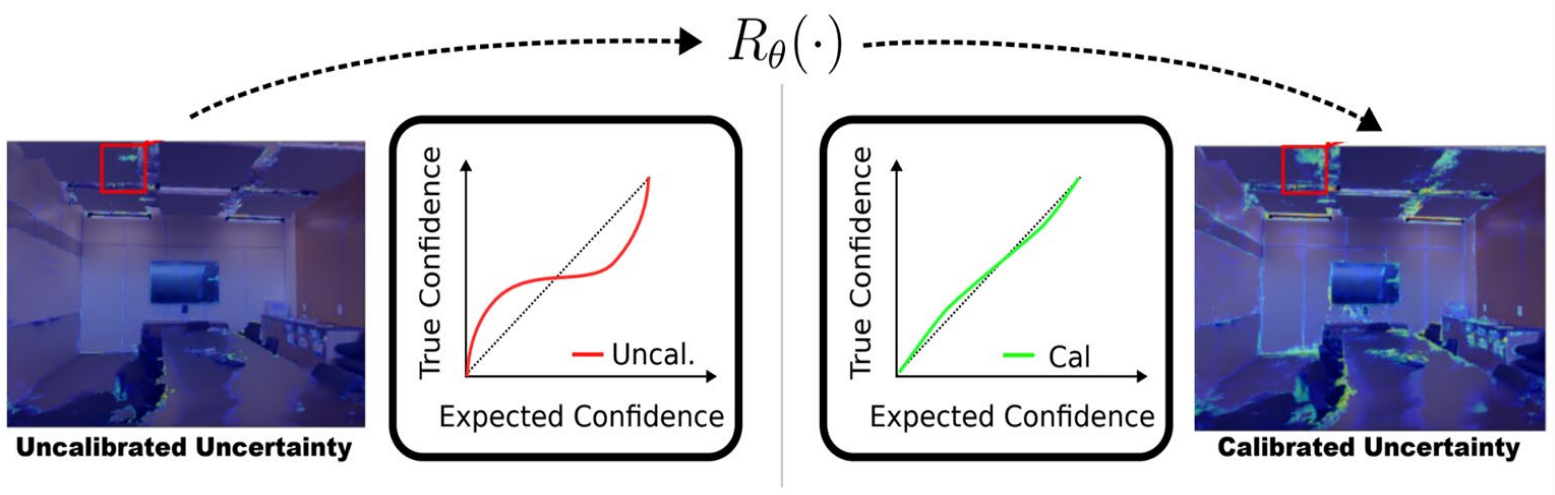
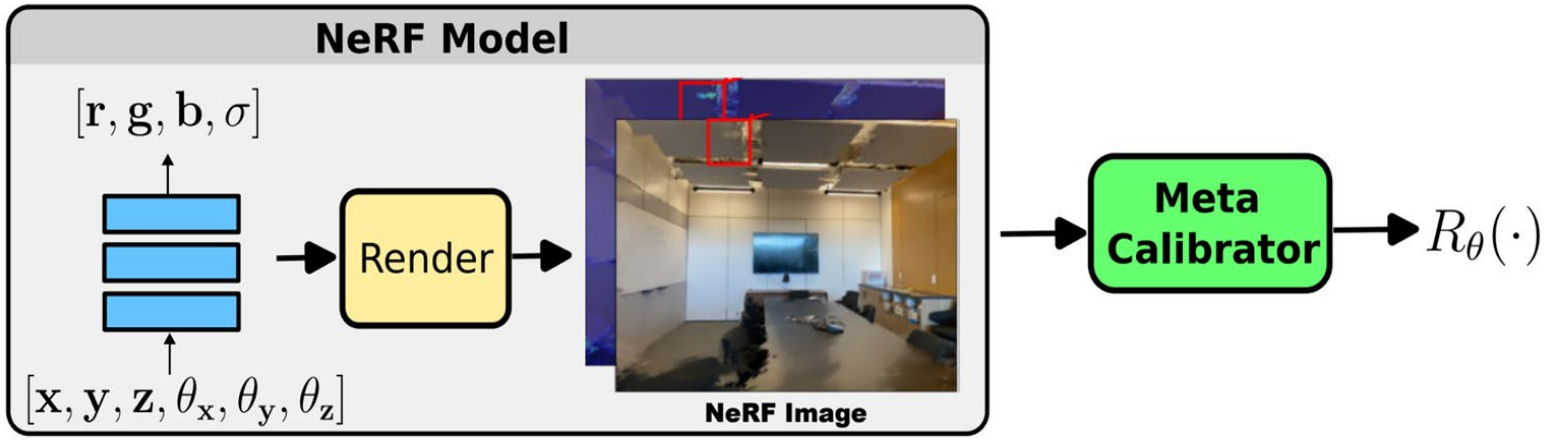
Instant Uncertainty Calibration of NeRFs Using a Meta-Calibrator





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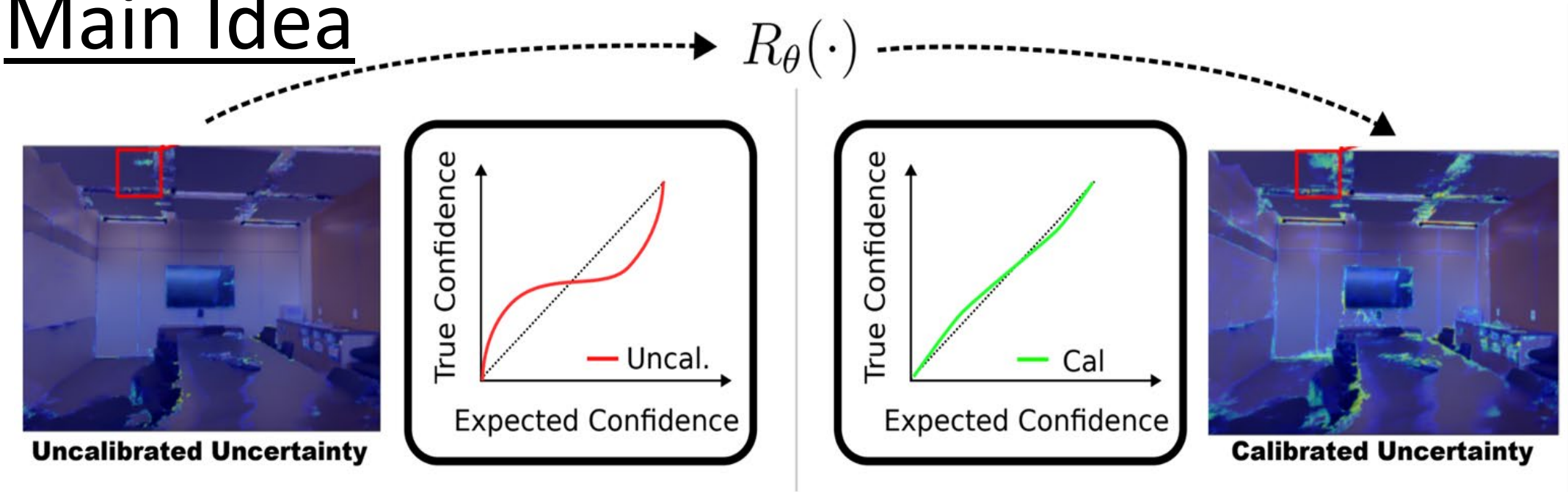
Main Idea

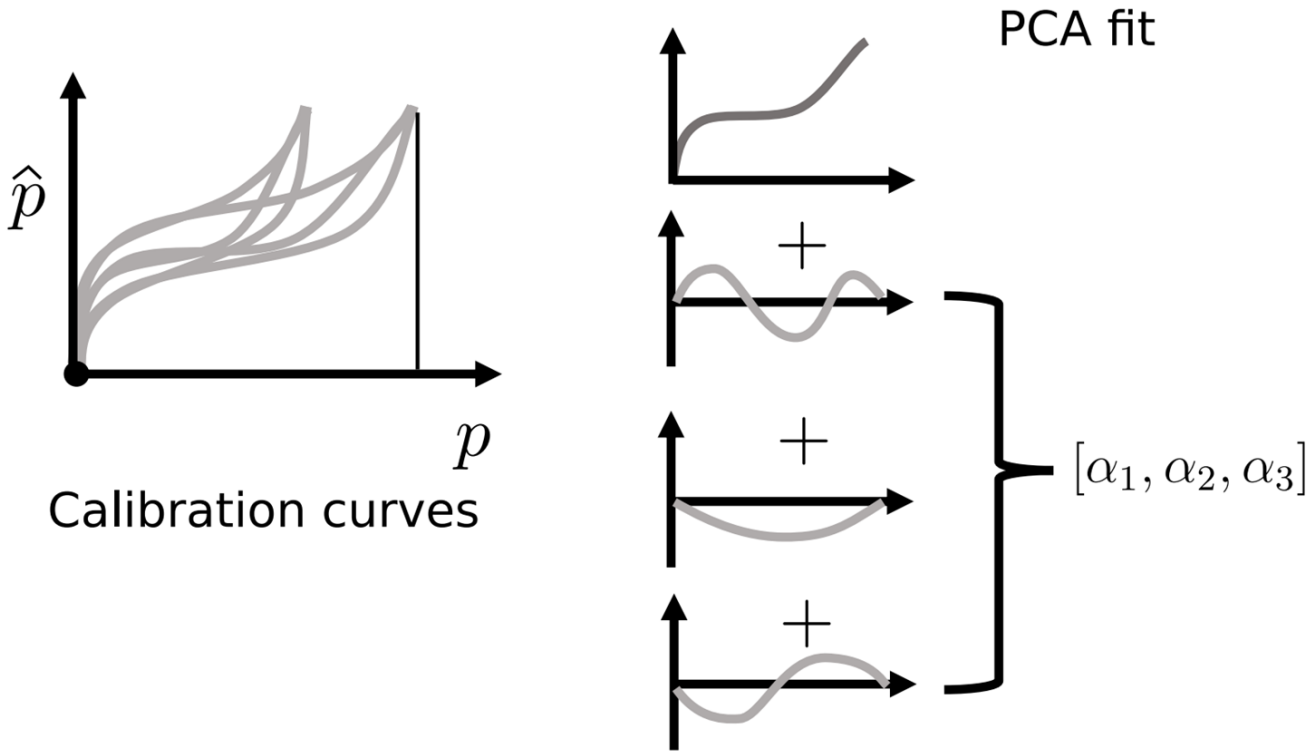


- Our goal is to *calibrate* NeRF uncertainties, so that the expected confidence matches the true confidence
- Typically requires holding out GT data from target scene (so there is less left to train the NeRF)
- To overcome this, we propose a novel meta-calibrator that calibrates NeRF uncertainties without holding out data from the target scene

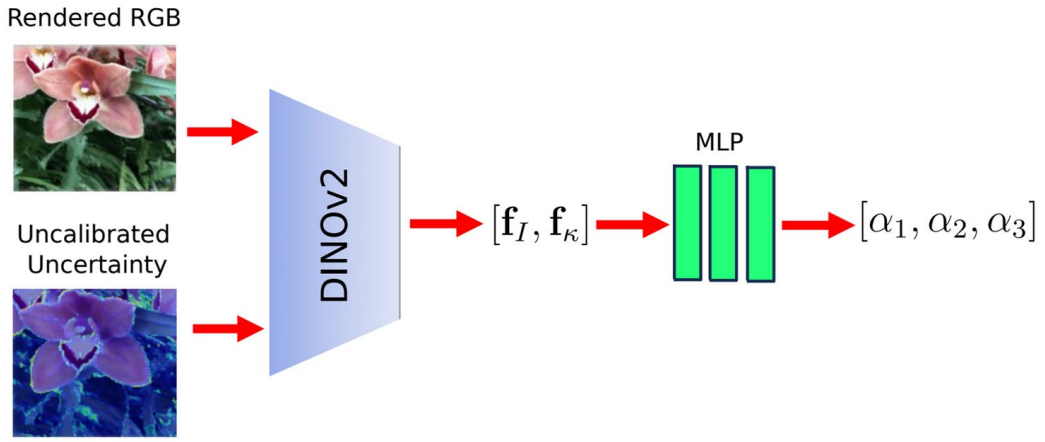
Contributions

- The first investigation into calibrating NeRF uncertainties
- A novel meta-calibrator that calibrates NeRF uncertainties without holding out ground truth data
- Experiments on LLFF & DTU showing our meta-calibrator achieves SoTA uncertainty and can be used for next-best view planning

Meta-Calibrator



(a) Creating a parametric model of the calibration curves.

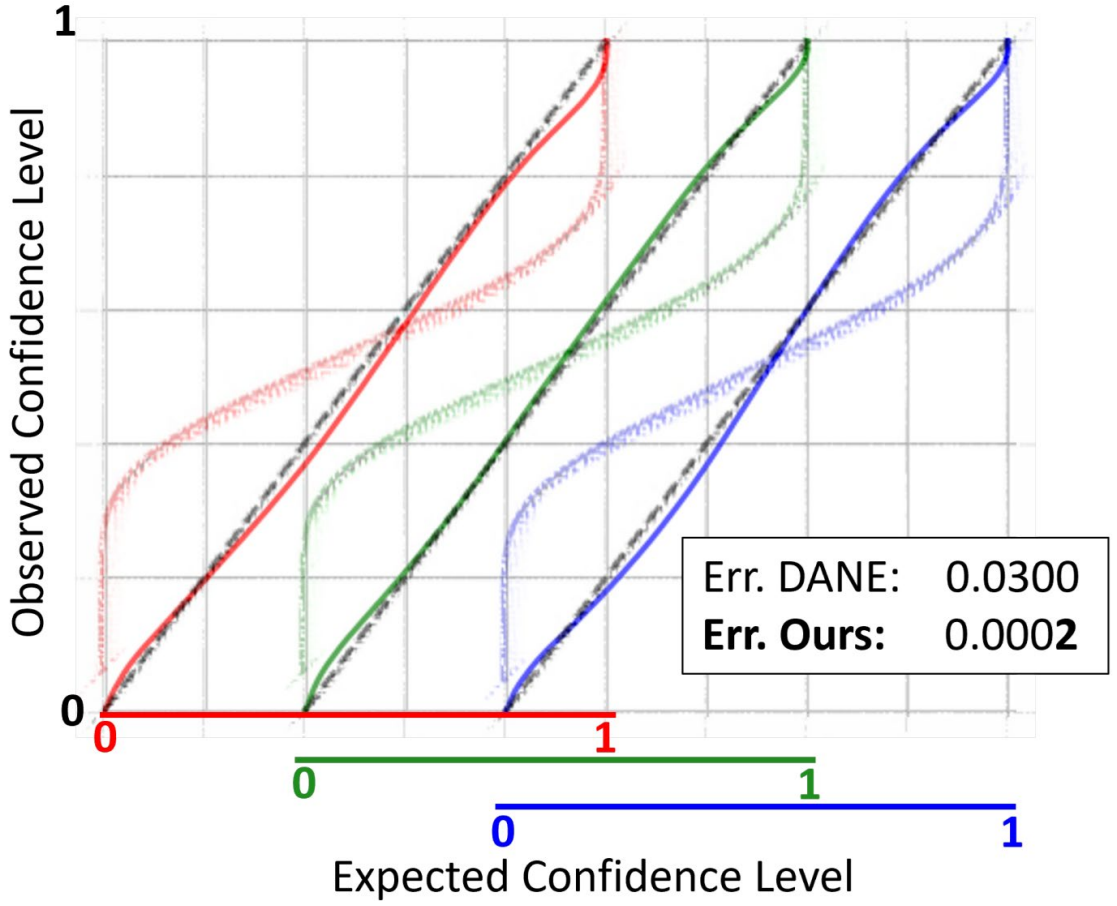


(b) Predicting the curve parameters.

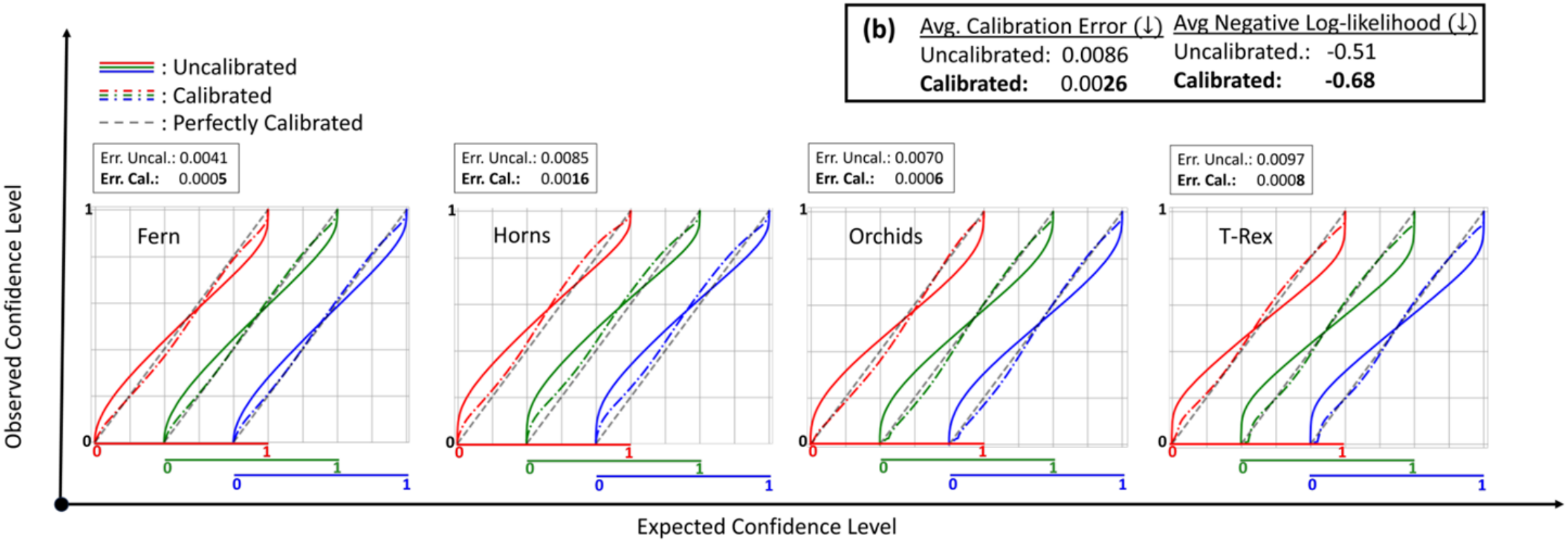
Results - Comparison to SoTA

	Uncertainty		Image Quality	
	Cal. Err. (↓)	NLL (↓)	PSNR (↑)	LPIPS (↓)
Naïve Ens.	0.0505	4.39	15.19	0.646
DANE [29]	0.0441	3.75	15.19	0.646
Ours	**0.0026**	**-0.68**	**19.34**	**0.235**

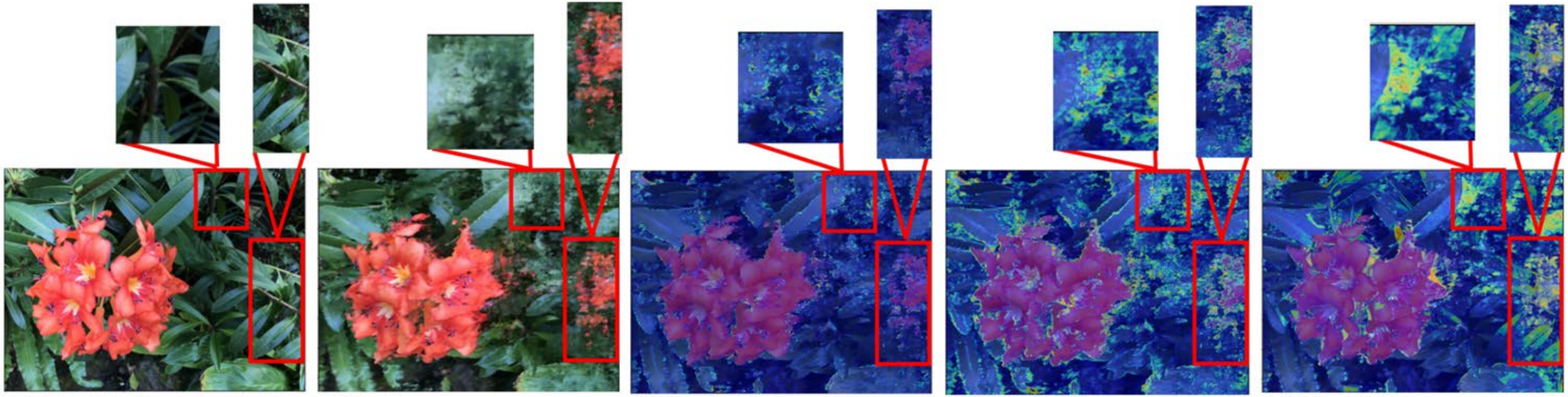
3-View LLFF



Results - Comparison to Uncalibrated Uncertainty

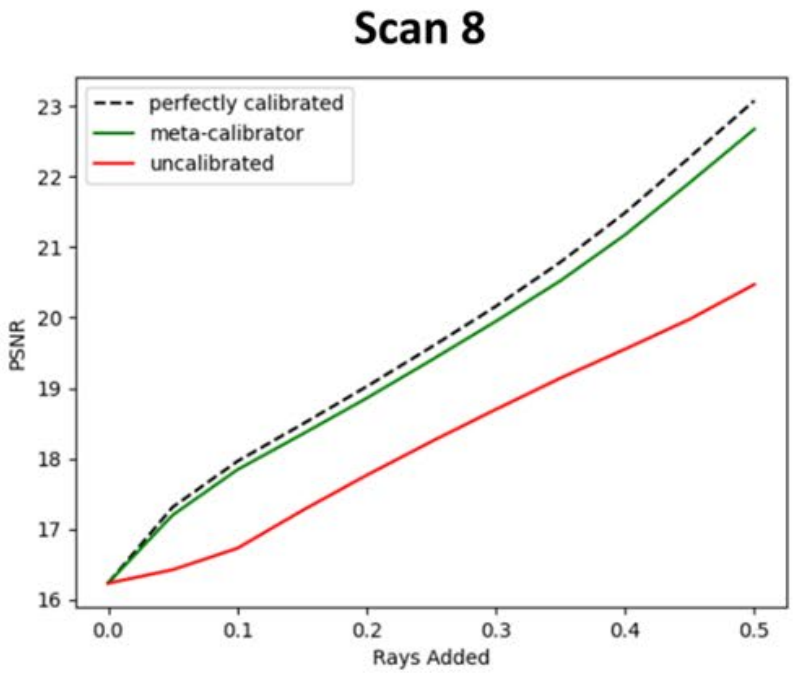


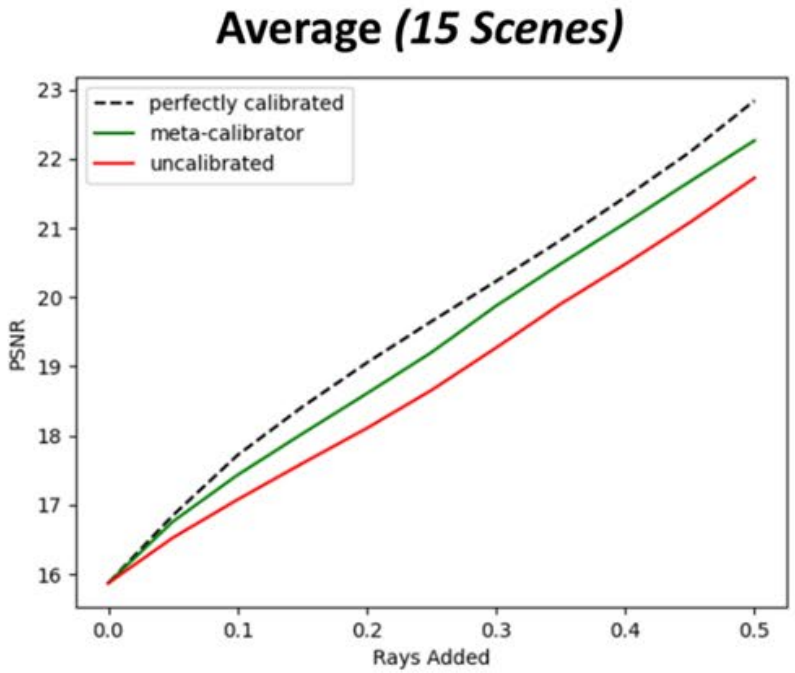
Results - Comparison to Uncalibrated Uncertainty

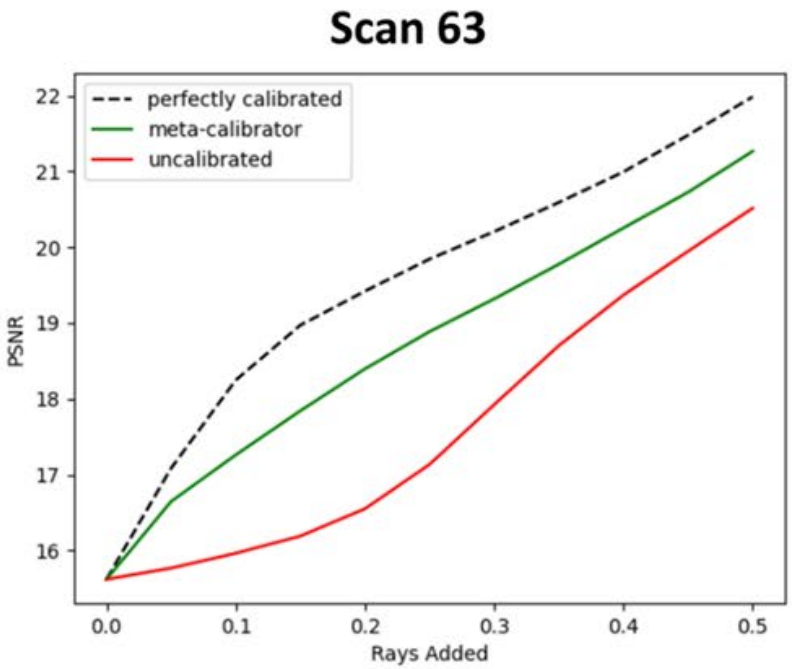


(a) Ground Truth (b) NeRF Image (c) Uncalibrated Uncertainty (d) Calibrated Uncertainty (e) Actual Error

Application - Next-Best View Planning







DTU

Thank you!