Yu Yuan

+1 765 694 9166 | mryuanyu@outlook.com | Webpage | West Lafayette, IN

Research Interests

Visual Understanding and Generation, Physically-Consistent Image/Video Synthesis, Physical AI, World Models, Computational Photography, Diffusion Models, Generative Modeling, Image/Video Restoration.

Education

Purdue University — West Lafayette, IN, US
PhD Student in Electrical and Computer Engineering — *Advisor: Stanley H. Chan* — *08/2023 – 05/2027 (expected)*

Shanghai Jiao Tong University — Shanghai, China
MS in Aeronautical and Astronautical Science and Technology — *09/2020 – 06/2023*

Shanghai Jiao Tong University — Shanghai, China
BEng in Aeronautics and Astronautics Engineering — *09/2016 – 06/2020*
Minor Degree in Administration Management — *10/2018 – 06/2020*

Skills

Languages: English (Fluent), Chinese (Native)

Programming: Python, PyTorch, MATLAB, HTML, JavaScript, C/C++ (Basic)

Technologies: Git, LaTex, Linux, Slurm, Markdown, NVIDIA Jetson, Adobe Photoshop, Adobe Premiere, Adobe Audition

Others: Photography, Fishing, Drones, Rowing

Selected Publications

First Author. NewtonGen: Physics-Consistent and Controllable Text-to-Video Generation via Neural Newtonian Dynamics.
arXiv 2025 [Under Review]

- Built a physics-consistent and controllable text-to-video framework that explicitly incorporates learnable dynamics into the generation process.
- Introduced Neural Newtonian Dynamics, which models different dynamics via unified neural ODEs.

First Author. Generative Photography: Scene-Consistent Camera Control for Realistic Text-to-Image Synthesis.
CVPR 2025 [Highlight & Demo]

- Introduced a new text-to-image generation paradigm for photography with an understanding of camera physics.
- Produced significantly more scene-consistent photorealistic images than state-of-the-art text-to-image models such as Stable Diffusion 3 and FLUX.

Co-Author. Learning Phase Distortion with Selective State Space Models for Video Turbulence Mitigation.
CVPR 2025 [Highlight]

- Performed video turbulence restoration by integrating the Mamba model with generative models, surpassing state-of-the-art methods in quality and inference speed.

First Author. iHDR: Iterative HDR Imaging with Arbitrary Number of Exposures.
ICIP 2025

- Proposed a novel high dynamic range (HDR) imaging framework capable of handling a flexible number of inputs.
- Utilized side information and attention mechanisms to effectively suppress artifacts during the fusion process.

Co-Author. Astrophotography Turbulence Mitigation via Generative Models.
ICIP 2025

- Established the first dataset dedicated to astronomical image turbulence restoration, comprising over 135K images.
- Presented a novel architecture integrating a generative prior for structural preservation with a restoration model.

Co-Author. RCMixer: Radar-Camera Fusion Based on Vision Transformer for Robust Object Detection.
JVCI 2024

- Proposed an end-to-end target detection network architecture based on radar-camera feature-level fusion.

First Author. Learning to Kindle the Starlight.
arXiv 2022

- Constructed the first star field image enhancement benchmark consisting of 355 real-shot and 854 semi-synthetic image pairs.
- Proposed the first star field image enhancement approach based on conditional denoising diffusion probabilistic models (DDPM), which outperformed state-of-the-art low-light image enhancement algorithms on different tasks.

First Author. Multimodal Image Fusion based on Hybrid CNN-Transformer and Non-local Cross-modal Attention.
arXiv 2022

- Designed a non-local cross-modal attention mechanism to capture both local and global dependencies by calculating associations between features.

Leading Projects

Physics-driven Video Generation. (on-going)

4D Understanding and Dynamics Modeling. (on-going)

Generative Astronomical Image Restoration Through Atmospheric Turbulence. 2024

Video Restoration Classifier. 2024

A Underwater Binocular Multi-exposure Imaging System. 2022

Ultra-wideband-based Cooperative Multi-UAV Positioning Technology. 2021

A Modular Custom Aviation Model Design for Tyros. 2020

Patent

A trajectory solving and alignment method based on inertial measurement unit and ultra-short baseline positioning sensors for autonomous underwater robots. China Patent. CN 114993313 B.

Awards & Competitions

Ivy League Scholarship for Exceptional Students (Innovation)	Top 1%
Outstanding Graduate of Shanghai Jiao Tong University	Top 15%
Shanghai International Creators Competition: Special Competition of Drones	First Prize
DELL AI for Social Innovation Competition: AI/ADAS of Intelligent Car	National Second Prize

Other Activities

Research Assistant, Purdue University	2023 – 2025
Teaching Assistant, Automatic Control Theory, Shanghai Jiao Tong University	2021

Workshop Co-organizer, WACV GAIP

Reviewer, CVPR, CVPRW, ICCV, WACV, ICIP, ICASSP

IEEE Graduate Student Member