Sara Sommariva

Curriculum Vitae

Via Dodecaneso 35 16146, Genova (GE), Italy ☎ +39 0103536644 ⊠ sommariva@dima.unige.it ™ http://www.dima.unige.it/~sommariva/ ☞ sarasommariva

Personal Information

Name Sara Sommariva Date of Birth 18th April 1989 Nationality Italian

Current Position

- 04/2021–Now **Postdoctoral Researcher**, *CNR-SPIN*, *Genoa (Italy)*. Supervisor: Professor Anna Maria Massone.
- 04/2019–Now Visitor Researcher, Department of Neuroscience and Biomedical Engineering, Aalto University, Espoo (Finland). Contact Professor: Professor Lauri Parkkonen.

Research and Working Experience

- 06/2021 **Co-founder of BEES (Bayesian Estimation for Engineering Solutions) s.r.l.**, Spin-off of University of Genova, Genoa (Italy).
- 04/2019– **Postdoctoral Researcher**, Department of Mathematics, University of Genova, Genoa (Italy).
- 04/2021 Supervisor: Professor Michele Piana.
- 09/2020- Data scientist consultant at Roche Italia, Monza (Italy).
- 12/2020
- 03/2017– **Postdoctoral Researcher**, Department of Neuroscience and Biomedical Engineering, Aalto 03/2019 University, Espoo (Finland).
 - Supervisor: Professor Lauri Parkkonen.

Education

01/2014- PhD degree in Mathematics and Applications, University of Genova (Italy), Date of

02/2017 Defence: 21st February 2017. Thesis Title: Numerical methods for the study of brain connectivity from biomagnetic data. Supervisor: Professor Alberto Sorrentino.

09/2011- Master degree in Mathematics, University of Genova (Italy), 110/110 cum laude.
 07/2013 Thesis Title: Monte Carlo semianalytic approach for Bayesian inverse problems with application to biomagnetic data.

Supervisor: Professor Alberto Sorrentino.

- 09/2008- Bachelor degree in Mathematics, University of Genova (Italy), 110/110 cum laude.
 07/2011 Thesis Title: Construction of a signal-space projector for analysis of biomagnetic data. Supervisor: Professor Michele Piana, Professor Annalisa Pascarella.
- 2003-2008 Scientific high school degree, Istituto S. Maria ad Nives, Marks: 100/100.

Publications

- In preparation S. Sommariva, N. Puthanmadam Subramaniyam and L. Parkkonen, An unsupervised clustering approach for MEG lead-field-based cortical parcellation.
 - Submitted S. Sommariva, G. Caviglia, S. Ravera, F. Frassoni, F. Benvenuto, L. Tortolina, N. Castagnino, S. Parodi, M. Piana, Computational quantification of global effects induced by mutations and drugs in signaling networks of colorectal cancer cells.
 - 2021 S. Sommariva, G. Caviglia, G. Sambuceti, M. Piana, Mathematical Models for FDG Kinetics in Cancer: A Review, Metabolites 11 (8), 519.
 - 2021 S. Sommariva, M. Scussolini, V. Cossu, C. Marini, G. Sambuceti, G. Caviglia, M. Piana, *The role of the endoplasmic reticulum in in vivo cancer FDG kinetics*, PLoS ONE 16(6).
 - 2021 S. Sommariva, G. Caviglia and M. Piana, Gain and Loss of Function mutations in biological chemical reaction networks: a mathematical model with application to colorectal cancer cells, Journal of Mathematical Biology 82(6), 1-25.
 - 2021 E. Vallarino, M. Piana, A. Sorrentino, S. Sommariva, The role of spectral complexity in connectivity estimation, Axioms 10(1), 35.
 - 2020 M. Piana, G. Caviglia, S. Sommariva, Mathematical modelling of nuclear medicine data, IEEE 20th Mediterranean Electrotechnical Conference (MELECON), Palermo, Italy, (2020), pp. 415-418.
 - 2020 E. Vallarino, S. Sommariva, A. Sorrentino, M. Piana, On the two-step estimation of the cross-power spectrum for dynamical linear inverse problems, Inverse Problems 36(4), 04501.
 - 2019 V. Vivaldi, S. Sommariva and A. Sorrentino, A simplex method for the calibration of a *MEG device*, Communications in applied and industrial mathematics, 10 (2), 35-46, 2019.
 - 2019 G. Luria, D. Duran, E. Visani, S. Sommariva, F. Rotondi, D. Rossi Sebastiano, F. Panzica, M. Piana and A. Sorrentino, *Bayesian multi-dipole modeling in the frequency domain*, The Journal of Neuroscience Methods 312, 27-36.
 - 2019 S. Sommariva, A. Sorrentino, M. Piana, V. Pizzella and L. Marzetti, A comparative study of the robustness of frequency-domain connectivity measures to finite data length, Brain Topography 32, 675-695.
 - 2017 F. Rossi, G. Luria, S. Sommariva and A. Sorrentino, *Bayesian multi-dipole localization* and uncertainty quantification from simultaneous EEG and MEG recordings, EMBEC 2017, IFMBE Proceedings, vol 65.
 - 2014 **S. Sommariva and A. Sorrentino**, Sequential Monte Carlo samplers for semi–linear inverse problems and application to Magnetoencephalography, Inverse Problems 30, 114020.

Developed software

2020 Sesameeg.

Python package implementing a Bayesian and Sequential Monte Carlo approach for the automatic estimation of dipolar sources form magneto-/electro-encephalographic data (pybees.github.io/sesameeg). The software is a side-project of MNE-python (https://mne.tools/dev/install/pre_install.html)

2018 MNE-python.

Python open-source software for magneto/electro-encephalograpic data analysis. I contributed to version 0.17 as a debugger (https://martinos.org/mne/stable/index.html)

2016 Neuronal CUrrent Dipoles Estimator (NeuroCUDE).

Python software with user-friendly Graphical User Interface for the automatic estimation of neural sources from magneto/electro-encephalographic data (available at http://mida.dima.unige.it/software/neurocude/)

Teaching Experience

09/2019– **Teaching Assistant in Linear Algebra and Numerical Analysis**, Department of Infor-09/2020 matics, Bioengineering, Robotic and System Engineering, University of Genova (Italy).

09/2015– **Teaching Assistant in Mathematical Analysis**, Department of Informatics, Bioengineer-12/2017 ing, Robotic and System Engineering, University of Genova (Italy).

2014/2015, **Maths freshman tutor**, *Department of Naval Engineering and Department of Mathematics*, 05–12/2014, *University of Genova (Italy)*.

03–09/2012

Supervision

- 2021 MSc Thesis in Mathematics, University of Trento, Martina Amerighi, (Co-supervisor).
- 2020 MSc Thesis in Mathematics, University of Trento, Giada Vallicella, (Co-supervisor).
- 2018 BSc Thesis in Electrical Engineering, Aalto University, Van Chau.
- 2018 MSc Thesis in Mathematics, University of Genova, Elisabetta Vallarino.
- 2017 MSc Thesis in Mathematics, University of Genova, Francesca Icardi.

Research funding and project

- 2021 Research contract with Roche S.p.A., PI Prof. Michele Piana 22000 Euro.
- 2019 GNCS-INDAM young researcher grant, PI 1200 Euro.
- 2017-2018 Aalto Brain Center Postodoctoral fellowship.
 - 2016 GNCS-INDAM Conference Grant, PI 600 Euro.
 - 2015 License and know-how transfer Agreement with BESA GmbH. Agreement signed by prof. Alberto Sorrentino for a C++ implementation of the Sequential Monte Carlo algorithm for M/EEG data analysis I developed in my master thesis.
- 2014-2016 PhD scholarship at the University of Genova, Italy.

Awards and Honour

- 2021 Finalist at the Start Cup Lazio with the spin-off BEES S.r.l..
- 2020 National French qualification as Maître de conférences in applied mathematics, 26-Mathématiques appliquées et applications des mathématiques.
- 2019 **Outstanding poster award at conference BaCl 2019**, *Paper: Impact of the degree of regularization on connectivity estimation.*
- 2019 **Outstanding poster award at conference BaCl 2019**, *Paper: SESAME: a powerful method for multi-dipole modeling in time and frequency with clinical applications.*
- 2017 Scholarship for the Sequential Monte Carlo summer school at Uppsala Universitet.
- 2011 IRIS award. Reward obtained as best student at the Department of Mathematics of the University of Genova during my first academic year.

Invited talks

- 2021 Lab Quattro.Zero Piemonte Orientale, Virtual seminar. Impresa intelligente uso dei dati
- 2021 **PRIMO talks**, Virtual seminar series. A dynamical-system model for loss and gain of function mutations in chemical reaction networks

- 2021 **SIAM conference on computational science and engineering**, *Virtual conference*. *Meg/eeg Source Localization in Time and Frequency Domain using Sesame: a Semi-Analytic Bayesian Approach to Conditionally Linear Inverse Problems*.
- 2018 **MIDA seminar**, Genova, Italy. An unsupervised clustering approach with spatial constraints for cortical parcellations based on the MEG forward model.
- 2018 **SIAM conference on imaging science**, *Bologna, Italy. Brain imaging from MEG data: an unsupervised clustering approach for source space reduction.*
- 2018 Easter Workshop on Biomedical Imaging and Bioelectromagnetism, Tampere, Finland. An unsupervised clustering approach for MEG-based cortical parcellations with reduced source-

An unsupervised clustering approach for MEG-based cortical parcellations with reduced sourceleackage.

- 2017 **Tampere University of Technology**, *Tampere, Finland*. *MEG and EEG data analysis: analytic comparison of different methods for inverse modelling and connectivity analysis.*
- 2016 **BIOMAG 2016 International Conference on Biomagnetism**, Seoul, South Korea. *Automatic multiple dipole estimation through Semi-Analytic Sequential Monte Carlo samplers.*
- 2016 **Institut de mathématiques**, *Université de Neuchâtel*, Neuchâtel, Switzerland. Functional brain connectivity from MEG/EEG data: a comparison between different spectral measures.
- 2015 **I.T.A.B, Istituto di Tecnologie Avanzata Biomediche**, *University G. d'Annunzio*, Chieti, Italy.

Source Estimation from M/EEG time-series through a Semi-Analytic Bayesian approach.

2014 SIMAI 2014, Taormina, Italy.

A semi-Analytic Bayesian Approach for Multiple Static Dipoles Estimation from a Time Series of MEG Data.

Contributions in Conferences and Seminars

- 2020 **Society of Mathematical Biology 2020 annual meeting**, Virtual Conference. Mathematical model of loss and gain of function mutations in a chemical reaction network for colorectal cancer cells.(Poster)
- 2020 **Dynamical Systems Applied to Biology and Natural Science**, Trento, Italy. *Validatio of a dynamic system model for the colon-rectal cancer cells via chemical reaction networks.* (Contributed Talk)
- 2019 **Inverse Days 2019**, Jyväskylä, Finland. *Optimal regularization technique for the estimation of the cross-power spectrum in underdetermined, dynamical inverse problems.* (Plenary Talk)
- 2019 Brain twitter conference 2019 #brainTC. Automatic multi-dipole estimation from M/EEG data in the time or frequency domain. (Presentation)
- 2017 **SMC summer school and workshop**, Uppsala, Sweden. *Multi-dipoles estimation from (simultaneous) MEG and EEG data: a semi-analytic Sequential Monte Carlo approach.* (Poster)
- 2017 Brain twitter conference #brainTC. Numerical comparison of different frequency-domain measures for the study of functional connectivity in the source space. (Presentation)
- 2016 **Human Brain Mapping**, Geneva, Switzerland. *A comparative study of the impact of the data length on different connectivity measures.* (Poster)
- 2016 **First Readings Group Seminar Workshop**, *University of Milan*, Milan, Italy. *Impact of the data length on different MEG/EEG connectivity measures: a comparative study.* (Presentation)

2015 **BaCI International Conference on Basic and Clinical Multimodal Imaging**, Utrecht, The Netherlands.

An easy-to-use Python module for multi-dipole modeling from ${\it Electro}/{\it Magnetoencephalographic}$ data (Poster)

2014 **Human Brain Mapping**, Hamburg, Germany. Bayesian estimation of Multiple Static Dipoles from a time serie of MEG data. (Poster)

Organized seminars

- 2021 Co-organizer of the INDAM workshop Non invasive mathematics, Virtual conference.
- 2018 **SIAM conference on imaging science**, Bologna, Italy. Co-organizer of the mini-symposium *Sequential Monte Carlo methods for inverse estimation in imaging science*.
- 2015-2016 Co-organizer of the cycles of seminars *PhD seminars* and *PhD colloquia* of the University of Genova, Genova, Italy.

Research visits

12/2019 **Department of Neuroscience and Biomedical Engineering**, *Aalto University*, Espoo, Finland.

06- **I.T.A.B, Istituto di Tecnologie Avanzata Biomediche**, *University G. d'Annunzio*, Chieti, 16/07/2015 Italy.

Computer skills

Advanced: Python, Matlab, Gnu/Linux, Latex Intermediate: C/C++, Html, Office

Language skills

Italian Mother tongue

English Fluent. Certificate: PET (Preliminary English Test).

Other

• Membership.

Member of the Finnish Inverse Problem Society since 2019.

 Activity as referee. I have been referee for the following international Journals and conferences: Inverse Problems, Neuroimage, Frontiers in Neuroscience, Journal of Neural Engineering, Journal of the Serbian Society for Computational Mechanics; IEEE International Workshop on Machine Learning for signal processing, IEEE International Conference on Acoustics, Speech and Signal Processing; EMBEC-NBC2017. I have acted as referee for two master thesis for the National Research University 'Higher School of Economics', Faculty of Social Sciences, School of Psychology, Moscow, Russia.

References

Professor Lauri Parkkonen, *lauri.parkkonen@aalto.fi*. Associate professor, Department of Neuroscience and Biomedical Engineering, Aalto University.

Professor Michele Piana, *piana@dima.unige.it*. Associate Professor, Dipartimento di Matematica, Università di Genova.

Professor Alberto Sorrentino, *sorrentino@dima.unige.it*. Associate Professor, Dipartimento di Matematica, Università di Genova.

Privacy policy

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Genova, Italy, August 11, 2021 Sara Sommariva