Upcoming oberseminars

!! Due to the current state of emergency (Corona virus), until further notice, all presentations are conducted exclusively virtually via the conferencing system. !!

The seminar takes place continuously (also during the semester break). In order to arrange a talk, please register through our Oberseminar registration form. This can only be done by the project supervisors.

Location: MI 03.13.010 (Seminar Room)

Zoom Link: The link is shared with CAMP members via email roughly two days before each presentation. (To students: please ask your project supervisors for the Zoom link)

Mobile view: If you are having trouble seeing the schedule on your phone screen, please switch to the desktop version using the button on the top left corner.

<table>
<thead>
<tr>
<th></th>
<th>Presentation</th>
<th>Discussion</th>
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</thead>
<tbody>
<tr>
<td>Thesis Kick-off</td>
<td>20 min</td>
<td>10 min</td>
</tr>
<tr>
<td>Thesis Final</td>
<td>25 min</td>
<td>5 min</td>
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<tr>
<td>IDP Kick-off</td>
<td>10 min</td>
<td>10 min</td>
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<tr>
<td>IDP Final</td>
<td>15 min</td>
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<tr>
<td>Guided Research Final</td>
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<td>5 min</td>
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Schedule:

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<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Presenter</th>
<th>Title</th>
<th>Type</th>
<th>Supervisor /Contact</th>
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</thead>
<tbody>
<tr>
<td>10. Jun</td>
<td>11:30</td>
<td>Chengyu Zhang</td>
<td>Stiffness-based Ultrasound and CT Registration for Optimal Scanning Trajectory</td>
<td>MA Final</td>
<td>Zhongliang Jiang</td>
</tr>
<tr>
<td>17. Jun</td>
<td>10:30</td>
<td>Dominik Schneider</td>
<td>Visualization of Robot Operating Modes for Surgical Assistants in Minimally Invasive Robotic Surgery via Optical-See Through Head-Mounted Displays</td>
<td>klinisches Anwendung sfach</td>
<td>Tianyu Song</td>
</tr>
<tr>
<td>17. Jun</td>
<td>11:00</td>
<td>Viktor Studenyak</td>
<td>Catheter localization and tracking in fluoroscopic X-ray images using transformer neural networks</td>
<td>MA Final</td>
<td>Shahroz Faghirooohi</td>
</tr>
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<td>17. Jun</td>
<td>11:30</td>
<td>Patris Valera / Zitti Andrei</td>
<td>Multi-Label Classification in Operating Rooms</td>
<td>klinisches Anwendung sfach</td>
<td>Ege Özsoy</td>
</tr>
<tr>
<td>17. Jun</td>
<td>12:00</td>
<td>Anna Cocan</td>
<td>Multi-Label Classification in Operating Rooms</td>
<td>klinisches Anwendung sfach</td>
<td>Ege Özsoy</td>
</tr>
</tbody>
</table>
Detailed schedule:

Date & Time | 10. Juni 2022 -- 10:30
---|---
Title | Monitoring the State of Sterility of Surfaces using Scene-flow and Augmented Reality inside a Medical Facility
Student | Ihsan Berkan Balaban
Type | MA Kick-Off
Supervisor | Kevin Yu
Additional supervisors | Prof. Dr. Dirk Wilhelm
Director | Prof. Dr. Nassir Navab
Abstract | A sterile environment is a fundamental requirement for any surgery and healthcare-related treatment. Tracking and monitoring non-sterile sources may provide the first step in estimating the state of sterility of surfaces. We extract the concept of monitoring sterility in surgery and implement it within a facility to monitor and diagnose potentially highly contagious patients, such as in the case of Covid-19. In particular, we use body tracking to monitor any patient movement within a designated space and simulate the flow of aerosols with an increased risk of contagious elements and surface contamination. We further deploy Augmented Reality to visualize any high-risk areas intuitively. The previous iteration of the system only rudimentarily implemented surface contamination and lacked adaptivity to changes inside the scene. In this Master's Thesis, we investigate Scene-flow using Deep-Learning for monitoring the changes within the surface representation of the scene and enable monitoring of surfaces with increased risk of infection over a more extended period and scene movements.
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<td>Prof. Nassir Navab</td>
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<tr>
<td>Abstract</td>
<td>Ultrasound (US) imaging is widely employed for biometric measurement and diagnosis of internal organs due to its high availability and the fact it does not emit radiation. However, free-hand US examinations are often time-consuming and required years of training for a novice. To address this challenge, robotic techniques have been seen as a promising solution to provide accurate and repeatable US scans. To further enable automatically scanning for the internal organs covered by ribs, we registered the point clouds from a template CT to the 3D point clouds obtained from US sweep. The point clouds consist of the object’s surface and the upper surface of the underlying bone. Afterward, an optimized trajectory can be computed using CT volume; and further, be transferred for robot execution.</td>
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<tr>
<td>Supervisor</td>
<td>Tianyu Song</td>
</tr>
<tr>
<td>Additional supervisors</td>
<td>Michael Sommersperger, Nikola Budjakoski</td>
</tr>
<tr>
<td>Director</td>
<td>Prof. Nassir Navab</td>
</tr>
<tr>
<td>Abstract</td>
<td>This project integrates a virtual representation of DLR's MIRO Surgery Robot. Our application combines the Head-Mounted-Display and AR visualization with the features of the MIRO robot to create GUI for multiple button options and explanations in a form of a tutorial. It also features a tracking technique to align the virtual robot with the real robot. Therefore we have created a communication protocol to send the configuration of the robot to the HMD and visualize the desired behavior.</td>
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<tr>
<td>Supervisor</td>
<td>Shahrooz Faghiroohi</td>
</tr>
<tr>
<td>Additional supervisors</td>
<td>Dr. Mai Bui</td>
</tr>
<tr>
<td>Director</td>
<td>Prof. Nassir Navab</td>
</tr>
<tr>
<td>Abstract</td>
<td>Although challenging, detecting and tracking catheters in fluoroscopic X-ray images is an essential task for interventional navigation during cardiac catheterization. Investigating catheter localization and tracking in a low dosage image setting is of even greater interest. Such a setting mitigates the risk of high radiation dosage exposure for both patient and physician. At the same time, catheter imaging is one of the ways to navigate the catheter to the operative field, which is essential for catheter placement. Wrong catheter guidance can result in lethal consequences. That is why the combination of catheter localization and tracking with low dosage images is a crucial problem. Recently, self-attention architectures have shown tremendous success in object detection and tracking for various computer vision tasks. However, the inclusion of temporal information into the framework of catheter tracking has not yet been investigated extensively. In this thesis, we create a self-attention-based neural network architecture for detecting and tracking catheter tips in sequences of fluoroscopic X-ray images.</td>
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</tr>
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<td>Abstract</td>
<td>Surgical Operations, which take place in operating rooms of different sizes, require the use of various medical instruments. These medical instruments are numerous and are moved a lot during the operations performed by the medical staff. The 4D-OR dataset includes 10 mock surgeries, where 6 cameras were used to capture the operating room. In this project, the goal is to use the captured images or point clouds to analyse the presence of instruments in the scene using computer vision.</td>
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</tr>
</tbody>
</table>
**Stratification of Type 2 Diabetes and Obesity Pathways by Clustering of Genetic Variants**

**Anna Tröbs**

**MA Final**

**Tobias Czempiel**

**Gareth Hawkes (University of Exeter)**

**Nassir Navab**

About 6.2% of the world’s adult population had type 2 diabetes (T2D) in 2017, and an expected 7.3% will have type 2 diabetes in 2030. This is not only associated with a lower quality of life for the patients due to the illness itself and its consequences but represents enormous health care costs and economic burden through lost productivity.

Type 2 diabetes is influenced by a variety of genetic and environmental factors. This thesis will attempt to cluster single nucleotide polymorphisms (SNPs) associated with a variety of adiposity-related phenotypes into genetic pathways and assess how these pathways affect the likelihood of developing type 2 diabetes, and other adiposity-related diseases.

The analysis can be divided into five steps. In step one, a small number of well-established SNPs will be clustered based on their associations with 7 T2D-linked biomarkers from UK Biobank. In step two, data derived from abdominal MRI scans will be included in the clustering to determine whether these additional phenotypes refine the clusters found in step one. In step three, the causality structures of the clusters will be tested on two external datasets: MAGIC, a consortium of insulin-related traits, and GIANT, which focuses on anthropomorphic phenotype. Based on these results we will link our SNP clusters to known biological pathways in step four. Finally, in step five, we will validate and enhance our results using a larger initial list of BMI-related SNPs.

**Optimization of lamp positioning for self-disinfection room**

**Iustin Curcean**

**BA Kick-Off**

**Thomas Wendler**

**Francesca De Benetti**

**Nassir Navab**

To be submitted promptly
<table>
<thead>
<tr>
<th>Date &amp; Time</th>
<th>24.Juni 2022 -- 11:30</th>
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</thead>
<tbody>
<tr>
<td>Title</td>
<td>Thyroid nodule segmentation in US images</td>
</tr>
<tr>
<td>Student</td>
<td>Stefan Schärdinger</td>
</tr>
<tr>
<td>Type</td>
<td>klinisches Anwendungsfach</td>
</tr>
<tr>
<td>Supervisor</td>
<td>Dr Thomas Wendler</td>
</tr>
<tr>
<td>Additional supervisors</td>
<td>Christine Eilers; Francesca De Benetti</td>
</tr>
<tr>
<td>Director</td>
<td>Prof. Dr. Nassir Navab</td>
</tr>
<tr>
<td>Abstract</td>
<td>Nodule segmentation is an essential step in the diagnosis and follow-up of thyroid pathologies. Automatic, deep learning based approaches for thyroid nodule segmentation can help the physicians to speed up the clinical workflow. In this project, a public dataset is used to train a deep learning network, which will be tested and fine tuned, if needed, on an in-house dataset.</td>
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<tbody>
<tr>
<td>Title</td>
<td>Real-time segmentation and visualization of peripheral vascular structures using B-mode and color Doppler images</td>
</tr>
<tr>
<td>Student</td>
<td>Felix Dülmer</td>
</tr>
<tr>
<td>Type</td>
<td>MA Final</td>
</tr>
<tr>
<td>Supervisor</td>
<td>Zhongliang Jiang</td>
</tr>
<tr>
<td>Director</td>
<td>Prof. Dr. Nassir Navab</td>
</tr>
<tr>
<td>Abstract</td>
<td>Ultrasound (US) imaging is widely employed for the diagnosis and staging of peripheral vascular diseases (PVD), mainly due to its high availability and the fact it does not emit radiation. Accurate, real-time segmentation of blood vessels in US images can aid in the measurement of lumen diameters and the assessment of vascular diseases. This, however, remains a challenging task, particularly for extremely small vessels that are difficult to visualize. To address this challenge, we are going to use the B-mode image and color Doppler image together to achieve robust and accurate segmentation results in real-time. The color Doppler images can provide a good estimation of vascular structures in the view of the current image. Besides, the spatial information of the arteries can be preserved from previous segmentation results using the optical flow technique. Afterward, the segmentation results are further used to guide the future movement of the robotic manipulator to accomplish the scan over limb arteries.</td>
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<tr>
<td>Date &amp; Time</td>
<td>08.Juli 2022 -- 10:30</td>
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<tr>
<td>Title</td>
<td>Towards Long-Term Visual Localization in Indoor Environments with Changes</td>
</tr>
<tr>
<td>Student</td>
<td>Julia Kabalar</td>
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<tr>
<td>Type</td>
<td>MA Final</td>
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<tr>
<td>Supervisor</td>
<td>Shun-Cheng Wu</td>
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<tr>
<td>Director</td>
<td>Federico Tombari</td>
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**Abstract**

In computer vision, the problem of visual re-localization aims at estimating the camera pose of a given image with respect to a reference scene. Many applications, from robotic navigation to augmented reality, rely on imaging data for localization, especially when additional modalities cannot be leveraged. This is a challenging task due to the presence of illumination changes, occlusion, and perception from novel viewpoints. Re-localizing camera pose in long-term raises more difficulties due to the changes in scene appearance and geometry introduced by human or natural deterioration. Recently, RIO10, a public benchmark has been introduced, which comprises versatile indoor scenarios over large time spans that exhibit challenging scene and illumination changes. To tackle these posed difficulties, strategies for re-localization for dynamic indoor environments are developed.

In this thesis, we investigate a way to re-localize camera poses under scene changes using similarity learning with semantic reasoning. Semantic understanding of a scene allows us to re-identify moved objects and track scene changes over time. In addition, we also improve the accuracy of local feature matching by semantic reranking.

The developed visual localization pipeline is evaluated against diversified real-world scenarios in public datasets showing the generalizability of our method.