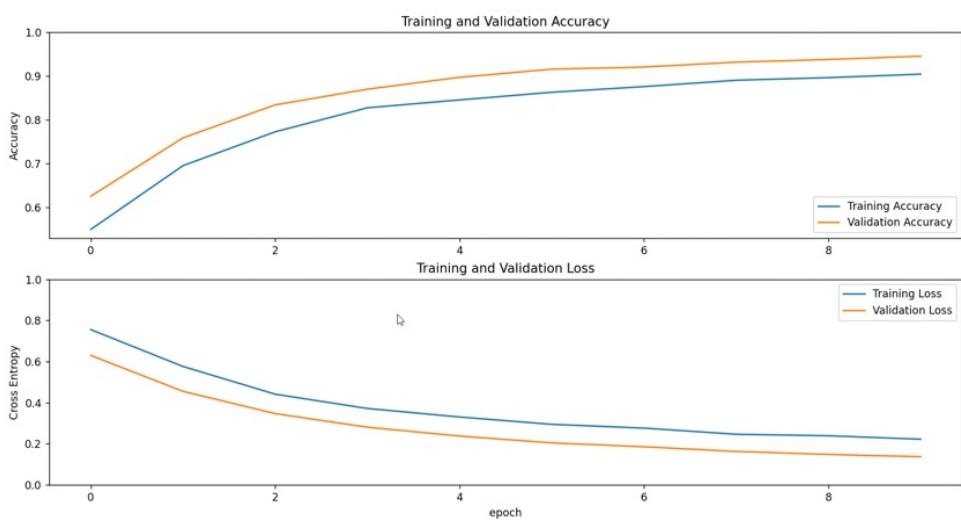


Figure 3



And, of course, we need to get our share of cute cats and dogs!

One more thing I forgot to add my task for today is:

1. to clean up the code
2. create function for extracting photos from videos
3. create 2 functions based on the code from the tutorial (data augmentation + fine tuning)

And this is what I managed to do, however then I decided to try to connect the GPU circuit to my computer and I messed with the installations... The whole thing stopped working, literally nothing works.

Seriously, here we are at 22:40, my dad and I, trying to fix PyCharm, because no code works... Imagine me going there and being like: Yea, unfortunately, the code doesn't work on my computer. Do you have any spare ones?

Fingers crossed it's going to work now!

Such a relief - it worked! Now I'm ready to go to the office!

2.02.2022

I went to the office and it was amazing! Amazing, phenomenal, fantastic, the list goes on... so I went there at 9:30, I remembered that it was somewhere in an alley, so I easily found them. Also, they had a sign, which really helped! I rung their bell and it was immediately answered and suddenly I hear this voice saying, "Hello?", I thought it was Can and noticed that I was on the wrong floor. When I went up, I saw a man in the doorway. He began questioning who I was and why I am here. While he searched for Can, he told me to wait in the kitchen area. Soon Can came, took me to a desk. Then, he wanted to eat something and wanted me to show him what I worked on. So, we went to the kitchen area, and he showed me a way to call the function that called all other functions. Then we went to the desks and I got introduced to the team via Zoom, in their daily SPRINT meetings, basically where they say what they worked on yesterday and what they will be working on today.

And we went over to the robots. It was so cool! I mean seriously! Can explained everything to me, and then we trained our own skill. What we did was we had an object, and moved the robot arm around the object, the robot learned the reverse way, so we went up it learned, that when an image looks like that, you need to go down. So we did like 15 of these takes.

We had to send it to the "cloud" box with several GPU's in order for it to train. This took 1.5 hours.

In the meantime we had lunch and I worked on my project, basically now taking the photos (extracted from the videos) organizing it and training the model on it.



Now this may sound easy, but, to be honest, I think it was the hardest part... However I managed to overcome it! Then I tried to input it into the model, but it turned out that the image size was wrong, so I wrote a whole function for it. (I somehow did it, by the way) I told Can, and then it turned out it was hard-coded in the code, so I changed it and it worked, but I had to create a whole new dataset...

After it trained the accuracy was unusually low, so I told Can how I organised the data, and I had to re-do it.

In the midst of this I also somehow managed to play with the robot and its' new skill, which had my name. But it was trained and it was amazing! I could move it anywhere and it returned to the object. Additionally, if you moved the object at the end the robot would follow you!



At 4, Can had a meeting and I was left to my own devices and was trying to figure out what class variable are, when this dude showed up and asked me what I was working on. (Well showed up is the wrong use of words as he sat on the opposite desk). And explained it all to me, but, damn! He really knew Python, like he was an expert programmer.

Oh, and I forgot to add, that I was waiting for Can in order to test if the robot improved, since we took takes in which the object was upside down, in order to check if it would work. He came at 5, and told me I could go, or wait until 6 to test it, because the stuff was moved (the box that contained the skill). I decided to call it a day.

Oh! I forgot to say so, but micropsi doesn't create robots, only 3D grippers, but most importantly the skills for the robot

I have been sitting now, training the model, when, instead of global variables I use classes, the accuracy is great, but an error appears at the end:

```
Run: ProjectRough
Epoch 20/20
57/57 [=====] - 62s 1s/step - loss: 0.1630 - accuracy: 0.9440 - val_loss: 0.3245 - val_accuracy: 0.9146
Traceback (most recent call last):
  File "C:/Users/micha/Documents/Python/machineLearning/Internship/ProjectRough.py", line 125, in <module>
    training(img_shape= img_shape)
  File "C:/Users/micha/Documents/Python/machineLearning/Internship/ProjectRough.py", line 106, in training
    loss, accuracy = model.evaluate(globalVariables.test_dataset)
  File "C:/Users/micha/Documents/Python/machineLearning/venv/lib/site-packages\keras\utils\traceback_utils.py", line 67, in error_handler
    raise e.with_traceback(filtered_tb) from None
  File "C:/Users/micha/Documents/Python/machineLearning/venv/lib/site-packages\keras\engine\data_adapter.py", line 991, in select_data_adapter
    _type_name(x), _type_name(y)))
ValueError: Failed to find data adapter that can handle input: <class 'NoneType'>, <class 'NoneType'>

Process finished with exit code 1
```

Version Control Run TODO Problems Python Packages Python Console Terminal

Download pre-built shared indexes: Reduce the indexing time and CPU load with pre-built Python packages shared indexes // Always download // Download once // Don't show again // Configure... (today 7:28 PM)

126.8 CRLF UTF-8

compared to the accuracy of the code with global variables:

```
Run: Project X
Epoch 20/20
57/57 [=====] - 62s 1s/step - loss: 0.3379 - accuracy: 0.8258 - val_loss: 0.4902 - val_accuracy: 0.7178
5/5 [=====] - 4s 724ms/step - loss: 0.4304 - accuracy: 0.7250
Test accuracy : 0.7250000238418579
Predictions:
[0 0 1 1 0 1 1 1 0 1 1 0 1 0 1 1 1 0 0 1 1 0 1 0 0 0 1 1 1]
Labels:
[0 0 1 0 0 1 1 1 0 0 1 0 1 0 1 1 0 0 1 1 0 0 1 0 0 1 0 0 1]
```

3.02.2022

This morning I have been fighting all morning to fix that error from yesterday... It was so nerve-racking, and my dad suggested to decrease the epoch size, in order to find the error, since it was crashing after all of the training. Then, I learned how to debug code, and I found that this line was causing the code:

```
loss, accuracy = model.evaluate(globalVariables.test_dataset)
```

So, first I investigated loss and accuracy, and couldn't find them be declared anywhere. I went to the tutorial and found some lines, where loss and acc were declared, and found that they weren't in my code, as I thought that they were only used for plotting data. Yet the error was `NoneType`, so it would make sense. This did not solve the error, so I changed acc to accuracy, this also didn't help... Then I deleted all the variables that I just added and focused on `test_dataset` instead. Bingo! I declared all the variables I used in both functions like this: (in a class)

```
class globalVariables:
    train_dataset=None
    validation_dataset=None
    test_dataset=None
    data_augmentation=keras.Sequential()
    preprocess_input = tf.keras.applications.mobilenet_v2.preprocess_input
```

And in order to access these variables I had to always write:
`globalVariables.variable_name`

Yet I didn't do it once, and there I added the most important information. Then, I ran it once completely and the accuracy was 91%!

```
Run: ProjectRough X
Epoch 20/20
57/57 [=====] - 72s 1s/step - loss: 0.1726 - accuracy: 0.9456 - val_loss: 0.3646 - val_accuracy: 0.8726
5/5 [=====] - 73s 1s/step - loss: 0.1630 - accuracy: 0.9462 - val_loss: 0.3406 - val_accuracy: 0.9000
Test accuracy : 0.9125000238418579
Predictions:
[1 1 1 0 1 1 1 0 0 1 0 0 1 1 1 0 1 1 1 1 0 1 1 1 1 0 0 1 1]
Labels:
[1 1 1 0 1 1 1 0 0 0 0 0 1 1 1 0 1 1 1 1 0 1 1 1 1 0 0 1 1]
Process finished with exit code 0
```

Just as I was training the model completely, I had a Zoom call with Can. And these are my tasks for today:

1. get the model to an accuracy of 96% or ideally 98%
2. write a function that uses the trained model, to predict the orientation of images
- 3 (he didn't say I should do it, but I want to) putting functions also in classes

He also said I should remind him about the workshop tomorrow, where my Python code will be "cleaned up" and optimised

So, at the beginning I tested different values for epochs, but it's really time consuming, so I decided to work on the function. However, in order to do that I needed to first save my model (otherwise I would have needed to train my model every single time before I could run it). So I researched about various packages that allow you to do that, like pickle, joblib, but nothing seemed to be working at the beginning I even ran it, for like 20 epochs.

Then, I found a way, using Tensorflow to save the model, but then could not load it, these errors kept popping up:

The screenshot shows a Jupyter Notebook interface with a 'Run' tab selected. The code cell contains the following Python code:

```
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.  
Traceback (most recent call last):  
  File "<ipython-input-1>", line 1, in <module>  
    model = keras.models.load_model(r'C:\Users\micha\Documents\Python\machineLearning\Internship\predictions.py')  
  File "C:\Users\micha\Documents\Python\machineLearning\Internship\venv\lib\site-packages\keras\utils\traceback_utils.py", line 67, in error_handler  
    raise e.with_traceback(filtered_tb) from None  
  File "C:\Users\micha\Documents\Python\machineLearning\Internship\venv\lib\site-packages\keras\saving\saved_model\load.py", line 707, in _reconstruct_model  
    if config['layers'][0]['class_name'] == 'InputLayer':  
IndexError: list index out of range
```

Below the code cell, the output shows:

```
Process finished with exit code 1
```

The interface includes standard Jupyter Notebook navigation buttons (Version Control, Find, Run, TODO, Problems, Debug, Python Packages, Python Console, Terminal) and status information (4:105 CRLF UTF-8 4 spaces).

or

The screenshot shows a Jupyter Notebook interface with a 'Run' tab selected. The code cell contains the following Python code:

```
File "C:\Users\micha\Documents\Python\machineLearning\Internship\venv\lib\site-packages\keras\engine\training.py", line 315, in __reduce__  
    pickle_utils.serialize_model_as_bytecode(self)  
File "C:\Users\micha\Documents\Python\machineLearning\Internship\venv\lib\site-packages\keras\saving\pickle_utils.py", line 64, in serialize_model_as_bytecode  
    model.save(temp_dir)  
  File "C:\Users\micha\Documents\Python\machineLearning\Internship\venv\lib\site-packages\keras\utils\traceback_utils.py", line 67, in error_handler  
    raise e.with_traceback(filtered_tb) from None  
  File "C:\Users\micha\Documents\Python\machineLearning\Internship\venv\lib\site-packages\tensorflow\python\saved_model\function_serialization.py", line 68, in serialize_concrete  
    "Failed to add concrete function '{concrete.function.name}' to object"  
KeyError: "Failed to add concrete function 'b'__inference_model_layer_call_fn_36302' to object-based SavedModel as it captures tensor <tf.Tensor: shape=(), dtype=resource, value="
```

Below the code cell, the output shows:

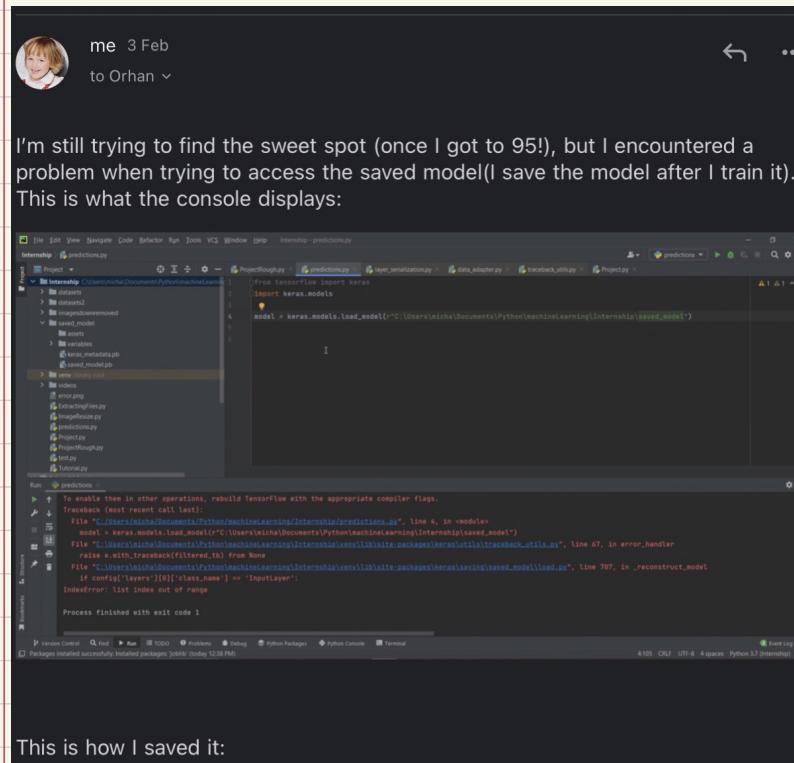
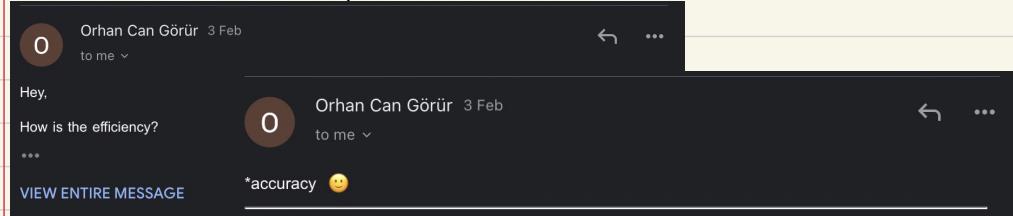
```
Process finished with exit code 1
```

The interface includes standard Jupyter Notebook navigation buttons (Version Control, Find, Run, TODO, Problems, Debug, Python Packages, Python Console, Terminal) and status information (4:105 CRLF UTF-8 4 spaces Python 3.7 (Intel) Event Log).

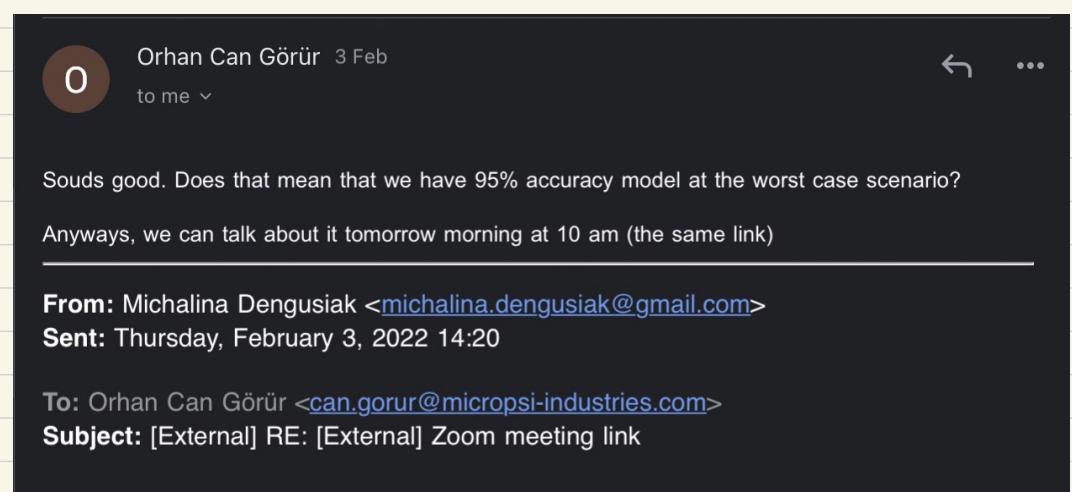
They kept on coming, and I wasn't able to solve them, no matter what I did. The frustration I felt was insane, so basically until lunch I didn't do anything. But then after some time, I cracked the code, I had to save it as a h5 file! Finally! So, then I wrote a function (which was largely based on the internet, but hey, that's how you learn), which plots the image and as a

title has the number 0,1, depending on how it classified it. Then, I decided to work on the accuracy again, yet it suddenly dropped to 76%. I thought it was because the number under the number of epochs now is 33 instead of 57. To be honest, I don't know why, but I didn't manage to solve this error.. However then I saw, that I didn't connect the variable "data augmentation", so when I did that, the highest accuracy I got to, which I saved was 85%.

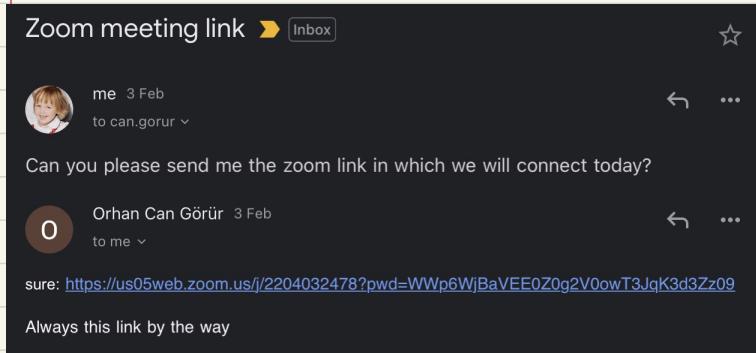
But there is a problem... Because Can wrote an email asking about the accuracy, and, well see for yourselves:



(me freaking out, because this was before lunch)



Also, I forgot to add, that I asked him for the zoom meeting link, as I didn't know we were always using the same one...



4.02.2022

This morning has been stressful. I was trying to improve the accuracy the whole time... But nothing works! The highest I got to was 85% yesterday evening!

Thankfully, in the meeting with Can everything was resolved. The way I declared the functions was wrong, like totally wrong. This was the way

```
4 import tensorflow as tf
5
6 class globalVariables:
7
8     def __init__(self, path_to_zip, img_size):
9         self.path_to_zip = path_to_zip
10        self.img_size = img_size
11        self.img_shape = img_size + (3, )
12        self.train_dataset=None
13        self.validation_dataset=None
14        self.test_dataset=None
15        self.data_augmentations=keras.Sequential()
16        self.preprocess_input = tf.keras.applications.mobilenet_v2.preprocess_input
17
18     def data(self):
19         path = os.path.join(os.path.dirname(self.path_to_zip), 'datasets')
20
21         train_dir = os.path.join(path, 'train')
22         validation_dir = os.path.join(path, 'validation')
```

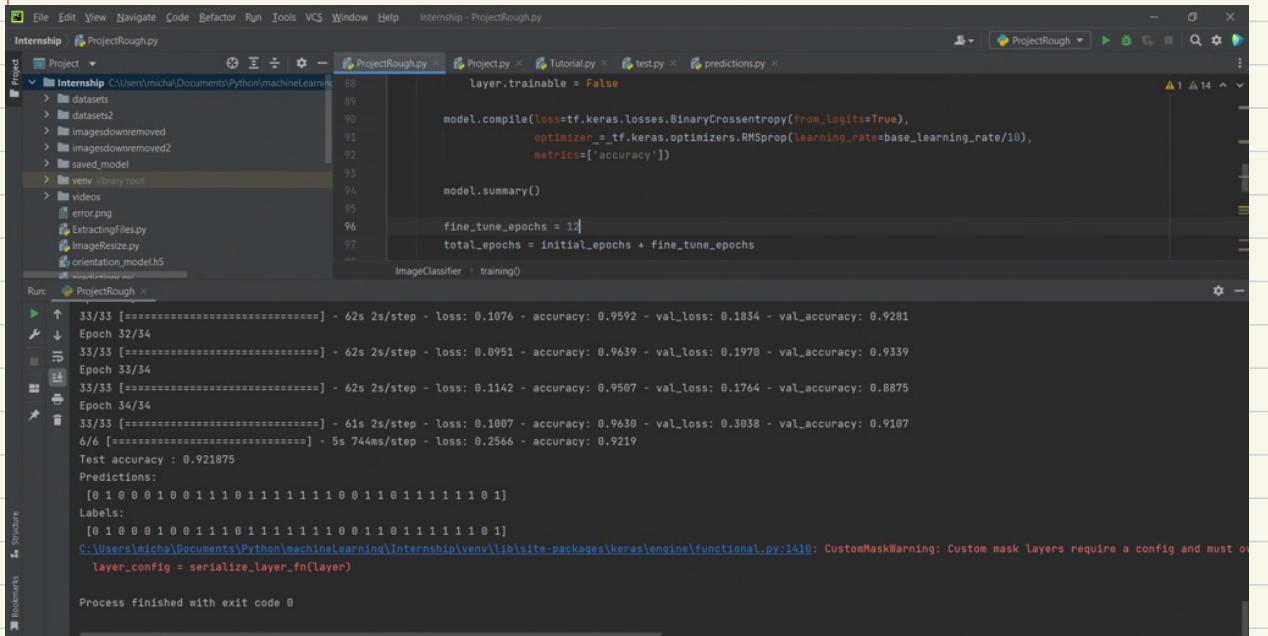
I was supposed to be doing it... However, I changed the classes and it looked better because there wasn't such an unexplainable difference between train_data and validation_data.

We would meet at 3:30 for a Python "workshop", basically he'll help me make my python code look professional. Up until that meeting, I was just tweaking the epoch number and data augmentation methods, in order to get the best accuracy. But, the most I got was 82%... Quite disappointing, if I dare say so myself.

During the meeting, Can helped me change my code to that of a professional software developer! It looks absolutely magnificent! I also learned a lot about classes! However, he was also confused as to why the code wasn't working. He told me to compare it to the tutorial, as maybe I missed or deleted something.

So, after the meeting, first I organized everything and added more functions (now I have data, training, plotting, saving, loading and predicting) and then I compared it to the tutorial. And bam! I found the error, I wasn't compiling the model! Such a stupid mistake, and missing this line ruined everything. This line was defining the loss and optimizers

I wished I looked at this earlier and I wouldn't have been yesterday and today in such a stress! However, there is a reason for everything, so I guess I just need to keep on believing! But I am so relieved!



The screenshot shows the PyCharm IDE interface. The top menu bar includes File, Edit, View, Navigate, Code, Refactor, Run, Tools, VCS, Window, Help, and Internship - ProjectRough.py. The left sidebar shows a project structure with files like ProjectRough.py, Project.py, Tutorial.py, test.py, and predictions.py. The main editor window displays Python code for training a model, including compilation with binary crossentropy loss, RMSprop optimizer, and accuracy metric. The Run tab shows the command-line output of the script, detailing training and validation steps, accuracy, and loss values. The bottom status bar indicates the process finished with exit code 0.

```

File Edit View Navigate Code Refactor Run Tools VCS Window Help Internship - ProjectRough.py
Internship > ProjectRough.py
Project Internship C:\Users\micha\Documents\Python\machineLearning>
ProjectRough.py 88
layer.trainable = False

model.compile(loss=tf.keras.losses.BinaryCrossentropy(from_logits=True),
               optimizer=_tf.keras.optimizers.RMSprop(learning_rate=base_learning_rate/10),
               metrics=['accuracy'])

model.summary()

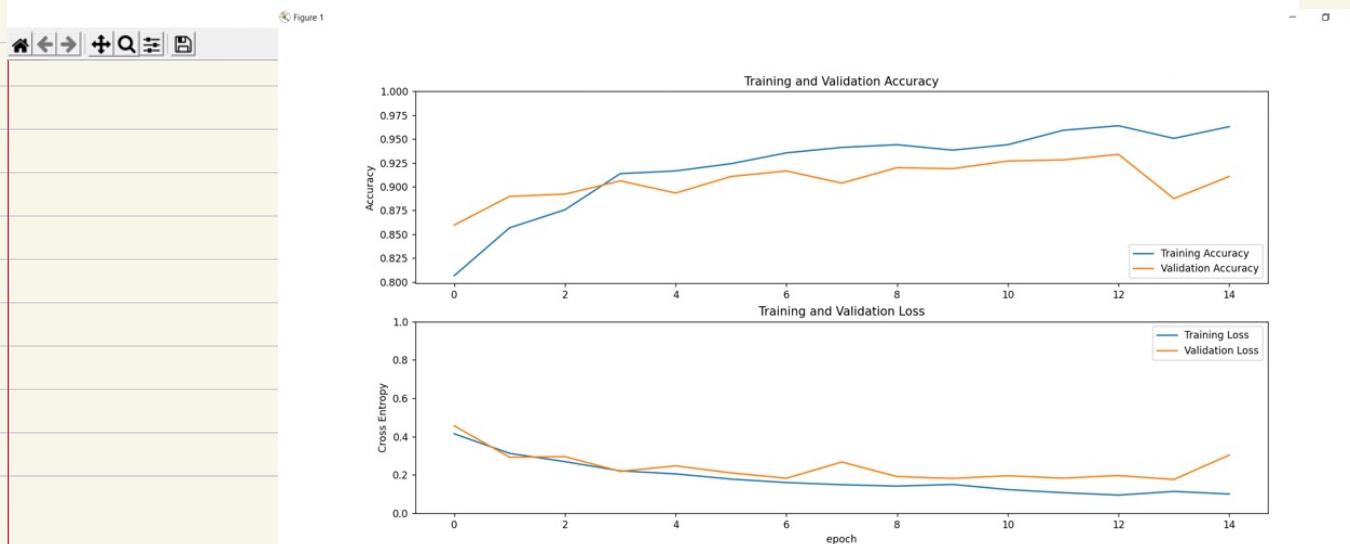
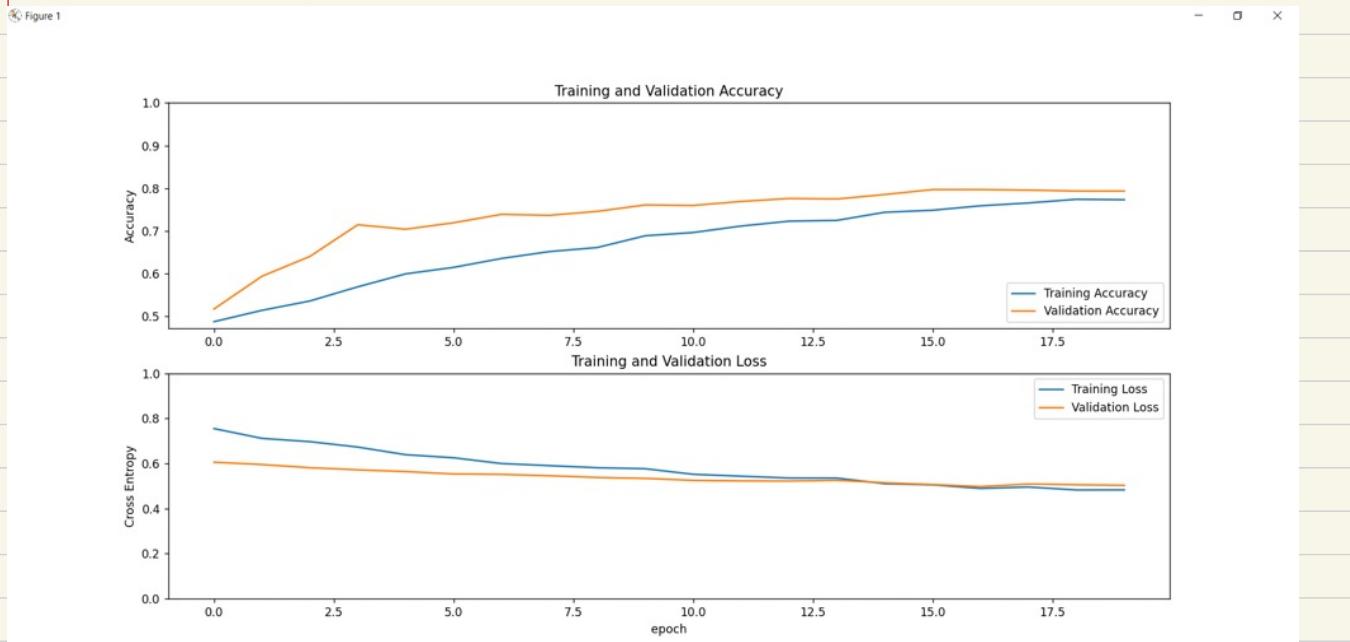
fine_tune_epochs = 12
total_epochs = initial_epochs + fine_tune_epochs
ImageClassifier : training0

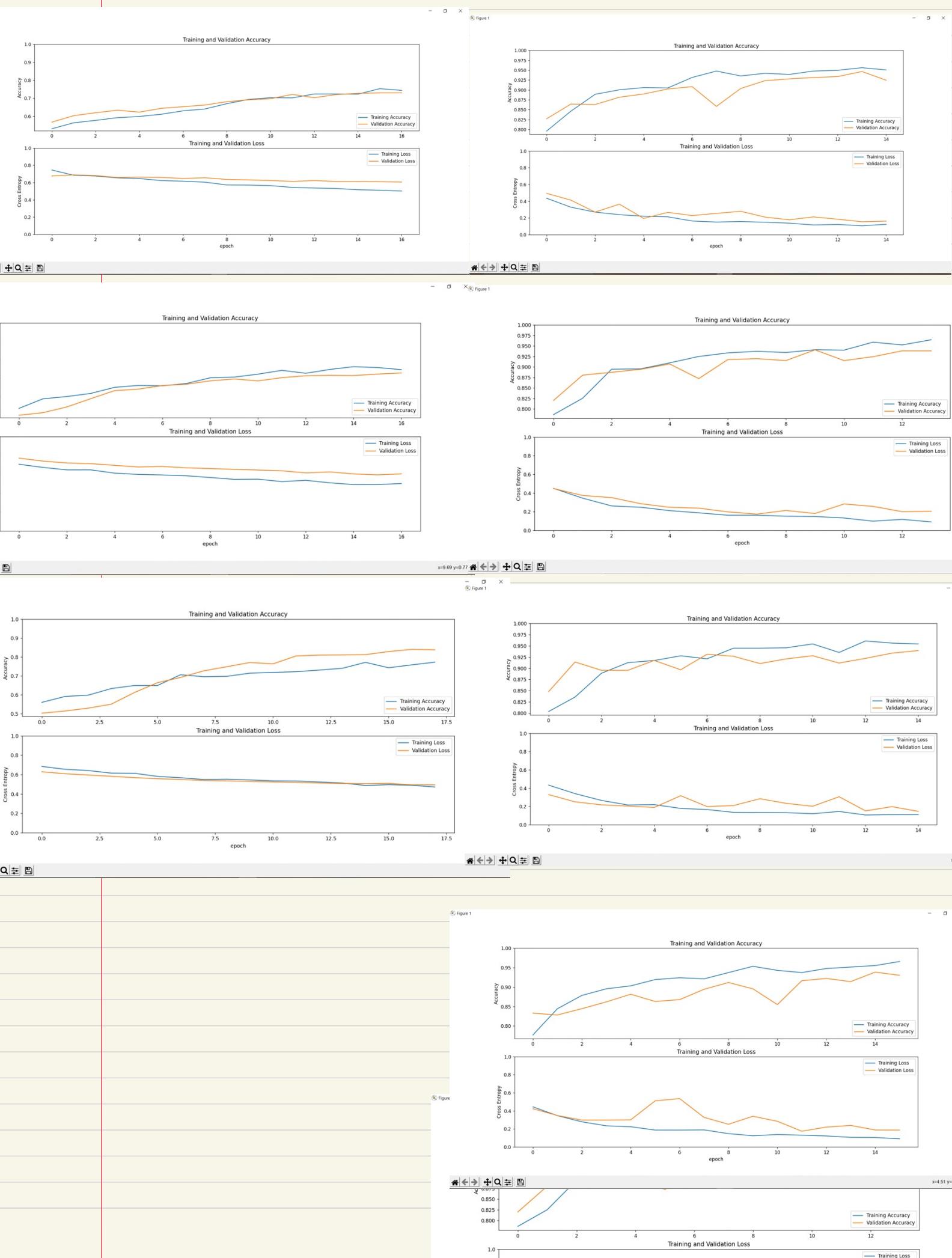
Run: ProjectRough
33/33 [=====] - 62s 2s/step - loss: 0.1076 - accuracy: 0.9592 - val_loss: 0.1834 - val_accuracy: 0.9281
33/33 [=====] - 62s 2s/step - loss: 0.0951 - accuracy: 0.9639 - val_loss: 0.1970 - val_accuracy: 0.9339
Epoch 33/34
33/33 [=====] - 62s 2s/step - loss: 0.1142 - accuracy: 0.9507 - val_loss: 0.1764 - val_accuracy: 0.8875
Epoch 34/34
33/33 [=====] - 61s 2s/step - loss: 0.1007 - accuracy: 0.9630 - val_loss: 0.3038 - val_accuracy: 0.9107
6/6 [=====] - 5s 744ms/step - loss: 0.2566 - accuracy: 0.9219
Test accuracy : 0.921875
Predictions:
[0 1 0 0 0 1 0 0 1 1 0 1 1 1 1 1 0 0 1 1 0 1 1 1 1 1 0 1]
Labels:
[0 1 0 0 0 1 0 0 1 1 0 1 1 1 1 1 0 0 1 1 0 1 1 1 1 1 0 1]
C:\Users\micha\Documents\Python\machineLearning\Internship\venv\lib\site-packages\keras\engine\functional.py:1410: CustomMaskWarning: Custom mask layers require a config and must override layer_config = serialize_layer_fn(layer)

Process finished with exit code 0

```

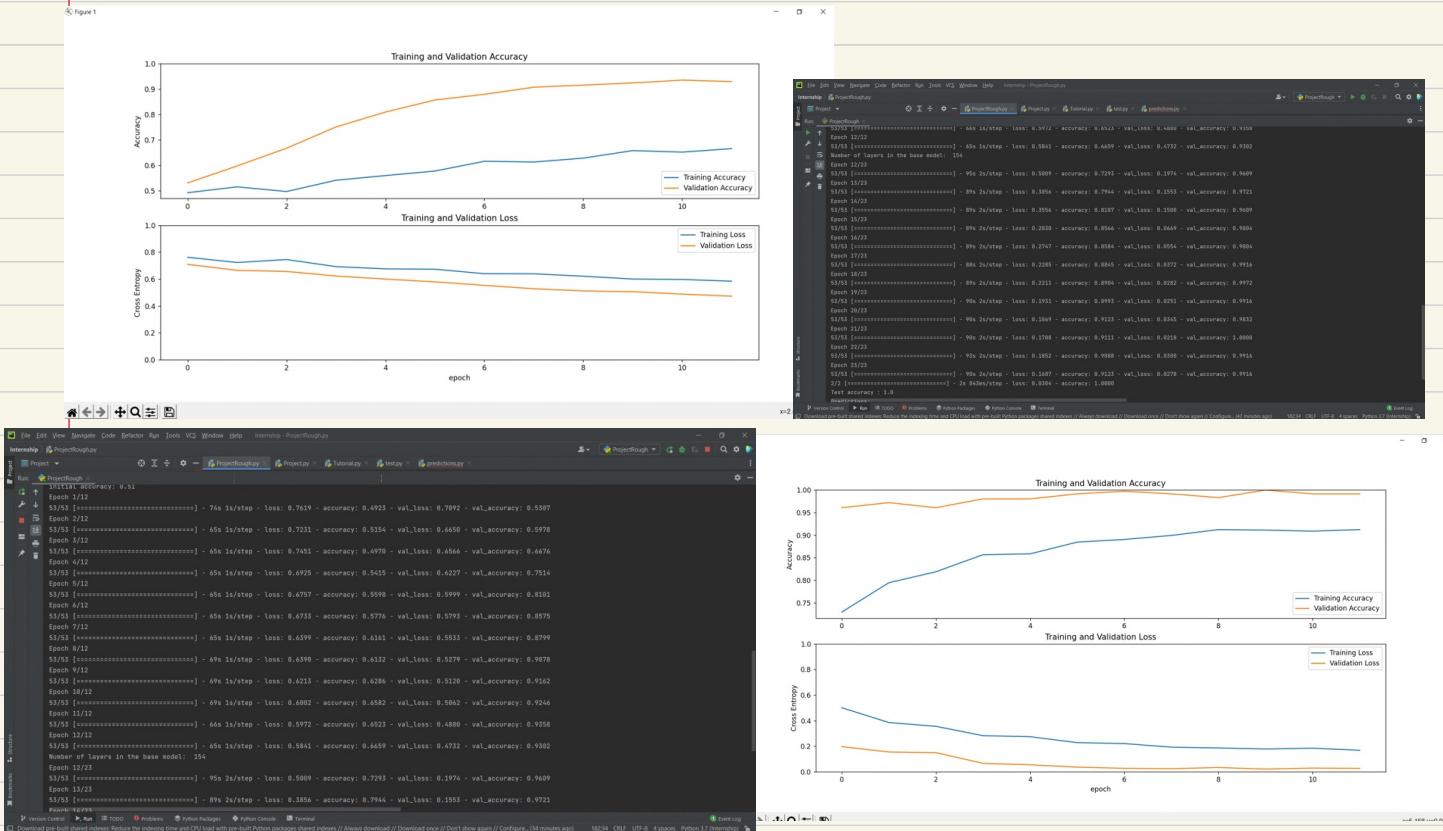
Evaluation of epochs



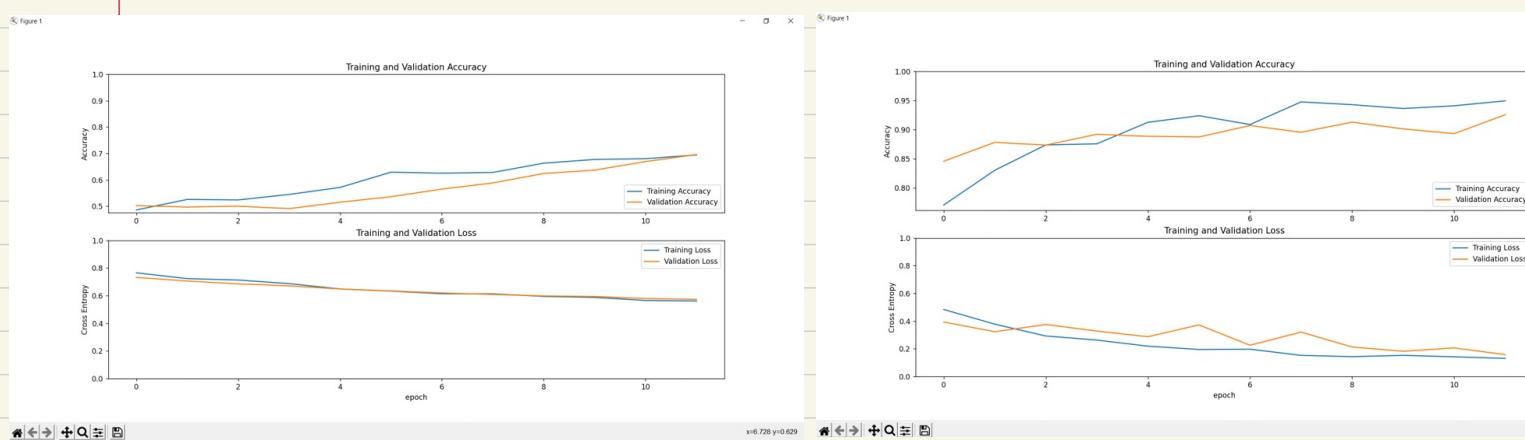


7.02.2021

Today I went to the office and so, before I left home I thought about the predictions and how you know the accuracy of saved models. When doing that, I needed to access the datasets and for path, I wrote the wrong dataset. So, I corrected that and ran it once again. And these are the results I got:

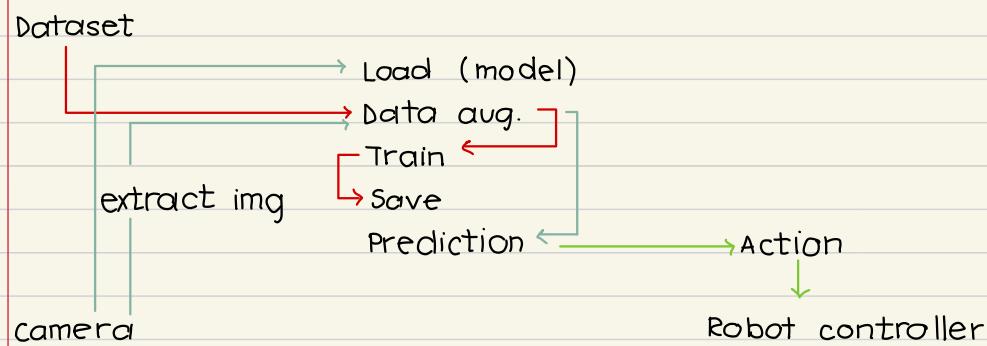


Basically, they were suspicious. So, when I was at the office, I tried to fix that problem, the same line. And I thought I managed to do it before lunch:



However, after lunch an error kept popping up, saying that Python has no permission to access files. And then it all began, but at the end I solved the problem by using a different library, so instead of os, I used pathlib. Then, at the end, Can and I talked about the long-term goal, and how we would get there. Oh, but before that, we talked about the predictions and what the model should be outputting. At the beginning, I was printing the class names, so 0 or 1. But, Can wanted to also see the confidence levels, so the percentage of how much the model thinks it is that class. So, I also added that. But, going back to what I said before,

this is a representation of the whole process with a diagram



It's after I came home, that I started questioning why the videos from the camera go to data augmentation... I'll find out tomorrow I guess!

8.2.2022

Today was really frustrating. My task for today, was to connect the camera they use on the robots, to my laptop. The end result was that whatever the camera was streaming could be the input for the prediction algorithm. However, this was impossible.

I thought I managed to do it before lunch. However then I was using the XIMEA (company of camera) application to record the video and was then saving this to a folder, which I was then accessing, I was super hyped. But, then when I told Can during lunch, he told me what my actual task is. By the way, this was my setup:

UR
↓
universal
robot

Also, during lunch, I asked Can about the continuation of this internship. I don't want this to end and for me to walk away from this, I want to continue to learn this, since I find that this is what I want to do.

He said, that he would talk with Dominik about it, but even if he would say no, we could do it somehow outside of Micropsi.



Before I continue, these were the results of the prediction function when I used the XIMEA app:

```
Predictions:  
[1 0 1 0 0 1 0 0 0 0 0 1 1 0 1 1 0 0 0 0 1]  
Labels:  
[0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0]  
  
Process finished with exit code 0
```

confidence levels

```

> test
> test2
> venv library root
> videos
> error.png
Run: ProjectRough x
Skipping registering GPU devices...
2022-02-08 11:59:34.390644: I tensorflow/core/platform/cpu_feature_guard.cc:151] This TensorFlow binary is op
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
Found 35 files belonging to 1 classes.
[8.162941 8.317324 6.922978 7.052686 8.464045 7.3074355 6.374249
 9.601772 8.042433 7.663326 7.688585 6.1355867 8.511422 7.6158156
 7.997779 8.759386 5.8186865 8.640432 7.241889 7.9345646 7.7684355
 8.202347 7.867616 7.6407137 6.0680194 8.0099945 7.114221 7.434425
 8.545598 7.673027 7.1708446 8.96151 ]
tf.Tensor(
[0.99971503 0.99975574 0.99901617 0.9991357 0.9997891 0.99933
 0.9982979 0.9999324 0.9996785 0.99953055 0.99954224 0.9978403
 0.9997989 0.99950767 0.9996639 0.999843 0.9970373 0.9998231
 0.9992845 0.999642 0.9995773 0.99972606 0.9996172 0.9995197
 0.9976896 0.999668 0.99918723 0.9994098 0.99980557 0.9995351
 0.99923193 0.99987173], shape=(32,), dtype=float32)
Predictions:
[1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1]

Process finished with exit code 0

```

After lunch, I continued with my original task. However no matter what I tried nothing seemed to be working! Either I could not access the USB camera or this error kept popping up:

```

output.mp4
predictions.py
Project.py
ProjectRough.py
saved_model.h5
saved_model_2.h5
test.py
test2.py
Run: test2 x
C:\Users\micha\Documents\Python\machineLearning\Internship\venv\Scripts\python.exe C:/Users/micha/Documents/Python/machineLearning/Internship/test2.py
[ WARN@0:0.269] global D:\openCV-python\openCV-python\openCV\modules\videoio\src\cap_msmf.cpp (539) `anonymous-namespace'::SourceReaderCB::~SourceReaderCB terminating async call
Traceback (most recent call last):
  File "C:/Users/micha/Documents/Python/machineLearning/internship/test2.py", line 13, in <module>
    cv2.imshow('frame', frame)
cv2.error: OpenCV(4.5.5) D:\openCV-python\openCV-python\openCV\modules\imgproc\src\color.cpp:182: error: (-215:Assertion failed) !_src.empty() in function 'cv::cvtColor'
Process finished with exit code 1

```

Can said he honestly wasn't surprised that it wasn't working because it was Windows, but we got to the conclusion because the camera is so high resolution, the bufsize isn't allowing the images to come through properly.

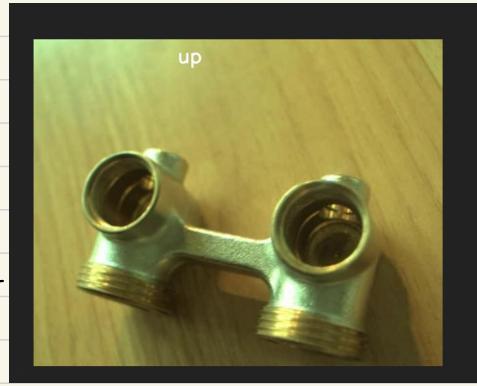
During the time when I was trying to figure it all out, this dude Michael talked to me and was quite impressed with what I was doing, he actually didn't work at Micropsi, but was here for business purposes. He tested the products and then reviewed them for his customers.

At the end, since the code wasn't working on my device, Can also ran it on his. However, when it was almost 6, and nothing was happening he said he would figure it out tomorrow and send me the recordings. Also, he had a private appointment, so we decided on a task for me to work on tomorrow, labelling images (of a video) with the orientation in the predict function.

9.2.2022

Today was much more productive than yesterday! I managed to do something! I stayed at home, and my task was to download the XIMEA Python library xiapi and label images (from a directory). At first, I tried to do this to only 1 image and that was pretty easy. The looping made it difficult and that's why it took all day! But, hey, look at the outcome of my work:

Yeah, I also forgot to add that Can sent me these videos and the script for streaming videos, but of course I couldn't test it out as I don't have a USB camera.



Also, I'm getting the hang of the morning meetings! I can now explain what I'm doing more freely and I feel so professional! :)

10.2.2022

Today was amazing, and I don't want the internship to end! I finally have a product of my hard work! And its unbelievable... :D I am so happy, elated, words cannot describe it!!! What I did today, was that I connected the USB camera and then I showed the object through that camera and it outputted me, whether that object is up or down. And it worked! But it wasn't that easy, mind you. So, Can had code, which connected the camera to my computer, however, the predictions were the problem and I had to turn that code into a class.

The problem with the predictions, was that an error kept popping up that **the model doesn't accept shape (32, 256, 3) it expects input (None, 256, 320, 3)**. Can had to help me, but it turned out, that I needed to create **out** of the object a 4 dimensional, the problem was fixed!

This was however the easy error. In order for the predictions to work they had to be in the loop, where the image is shown on the screen. And this were I just didn't know what to do, but, to my defense, Can also found this difficult. He racked our brains, until Can remembered about Threading, and when this worked we were soooo happy!

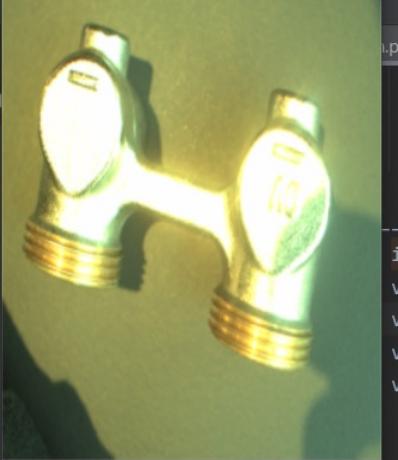
Before the threading, this was the problem:

```
self.data = None
self.stream = None
if enable_stream:
    print("we are here")
    self.stream = VideoStream(height, width)
    print("are we also here?")
def data(self, data_path):
```

```
we are here
Opening first camera...
Starting data acquisition...
Starting video. Press CTRL+C to exit.
```

Then, we wanted the robot to react in certain ways, depending on how it classifies the object (e.g. when its up - pick it up, if its down flip it). Therefore, Cam needed to download Tensorflow, in order to run my code on his pc, as he had all the applications necessary for the robot. This took a long time... Like a really long time. And just when we wanted to try it on the robot, there was a problem, and the solution would take too long, and it was already late.

But I took this video, where I just streamed the video from the USB camera. And it labelled the image on the screen up or down.



```
Project.py 241
ProjectRough.py 242
saved_model.h5 243
saved_model_2.h5 244
test.py 245
test2.py 246
Tutorial.py 247
ximea_stream_r.py 248

> External Libraries
Scratches and Cons
```

Run: ProjectRough

```
tf.Tensor([0], shape=(1,))  
tf.Tensor([0], shape=(1,))  
tf.Tensor([0], shape=(1,))  
tf.Tensor([0], shape=(1,))  
tf.Tensor([0], shape=(1,))  
tf.Tensor([0], shape=(1,))  
tf.Tensor([0], shape=(1,))
```

11.02

Today was the last day of my internship... I cannot believe it! I did so much and the thought of returning to school is simply unbelievable. I will definitely continue working with Micropsi. Today I didn't do much... But, I did the most important thing: I presented what I did. In the morning meeting that we always have, I showed everyone the product of my 2 weeks worth of hard work- and they were impressed. The presentation wasn't very formal but I felt accomplished and fulfilled and most importantly I now know what I want to do in the future!

These are the emails that were sent after/in the last days of the internship:

Internship Feedback formula **Inbox**

me 10 Feb
to Orhan ▾

Dear Can,

I was looking through the requirements of my internship and noticed I forgot to ask you one thing. At the end of the internship it is required that the person, who was supervising our internship, fills out a feedback formula. Would it be possible for you to do that?

I'm so sorry for contacting you on such short notice!

Michalina

From: [Orhan Can Görür](#)
Sent: Friday, February 11, 2022 12:10 PM
To: [Michalina Dengusiak](#)
Subject: Re: [External] Internship Feedback formula

Hey,

Attached is your feedback document.

Could you please share the video and the final version of your scripts once they are ready? I need to store them in our company repos.

me 11 Feb
to Orhan ▾

Thanks!

I have attached the python files, and I hope we'll see each other soon!

Orhan Can Görür 14 Feb
to me ▾

Hi Michalina,

I hope you are doing well.
I would like to ask you to also send me the datasets you used for training the model (the last version of the train set with all the up and down images).
If the folders are too large, you can use <https://wetransfer.com/> (it is a safe and easy way)

Thanks in advance,
Can

On Thu, 10 Feb 2022 at 17:57, Orhan Can Görür <cangorur88@gmail.com> wrote:

Orhan Can Görür 11 Feb
to me ▾

Awesome thanks!
Can you also send me the video you showed today? (you can send me over whatsapp)
I will show it to Dominik as well to report our results.

Hope to see you too!

Bests,
Can

me 15 Feb
to Orhan ▾

Hey,

I transferred the datasets to we transfer, here is the link: <https://we.tl/t-msW1vRMaGT>

Hope this helps,
Michalina

 DW

Dominik Welland
To You

14 Feb

...

Hi Michalina

Congratulations on the outcome of your internship - unfortunately I was out for the demo, but I have seen the video - it's quite a feat what you've accomplished!

I'd be interested in how you perceived these two weeks - did you enjoy it, was there anything missing? Can was very impressed by how much you already brought with you, and how quickly you've picked up the rest!

I do hope it was a good and fulfilling experience for you.

We were happy to have you on board for the two weeks, and if there's any opportunity for a collaboration in the future, be assured that we'll be very happy to have you again.

All the best for now,
cheers,
/Dominik

--

micropsi industries GmbH | [Karl-Marx-Straße 58, 12043 Berlin](http://Karl-Marx-Straße%2058,%2012043%20Berlin) | Geschäftsführer: Ronnie Vuine | Handelsregister HRB 161886 B

My internship feedback document:



Internship - Company Feedback

Company: Micropsi-Industries GmbH

Department: Robotics Software and Infrastructure

Name of the student: Michalina Dengusiak

Dear Sir or Madam,

We would like to thank you for allowing one of our students to experience your company first hand. We would kindly ask you to complete the brief feedback sheet below so that we can learn more about our student's behaviour and progress during his/her internship.

Many thanks for your cooperation and help.

Kind regards,

Berlin Cosmopolitan School

Please grade the following characteristics (1 - very good; 5 - inadequate)

Characteristic	Grade	Characteristic	Grade
Punctuality	1 2 3 4 5 ● ○ ○ ○ ○	Adaptability	1 2 3 4 5 ● ○ ○ ○ ○
Attendance	1 2 3 4 5 ● ○ ○ ○ ○	Interest	1 2 3 4 5 ● ○ ○ ○ ○
Politeness	1 2 3 4 5 ● ○ ○ ○ ○	Relationship to colleagues	1 2 3 4 5 ● ○ ○ ○ ○
Engagement	1 2 3 4 5 ● ○ ○ ○ ○	Ability to accept and act on feedback	1 2 3 4 5 ● ○ ○ ○ ○
Communication (Written/Verbal)	1 2 3 4 5 ● ○ ○ ○ ○	Overall grade:	1 2 3 4 5 ● ○ ○ ○ ○

1

Please provide us with an insight into what the student has learnt during their time with you, how they have progressed and any additional positive or negative feedback you would like to share with us:

Michalina worked on a machine learning project that classifies an industrial material's orientation on a workbench. This is a crucial functionality for our operation so that our industrial robots decide on an appropriate gripping pose based on the object's orientation to pick the object safely.

Michalina had only two weeks of time to finalize such a complex task. She started with a tutorial on how to train a machine learning model for an image classification task. She quickly progressed on it so that she could move fast to the actual task. She learnt how to develop such a machine learning process, using Deep Neural Networks, and was able to successfully apply it on our object orientation classification. At the end of the first week, she completed a successful machine learning model for her classification task, along with the software that runs the model on general image classification problems.

During the second week, her task was to deploy the classification system to run it in real-time over a video camera stream. She integrated our industrial camera and successfully retrieved image frames to work on. Then, she improved her machine learning software to run predictions on the object's orientation received from live video streams. The actual value of her work is that the system she developed is reusable on similar tasks. She demonstrated her results on the workbench (on the real system) to the team. In general, we are happy with her contribution to our project.

Michalina is a hardworking student with a high potential. She quickly grabbed and owned the task as if she was a professional software engineer. We are very impressed by her results and the system she developed in such a short time. Additionally, she has great communication skills and a very positive attitude with a very proactive work ethic. We wish her great success in her studies and her future career.