Seminar: Advanced topics on 3D Reconstruction

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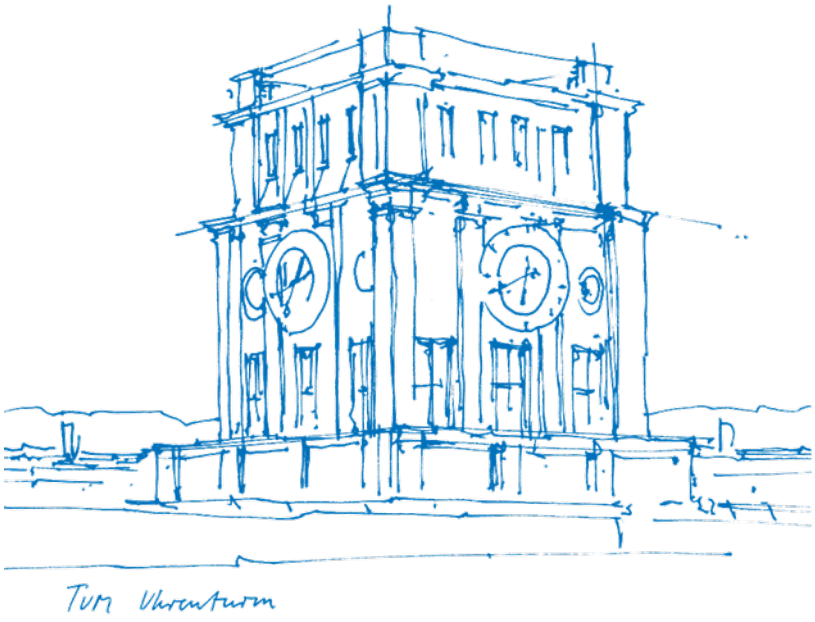

How can I access these slides?

- Option 1 (preferred): seminar web page
  - `https://vision.in.tum.de/teaching/ss2022/reconstruction_ss22`
  - Password for material page: `reconstruction-ss22`
  - Material page will go online after this pre-meeting
- Option 2: contact organizers
  - `reconstruction-ss22@vision.in.tum.de`
  - **Only use this option if you forgot the password**

Outline

- General Information
  - About the Seminar
  - Registration
- Possible Papers
  - 3D reconstruction
- Questions

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How is the seminar organized?

- Seminar meetings: Talks and discussion
  - Day: 07-08.04.2022
  - Time: 9:30am-14:00pm
  - Location: BBB or zoom
  - In case of special circumstances please let us know and we will find a solution
  - Each day will consist of 4 talks which are held in English
  - **Attendance is mandatory!**

How is the seminar organized?

- Talk preparation / contact with supervisor
  - Three weeks before the talk: meet your supervisor if you have any questions or ask for suggestions (optional, but recommended).
  - Two weeks before the talk: meet your supervisor to go through slides (optional, but recommended).
  - One week before talk: send slides to your supervisor (mandatory)
  - Before **11:59pm 29.04.2022**: submit your report via email (mandatory)

Please don't send us emails on Friday evening or weekends ask for advises when the deadline is next Monday. Please at least give us 1 work day to answer your emails and 2 work days if you need us to read your slides draft.

What about the presentation?

- General set-up:
  - Duration: 20–25 minutes talk + 10–15 minutes discussion
  - Make sure to finish on time - not too early and not too late!
  - Rule of thumb: 1–2 minutes per slide $\rightarrow$ 10–20 slides

Too long or too short presentation will influence your grade. Please rehearsal before the presentation.

What about the presentation?

- Tips about the slides and the presentation
  - less text/information within one slide.
  - use graphs/figures.
  - use examples.
  - rehearsal and record then watch by yourself.
- Recommended structure of the slides (only optional):
  - Introduction
  - Overview / Outline
  - Method description
  - Experiments and results
  - Personal comments
  - Summary

What about the discussion after each talk?

- Discussion afterwards **will** influence your grade
- Ask questions!
- There are **no** stupid questions!

What about the final report?

- General set-up:
  - Use LaTeX template provided on web page
  - Length: 3-4 pages
  - Send final report as pdf by email to `reconstruction-ss22@vision.in.tum.de`
  - Submission deadline: **11:59pm 29.04.2022**
- Recommended structure (main text only):
  - Introduction
  - Method description
  - Experiments and results
  - Discussion of results
  - Summary

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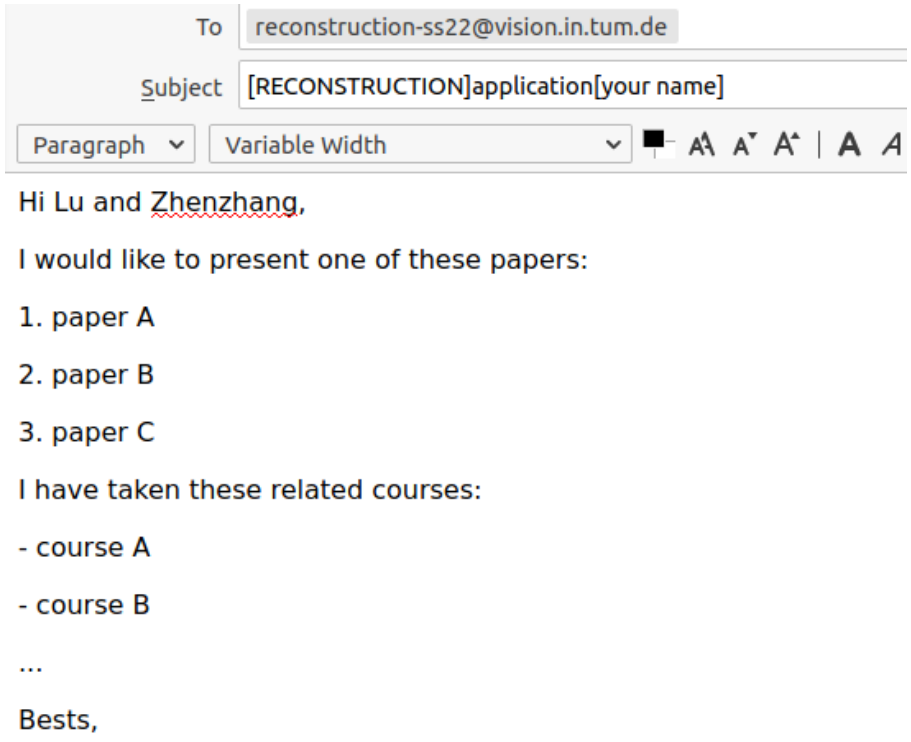
How do you register for the seminar?

- Step 1: Official registration via TUM matching system
  - Go to `https://matching.in.tum.de`
  - Register for seminar with the title *An Overview of Methods for Accurate Geometry Reconstruction*
- Step 2: Personal registration via email
  - In the list of papers on the web page, select your three favorites
  - Write an email ranking these three favorites to the seminar email address
  - Email subject: "[RECONSTRUCTION] application [your name]"
  - Include information about related lectures / courses you have taken so far.
  - We do **not** need your CV or a motivation letter!
  - Registrations without email / emails with missing information will be ignored!
- Deadline for both registrations: 15.02.2022

How do you register for the seminar?

Example registration email:


To: reconstruction-ss22@vision.in.tum.de

Subject: [RECONSTRUCTION]application[your name]

Paragraph | Variable Width

Hi Lu and Zhenzhang,

I would like to present one of these papers:

1. paper A

2. paper B

3. paper C

I have taken these related courses:

- course A

- course B

...

Bests,

How do we select candidates and assign papers?

- Candidate selection
  - Only students registered in the matching system **AND**

    emails containing all required information will be considered
  - Among students meeting the formal criteria, selection will be random
  - Note that if you have not taken any related course, you must be willing to invest a lot of work to learn the required basics
  - You will get notified by the matching system about the decision.
- Paper assignment
  - Papers are assigned after the participant list is finalized
  - We give our best to accommodate your preference list in the assignment

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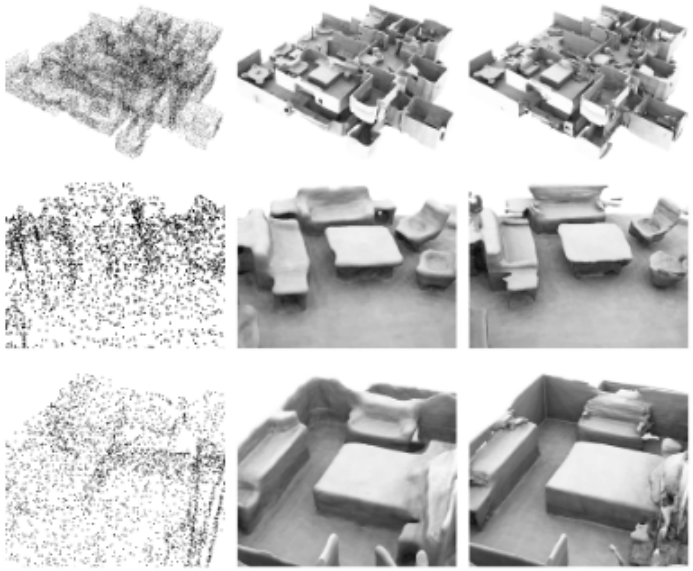
POCO: Point Convolution for Surface Reconstruction

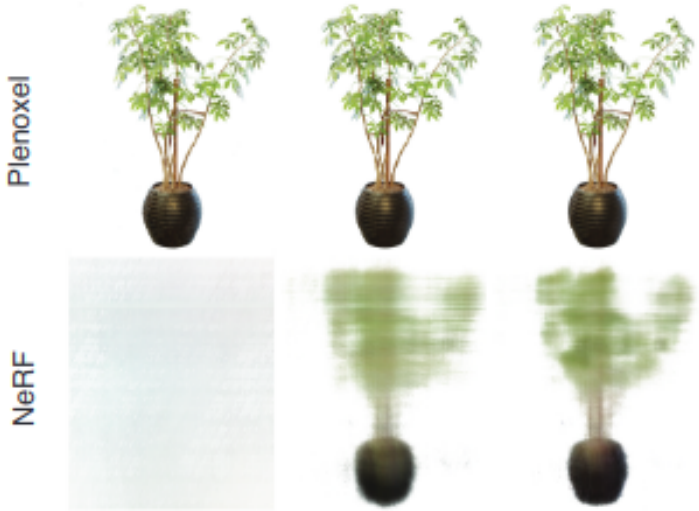
A. Boulch and R. Marlet. Poco: Point convolution for surface reconstruction, 2022



- A point-cloud based neural network method for accurate 3d reconstruction.

Plenoxels: Radiance Fields without Neural Networks

Alex Yu and Sara Fridovich-Keil, M. Tancik, Q. Chen, B. Recht, and A. Kanazawa. Plenoxels: Radiance fields without neural networks, 2021

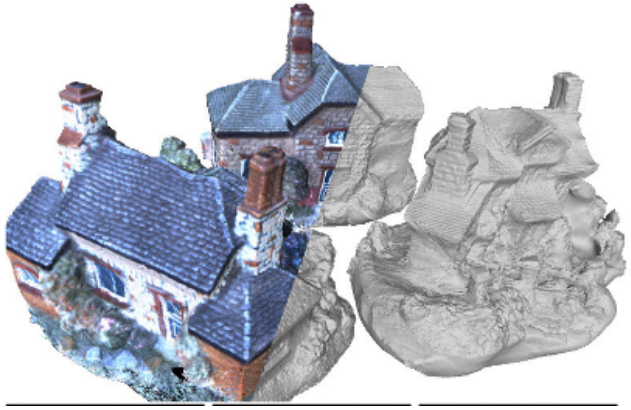


- An over-fitting method for realistic scene.
- Traditional optimization method combine neural network scheme.
- recommend read Nerf first.

A Differential Volumetric Approach to Multi-View Photometric Stereo

F. Logothetis, R. Mecca, and R. Cipolla. A differential volumetric approach to multi-view photometric stereo.

CoRR, abs/1811.01984, 2018



- pure traditional signed distance field method
- hard optimization and interesting set up.

TextureFusion: High-Quality Texture Acquisition for Real-Time RGB-D Scanning

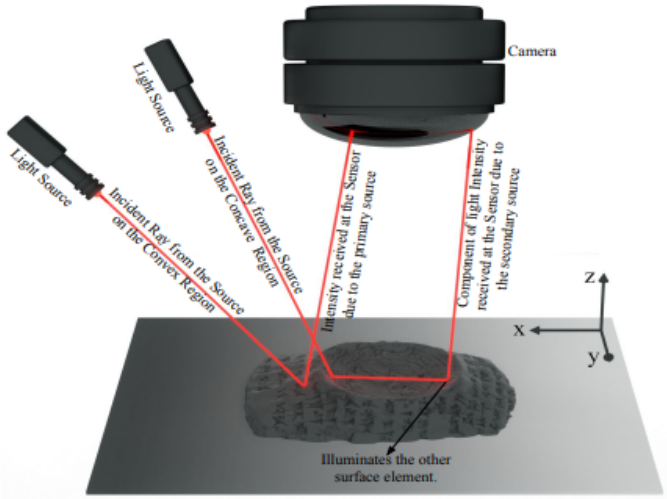
J. H. Lee, H. Ha, Y. Dong, X. Tong, and M. H. Kim. Texturefusion: High-quality texture acquisition for real-time rgb-d scanning.

In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, June 2020

- real time capable
- traditional approaches to achieve accurate geometry reconstruction

Uncalibrated Neural Inverse Rendering for Photometric Stereo of General Surfaces

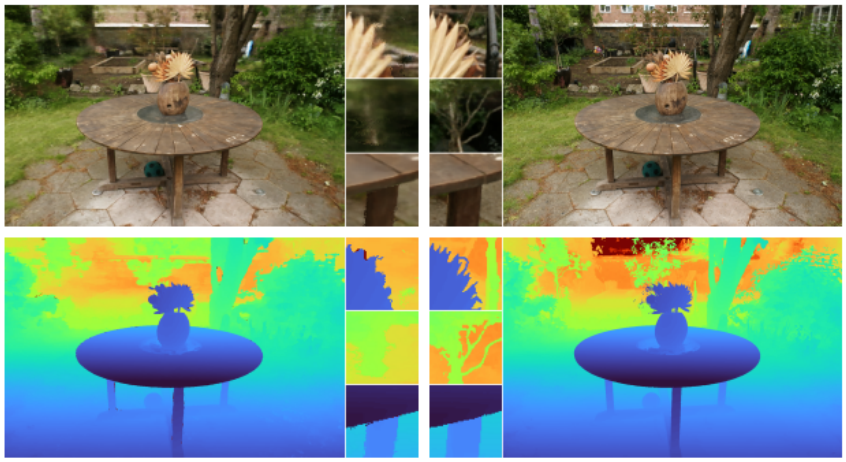
B. Kaya, S. Kumar, C. Oliveira, V. Ferrari, and L. Van Gool. Uncalibrated neural inverse rendering for photometric stereo of general surfaces



- The reflection from surface.
- Requires no ground truth normals.

Mip-NeRF 360: Unbounded Anti-Aliased Neural Radiance Fields

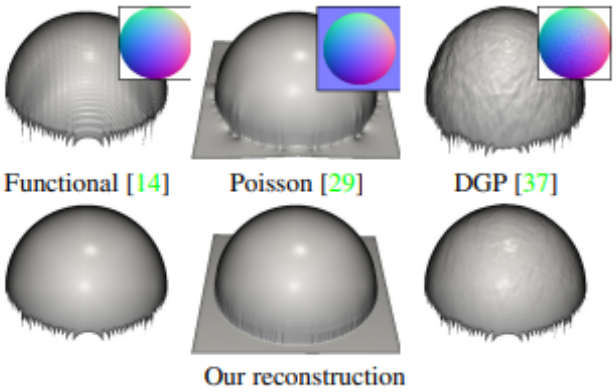
J. T. Barron, B. Mildenhall, D. Verbin, P. P. Srinivasan, and P. Hedman. Mip-nerf 360: Unbounded anti-aliased neural radiance fields



- Unconstrained camera orientations.
- Scene parameterization, distillation framework and regularization.

Normal Integration via Inverse Plane Fitting with Minimum Point-to-Plane Distance

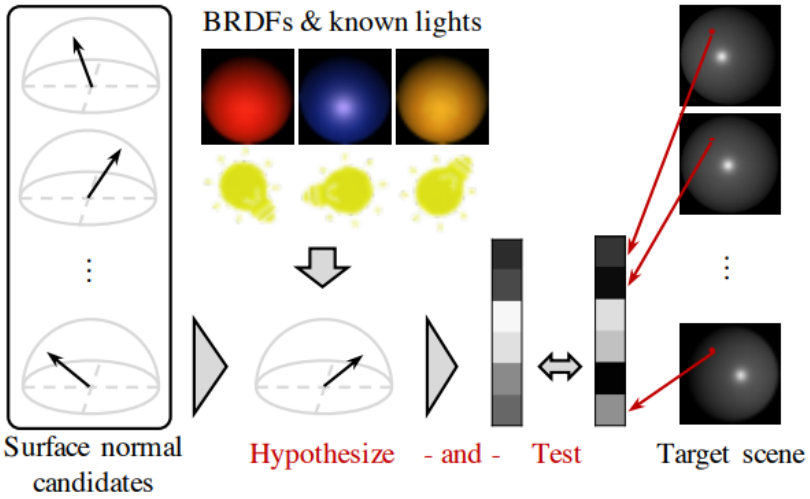
X. Cao, B. Shi, F. Okura, and Y. Matsushita. Normal integration via inverse plane fitting with minimum point-to-plane distance



- Solve an inverse problem of local plane fitting.
- Minimize the sum of squared point-to-plane distances.

Photometric Stereo via Discrete Hypothesis-and-Test Search

K. Enomoto, M. Waechter, K. N. Kutulakos, and Y. Matsushita. Photometric stereo via discrete hypothesis-and-test search



- Cast the problem as a discrete hypothesis-and-test search problem.
- Precomuptation guarantees the efficiency.

Questions?

Reminder:

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References I

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  Uncalibrated neural inverse rendering for photometric stereo of general surfaces.

References II

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