Demetrio Ferro

Curriculum Vitae

Personal information

Address Calle Ramon Trias Fargas, 25-27 | 08005, Barcelona, Spain.

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Website(s) d-ferro.github.io

Current position

PostDoctoral researcher

Field of Expertise: Computational & Cognitive Neuroscience, Information Theory.

I work in the group of Theoretical and Computational Neuroscience (TCN), within the Center for Brain and Computation (CBC) at the Department of Engineering of Informationand Communication Technologies (ETIC), at the University Pompeu Fabra (UPF).

Education and skills

Scientific Background Academic knowledge of cognitive neuroscience with focus on neurophysiological interactions and functional connectivity at intracortical level. General background in structural/functional neuroanatomy and physiology of cognitive neural functions.

Languages Italian : *C2*; English: *C1*; French: *B2*; Spanish: *B2* (CEFR Levels).

Software skills MATLAB, Matlab GUI, Python, Jupyter Notebook, Conda, Rstudio, Github, Microsoft Visual Studio, Eclipse IDE, CodeBlocks, Netbeans, Wireshark, Microsoft Office Suite, TexMaker, Adobe Photoshop, Adobe Illustrator, Inkscape, GNU Emacs, Vi/Vim.

Software languages MATLAB, R, Python, Ruby, JAVA, C, C++, HTML, CSS, Javascript, VHDL, SQL, BASH, LaTeX, **O.S.** Unix, Windows. **DataBase** MySQL, Oracle.

Certificates
· Coursera - Medical Neuroscience, Prof. Leonard E. White, Duke University;
· Coursera - Machine Learning, Prof. Andrew Ng, Stanford University.

Repository Data and code from published material and related tools developed: Gin G-Node.

Academic path

2016-2019 **Ph.D. Degree in Cognitive Neuroscience**,
University of Trento, Rovereto, Italy

Advisors: Prof. S. Panzeri (*Rovereto, Italy*), Prof. A. Thiele (*Univ. of Newcastle, UK*).
Thesis: Effects of attention between cortical layers and cortical areas V1 and V4

2013-2015 **M.Sc. Degree in Telecommunication Engineering**,
Polytechnic of Turin, Turin, Italy (*cum laude*)

Advisors: Prof. Guido Montorsi (*Polytechnic of Turin, Turin, Italy*),
Prof. Claude Berrou and Vincent Gripon, PhD (*Télécom Bretagne, Brest, France*).
Thesis: Nearest Neighbour Search using binary clustered Neural Networks.

2009-2013 **B.Sc. Computer Engineering Degree**,
Università degli Studi di Salerno, Fisciano, Italy

Advisors: Prof. Stefano Marano and Prof. Vincenzo Matta *(Univ. of Salerno, Fisciano, Italy)*.
Thesis: Information Flows hidden in network traffic: analysis of embedding policies.
Analytical and simulated capacity of information transfer embedded under cover traffic.

Research path

Oct 2020 current **PostDoctoral researcher - Universitat Pompeu Fabra**,
Dept. of Engineering and Information Technologies (ETIC),
Teorethical and Computational Neuroscience (TCN), Barcelona, ES.
Lab head: Prof. Rubén Moreno-Bote

Nov 2019 Aug 2020 **Internship at CNCS - Italian Institute of Technology**,
Center for Neuroscience and Cognitive Systems, Rovereto, Trento, IT
Lab head: Prof. Stefano Panzeri.

Apr 2016 Sep 2016 **Internship at CNCS - Italian Institute of Technology**,
Center for Neuroscience and Cognitive Systems, Rovereto, Trento, IT
Lab head: Prof. Stefano Panzeri.

Apr 2015 Sep 2015 **M.Sc. Thesis at NeuCod - Télécom Bretagne**,
Neural Coding group, Brest, Bretagne, France
Advisor: Prof. Claude Berrou, Co-advisor: Vincent Gripon, PhD.

Oct 2012 Mar 2013 **B.Sc. Thesis at CoRiTel - Ericsson**,
Research Consortium on Telecommunications, Fisciano, Salerno, IT
Advisors: Prof. Stefano Marano and Prof. Vincenzo Matta.

Teaching & supervising

TFG 2025 **Chair of the Bachelor Degree theses dissertations committee**,
Universitat Pompeu Fabra, June 25th 2025.

TFG 2024 **Chair of the Bachelor Degree theses dissertations committee**,
Universitat Pompeu Fabra, July 15-17th 2024.

Jan 2024 July 2024 **Thesis supervisor**, *Student: Pau Boncompte Carre*,
Universitat Pompeu Fabra, Faculty of Biomedical Engineering.

Sept 2023 Nov 2023 **Internship supervisor**, *Student: Marcel Socoró Garrigosa*,
Universitat Pompeu Fabra, Faculty of Biomedical Engineering.

July 2023 Aug 2023 **Internship supervisor**, *Student: Pau Garriga Marsans*,
Universitat Pompeu Fabra, Faculty of Biomedical Engineering.

2021-2023 **Scientific Communication**, *(2 years, 3 ECTS credits each year)*,
Universitat Pompeu Fabra, Faculty of Biomedical Engineering.

TFM 2022 **Chair of the Master Degree theses dissertations committee**,
Universitat Pompeu Fabra, July 11th 2022.

Sept 2020 Feb 2021 **Thesis supervisor**, *Student: Anna Rifé Mata*,
Universitat Pompeu Fabra, Faculty of Biomedical Engineering.

Publications

bioRxiv 2025 **D. Ferro**, H. Azab, B. Hayden and R. Moreno-Bote, "*Accumulation of virtual tokens towards a jackpot reward enhances performance and value encoding in dorsal anterior cingulate cortex*", bioRxiv 2025. DOI: 10.1101/2025.03.03.640771.

CCN 2025 **D. Ferro**, T. Yang, R. Moreno-Bote, "*A closed-loop model for the coordination of gaze control and decision-making*", Cognitive, Computational Neuroscience (CCN), 2025; PDF: CCN2025.

CCN 2025 **D. Ferro**, H. Azab, B. Y. Hayden, R. Moreno-Bote, "*Decision-making reference point biases in the dorsal anterior cingulate cortex*", CCN, 2025; PDF: CCN2025.

Nature Comm.s 2024 **D. Ferro**, T. Cash-Padgett, M. Z. Wang, B. Hayden and R. Moreno-Bote, "*Gaze-centered gating, reactivation, and reevaluation of economic value in orbitofrontal cortex*", Nature Communications, 15(6163), July 2024. DOI: 10.1038/s41467-024-50214-2.

CCN 2023 **D. Ferro**, Anna Rifé, T. Cash-Padgett, M. Z. Wang, B. Hayden and R. Moreno-Bote, "*The role of gaze for value encoding and recollection in orbitofrontal cortex*", Conference on Cognitive Computational Neuroscience, Oxford, August 2023. DOI: 10.32470/CCN.2023.1122-0.

HPB KG 2023 **D. Ferro**, B. Hayden and R. Moreno-Bote, "*Model of gaze centred activation and reactivation of value encoding in orbitofrontal cortex*", Human Brain Project Knowledge Graph, 2023.

bioRxiv 2023 **D. Ferro**, T. Cash-Padgett, M. Z. Wang, B. Hayden and R. Moreno-Bote, "*Gaze-centered gating and re-activation of value encoding in orbitofrontal cortex*", bioRxiv, April 2023. DOI: 10.1101/2023.04.20.537677.

PNAS 2021 **D. Ferro**, J. van Kempen, M. Boyd, S. Panzeri and A. Thiele, "*Directed information exchange between cortical layers in macaque V1 and V4 and its modulation by attention.*", Proceedings of the National Academy of Sciences, 118(12), March 2021. DOI: 10.1073/pnas.2022097118.

bioRxiv 2020 **D. Ferro**, J. van Kempen, M. Boyd, S. Panzeri and A. Thiele, "*Directed information exchange between cortical layers in macaque V1 and V4 and its modulation by attention.*", bioRxiv, June 2020. DOI: 10.1101/2020.06.09.142190.

IRIS 2020 **D. Ferro**, "*Effects of attention on visual processing between cortical layers and cortical areas V1 and V4.*", PhD Thesis published in Academic Institutional Research Information System (IRIS), Dec. 2019. DOI: 10.15168/11572_246290.

IJCNN 2016 **D. Ferro**, V. Gripon, and X. Jiang. "*Nearest neighbour search using binary neural networks.*", International Joint Conference on Neural Networks (IJCNN). IEEE, July 2016. DOI: 10.1109/IJCNN.2016.7727873.

Abstracts & Talks

CCN 2025 (Poster) **D. Ferro**, T. Yang, R. Moreno-Bote, "*A closed-loop model for the coordination of gaze control and decision-making*", Cognitive, Computational Neuroscience, August 2025 (Amsterdam, NL).

CCN 2025 (Poster) **D. Ferro**, H. Azab, B. Y. Hayden, R. Moreno-Bote, "*Decision-making reference point biases in the dorsal anterior cingulate cortex*", CCN 2025, August 2025 (Amsterdam, NL).

CRM 2025 (Talk) **D. Ferro**, H. Azab, B. Y. Hayden, R. Moreno-Bote, "*Accumulation of virtual tokens towards a jackpot reward enhances performance and value encoding in dorsal anterior cingulate cortex*", Centre de Recerca Matematica, April 2025 (Barcelona, ES).

UvA 2024 (Talk) **D. Ferro**, "*From attention to intention: how covert and overt gaze behavior implements the selective encoding of reward variables*", Univ. van Amsterdam, Oct. 2024 (Amsterdam, NL).

ICT 2024 (Talk) **D. Ferro**, T. Cash-Padgett, M. Z. Wang, B. Y. Hayden, R. Moreno-Bote, "*Economic decision-making in the brain: how does gaze relate to the activity of orbitofrontal cortex neurons?*", International Conference on Thinking, June 2024 (Milan, IT).

ICT 2024 (Poster) R. Moreno-Bote, **D. Ferro**, J. Ramirez-Ruiz, "*Theories of intrinsically motivated behavior: comparing Empowerment, Free Energy Principle and Maximum Occupancy Principle*", International Conference on Thinking, June 2024 (Milan, IT).

CCN 2023 (Poster) **D. Ferro**, A. Rifé-Mata, T. Cash-Padgett, M. Z. Wang, B. Y. Hayden, R. Moreno-Bote, "*The role of gaze for value encoding and recollection in orbitofrontal cortex*", Cognitive, Computational Neuroscience, August 2023 (Oxford, UK).

HBP WP2 2023 (Talk) **D. Ferro**, A. Rifé-Mata, T. Cash-Padgett, M. Z. Wang, B. Y. Hayden, R. Moreno-Bote, "*Gaze-centered gating and re-activation of value encoding in orbitofrontal cortex*", Human Brain Project (HBP) Work Package 2 (WP2) Meeting, June 2023 (Barcelona, ES).

HPB Summit 2023 (Poster) **D. Ferro**, A. Rifé-Mata, T. Cash-Padgett, M. Z. Wang, B. Y. Hayden, R. Moreno-Bote, "*Looking at previous cue sites reactivates value coding for serial evaluation in orbitofrontal cortex*", Human Brain Project Summit 2023, March 2023 (Marseille, FR).

MSBFIINE 2022 (Talk) **D. Ferro**, A. Rifé-Mata, T. Cash-Padgett, M. Z. Wang, B. Y. Hayden, R. Moreno-Bote, "*Recalling what was there: Eye position in reward gambling and the role of orbito-frontal cortex in encoding the value of visually cued offers*", MSBFIINE, Dec 2022 (Varenna, IT).

Barccsyn 2022 (Poster) **D. Ferro**, A. Rifé-Mata, T. Cash-Padgett, M. Z. Wang, B. Y. Hayden, R. Moreno-Bote, "*Imagining what was there: Looking at an absent offer location modulates neural response in orbito-frontal cortex.*", Barccsyn, May 2022 (Barcelona, ES).

Cosyne 2022 (Poster) **D. Ferro**, A. Rifé-Mata, T. Cash-Padgett, M. Z. Wang, B. Y. Hayden, R. Moreno-Bote, "*Imagining what was there: Looking at an absent offer location modulates neural response in orbito-frontal cortex.*", Cosyne, March 2022 (Lisbon and Cascais, PT).

COREDEM 2021 (Talk) **D. Ferro**, A. Rifé-Mata, T. Cash-Padgett, M. Z. Wang, B. Y. Hayden, R. Moreno-Bote, "*Imagining what was there: Looking at an absent offer location modulates neural response in orbito-frontal cortex.*", COREDEM (Human Brain Project, WP2), Nov. 2021 (Barcelona, ES).

SINC^2 2021 (Poster) **D. Ferro**, A. Rifé-Mata, T. Cash-Padgett, M. Z. Wang, B. Y. Hayden, R. Moreno-Bote, "*Is your gaze your aim? Eye position in reward gambling [...] in encoding the value of visually cued offers.*", Spanish Network for the Interaction between Computational and Cognitive Neuroscience (SINC^2), Nov. 2021 (Lleida, ES).

SENC 2021 (Poster) **D. Ferro**, A. Rifé-Mata, T. Cash-Padgett, M. Z. Wang, B. Y. Hayden, R. Moreno-Bote, "*Is your gaze your aim? Eye position in reward gambling [...] in encoding the value of visually cued offers.*", Sociedad Española de Neurociencia (SENC), Nov. 2021 (Lleida, ES).

Barccsyn 2021 (Poster) **D. Ferro**, A. Rifé-Mata, T. Cash-Padgett, M. Z. Wang, B. Y. Hayden, R. Moreno-Bote, "*Is your gaze your aim? Eye position in reward gambling and the role of orbitofrontal cortex in encoding the value of visually cued offers.*", Barcelona Computational, Cognitive, Systems Neuroscience (BARCCSYN), July 2021 (Barcelona, ES).

INT 2020 (Talk) **D. Ferro**, J. van Kempen, M. Boyd, S. Panzeri, A. Thiele, "*Effects of attention on Granger causal interactions between cortical layers and cortical areas V1 and V4*", Institut de Neuroscience de la Timone (*INT*), Feb. 2020 (Marseille, FR).

SfN 2019 (Poster) **D. Ferro**, J. van Kempen, M. Boyd, S. Panzeri, A. Thiele, "*Effects of attention on Granger causal interactions between cortical layers and cortical areas V1 and V4*", Annual Meeting of the Society for Neuroscience (*SfN*), 2019 (Chicago, IL, USA).

Unitn 2019 (Poster) **D. Ferro**, J. van Kempen, M. Boyd, S. Panzeri, A. Thiele, "*Effects of attention on visual processing between cortical layers and cortical areas V1 and V4.*", PhD Doctoral student Day at the University of Trento, 2019 (Rovereto, IT).

Unitn 2017 (Poster) **D. Ferro**, J. van Kempen, M. Boyd, S. Panzeri, A. Thiele, "*Effects of attention on visual processing between cortical layers and cortical areas V1 and V4*". Ten Years of Mind/Brain Sciences Conference at the University of Trento, 2017 (Rovereto, IT).

SfN 2017 (Poster) A. Thiele, **D. Ferro**, M. Boyd and S. Panzeri, "*Layer dependent attentional modulation of broad and narrow spiking cells in primate V1*", Annual Meeting of the Society for Neuroscience (*SfN*), 2017 (Washington, DC, USA).

Attended Events

CASES 2025 CASES (Citizen science And SciEntific reSearch), EUTOPIA Impact and Dissemination, July 2025 (Barcelona, Spain). [certificate]

Barccsyn 2025 Barcelona Computational, Cognitive and Systems Neuroscience (Barccsyn), May 2025 (Barcelona, Spain). [programme]

PostDoc Day 2024 PostDoc Day in Biomedical Research, organized by the Instituto de Recerca Biomedica (IRB), Vall d'Hebron Institute of Oncology (VHIO) and the Societat Catalana de Biologia (SCB), November 2024 (Barcelona, Spain). [programme] [certificate]

CASES 2024 CASES (Citizen science And SciEntific reSearch), EUTOPIA Impact and Dissemination, September 2024 (Barcelona, Spain). [certificate]

Barccsyn 2024 Barcelona Computational, Cognitive and Systems Neuroscience (Barccsyn), May 2024 (Barcelona, Spain). [programme]

NeuroChats 2024–2025 NeuroChats: bimestral meetings organized by the Centre de Recerca Matematica (CRM). Informal talks and follow-up discussions among pre- and postdoctoral researchers based or visiting Barcelona. 2024–ongoing (Barcelona, Spain).

Barccsyn 2023 Barcelona Computational, Cognitive and Systems Neuroscience (Barccsyn), May 2023 (Barcelona, Spain). [programme]

HBP PFC 2023 Anatomy and function of the prefrontal cortex across species (Human Brain Project), March 2023 (Paris, France). [programme]

HBP WP2 2023 COREDEM (Human Brain Project, Work Package 2), July 2022 (Paris, France). [programme]

CBC Seminars 2020– CBC Seminars: periodic meetings with international invited speakers at the Center for Brain and Cognition, October 2020–ongoing (Barcelona, Spain).

NeuCod 2018 Neural Coding Conference, University of Turin, Sep. 2018 (Turin, Italy). [programme]

Slow Dyn 2017 Experimental and Theoretical Analysis of Cortical Dynamics Workshop, September 2017 (Rovereto, Italy). [programme]

Brown Bag 2016–2020 Brown Bag: lunchtime weekly meetings with local scientists and visitors at the Center for Mind/Brain Sciences, April 2016–February 2020 (Rovereto, Italy).

Organized Events

Barccsyn 2024 The 10th Retreat of the Barccsyn community, Nov. 2024 (St. Feliu de Guixols, Spain).

Barccsyn 2022 The 7th Retreat of the Barccsyn community, Feb. 2022 (St. Feliu de Guixols, Spain).

2021 COREDEM Consortium Meeting (HBP, WP2), November 2021 (Barcelona, Spain).

2018 Lab Fair: research work exhibition at the Center for Mind/Brain Sciences, November 2018 (Rovereto, Italy).

2017–2018 Brown Bag Meetings: lunchtime, weekly meetings with local and visiting scientists at the Center for Mind/Brain Sciences, March 2017–April 2018 (Rovereto, Italy).

Fundings

Bial 2022 *Gaze-centered decision making.* [Grants 2022] [Bial Foundation cloud] [report]

Peer Reviews

2024-2025 1 Verified review for *Nature Communications* [ORCID].
7 Verified reviews for *PLOS Computational Biology* [Web of Science].
1 Verified review for *Qeios* [Web of Science].

International Collaborations

Thiele Lab 2017–2021 Analysis of neural data recorded during attention-demanding visual tasks in the lab of Prof. A. Thiele at the University of Newcastle, UK. (Ferro et al., PNAS 2021).

Prof. Hayden 2021– Analysis of neural data related to decision-making tasks in the lab of Prof. B. Hayden at the Baylor College of Medicine, Houston, USA. (Ferro et al., CCN 2023; Ferro et al., Nature Communications 2024; Ferro et al., CCN 2025; Ferro et al., bioRxiv 2025).

HBP WP2 2022–2023 Data-driven and validated multiscale computational models and neuromorphic implementations [(D17 - SGA3 M42) report]. Model of gaze-centred activation of value encoding in orbitofrontal cortex [EBRAINS]. Co-funded by the European Union.

Gaze2Decision 2024– Neural network models for gaze-to-decision coordination, collaborating with the lab of Dr. T. Yang at the NYU-ECNU in Shanghai, China. (Ferro et al., CCN 2025).

Vision4Action 2024– Analysis of neural data during a hand landing task for the coordination of visual and motor functions (under development). Joint venture between the lab of Prof. S. Grün (Institute for Advanced Simulations, Jülich, Germany) and the lab of Dr. T. Brochier (Institut de Neuroscience de la Timone, Marseille, France).