Semester and Master projects
The CVL offers a wide range of semester projects for Bachelor and Master students. An overview can be found on our Website: www.vision.ee.ethz.ch/education.

For individual thesis subjects, please contact:

Radu Timofte for ICU (radu.timofte@vision.ee.ethz.ch),
Ender Konukoglu for BMIC (ender.konukoglu@vision.ee.ethz.ch)
Orçun Göksel for CAiM (orcun.goeksel@vision.ee.ethz.ch)

P&S
Each semester the P&S “Vision goes Vegas” and “Learning to have Night Vision” are organised from our group. In cooperation with the “Automatic Control Laboratory” of ETH we coordinate the RoboCup participation for students each year: www.robocup.ethz.ch/

Lectures (jointly with other ETH institutes)
Spring Semester:
- Image Analysis and Computer Vision
- Knowledge-Based Image Interpretation
- Computer Vision
- Humans and Machines
- Virtual and Augmented Reality in Medicine
- Autonomous Driving

Autumn Semester:
- Medical Imaging I
- Ultrasound Fundamentals, Imaging, and Medical Applications
- Medical Image Analysis
- Knowledge-Based Image Interpretation

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The Computer Vision Lab
CVL performs research in the fields of Medical Image Analysis and Visualization, Object Recognition, Gesture Analysis, Tracking, and Scene Understanding and Modeling.

**Image Communication and Understanding**
Our research group mainly focuses on image analysis. We focus on tracking and gesture analysis, object recognition and image-based retrieval, texture analysis and synthesis, and 3D modeling. Our team has created several spin-off companies already, some of which have been acquired.

**Biomedical Image Computing**
The research of our group focuses on developing computational methods for analysing medical images. The goals are to extract semantic information, perform quantitative measurements and population comparisons and to aid diagnosis, treatment and clinical research.

**Computer-assisted Applications in Medicine**
Our research focus is on biomedical technology and imaging for computer-assisted interventions and image-guided therapy. We devise and develop novel imaging and image analysis techniques, personalized modeling and simulation methods, and machine learning solutions for diagnosis and interventions.

The Computer Vision Lab treats the complete cycle from signals to their interpretation, and to the resulting action. It is our objective to develop universal concepts and methods. In order to meet these challenges, we want to keep our finger at the pulse of international, ongoing research and we operate in the context of many collaborations with other labs and projects.

**Research and Project News**

**CVL Seminar**
Please visit our CVL seminar, held usually on Thursday, 10:30 in room ETF C106. In this seminar scientific talks of invited speakers and the oral presentations of Master students are given.

**ICU**
- ICU is working closely with Toyota to research, develop, and equip the safe autonomous cars of tomorrow, providing them with the sensors and processing needed to understand their surroundings.
- ICU and its industry partners are benchmarking the current and the next generation mobile devices for their capabilities to run AI models.
- ICU, in collaboration with Huawei, develops the next generation processing pipelines for camera sensors such as those from smartphones. Another direction of research is mobile-based 3D modeling and understanding.

**BMIC**
BMIC and CAiM are currently teaming up with doctors and other researchers at ETH Zürich and Balgrist hospital to transform lumbar spine surgery.
Within the flagship project SURGENT from Hochschulmedizin Zürich, a pipeline is being developed to pre-operatively visualize a 3D model of the lumbar spine. The new work of Dr. Baumgartner on principled uncertainty estimation in medical image segmentation has been presented @ miccai2019. The proposed probabilistic hierarchical model allows to sample from the distribution of segmentations.

**CAiM**
- Novel ultrasound imaging sequences are being developed for new tissue contrasts such as acoustic speed and attenuation, potential for imaging cancer and other diseases.
- Related work by Dr. Richard Rau received the Best Presentation Award @ miccai2019!
- Deep-learning based image reconstruction techniques (Dr. Valery Vishnevskiy), extending pretrained networks without forgetting (Firat Ozdemir), ultrasound simulation with animated and deformable models (Rastislav Starkov), and corneal imaging advances with optical coherence elastography (Dr. Sabine Kling) have been among our other recent research highlights.