# NFPLight: Deep SVBRDF Estimation via the Combination of Near and Far Field Point lighting -Supplemental Material-

LI WANG, LIANGHAO ZHANG, FANGZHOU GAO, YUZHEN KANG, and JIAWAN ZHANG<sup>\*</sup>, Tianjin University, China



Fig. 1. The rendering of our estimated real-world material under the environment lighting.

#### $\label{eq:CCS} \text{Concepts:} \bullet \textbf{Computing methodologies} \to \textbf{Reflectance modeling}.$

Additional Key Words and Phrases: Material Reflectance Modeling, SVBRDF, Deep Learning, Rendering

#### **ACM Reference Format:**

Li Wang, Lianghao Zhang, Fangzhou Gao, Yuzhen Kang, and Jiawan Zhang. 2024. NFPLight: Deep SVBRDF Estimation via the Combination of Near and Far Field Point lighting -Supplemental Material- . *ACM Trans. Graph.* 43, 6, Article 1 (December 2024), 11 pages. https://doi.org/10.1145/3687978

## 1 DETAILS OF REGISTRATION MODULE

The registration module aims to align the captured contents of near-field and far-field images to the same material region, which can be achieved through homography transformation. The key to this transformation lies in finding correspondences, for which we provide two detection methods. For materials with rich textures, we employ LoFTR [Sun et al. 2021], a computer vision method for vision-based detection. In practice, we choose the whole *Near-field Image* as the concerned material region, and transfer *Far-field Image* into the same area by homography. For materials with less texture, we place a square bounding box on the material, thereby finding the correspondences by identifying corner points. The results are shown in Fig. 2.

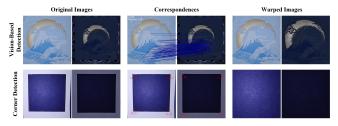
\*Corresponding authors.

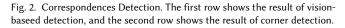
Authors' address: Li Wang, li\_wang@tju.edu.cn; Lianghao Zhang, lianghaozhang@tju. edu.cn; Fangzhou Gao, gaofangzhou@tju.edu.cn; Yuzhen Kang, yu\_zhen@tju.edu.cn; Jiawan Zhang, jwzhang@tju.edu.cn, Tianjin University, China.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than the author(s) must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from permissions@acm.org.

@ 2024 Copyright held by the owner/author (s). Publication rights licensed to ACM. ACM 0730-0301/2024/12-ART1

https://doi.org/10.1145/3687978





#### 2 COMPARISON RESULTS ON SYNTHETIC SCENES

In figure 3, we show more fair comparison results on synthetic scenes against FSC of [Deschaintre et al. 2019], DIR of [Gao et al. 2019], MGAN of [Guo et al. 2020] and DeepBasis of [Wang et al. 2023]. In figure 4, we show more enhanced comparison results. In this refined comparison, we replace the inputs of the multi-image methods FSC+, DIR+, and MGAN+ with our novel combination of near and far images. Additionally,in Fig. 5 we also show more results of challenging comparison against multi-images methods with 20 input images (FSC-20, DIR-20, MGAN-20) and planar lighting methods LPL [Zhang et al. 2023].

#### 3 COMPARISON RESULTS ON REAL-WORLD SCENES

We offer more real-data results on fair comparison (Fig. 6-7), enhanced comparison (Fig. 8-9) and challenging comparison (Fig. 10-11), respectively.

## 1:2 • Li Wang, Lianghao Zhang, Fangzhou Gao, Yuzhen Kang, and Jiawan Zhang

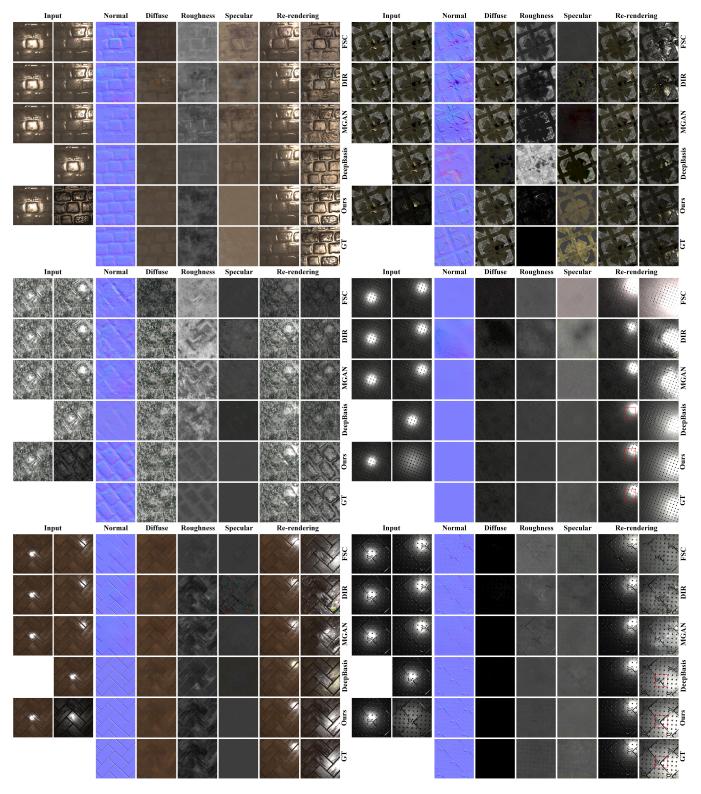


Fig. 3. The fair comparison results on synthetic scenes against FSC of [Deschaintre et al. 2019], DIR of [Gao et al. 2019], MGAN of [Guo et al. 2020] and DeepBasis of [Wang et al. 2023].

#### NFPLight: Deep SVBRDF Estimation via the Combination of Near and Far Field Point lighting • 1:3

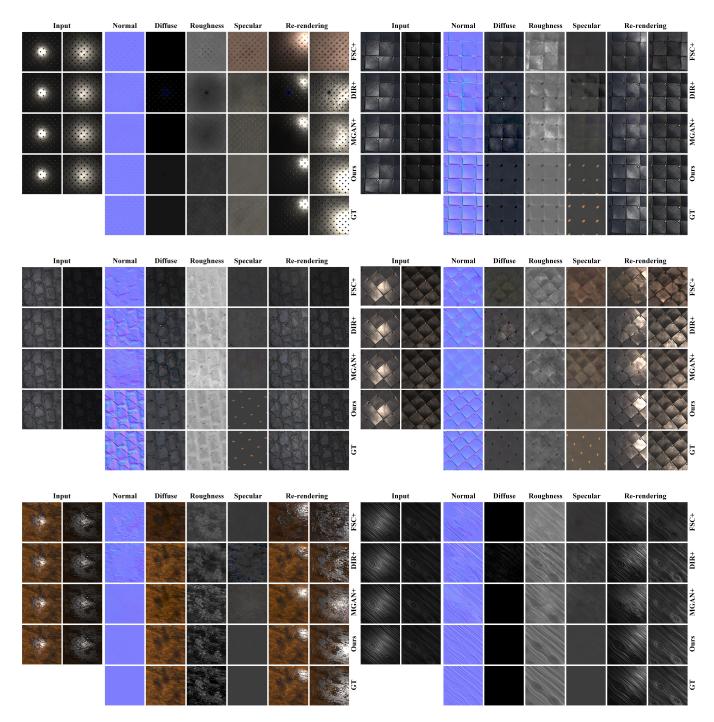


Fig. 4. The enhanced comparison results on synthetic scenes against FSC + of [Deschaintre et al. 2019], DIR+ of [Gao et al. 2019] and MGAN+ of [Guo et al. 2020]. In this comparison, the inputs of these methods are replaced by our novel combination of near-field and far-field images.

# 1:4 • Li Wang, Lianghao Zhang, Fangzhou Gao, Yuzhen Kang, and Jiawan Zhang

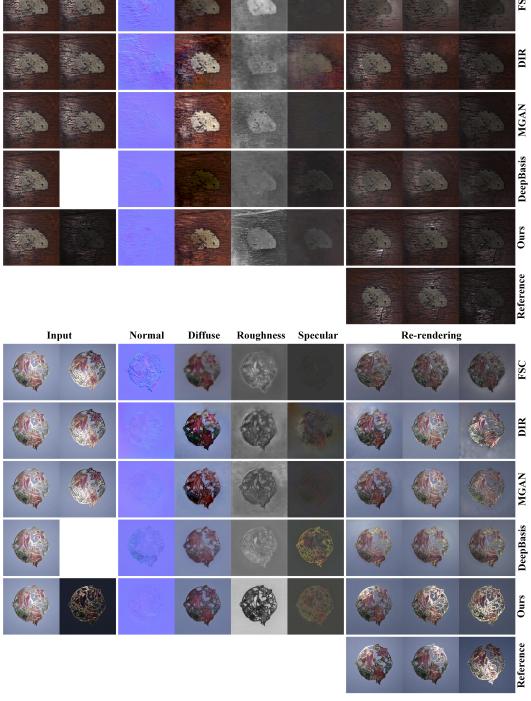
Input	Normal	Diffuse	Roughness	Specular	Re-rende	ring	Inpu	ıt	Normal	Diffuse	Roughness	Specular	Re-reno	lering
	A.	T				FSC-20	*	*						FSC-20
			P	The		DIR-20	. *	*					¢	DIR-20
714 714 714 714	The second			1		MGAN-20		*					Ē	MGAN-20
	A A A A A A A A A A A A A A A A A A A					LPL							ί₽.	TaT
	A A A A A A A A A A A A A A A A A A A					Ours							¢.	Ours
	A A					GT							æ	GT
Input	Normal	Diffuse	Roughness	Specular	Re-rendo	ering	Inpu	ıt	Normal	Diffuse	Roughness	Specular	Re-rend	lering
						FSC-20								FSC-20
						DIR-20	STATISTICS STATISTICS							DIR-20
						MGAN-20								MGAN-20
						Th								U TAT
						Ours						R		Ours
						5								GT
	Normal	Diffuse	Kougnness	Specular	Ke-rendo	ESC-20	Inpu		Normal	Dimuse	Rougnness	Specular	Ke-rend	ESC-20
				335		DIR-20							000	1R-20
				Farm.		MGAN-20				• •			0 0	MGAN-20 D
						LPL			ee			• •	000	W IIII
						Ours		• •				• •	00	Ours
						5	0 0	0 0		•••		•••	00	
	FT			a 1 (3) (3)	A PAY				00		-1-1-	• •	00	

Fig. 5. The challenging comparison results on synthetic scenes against FSC-20 of [Deschaintre et al. 2019], DIR-20 of [Gao et al. 2019], MGAN-20 of [Guo et al. 2020] and LPL of [Zhang et al. 2023]. In this comparison, we offer 20 input images for multi-image methods.

ACM Trans. Graph., Vol. 43, No. 6, Article 1. Publication date: December 2024.



NFPLight: Deep SVBRDF Estimation via the Combination of Near and Far Field Point lighting • 1:5



Input

Fig. 6. The fair comparison results on real-world data against FSC of [Deschaintre et al. 2019], DIR of [Gao et al. 2019], MGAN of [Guo et al. 2020] and DeepBasis of [Wang et al. 2023].

# 1:6 • Li Wang, Lianghao Zhang, Fangzhou Gao, Yuzhen Kang, and Jiawan Zhang

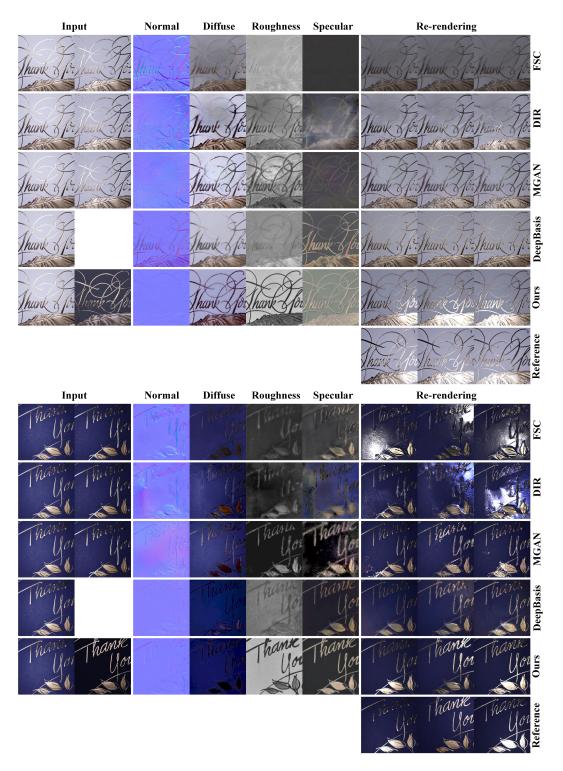
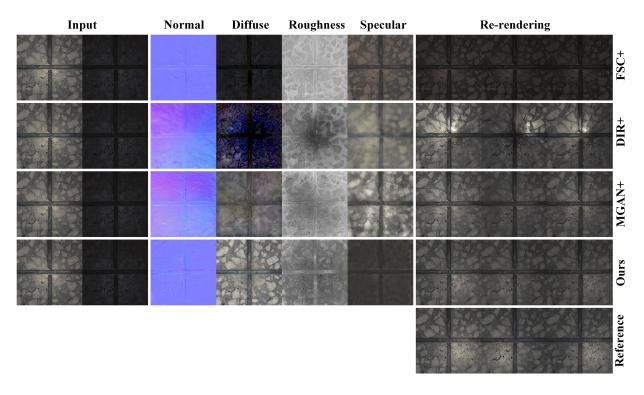


Fig. 7. The fair comparison results on real-world data against FSC of [Deschaintre et al. 2019], DIR of [Gao et al. 2019], MGAN of [Guo et al. 2020] and DeepBasis of [Wang et al. 2023].



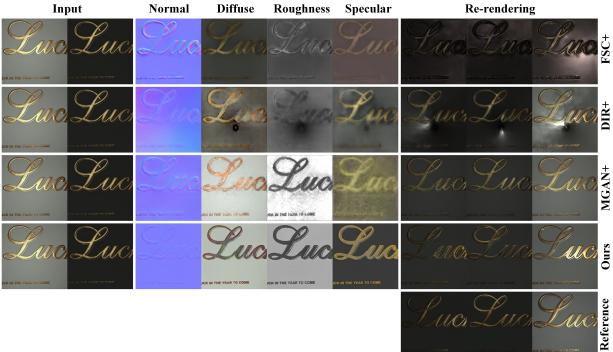
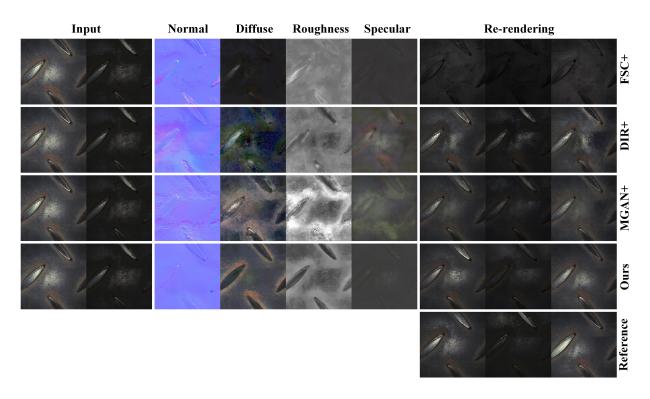


Fig. 8. The enhanced comparison results on real-world data against FSC+ of [Deschaintre et al. 2019], DIR+ of [Gao et al. 2019] and MGAN+ of [Guo et al. 2020]. In this comparison, the inputs of these methods are replaced by our novel combination of near-field and far-field images.

## 1:8 • Li Wang, Lianghao Zhang, Fangzhou Gao, Yuzhen Kang, and Jiawan Zhang



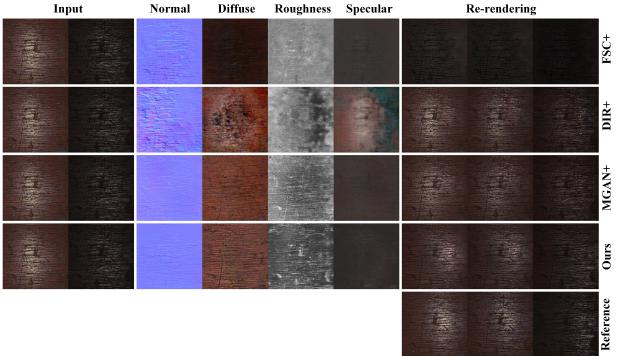


Fig. 9. The enhanced comparison results on real-world data against FSC+ of [Deschaintre et al. 2019], DIR+ of [Gao et al. 2019] and MGAN+ of [Guo et al. 2020]. In this comparison, the inputs of these methods are replaced by our novel combination of near-field and far-field images.

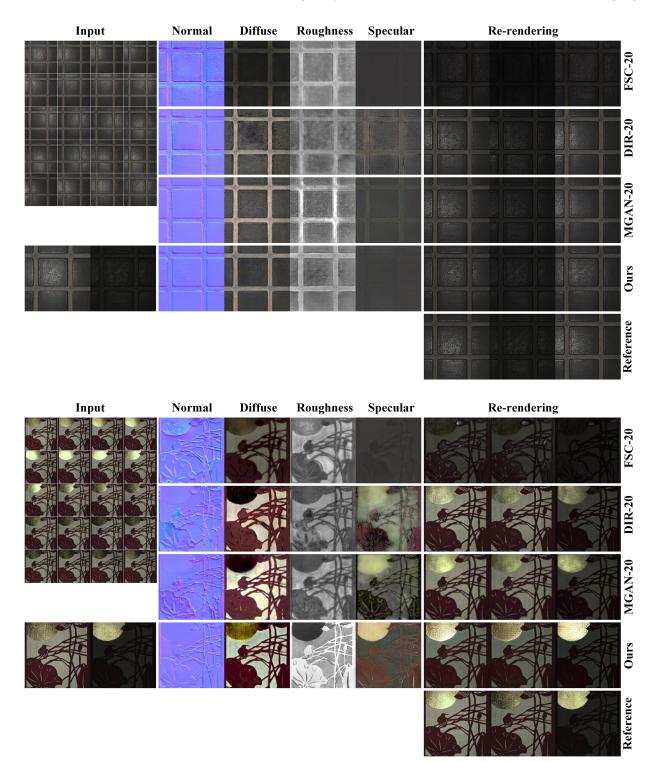


Fig. 10. The challenging comparison results on real-world data against FSC-20 of [Deschaintre et al. 2019], DIR-20 of [Gao et al. 2019] and MGAN-20 of [Guo et al. 2020]. In this comparison, we offer 20 input images for multi-image methods.

## 1:10 • Li Wang, Lianghao Zhang, Fangzhou Gao, Yuzhen Kang, and Jiawan Zhang

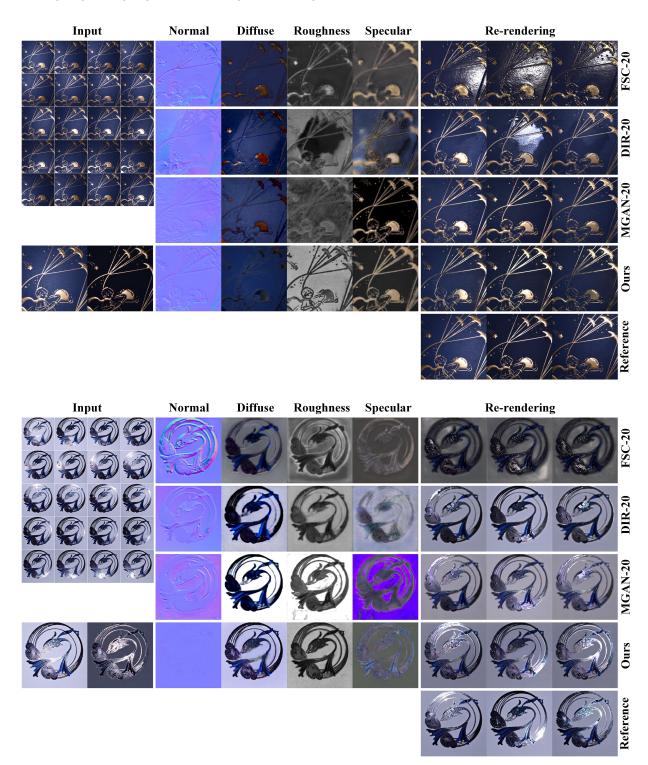


Fig. 11. The challenging comparison results on real-world data against FSC-20 of [Deschaintre et al. 2019], DIR-20 of [Gao et al. 2019] and MGAN-20 of [Guo et al. 2020]. In this comparison, we offer 20 input images for multi-image methods.

#### REFERENCES

- Valentin Deschaintre, Miika Aittala, Frédo Durand, George Drettakis, and Adrien Bousseau. 2019. Flexible svbrdf capture with a multi-image deep network. In *Computer graphics forum*, Vol. 38. Wiley Online Library, 1–13.
- Duan Gao, Xiao Li, Yue Dong, Pieter Peers, Kun Xu, and Xin Tong. 2019. Deep Inverse Rendering for High-Resolution SVBRDF Estimation from an Arbitrary Number of Images. 38, 4, Article 134 (jul 2019), 15 pages. https://doi.org/10.1145/3306346. 3323042
- Yu Guo, Cameron Smith, Miloš Hašan, Kalyan Sunkavalli, and Shuang Zhao. 2020. MaterialGAN: Reflectance Capture Using a Generative SVBRDF Model. 39, 6, Article 254 (nov 2020), 13 pages. https://doi.org/10.1145/3414685.3417779
- Jiaming Sun, Zehong Shen, Yuang Wang, Hujun Bao, and Xiaowei Zhou. 2021. LoFTR: Detector-Free Local Feature Matching With Transformers. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR). 8922–8931.
- Li Wang, Lianghao Zhang, Fangzhou Gao, and Jiawan Zhang. 2023. DeepBasis: Hand-Held Single-Image SVBRDF Capture via Two-Level Basis Material Model. In *SIG-GRAPH Asia 2023 Conference Papers*. 1–11.
- Lianghao Zhang, Fangzhou Gao, Li Wang, Minjing Yu, Jiamin Cheng, and Jiawan Zhang. 2023. Deep SVBRDF Estimation from Single Image under Learned Planar Lighting. In ACM SIGGRAPH 2023 Conference Proceedings. 1–11.