

DONG HUO

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Education

University of Alberta

Ph.D., Computing Science

Sept 2018 - Jun 2024

Edmonton, Alberta

Harbin Institute of Technology

B.Eng., Software Engineering

Sept 2014 - Jun 2018

Harbin, Heilongjiang, China

Research Experience (First Author)

Huawei Technologies Co., Ltd

Research Intern, advised by Juwei Lu

Apr 2023 – Present

Markham, Ontario

CVPR 2024 (Under review) – Diffusion-based Texture Generation and Editing for 3D Objects

- Proposed a novel algorithm to address view inconsistency issues of 2D image generation models, resulting in a significant and perceptible enhancement in texture quality by 37%.
- Demonstrated exceptional efficiency by reducing optimization time by 59% compared to the widely-adopted Score Distillation Sampling (SDS) algorithm.
- Extended the application of the method to enable the editing of textures, showcasing adaptability and versatility in texture processing.

Computer Graphics Lab, University of Alberta

Research Assistant, advised by Herb Yang

Jun 2019 – Mar 2023

Edmonton, Alberta

TPAMI 2023 – Blind Image Deconvolution Using Variational Deep Image Prior [code link]

- Mathematically validated the effectiveness of integrating variational Bayes with the deep image prior (DIP) to address single image blind deconvolution challenges, providing a robust theoretical foundation.
- Expanded the PyTorch implementation of the DIP framework based on our novel mathematical derivation, and demonstrated a substantial 22% improvement in deconvolution performance compared to the DIP, highlighting the practical impact of our contributions in image restoration.

TIP 2023 – Glass Segmentation with RGB-Thermal Image Pairs [code link]

- Developed an innovative multi-modal fusion network that leverages both CNN and transformer modules, achieving a remarkable improvement of over 39% compared to 24 other related methods.
- Conducted a comprehensive physical analysis of the feasibility of combining RGB images and thermal images to enhance glass segmentation accuracy, resulting in an impressive 52% performance enhancement over using only RGB images.

TIP 2023 (Under review) – Learning to Recover Spectral Reflectance from RGB Images [code link]

- Proposing an innovative architecture, grounded in a proprietary theorem, seamlessly integrated the intrinsic physical properties of spectral reflectances, resulting in a notable 11% performance improvement.
- Implemented meta-auxiliary learning techniques to effectively narrow the domain gap between training and testing data, resulting in an impressive 8% reduction in domain discrepancy.

CVPRW 2022 – Motion Deblurring using Atrous Spatial Pyramid Deformable Convolution [code link]

- Proposed a novel architecture for better generalization on non-uniform blur by using deformable convolution with different dilation rates to adaptively adjust the shapes and values of convolution kernels.
- Implemented the architecture with Pytorch and achieved 7% performance gain compared with architectures without adaptive kernels.

Projects

3D Editing with 3D Gaussian Splatting (3DGS) and Neural Radiance Fields (NeRF)

Sept 2023 - Present

- Adopted the SAM on a reference view for editing region segmentation, propagated the segmentation mask to additional views through depth estimation, and executed 3D semantic mask reconstruction to accurately localize edited regions within the 3D scene.
- Leveraged ControlNet, Instruct-Pix2Pix, null-text inversion and prompt-to-prompt methodology for seamless view-consistent image editing, complemented by sampling score distillation (SDS) to effectively minimize view-inconsistency, resulting in artifact-free edited 3D reconstruction.

Technical Skills

Languages: Python, Java, MATLAB, C/C++, SQL, Shell

Technologies/Frameworks: Pytorch, TensorFlow, JAX, NeRFStudio, ThreeStudio, Diffusers, Android, OpenCV, ROS