UnDEMoN : Unsupervised Deep Network for Depth and Ego Motion Estimation

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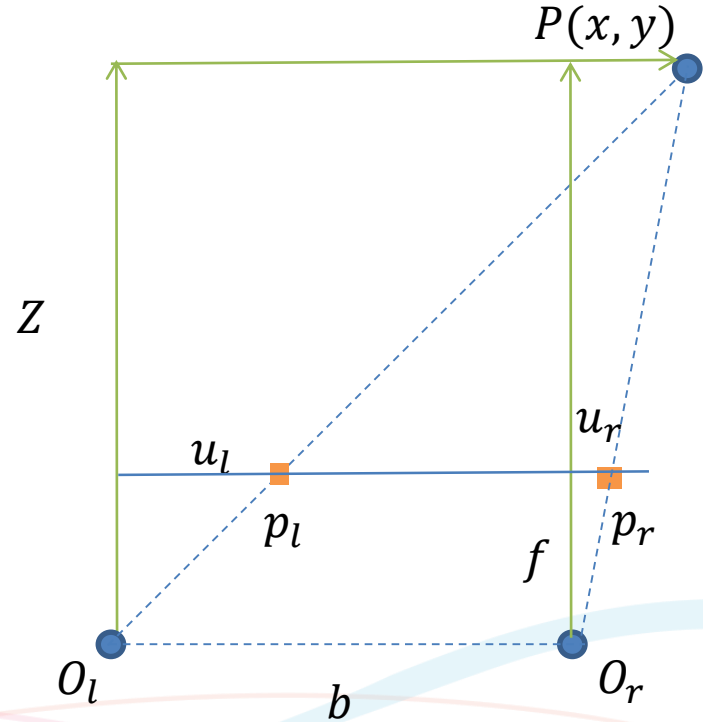
- Given a pair of left and right images (I_l, I_r) the depth Z can be estimated by calculating disparity d between the (I_l, I_r) as follows
- From the geometry of similar triangles

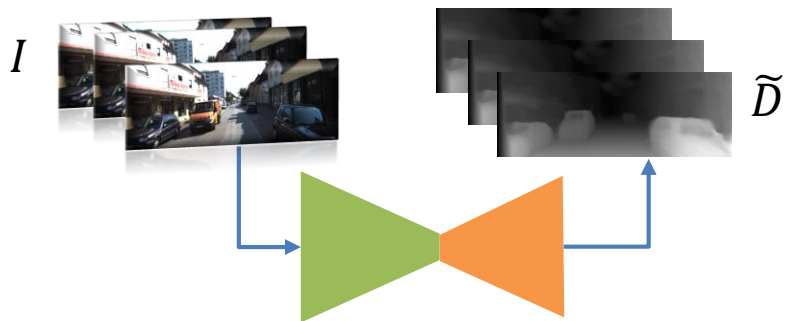$$\frac{Z}{f} = \frac{x}{u_l} \qquad \frac{Z}{f} = \frac{b-x}{u_r}$$

$$Let \; d = u_l - u_r$$

$$z = \frac{bf}{d} \qquad \text{b: base line ; f: focal Length}$$

- Formally the "d" is know as disparity between the left right images.

$$P(x, y)$$

$$Z$$

$$u_r$$

$$u_l$$

$$p_l$$

$$p_r$$

$$f$$

$$O_l$$

$$b$$

$$O_r$$

Estimating Disparity / Depth using Deep Learning

Supervised Learning Paradigm

Encoder

Decoder

Estimating Disparity / Depth using Deep Learning
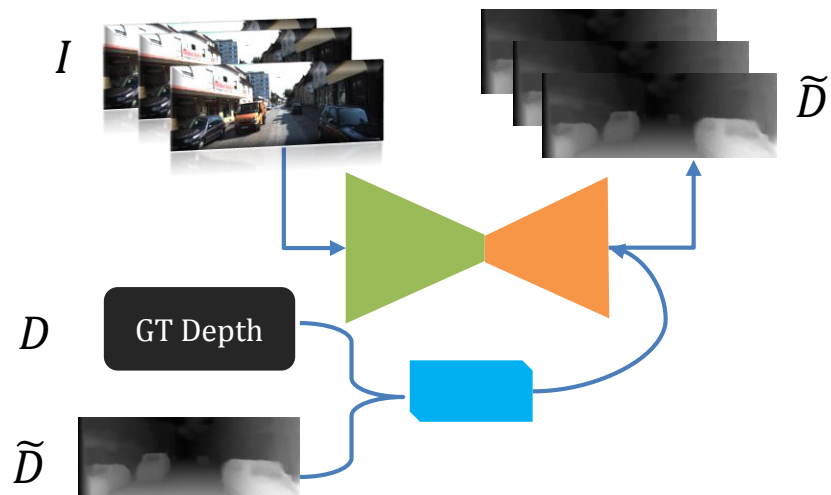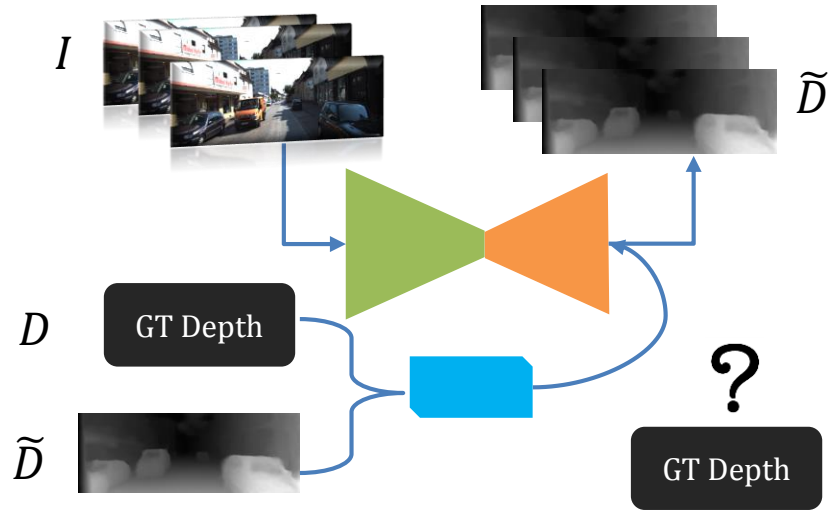
Estimating Disparity / Depth using Deep Learning

Supervised Learning Paradigm

Encoder

Decoder

Supervised Losses
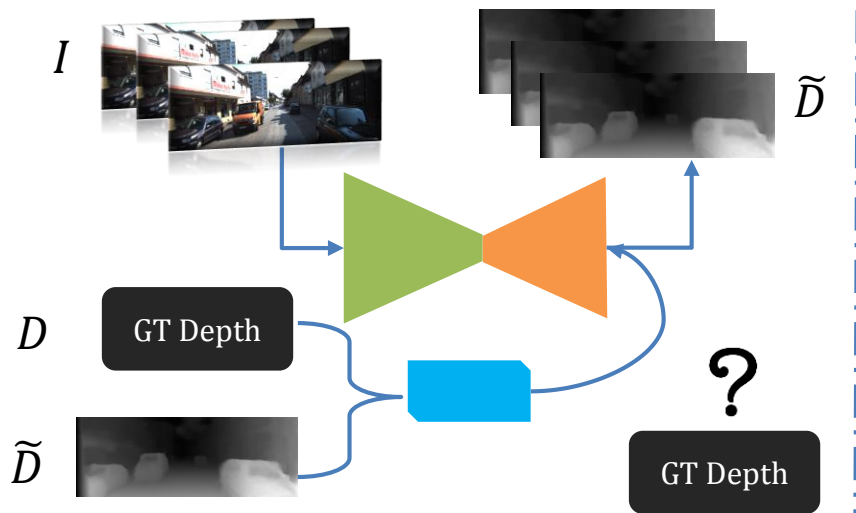
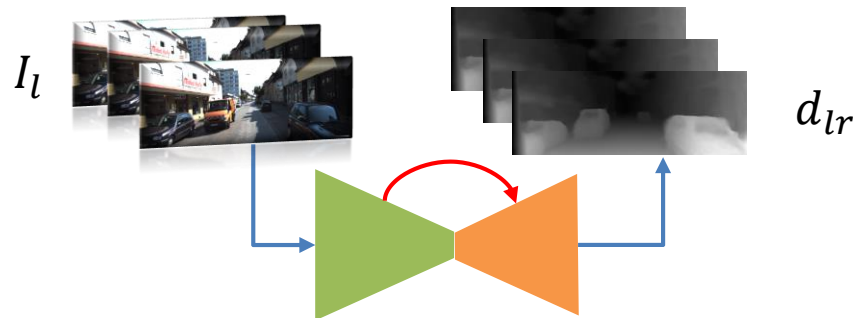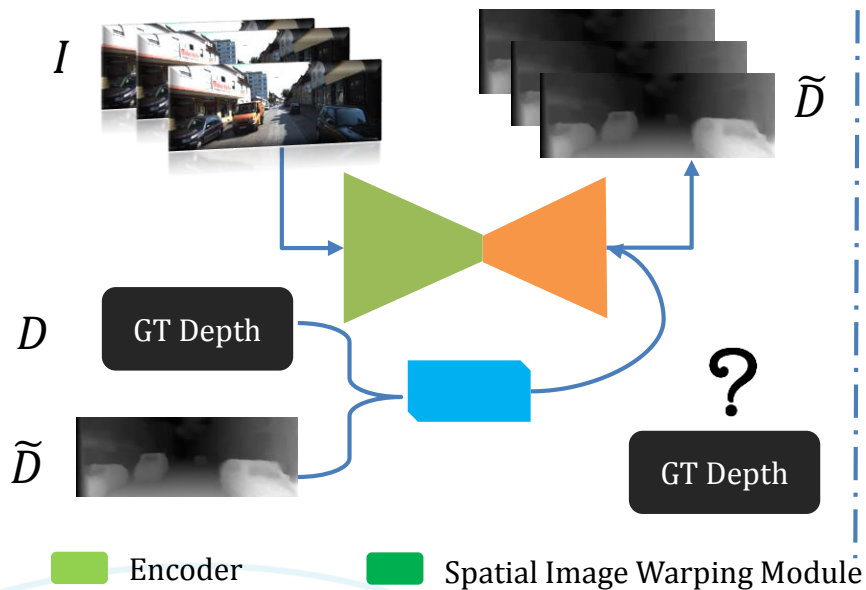# Estimating Disparity / Depth using Deep Learning

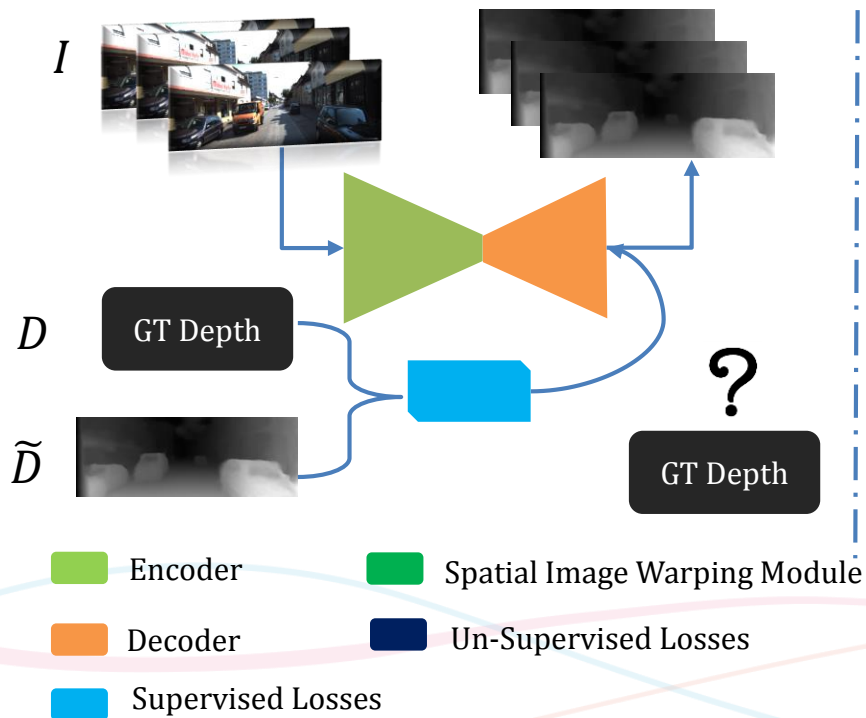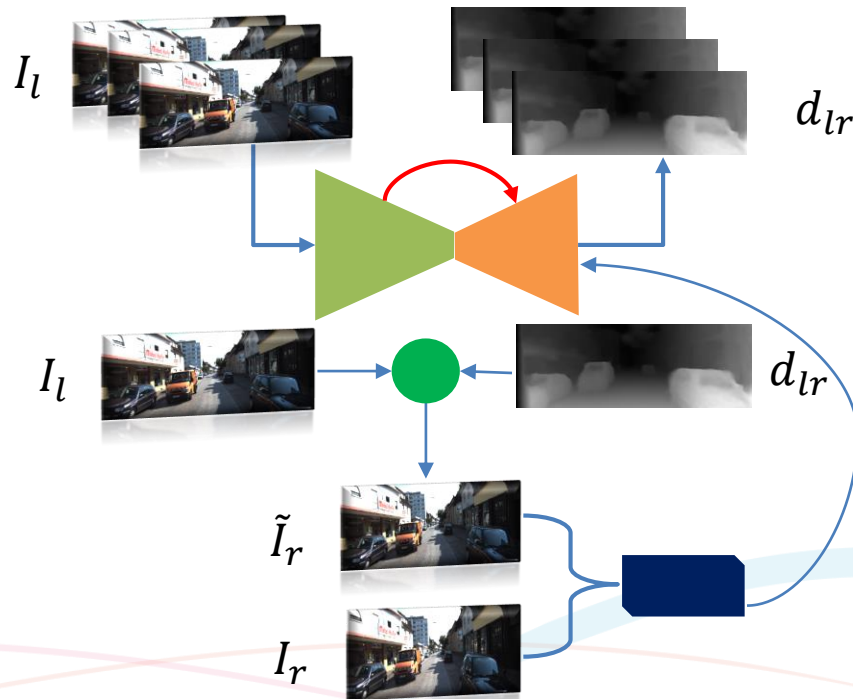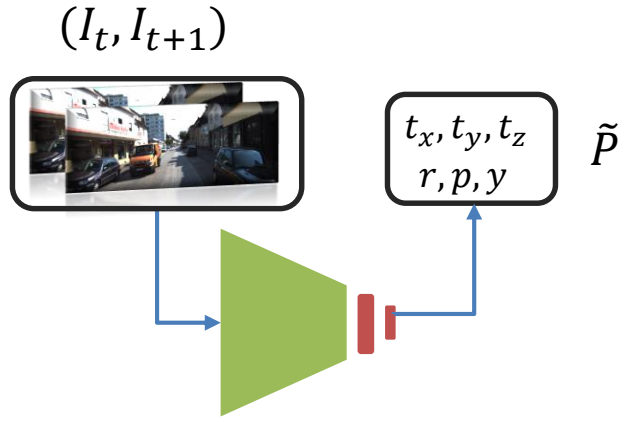# Estimating Disparity / Depth using Deep Learning

Supervised Learning Paradigm

I

$\widetilde{D}$

D

GT Depth

$\widetilde{D}$

GT Depth

?

Unsupervised Learning Paradigm

I_l

d_{lr}

I_l

d_{lr}

$\tilde{I}_r$

Encoder

Spatial Image Warping Module
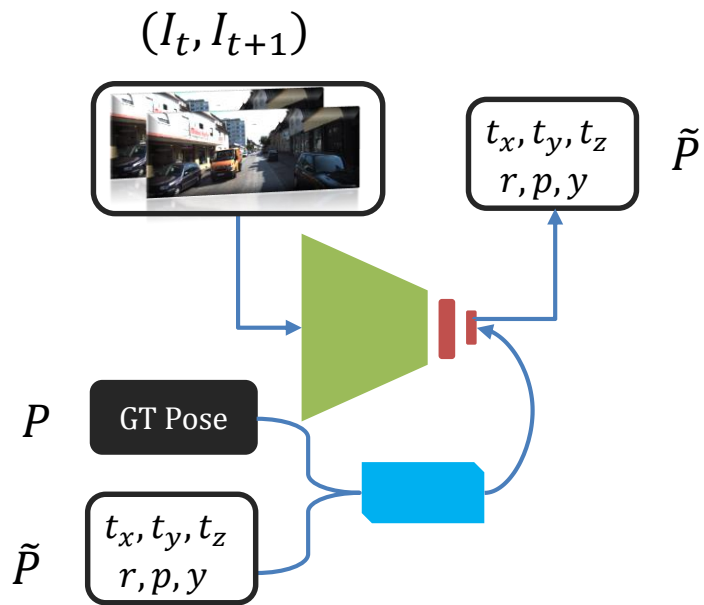
Decoder

Supervised Losses

Estimating Disparity / Depth using Deep Learning

Ego Motion Estimation using Deep Learning

(I_t, I_{t+1})

$\begin{array}{c} t_x, t_y, t_z \\ r, p, y \end{array}$ $\tilde{P}$
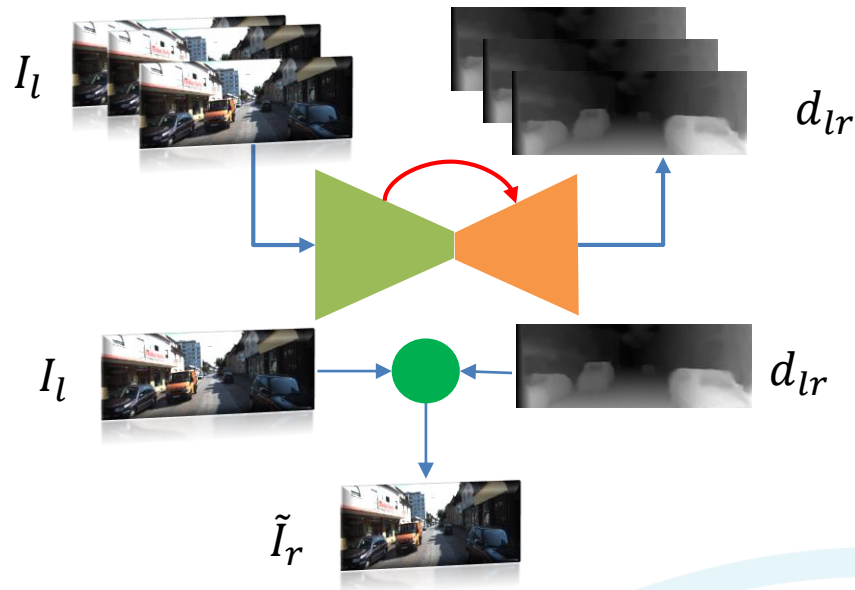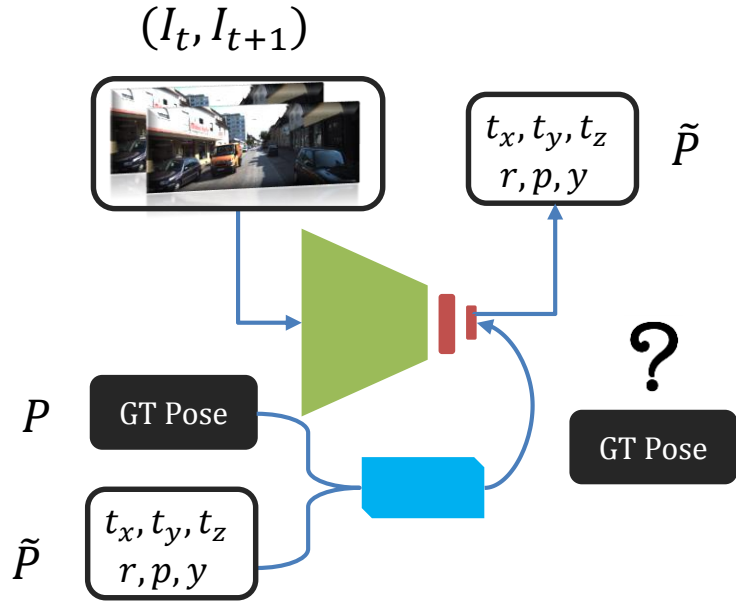
Encoder

FC Layers

Ego Motion Estimation using Deep Learning

(I_t, I_{t+1})

t_x, t_y, t_z
r, p, y

$\tilde{P}$
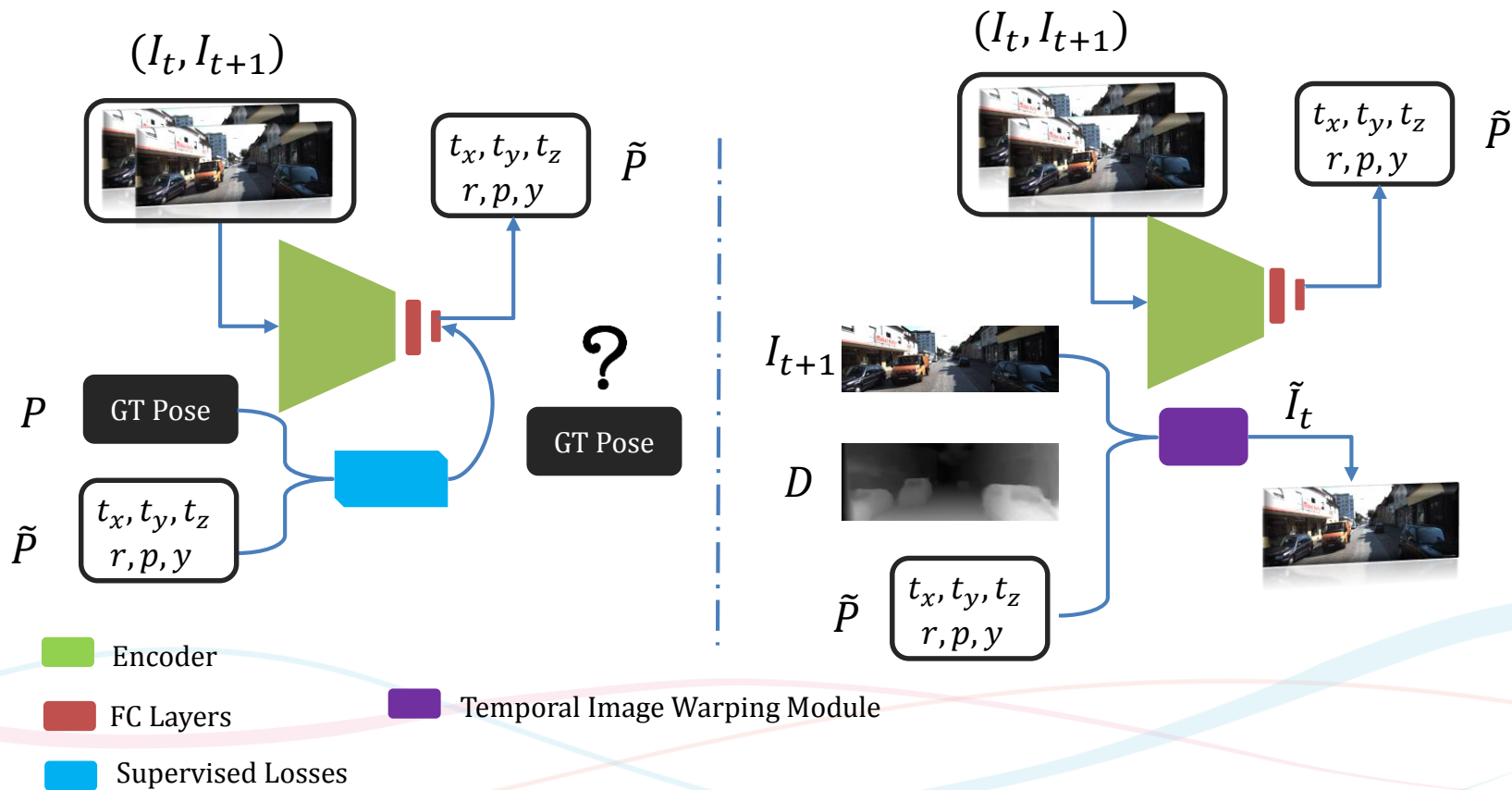
P

GT Pose

$\tilde{P}$

t_x, t_y, t_z
r, p, y

Encoder
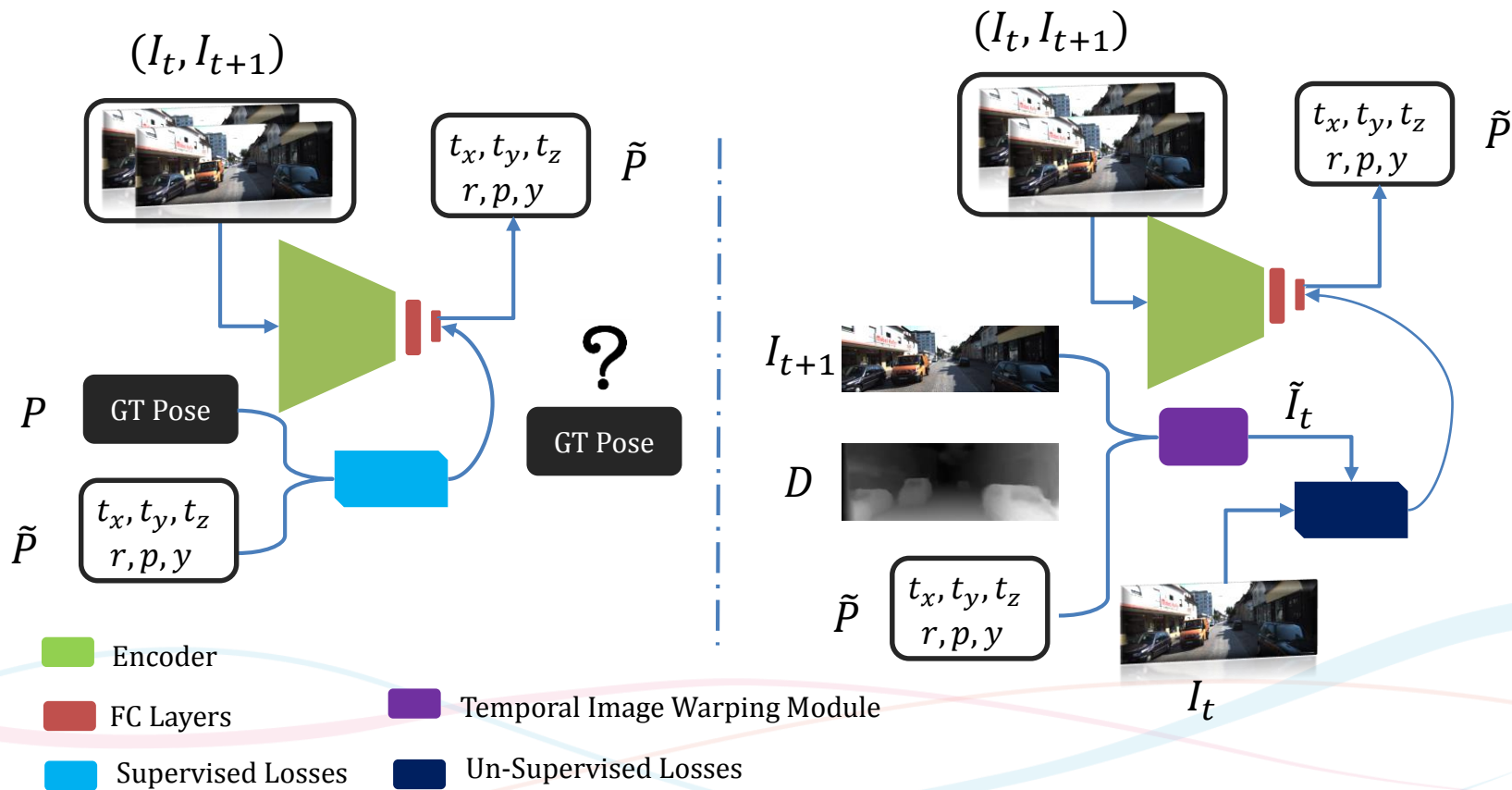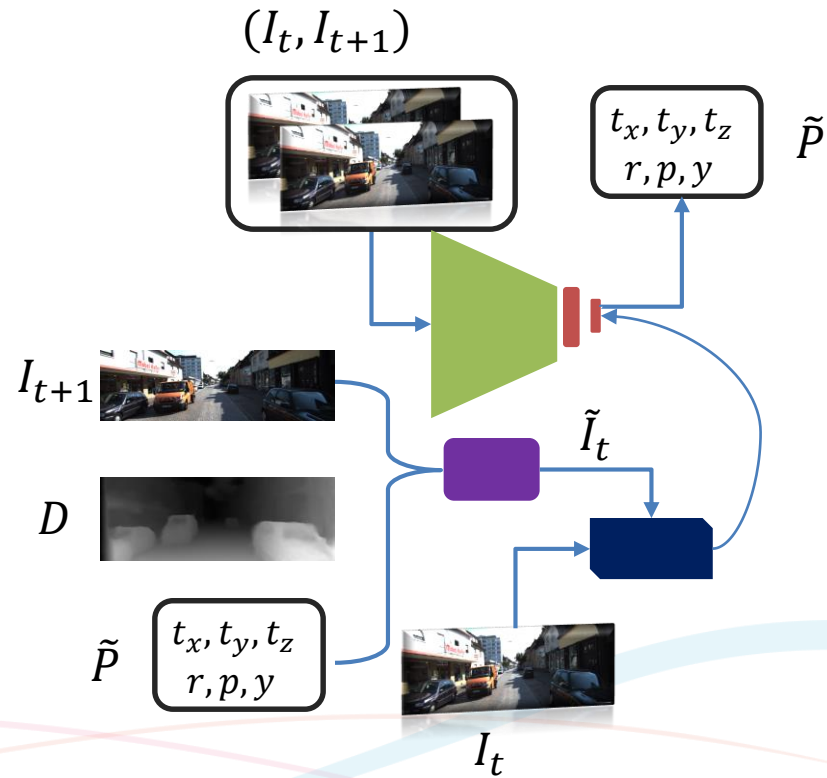
FC Layers

Supervised Losses

Ego Motion Estimation using Deep Learning

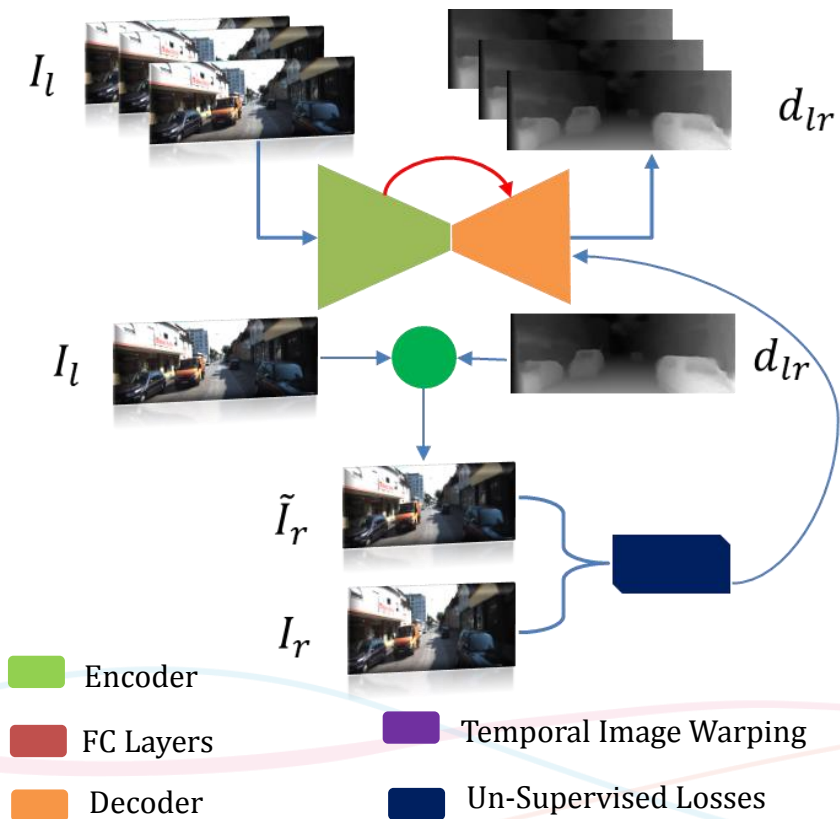# Ego Motion Estimation using Deep Learning
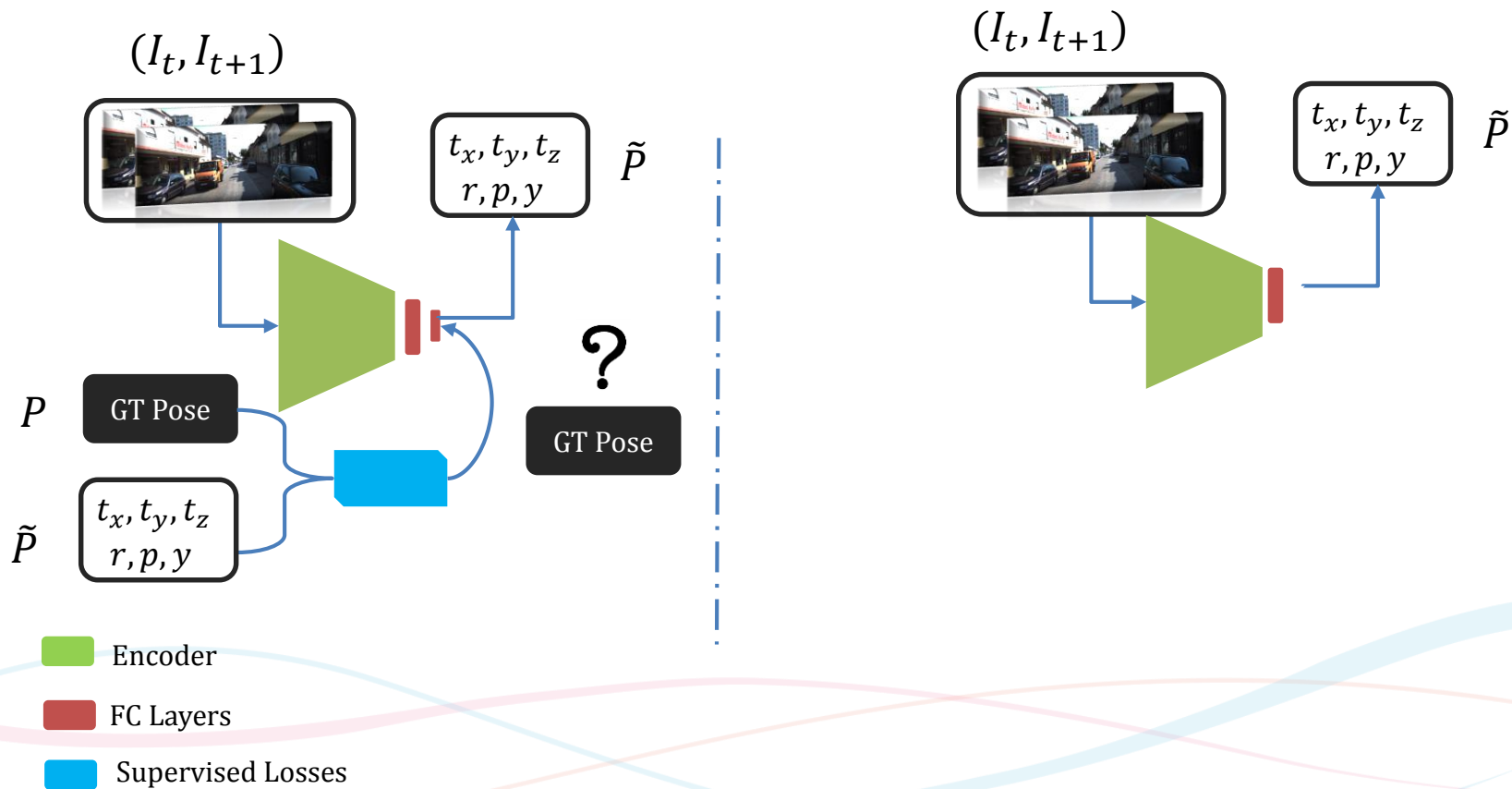
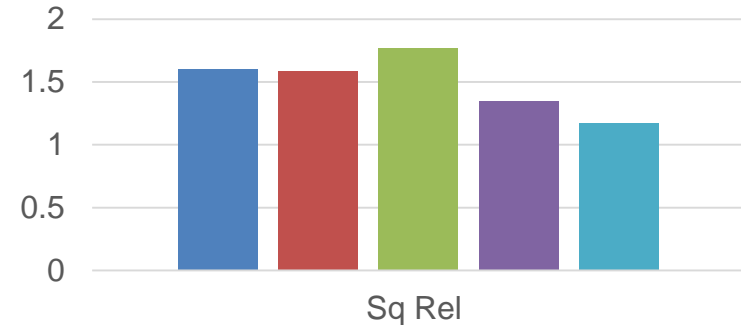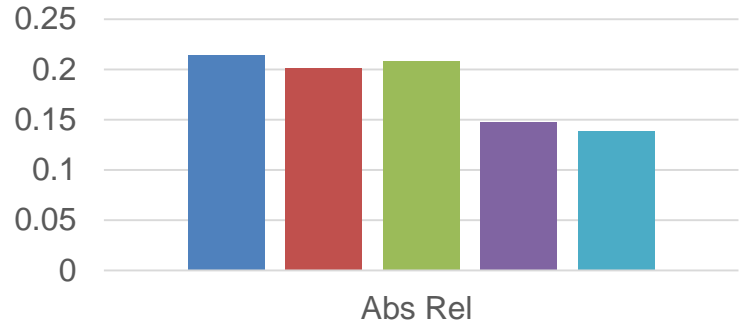# Ego Motion Estimation using Deep Learning

Ego Motion Estimation using Deep Learning

UnDEMoN : Depth + Ego Motion Estimation

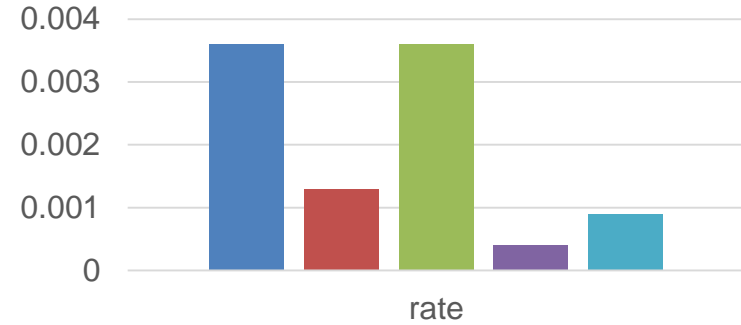Depth Results on KITTI Eigen Split

Pose Results on KITTI Eigen Split (05)

Thank You