# Valeria Fascianelli

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# Research activities and responsibilities

2020– Postdoctoral Research Scientist, Computational Neuroscience (Fusi lab), Center for ongoing Theoretical Neuroscience, Columbia University, New York, USA.

**Project 1**: Neural signatures of stress susceptibility in the statistical structure of neural states in the amygdala and hippocampus (*published in Nature*). Supervisors: Stefano Fusi and Mazen Kheirbek.

**Project 2**: Neural representational geometries reflect behavioral differences in monkeys and recurrent neural networks (*published in Nature Communications*) Supervisor: Stefano Fusi.

**Project 3**: Study of the role of the cerebellum in cognitive tasks.(pre-print on bioRxiv). *Submitted to J.Neuroscience*. Supervisors: Stefano Fusi and Michael E. Goldberg.

2019 Ph.D. visitor at Columbia University, Center for Theoretical Neuroscience, Columbia University, New York, USA. Neural decoding, geometry of neural representations, training of artificial neural networks to perform cognitive tasks.

## Education and training

- 2016-2020 Ph.D. in Neuroscience (Genovesio lab), La Sapienza University, Rome, Italy. Thesis title: The geometry of abstraction in macaque dorsolateral and orbital prefrontal cortex in a visually cued strategy task" Grade: with honors
  - 2015 **Master student visitor at CERN**, *CERN*, Geneva, Switzerland. Based constantly at CERN as expert of, and part of, the teams of people responsible for, the development and operation of the Level 1 and Level 2 trigger software of NA62 experiment.
- 2014-2016 Master of Research in Particle Physics, University of Birmingham, Birmingham, UK. Thesis title: Development of a software trigger algorithm for electron identification using the NA62 RICH Cherenkov detector Grade: with honors
- 2013-2014 Undergraduate fellow at the Italian National Laboratories of Nuclear Physics, *INFN*, Rome, Italy.

Monte Carlo simulation to study the feasibility of an exclusive search for two-body decays of Heavy Neutrinos at the NA62 experiment.

- 2012-2014 M.Sc. in Nuclear and Subnuclear Physics, University Tor Vergata, Rome, Italy. Thesis title: Search for Heavy Neutrinos at the NA62 experiment at CERN Grade: 110/110 with honors
- 2008-2011 **B.Sc. degree in Physics**, University Tor Vergata, Rome, Italy. Thesis title: Measure of the muon lifetime Grade: 110/110 with honors
  - 2008 High School Graduation at Classical Lyceum, Liceo Classico Ugo Foscolo, Albano Laziale, Rome, Italy.

Grade: 100/100

## Teaching activities and mentorship

- 2025 Invited as Teacher to Mathematical Methods in Computational Neuroscience Summer School, *Kavli Institute for Systems Neuroscience*, Eresfjord, Norway.
- 2024 Lecturer for the Advanced Neurotheory Course, Center for Theoretical Neuroscience, Columbia University, New York, USA. Lecture's title: The Geometries of Neural Representations
- 2023 Teaching assistant of Cognitive Science, Barnard College, New York, USA.
- 2023 Teaching assistant at the Methods in Computational Neuroscience summer school, Marine Biological Laboratory, Woods Hole, MA, USA.
- 2022 Teaching assistant of Cognitive Science, Barnard College, New York, USA.
- 2022 Mentor for the Summer program within the Leadership Alliance Program, Center for Theoretical Neuroscience, Columbia University, New York, USA.
- 2022 Lecturer for the Advanced Neurotheory Course, Center for Theoretical Neuroscience, Columbia University, New York, USA. Lecture's title: The geometries of Abstraction
- 2014-2015 **Teaching Assistant of Calculus**, School of Physics and Astronomy, University of Birmingham, Birmingham, UK.

## Working Experiences

- 2025 Invited as Research Visitor, Kavli Institute for Systems Neuroscience, Trondheim, Norway.
- 2025 **Invited as Co-chair of Biocomputation Session**, Mathematics of Neuroscience and AI Conference, Split, Croatia.
- 2024- Reviewer for COSYNE.
- ongoing
  - 2024- Reviewer for Journal of Neuroscience.
- ongoing
  - 2023- Reviewer for PNAS journal.
- ongoing
- 2021- Reviewer for PeerJ journal.
- ongoing
  - 2022 Organizer of the workshop at COSYNE2022. Workshop title: "Is geometry all you need?"
- 2021-2022 Organizer of the weekly Seminar at the Center for Theoretical Neuroscience,. Columbia University, New York (USA)

### Conferences

#### Neuroscience Conferences:

- 2025 Bernstein Conference, Main, Germany. Invited Speaker to the workshop "Relational Inference and knowledge composition via neuronal geometric representations"
  2025 Mathematics for Neuroscience and AI, Split, Croatia. Invited Co-Chair of the session "Neural Data"
- 2025 **COSYNE**, Montreal, Canada. Invited Speaker to the workshop: "Brain mechanisms of working memory: where do we stand?"
- 2024 AREADNE, Milos, Greece. Poster title: "Neural signatures of stress susceptibility and resilience in amygdala-hippocampal network"

- 2024 COSYNE2024, Lisbon, Portugal. Poster title: "Neural signatures of stress susceptibility and resilience in amygdala-hippocampal network"
- 2023 **COSYNE2023**, Montreal, Canada. **Poster title**: "Decoding stress susceptibility from activity in amygdala-ventral hippocampal network"
- 2022 SFN 2022, San Diego, USA. Poster title: "Neural representational geometry correlates with behavioral differences between monkeys"
- 2022 Neuronex meeting, San Diego, USA. Poster title: "Neural representational geometry correlates with behavioral differences between monkeys"
- 2022 Swartz meeting, Cold Spring Harbor Laboratory,Long Island, USA. Talk title: "Neural representational geometry correlates with behavioral differences between monkeys"
- 2022 **Tri-Center Gatsby meeting**, Hebrew University, Jerusalem, Israel. **Talk title**: "Neural representational geometry correlates with behavioral differences between monkeys"
- 2021 SFN 2021, online. Poster title: "Stimulus and response encoding in a population of Purkinje cells in Crus I and Crus II of the cerebellum during learning of a visuomotor association task"
- 2021 SFN 2021, online. Poster title: "Neural representational geometry correlates with behavioral differences between monkeys"
- 2018 Italian National Congress in Neuroscience, Ischia, Italy. Poster title: "Autocorrelation structure in the macaque dorsolateral, but not orbital or polar, prefrontal cortex predicts response-coding strength in a visually cued strategy task"
- 2017 Italian national Meeting of PhD students in Neuroscience, Naples, Italy. Poster title: "Neural intrinsic timescales in the macaque dorsal premotor cortex predict the strength of spatial response coding"

#### **Physics Conferences:**

- 2015 Collaboration meeting of the NA62 experiment at CERN, Prague, Czech Republic. Talk title: "RICH L1 trigger for dilepton decays: new studies and improvement"
- 2015 Collaboration meeting of the NA62 experiment at CERN, CERN, Geneva. Talk title: "RICH L1 trigger for dilepton decays"
- 2014 Collaboration meeting of the NA62 experiment at CERN, CERN, Geneva. Talk title: "Cross talk studies for the KTAG detector"
- 2014 Collaboration meeting of the NA62 experiment at CERN, CERN, Geneva. Talk title: "Search for Heavy Neutrinos at the NA62 experiment at CERN"

## Awards and Fellowships

- 2025 Research Fellowship at the Italian Academy in New York, New York, USA.
- 2018 "Avvio alla Ricerca" grant of Sapienza University of Rome, Sapienza University of Rome, Rome, Italy.

 ${\bf Project\ title:"} Neural\ correlates\ of\ rule\ switching\ in\ orbital\ prefrontal\ cortex"$ 

- 2018 Best Project Award at BCBT Summer School, Institute for Bioengineering of Catalonia (IBEC), Barcelona, Spain.
   Project title: "Evaluation of metacognitive abilities in an uncertain collaborative task"
- 2017 Best Poster Award at Italian National Congress in Neuroscience, Italian Society for Neuroscience, Ischia, Italy.
   Poster title: "Autocorrelation structure in the macaque dorsolateral, but not orbital or polar, prefrontal cortex predicts response-coding strength in a visually cued strategy task"

- 2017 Best Poster Award at National Meeting of PhD students in Neuroscience, Italian Society for Neuroscience, Naples, Italy.
   Poster title: "Neural intrinsic timescales in the macaque dorsal premotor cortex predict the strength of spatial response coding"
- 2013-2014 Undergraduate research fellow at the National Laboratories of Nuclear Physics, *INFN*, Rome, Italy.
- 2012-2013 First classified for the grant "Best students" as undergraduate student, University Tor Vergata, Rome, Italy.

## **—** List of Publications

#### Neuroscience publications

- 2024 F.Xia\*, V.Fascianelli\*, N.Vishwakarma, F.G.Ghinger, A.O. Kwon, M.M. Gergues, L.K. Lalani, S.Fusi, M.A. Kheirbek, Understanding the neural code of stress to control anhedonia., Nature.
  \*Equal contribution
- 2024 V.Fascianelli, A.Battista, F.Stefanini, S.Tsujimoto, A.Genovesio, S.Fusi, Neural representational geometries reflect behavioral differences in monkeys and recurrent neural networks, Nature Communications.
- 2024 A.E. Ipata\*, V.Fascianelli\*, C.I. De Zeeuw, N.Sendhilnathan, S. Fusi, M.E. Goldberg, Purkinje cells in Crus I and II encode the visual stimulus and the impending choice as monkeys learn a reinforcement based visuomotor association task, bioRxiv, Submitted to Journal of Neuroscience.
  \* equal contribution
- 2024 S.Nougaret, L.Ferrucci, F.Ceccarelli, S.Sacchetti, D.Benozzo, V.Fascianelli, R.C.Saunders, L.Renaud, A. Genovesio, Neurons in the monkey frontopolar cortex encode learning stage and goal during a fast learning task, PLoS Biology.
- 2023 F.Xia\*, V.Fascianelli\*, N.Vishwakarma, F.G.Ghinger, S.Fusi, M.A.Kheirbek, Neural signatures of stress susceptibility and resilience in the amygdala-hippocampal network, bioRxiv. \* equal contribution
- 2022 L.Ferrucci, S.Nougaret, F.Ceccarelli, S.Sacchetti, V.Fascianelli, D.Benozzo, A.Genovesio, Social monitoring of actions in the macaque frontopolar cortex, Progress in Neurobiology.
- 2021 S.Nougaret, V.Fascianelli, S.Ravel, A.Genovesio, Intrinsic timescales across the basal ganglia, Scientific Reports.
- 2020 V.Fascianelli, L.Ferrucci, S.Tsujimoto, A.Genovesio, Neural correlates of strategy switching in the macaque orbital prefrontal cortex, Journal of Neuroscience.
- 2019 V.Fascianelli, E.Marcos, S.Tsujimoto, A.Genovesio, Autocorrelation structure in the macaque dorsolateral, but not orbital or polar, prefrontal cortex predicts response-coding strength in a visually cued strategy task, Cerebral Cortex.
- 2018 **R.Cirillo\*, V.Fascianelli\*, L.Ferrucci, A.Genovesio**, Neural intrinsic timescales in the macaque dorsal premotor cortex predict the strength of spatial response coding, iScience. \* equal contribution

- 2024 EC.Gil et al., Measurement of the  $K^+ \to \pi^+ \gamma \gamma$  decay, Physics Letters B.
- 2023 EC.Gil et al., Performance of the NA62 trigger system, Journal of High Energy Physics.
- 2023 EC.Gil et al., A search for the  $K^+ \to \mu^- \nu e^+ e^+$  decay, Physics Letters B.
- 2022 EC.Gil et al., A measurement of the  $K^+ \to \pi^+ \mu^+ \mu^-$  decay, Journal of High Energy Physics.
- 2022 EC.Gil et al., Searches for lepton number violating  $K^+ \to \pi^- \pi^0 e^+ e^+$  decays, Physics Letters B.
- 2022 A.Akmete et al., *High level performance of the NA62 RICH detector*, Nuclear Intruments and Methods In Physics Research.
- 2021 **R.Aliberti et al.**, Search for Lepton Number and Flavor Violation in  $K^+$  and  $\pi^0$  Decays, Physical Review Letters.
- 2021 E.C Gil et al., Measurement of the very rare  $K^+ \to \pi^+ \nu \overline{\nu}$  decay, Journal of High Energy Physics.
- 2021 EC.Gil et al., Search for a feebly interacting particle X in the decay  $K^+ \to \pi^+ X$ , Journal of High Energy Physics.
- 2021 **F.Ambrosino et al.**, Search for Lepton Number and Flavor Violation in and Decays, Physical Review Letters.
- 2020 **EC.Gil et al.**, Search for heavy neutral lepton production in  $K^+$  decays to positrons, Physics Letters B.
- 2020 EC.Gil et al., Final performances of the NA62 RICH detector, Journal of Instrumentations.
- 2019 **EC.Gil et al.**, Search for production of an invisible dark photon in  $\pi^0$  decays, Journal of High Energy Physics.
- 2019 **EC.Gil et al.**, First search for  $K^+ \to \pi^+ \nu \overline{\nu}$  using the decay-in-flight technique, Physics Letters B.
- 2018 **R.Aliberti et al.**, Search for heavy neutral leptons at the NA62 experiment at CERN, International Journal of Modern Physics A.
- 2017 EC.Gil et al., The Beam and detector of the NA62 experiment at CERN, Journal of instrumentation.
- 2017 G.A.Rinella et al., NA62 Charged Particle Hodoscope. Design and performance in 2016 run, Journal of instrumentation.

For a complete list of all publications refer to My Google Scholar page