

Maximilian F. EGGL

PERSONAL INFORMATION

PLACE AND DATE OF BIRTH: London, England | 03 June 1993
NATIONALITY: Austrian
LANGUAGES: **English** (Native)
German (Native)
Spanish (Intermediate)
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EDUCATION

SEPTEMBER 2019 | PhD in APPLIED MATHEMATICS, **Imperial College**, London
Thesis: "Adjoint-Based Mixing Enhancement for Binary Fluids"
Advisor: Prof. Peter SCHMID

OCTOBER 2015 | MSc in APPLIED MATHEMATICS, **Imperial College**, London
1ST Class Degree
Thesis: "The Physical and Mathematical Consequences of three coalescing eigenvalues"
Advisor: Dr. Eva-Maria GRAEFE

JUNE 2014 | BSc in MATHEMATICS, **Imperial College**, London
1ST Class Degree

JULY 2011 | European Baccalaureate, **European School**, Frankfurt
Final Grade: 94.08/100

PROFESSIONAL EXPERIENCE

PRESENT
FEB 2024 | **Emerging Principle Investigator** at the Institute of Neuroscience, CSIC-UMH, Alicante
Funded by the La Caixa Junior Leader Fellowship, I am working the project entitled: *AI enhanced diffusion-weighted MRI to non-invasively and in-vivo unearth changes from neurodegeneration*. The aim of the project is to combine machine learning tools with MRI to enhance the early detection of diseases such as Alzheimer's or Parkinson's.

DEC 2023
SEP 2020 | **Postdoctoral Researcher** at Max Planck Institute for Brain Research, Frankfurt / University of Bonn, Bonn / University of Mainz, Mainz
Worked on a project that tries to understand heterosynaptic plasticity from a mathematical modelling point of view, and the results this understanding could have on memory formation. Additional, implemented a machine learning approach to evaluation of Calcium imaging data. Finally, initiated a collaboration with the group of Prof. Lutz and University of Mainz with the aim of understanding the mechanisms underlying PTSD.

SEP 2020
JAN 2020 | **Lecturer** at Princeton University, Princeton
Designed and ran a course entitled "Optimal control and Estimation" aimed at graduate level students. This first experience in overseeing a course included formulating the course curriculum, teaching the lessons and evaluating the progress of the students. Topics including gradient-free optimization, non-linear adjoint optimization and optimal estimation were studied.

SEP 2020
SEP2019 | **Postdoctoral Researcher** at Princeton University, Princeton
Worked on a project that involves system identification and control "on the fly". This entailed gathering data and developing a model of a system, and a model-based controller, in real time. Trade-offs and advantage of knowledge must be combined in order to design a controller to achieve some desired objective.

REFERENCES

Name: Prof. Peter Schmid Role: PhD Supervisor Institution: King Abdullah University of Science and Technology, Thuwal, Saudi Arabia Email address: peter.schmid@kaust.edu.sa	Name: Prof. Tatjana Tchumatchenko Role: PostDoc Supervisor Institution: Institut of experimental epileptology, Uniklinikum Bonn, Bonn, Germany Email address: tatjana.tchumatchenko@uni-bonn.de
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PUBLICATIONS

Eggl MF* & De Santis* S, 2026, **Simulation-based inference at the theoretical limit for fast, robust microstructural MRI with minimal diffusion MRI Data**, NATURE COMMUNICATIONS MEDICINE 6, * Co-corresponding authors

Eggl MF*, Wagle S*, Filling JP* et al., 2025, **SpyDen: Simplifying molecular and structural analysis across spines and dendrites**, BIOINFORMATICS, BTAF339

Wieczorek T, ... , Eggl MF, 2024, **A framework for the emergence and analysis of language in social learning agents**, NAT. COMMS. 15 (1), 7590

Chater TC*, Eggl MF*, et al., 2024, **Competitive processes shape multi-synapse plasticity along dendritic segments**, NAT. COMMS. 15 (1), 7572

Carruth J, Eggl MF et al., 2024, **Controlling Unknown Linear Dynamics with Almost Optimal Regret**, REVISTA MATEMÁTICA IBEROAMERICANA 41 (2), 745-806

Carruth J, Eggl MF et al., 2024, **Optimal Agnostic Control of Unknown Linear Dynamics in a Bounded Parameter Range**, REVISTA MATEMÁTICA IBEROAMERICANA 41 (2), 651-744

Eggl MF*, Chater TC*, Petkovic J* et al., 2023, **Linking spontaneous and stimulated spine dynamics**, NAT. COMMS. BIO 6 (1), 930

Carruth J, Eggl MF et al., 2022, **Controlling Unknown Linear Dynamics with Bounded Multiplicative Regret**, REVISTA MATEMÁTICA IBEROAMERICANA 38 (7), 2185-2216

Eggl MF* & Schmid PJ, 2022, **Mixing by stirring: Optimizing shapes and strategies**, PHYS. REV. FLUIDS 7, 073904, doi.org/10.1103/PhysRevFluids.7.073904

Skene CS, Eggl MF & Schmid PJ, 2021, **A parallel-in-time approach for accelerating direct-adjoint studies**, JOURNAL OF COMPUTATIONAL PHYSICS, ISSN 0021-9991, doi.org/10.1016/j.jcp.2020.110033

Eggl MF* & Schmid PJ, 2020, **Mixing enhancement in binary fluids using optimised stirring strategies**, JOURNAL OF FLUID MECHANICS, 899, A24. doi:10.1017/jfm.2020.448

Eggl MF* & Schmid PJ, 2020, **Shape optimization of stirring rods for mixing binary fluids** IMA JOURNAL OF APPLIED MATHEMATICS, 85 (5), 762-789

Eggl MF* & Schmid PJ, 2018, **A gradient-based framework for maximizing mixing in binary fluids**, JOURNAL OF COMPUTATIONAL PHYSICS, Vol: 368, ISSN: 0021-9991, Pages: 131-153

PRE-PRINTS

Ugarte-Perez E, Espinos Soler E, Antonio Cerdan Cerda A, S. Maroto A, Martinez- Tazo P, Eggl MF, Perez-Cervera L, Canals S, De Santis S., 2026, **Longitudinal MRI reveals hormone-dependent brain remodeling supporting preserved cognition in aged females**, Under review at Nature Neuroscience, BIORXIV, 2026.04. 02.715844

Petkovic J, Eggl MF, Pathirana D, Chater TE, Hasenauer J, Rizzoli SO, Tchumatchenko T., 2026, **Push-and-pull protein dynamics leads to log-normal synaptic sizes and probabilistic multi-spine plasticity**, Under review at Nature Communications, BIORXIV, 2026.01. 29.702571

Müller L, Sartori F, Dehning J, Eggl MF, Priesemann V., 2026, **Optimizing infectious disease mitigation under dynamic conditions**, Under review at PNAS, ARXIV:2512.11454

PRIZES, GRANTS & FELLOWSHIPS

DEC 2025	"InfectoModelling", Astrazeneca CyberGrant A one year grant of €15,000 to fund a master's student. In this proposed project, we are studying how mathematical modelling and optimisation theory can be used to study and control epidemics.
JUN 2025	Ramon y Cajal Fellowship The Ramón y Cajal Fellowship is a highly competitive program in Spain designed to attract outstanding researchers with international experience. It provides substantial funding and long-term support to help them establish independent research lines and integrate into the Spanish research system

FEB 2024	La Caixa Junior Leader Fellow - Incoming The La Caixa Junior Leader Fellowship is a prestigious postdoctoral program in Spain that supports early-career researchers across various scientific disciplines. It provides generous financial support for young researchers to reach independence
2022 - Ongoing	“Begegnungszonen” Funding of the Joachim Herz fellowship € 12,000 euros were awarded in four separate years to organize the workshop on “Bio-inspired Deep Learning” due to the success of the previous iteration. This included 20 participants who, in combination of an expert in the field, spent three days at a remote location learning and applying techniques from machine learning and neuroscience to study cutting-edge research topics
Nov 2020	Add-on Fellowships for Interdisciplinary Life Science The fellowship addresses scientists who already have a position at or current basic funding from a German research institution and aim to answer biological research questions. It allows PhD candidates and postdocs who are interested in further training in related disciplines to attend conferences, conduct research stays or undertake professional training needed in order to gain new insights into relevant research methods. The Add-on fellows receives a maximum amount of € 12,500 per person to be spent over a period of two years.
JAN 2019	Finalist of the 2019 IMA Lighthill Thwaites Prize The £1,000 prize is awarded every two years by the IMA in cooperation with the IMA Journal of Applied Mathematics and the British Applied Mathematics Colloquium.
DEC 2018	Associate Fellow of the UK Higher Education Academy
1 OCT 2015	Imperial College, Department of Mathematics, Roth Scholarship A fully funded scholarship for tuition fees, living costs and conference attendance fund given to exceptional students wishing to pursue a doctoral degree at Imperial in Mathematics
JUN 2015	Faculty of Natural Sciences Prize of Excellence in the Support of Teaching and Learning