EPFL Computer Vision Lab
Lausanne
Switzerland
EPFL CVLab

The research team:
• 1 Professor
• 1 Senior researcher
• 8 Postdocs
• 15 PhD candidates
• 3 Research engineers

Research Topics:
• 2D scene understanding
• 3D reconstruction
• Biomedical image analysis
• Deep learning
Analyzing and Modeling People from Images
Two-step process:
1. Detection in each time-frame independently using a generative model.
2. Linking detections across frames using an LP solver.

-> System is very robust to occlusions and occasional detection failures.
Dealing with Crowds
Recovering 3D Pose
Exploiting Unsupervised Data

Qualitative results on skiing

Training on the ski dataset with weak multi-view supervision improves accuracy.

Cropped input

Our method* (trained on new ski dataset) Baseline* (trained on H3.6M)

*smoothed temporally with a Gaussian window of std=1
3D Deformable Surfaces
Draping Garments on 3D Body Models
Biomedical Image Analysis
Mapping the Brain

Fluorescent neurons in vivo in the adult mouse brain. Imaged through a cranial window using a 2-photon microscope. FIB stack and reconstructed neurites.

Courtesy of G. Knott
Mapping the Brain

Processing steps:

1. Delineation in LM imagery at micrometer resolution.
2. Segmentation in EM imagery at nanometer resolution.
3. Registering them into a single model.
Neural Structures in Light Microscopy

Brainbow Stack

Ground Truth  QMIP reconstruction

Courtesy of J. Lichtman
Mitochondria
Capturing Space Debris
Space Debris Capture

• The EPFL space center is developing a system to capture the debris that pollute the Earth’s orbit

• This requires estimating the 6D pose of the debris w.r.t. the capture system so as to synchronize their motions

Courtesy of EPFL eSpace

Result from K. Gerard’s MS thesis (EPFL)
Based on Hu et al., CVPR’18

Collaboration with M. Richard at EPFL eSpace
Challenges: Dealing with Unknown Objects

• To handle any debris, we will have to estimate the pose of objects that were never seen during training
Challenges: Lack of Real Space Images

- Images in space are expensive to acquire
- We will leverage synthetic data and lab-acquired images via domain adaptation and generalization
Challenges: Dealing with Limited Resources

- Computation power and memory on the capture device will be limited
- We will study approaches to deep network compression

**Standard network: 3.7M parameters**

![Standard Network Diagram]

Accuracy: 89.3%

**Our approach: 290K parameters**

![Our Approach Diagram]

Accuracy: 90.8%
Reconfiguring Comics
Motivation

Over the years, authors have always had to adapt their creations

E.g., from strip...
Motivation

... to album
Motivation

Painstaking manual process

Even more acute nowadays with transfer to digital devices
Goal

Facilitate comics reconfiguration

Collaboration with S. Süssstrunk
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