Gergely Ferenczi

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PROFILE

Physicist working in Virtual Reality. I am interested in the capacity of games & VR as a means of learning about the abstract ideas of maths and physics recruiting the intuitive and experiential faculties of the human body to supplement its analytical ones. As a guiding principle I hold that virtual reality, for this purpose, should not aim to provide a facsimile of reality but make available otherwise inaccessible realms of experience in ways in which it is uniquely positioned, amongst the other technologies, to do.

I have a strong foundation in continual learning with my academic career having spanned disparate areas of optics from foundational questions in quantum theory to classical imaging. I see great value in bringing many vantage points to problem solving so I aim to be a generalist rather than a specialist.

I hold personal relationships to be important in establishing professional relationships which is both a strength and a weakness. I am not a lone wolf.

EMPLOYMENT HISTORY

Programmer
2022 Oct. - 2025 Mar.

MXTreality UK Ltd (PGM-1)

Shipped a mixed reality driving simulator with networked traffic that has been used in three driver response studies by WSP and ARUP

Improved the fidelity microscopic behaviour of the simulation by having becoming team specialist in SUMO. Implemented a collision avoidance system to conpensate for client and server seeing slightly different game states. Created automated tests to facilitate these both in Python and Unity.

Improved the visual realism by implementing trailer and vehicle kinematics to interpolate realistic motion between sparse simulation data keeping animation code performant. Implemented vehicle lights receiving data from the simulation, efficiently communicating it to a custom shader on the client.

Adapted the traffic statistical realism to reflect vehicle distribution seen on UK roads and extended to pathfinding algorithm to help tune route distributions, including allowing for the closing off of roads, to achieve realistic looking traffic across our A-road and Motorway system.

Helped develop tooling in our Road Editor for editing the road network and exporting traffic, including adapting the traffic light system to allow signals to be duplicated and placed according to Highways regulations. Contributed to collaborative design of new Road Editor tool an began implementation in C++ & Unreal.

Performed prospective research exploring new tools in service of exploring potential services to meet client needs.

Post-Doctoral Research Asociate
2021 Dec. - 2022 Jun.

Imaging Concepts Group, University of Glasgow (PD-6)

Investigated computational means of undoing artefacts, due to sample motion during scanning, in the lightsheet microscope. Developed code in Python to undo these artefacts based on an iterated process of de- and reconvolutions.

Post-Doctoral Research Asociate
2021 May - 2021 Aug.

Optics Group, University of Glasgow (PD-5)

Investigated the origins of experimentally observed asymmetry in Hong-Ou-Mandel dip shapes. This work is currently subject to further development.

Post-Doctoral Research Asociate
2018 Apr. - 2021 Mar.

Semiconductor Spectroscopy and Devices Group, University of Strathclyde (PD-4)

Worked on the analysis of electron backscatter diffraction image maps of semiconductor substrates using MATLAB. The work focused on characterising samples in particular determining variation in crystal growth orientations of substrates.

Post-Doctoral Research Asociate
2017 Dec. - 2018 Mar.

Quantum Theory Group, University of Glasgow (PD-3)

Studied the statistical properties of photon-added and photon-subtracted states using moment generating functions.

Post-Doctoral Research Asociate 2017 Aug. - 2017 Nov.	**Optics Group, University of Glasgow**	(PD-2)

Worked on the ray tracer DrTIM (The Interactive Metatoy), written in Java. In particular, implemented Fresnel lenses for the purposes of simulating transformation optics devices.

Post-Doctoral Research Asociate 2016 Aug. - 2016 Dec.	**Quantum Theory Group, University of Glasgow**	(PD-1)

Developed, using analytic methods, a novel tomography protocol for the transverse spatial profile of a particle, exploiting two-particle interference.

EDUCATION

PhD 2012 - 2016	**Quantum Theory Group, University of Glasgow**	(ED-2)

Quantum Optics

Which-path problem for one and two particles with two degrees of freedom and a relation between transverse spatial structure and group velocity of light   Supervisor: Prof. Stephen Barnett

MSci 2007 - 2012	**Imperial College London**	(ED-1)

Physics with Theoretical Physics (First-Class Honours)

Applications of singular Sturn-Liouville eigenvalue problems in quantum mechanics
Supervisor: Prof. Yang Chen

PUBLICATIONS

Investigation of (mis-)orientation in zincblende GaN grown on micro-patterned Si(001) using electron backscatter diffraction, Dale M. Waters *et. al* Journal of Applied Physics **137**, 045701 (2025).   (PD-4)

Skew-lens image rotator, J. Bělin, G. Ferenczi, J. Courtial Optics Express **30**, 25958(16) (2022). (PD-2)

Structural luminescence imaging and characterisation of semicondutors in the scanning electron microscope, C. Trager-Cowan *et. al* Semiconductor Science and Technology **35**, 054001(15) (2020).   (PD-4)

Statistics of photon-subtracted and photon-added states, S. M. Barnett, G. Ferenczi, C. R. Gilson, and F. C. Speirits.   (PD-3)

Ray-optical transformation optics with ideal thin lenses makes omnidirectinal lenses, J. Courtial, T. Tyc, J. Bělin, S. Oxburgh, G. Ferenczi, E. N. Cowie, C. D. White, Optics Express **26**, 17872-17888 (2018).   (PD-2)

Holographic quantum imaging: reconstructing spatial properties via two-particle interference, N. Trautmann, G. Ferenczi, S. Croke and S.M. Barnett, Journal of Optics **19**, 054005 (2017).   (PD-1)

Spatially structured photons that travel in free space slower than the speed of light, D. Giovannini, J. Romero, V. Potoček, G. Ferenczi, F. Speirits, S.M. Barnett, D. Faccio, and M.J. Padgett, Science **347**, 857 (2015).   (ED-2)

Which-way information in a nested Mach-Zehnder interferometer, V. Potoček and G. Ferenczi, Physical Review A **92**, 023829 (2015).   (ED-2)

Two particle multi-mode interference, G. Ferenczi, V. Potoček, and S.M. Barnett, Journal of Optics **16**, 105710 (2014). Also included in the *Highlights of 2014* issue.   (ED-2)

TEACHING AND SUPERVISION

2018 - 2020	**University of Strathclyde**

Co-supervision (with Dr. Carol Trager-Cowan and Dr. Jochen Bruckbauer) of undergraduate project student *2019-2020* (PD-4).

Co-supervision (with Prof. John Jeffers) of undergraduate project studen *2019-2020* (PD-4).

1st year laboratory demonstrator *2018-2019* & *2019-2020* (PD-4).

2014-2015	**University of Glasgow**

1st year laboratory demonstrator *2014-2015* (ED-2).

Skills

Tech & Science

C#, C++, Python, Java, Git

GitLab/GitHub, Jira

MATLAB, MTEX, Mathematica

Unity, Unreal
LaTeX

Arts

Blender, PowerPoint, compass & straight edge methods, free-hand illustration @gferenczi.science

Ableton Live, ffmpeg, DaVinci Resolve

Much of my free-time is spent on near completely autodidactic pursuits of art & music: @gferenczi.art, @gferenczi.music

Designed the Quantum Theory Group's logo which is still in use since 2013.