Alessio Paolo Buccino

Electrophysiology Data Engineer
Scientific Consultant
Open-source Software Developer

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Professional Experience

Mar 2022–present	Electrophysiology Pipeline Development Engineer at Allen Institute for Neural Dynamics
	Development of cloud-based efficient pipelines for the analysis of large-scale electrophysiology data
Jul 2020–present	Neurodata Scientist Consultant (5 hr/week) at CatalystNeuro
	Collaboration with academic institutions to standardize analysis and storage of neuroscientific data

Academic Positions

Mar 2020–Feb 2022	ETH Postdoctoral Fellow, Bio Engineering Lab (Prof. Hierlemann)
	Project Title: “Multi-modal intracellular and extracellular modeling and investigation of neuronal single-cell dynamics”
Dec 2019–Mar 2020	Researcher, University of Oslo

Education

Dec 2015– Jan 2020	SUURPh Ph.D. program, Center for Intrgrative Neuroplasticity (CINPLA), University of Oslo
(Aug 2017–Aug 2018)	Exchange (1 year), University of California in San Diego (UCSD)
	Thesis Title: "A computationally-assisted approach to extracellular neural electrophysiology with multi-electrode arrays"
	Supervisors: Philipp Häfliger (UiO), Marianne Fyhn (UiO), Gaute Einevoll (NMBU), and Gert Cauwenberghs (UCSD)
Sep 2013– Sep 2015	M.Sc., Biomedical Engineering & Computer Science, Polytechnic University of Milan & University of Houston (Atlantis double degree program)
Sep 2010– Jul 2013	B.Sc., Biomedical Engineering, Polytechnic University of Milan

Teaching

2016	TA – INF5460 – Electrical noise	University of Oslo
2018	TA – IN5230 – Electrical noise	University of Oslo
2018	Guest Lecturer, Cognitive Psychology	University of San Diego
2020	TA – Lab practicals - Neural Data Analysis	ETH Zurich
2020	Project Mentor	Neuromatch Academy
2021	Guest Lecturer, Systems Neuroscience	Mount Holyoke College
2021	TA – Lab practicals - Neural Data Analysis	ETH Zurich

Supervision

2018-2019	Can Hicabi Tartanoglu, Master	Dept. of Biosciences, University of Oslo
2018-2019	Dejana Mitrovic, Master	Dept. of Biosciences, University of Oslo
2020-2021	Payam Sadeghi, Master	Dept. BSSE, ETH Zurich
2020-2022	Xiaohan Xue, PhD	Dept. BSSE, ETH Zurich
2021-2022	Mattia Randazzo, Master	Dept. BSSE, ETH Zurich

Selected Honours and Awards

2020	ETH Personal Postdoctoral Fellowship (230 kCHF)
2018	Finalist of 1st EPFL Engineering PhD summit
2014	Atlantis CRISP double degree program (12,000€)
2011	Best freshmen of the year - Polytechnic University of Milano (1,500€)

Certificates and International Courses

2016	Experimental Animal Studies (FELASA-C)	University of Oslo
2016	Summer School in Computational Physiology	Simula - UCSD
2017	G-Node Advanced Neural Data Analysis	Jülich Research Center
2019	Neuropixels course	UCL

Organization of international meetings

2019	Spike Sorting and Reproducibility for Next Generation Electrophysiology (SSNGE) (Co-organizer)	University of Edinburgh
2022	Spike Sorting Hackathon Hybrid Event (https://catalystneuro.github.io/spike-sorting-hackathon/) (Co-organizer)	Flatiron Institute - New York City

Revision activity for scientific journals

Journal of Neuroscience Methods, Neuroinformatics, Journal of Neural Engineering, IEEE Transactions on Biomedical Engineering, IEEE Transactions on Cognitive and Developmental Systems, IEEE Transactions on Biomedical Circuits and Systems, Frontiers in Computational Neuroscience, Frontiers in Neuroinformatics, Frontiers in Neuroscience, Neural Networks, Cognitive Neurodynamics, iScience, HardwareX

Publications

Journal papers

[1] **Buccino AP**, Garcia S & Yger P (2022). Spike sorting: new trends and challenges of the era of high-density probes. *Progress in Biomedical Engineering*.
DOI: https://doi.org/10.1088/2516-1091/ac6b96

[2] **Buccino AP**, Yuan X, Emmenegger V, Xue X, Gänswein T, & Hierlemann A (2022). An automated method for precise axon reconstruction from recordings of high-density micro-electrode arrays. *Journal of Neural Engineering*.
DOI: https://doi.org/10.1088/1741-2552/ac59a2

[3] Garcia S, Sprenger J, Holtzman T & **Buccino AP** (2022). ProbeInterface: a unified framework for probe handling in extracellular electrophysiology. *Frontiers in Neuroinformatics*.
DOI: https://doi.org/10.3389/fninf.2022.823056

[4] Lepperød M, Christensen AC, Lensø KL, **Buccino AP**, Yu J, Fyhn M & Hafting T (2021). Optogenetic pacing of medial septum parvalbumin-positive cells disrupts temporal but not spatial firing in grid cells. *Science Advances*.
DOI: https://doi.org/10.1126/sciadv.abd5684

[5] Ronchi S, **Buccino AP**, Prack G, Kumar SS, Schröter M, Fiscella M, & Hierlemann A (2021). Electrophysiological phenotype characterization of human iPSC-derived neuronal cell lines by means of high-density microelectrode Arrays. *Advanced Biology*.
DOI: https://doi.org/10.1002/adbi.202000223

[6] **Buccino AP***, Hurwitz CL*, Magland J, Garcia S, Siegle JH, Hurwitz R, & Hennig MH (2020). SpikeInterface, a unified framework for spike sorting. *eLife*.
DOI: https://doi.org/10.7554/eLife.61834

[7] Magland J, Jun JJ, Lovero E, Morley AJ, Hurwitz CL, **Buccino AP**, Garcia S, & Barnett AH (2020). SpikeForest: reproducible web-facing ground-truth validation of automated neural spike sorters. *eLife*.
DOI: https://doi.org/10.7554/eLife.55167

[8] **Buccino AP** & Einevoll GT (2020). MEArec: a fast and customizable testbench simulator for ground-truth extracellular spiking activity. *Neuroinformatics*.
DOI: https://doi.org/10.1007/s12021-020-09467-7

[9] Lepperød M, Dragly SA, **Buccino AP**, Mobarhan MH, Malthe-Sørenssen A, Hafting T, & Fyhn M (2020). Experimental Pipeline (Expipe): A Lightweight Data Management Platform to Simplify the Steps From Experiment to Data Analysis. *Frontiers in Neuroinformatics*.
DOI: https://doi.org/10.3389/fninf.2020.00030

[10] **Buccino AP**, Kutcha M, Jæger KH, Ness TV, Berthet P, Mardal KA, Cauwenberghs G, & Tveito A (2018). How does the presence of neural probes affect extracellular potentials? *Journal of Neural Engineering*.
DOI: https://doi.org/10.1088/1741-2552/ab03a1

[11] **Buccino AP**, Lepperød M, Dragly SA, Häfliger P, Fyhn M, & Hafting T (2018). Open source modules for tracking animal behavior and closed-loop stimulation based on Open Ephys and Bonsai. *Journal of Neural Engineering*.
DOI: https://doi.org/10.1088/1741-2552/aacf45

[12] **Buccino AP***, Kordovan M*, Ness TV, Merkt B, Häfliger P, Fyhn M, Cauwenberghs G, Rotter S & Einevoll G (2018). Combining biophysical modeling and deep learning for multielectrode array neuron localization and classification. *Journal of Neurophysiology*.
DOI: https://doi.org/10.1152/jn.00210.2018

[13] **Buccino AP**, Keles HO, & Omurtag A (2016). Hybrid EEG-fNIRS asynchronous Brain-Computer Interface for multiple motor tasks. *PLoS ONE*.
DOI: https://doi.org/10.1371/journal.pone.0146610

Preprints

[1] Xue X*, **Buccino AP***, Kumar SS, Hierlemann A & Bartram J (2022). Inferring monosynaptic connections from paired dendritic spine Ca2+ imaging and large-scale recording of extracellular spiking. *biorXiv*.
DOI: **https://doi.org/10.1101/2021.06.12.448051**

[2] Garcia S, **Buccino AP** & Yger P (2021). How do spike collisions affect spike sorting performance? *biorXiv*.
DOI: https://doi.org/10.1101/2021.11.29.470450

[3] Sharf T, van der Molen T, Glasauer SMK, Guzman E, **Buccino AP**, Luna G, Cheng Z, Audouard M, Ranasinghe KG, Kudo K, Nagarajan SS, Tovar KR, Petzold LR, Hierlemann A, Hansma PK, & Kosik KS (2021). Human brain organoid networks. *biorXiv*.
DOI: https://doi.org/10.1101/2021.01.28.428643

Conference papers

[1] Sadeghi PS, **Buccino AP**, Kumar SS, Pedrocchi A & Hierlemann A (2021). A modulated template-matching approach to improve spike sorting of bursting neurons. In: *Biomedical Circuits and Systems Conference* (BioCAS), 2021 IEEE.
DOI: https://doi.org/10.1109/BioCAS49922.2021.9644995

[2] Wang J, Liu R, Tchoe Y, **Buccino AP**, Paul A, D'Antonio-Chronowska A, Frazer KA, Kim C, Dayeh S, & Cauwenberghs G (2021). Low-Power 256-Channel Nanowire Electrode-on-Chip Neural Interface for Intracellular Electrophysiology. In: *Biomedical Circuits and Systems Conference* (BioCAS), 2021 IEEE.
DOI: https://doi.org/10.1109/BioCAS49922.2021.9645036

[3] Hurwitz CL, Xu K, Srivastava A, **Buccino AP**, & Hennig MH (2019). Scalable Spike Source Localization in Extracellular Recordings using Amortized Variational Inference. In: *Advances*

in Neural Information Processing Systems. bioRxiv (preprint).
DOI: https://doi.org/10.1101/656389

[4] **Buccino AP**, Hsu SH & Cauwenberghs G (2018). Real-Time Spike Sorting for Multi-Electrode Arrays with Online Independent Component Analysis. In: *Biomedical Circuits and Systems Conference* (BioCAS), 2018 IEEE.
DOI: https://doi.org/10.1109/BIOCAS.2018.8584797

[5] **Buccino AP**, Hagen E, Einevoll GT, Häfliger P, & Cauwenberghs G. (2018, July). Independent Component Analysis for Fully Automated Multi-Electrode Array Spike Sorting. In: *Engineering in Medicine and Biology Society* (EMBC), 2018 IEEE.
DOI: https://doi.org/10.1109/EMBC.2018.8512788

[6] **Buccino AP**, Ness TV, Einevoll GT, Cauwenberghs G, & Häfliger P. (2018). A deep learning approach for the classification of neuronal cell types. In: *Engineering in Medicine and Biology Society* (EMBC), 2018 IEEE.
DOI: https://doi.org/10.1109/EMBC.2018.8512498

[7] **Buccino AP**, Ness TV, Einevoll GT, Cauwenberghs G, & Häfliger P. (2017). Localizing neuronal somata from Multi-Electrode Array in-vivo recordings using deep learning. In: *Engineering in Medicine and Biology Society* (EMBC), 2017.
DOI: https://doi.org/10.1109/EMBC.2017.8036988

[8] **Buccino AP**, Stöber T, Næss S, Cauwenberghs G & Häfliger P (2016). Extracellular single neuron stimulation with high-density multi-electrode array. In: *Biomedical Circuits and Systems Conference* (BioCAS), 2016 IEEE.
DOI: https://doi.org/10.1109/BioCAS.2016.7833846

Book Chapters

[1] **Buccino AP**, Kutcha M, Schreiner J, Mardal KA, & Tveito A. (2020). Chapter 7: Improving Neural Simulations with the EMI Model. *Modeling Excitable Tissue. Simula SpringerBriefs on Computing (2020)*
DOI: https://doi.org/10.1007/978-3-030-61157-6_7.

[2] Akinin A, Paul A, Wang J, **Buccino AP**, & Cauwenberghs G. (2020). Chapter 2: Biopotential Measurements and Electrodes. *Neural Engineering. Springer (2020)*
DOI: https://doi.org/10.1007/978-3-030-43395-6_2.

Theses and dissertations

[1] **Buccino AP**. (2020) PhD thesis. A computationally-assisted approach to extracellular neural electrophysiology with multi-electrode arrays. PhD Dissertation. University of Oslo. Online at https://www.duo.uio.no/handle/10852/72480

[2] **Buccino AP**. (2015) Master thesis. Development of a hybrid EEG-NIRS brain computer interface for multiple motor tasks. M.Sc. Dissertation. Polytechnic University of Milan. Online at https://www.politesi.polimi.it/handle/10589/112424

[3] **Buccino AP**. (2013) Bachelor thesis. MYOCONTROL - Development of an EMG controller for a 3-Degree-Of-Freedom Robotic Platform. Polytechnic University of Milan.

Posters

[1] **Buccino AP**, Kutcha M, Horgmo KJ, Ness TV, Cauwenberghs G, Mardal KA, & Tveito A. (2018, November). Can the presence of neural probes be neglected in computational modeling of extracellular potentials?. Society for Neuroscience (SfN) 2018, San Diego, USA.

[2] **Buccino AP**, Ness TV, Einevoll GT, Hafting T, Fyhn M, Cauwenberghs G, & Häfliger P. (2017, November). Classification of Neural Cell-types from Extracellular Signatures on Multi-Electrode Arrays using Deep Learning. Society for Neuroscience (SfN) 2017, Washington DC, USA.

[3] **Buccino AP**, Ness TV, Einevoll GT, Cauwenberghs G, & Häfliger P. (2017, July). Localizing neuronal somata from Multi-Electrode Array in-vivo recordings using deep learning. In: Engineering in Medicine and Biology Society (EMBC), 2017 IEEE (pp. 974-977). Jeju Island, South Korea.

[4] **Buccino AP**, Stöber T, Næss S, Cauwenberghs G & Häfliger P (2016, November). Spatial Pattern Optimization for Neural Stimulation with High-Density Multi-Electrode Arrays. Society for Neuroscience (SfN) 2016, San Diego, USA.

[5] **Buccino AP**, Stöber T, Næss S, Cauwenberghs G & Häfliger P (2016, October). Extracellular single neuron stimulation with high-density multi-electrode array. In: Biomedical Circuits and Systems Conference (BioCAS), 2016 IEEE. Shanghai, China.

Contributed Presentations and Invited Talks

[1] SpikeInterface: a unified framework for spike sorting. “Open Neuroscience - World Wide Neuro”, Virtual, 11/06/2021

[2] Spike Sorting. “Cambridge Neurotech Webinars”, Virtual, 08/04/2021

[3] SpikeInterface: a unified framework for spike sorting. “Maxwell Biosystems Webinars”, Virtual, 25/03/2021

[4] A multi-modal fitting procedure to construct biophysically detailed multicompartment models. “Neuromatch 3.0”, Virtual, 30/10/2020

[5] SpikeInterface for NWB Users. “9th NWB User Days”, Virtual, 21/09/2020

[6] SpikeInterface for NWB Users. “8th NWB User Days”, Virtual, 12/05/2020

[7] Machine Learning in Plain Italian: How it works. “From the Teaching Machines to Machine Learning”, Padua, Italy, 19/11/2019

[8] SpikeInterface: a unified framework for spike sorting. “Getting your hands-on data management workshop”, Trondheim, Norway, 07/11/2019

[9] SpikeInterface: a unified framework for spike sorting. “Norwegian Research School of Neuroscience PhD conference”, Bergen, Norway, 19/09/2019

[10] MEArec: a fast and customizable testbench simulatorfor ground-truth extracellular spiking activity. “Spike Sorting and Reproducibility for Next Generation Electrophysiology”, Edinburgh, Scotland

[11] A computationally-assisted approach to neural electrophysiology. “Blue Brain Project Seminar Series”, Geneve, Switzerland, 22/05/2019

[12] A computationally-assisted approach to neural electrophysiology. “Bersntein Center Seminar Series”, Freiburg, Germany, 16/02/2019

[13] A computationally-assisted approach to neural electrophysiology. “EPFL PhD Engineering Summit”, Lausanne, Switzerland, 08/10/2018

[14] Independent Component Analysis for Fully Automated Multi-Electrode Array Spike Sorting. “Engineering in Medicine and Biology Society (EMBC)”, Honolulu, USA, 20/07/2018

[15] A deep learning approach for the classification of neuronal cell types. “Engineering in Medicine and Biology Society (EMBC)”, Honolulu, USA, 19/07/2018

[16] A computationally-assisted approach to electrophysiology: improving neural recordings and stimulation using biophysical simulations. “UCSD INC Chalk Talk”, San Diego, US, 25/01/2018

Github accounts

- https://github.com/alejoe91
- https://github.com/SpikeInterface