Job Description

6D pose estimation for 3D objects is crucial for many industrial applications, e.g. for robotic grasping or autonomous driving. In order to pick an object successfully, the robot needs precise knowledge of the orientation and location of the object. Most current approaches use feature-points-based methods and run the PnP algorithm. However, these methods need 3D CAD models of each object during inference and cannot scale to unknown objects. Furthermore, the accuracy of these methods is highly dependent on each single feature point, which is not robust especially in the case of truncation and occlusion. Most of these approaches are also unable to leverage uncertainty estimates of different features and either just average over the features or use the argmax for feature selection.

- You assist us by proposing a new method that aggregates the information of all features in the latent space and uses gaussian conditioning to allocate uncertainty for each feature vector. This makes the method scalable to new objects and more robust.
- During your assignment, you implement and improve two existing state-of-the-art methods, one RGB-based method and one RGB-D based method, with bayesian information aggregation.
- Afterwards you compare the results to existing methods in public datasets (LineMOD and YCB datasets).
- Ultimately test the developed methods in a real-world setting with a robot arm.

Qualifications

- **Education:** master studies in the field of Mathematics, Computer Science, Physics, Robotics, Machine Learning or comparable
- **Personality and Working Practice:** communicative, team-minded and independent
- **Experience and Knowledge:** experienced in optimization and learning techniques (hyper-parameter optimization, sample-based method), experienced in ROS, knowledge of probabilistic model e.g. Bayesian and Gaussian conditioning and computer vision, programming skills in Python and deep learning framework (Pytorch or Tensorflow) are desirable
- **Languages:** good in English

Additional Information

- **Start:** according to prior agreement

- **Duration:** 6 months

- **Bursary:** The student will also get bursary during this time from Bosch.

Requirement for this thesis is the enrollment at university. Please attach a motivation letter, your CV, transcript of records, examination regulations and if indicated a valid work and residence permit.

Further information please visit the application link.