

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

Associate Research Intern, advised by Juwei Lu

Apr 2023 – Present

Markham, Ontario

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

- Leveraged 2D ControlNet pipeline from diffusers to generate multi-view images, incorporating camera pose and depth information, while pioneering a novel algorithm to address view inconsistency issues and seamlessly stitch adjacent views, resulting in a significant and perceptible enhancement in texture quality.
- Demonstrated exceptional efficiency by reducing optimization time by 60% compared to the widely-adopted Score Distillation Sampling (SDS) algorithm.
- Extended the application of the method to enable global and local 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, resulting in a more tightly constrained optimization process.
- Demonstrated a substantial 22% improvement in deconvolution performance compared to the baseline DIP method, 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 38.6% 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]

- Proposed an innovative architecture based on a proprietary theorem, which seamlessly integrated the inherent physical properties of spectral reflectances. This approach led to a remarkable 10% performance improvement when compared to conventional end-to-end learning methods.
- 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 6% performance gain compared with architectures without adaptive kernels.

Projects

3D Object editing with 3D Gaussian Splatting

Sept 2023 - Present

- Trained a 3D Gaussian Splatting (3DGS) model using images of a specific object and subsequently generated rendered images around the object.
- Implemented a combination of ControlNet and Instruct-Pix2Pix for image editing, and adopted prompt-to-prompt methodology to ensure view consistency.
- Fine-tuned the pretrained model by incorporating point clouds aligned with edited images to facilitate both global and local editing capabilities.

Object Removal in NeRF

Apr 2023 - Jul 2023

- Adopted the Segment Anything Model (SAM) for precise object segmentation, and utilized NeRF to generate a 3D segmentation mask specifically tailored to the isolated target object.
- Enhanced the proposal network for density resampling, followed by hole inpainting with LaMa for retraining the NeRF.
- Integrated the entire pipeline into NeRFStudio, contributing to a more versatile 3D scene modeling framework.

Diagnostic Report Generation | *Patent CN109003269A & CN109065110B*

Feb 2018 - Jun 2018

- Trained a Fast R-CNN for lung tumor detection on CT scans with labeled bounding boxes.
- Implemented an Bi-LSTM-based diagnostic report generator and an Bi-LSTM-based entity relation extractor from diagnostic reports with TensorFlow.

Technical Skills

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

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