EPFL Computer Vision Lab
Lausanne
Switzerland
EPFL CVLab

The research team:
- 1 Professor
- 1 Senior scientist
- 6 Post docs
- 14 PhD candidates

Research Topics:
- Shape and motion from video.
- People tracking.
- Neural Structures from Microscopy.
What do You See?

Scene understanding requires:
• Scene models.
• Fitting these models to noisy data.
→ Machine Learning, Signal Processing, Numerical Optimization, Geometric modeling ....
Aerial Reconstruction

Drone: http://www.sensefly.com/  
Mapping: http://www.pix4d.com/
Brain Mapping

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
Deformable Surfaces

Real Time Implementation on an iPad.

Dat et al., PAMI’15
3D Deformable Surface
3D Shape Design

Baqué et al., ICML’18
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.

Ben Shitrit et al., PAMI’14
• 2005: First ICCV paper published.
• 2014: PlayfulVision founded.
• 2016: Large NBA contract signed.
• 2017: System deployed in NBA arenas.
Mean Field has been replaced by Multiple Mean Fields that can handle multiple hypotheses in each frame, and therefore ambiguities.
... and even Denser.

Venice

Lausanne

- Regress from image to people density.
- Impose geometric constraints.
- Impose temporal consistency on the flow.
Training Data can be Hard to Find

Training on Human 3.6M is insufficient to reconstruct ski motion

Baseline (trained on H3.6M)
Multiview Semi-Supervised Training

Training (Multiview)  Testing (Monocular)
Improved Reconstruction

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

Rhodin et al., CVPR’18
PhD Topics

• Tracing large-scale neural structures.
• Modeling people and their clothes.
• From 2D comics to 3D representations.