

Davide Valeriani, PhD

Dystonia and Speech Motor Control Laboratory
Suite 421, 243 Charles St, Boston, MA 02114, USA
Massachusetts Eye and Ear – Harvard Medical School – Massachusetts General Hospital
davide_valeriani@meei.harvard.edu — (+1) 857 869 4619
Website: www.davidevaleriani.it

Research Interests

My research interests are in the area of computational neuroscience and machine learning. I build neurotechnologies to improve decision making. In my Ph.D., I have developed EEG-based collaborative Brain-Computer Interfaces (BCIs) to decode the decision confidence of multiple users during visual and auditory decision-making tasks from their brain signals. These confidence estimates were then used to weigh individual decisions and obtain more accurate group decisions than equally-sized groups based on standard majority. My current research is focused on developing automatic diagnostic tools of speech disorders, using multimodal neuroimaging and deep learning.

Education

Oct 2013 – Jul 2017	Ph.D. in Computing and Electronic Systems, University of Essex, UK. Thesis Title: <i>Improving Group Decision Making with Collaborative Brain-Computer Interfaces.</i> Supervisors: Prof Riccardo Poli and Dr Caterina Cinel.
Sep 2010 – Mar 2013	Laurea magistrale (equivalent to MEng) in Computer Engineering (<i>summa cum laude</i>), University of Parma, Italy. Dissertation Title: <i>A 3D Perception System for Mobile Robot Navigation and Object Detection.</i> Supervisors: Prof Stefano Caselli and Dr Dario Lodi Rizzini.
Sep 2007 – Dec 2010	Laurea (equivalent to BEng) in Computer Engineering (<i>summa cum laude</i>), University of Parma, Italy. Dissertation Title: <i>Development of a Software Library for Programming the Comau Smart Six Robot Manipulator.</i> Supervisors: Prof Stefano Caselli and Dr Jacopo Aleotti.

Teaching Experience

Jun 2019 – Aug 2019	Mentor <i>Harvard Summer School, Harvard University, USA</i> Mentoring two high-school students for the course “Becoming a Brain Scientist”.
Oct 2017 – Dec 2017	Lecturer <i>School of Computer Science and Electronic Engineering, University of Essex, UK</i> Teaching the course Large Scale Software Systems and Extreme Programming.
Oct 2013 – Mar 2016	Graduate Laboratory Assistant <i>School of Computer Science and Electronic Engineering, University of Essex, UK</i> Lab assistant for the courses: Large Scale Software Systems and Extreme Programming, Mobile & Social Applications Programming, Data Structures and Algorithms, Professional Development, Applied Mathematics, and Introduction to Programming.
Jan 2012 – Dec 2012	Laboratory Assistant <i>Department of Information Engineering, University of Parma, Italy</i> Lab assistant for the courses: Computer Architectures, and C++ Programming.

Research Experience

Sep 2018 – today	Postdoctoral Research Fellow <i>Massachusetts Eye and Ear, Harvard Medical School, USA.</i> Combining multimodal neuroimaging and machine-learning algorithms to improve critical decision making, including the diagnosis of focal dystonia (PI: Dr Kristina Simonyan).
Feb 2017 – Jul 2018	Postdoctoral Research Fellow <i>School of Computer Science and Electronic Engineering, University of Essex, UK.</i> Working on the MURI project “Closed-Loop Multisensory Brain-Computer Interface for Enhanced Decision Accuracy” (PI: Dr Luca Citi).
May 2018 – Jun 2018	Visiting Researcher <i>Viterbi School of Engineering, University of Southern California, USA.</i> Working on decoding decision confidence from high-density (256 channel) EEG signals during realistic decision making (host: Dr Maryam Shanechi).
Nov 2016 – Dec 2016	Research Consultant <i>Institute for Analytics and Data Science, University of Essex, UK.</i> Consultancy for Hood Group Ltd (Southend-on-Sea, UK) on the application of machine learning and big data analytics techniques to insurance schemes.
Oct 2016 – Dec 2016	Visiting Researcher <i>John A. Paulson School of Engineering and Applied Sciences, Harvard University, USA.</i> Developing state-space models for tracking the dynamics of the attentional state of a decision maker (host: Dr Demba Ba).
May 2016 – Jul 2016	Senior Research Officer <i>School of Computer Science and Electronic Engineering, University of Essex, UK.</i> Writing a literature review and a full grant proposal on neuroscience technologies for human augmentation.
Sep 2015 – Jul 2016	Research Officer <i>School of Computer Science and Electronic Engineering, University of Essex, UK.</i> Investigating brain-to-brain communication via EEG signals and transcranial direct-current stimulation.
Oct 2015 – Nov 2015	Research Consultant <i>Institute for Analytics and Data Science, University of Essex, UK.</i> Consultancy for Objective Computing Ltd (Chelmsford, UK) on the application of machine learning and big data analytics techniques to marketing strategy.

Research Grants

Sep 2018 - Aug 2021	Co-Investigator of a research project entitled “Adaptive joint cognitive systems for complex and strategic decision making” involving USC, Harvard, UMass, Berkeley, University of Essex and Oxford University (Harvard funding: approx \$385,000), funded by the US Department of Defense and the UK Ministry of Defence.
Jan 2017 - Mar 2019	Co-Investigator of a research project entitled “Brain-computer-interface-assisted confidence estimation for group decision making, group selection and personnel training” (approx £390,000) funded by the UK’s Ministry of Defence through the Defence Human Capability Science and Technology Centre.
May 2015 - Jul 2015	Co-Investigator in a departmental Research Innovation Fund project (£4,990) supporting the participation of our team to the Cybathlon 2016.

Awards and Honors

Jun 2019	People's Choice Abstract Award, Organizational Human Brain Mapping (OHBM) Annual Meeting 2019, Rome (Italy).
Jul 2018	Shortlisted for MoBI award for our <i>Scientific Reports</i> paper.
Oct 2016	Bronze medal with the Essex Brainstormers team in the BCI race of the Cybathlon 2016.
May 2016	Winner of the IET Present Around The World local network competition.
Apr 2015	Best paper award, 7 th International IEEE EMBS Neural Engineering Conference (NER'15), Montpellier (France).
Jun 2014	Associate Fellow of the UK's Higher Education Academy (#PR068571)
Mar 2015	London Science Museum Award for winning HackTheBrain UK.
Oct 2013	Student travel grant, 4 th International Conference on Robotics in Education, Łódź (Poland).
Sep 2012	Winner with the Parma RedBeard Button team of the Sick Robot Day 2012.

Skills

Spoken languages	Italian (native), English (proficient), French (elementary).
Programming	Python, Java, C++, Matlab, Pascal, PHP, HTML/CSS.
Communication	Interviewed by Sky News, AWS, The Guardian, BBC, ITV, The Conversation.

Oral Presentations

Jul 2019	<i>Neurotechnologies for Enhancing Complex Decision Making in Human-Machine Teams</i> , Seminar at Fluid Interfaces Lab Meeting, MIT Media Lab – Cambridge, MA, USA.
May 2019	<i>Neurotechnologies for Enhancing Complex Decision Making in Human-Machine Teams</i> , Eaton-Peabody Laboratory, Massachusetts Eye and Ear – Boston, MA, USA.
Apr 2019	<i>Neurotechnologies for Restoring and Enhancing Effective Communication</i> , CRISP Laboratory, John A. Paulson School of Engineering and Applied Sciences, Harvard University – Cambridge, MA, USA
Nov 2018	<i>Automatic Diagnosis of Speech Disorders with Machine Learning Algorithms</i> , Interview at Amazon Web Services re:Invent – Las Vegas, NV, USA.
May 2018	<i>Collaborative Brain-Computer Interfaces to Enhance Group Decision Making</i> , Seminar at Metacognition Meeting, University College London (UCL) – London, UK.
Jan 2018	<i>Past, Present and Future of Machine Learning and Neuroscience: Collaboration, Achievements and Limitations</i> , Panelist at MeetAI Series event – London, UK.
Jul 2017	<i>A Collaborative BCI Trained to Aid Group Decisions in a Visual Search Task Works Well with Similar Tasks</i> , 1 st Neuroadaptive Technology Conference – Berlin, Germany.
Jun 2016	<i>Making Better Decisions via Collaborative Brain-Computer Interfaces</i> , Seminar, University of Twente – Enschede, Netherlands.
Mar 2016	<i>Brain-Computer Interfaces</i> , Seminar, University of Parma – Parma, Italy.
Sep 2015	<i>A Comparison of Ensemble Methods for Motor Imagery Brain-Computer Interfaces</i> , European Conference on Data Analysis 2015 – Colchester, UK.
Sep 2015	<i>Towards a Wearable Device for Controlling a Smartphone with Eye Winks</i> , 7 th Computer Science and Electronic Engineering Conference – Colchester, UK.
Apr 2015	<i>A Collaborative Brain-Computer Interface to Improve Human Performance in a Visual Search Task</i> , 7 th International IEEE EMBS Neural Engineering Conference – Montpellier, France.
Dec 2013	<i>Robotics in Education</i> , Department of Information Engineering, University of Parma – Parma, Italy.
Sep 2013	<i>Lessons Learned in a Ball Fetch-And-Carry Robotic Competition</i> , 4 th International Conference on Robotics in Education – Łódź, Poland.

Other Roles

Jan 2015 – today	Director of EyeWink Ltd, Colchester, UK.
Jan 2015 – Sep 2015	Programme Chair of the 7 th Computer Science and Electronic Engineering Conference.
Jan 2014 – Sep 2014	Programme committee member of the 6 th Computer Science and Electronic Engineering Conference.
Nov 2013 – Aug 2015	Research Students and GLA/GTAs representative, School of Computer Science and Electronic Engineering, University of Essex, UK.
Oct 2009 – Mar 2013	Student Representative in the Senate, Students' Council, Department of Information Engineering Council, Computer Engineering Council and Evaluation Committee, University of Parma, Italy.

Journal Publications

1. **Valeriani, D.**, & Poli, R. (2019). Cyborg groups enhance face recognition in crowded environments. *PLOS ONE*, 14(3), e0212935. doi:10.1371/journal.pone.0212935
2. **Valeriani, D.**, Cinel, C., & Poli, R. (2019). Brain-Computer Interfaces for Human Augmentation. *Brain Sciences*, 9(2), 22. doi:10.3390/brainsci9020022
3. 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
4. **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
5. **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
6. 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
7. 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

Conference Proceedings and Abstracts

1. **Valeriani, D.**, & Simonyan, K. (2019). Towards Automatic Diagnosis of Laryngeal Dystonia. 2019 Boston Speech Motor Control Symposium. Boston, MA, USA.
2. **Valeriani, D.**, & Simonyan, K. (2019). Automatic Diagnosis of Spasmodic Dysphonia with Structural MRI and Machine Learning. 2019 Organization for Human Brain Mapping (OHBM) Annual Meeting. Rome, Italy.
3. Bhattacharyya, S., **Valeriani, D.**, Cinel, C., Citi, L., & Poli, R. (2019). Collaborative Brain-Computer Interfaces to Enhance Group Decisions in an Outpost Surveillance Task. In 41st Annual International IEEE EMBS Conference (EMBC'19). Berlin, Germany.
4. Bhattacharyya, S., Cinel, C., Citi, L., **Valeriani, D.**, & Poli, R. (2019). Walking Improves the Performance of a Brain-Computer Interface for Group Decision Making. Neuroadaptive Technology Conference (NAT'19). Liverpool, UK.
5. 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. 2019 9th International IEEE/EMBS Conference on Neural Engineering (NER). San Francisco, CA, USA.
6. **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. Asilomar, CA, USA.
7. **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. Neuroadaptive Technology Conference (NAT'17). Berlin, Germany.
8. **Valeriani, D.**, Cinel, C., & Poli, R. (2017). Augmenting group performance in target-face recognition via collaborative brain-computer interfaces for surveillance applications. 2017 8th International IEEE/EMBS Conference on Neural Engineering (NER) (pp. 415-418). Shanghai, China: IEEE. doi:10.1109/NER.2017.8008378
9. **Valeriani, D.**, Cinel, C., & Poli, R. (2016). Hybrid Collaborative Brain-Computer Interfaces to Augment Group Decision Making. 1st International Neuroergonomics Conference. Paris, France.

10. **Valeriani, D.**, Cinel, C., & Poli, R. (2016). Improving Speech Perception with Collaborative Brain-Computer Interfaces. 38th Annual International IEEE EMBS Conference. Orlando, FL, USA.
11. **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 2015. Colchester, UK.
12. **Valeriani, D.**, & Matran-Fernandez, A. (2015). Towards a wearable device for controlling a smartphone with eye winks. 2015 7th Computer Science and Electronic Engineering Conference (CEECE2015), pp. 41-46. Colchester, UK. doi:10.1109/CEECE.2015.7332697
13. **Valeriani, D.**, Poli, R., & Cinel, C. (2015). A collaborative Brain-Computer Interface for improving group detection of visual targets in complex natural environments. 2015 7th International IEEE/EMBS Conference on Neural Engineering (NER) (pp. 25-28). Montpellier, France: IEEE. doi:10.1109/NER.2015.7146551
14. **Valeriani, D.**, Poli, R., & Cinel, C. (2015). A collaborative Brain-Computer Interface to improve human performance in a visual search task. 2015 7th International IEEE/EMBS Conference on Neural Engineering (NER) (pp. 218-223). Montpellier, France: IEEE. doi:10.1109/NER.2015.7146599
15. 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. IV International Conference on Robotics in Education. Łódź, Poland.
16. **Valeriani, D.**, Lodi Rizzini, D., Oleari, F., & Caselli, S. (2013). A Viewpoint Planning and Navigation Algorithm for Mobile Robots using Depth Images. Australasian Conference on Robotics and Automation (ACRA2013). Sydney, Australia.
17. Mesejo, P., Cagnoni, S., Costalunga, A., & **Valeriani, D.** (2013). Segmentation of histological images using a metaheuristic-based level set approach. 15th annual conference companion on Genetic and evolutionary computation (GECCO '13 Companion) (pp. 1455-1462). New York, NY, USA: ACM Press. 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.
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* (pp. 219-240). CRC Press. doi:10.1201/b19682-12

Professional Memberships

Associate Fellow of the UK's Higher Education Academy (#PR068571), chartered Engineer (Italy), OHBM society student member.

References

References provided upon request.