Learning For Self-Driving Cars and Intelligent Systems

Practical Course
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Winter Semester 2021

Course webpage:
https://vision.in.tum.de/teaching/ws2021/intellisys_ws2021
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, 3-5 pm [Onsite or online, TBD]
- 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, For 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/
- Select your preference of the lab course between 15 July to 20 July on the system
- Application documents to be sent separately
- **Send your CV and Transcripts by 20 July 2021 to:** intellisys-ws21.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 12.07.2021
Projects

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

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

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

Accessed on: 12.07.2021
Projects

- Object detection & tracking
- Dynamic object segmentation

Accessed on 12.07.2021
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 Networks,
  - Social Networks, Internet, Molecules /Drug discovery etc.

Accessed on: 13.07.2021
QUESTIONS