

Miguel Crespo–Castaño

@ miguel@mcrespo.me
Google scholar profile

mcrespo.me

Switzerland

mcrescas

mcrescas

0000-0001-8738-9263

Summary

Computer Science engineer with 6+ years of experience in research and software development, specializing in Computer Graphics and Vision, Computational Imaging, and High-Performance Computing. Proven track record of leading innovative projects while contributing to and developing open-source software — creator of VERIV (13.3k+ installs) and MiTransient (7.8k+ downloads). Published in ACM TOG and Optics Letters. Experienced mentor, technical reviewer, and community contributor.

Education



Master in Biomedical Engineering, **Universidad de Zaragoza**

2018 - 2019

- Major in Information and Communications Technologies
- Ranked first in Master Thesis.
- Medical Robotics · Computer Vision · Biomedical Signal and Image Processing · Biostatistics and Numerical Simulation · Models and Systems of Physiological Control · Computer Aided Prosthesis and Implant Design.

Bachelor in Computer Science, **Universidad de Zaragoza**

2014 - 2018

- Major in Numerical and Visual Computing
- Ranked first in Computer Graphics, Robotics, Hardware, and Operating Systems.
- Computer Graphics · Machine Learning · Computer Vision · Robotics · Compilers and Operating Systems · Data Structures and Algorithms · Natural Language Processing · Concurrent Algorithms · Distributed Systems · Functional Programming.

Work Experience



2021 - Present

Doctoral Research Assistant, **Realistic Graphics Lab (EPFL)**

Lausanne, Switzerland

- Led research advised by Prof. Wenzel Jakob on Physically-based and Differentiable rendering for Atmospheric Science, supported by an ERC Grant.
- Engineered a high-performance system that evolved Mitsuba 3 into a radiative transfer solver for atmospheric modeling, featuring fully vectorized computations, sophisticated data management for diverse atmospheric states, and efficient data pipelines for processing real-world data.
- Researched Monte Carlo methods and variance reduction techniques for 3D multi-spectral simulations and inverse retrieval of atmospheric composition from satellite and airborne imagery.
- Contributed to the Mitsuba 3 open-source project (389.73k downloads).

2018 - 2020

Junior Research Scientist, **Graphics & Imaging Lab**

Zaragoza, Spain

- Developed a high-performance Physically-Based Rendering algorithm, integrating smooth quadrature approximations and high-frequency Monte Carlo, building upon Bachelor's thesis research.
- This work culminated in a full publication in *ACM Transactions On Graphics*, a premier journal for computer graphics research.
- Advanced Non-Line-of-Sight Imaging research by expanding the application of Phasor Fields to enable reconstructions in environments with participating media.
- This research formed the basis of my Master's thesis and resulted in a publication in *Optics Letters*.

Summer 2018

Research Engineer, **Graphics & Imaging Lab**

Zaragoza, Spain

- Refactored and optimized Virtual Reality (VR) rendering code, improving performance by 40%.
- Tested innovative algorithms to enhance user immersion in VR and took full responsibility for conducting rigorous user studies to validate the approaches.

Projects



- VERIV - VSCode Extended Range Imaging Viewer** ⓘ 13.3k installs 🔗 Project page 📁 Repository
 - LDR/HDR image viewer widely adopted by the community for its convenience and features. It excels in remote environments by eliminating data transfer friction, significantly enhancing efficiency.
- MiTransient - Mitsuba 3 Transient Rendering** ⓘ 7.8k downloads 🔗 Project page 📁 Repository
 - Overcame technological limitations in transient rendering by developing a library that enables state-of-the-art computation while maintaining ease of use. Adopted by researchers and recognized with the Best Poster award at ICCP 2024.
- Master Thesis - Vision through Turbid Media using Phasor Fields** 🔗 Project page
 - Award-winning thesis on computational imaging through human skin by leveraging Non-line-of-Sight reconstructions, paving the way for applications in non-invasive medical screenings.
 - Advised by Prof. Adrian Jarabo.
- Bachelor Thesis - Adaptive Rendering using Quadrature Techniques** 🔗 Project page
 - Led a Physically-based Rendering project that enhanced simulation performance by using adaptive quadrature schemes and pioneered a new research direction, resulting in follow-up publications.
 - Advised by Prof. Adolfo Muñoz.

Publications



- Non-line-of-sight imaging in the presence of scattering media using phasor fields.** 🔗 Webpage 📄 PDF
*Pablo Luesia * , Miguel Crespo * , Adrian Jarabo, and Albert Redo-Sanchez.*
In: *Opt. Lett.*, vol. 47, Aug. 2022. DOI: 10.1364/OL.463296.
* Joint first authors
- Primary-Space Adaptive Control Variates using Piecewise-Polynomial Approximations.** 🔗 Webpage 📄 PDF
Miguel Crespo, Adrian Jarabo, and Adolfo Muñoz.
In: *ACM Transactions on Graphics*, vol. 40, Jul. 2021. DOI: 10.1145/3450627.

Additional Experience



- Teaching Assistant (Master and Bachelor level), EPFL** 📅 2021 - 2024
 - Served as Lead Teaching Assistant for courses in computer graphics, numerical methods for visual computing and ML, and programming technologies.
 - Led and developed the initiative to upgrade automation systems for grading and cheat detection, reducing assistants' workload by over 50%.
- Supervision of Research Projects and Master Theses, EPFL** 📅 2021 - 2024
 - Supervision and mentoring of 8 students in projects spanning Atmospheric Illumination and Absorption, Computed Tomography reconstruction, Uncertainty Estimation, Hair shading, Adaptive Volume Grids, Optimization Methods, and Differentiable Mip-mapping.
- Participation in Hackathons** 📅 2017 - 2019
 - Led teams in multiple editions of UCODE, successfully completing projects including neural classification of complex athlete movement sequences (2019), indoor localization system using Bluetooth (2018), and AI-enhanced semantic search engine for videos (2017).

Skills



Analytical	Computer graphics · Physically-Based Rendering · Differentiable Rendering · Neural Rendering · Machine Learning · Computer Vision · Computational Imaging · High-Performance Computing · JIT compilation · Volume Rendering · Computed Tomography · Atmospheric Science · Monte Carlo methods · Optimization · Real-Time Rendering · Virtual Reality.
Programming	C++ · C · Python (including Nanobind and PyBind11 bindings) · Java · Rust · CUDA · JAX · PyTorch · Dr.JIT · OpenGL · GLSL · HTML · CSS · Typescript · Javascript.
Systems & Tools	Linux · Bash scripting · Git · CMake · Matlab · Photoshop · Illustrator · Premiere · LaTeX.
Code Quality	Tests and documentation · Continuous integration · Code reviews.
Languages	English (proficient) · Spanish (native speaker) · French (beginner).