Samuel Eckmann, Ph.D.

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WORK EXPERIENCE & EDUCATION

05|2022 – *to date* **Postdoctoral Research Fellow**
Computational and Biological Learning Lab, Department of Engineering, University of Cambridge, United Kingdom.
Collaborators: Prof. Dr. Máté Lengyel, Dr. Yashar Ahmadian.
from 03|2023 Independent Royal Society Newton International Fellow

05|2022 **Fast track Ph.D. in Computational Neuroscience**
"Plasticity of Inhibition in Recurrent Circuits."
Goethe University, Frankfurt am Main, Germany.
from 09|2019 Max Planck Institute for Brain Research, Advisor: Prof. Dr. Julijana Gjorgjieva.
from 09|2015 Frankfurt Institute for Advanced Studies, Advisor: Prof. Dr. Jochen Triesch.

04|2015 **Bachelor of Science, Physics**
"Cubic Learning Rules for Unsupervised Self-Limiting Hebbian Learning in Artificial Neural Networks."
Goethe University, Frankfurt am Main, Germnay.

09|2014 **Term Abroad at the University of Birmingham**
Courses in Psychology and Computer Science. University of Birmingham, Birmingham, United Kingdom.

JOURNAL PAPERS

2022 "Synapse-type-specific competitive Hebbian learning forms functional recurrent networks,"
S. Eckmann, E. J. Young, J. Gjorgjieva, bioRxiv. (doi.org/10.1101/2022.03.11.483899)

2020 "Active Efficient Coding Explains the Development of Binocular Vision and its Failure in Amblyopia,"
S. Eckmann, L. Klimmasch, B. E. Shi, J. Triesch, PNAS. (doi.org/10.1073/pnas.1908100117)

2015 "The Fisher Information as a Neural Guiding Principle for Independent Component Analysis,"
R. Echeveste, S. Eckmann, C. Gros, Entropy. (doi.org/10.3390/e17063838)

GRANTS & AWARDS

03|2023 **Royal Society Newton International Fellowship**
Personal grant by The Royal Society to study "Inhibition stabilized hippocampal circuits."
To be held for two years at the University of Cambridge.

03|2022 **NAISYS Travel Award**
Granted in support of attending the NAISYS conference 2022 in Cold Spring Harbour, NY, USA.

06|2019 **C3N Summer School**
"Cellular, Computational and Cognitive Neuroscience," Princeton, New Jersey, USA.

02|2019 **COSYNE Travel Award**
Granted to attend the COSYNE conference 2019 in Lisbon, Portugal.

08|2018 **Logistics of Neuronal Function Summer School**
"Giersch International Symposium & Summer School," Frankfurt, Germany.

09|2016 **Visual Neuroscience Summer School**
"From Spikes to Awareness," Schloss Rauischholzhausen, Germany.

09|2014 **Goethe University Strategic Partnership Program**
Scholarship granted by the German Academic Exchange Service (DAAD) to study one term in the UK.

INVITED TALKS

03|2024 Champalimaud Centre for the Unknown
"Top-down modulated surround suppression," Lisbon, Portugal. Hosted by Leopoldo Petreanu

10|2021 Search Symposium, Cognitive Science Department Osnabrück, Germany
"Computation and learning in biological neural networks," Osnabrück, Germany.

05|2021 Bernstein SmartSteps Seminar Series
"A theory for Hebbian Learning in recurrent E-I networks," online.

12|2020 Computational and Biological Learning Lab, Department of Engineering, Cambridge
"A theory for Hebbian Learning in recurrent E-I networks," Cambridge, UK.

11|2020 sinc(i) – Research Institute for Signals, Systems and Computational Intelligence, Institute Seminar
"A theory for Hebbian Learning in recurrent E-I networks," Santa Fe, Argentina.

09|2020 Max Planck Institute for Brain Research, Institute Seminar
"A theory for Hebbian Learning in recurrent E-I networks," Frankfurt am Main, Germany.

08|2018 Computational and Mathematical Models in Vision, Conference Talk
"An active efficient coding model of the development of amblyopia," St. Pete Beach, Florida, USA.

CONFERENCE CONTRIBUTIONS

02|2024 COSYNE - Computational and Systems Neuroscience Conference
"Inhibition-stabilized supralinear memory ensembles"
S. Eckmann, Y. Ahmadian, M, Lengyel. Lisbon, Portugal.

02|2023 COSYNE - Computational and Systems Neuroscience Conference
"Input-dominated Hebbian learning enables image-computable E-I networks,"
S. Eckmann, Y. Ahmadian, M, Lengyel. Montreal, Canada.

08|2022 EVCM - European Visual Cortex Meeting
"Synapse-type-specific competitive Hebbian learning forms functional recurrent networks,"
S. Eckmann, J. Gjorgjieva. Seeon, Germany.

04|2022 NAISYS - From Neuroscience to Artificially Intelligent Systems
"Unsupervised competitive Hebbian learning explains the emergence of functional recurrent E-I networks," S. Eckmann, J. Gjorgjieva. Cold Spring Harbor, New York, USA.

02|2021 COSYNE - Computational and Systems Neuroscience Conference
"A theory for Hebbian plasticity in recurrent E-I networks,"
S. Eckmann, J. Gjorgjieva. Online.

09|2020 Bernstein Computational Neuroscience Conference
"Hebbian learning of stable receptive fields in recurrent E-I networks,"
S. Eckmann, J. Gjorgjieva. Online. (doi.org/10.12751/nncn.bc2020.0077)

02|2019 COSYNE - Computational and Systems Neuroscience Conference
"Stable memories despite large spontaneous synaptic fluctuations,"
S. Eckmann, S. S. Jhutty, J. Triesch. Lisbon, Portugal.

08|2018 ECVP - European Conference on Visual Perception
"A computational model of the development and treatment of anisometropic amblyopia,"
S. Eckmann, L. Klimmasch, B. E. Shi, J. Triesch. Triest, Italy.

05|2018 VSS - Vision Science Society Annual Conference
"A model of the development of anisometropic amblyopia through recruitment of interocular suppression," S. Eckmann, L. Klimmasch, B. E. Shi, J. Triesch. St. Pete Beach, Florida, USA.

05|2017 **VSS - Vision Science Society Annual Conference**
"A computational model for the joint development of accommodation and vergence control,"
J. Triesch, S. Eckmann, and B. E. Shi. St. Pete Beach, Florida, USA.

07|2015 **CNS - Annual Computational Neuroscience Meeting**
"Should Hebbian learning be selective for negative excess kurtosis?"
C. Gros, S. Eckmann, and R. Echeveste. Prague, Czech Republic.

06|2015 **EITN - European Institute for Theoretical Neuroscience Workshop on Learning and Plasticity**
"An Objective Function for Hebbian self-stabilizing Plasticity Rules,"
R. Echeveste, S. Eckmann, and C. Gros. Paris, France.

05|2015 **OCCAM - Osnabrück Computational Cognition Alliance Meeting**
"From Stationarity to ICA: an Objective Function for Hebbian self-stabilizing Plasticity Rules,"
R. Echeveste, S. Eckmann, and C. Gros. Osnabrück, Germany.

TEACHING EXPERIENCE

2023/24 **Teaching Assistant in Computational Neuroscience** (Graduate level)
Grading of midterm papers on "The asynchronous & irregular state of cortical circuits."

2017 **Teaching Assistant in Theoretical Neuroscience** (Graduate level)
Conducting accompanying tutorials based on the text book "Theoretical Neuroscience" (Dayan & Abbot). Design, correction and presentation of excercises. Grading of final exams.

2013 **Teaching Assistant in Theoretical Physics** (Undergraduate level)
Conducting tutoriums in theoretical electrodynamics. Presentation of excercises. Grading of final exams.

MENTORING

2024 **Rebeca Ianov Vitanov** (PhD Thesis)
„Functional models of cortical circuits"

2023 **Edward James Young** (PhD Thesis)
„Homeostatic scaling in recurrent neural networks"

2023 **Mete Hergul** (Thesis)
„Normalization in recurrent neural networks"

2022 **Abraham Alsawaf** (Thesis - afterwards MD student)
„Homeostatic scaling in recurrent E-I networks."

2019 **Nils Möbus** (Thesis)
„An introduction to Principle Component Analysis."

2019 **Suneet Singh Jhutty** (Thesis – afterwards PhD student with Prof. Esteban Hernandez-Vargas)
„Neuronal balance through homeostatic mechanisms on different timescales."

2018 **Marius Vieth** (Internship – afterwards PhD student with Prof. Jochen Triesch)
„Synaptic lifetimes in recurrent neural networks."

SERVICE & LEADERSHIP

2023/24 Reviewer for COSYNE 2023 & 2024

2023 COSYNE workshop organiser: "Shaping circuit functions via plastic and diverse inhibition."

2021 Co-initiator of the cross-disciplinary initiative "Learning in Spiking Neural Networks" at Goethe University.

2018 Initiator and organiser of the "Computational Neuroscience Journal Club" at FIAS.