Lernbasierte Computer Vision
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Self-Driving Cars
Exercise 0 – Introduction

Release date: Fri, 18. October 2019 - **Deadline for Homework: Wed, 30. October 2019 - 21:00**

Important Information

a) **Exercise Procedure via "ILIAS"**

- We will organize the exercises sheets and your submissions using the **ILIAS**-System (https://ovidius.uni-tuebingen.de/ilias3).
- **Please register by no later than Monday, 21.10.19 23:59 as follows:**
  1. Go to the ILIAS-website and login into your account using your personal ZDV credentials.
  2. In section **Informatik/Computergrafik** please enroll into the lecture **Self-Driving Cars**. URL is https://ovidius.uni-tuebingen.de/ilias3/ilias.php?ref_id=2023089&cmdClass=ilrepositorygui&cmdNode=v2&baseClass=ilRepositoryGUI
  3. You will need to provide some information there (name, matriculation number, . . .).
  4. *After* completing the survey, you should be able to download your first homework from the **Exercise** section.
  5. If you have any questions regarding the exercises, please ask at the **Forum**.
  6. Please upload – although you get no points this time – your solution for the tasks below into ILIAS, to familiarize yourself with the system.
- **Exercise sheets** will be available after the lecture in the ILIAS system for download. Please solve these homeworks until the next Wednesday 21:00:00. The submission deadline will be stated in each exercise sheet.
  - We encourage you to discuss these homeworks within a group. You are eligible to finish the homeworks within a group up to 2 people, but **each person must submit a solution.**
  - By continuous and active participation in the weekly exercises, students may obtain a 0.3 bonus on the final grade, if and only if passing the exam. To qualify for this bonus, the student must successfully solve 50% of the assigned homework problems which will be determined by grading the submitted homework solutions.

b) **Submitting your solutions:**

- Please compress your submission using the ZIP format and *only* include necessary files.
- We will provide a template for most tasks to avoid potential confusions. Please follow them to ensure a smooth procedure.

c) **Infrastructure:**

- You are eligible to use the Training Center for Machine Learning (TCML) cluster. Please read the cluster documentation for more details (https://docs.google.com/document/d/1AgtLy28VVZaPe79TwOb9jjC4F1KVzffb8y1vZoURZE8/edit?usp=sharing).

Exercises

0.1 Local PyTorch Installation (0 Points)

We use PyTorch for exercises. To ensure a working environment, we ask you to install PyTorch on your machine:

a) It is recommended to manage PyTorch with Anaconda. Please install Anaconda with Python version 3.5+ following instructions at https://www.anaconda.com/download/.

b) Install PyTorch following instructions at https://pytorch.org/get-started/locally/.

c) We ask you to run the toy regression code `exercise_pytorch.py` we provided. You may additionally need to install `matplotlib`:

```
1       pip3 install matplotlib
```

d) Please save the output log in the terminal as a `.txt` file. Please pack all files in this exercise into a ZIP file and upload it to the ILIAS system. Please rename the ZIP file as your name.

0.2 Local OpenAI Gym Installation (0 Points)

We ask you to install OpenAI Gym on your machine:

a) Please install Python 3.5+ if you don't have it.

b) Install the Box2D enviroment using the provided file `sdc_gym.zip` by the following commands

```
1   unzip sdc_gym.zip
2   cd sdc_gym
3   pip3 install -e '.[box2d]'
```

c) After installation, please take a screen-shot of your **full** screen with the car racing game on top. Please pack the screen-shot into the ZIP file and upload it to the ILIAS system. If you are in the `sdc_gym` folder, you should be able to start the car racing game by the command

```
1   cd gym/envs/box2d
2   python3 car_racing.py
```

0.3 Cluster Setup (0 Points)

To get fimilar with the TCML cluster, we ask you to run a small Python script with the Singularity image we provided:

a) Read the cluster documentation and log in to the cluster after you get the account.

b) Download the Singularity image and copy it to your home directories on the cluster (you could use `wget` or `scp`): https://owncloud.tuebingen.mpg.de/index.php/s/CbGdQrCfcpP4EFA/download

c) Submit a task to the cluster to run the Python script `exercise_gym.py` as follow. You need to create a `.sbatch` file to submit the task.

```
1   from pyvirtualdisplay import Display
2   import gym
3
4   display = Display(visible=0, size=(800,600))
5   display.start()
6   env = gym.make('CarRacing-v0')
7   obs, done = env.reset(), False
8   ep_rew = 0.0
9   while not done:
```

```
10      obs, rew, done, _ = env.step([0.0, 1.0, 0.0])
11      ep_rew += rew
12  print(ep_rew)
13  display.stop()
```

Note that you need to run python with our provided Singularity Container `sdc_gym.simg`, such as

```
1  # when using the OpenAI gym and rendering to a virtual display
2  singularity exec ~/sdc_gym.simg python your_python_script.py
3  # when training networks on GPUs in PyTorch without accessing the gym environment
4  singularity exec --nv ~/sdc_gym.simg python your_python_script.py
```

Please pack the output file on the cluster (job.JOBID.out) into the ZIP file and upload it to the ILIAS system.