Ali Özgür **Argunşah, Ph.D.**

Neuroscientist · Engineer

Eggbühlstrasse 20, 8050 Zürich - SWITZERLAND

+41784011868 | aliozgur.argunsah@gmail.com | argunsah | ali-Özgür-argunşah | argunsah | @aoargunsah | Publications

Summary

I have a background in biomedical engineering with a focus on biomedical instrumentation. During my master's studies, I transitioned from circuit design to developing machine learning algorithms for analyzing EEG-based brain-computer interfaces. For my Ph.D., I shifted my focus to biology and investigated synaptic plasticity, specifically exploring the effects of naturalistic activity patterns on individual dendritic spines. Currently, I'm a research scientist specializing in developmental neuroscience, where I explore the biological foundations of neural circuit formation.

Research Experience

Department of Molecular Biology and Genetics, Kadir Has University — *Istanbul, Turkiye*

Visiting Scholar — *Jan. 2023 - Current*

Brain Research Institute (HiFo), University of Zürich — *Zürich, Switzerland*

Oberassistent — *Sep. 2022 - Current*

Brain Research Institute (HiFo), University of Zürich — *Zürich, Switzerland*

Postdoc — *Sep. 2016 - Sep. 2022*

Neuroscience Statistics Research Laboratory, Massachusetts General Hospital — *Massachusetts, USA*

Visiting Researcher — *Aug. 2007 - Jan. 2008*

Education

Champalimaud Neuroscience Programme — *Lisbon, Portugal*

Ph.D. Biology | Neuroscience — *Sep. 2009 - Jul. 2016*

- **Thesis Title:** Activity Dynamics Lead to Diverse Structural Plasticity at Single Dendritic Spines.
- **Thesis Summary:** Inducing synaptic plasticity at single dendritic spines using two-photon glutamate uncaging and structural imaging to study activity-dependent structural long-term plasticity of CA1 neurons in mice hippocampus.
- **PhD Advisor:** Dr. Inbal Israely

Riken Brain Science Institute — *Wako, Saitama, Japan.*

Riken Summer School — *July. 2012 - Aug. 2012*

- **Project:**I performed in-vivo ephys recordings using self-made tetrodes from freely moving mice.
- **Supervisor:** Dr. Thomas J. McHugh

Sabancı University — *Istanbul, Turkey*

M.S. Electronics Engineering and Computer Science — *Jan. 2006 - Aug. 2009*

- **Thesis Title:** An HMM-PCA Approach for EEG-Based Brain-Computer Interfaces.
- **Thesis Summary:** Developed machine learning algorithms for the classification of EEG data for brain-computer interface applications.
- **MS Advisor:** Dr. Mujdat Cetin

University of São Paulo — *Ribeirão Preto, SP, Brazil*

Latin American School on Computational Neuroscience — *June. 2008 - Aug. 2008*

- The school was three weeks long and covered the following topics: biophysically detailed single neuron models; simplified neuron models; neural network models; synaptic plasticity and memory models; and biochemical modeling. These models were illustrated with the use of programs NEURON, GENESIS, neuroConstruct, XPP-AUTO and Matlab. The faculty was composed of an international team of world-renowned researchers in the field of computational neuroscience.

Başkent University — *Ankara, Turkey*

B.S. Biomedical Engineering — *Sep. 1999 - Jun. 2004*

- **Senior Project:** Design and Implementation of a Mobile EEG Acquisition System.
- **Project Summary:** Designed a mobile two-channel EEG amplifier coupled with a data recording and visualisation interface using Palm PDA.

Journal Papers

In Prep. **Progressive engagement of SST+ interneurons via Elfn1 regulates the barrel-septa response deviation**,
Argunsah, A.Ö.,Stachniak T.J.E., Yang J.W.,...,Karayannis T.

In Prep. **Cajal Retzius Neurons from Multiple Ontogenetic Origins Contribute to Circuit Dynamics within the Early Postnatal Primary Sensory Cortex Based on their Distinct Subtype Identities.**,
Hanley O., **Argunsah, A.Ö.**, Marinescu A.M,..., Karayannis T.

1^{st} Revision **Developmental Cajal-Retzius cell death contributes to the maturation of cortical inhibition and somatosensory processing**, Damilou, A., Cai, L., **Argunsah, A.Ö.**,..., Karayannis T.,
Nature Communications

4^{th} Revision **Presynaptic kainate receptors onto somatostatin interneurons are recruited by activity throughout development and contribute to cortical sensory adaptation**,
Stachniak T.J.E., **Argunsah, A.Ö.**, Yang J.W., Karayannis T.
Journal of Neuroscience

2023 **Homosynaptic plasticity induction causes heterosynaptic changes at the unstimulated neighbors in an induction pattern and location-specific manner**,
Argunsah, A.Ö., Israely, I.
Frontiers in Cellular Neuroscience, Accepted.

2023 **The temporal pattern of synaptic activation determines the longevity of structural plasticity at dendritic spines**,
Argunsah, A.Ö., Israely, I.,
iScience, Volume 26, Issue 6, 2023, 106835, ISSN 2589-0042, https://doi.org/10.1016/j.isci.2023.106835.

2022 **Sparse postnatal labeling and quantification of superficial cortical cell synapses in the mouse neocortex.**,
Gesuita L.*, **Argunsah, A.Ö.***, Karayannis T.,
STAR Protocols, 3(4), p.101837.

2022 **An interactive time series analysis software for dendritic spines**,
Argunsah, A.Ö.*, Erdil E.*, Ghani M.U., Ramiro-Cortes Y., Hobbiss A., Karayannis T., Cetin, M., Israely I., Unay D.,
Scientific Reports 12, 12405 (2022). https://doi.org/10.1038/s41598-022-16137-y

2022 **Microglia contribute to the postnatal development of cortical SST+ inhibitory cells and to whisker-evoked cortical activity**,
Gesuita, L., Cavaccini, A., **Argunsah, A.Ö.**, Favuzzi, A.E., Ibrahim, L.A., Stachniak, T., Gennaro, M., Utz, S., Greter, M., Karayannis, T.,
Cell reports, 40(7), p.111209.

2021 **Post-mitotic Prox1 expression controls the final specification of cortical VIP interneuron subtypes**,
Stachniak T.J.*, Kaestli R.*, Hanley O., **Argunsah, A.Ö.**, Karayannis, T.,
Journal of Neuroscience 11 August 2021, JN-RM-1021-21; DOI: 10.1523/JNEUROSCI.1021-21.2021

2020 **Developmental Divergence of Sensory Stimulus Representation in Cortical Interneurons**,
Kaestli R.*, Vighagen R.*, Bourg, A.*, **Argunsah, A.Ö.***, Iqbal, A., Voigt, F., Kirschenbaum, D., Aguzzi, A., Helmchen, F., Karayannis, T.,
Nature Communications 11, no. 1 (2020): 1-14.

2018 **Tracking-assisted Detection of Dendritic Spines in Time-Lapse Microscopic Images**,
Rada L., Kilic, B., Erdil, E., Ramiro-Cortés, Y., Israely I., Unay D., Cetin, M., **Argunsah, A.Ö.**.,
Neuroscience, 394, 189-205.

2017 **Nonparametric joint shape and feature priors for image segmentation**,
Erdil E., Ghani M.U., Rada, L., **Argunsah, A.Ö.**, Unay D., Tasdizen T., Cetin, M.,
IEEE Transactions on Image Processing, 26 (11), 5312-5323.

2017 **Dendritic Spine Classification using Shape and Appearance Features based on Two-Photon Microscopy**,
Ghani M.U., Mesadi F., Kanik S.D., **Argunsah, A.Ö.**, Hobbiss A.F., Israely I., Unay D., Tasdizen T., Cetin, M.,
Journal of Neuroscience Methods, Volume 279, Pages 13-21, doi.org/10.1016/j.jneumeth.2016.12.006.

Selected Conference Proceedings (Peer Reviewed)

2022 **Enhancing Two-Photon Images for Anatomical Visualisation using Super-Resolution**,
Aydeniz B., Metin S.C., Unay D., Karayannis, T., Turkan M., **Argunsah, A.Ö.**,
Medical Technologies Congress (TIPTEKNO), pp. 1-4, doi: 10.1109/TIPTEKNO56568.2022.9960191.

2019 **Combining nonparametric spatial context priors with nonparametric shape priors for dendritic spine segmentation in 2-photon microscopy images**,
Erdil E., **Argunsah, A.Ö.**, Tasdizen T., Unay D., Cetin, M.,
IEEE 16th International Symposium on Biomedical Imaging (ISBI), pp. 204-207, doi: 10.1109/ISBI.2019.8759273.

2016 **Dendritic Spine Shape Analysis: A Clustering Perspective**,
Ghani M.U., Erdil E., Kanik S.D., **Argunsah, A.Ö.**, Hobbiss A.F., Israely I., Unay D., Tasdizen T., Cetin, M.,
Lecture Notes in Computer Science, vol 9913. Springer, Cham.

2016 **Nonparametric joint shape and feature priors for segmentation of dendritic spines**,
Erdil E., Rada L., **Argunsah, A.Ö.**, Israely, I., Unay D., Tasdizen T., Cetin, M.,
IEEE 13th International Symposium on Biomedical Imaging (ISBI), pp. 343-346, doi: 10.1109/ISBI.2016.7493279.

2016 **On comparison of manifold learning techniques for dendritic spine classification**,
Ghani M.U., **Argunsah, A.Ö.**, Israely I., Unay D., Tasdizen T., Cetin, M.,
IEEE 13th International Symposium on Biomedical Imaging (ISBI), pp. 339-342, doi: 10.1109/ISBI.2016.7493278.

2015 **A joint classification and segmentation approach for dendritic spine segmentation in 2-photon microscopy images**,
Erdil E., **Argunsah, A.O.**, Tasdizen T., Unay D., Cetin, M.,
IEEE 12th International Symposium on Biomedical Imaging (ISBI), pp. 797-800, doi: 10.1109/ISBI.2015.7163992.

2014 **Automatic dendritic spine detection using multiscale dot enhancement filters and sift features**,
Rada L., Erdil E., **Argunsah, A.Ö.**, Unay D., Cetin, M.,
Image Processing (ICIP), IEEE International Conference on Image Processing (ICIP), Paris, France, pp. 26-30, doi: 10.1109/ICIP.2014.7025004

2012 **A tool for automatic dendritic spine detection and analysis. Part I: Dendritic spine detection using multi-level region-based segmentation**,
Erdil, E., Yagci A.M., **Argunsah, A.Ö.**, Ramiro-Cortes Y., Hobbiss A.F., Israely, I., Unay, D.,
International Conference on Image Processing Theory, Tools and Applications (IPTA), Istanbul, Turkey, pp. 167-171, doi: 10.1109/IPTA.2012.6469558

2010 **AR-PCA-HMM approach for sensorimotor task classification in EEG-based brain-computer interfaces,**,
Argunsah, A.Ö., Cetin, M., 20th International Conference on Pattern Recognition, Istanbul, Turkey, pp. 113-116, doi: 10.1109/ICPR.2010.36.

2007 **Comparison of Different Feature Extraction Methods on Classification of Gene Expression Data**,
Argunsah, A.Ö. , Akan, B., Ercil, A., Sezerman, U.,
IEEE 15th Signal Processing and Communications Applications, Eskisehir, Turkey, pp. 1-4, doi: 10.1109/SIU.2007.4298706

2007 **A human-computer interface (HCI) based on electrooculogram (EOG) for handicapped,**,
Akan B., **Argunsah, A.Ö.**, IEEE 15th Signal Processing and Communications Applications, Eskisehir, Turkey, 2007, pp. 1-3, doi: 10.1109/SIU.2007.4298649

2004 **Mobile EEG Acquisition System,**,
Argunsah, A.Ö., Yagcioglu S., Erogul O., Duman F., Proceedings of BIYOMUT 2004, Biomedical Engineering National Meeting, Istanbul, Turkey

Grants, Scholarships & Awards

Grants

2014-2017	**Probabilistic and Machine Learning-based Methods for Automatic Dendritic Spine Segmentation, Classification, and Tracking in Two-Photon Microscopy Images**, TÜBITAK (Scientific and Technological Research Council of Turkey), Turkey	*345K TRY (165K USD)*
2010-2013	**Hippocampal Synaptic Plasticity Induced by Natural Spike Trains**, FCT (Foundation for Science and Technology), Portugal	*44K Euro (59K USD)*
2007-2010	**Development of Electroencephalography (EEG) Signal Analysis Techniques for Brain Computer Interface (BCI) Systems**, TÜBITAK (Scientific and Technological Research Council of Turkey), Turkey	*360K TRY (250K USD)*

Scholarships & Awards

2023	**Best Presentation**, Turkish Neuroscience Ccnference, Bolu, Turkey	-
2014-2016	**Ph.D. Fellowship**, Champalimaud Foundation, Portugal	*Salary*
2012	**Travel Grant**, RIKEN BSI Summer School, Japan	*Flight+Acc.*
2006	**BAD-Wyeth Travel and Education Scholarship**, Brain Research Society, Turkey	*3500 TRY (2500 USD)*
2004	**One of Best 50 Graduation Projects of the Year**, Interpro Weekly Information Systems Journal, Turkey	-
2004	**Best Poster Award**, National Biophysics Congress, Turkey	-

Scientific Activities

2023-Current	**Review Editor**, Frontiers in Neuroinformatics.	-
-	**Reviewer**, Communications Biology, PloS one., PloS Computational Biology, IEEE transactions on medical imaging, Computer methods in biomechanics and biomedical engineering	-

Extracurricular Activity

Member of Working Group on Flight Emissions — *University of Zurich*

Faculty of Medicine — *2018*

- The University Management has decided a reduction of 40 percent of carbon emission caused through flights by university staff compared to 2018/19 followed by an annual decrease of 3% until 2030. Faculties are to develop and propose suitable measures until June 2022.

Neuronal Circuit Assembly Lab., Brain Research Institute — *University of Zurich*

Deputy study director of animal experimentation. — *Jan. 2022 - Jan. 2026*

- Coordination of Experimental Procedures

Postdoctoral Representative of Faculty of Medicine — *University of Zurich*

Association of Junior Researchers — *Sep. 2020 - Sep. 2022*

Member of Faculty Hiring Committee — *University of Zurich and ETH Zurich*

Institute of Neuroinformatics — *2018*

- Postdoctoral Representative of Hiring Committee

Co-Organizer — *Sesimbra/Lisbon, Portugal*

European Neuroscience Conference by Doctoral Students — *2015*

- One of the three organizers of the second edition of the ENCODS, hosted 80 students and 8 faculty, supported by Google, Boehringer Ingelheim, Gatsby Foundation, FENS, IBRO, Roche