Analisi di Immagini e Video (Computer Vision)

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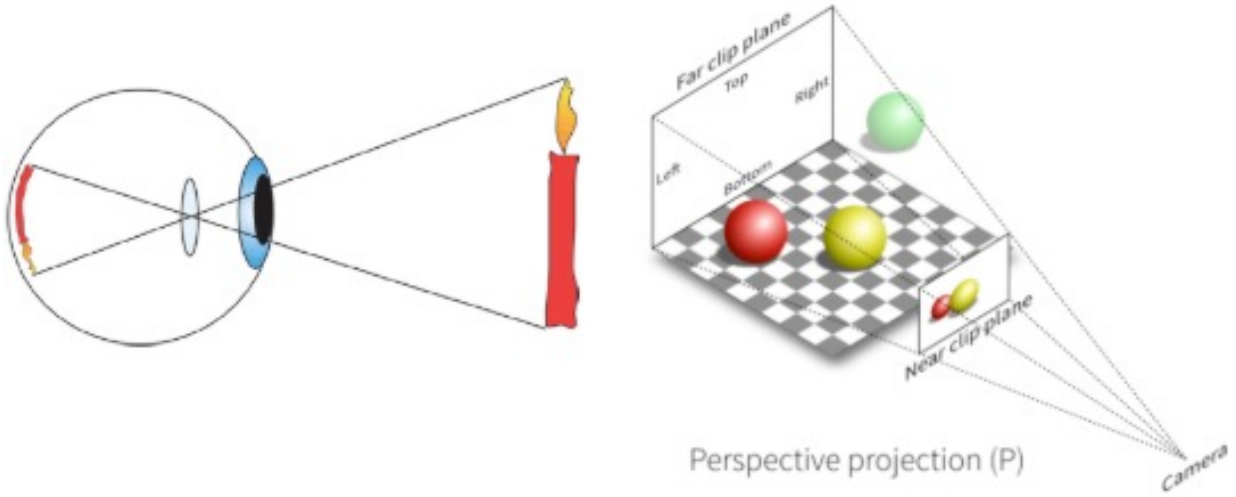
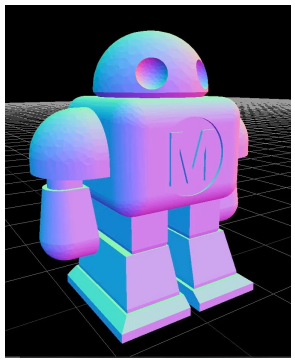
Depth Estimation

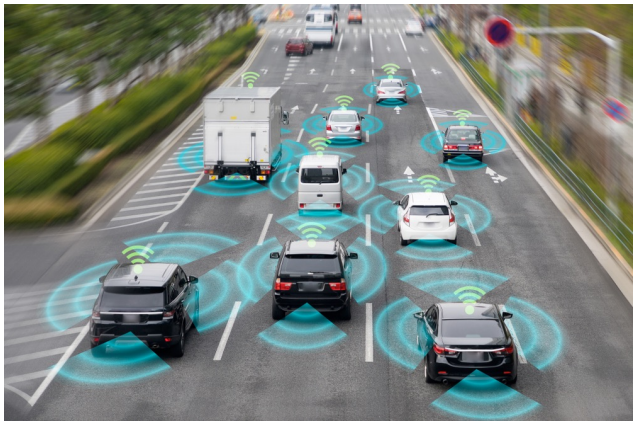
Goal: Measuring distance relative to a camera

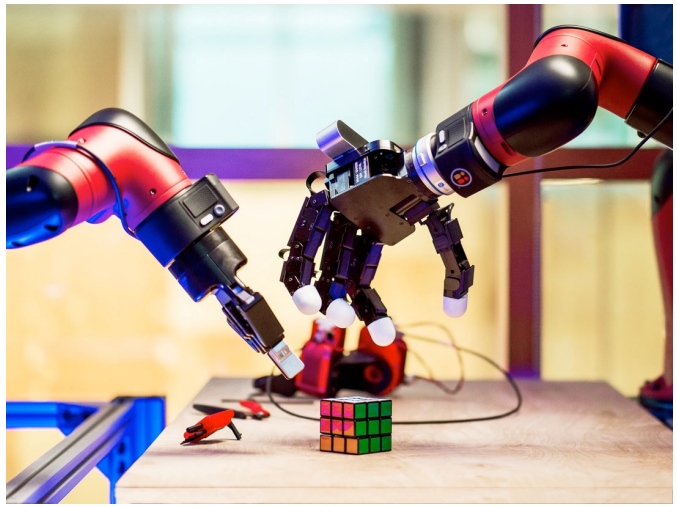


Depth Estimation - Why

- Autonomous driving
- Robotics
- 3D modeling
- AR
- Biometric
- …



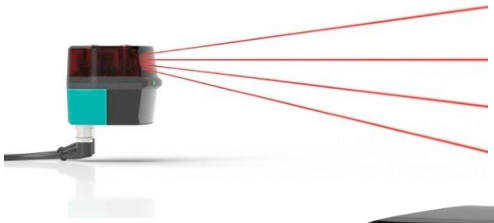


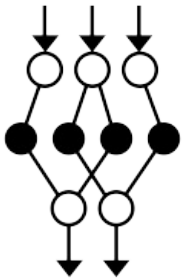


Depth Estimation – How

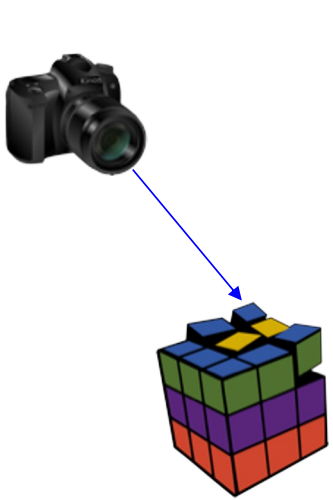
HW vs SW

- LiDAR
- Time of Flight (e.g., Kinect 2)
- Structured light (e.g., Kinect 1)
- …

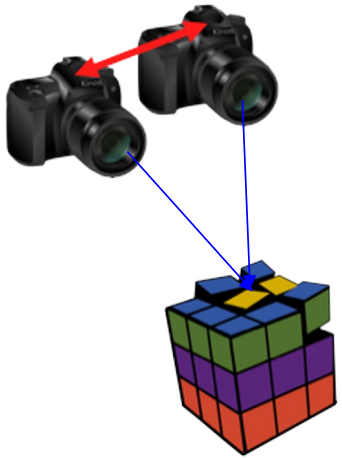




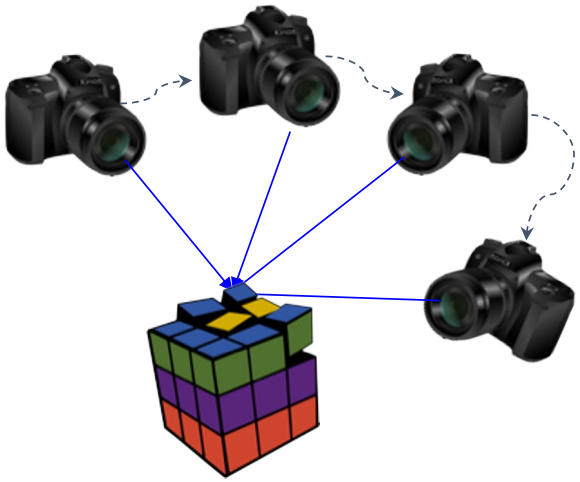
Depth Estimation – How (sw)



Monocular

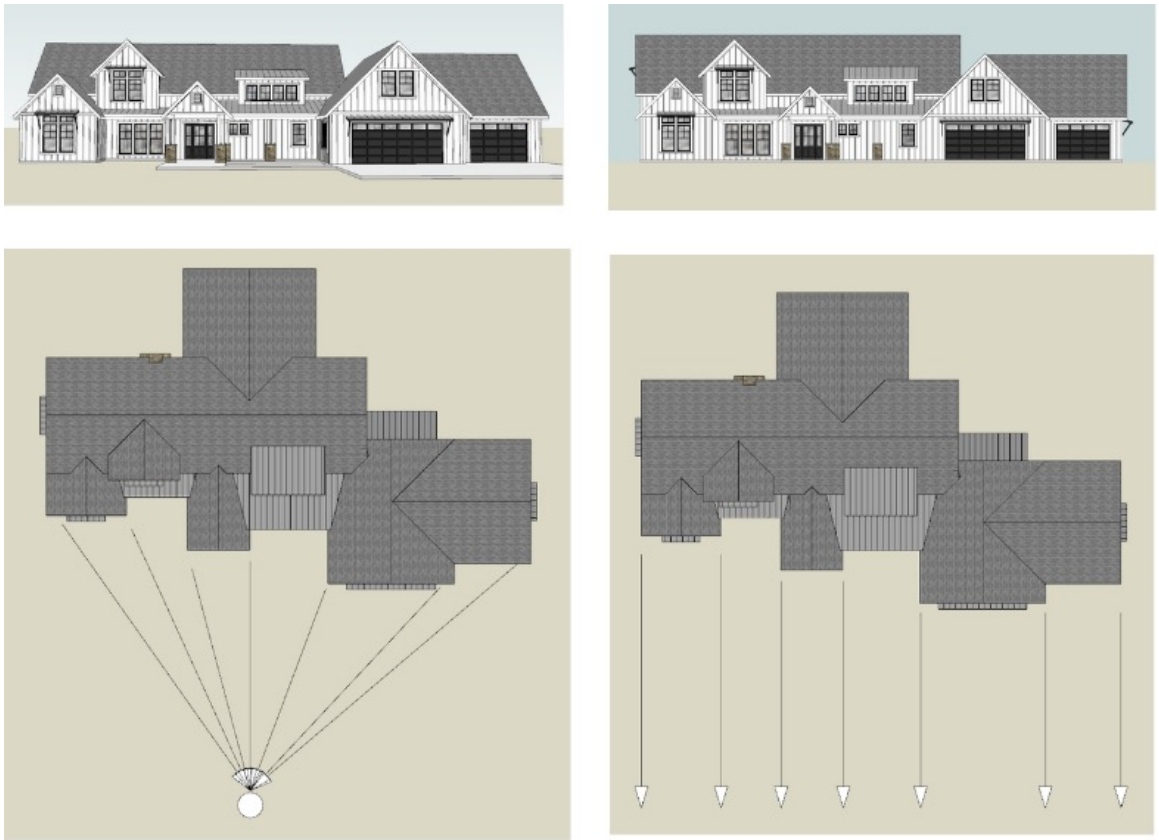


Stereo

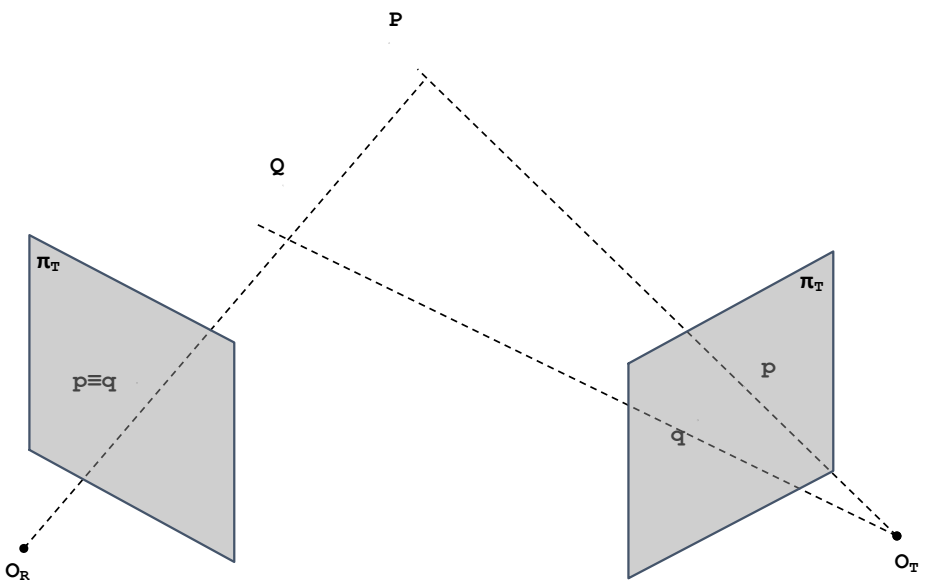


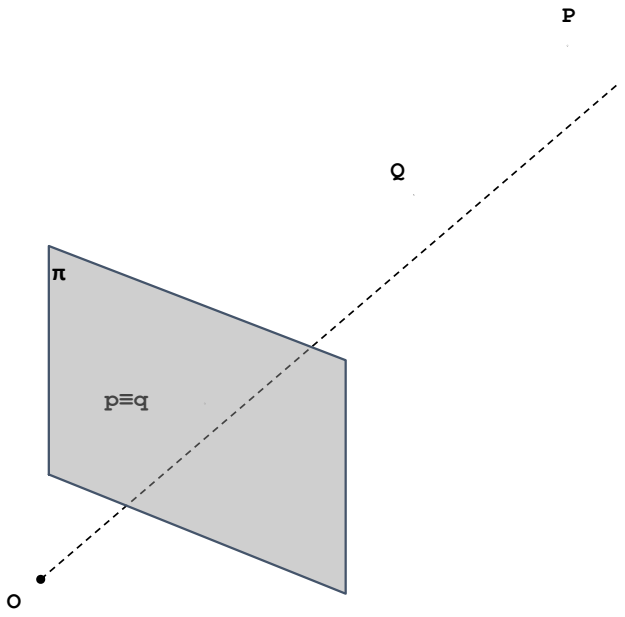
Multi-view stereo

Depth Estimation – Problems

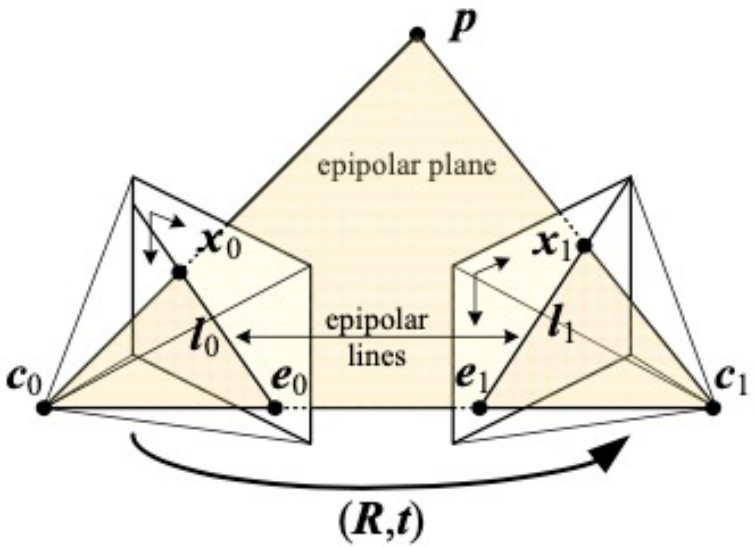


Depth Estimation – Stereo vs Mono

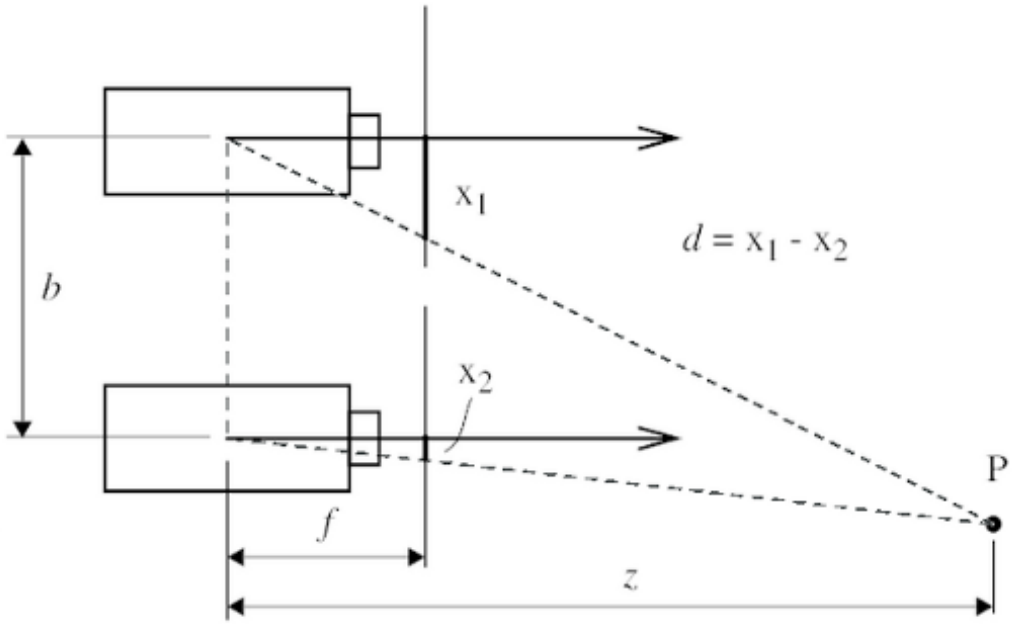




Depth Estimation – Stereo Problems



Depth Estimation – Distance

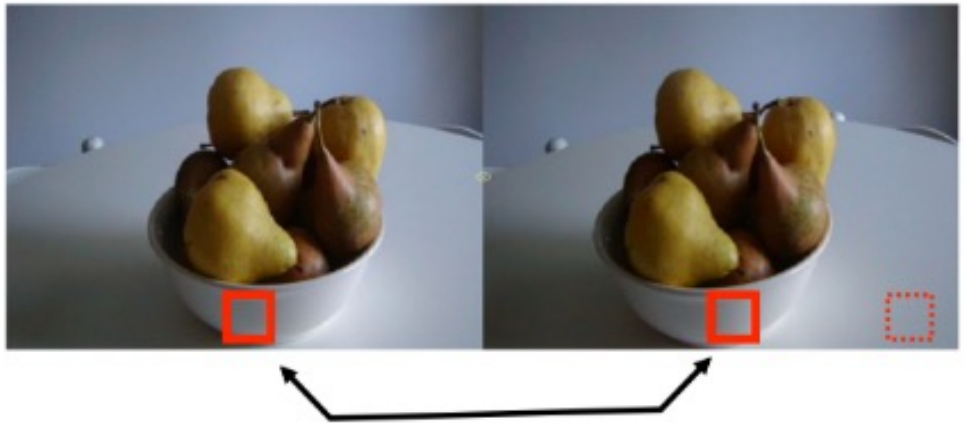


From similar triangles,

$$\frac{d}{b} = \frac{f}{z}$$

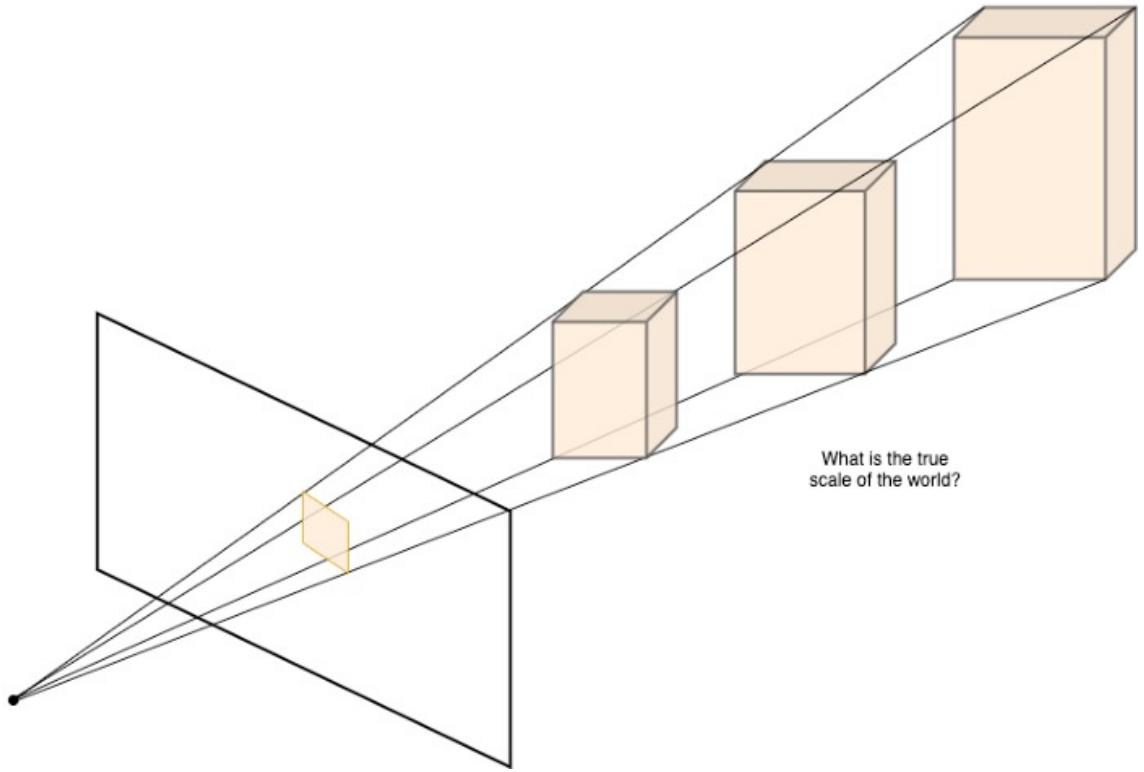
Depth Estimation – Stereo (2)

Point matching is hard

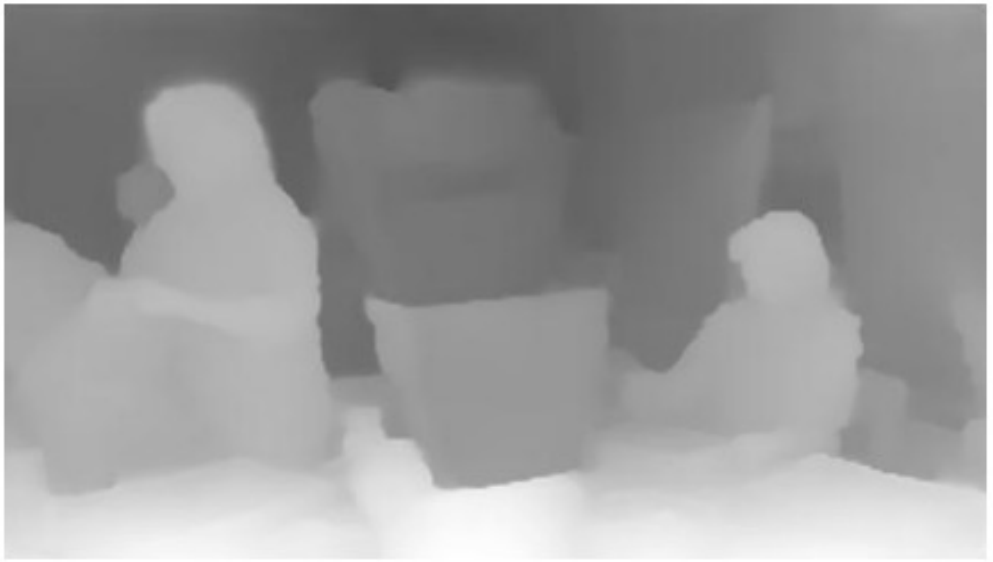


Depth Estimation – Mono

Depth Estimation is an hard task

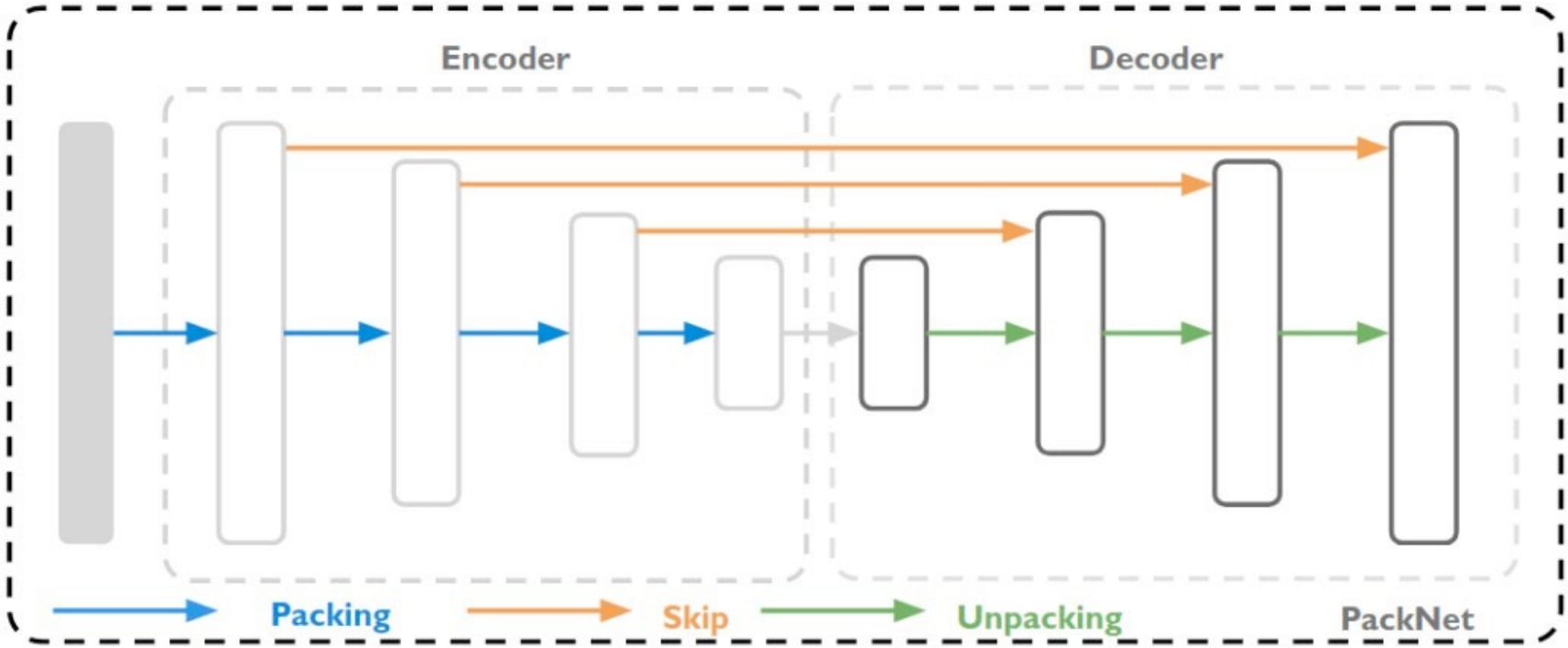


Depth Estimation - Example



Depth Estimation - PackNet

PackNet, a neural network architecture specifically tailored for self-supervised monocular depth estimation



Depth Estimation - PackNet