

HDR Techniques with Dynamic Scenes for Mobile Imaging

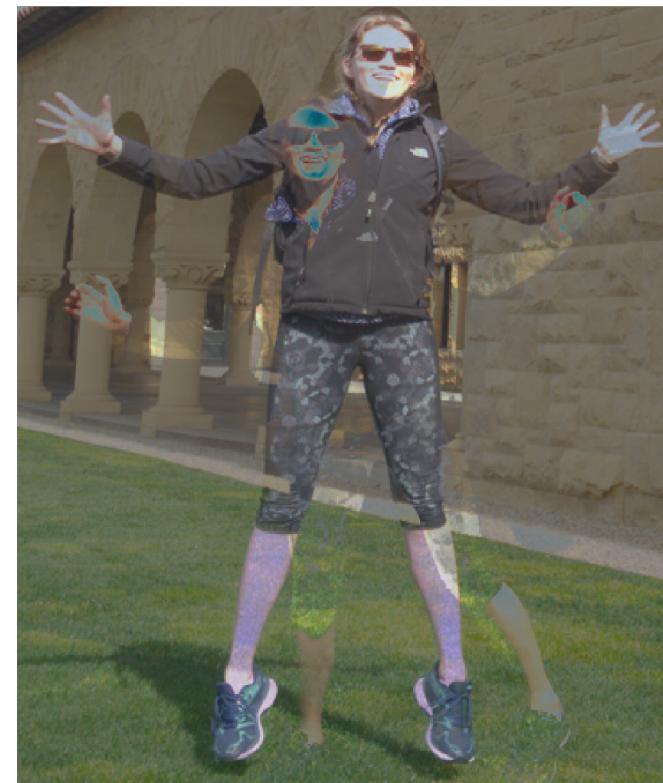
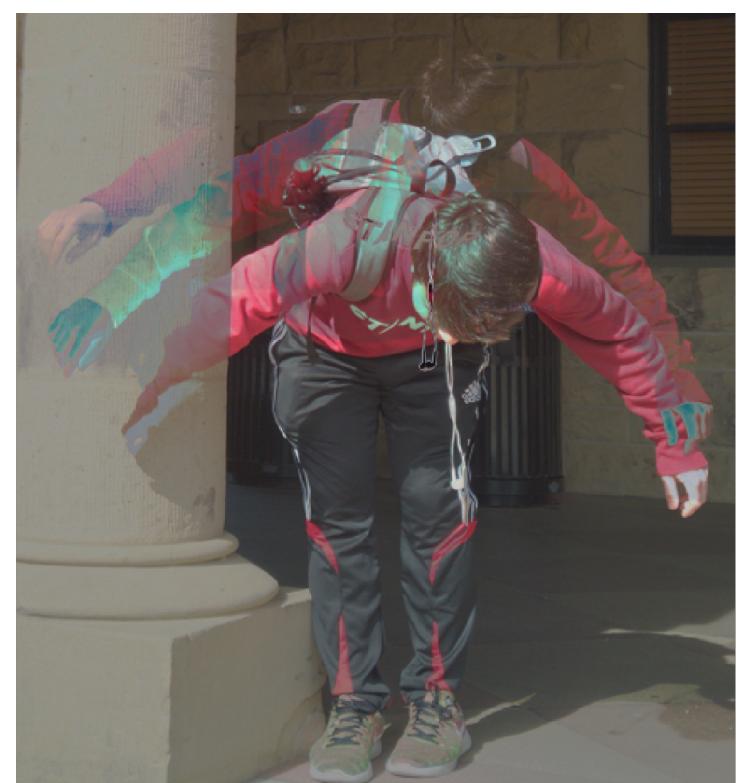
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MOTIVATION

- Mobile phones have very low dynamic ranges
- HDR algorithms suffer with dynamic scenes as multiple exposures are required
- Dynamic scenes result in ghosting and tearing effects



2. NEW TECHNIQUE

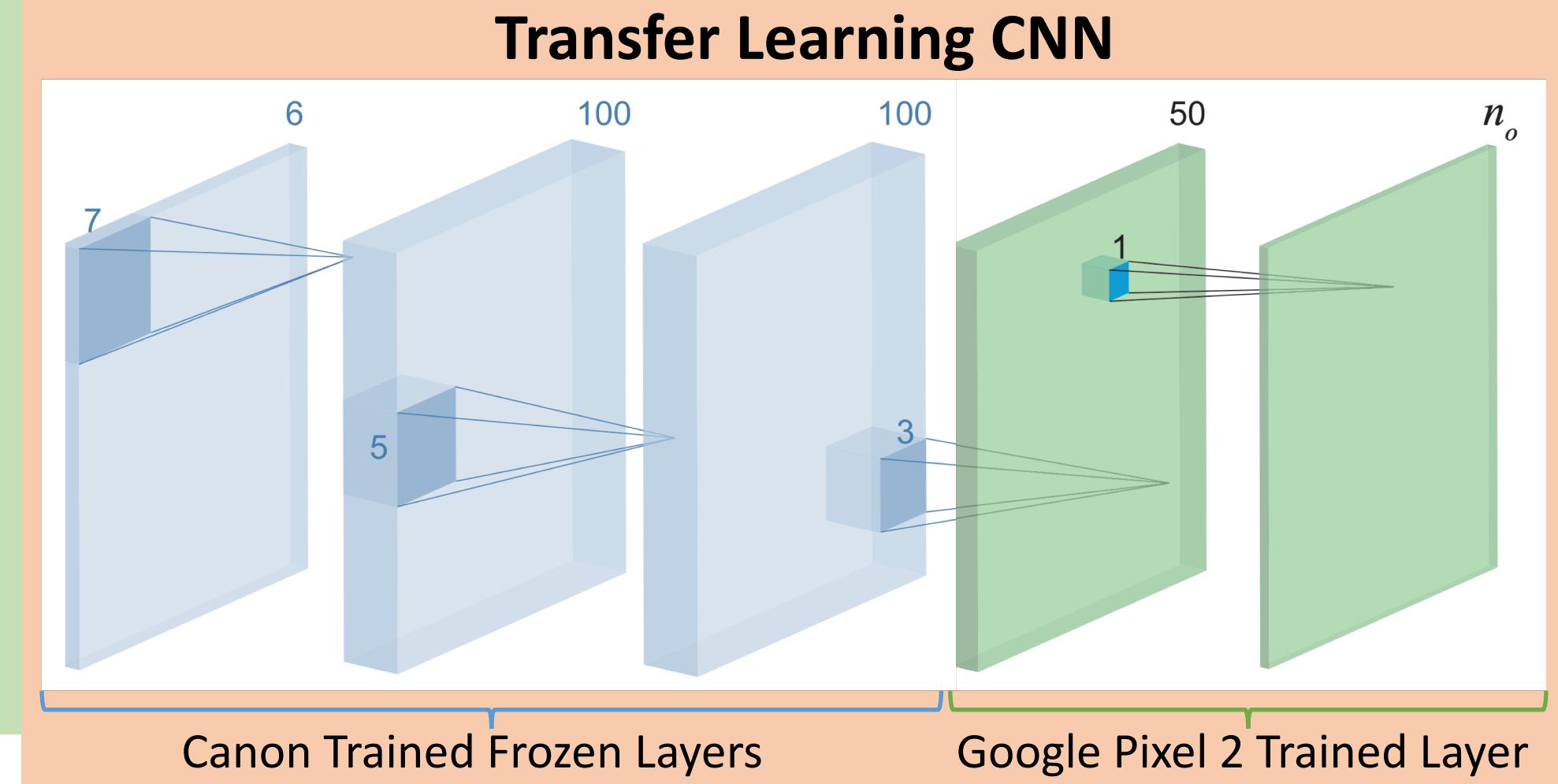
HDR Formation

$$\Lambda_1(I_2) \quad \Lambda_2(I_2) \quad \Lambda_3(I_2)$$

$$I_2 \quad I_2 \quad I_2$$

$$\alpha_1 = 1 - \Lambda_1(I_2), \quad \alpha_2 = \Lambda_2(I_2), \quad \alpha_3 = 1 - \Lambda_3(I_2)$$

$$\hat{H}(p) = \frac{\sum_{j=1}^3 \alpha_j(p) H_j(p)}{\sum_{j=1}^3 \alpha_j(p)}, \quad \text{where} \quad H_j(p) = \frac{I_j^\gamma}{t_j}$$



Tonemapping

 ~~$H^{1/\gamma}$ with $\gamma > 1$~~

$$T = \frac{\log(1 + \mu H)}{\log(1 + \mu)}$$

Loss Function

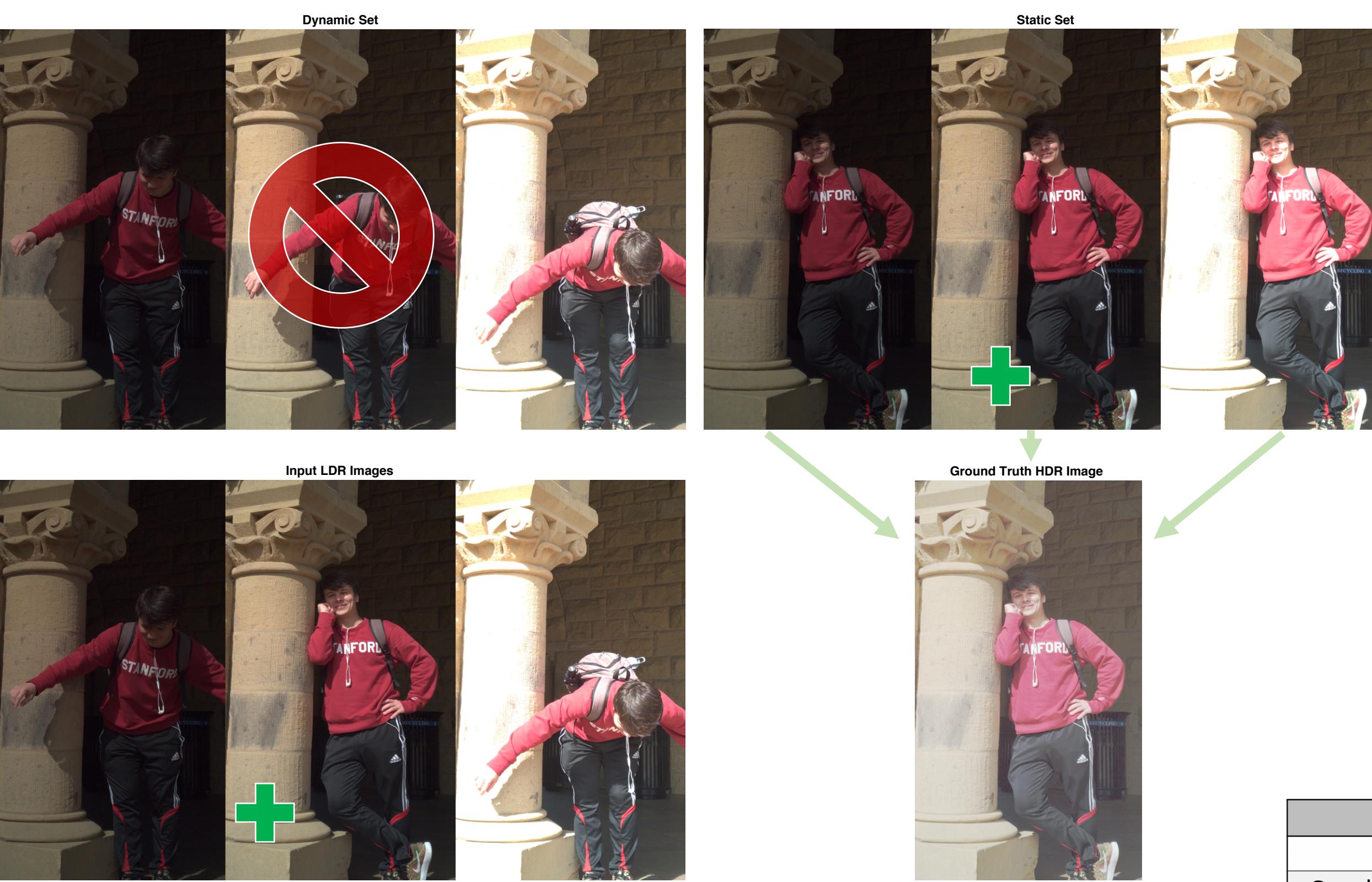
$$E = \sum_{k=1}^3 (\hat{T}_k - T_k)^2$$

RELATED WORK

- Deep High Dynamic Range Imaging of Dynamic Scenes
- Burst Photography for High Dynamic Range and Low-Light Imaging on Mobile Cameras
- High Dynamic Range Imaging on Mobile Devices

1. DATASET

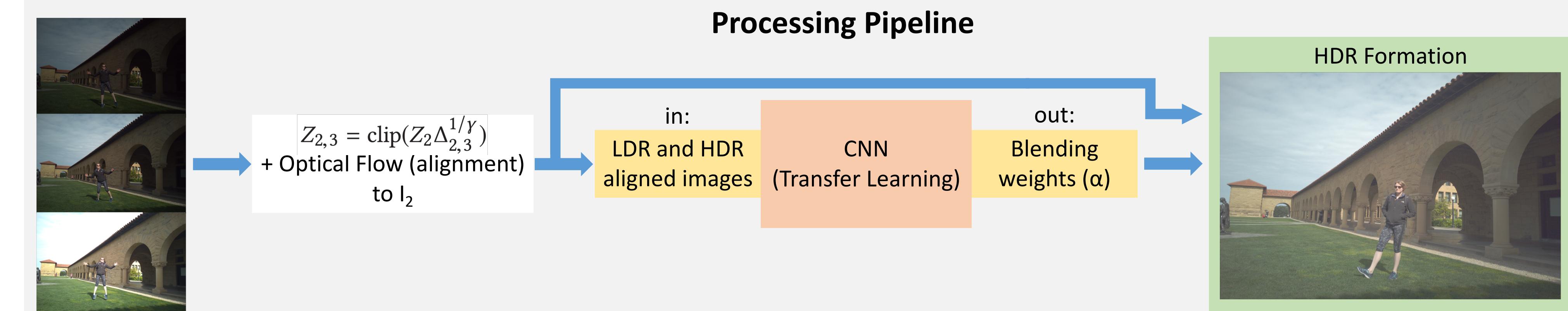
- 16 Scenes (augmented to 160) of the Google Pixel 2's distribution
- LDR bracketed exposure images separated by two stops



REFERENCES

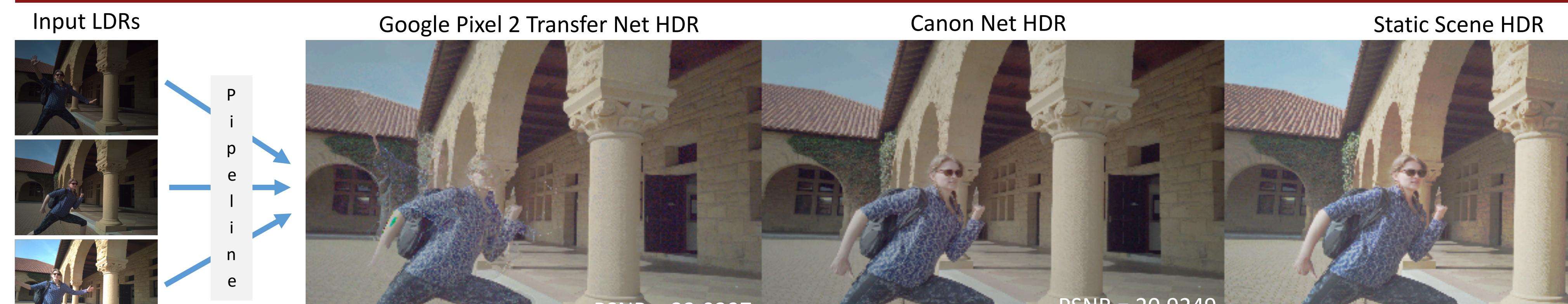
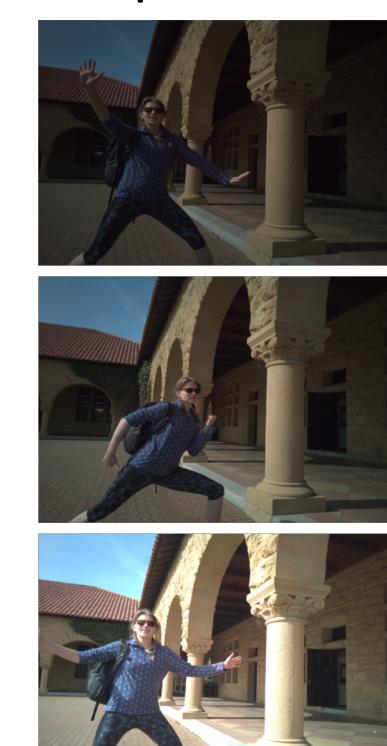
- [1] Nima Khademi Kalantari and Ravi Ramamoorthi, Deep high dynamic range imaging of dynamic scenes, ACM Trans of Graphics, 2017
[2] Samuel W. Hasinoff, Dillon Sharlet, Ryan Geiss, et.al, Burst photography for high dynamic range and low-light imaging on mobile cameras, ACM Trans of Graphics, 2016
[3] Radu Ciprian Bilcu, Adrian Burian, Aleksi Knuutila and Markku Vehvilainen, High Dynamic Range Imaging on Mobile Devices, IEE, 2008

Processing Pipeline



3. Experimental Results

Input LDRs



	Average PSNR	Average SSIM
Google Pixel 2 Transfer Net	23.2151	0.7826
Canon Net	21.4268	0.9071

