Learning For Self-Driving Cars and Intelligent Systems

Practical Course
Qadeer Khan, Mariia Gladkova
Summer Semester 2022

Course webpage:
https://vision.in.tum.de/teaching/ss2022/intellisys_ss2022
Structure

- Masters practical course
- Data modalities: images, GNSS, IMU, point clouds, sets, graphs etc.
- Programming assignments in the initial weeks
- Research oriented projects
- max. 2 persons per each group
- Dynamic research goals
- One-on-one meetings with supervisors for updates and resolving issues
- Final Presentations
- Weekly summaries of the work progress
- Tuesday, 11 am - 1 pm [Online | Onsite]
- You will be provided remote access to compute resources via ssh for this course.
- Final Evaluation will be a combination of the programming assignments, weekly/final reports, presentation, viva, project code and results etc.
Prerequisites

- Proficient in python programming
- Familiar with version control (git)
- Comfortable with DL frameworks: PyTorch, Tensorflow etc.
- Good knowledge of basic mathematics, linear algebra, probability, numerics, analysis etc.
- Participation in at least one of the offered deep learning lectures at TUM, e.g. [1, 2, 3, ...]
- Or participation in at least one of Multi-View Geometry courses / labs, e.g. [1, 2, 3, ...]
- We may consider other courses offered outside of TUM if the contents match with the example courses referenced above. Please highlight the content of those courses in your application.
Application

- Assignement to the course done via the matching system: [https://matching.in.tum.de/](https://matching.in.tum.de/)
- Select your preference of the lab course between 10 to 15 February on the system
- Application documents to be sent separately
- **Send your CV and Transcripts by 16 February 2022 to:** `intellisys-ss22@vision.in.tum.de`
  
  Please see the email format on the next slide
- We can only consider candidates who applied to the matching system **AND** sent their application documents
Application Email Format

In order to easily evaluate your profile for matching, we ask you to follow the format below:

**Subject:** Application [Your Matriculation Number]

*In the body please give at least the following details:*

- Matriculation #:
- Name:
- Name of Degree:
- Masters Semester #:
- Average Grade:
  - Bachelor:
  - Master (For the previous semester, if available)
- List of Relevant courses taken with grade

Please remember to also attach your CV and transcripts (Bachelor + Master) with the email.

Feel free to share any additional documents, information (for eg. link to git, past research projects) that could support your application. *Optional:* If you also have a project suggestion matching the theme of the lab course, please briefly describe.
Projects

- Practical project experience with real-world problems
- Novel application-oriented research challenges
- Project Assignment to be done after the initial weeks of programming tasks
- Projects specifics will be decided later
- However, if you have project proposals prior to beginning of the semester. It may be considered
- Nevertheless, some general research areas can be found in the next slides
Projects

- SLAM
  - Deep depth $D$, deep pose and deep uncertainty $\Sigma$ based on a single view $I_t$ \[1\]
- 3D reconstruction
  - Dense reconstruction using a deep neural network \[2\]

Reference (top):  
https://vision.in.tum.de/research/vslam/d3vo

Reference (left):  
https://vision.in.tum.de/research/monorec

Accessed on 03.02.2022
Projects

- Perception for self-driving cars
- Scene understanding
- Global localization

Reference (top): [https://vision.in.tum.de/research/vslam/tirdso](https://vision.in.tum.de/research/vslam/tirdso)

Reference (left): [https://vision.in.tum.de/research/vslam/gn-net](https://vision.in.tum.de/research/vslam/gn-net)

Accessed on: 03.02.2022
Projects

- Object detection & tracking
- Dynamic object segmentation

Accessed on 03.02.2022
Projects

- Robot control
  - Embodied agents (Next slide)
  - Robustness to noisy data
  - Multiple Input Modalities
Projects

- Testing control algorithms on embodied agents
- Interaction with the environment
- Supervised, self-supervised, reinforcement learning

Projects

- Learning on Graphical Neural Networks (GNNs)


QUESTIONS