Davide Valeriani

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Research Interests

Brain-computer interfaces, machine learning, neuroimaging, data science, artificial intelligence, decision-making.

Work Experience

Neurable Inc.
Senior Machine Learning Scientist — Feb 2021 – present

Massachusetts Eye and Ear, Harvard Medical School
Postdoctoral Research Fellow in Multimodal Neuroimaging — Sep 2018 – Feb 2021
Supervisor: Prof. Kristina Simonyan

University of Essex
Postdoctoral Research Associate in Neural Engineering — Feb 2017 – Jul 2018
Supervisor: Prof. Luca Citi

Education and Training

University of Essex
Ph.D. in Computing and Electronic Systems — 2013 – 2017
Supervisors: Prof. Riccardo Poli and Dr. Caterina Cinel
Thesis title: *Improving Group Decision Making with Collaborative Brain-Computer Interfaces*

University of Parma
M.S. in Computer Science Engineering (*summa cum laude*) — 2010 – 2013
Supervisors: Prof. Stefano Caselli and Dr. Dario Lodi Rizzini
Thesis title: *A 3D Perception System for Mobile Robot Navigation and Object Detection*
B.S. in Computer Science Engineering (*summa cum laude*) — 2007 – 2010
Supervisors: Prof. Stefano Caselli and Dr. Jacopo Aleotti
Thesis title: *Development of a Software Library for Programming the Comau Smart Six Robot Manipulator*

Research Grants

U.S. Department of Defense, W911NF1810434 — Sep 2018 – Aug 2021
Project title: *Adaptive joint cognitive systems for complex and strategic decision making*
Role: Co-Investigator — $385,000

U.K. Ministry of Defence — Jan 2017 – Mar 2019
Project title: *Brain-computer-interface-assisted confidence estimation for group decision making, group selection and personnel training*
Role: Co-Investigator — £390,000

University of Essex, DC10758 — Oct 2016
Project title: *Towards Cybathlon 2016*
Role: Co-Investigator — £4,989

Publications

Google Scholar: https://scholar.google.com/citations?user=kBHV5dAAAAAJ

Journal Articles

1. Fernandez-Vargas J, Tremmel C, **Valeriani D**, Bhattacharyya S, Cinel C, Citi L, Poli R (2021). Subject- and task-independent neural correlates and prediction of decision confidence in perceptual decision making. *Journal of Neural Engineering*. doi:10.1088/1741-2552/abf2e4
2. Easttom C, Bianchi L, **Valeriani D**, Nam C S, Hossaini A, Zapala D, Roman-Gonzalez A, Singh A K, Antonietti A, Sahonero-Alvarez G, Balachandran P (2021). A Functional Model for Unifying Brain Computer Interface Terminology. *IEEE Open Journal of Engineering in Medicine and Biology*. 2: 91-96. doi:10.1109/OJEMB.2021.3057471
3. **Valeriani D**, Simonyan K (2020). A microstructural neural network biomarker for dystonia diagnosis identified by a DystoniaNet deep learning platform. *PNAS*, 117(42): 26398-26405. doi:10.1073/pnas.2009165117
4. Bielczyk N Z, Ando A, Badhwar A, Caldinelli C, Gao M, Haugg A, Hernandez L, Ito K, Kessler D, Lurie D, Makary M, Nikolaidis A, Veldsman M, Allen C, Bankston A, Bottenhorn K, Braukmann R, Calhoun V, Cheplygina V, Costa Boffino C, Ercan E, Finc K, Foo H, Khatibi A, La C, Mehler D, Narayanan S, Poldrack R, Reddy Raamana P, Salo T, Godard-Sebillotte C, Uddin L, **Valeriani D**, Valk S, Walton C, Ward P, Yanes J, Zhou X, OHBM Student and Postdoc Special Interest Group (2020). Effective Self-Management for Early Career Researchers in the Natural and Life Sciences. *Neuron*, 106(2): 212-217. doi:10.1016/j.neuron.2020.03.015
5. **Valeriani D**[†], Poli R (2019). Cyborg groups enhance face recognition in crowded environments. *PLOS ONE*, 14(3): e0212935. doi:10.1371/journal.pone.0212935
6. **Valeriani D**, Cinel C, Poli R (2019). Brain-Computer Interfaces for Human Augmentation. *Brain Sciences*, 9(2): 22. doi:10.3390/brainsci9020022
7. Cinel C, **Valeriani D**, Poli R (2019). Neurotechnologies for Human Cognitive Augmentation: Current State of the Art and Future Prospects. *Frontiers Human Neuroscience*, 13(13). doi:10.3389/fnhum.2019.00013
8. **Valeriani D**[†], Cinel C, Poli R (2017). Group Augmentation in Realistic Visual-Search Decisions via a Hybrid Brain-Computer Interface. *Scientific Reports*, 7(7772): 1-12. doi:10.1038/s41598-017-08265-7
9. **Valeriani D**[†], Poli R, Cinel C (2016). Enhancement of Group Perception via a Collaborative Brain-Computer Interface. *IEEE Transactions on Biomedical Engineering*, 64(6): 1238-1248. doi:10.1109/TBME.2016.2598875
10. Poli R, **Valeriani D**, Cinel C (2014). Collaborative Brain-Computer Interface for Aiding Decision-Making. *PLOS ONE*, 9(7): e102693. doi:10.1371/journal.pone.0102693
11. Cigolini M, Costalunga A, Parisi F, Patander M, Salsi I, Signifredi A, **Valeriani D**, Lodi Rizzini D, Caselli S (2014). Lessons Learned in a Ball Fetch-And-Carry Robotic Competition. *Journal of Automation, Mobile Robotics & Intelligent Systems*, 8(1): 82-90. doi:10.1431/JAMRIS_1-2014/11

[†]Corresponding author.

Conference Proceedings

1. Fernandez-Vargas J, **Valeriani D**, Cinel C, Sadras N, Ahmadipour P, Shanechi M, Citi L, Poli R (2020). Confidence Prediction From EEG Recordings in a Multisensory Environment. Proceedings of the 2020 10th International Conference on Biomedical Engineering and Technology (ICBET). doi:10.1145/3397391.3397426
2. Bhattacharyya S, **Valeriani D**, Cinel C, Citi L, Poli R (2019). Collaborative Brain-Computer Interfaces to Enhance Group Decisions in an Outpost Surveillance Task. Proceedings of the 2019 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC). doi:10.1109/EMBC.2019.8856309
3. Bhattacharyya S, **Valeriani D**, Cinel C, Citi L, Poli R (2019). Target Detection in Video Feeds with Selected Dyads and Groups Assisted by Collaborative Brain-Computer Interfaces. Proceedings of the 2019 9th International IEEE/EMBS Conference on Neural Engineering (NER). doi:10.1109/NER.2019.8717146

4. **Valeriani D**, Cinel C, Poli R (2017). Augmenting group performance in target-face recognition via collaborative brain-computer interfaces for surveillance applications. Proceedings of the 2017 8th International IEEE/EMBS Conference on Neural Engineering (NER). doi:10.1109/NER.2017.8008378
5. **Valeriani D**, Matran-Fernandez A (2015). Towards a wearable device for controlling a smartphone with eye winks. Proceedings of the 2015 7th Computer Science and Electronic Engineering Conference (CEEC). doi:10.1109/CEEC.2015.7332697
6. **Valeriani D**, Poli R, Cinel C (2015). A collaborative Brain-Computer Interface for improving group detection of visual targets in complex natural environments. Proceedings of the 2015 7th International IEEE/EMBS Conference on Neural Engineering (NER). doi:10.1109/NER.2015.7146551
7. **Valeriani D**, Poli R, Cinel C (2015). A collaborative Brain-Computer Interface to improve human performance in a visual search task. Proceedings of the 2015 7th International IEEE/EMBS Conference on Neural Engineering (NER). doi:10.1109/NER.2015.7146599
8. **Valeriani D**, Lodi Rizzini D, Oleari F, Caselli S (2013). A Viewpoint Planning and Navigation Algorithm for Mobile Robots using Depth Images. Proceedings of the Australasian Conference on Robotics and Automation.
9. Mesejo P, Cagnoni S, Costalunga A, **Valeriani D** (2013). Segmentation of histological images using a metaheuristic-based level set approach. Proceedings of the 15th Annual Conference Companion on Genetic and Evolutionary Computation (GECCO). doi:10.1145/2464576.2466808

Book Chapters

1. **Valeriani D**, Cinel C, Poli R (2019). Hybrid Collaborative Brain-Computer Interfaces to Augment Group Decision Making. In H. Ayaz & F. Dehais (Eds.), Neuroergonomics: The Brain at Work and in Everyday Life. Elsevier. doi:10.1016/B978-0-12-811926-6.00031-2
2. **Valeriani D**, Matran-Fernandez A (2018). Past and Future of Multi-Mind Brain-Computer Interfaces. In C. S. Nam, A. Nijholt, & F. Lotte (Eds.), Brain-Computer Interfaces Handbook: Technological and Theoretical Advances. CRC Press.
3. Matran-Fernandez A, **Valeriani D**, Poli R (2016). Toward BCIs Out of the Lab: Impact of Motion Artifacts on Brain-Computer Interface Performance. In P. Salvo & M. Hernandez-Silveira (Eds.), Wireless Medical Systems and Algorithms. CRC Press. doi:10.1201/b19682-12

Conference Abstracts

1. **Valeriani D** (2020). Neurotechnologies for Optimal Human-Machine Collaboration in Decision-Making. 2020 IEEE Brain Workshop on Advanced Neurotechnologies.
2. **Valeriani D**, Simonyan K (2020). DystoniaNet: Neural Biomarker-Based Platform for Dystonia Diagnosis using Deep Learning. International Congress of Parkinson's Disease and Movement Disorders 2020.
3. **Valeriani D**, O'Flynn L C, Worthley A, Simonyan K (2020). Neural Correlates of Accuracy and Confidence during Realistic Decision-Making in Noisy Environments. Organization for Human Brain Mapping (OHBM) Annual Meeting 2020.
4. Manmadhan-Nair R, Ghasem-Sani O, Sadras N, Song C, Ahmadipouranari P, **Valeriani D**, Cinel C, Citi L, Poli R, Shanechi M (2019). Decoding human confidence from neural signals. Society for Neuroscience (SfN) Annual Meeting 2019.
5. Narasimham S, **Valeriani D**, Hutchinson M, Simonyan K, Reilly R (2019). Evaluating Multimodal Integration of Abnormalities in Adult Onset Idiopathic Focal Dystonia (AOIFD) via Multivariate Pattern Analysis (MVPA) and Ensemble Learning (EL). International Congress of Parkinson's Disease and Movement Disorders 2019.
6. **Valeriani D**, Simonyan K (2019). Towards Automatic Diagnosis of Laryngeal Dystonia. 2019 Boston Speech Motor Control Symposium.
7. **Valeriani D**, Simonyan K (2019). Automatic Diagnosis of Spasmodic Dysphonia with Structural MRI and Machine Learning. Organization for Human Brain Mapping (OHBM) Annual Meeting 2019.

8. Bhattacharyya S, Cinel C, Citi L, **Valeriani D**, Poli R (2019). Walking Improves the Performance of a Brain-Computer Interface for Group Decision Making. 2nd Neuroadaptive Technology Conference (NAT'19).
9. **Valeriani D**, Bhattacharyya S, Cinel C, Citi L, Poli R (2018). Augmenting group decision making accuracy in a realistic environment using collaborative brain-computer interfaces based on error-related potentials. 7th International BCI Meeting.
10. **Valeriani D**, Cinel C, Poli R (2017). A Collaborative BCI Trained to Aid Group Decisions in a Visual Search Task Works Well with Similar Tasks. 1st Neuroadaptive Technology Conference (NAT'17).
11. **Valeriani D**, Cinel C, Poli R (2016). Hybrid Collaborative Brain-Computer Interfaces to Augment Group Decision Making. 1st International Neuroergonomics Conference.
12. **Valeriani D**, Cinel C, Poli R (2016). Improving Speech Perception with Collaborative Brain-Computer Interfaces. 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC).
13. **Valeriani D**, Matran-Fernandez A, Perez-Liebana D, Asensio-Cubero J, O'Connell C, Iacob A (2015). A Comparison of Ensemble Methods for Motor Imagery Brain-Computer Interfaces. European Conference on Data Analysis (ECDA) 2015.
14. Cigolini M, Costalunga A, Parisi F, Patander M, Salsi I, Signifredi A, **Valeriani D**, Lodi Rizzini D, Caselli S (2013). Lessons Learned in a Ball Fetch-And-Carry Robotic Competition. 4th International Conference on Robotics in Education.

Patents

1. Simonyan K, **Valeriani D** (2021). *Objective Evaluation of Neurological Movement Disorders from Medical Imaging*. International Patent Application No. PCT/US2020/053571.

Teaching and Mentoring

Associate Fellow of the UK's Higher Education Academy (#PR068571).

Courses

University of Essex

Large Scale Software Systems and Extreme Programming (CE320) (Undergraduate)
Role: Co-Instructor (1/2 of frontal lectures, prepared assignments and final exams, coordinated 3 TAs) 2017
Role: Teaching Assistant 2013, 2014, 2015

Mobile & Social Application Programming (CE881) (Master)
Role: Teaching Assistant 2014, 2015

Introduction to Programming (CE151) (Undergraduate)
Role: Teaching Assistant 2014

Data Structures and Algorithms (CE204) (Undergraduate)
Role: Teaching Assistant 2013, 2014

Applied Mathematics (MA105) (Undergraduate)
Role: Teaching Assistant 2014

Professional Development (CE101) (Undergraduate)
Role: Teaching Assistant 2013, 2014

University of Parma

Computer Architectures (Undergraduate)
Role: Teaching Assistant 2012

C++ Programming (Undergraduate)
Role: Teaching Assistant 2012

Students

Jessica Yatvitskiy (High School), The Pingry School	Summer 2019
Thrusha Puttaraju (High School), Harvard Summer School	Summer 2019
Mariam Tigane (High School), Harvard Summer School	Summer 2019
Alice Agnoletto (Undergraduate), University of Parma	Summer 2017

Volunteering

Skype a Scientist 2019 – present
Scientist

Penne amiche della scienza 2019 – present
Scientist pen pal

Letters to Pre-Scientist 2018 – present
Scientist pen pal

Awards and Honors

Student Award, 8th International BCI Meeting	2021
Abstract Award, 2nd Annual Computational Data Neuroscience Symposium	2020
NetSci 2020 Fellowship	2020
Radcliffe Exploratory Seminar Award ($18,000)	2020
Shortlisted for MoBI award	2020
Harvard Brain Initiative Host-a-Scholar Award ($4,000)	2019
OHBM People's Choice Abstract Award ($500)	2019
Shortlisted for MoBI award	2018
Bronze medal at Cybathlon BCI race	2016
Winner of IET Present Around The World local network competition	2016
Best paper award, 7th International IEEE EMBS Neural Engineering Conference	2015
London Science Museum Award for winning HackTheBrain UK	2015
Best paper award, 4th International Conference on Robotics in Education	2013
Winner of the Sick Robot Day	2012

Media Coverage (selected)

Neurology Live Focal Dystonia Accurately Identified by AI-Based Deep Learning Platform	2020
Wired Why computers won't be reading your mind any time soon	2020
BBC Science Focus Should you upgrade your brain?	2019
The Conversation Humans and machines can improve accuracy when they work together	2019
AWS re:invent Automatic Diagnosis of Speech Disorders with Machine Learning Algorithms	2018
Sky News 'Mind-reading' computers could enhance human brain and help police, surgeons and City traders	2018
The Guardian Neurotechnology, Elon Musk and the goal of human enhancement	2018
The Conversation Sometimes one head is better than two when it comes to decisions	2017
The Conversation Elon Musk wants to merge man and machine - here's what he'll need to work out	2017

Academic Service and Leadership

BCI Society 2020 – present
Chair of Student and Postdoc Committee

Frontiers in Neuroergonomics 2020 – present
Associate Editor

Frontiers in Neuroscience 2018 – present
Guest Associate Editor in Neural Technology

PLOS ONE, Scientific Reports, Frontiers, Brain Sciences, Sensors, Movement Disorders 2017 – present
Reviewer

Harvard Medical Postdoctoral Association 2019 – 2021
Board Member

European Commission 2020
Reviewer of Marie Skłodowska-Curie Individual Fellowships

Neuromatch 2020
Chair of Observer Track in Neuromatch Academy, Volunteer in Neuromatch Conference

Brain Sciences 2017 – 2018
Guest Editor

7th Computer Science and Electronic Engineering Conference 2015
Program Chair

University of Essex 2020
PhD Student Representative in Departmental and Faculty Committees

Invited Talks (selected)

NYU Langone Departmental seminar (online) 2021
US-Korea Conference Plenary talk (online) 2020
NeuroBoston Fall Symposium Selected talk (online) 2020
2nd Annual Computational Data Neuroscience Symposium at Harvard Selected talk (online) 2020
IEEE Brain Workshop on Advanced Neurotechnologies Talk (online) 2020
International Congress on Parkinson's Disease and Movement Disorders Selected talk (online) 2020
BCI Un-Conference Selected talk (online) 2020
IEEE WCCI 2020 - BCI Workshop Talk (online) 2020
International STEM Awards Talk (online) 2020
Neuromatch 1.0 and 3.0 Talk (online) 2020
Athinoula A. Martinos Center for Biomedical Imaging Science on Tap seminar (Boston, MA) 2019
MIT Media Lab Fluid Interfaces group seminar (Cambridge, MA) 2019
Harvard University CRISP group seminar (Cambridge, MA) 2019
7th International BCI Meeting Plenary talk (Pacific Grove, CA) 2018
University College London Metacognition meeting seminar (London, UK) 2018
University of Twente Seminar (Enschede, Netherlands) 2016
University of Parma Seminar (Parma, Italy) 2016
7th International IEEE EMBS Neural Engineering Conference Plenary talk (Montpellier, France) 2015