

# **NeRF in the Wild**

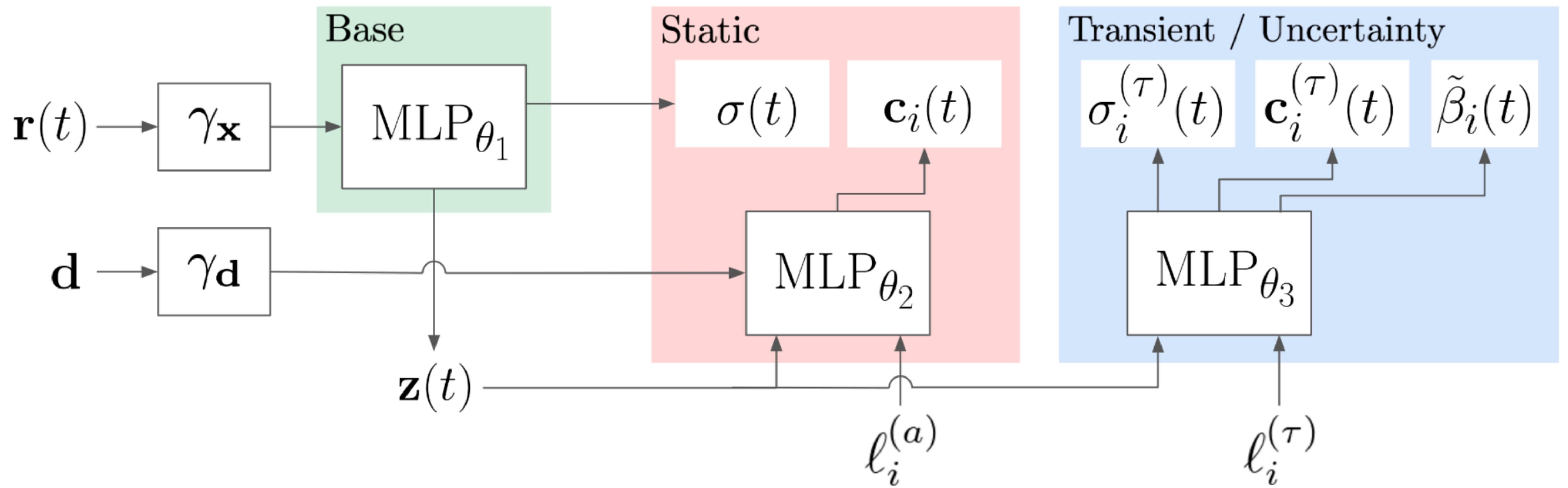
## **Neural Radiance Fields for Unconstrained Photo Collections**

**Смирнов Павел 172**

# Проблемы NeRF



# Архитектура NeRF-W



# Процесс рендеринга NeRF-W.



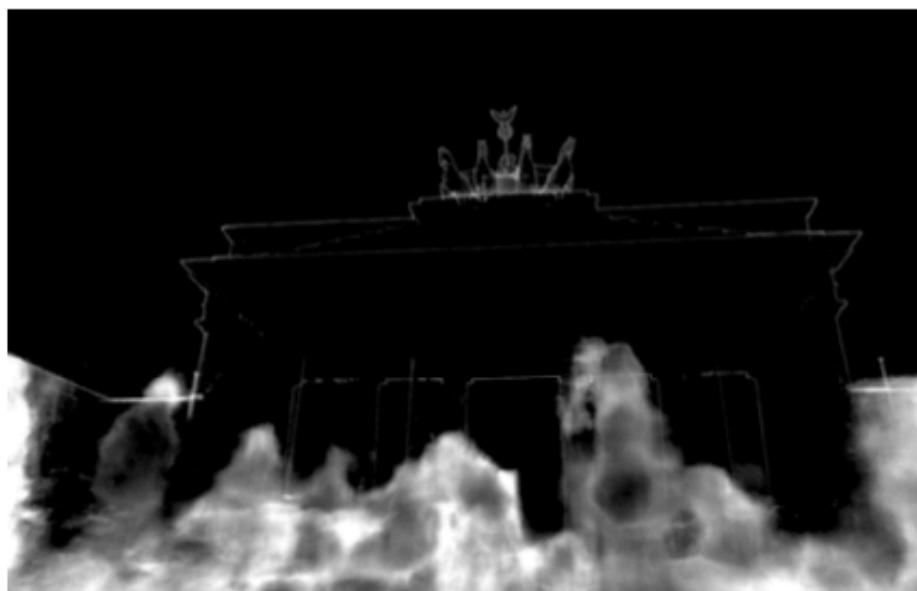
(a) Static



(b) Transient



(c) Combined



(d) Uncertainty



(e) Reference

# Моделирование скрытого внешнего вида

$$\bar{\mathbf{C}}_i(\mathbf{r}) = \int_{t_n}^{t_f} T(t) \sigma(t) \mathbf{c}_i(t) dt \quad (8)$$

$$\mathbf{c}_i(t) = \text{MLP}_{\theta_2} \left( \mathbf{z}(t), \gamma_{\mathbf{d}}(\mathbf{d}), \boldsymbol{\ell}_i^{(a)} \right). \quad (9)$$

# Переходные объекты

$$\bar{\mathbf{C}}_i(\mathbf{r}) = \int_{t_n}^{t_f} T_i(t) \left( \sigma(t) \mathbf{c}_i(t) + \sigma_i^{(\tau)}(t) \mathbf{c}_i^{(\tau)}(t) \right) dt, \quad (10)$$

where  $T_i(t) = \exp \left( - \int_{t_n}^t (\sigma(s) + \sigma_i^{(\tau)}(s)) ds \right).$  (11)

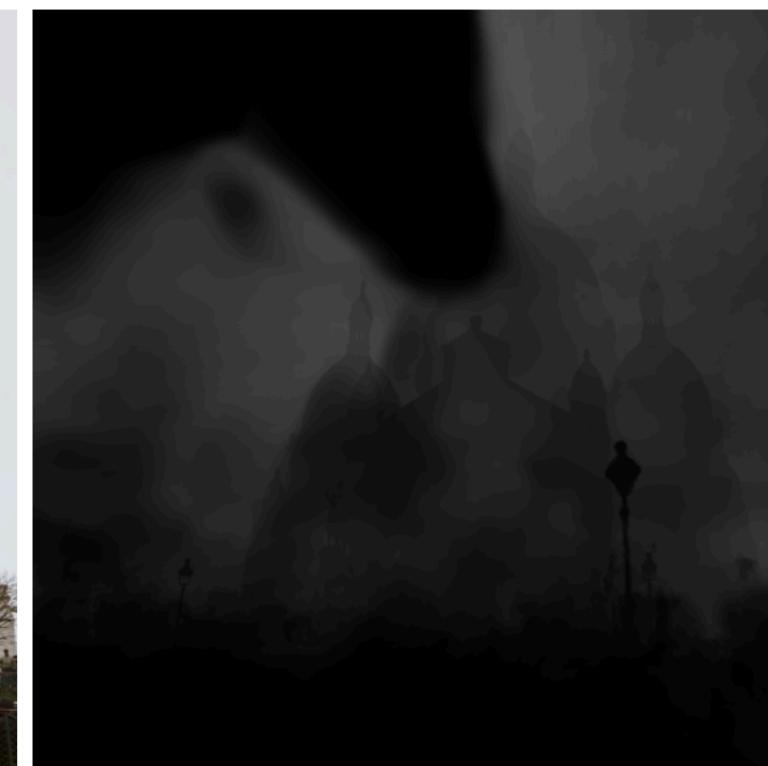
$$\mathbf{C}_i(\mathbf{r}) \sim \mathcal{N}(\bar{\mathbf{C}}_i(\mathbf{r}), \beta_i(\mathbf{r})^2 \mathbb{I}_3). \quad (12)$$

$$L_i(\mathbf{r}) = \frac{1}{2\beta_i(\mathbf{r})^2} \left\| \mathbf{C}_i(\mathbf{r}) - \hat{\mathbf{C}}_i(\mathbf{r}) \right\|_2^2 + \frac{1}{2} \log \beta_i(\mathbf{r})^2 + \frac{\lambda_u}{K} \sum_{k=1}^K \sigma_i^{(\tau)}(t_k). \quad (17)$$

$$\left[ \sigma_i^{(\tau)}(t), \mathbf{c}_i^{(\tau)}(t), \tilde{\beta}_i(t) \right] = \text{MLP}_{\theta_3} \left( \mathbf{z}(t), \boldsymbol{\ell}_i^{(\tau)} \right), \quad (15)$$

$$\beta_i(t) = \beta_{\min} + \log \left( 1 + \exp \left( \tilde{\beta}_i(t) \right) \right), \quad (16)$$

# Эксперименты



(a) Reference

(b) NeRF

(c) NeRF-W

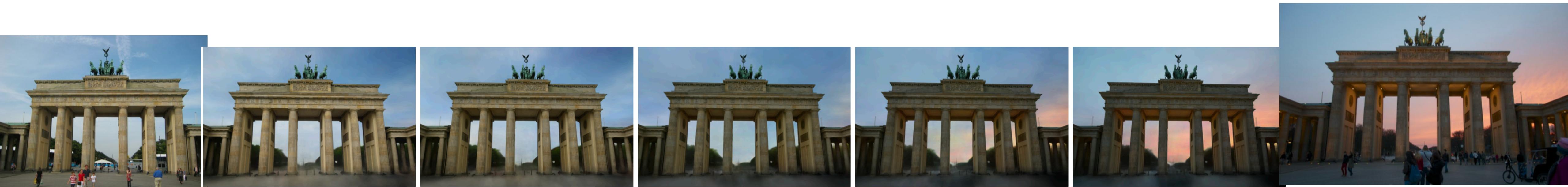
# Эксперименты



# Эксперименты

	BRANDENBURG GATE				SACRE COEUR				TREVI FOUNTAIN			
	↑ PSNR	↑ SSIM	↓ CT	↓ LPIPS	↑ PSNR	↑ SSIM	↓ CT	↓ LPIPS	↑ PSNR	↑ SSIM	↓ CT	↓ LPIPS
NRW [20]	23.85	0.914	0.091	0.141	19.39	0.797	0.233	0.229	20.56	0.811	0.225	0.242
NERF	21.05	0.895	0.072	0.208	17.12	0.781	0.185	0.278	17.46	0.778	0.186	0.334
NERF-A	27.96	0.941	0.063	0.145	24.43	0.923	0.159	0.174	26.24	0.924	0.154	0.211
NERF-U	19.49	0.921	0.067	0.174	15.99	0.826	0.170	0.223	15.03	0.795	0.199	0.277
NERF-W	<b>29.08</b>	<b>0.962</b>	<b>0.055</b>	<b>0.110</b>	<b>25.34</b>	<b>0.939</b>	<b>0.150</b>	<b>0.151</b>	<b>26.58</b>	<b>0.934</b>	<b>0.148</b>	<b>0.189</b>

# Эксперименты



# Эксперименты



# Эксперименты

	ORIGINAL				COLOR PERTURBATIONS			
	↑ PSNR	↑ MSSSIM	↓ CT	↓ LPIPS	↑ PSNR	↑ MSSSIM	↓ CT	↓ LPIPS
NERF	<b>33.35</b> ±0.05	<b>0.989</b> ±0.000	<b>0.033</b> ±0.000	<b>0.019</b> ±0.000	23.38±0.05	0.964±0.001	0.039±0.000	0.076±0.001
NERF-A	33.04±0.06	<b>0.989</b> ±0.000	<b>0.033</b> ±0.000	<b>0.020</b> ±0.000	<b>30.66</b> ±1.38	<b>0.983</b> ±0.007	<b>0.038</b> ±0.006	<b>0.031</b> ±0.015
NERF-U	<b>33.07</b> ±0.27	<b>0.989</b> ±0.001	<b>0.033</b> ±0.000	<b>0.019</b> ±0.001	24.87±0.52	0.968±0.000	0.039±0.001	0.063±0.007
NERF-W	32.89±0.14	<b>0.989</b> ±0.000	<b>0.033</b> ±0.000	<b>0.020</b> ±0.001	<b>31.51</b> ±0.28	<b>0.987</b> ±0.001	<b>0.034</b> ±0.000	<b>0.022</b> ±0.001
	OCCLUDERS				COLORS PERTURBATIONS & OCCLUDERS			
	↑ PSNR	↑ MSSSIM	↓ CT	↓ LPIPS	↑ PSNR	↑ MSSSIM	↓ CT	↓ LPIPS
NERF	19.35±0.11	0.891±0.001	0.057±0.000	0.112±0.001	15.73±3.13	0.804±0.109	0.061±0.003	0.217±0.100
NERF-A	22.71±0.63	0.922±0.005	0.051±0.001	0.086±0.003	<b>21.08</b> ±0.41	<b>0.903</b> ±0.007	0.057±0.004	<b>0.116</b> ±0.016
NERF-U	<b>23.47</b> ±0.50	<b>0.944</b> ±0.004	<b>0.045</b> ±0.001	<b>0.059</b> ±0.004	17.65±4.10	0.846±0.130	<b>0.053</b> ±0.007	0.183±0.117
NERF-W	<b>25.03</b> ±1.00	<b>0.946</b> ±0.009	<b>0.046</b> ±0.002	<b>0.063</b> ±0.009	<b>22.19</b> ±0.30	<b>0.927</b> ±0.003	<b>0.050</b> ±0.001	<b>0.087</b> ±0.004

