Lorenzo Fontolan

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Professional Positions

CENTURI Group Leader   05/2023 - present
Aix-Marseille University, France

Research Scientist   09/2021 - 04/2023
Janelia Research Campus, HHMI

Postdoctoral Fellow   06/2015 - 08/2021
Janelia Research Campus, HHMI
Adviser: Dr. Sandro Romani

Education

Ph.D. in Neuroscience   2015
University of Geneva, Switzerland
Ecole Normale Superieure, France
Thesis title: *Encoding speech through brain rhythms*
Advisers: Prof. Boris Gutkin and Prof. Anne-Lise Giraud

M.S. in Physics   2011
Summa cum laude
La Sapienza Università di Roma, Italy
Columbia University of New York, USA
Thesis title: *Learning of hierarchical memories with binary synapses*
Advisers: Prof. Enzo Marinari and Prof. Stefano Fusi

B.S. in Physics   2007
La Sapienza Università di Roma, Italy

Prizes and Awards

Best Ph.D. Thesis in Neuroscience   2015
Amicitia Excellence Prize

Study abroad scholarship   2009
La Sapienza University of Rome

Publications

Daie K, **Fontolan L**, Druckmann S, Svoboda K (2023) *Feedforward amplification in recurrent networks underlies paradoxical neural coding.* bioRxiv 2023.08.04.552026

Majumder S, Hirokawa K, Yang Z, Paletzki R, Gerfen CR, **Fontolan L**, Romani S, Jain A, Yasuda R, Inagaki HK (2023) *Cell-type-specific plasticity shapes neocortical dynamics for motor learning.* bioRxiv 2023.08.09.552699

Inagaki HK, Chen S, Daie K, Finkelstein A, **Fontolan L**, Romani S, Svoboda K (2022) *Neural algorithms and circuits for motor planning.* Annu Rev Neurosci. 2022 Jul 8;45:249-271.

't Hart BM, [...], **Fontolan L**, et al. (2022) *Neuromatch Academy: a 3-week, online summer school in computational neuroscience.* Journal of Open Source Education, 5(49), 118.

Finkelstein* A, **Fontolan* L**, Economo M, Li N, Romani S, Svoboda K (2021) *Attractor dynamics gate cortical information flow during decision-making.* Nat Neurosci, 24, 843-850. *equal contribution*

Inagaki HK, **Fontolan L**, Romani S, Svoboda K (2019) *Discrete attractor dynamics underlying selective persistent activity in frontal cortex.* Nature, 566: 212-217.

Pefkou M, Arnal L, **Fontolan L**, Giraud AL (2017) *Theta- and beta-band neural activity reflect independent syllable tracking and intelligibility of time-compressed speech.* J Neurosci, 37: 7930-7938.

Hyafil A, Giraud AL, **Fontolan L**, Gutkin B (2015) *Neural cross-frequency coupling: From mechanisms to functions.* Trends Neurosci, 2015;38: 725-740.

Hyafil A, **Fontolan L**, Kabdebon C, Gutkin B, Giraud AL (2015) *Speech encoding by coupled cortical theta and gamma oscillations.* eLife, 10.7554/eLife.06213.

Fontolan L, Morillon B, Liegeois-Chauvel C, Giraud AL (2014) *The contribution of frequency-specific activity to hierarchical information processing in the human auditory cortex.* Nat Commun, 5(May), 4694.

Fontolan L, Krupa MP, Hyafil A, Gutkin B (2013) *Analytical insights on theta-gamma coupled neural oscillators*. J Math Neurosci, 3:16.

Book Chapters:

Fontolan L (2023) *Le Neuroscienze: uno Sguardo all'Inizio del Terzo Millennio* (Neurosciences: a look at the beginning of the third millennium). In *Alle frontiere della conoscenza dell'uomo :neuroscienze, genetica e intelligenza artificiale*. Franco Angeli Ed. (in press)

Fontolan L (2017) *Neuroscienze e libertà dell'Uomo* (Neuroscience and human free will, in Italian). In *Libera Natura Umana*. Libreriauniversitaria.it, 17-40.

Seminars and Conference Talks

Dynamic attractors shape neural activity during motor planning (2021), University of Oregon, USA; Rice University, USA.

Neural circuit dynamics underlying short-term memory in frontal cortex (2019), Brandeis University, USA; NJIT, USA; IDIBAPS Barcelona, Spain; ENS Paris, France; University of Padua, Italy.

A simple model of Theta-Gamma coupling (2015), International Conference on Mathematical Neuroscience, France.

The contribution of frequency-specific activity to hierarchical information processing in the human auditory cortex (2014), Nanosymposium at the Society for Neuroscience Annual Meeting, Washington DC, USA.

Inference with cortical rhythms in auditory cortex: the role of oscillations and predictive coding (2014), Predictive coding and oscillations workshop, Geneva, Switzerland.

The role of oscillations in auditory cortex (2012), Institut de Neurosciences de la Timone, Marseille, France.

Selected Conference Abstracts

Cascino Milani F, **Fontolan** L, Fischer S, Ache J (2022). *Electrophysiological characterization and computational modeling of insulin producing cells in Drosophila*. FENS Forum, Paris, France.

Fontolan L, Finkelstein A, Economo M, Li N, Romani S, Svoboda K (2020). *Attractor dynamics gate cortical information flow during decision-making.* CoSyNe, Denver, USA.

Fontolan L, Inagaki H, Romani S, Svoboda K (2018). *Discrete attractors underlie preparatory activity in rodent frontal cortex.* CoSyNe, Denver, USA.

Fontolan L, Inagaki H, Romani S, Svoboda K (2017). *Models for short-term memory in a motor preparation task.* Society for Neuroscience Annual Meeting, Washington DC, USA.

Fontolan L, Krupa M, Romani S, Gutkin B (2015). *A simple model of Theta-Gamma coupling.* Society for Neuroscience Annual Meeting, Chicago, USA.

Fontolan L, Morillon B, Liegeois-Chauvel C, Giraud AL (2014). *Frequency specific activity in human auditory cortex.* Gordon Research Conference on Neurobiology of Cognition, Maine, USA.

Fontolan L, Krupa M, Hyafil A, Giraud AL, Gutkin B (2013). *Dynamics of coupled theta-gamma neural oscillators.* Society for Neuroscience Annual Meeting, San Diego, USA.

Fontolan L, Liegeois-Chauvel C, Morillon B, Giraud AL (2012). *Distinct contribution of gamma and beta activity to hierarchical message-passing in auditory cortices.* 4th International Conference on Auditory Cortex. Lausanne, Switzerland.

Teaching and Mentoring

Lecturer, CENTURI Summer School *From data to biology and back*	2023
Judge, ABRCMS ePoster Spring Symposium for Emerging Scientists	2022
Mentor, 2nd Neuromatch academy school in computational neuroscience	2021
Organizer and lecturer, *Mathematical methods for neuroscience and machine learning*, Janelia Research Campus	2019
Guest Lecturer, *General Philosophy*, Catholic University of America	2018
Lecturer *Introduction to Computational Neuroscience*, American University and George Washington University	2017, 2019
Adviser, B.S. Dissertation in Physics *Isomorphism of Hopfield nets and Ising model*, La Sapienza University of Rome	2016

Other Academic and Professional activities

Board member, Opus73 Foundation – Education-oriented Data Science startup	2022
Organizer, Bernstein symposium *Control mechanisms for contextual computations and behavior*, Berlin, Germany	2021
Content Reviewer, 1st Neuromatch academy school in computational neuroscience	2020
Speaker, Venice Summer School in Computational and Theoretical Models in Neuroscience	2019
Creator, scientific exhibition on brain-inspired AI *WHAT? Machines that learn*, Rimini, Italy	2017
Attendee, Scientists Teaching Science pedagogy course (NIH, STEM Education Solutions)	2017
Attendee, Methods in Computational Neuroscience Summer School, Marine Biological Laboratory, Woods Hole, USA	2016
Co-organizer, Predictive Coding and Oscillations Workshop. Geneva, Switzerland	2014
Co-organizer, Paris Area Computational Neuroscience Day. Paris, France	2012
Intern, Radius Ventures LLC, New York City, USA	2003

Reviewed for: Nature Neuroscience; Neuron; Physical Review X; PNAS; PLOS Computational Biology, Cortex; Communications Biology; Neurons behav. data anal. theory; Computers in Biology and Medicine; Language, Cognition and Neuroscience.

Languages: Italian, English, French, Spanish.