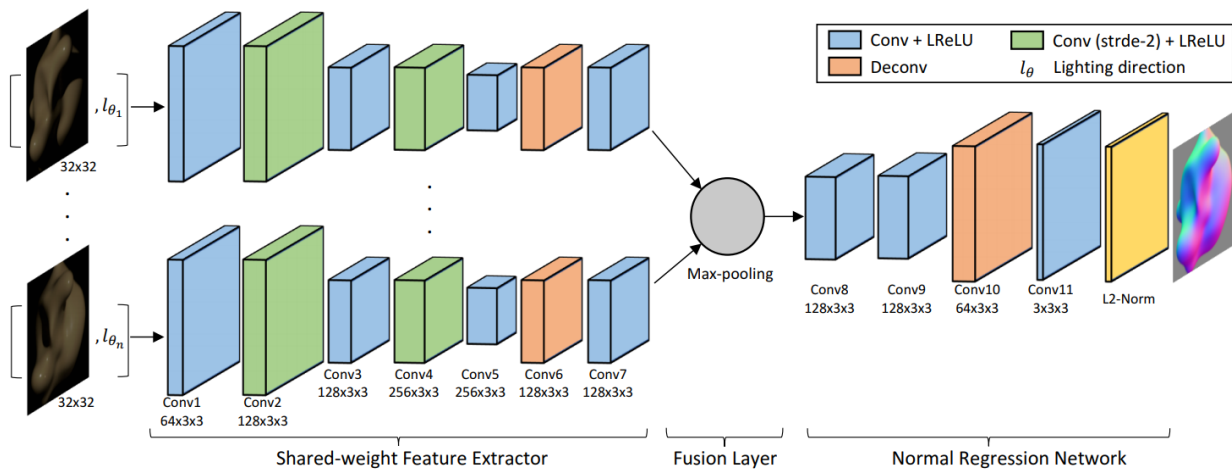


# PS-FCN: A Flexible Learning Framework for Photometric Stereo

複数の方向から光を照射した画像群を入力として  
物体の表面方向を推定するFCN構造のDNN



全体のアーキテクチャ



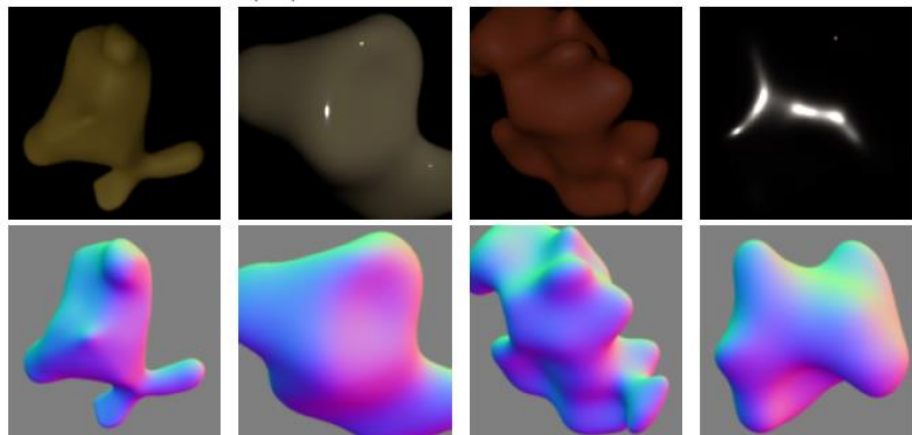
$$Loss = \frac{1}{hw} \sum_{i,j} (1 - N_{ij} \cdot \tilde{N}_{ij})$$

PS-FCN モデル構造

# PS-FCN: A Flexible Learning Framework for Photometric Stereo

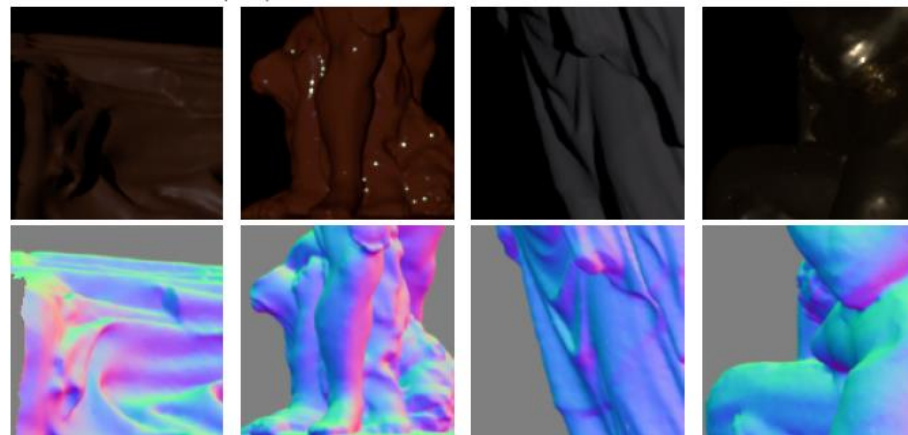
## Dataset

### Bloppy shape



Data size : 25,910 samples  
Image size : 128×128  
Train : Test = 99 : 1

### Sculpture shape

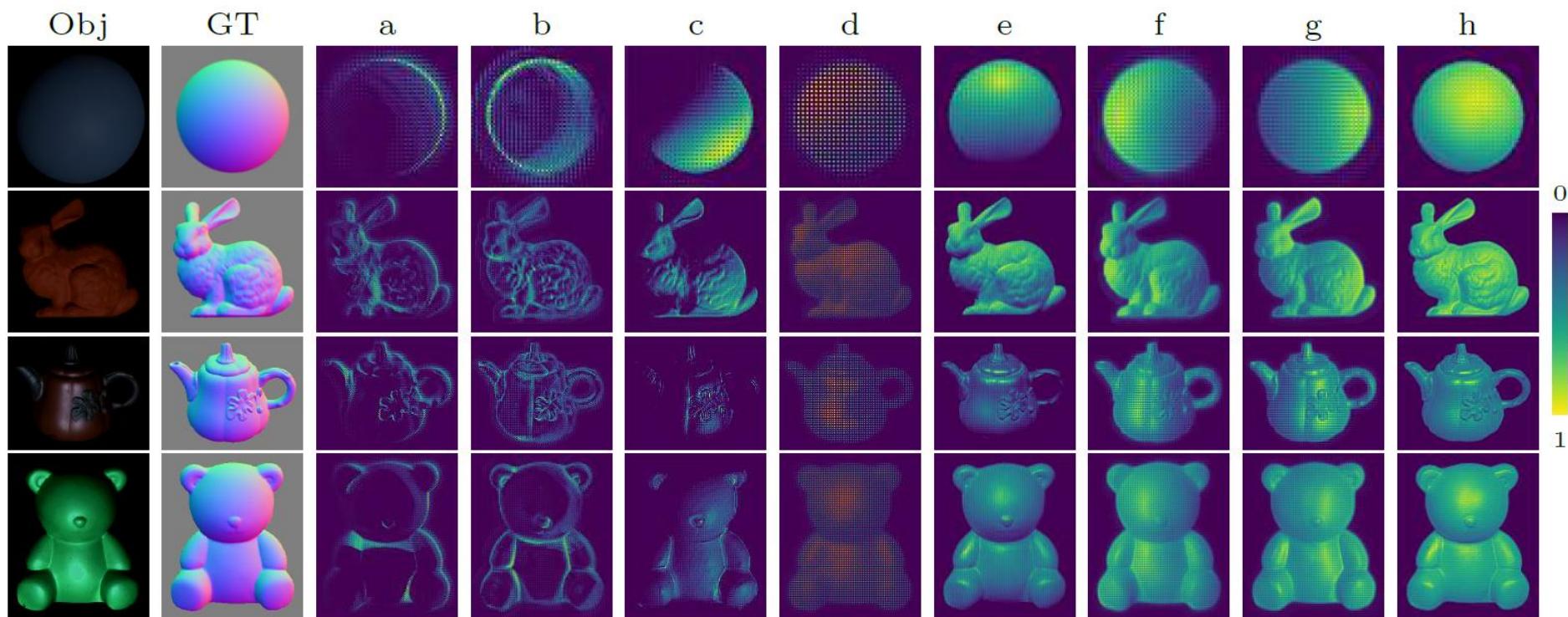


Data size : 59,282 samples  
Image size : 128×128  
Train : Test = 99 : 1

### Data augmentation

- 128×128内でランダムに32×128をcropし, 再スケーリング
- 5%の範囲でランダムノイズ付与
- 32×32でrandom cropしてトレーニング

# PS-FCN: A Flexible Learning Framework for Photometric Stereo



Obj : 原画像中の1枚

GT : 正解となる面法線方向

a-e : FusionLayer層における128channel中の8channel特徴マップ

# PS-FCN: A Flexible Learning Framework for Photometric Stereo

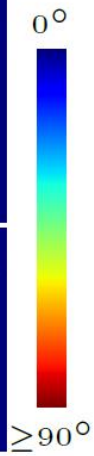
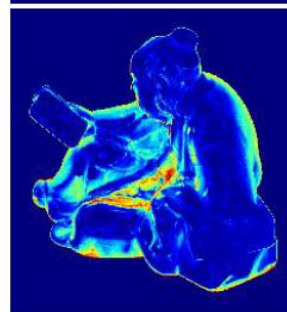
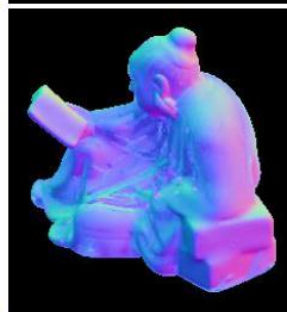
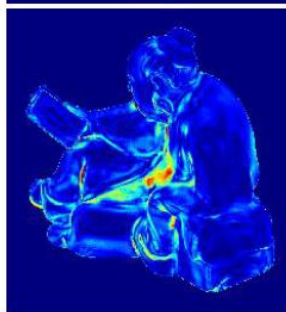
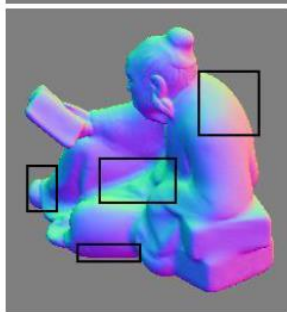
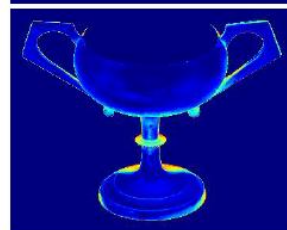
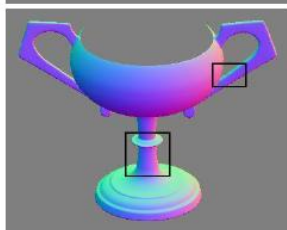
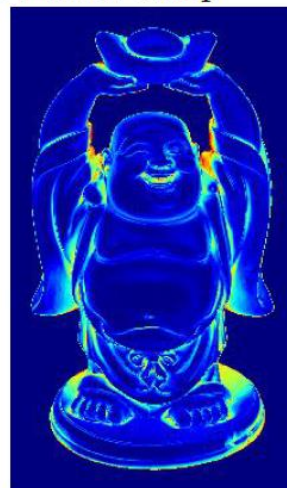
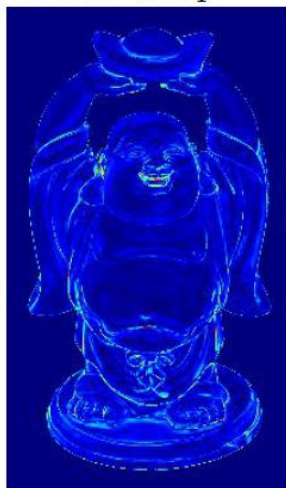
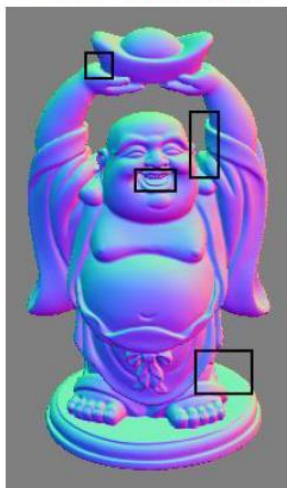
## Evaluation Experience

Objects

GT Normal

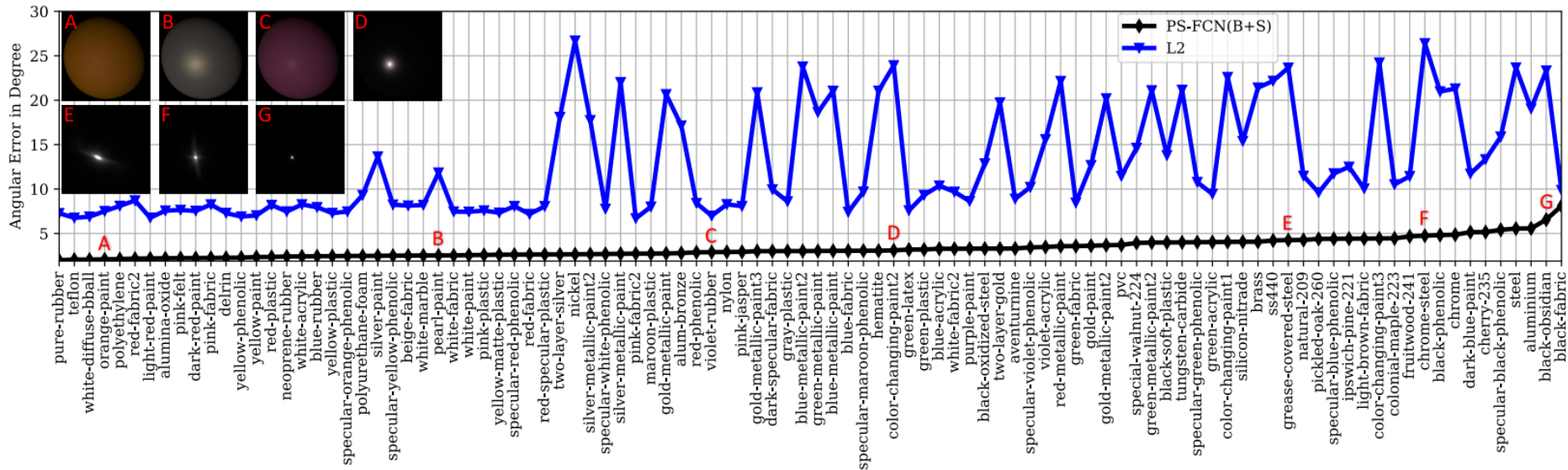
Ours Est. & Error Map

DPSN Est. & Error Map



# PS-FCN: A Flexible Learning Framework for Photometric Stereo

## Evaluation Experience



Method	ball	cat	pot1	bear	pot2	buddha	goblet	reading	cow	harvest	Avg.
L2 [1]	4.10	8.41	8.89	8.39	14.65	14.92	18.50	19.80	25.60	30.62	15.39
AZ08 [14]	2.71	6.53	7.23	<b>5.96</b>	11.03	12.54	13.93	14.17	21.48	30.50	12.61
WG10 [17]	2.06	6.73	7.18	6.50	13.12	10.91	15.70	15.39	25.89	30.01	13.35
IA14 [23]	3.34	6.74	6.64	7.11	8.77	10.47	9.71	14.19	13.05	25.95	10.60
ST14 [22]	<b>1.74</b>	<b>6.12</b>	<b>6.51</b>	6.12	8.78	10.60	10.09	13.63	13.93	25.44	10.30
DPSN [8]	2.02	6.54	7.05	6.31	7.86	12.68	11.28	15.51	8.01	16.86	9.41
PS-FCN (B+S+32, 16)	3.31	7.64	8.14	7.47	8.22	8.76	9.81	14.09	8.78	17.48	9.37
PS-FCN (B+S+32, 96)	2.82	6.16	7.13	7.55	<b>7.25</b>	<b>7.91</b>	<b>8.60</b>	<b>13.33</b>	<b>7.33</b>	<b>15.85</b>	<b>8.39</b>