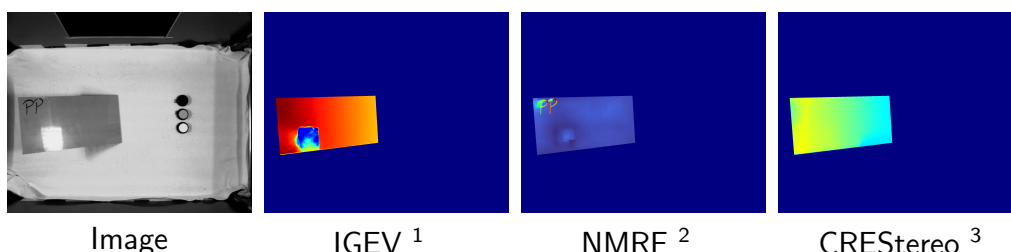


Proposal for a Research Internship/Minor Project

Topic: Evaluating the Impact of Specular-Aware Data Augmentation on State-of-the-Art Disparity Estimation Networks

Description: Disparity estimation plays a crucial role in computer vision, particularly for depth perception and 3D reconstruction. While neural networks have achieved remarkable performance in this domain ^{1,2,3}, they struggle with smooth and textureless surfaces like plastics (see Figure below).



To address this challenge, the goal of this work is to generate a specialized dataset that specifically includes specular reflections and textureless surfaces. These new training and test data will be used to augment existing datasets, aiming to bridge the domain gap that current models encounter in such scenarios.

Specifically, the three state-of-the-art networks IGEV, NMRF, and CREStereo will be retrained using this extended data base. By integrating these targeted samples into the training process, we aim to enhance the networks' robustness without compromising their general performance. Finally, the impact of this data augmentation will be evaluated to determine to what extent the additional information helps the models to better generalize to difficult, reflective environments.

Tasks:

- Understanding of principle of state-of-the-art neural networks for disparity estimation
- Generation of new training and test data
- Retraining of networks with additional training and test data
- Evaluation of the retrained neural networks considering common metrics, synthetic data and real-world data

Prerequisites: Excellent knowledge of Python programming, experience in ML/DL

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Professor: Prof. Dr.-Ing. André Kaup

Available: Immediately (April 2026)

¹G. Xu et al.: "Iterative Geometry Encoding Volume for Stereo Matching", CVPR 2023.

²T. Guan et al.: "Neural Markov Random Field for Stereo Matching", CVPR 2024.

³J. Li et al.: "Practical Stereo Matching via Cascaded Recurrent Network with Adaptive Correlation", CVPR 2022.