

PEDRO FIGUEIREDO

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RESEARCH SUMMARY

Final-year Ph.D. candidate at Texas A&M University specializing in the intersection of **Physically Based Rendering** and **Generative AI**. Expertise centers on developing **fast and efficient** neural light transport solutions, from high-level rapid PyTorch prototyping and fine-tuning of large **diffusion models**, to low-level **C++/CUDA** neural implementations that maximize hardware performance. Experienced researcher with top-tier publications at SIGGRAPH, CGF, EGSR, and WACV with industry experience in leading research labs at **Intel** and **NVIDIA**. Interested in consistent diffusion rendering, optimizations to neural light transport, and world models.

EDUCATION

Texas A&M University, United States of America

January 2020 - Present

Doctor of Philosophy in Computer Science

Eötvös Loránd University, Hungary

January 2018 - December 2019

Bachelor of Science in Computer Science

Universidade Federal da Paraíba*, Brazil

February 2015 - December 2017

Bachelor of Science in Computer Engineering

**Transferred to Eötvös Loránd University*

EXPERIENCE

Graphics Research Intern

September 2025 - January 2026

Intel, USA

- Finetuned pre-trained image **diffusion models** to enable the next generation of real-time generative gaming on mobile GPUs.
- Introduced automatic data resampling to improve scene-wide conditioning, driving more **consistent video generation**.
- Engineered **multi-node distributed training** to accelerate iteration speed while adhering to a strict inference VRAM budget.

Research Intern

May 2023 - August 2023

NVIDIA, USA

- Researched **frame interpolation** algorithms for **DLSS**, exploring neural optical flow estimation toward multi-frame generation.
- Designed architecture improvements to mitigate ghosting artifacts from disocclusions and to **optimize rendering speed**.

Machine Learning Intern

May 2021 - August 2021

Ericsson, USA

- Built a containerized deep-learning resource forecasting pipeline to optimize infrastructure allocation.
- Developed an internal semantic search engine to accelerate documentation discovery for engineering teams.

Software Developer Intern

May 2018 - December 2019

Ericsson, Hungary

- Prototyped edge-computing containerized solutions and 5G IoT applications hosted on AWS and Azure.

C++ Developer Intern

January 2016 - December 2017

LAVID/UFPB, Brazil

- Created a real-time image/video processing prototype for the hearing impaired.
- Integrated CNN-based object recognition with text-to-speech for sign language translation (**VLIBRAS project**).

SELECTED PUBLICATIONS AND PREPRINTS

Learning Complex Luminaires with Light Tracing

In submission

Pedro Figueiredo, Zixuan Li, Beibei Wang, Miloš Hašan, Nima Khademi Kalantari

- Learns arbitrarily complex luminaires purely from light tracing samples using combination of photon mapping and normalizing flows.
- Proposes a importance sampling approach without discretization assumptions and a distillation method to enable fast inference.

RealMat: Realistic Materials with Diffusion and Reinforcement Learning

CGF 2026

Xilong Zhou, Pedro Figueiredo, Miloš Hašan, Valentine Deschaintre, Paul Guerrero, Yiwei Hu, Nima Khademi Kalantari

- Generates realistic SVBRDF materials using diffusion models and reinforcement learning.
- Leverages Stable Diffusion XL and a trained realism reward function to improve synthetic training data bias.

Neural Importance Sampling of Many Lights

SIGGRAPH 2025

Pedro Figueiredo, Qihao He, Steve Bako, Nima Khademi Kalantari

- Improves Monte Carlo rendering by learning continuous spatially-varying light selection distributions.
- Scales to hundreds of lights via residual learning with existing light hierarchy techniques.

Neural Path Guiding with Distribution Factorization

EGSR 2025

Pedro Figueiredo, Qihao He, Nima Khademi Kalantari

- Factorizes the 2D directional distribution into two 1D PDFs using TinyCUDA networks.
- Caches incoming radiance in a secondary network to improve optimization and reduce variance.

Frame Interpolation for Dynamic Scenes with Implicit Flow Encoding

WACV 2023

Pedro Figueiredo, Avinash Paliwal, Nima Khademi Kalantari

- Interpolates dynamic scenes under varying illumination.
- Encodes bidirectional flows in a hypernetwork-driven MLP to learn interpolation without intermediate ground-truths.

TEACHING AND MENTORING

Research Mentor

January 2024 - Present

Texas A&M University, USA

- Mentored Ph.D., M.S. and B.Sc. students on rendering projects. Advised on graphics theory and its efficient implementation.
 - Ph.D.: Qihao He [2024-2026], Yuxin Dai [2024-2026], and Aakash Garg [2025-2026]
 - M.S.: Jay Nehete [2024-2025]
 - B.Sc.: Priyadarsi Mishra [2024-2025] and Shuyu Wang [2024]

Researcher

June 2024

NSF RET in Engineering and Computer Science, USA

- Taught rendering concepts to a public school teacher via [WebGL application](#) to inspire graphics-related classroom activities.

Graduate Teaching Assistant

January 2021 - May 2023

Texas A&M University, USA

- Delivered lectures and practice sessions for CSCE 121 (Introduction to Programming) and CSCE 221 (Data Structures), and conducted office hours and grading for CSCE 641 (Computer Graphics) and CSCE 648 (Computational Photography).

Lecturer

January 2019 - December 2019

Eötvös Loránd University, Hungary

- Designed and taught undergraduate practice classes on functional programming using fill-in activities on a larger ray-tracing system.

PROJECTS

Real-Time Affine Transformations of 3D Meshes

2020

Eötvös Loránd University, Hungary

- Created OpenGL application using octrees to leverage SDFs as a way of performing fast affine transformations in 3D meshes.

Increased Interest in Functional Programming via Raytracing

2019

Eötvös Loránd University, Hungary

- Designed a raytracing application in Clean programming language to motivate undergraduate students.

Physically-Based Rendering for Motivating Undergraduate Students

2017

Universidade Federal da Paraíba, Brazil

- Developed a [C++ CPU path tracer](#) to engage undergraduates and combat student evasion.

TALKS

How Becoming a Researcher Can Get You Around the World

Roraima State Scientific Talks, 2025

Boa Vista, Brazil

Octree-based Approach for Real-time Visualization of Surfaces Defined by Signed Distance Fields

TDK, 2019

Budapest, Hungary

Generating Adaptive Distance Fields from Triangle Meshes

ICMI, 2019

Târgu Mureș, Romania

AWARDS

- Research and Presentation Travel Award (1,000 USD each) at Texas A&M University. 2022 and 2025
- Outstanding Bachelor's Thesis Award (120,000 HUF) at Eötvös Loránd University. 2020
- First Place Award (60,000 HUF) on the Scientific Students' Associations (TDK) at Eötvös Loránd University. 2019
- National Higher Education Scholarship (90,000 HUF/month) at Eötvös Loránd University. 2019
- Stipendium Hungaricum Scholarship (full-ride) at Eötvös Loránd University. 2018

SKILLS

ML / GenAI	PyTorch, Diffusion, Flow Matching, Image & Video Generation, Frame Interpolation, LoRA, Distillation
Graphics / Rendering	Normalizing Flows, Neural Importance Sampling, Neural Radiance Cache, Ray Tracing, Monte Carlo Rendering, Bidirectional Path Tracing, Path Guiding, Photon Mapping, Many-Lights Sampling, Signed Distance Fields
Programming / Systems	Python, C, C++, CUDA, ETX , Mitsuba, PBRT, Blender, Multi-node Distributed Training, Preprocessing