


FACULTY OF MATHEMATICS,
PHYSICS AND INFORMATICS
Comenius University
Bratislava

3D Vision

Lecture 10: 3D Object Detection, 3D Pose Estimation, Camera Pose Estimation

Ing. Viktor Kocur, PhD.

7.5.2024

Contents

Human Pose Estimation 2D to 3D

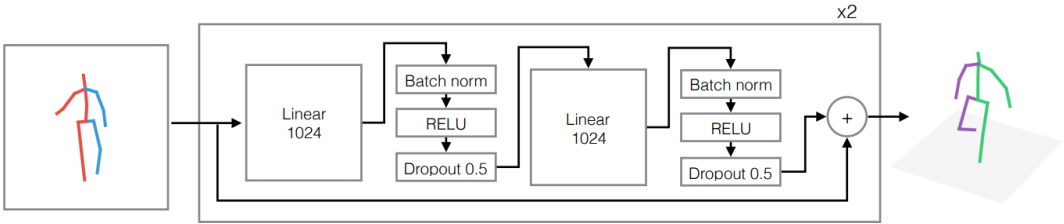


Image adopted from: Julieta Martinez et al. “A simple yet effective baseline for 3d human pose estimation.” In: *Proceedings of the IEEE international conference on computer vision*. 2017, pp. 2640–2649

Weakly-supervised Human Pose Estimation

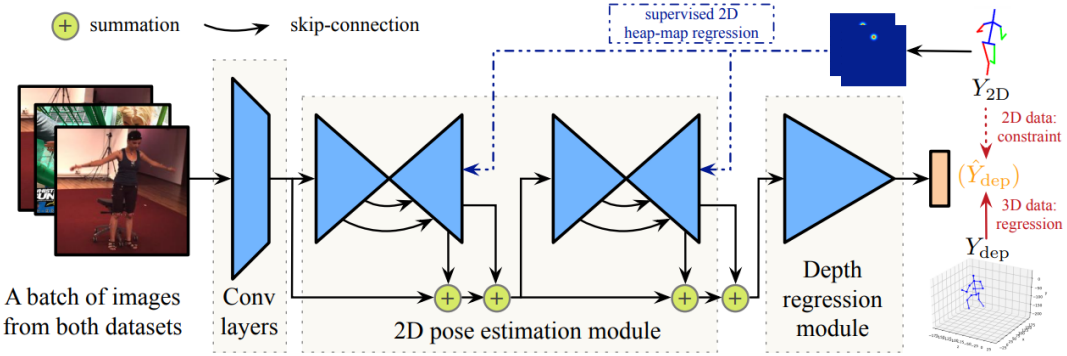


Image adopted from: Xingyi Zhou et al. “Towards 3d human pose estimation in the wild: a weakly-supervised approach.” In: *Proceedings of the IEEE international conference on computer vision*. 2017, pp. 398–407

3D Hand Pose Estimation

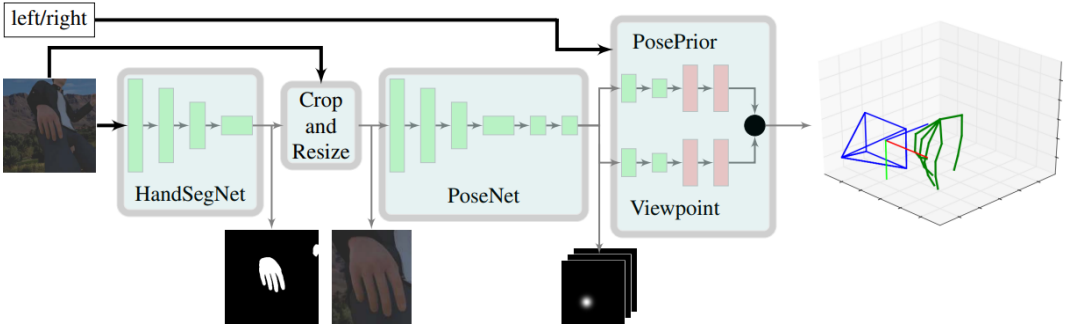


Image adopted from: Christian Zimmermann and Thomas Brox. “Learning to estimate 3d hand pose from single rgb images.” In: *Proceedings of the IEEE international conference on computer vision*. 2017, pp. 4903–4911

3D Hand PosePrior

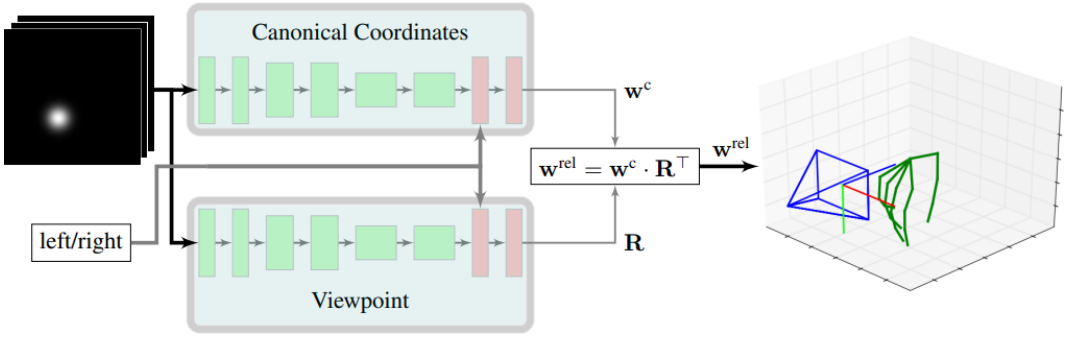


Image adopted from: Christian Zimmermann and Thomas Brox. “Learning to estimate 3d hand pose from single rgb images.” In: *Proceedings of the IEEE international conference on computer vision*. 2017, pp. 4903–4911

Generating Synthetic Annotations Using GANs

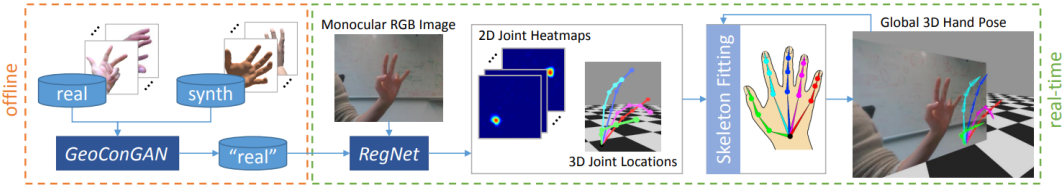


Image adopted from: Franziska Mueller et al. "GANerated Hands for Real-Time 3D Hand Tracking from Monocular RGB." In: *Proceedings of Computer Vision and Pattern Recognition (CVPR)*. 2018. URL: `https://handtracker.mpi-inf.mpg.de/projects/GANeratedHands/`

Weakly Supervised 3D Hand Pose Estimation

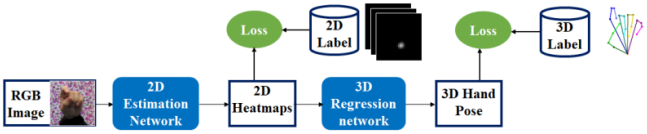


Image adopted from: Yujun Cai et al. “Weakly-supervised 3d hand pose estimation from monocular rgb images.” In: *Proceedings of the European conference on computer vision (ECCV)*. 2018, pp. 666–682

Detecting Hands Grasping Objects

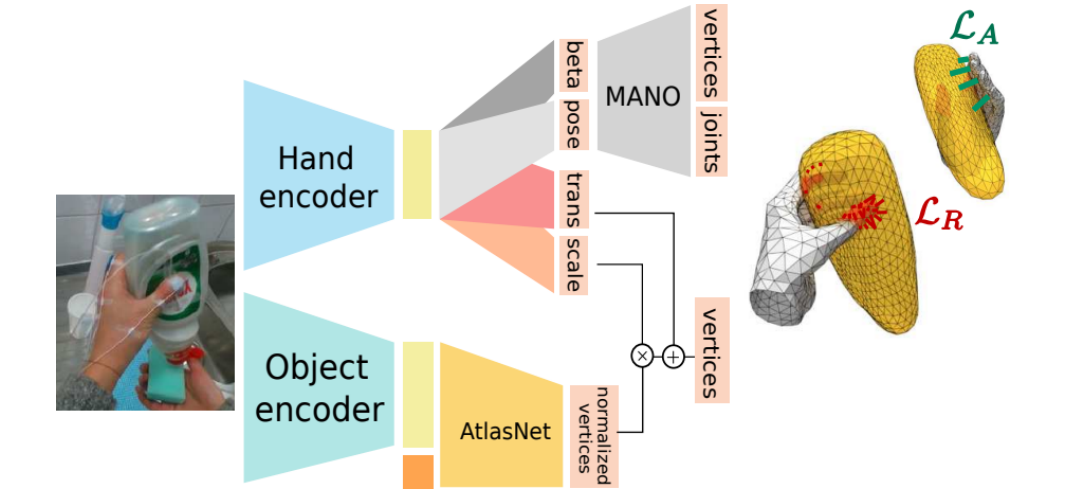


Image adopted from: Yana Hasson et al. “Learning joint reconstruction of hands and manipulated objects.” In: *Proceedings of the IEEE/CVF conference on computer vision and pattern recognition*. 2019, pp. 11807–11816

Deep F without Correspondences

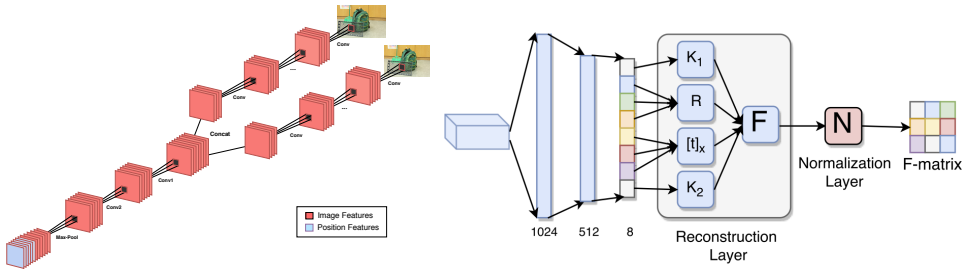
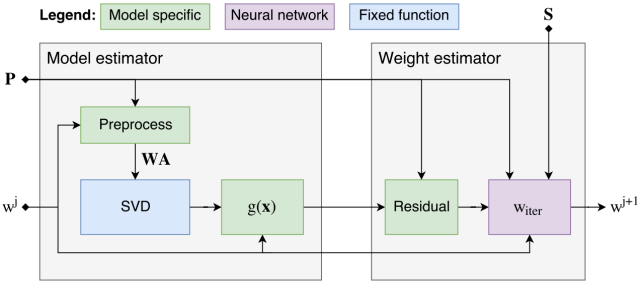


Image adopted from: Omid Poursaeed et al. “Deep fundamental matrix estimation without correspondences.” In: *Proceedings of the European Conference on Computer Vision (ECCV) Workshops*. 2018, pp. 0–0

Deep F Estimation



The network uses as inputs point correspondences and learns to obtain weights for iterative least squares loop.

Image adopted from: René Ranftl and Vladlen Koltun. “Deep fundamental matrix estimation.” In: *Proceedings of the European conference on computer vision (ECCV)*. 2018, pp. 284–299

Learning to find good models in RANSAC

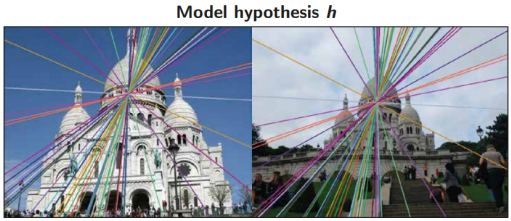


Image adopted from: Daniel Barath, Luca Cavalli, and Marc Pollefeys. “Learning to find good models in RANSAC.” In: *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*. 2022, pp. 15744–15753

Posenet

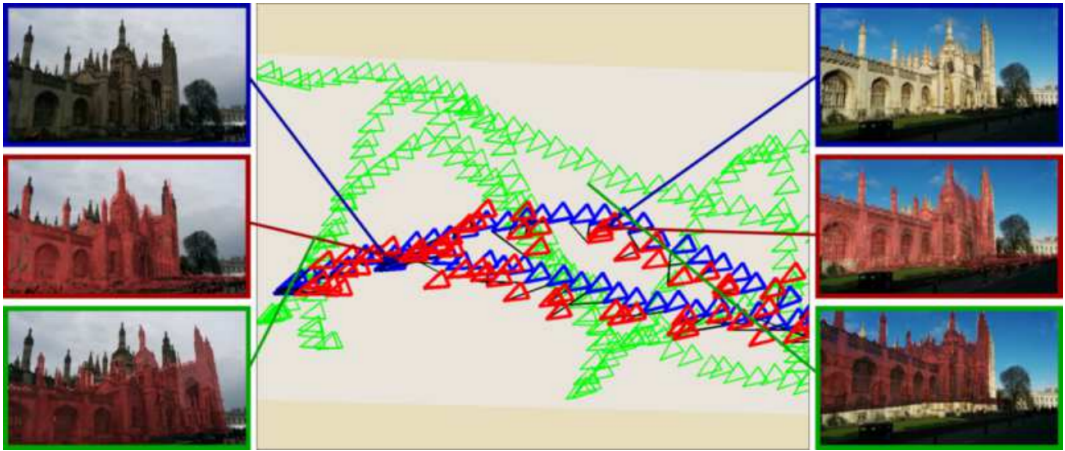


Image adopted from: Alex Kendall, Matthew Grimes, and Roberto Cipolla. “Posenet: A convolutional network for real-time 6-dof camera relocalization.” In: *Proceedings of the IEEE international conference on computer vision*. 2015, pp. 2938–2946

DUSt3R

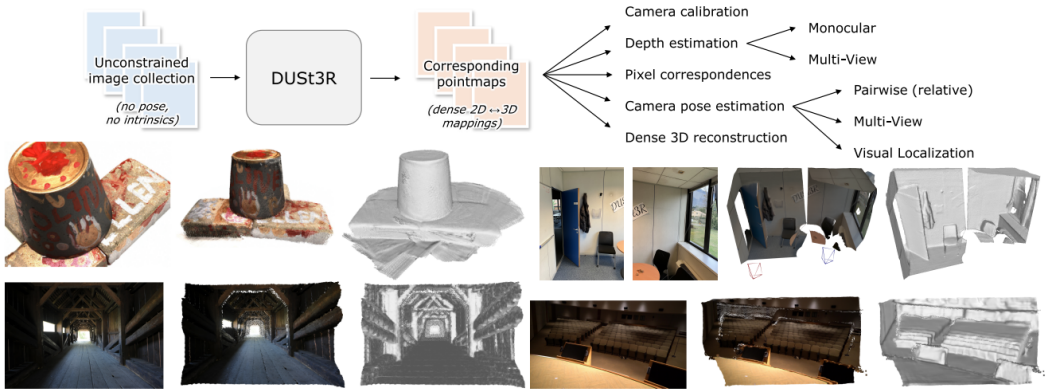


Image adopted from: Shuzhe Wang et al. “Dust3r: Geometric 3d vision made easy.” In: *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*. 2024, pp. 20697–20709

DUSt3R

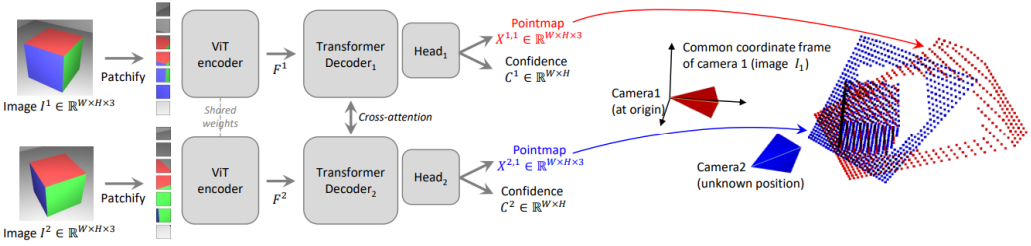


Image adopted from: Shuzhe Wang et al. “Dust3r: Geometric 3d vision made easy.” In: *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*. 2024, pp. 20697–20709

MASt3R

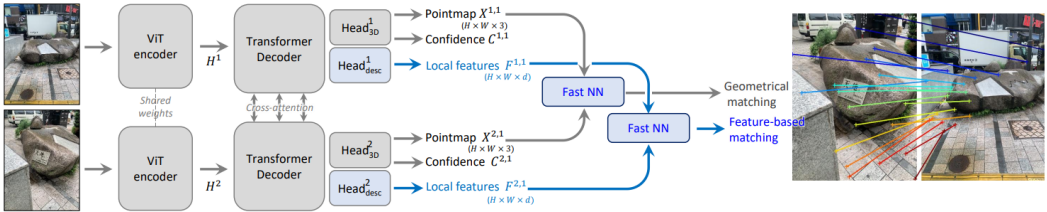


Image adopted from: Shuzhe Wang et al. “Dust3r: Geometric 3d vision made easy.” In: *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*. 2024, pp. 20697–20709

Neural Radiance Fields

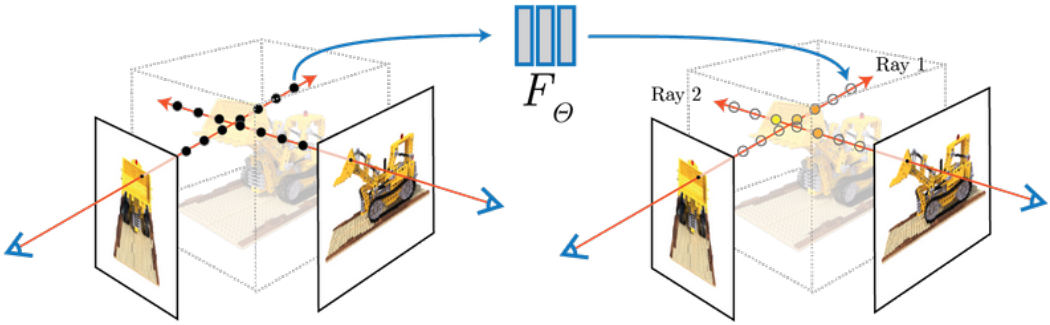
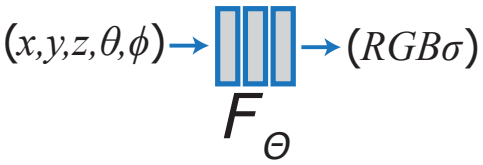


Image adopted from: Ben Mildenhall et al. “Nerf: Representing scenes as neural radiance fields for view synthesis.” In: *Communications of the ACM* 65.1 (2021), pp. 99–106

Neural Radiance Fields



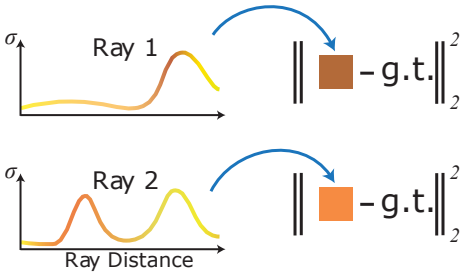


Image adopted from: Ben Mildenhall et al. “Nerf: Representing scenes as neural radiance fields for view synthesis.” In: *Communications of the ACM* 65.1 (2021), pp. 99–106

Inverted NeRF

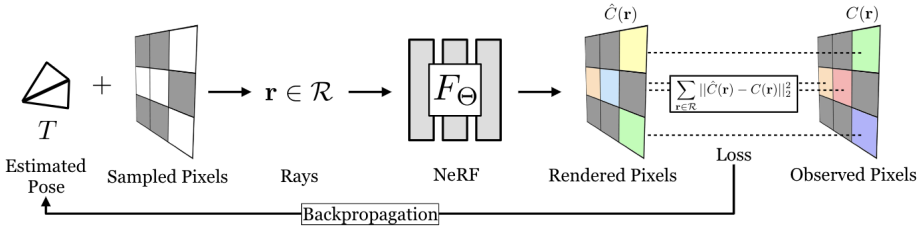


Image adopted from: Lin Yen-Chen et al. “iNeRF: Inverting Neural Radiance Fields for Pose Estimation.” In: *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. 2021

BudleSDF

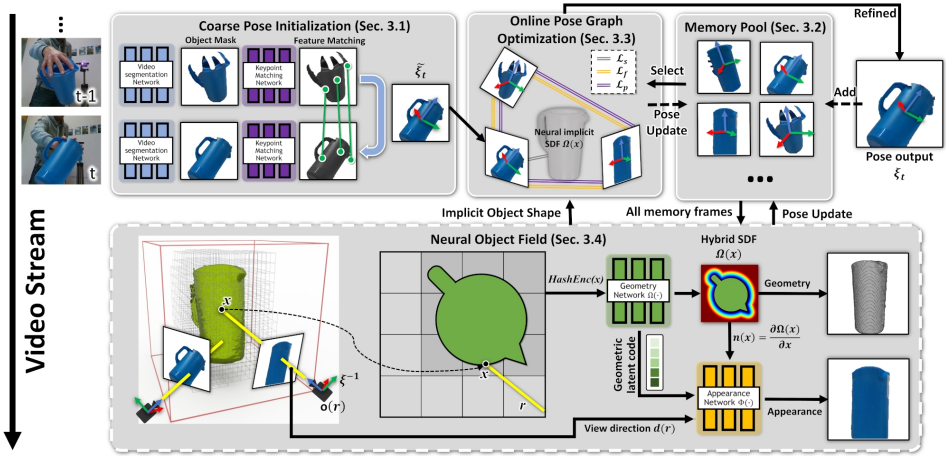


Image adopted from: Bowen Wen et al. “Bundlesdf: Neural 6-dof tracking and 3d reconstruction of unknown objects.” In: *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*. 2023, pp. 606–617

Gaussian Splatting

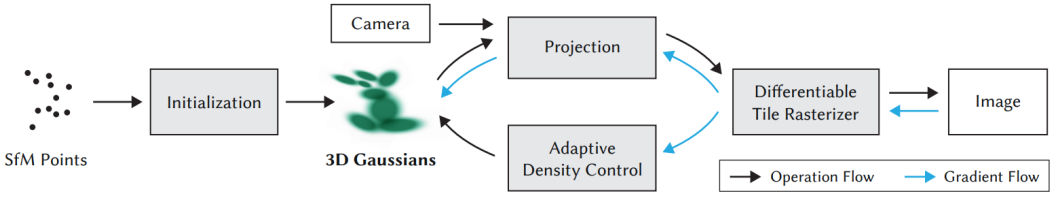


Image adopted from: Bernhard Kerbl et al. “3d gaussian splatting for real-time radiance field rendering..” In: *ACM Trans. Graph.* 42.4 (2023), pp. 139–1

InstantSplat

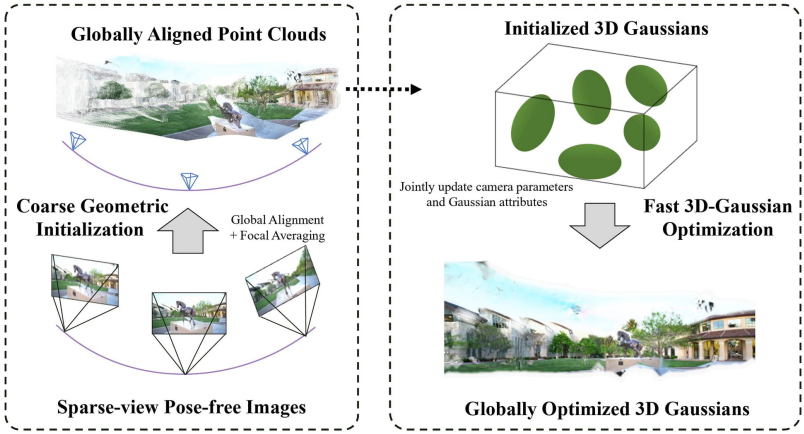


Image adopted from: Zhiwen Fan et al. “Instantsplat: Unbounded sparse-view pose-free gaussian splatting in 40 seconds.” In: *arXiv preprint arXiv:2403.20309* 2.3 (2024), p. 4