

## EDUCATION

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- **Christian-Albrechts-Universität zu Kiel** Kiel, Germany  
*Ph.D. in Computer Science* Nov 2020 – Present
  - **Topic::** Underwater Refractive Camera Calibration and 3D Scene Reconstruction
  - **Advisor & Reference:** Prof. Dr. -Ing. Kevin Köser
- **Chongqing University** Chongqing, China  
*Master of Science in Surveying and Mapping Engineering (Geo-informatics)* Sep 2017 – June 2020
- **Chongqing University** Chongqing, China  
*Bachelor of Surveying and Mapping Engineering (Geo-informatics)* Sep 2013 – June 2017

## EXPERIENCE

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- **Helmholtz Centre for Ocean Research, Kiel, GEOMAR** Kiel, Germany  
*Research Assistant at Oceanic Machine Vision Group (OMV)* Nov 2020 – June 2024
  - **Refractive Geometry and Camera Models:** Derive and implement novel camera models for underwater camera systems to account for geometric distortion induced by refraction (paper [5, 7]).
  - **Refractive Image-based 3D Reconstruction:** Research and develop a refractive structure-from-motion (SfM) approach for image-based 3D reconstruction from underwater imagery (paper [2]).
  - **C++ Open-Source Underwater Mapping Software:** Implement and integrate the refractive camera models and refractive SfM into the popular C++ based open-source 3D reconstruction software COLMAP. (project link: [gitlab:colmap-underwater](https://github.com/colmap/colmap-underwater))
  - **Sensor Fusion with Navigation:** Develop a loosely-coupled visual-navigation fusion strategy for mapping a large-scale of seafloor (paper: [3]).
  - **Underwater Neural Radiance Field:** Learning a medium- and light-independent scene representation by modeling the camera-attached co-moving light source with hash-encoded neural network (paper: [1]).
  - **Macro-lens Camera Calibration:** Derive a novel affine transform camera model for the focus-stacked image and develop a C++ based calibration approach for macro-lens camera system (paper: [6]).
  - **Tiny- and Semi-transparent Object Reconstruction:** Develop a method by combining differentiable rendering with neural radiance field to reconstruct very tiny- and semi-transparent objects (paper: [8]).
  - **Teaching Assistant - Probabilistic Robotics:** Responsible for the tutorial sessions and the final exam.
- **Helmholtz Centre for Ocean Research, Kiel, GEOMAR** Kiel, Germany  
*Internship & Master Thesis* Jan 2019 – Jan 2020
  - **BubbleBox Project:** Develop a synchronized high-speed (80 Hz) machine vision stereo camera system. Develop a C++ based software to measure and quantify the volumes of released gas bubbles using image processing and stereo vision techniques.
- **Computer Vision Freelancer** Kiel, Germany  
*Working as a freelancer using free time for various small-to-medium size projects* 2021 – 2024
  - **Localizing Robot Arm End Effector:** Develop a synchronized 4-camera system to track and localize the end effector of a robot arm in 3D using Aruco maker.
  - **Intrinsic & Extrinsic Calibration of a Camera Array:** Develop a calibration method to calibrate the intrinsic and relative extrinsic parameters of a 26-cameras camera array for human-body scanning.

## SKILLS

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- **Skill Set:** Computational Imaging; Camera Calibration; 3D Reconstruction; SfM / SLAM; Optimization; Neural Radiance Field.
- **Programming & Tools:** C++, CMake, Python, PyTorch, OpenCV, Ceres-Solver, Linux, Git, ROS (basic), LaTeX
- **Scientific Skills:** Problem Solving; Mathematical Modeling; Scientific Drawing and Writing.
- **Communication:** English (proficient); German (A2); Chinese (native)

## AWARDS & SCHOLARSHIP

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- **Ph.D. Scholarship:** Doctoral scholarship granted by China Scholarship Council (CSC, 2020 – 2024)
- **Travel Grant:** Travel grant for young researchers by Deutsche Arbeitsgemeinschaft für Mustererkennung, DAGM 2019

## SELECTED PUBLICATIONS

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18 publications listed on Google Scholar, with a total of 199 citations and an H-index of 8. Below are selected publications:

- [1]: **M. She**, F. Seegräber, D. Nakath, P. Schöntag, K. Köser. Relative Illumination Fields: Learning Medium and Light Independent Underwater Scenes. (Submitted to *CVPR*, 2025)
- [2]: **M. She**, F. Seegräber, D. Nakath, K. Köser. Refractive COLMAP: Refractive Structure-from-Motion Revisited. In *IROS*, 2024 (**Oral**)
- [3]: **M. She**, Y. Song, D. Nakath, K. Köser. Semihierarchical Reconstruction and Weak-area Revisiting for Robotic Visual Seafloor Mapping. In *Journal of Field Robotics*
- [4]: **M. She**, T. Weiß, Y. Song, P. Urban, J. Greinert, K. Köser. Marine Bubble Flow Quantification Using Wide-baseline Stereo Photogrammetry. In *ISPRS Photogrammetry and Remote Sensing*
- [5]: **M. She**, D. Nakath, Y. Song, K. Köser. Refractive Geometry on Underwater Domes. In *ISPRS Photogrammetry and Remote Sensing*
- [6]: X. Weng\*, **M. She\***, D. Nakath, K. Köser (\**Equal Contribution*). Macal - Macro Lens Calibration and the Focus Stack Camera Model. In *3DV*, 2021 (**Oral**)
- [7]: **M. She**, Y. Song, J. Mohrmann, K. Köser. Adjustment and Calibration of Dome Port Camera Systems for Underwater Vision. In *GCPR*, 2019 (**Oral**)
- [8]: D. Nakath, X. Weng, **M. She**, K. Köser. Visual Tomography: Physically Faithful Volumetric Models of Partially Translucent Objects. In *3DV*, 2024