TOMMASO VOLPI

Curriculum Vitae

Researcher unique identifier(s): **ORCID:** 0000-0002-5451-6710

Date of birth: June 11th, 1992
Nationality: Italian

Emails:
tommaso.volpi@yale.edu
tommasovlp@gmail.com

CURRENT POSITION

2022 – present **Postdoctoral Associate,**
Yale PET Center, Department of Radiology and Biomedical Imaging, Yale University School of Medicine, New Haven, CT, USA

Supervisors: Prof. Richard Carson, Dr. Sophie Holmes

Research areas: PET kinetic modelling, parametric imaging, synaptic density, receptor occupancy, resting-state fMRI, multimodal integration, epilepsy, Parkinson's disease, Alzheimer's disease

2019 – 2022 **PhD Student in Neuroscience**,
Padova Neuroscience Center, University of Padova, IT

Supervisors: Prof. Alessandra Bertoldo, Prof. Maurizio Corbetta

Thesis title: "Investigating the brain's "dark energy" through the complex coupling of [^{18}F]FDG PET and resting-state functional MRI".
Expected thesis defense: January 2023

Research areas: PET kinetic modelling, parametric mapping of microparameters (Variational Bayesian approach), image-derived input function, venous plasma samples modelling, nonlinear mixed-effects modelling, resting-state fMRI, multimodal integration, PET connectivity modelling

PREVIOUS POSITIONS

2018 Dec-
2019 July **Research fellow**,
Department of Neurosciences, University of Padova, Italy

2019 Jan-June **Visiting Scholar**,
Department of Neurology, Washington University in Saint Louis, Missouri, USA

Research areas: cluster analysis on structural MRI, functional MRI and behavioral data from stroke patients.

EDUCATION

2018 Mar **Medical License**,
Order of Physicians and Surgeons, Padova, Italy

2017 Sep **Doctor of Medicine (M.D.) degree**,
University of Padova, Italy
Final grade: 110/110 cum laude
Thesis: "Patterns of brain atrophy and hypometabolism associated with C9ORF72 mutation in the FTD/ALS spectrum"
Supervisor: Prof. Annachiara Cagnin

PERSONAL SKILLS

Mother Language	Italian
Other Languages	English (Proficient), French (Basic)

RESEARCH AND PROFESSIONAL SKILLS

Computer skills	**Linux/Windows/MacOS** user **Matlab** (Proficient) **R** (Intermediate) **Python** (Basic) **Bash** (Intermediate) **LaTeX** (Intermediate) **IDL** (basic) **Microsoft Office** – Word, Excel, Power Point (Proficient) **Graphic and video editing** (Intermediate)
PET Image Analysis	Experience in **PET kinetic modelling at region and voxel level** *Tracers*: [^{18}F]FDG, [^{15}O]H_2O, [^{15}O]O_2, [^{15}O]CO *Modelling strategies*: compartmental modelling, spectral analysis, graphical methods (Patlak, Logan), semiquantitative approaches (SUVR)

Noninvasive input function extraction and modelling: image-derived input function, modelling of venous plasma samples

Assessment of impact of filtered back-projection vs. OSEM *reconstruction* on kinetic modelling

Similarity analysis between PET time-activity curves for *PET connectivity* estimation.

MR Image Analysis

Experience in Structural MRI preprocessing

Tasks: Bias field correction, brain extraction, tissue segmentation, image registration, normalization, surface mapping (*ANTs, FSL, Freesurfer*)

Experience in Resting-state Functional MRI preprocessing

Tasks: Slice time correction, motion correction, nuisance regression, filtering, normalization, surface mapping (*ANTs, FSL, Freesurfer, Workbench*)

Experience in Resting-state Functional MRI analysis

Tasks: Extraction of signal-based features, regional homogeneity, static functional connectivity, sliding-windows-based time-varying functional connectivity.

Statistical skills

Experience in

Descriptive statistics

Statistical testing (parametric and nonparametric)

Linear least squares modelling

Regularization for multilinear models (ridge, LASSO, elastic net)

Feature selection approaches for multiple regression

Nonlinear least squares modelling

Population modelling (linear and nonlinear mixed-effects modelling with covariate selection)

Principal component analysis

Independent component analysis

Cluster analysis

Sparse inverse covariance estimation

Similarity analysis via angle-based and distance-based approaches.

Data Acquisition

Acquisition of data for the "BrainMap Project"

PIs: Professors Alessandra Bertoldo, Maurizio Corbetta and Diego Cecchin, University of Padova, Italy

Aim: simultaneously collecting high-quality PET, MRI and EEG data on a Siemens Biograph mMR scanner to explore multimodal relationships

Protocol: dynamic [^{18}F]FDG PET (55 min list-mode acquisition), T1w structural MRI (MPRAGE, 1x1x1 mm^3), diffusion MRI (3 shells, b-values = 300, 1000, 2000 s/m^2), resting-state fMRI (TR = 1700 ms, 3x3x3 mm^3, 15 min), high-density EEG (256 channels, 15 min).

Duties related to data acquisition: helping with the EEG setup and with supervision of the MRI sequences.

FELLOWSHIPS AND AWARDS

2022 June **"Niels Lassen" Award Finalist**
Brain & Brain PET 2022, Glasgow, Scotland, UK
Abstract: "The spatial organization of [^{18}F]FDG inflow and phosphorylation and their association with resting-state fMRI measures"

2022 May **Early Career Investigator Travel Bursary Awardee**
Brain & Brain PET 2022, Glasgow, Scotland, UK

2020 October **Gamma Prize – PET contest 2020 for Best Oral Proffered Talk**
PET is Wonderful 2020 Conference (virtual)
Abstract: "The negative relationship between brain metabolism and its network dynamics: stability requires more energy"

2019 Jan-June **Visiting Scholar**
Department of Neurology, Washington University in Saint Louis, Missouri
Supervisor: Prof. Gordon L. Shulman

INVITATIONS FOR CONFERENCES AND LECTURES

2022 Sep **Invited speaker ("Gamma Prize" Winner)**
PET is Wonderful 2022 Conference, University of Edinburgh, Scotland

2022 July **Chair of session "Data Driven Systems and Knowledge Modeling"**
IEEE EMBC 2022, Glasgow, Scotland

2022 May **Chair of session "Aging and Dementia"**
Brain & Brain PET 2022, Glasgow, Scotland

2022 Feb **Invited speaker for 1-hr Lecture on PET quantification**
GIGA, University of Liège, Belgium
Talk title: From compartmental modelling to SUV: a (personal) journey into PET quantification

2021 Oct **Invited speaker at [^{18}F]FDG PET Workshop**
"Assessing Brain Glucose Metabolism in Patients with Disorders of Consciousness: from Acquisition to Interpretation"
GIGA Consciousness group, University of Liège, Belgium
Talk title: Principles of [^{18}F]FDG Tracer Kinetics

2021 June **Invited speaker at Symposium "PET imaging of brain connectivity: hype or future?"**
OHBM 2021 (virtual meeting)
Organizers: Dr. Arianna Sala, Dr. Igor Yakushev

SUPERVISION OF STUDENTS

2021 – 2022 **Co-Supervisor of 2 master's degree theses in Bioengineering**,
Department of Information Engineering, University of Padova, Italy
Supervisor: Prof. Alessandra Bertoldo
Theses titles:

1. "Quantification of [^{18}F]FDG PET kinetic parameters using an image-derived input function and multimodal integration with resting-state fMRI metrics" (graduated in April 2022)
2. "Methods for estimating metabolic brain connectivity at the region and voxel level using dynamic [^{18}F]FDG Positron Emission Tomography" (graduated in July 2022)

2018 – 2019 **Private Tutor** in Biochemistry, Physiology and Physiopathology

TEACHING ACTIVITIES

2021-2022 **Tutoring activity**
Course: "Biomarkers, Precision Medicine and Drug Development"
Master's degree in Bioengineering
Department of Information Engineering, University of Padova, Italy
Coordinator: Prof. Mattia Veronese

2020 – present **Tutoring activity**
Course: "Imaging for neuroscience"
Master's degree in Bioengineering
Department of Information Engineering, University of Padova, Italy
Coordinator: Prof. Alessandra Bertoldo

INSTITUTIONAL RESPONSIBILITIES

2019 – 2021 **Organizer of the local European Researchers' Night** ("VenetoNight")
Padova Neuroscience Center, University of Padova, Italy

REVIEWING ACTIVITIES

2022 Reviewer for **Neuroimage**

2021 Reviewer for **NeuroReceptor Mapping (NRM) 2021**

MEMBERSHIPS IN SCIENTIFIC SOCIETIES

2022	Member of International Society for Cerebral Blood Flow and Metabolism (**ISCBFM**)
2021–present	Member of Engineering in Medicine and Biology Society (**EMBS**), Institute of Electrical and Electronics Engineers (**IEEE**)
2020	Member of International Society for Magnetic Resonance in Medicine (**ISMRM**)

ATTENDED INTERNATIONAL CONFERENCES

2022 **PET is Wonderful 2022**
Edinburgh, Scotland, UK
"*Gamma Prize*" Talk

2022 **Engineering in Medicine and Biology (EMBC) 2022**
Glasgow, Scotland, UK
2 Conference Papers accepted for **Oral** Presentations, Chair of one session

2022 **Brain & Brain PET 2022**
Glasgow, Scotland, UK
3 **Oral** Presentations, 2 Poster Presentations, Chair of one session

2022 **Organization for Human Brain Mapping (OHBM) 2022**
Glasgow, Scotland, UK
1 Poster Presentation

2021 **NRM 2021**
Virtual meeting
3 Poster Presentations

2021 **EMBC 2021**
Virtual meeting
1 Conference Paper accepted for Oral Presentation

2021 **OHBM 2021**
Virtual meeting
Speaker at symposium "PET imaging of brain connectivity: hyper or future?"

2020 **PET is Wonderful 2020**
Virtual meeting
1 **Oral** Presentation, winner of *Gamma Prize*

2020 **ISMRM 2020**
Virtual meeting

2020 **OHBM 2020**
Virtual meeting

ATTENDED COURSES, SEMINARS AND SYMPOSIA

2022 **Satellite meeting "PET for brain connectivity: back to the future?"**
Brain & Brain PET 2022, Glasgow, Scotland, UK

2022 **PET Pharmacokinetics Course**
Edinburgh, Scotland, UK

2022 **Imaging Transcriptomics: current advances and future directions**
King's College London (virtual meeting)

2021 **Noise as Signal: Finding Hemo**
Virtual meeting

2020 **Dynamic Modelling of Brain Functional Data**
King's College London (virtual)

2020 **Analysis of PET data, ISTAART Alzheimer's association**
Virtual meeting

2019 **Summer School in Computational and Theoretical Models in Neuroscience**
Venice, Italy

EXTERNAL COLLABORATIONS

2021 – present **Dr. Andrei G. Vlassenko, Dr. Manu S. Goyal, Dr. John J. Lee**
Department of Radiology, Washington University in Saint Louis, Missouri, USA
Research areas: PET kinetic modelling ($[^{18}F]$FDG, $[^{15}O]H_2O$, $[^{15}O]O_2$), Image-derived input function, aerobic glycolysis, PET-fMRI integration, PET connectivity

2021 – present **Dr. Arianna Sala**
GIGA Consciousness group, University of Liège, Belgium
Research areas: PET connectivity, $[^{18}F]$FDG PET kinetic modelling, Image-derived input function

2021 – present **Dr. Keith St Lawrence, Dr. Lucas Narciso**
Department of Medical Biophysics, London, Ontario, Canada
Research areas: $[^{18}F]$FDG PET kinetic modelling, parametric mapping (Variational Bayesian approach)

2021 – present **Prof. Oliver Howes, Dr. Katherine Beck, Dr. Tiago Reis Marques**
Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, UK

Research areas: PET connectivity, [^{18}F]GE-179 and [^{11}C]Ro15-4513 PET kinetic modelling

2019 – present **Dr. Marco Aiello**

IRCSS SDN, Napoli, Italy

Research areas: [^{18}F]FDG PET-fMRI integration

PUBLICATIONS

Palombit, A., Silvestri, E., Volpi, T., Aiello, M., Cecchin, D., Bertoldo A., Corbetta, M. Variability of regional glucose metabolism and the topology of functional networks in the human brain. Neuroimage 2022 May 4;257:119280. DOI:10.1016/j.neuroimage.2022.119280.

Volpi, T., Lee, J.J., Silvestri, E., Durbin, T., Corbetta, M., Goyal, M.S., Vlassenko, A.G., Bertoldo, A. Modeling venous plasma samples in [18F]FDG PET studies: a nonlinear mixed-effects approach. Annu Int Conf IEEE Eng Med Biol Soc. 2022 Jul; 2022:4704-4707. DOI:10.1109/EMBC48229.2022.9871429.

Volpi, T.*, Silvestri, E.*, Bettinelli, A., De Francisci, M., Jones, J., Corbetta, M., Cecchin, D., Bertoldo, A. Image-derived Input Function in brain [18F]FDG PET studies: which alternatives to the carotid syphons? Annu Int Conf IEEE Eng Med Biol Soc. 2022 Jul; 2022:243-246. DOI:10.1109/EMBC48229.2022.9871200. *shared first author

Volpi, T., Lee, J.J., Vlassenko, A.G., Goyal, M.S., Bertoldo, A., Corbetta, M., The spatial organization of [^{18}F]FDG inflow and phosphorylation and their association with resting-state fMRI measures. Abstract. Accepted for **Oral Presentation** at Brain & Brain PET 2022, **finalist at the Niels Lassen Award**. DOI:10.1177/0271678X221096356.

Volpi, T., De Francisci, M., Lee, J.J., Vlassenko, A.G., Goyal, M.S., Corbetta, M., Bertoldo, A., The many faces of 'metabolic connectivity': comparing [^{18}F]FDG kinetic model parameters vs. SUVR networks. Abstract, accepted for **Oral Presentation** at Brain & Brain PET 2022. DOI:10.1177/0271678X221096356.

Volpi, T., Silvestri, E., Lee, J.J., Vlassenko, A.G., Goyal, M.S., Corbetta, M., Bertoldo, A., The role of neurotransmitter systems in shaping glucose metabolism: evidence from brain PET studies. Abstract. Accepted for **Oral Presentation** at Brain & Brain PET 2022. DOI:10.1177/0271678X221096356.

Volpi, T., Vallini, G., Lee, J.J., Goyal, M.S., Vlassenko, A.G., Corbetta, M., Bertoldo, A., Network hubs revealed by "metabolic connectivity" mapping from [^{18}F]FDG kinetic parameters. Abstract. Accepted for Flash Presentation and Poster at Brain & Brain PET 2022. DOI:10.1177/0271678X221099127.

Volpi, T., Silvestri, E., Aiello, M., Corbetta, M., Bertoldo, A. Investigating possible nonlinearities in the spatial association between [^{18}F]FDG PET and resting-state fMRI variables. Abstract. Accepted for Poster Presentation at Brain & Brain PET 2022. DOI:10.1177/0271678X221096357.

Volpi, T., Silvestri, E., Aiello, M., Corbetta, M., Bertoldo, A. Investigating the spatial relationship between BOLD fMRI features and brain glucose metabolism. Abstract. Accepted for Poster Presentation at OHBM 2022.

Volpi, T., Silvestri, E., Hammers, A., Bertoldo, A. Individual-level molecular connectivity of $GABA_A$ receptors: assessing the similarity of [^{11}C]Ro15-4513 kinetics across brain regions. Abstract. Accepted for Poster Presentation at NRM 2021. DOI: 10.1177/0271678X211061050.

Volpi, T., Silvestri, E., Aiello, M., Corbetta, M., Bertoldo, A. A multiple regression modelling approach to investigate the coupling between [^{18}F]fluorodeoxyglucose positron emission tomography and resting-state functional MRI. Abstract. Accepted for Poster Presentation at NRM 2021. DOI: 10.1177/0271678X211061050.

Narciso, L., Taha, A., Dassanayake, P., Volpi, T., Liu, L., Soddu, A., Anazodo, U., Bertoldo, A., St Lawrence, K. Development of a non-invasive PET/MRI method for quantifying cerebral glucose kinetics. Abstract. Accepted for Poster Presentation at NRM 2021. DOI: 10.1177/0271678X211061050.

Volpi, T., Aiello, M., Riedl, V., Corbetta, M., Bertoldo, A. Anti-correlations between ^{18}F-FDG PET and resting state dynamic functional connectivity: insights into brain network variability. Abstract. Accepted for Poster Presentation at NRM 2021. DOI: 10.1177/0271678X211061050.

Volpi, T., Silvestri, E., Corbetta, M., Bertoldo, A. Assessing different approaches to estimate single-subject metabolic connectivity from dynamic [^{18}F]FDG Positron Emission Tomography data. Annu Int Conf IEEE Eng Med Biol Soc. 2021 Nov; 2021:3259-3262. DOI: 10.1109/EMBC46164.2021.9630441.

Volpi, T., Silvestri, E., Aiello, M., Corbetta, M., Bertoldo, A. The complexity of the relationship between spontaneous brain activity and glucose metabolism (preprint). DOI: 10.21203/rs.3.rs-728300/v1.

Volpi, T., Aiello, M., Corbetta, M., Bertoldo, A. The negative relationship between brain metabolism and its network dynamics: stability requires more energy. Abstract. Accepted for Oral Presentation at PET is Wonderful 2020 and awarded the "Gamma Prize".

Google Scholar:
https://scholar.google.com/citations?user=WsnzU30AAAAJ&hl=en&oi=ao

ResearchGate:
https://www.researchgate.net/profile/Tommaso-Volpi

Lab:
http://fair.dei.unipd.it/tommaso-volpi/

LinkedIn:
https://www.linkedin.com/in/tommaso-volpi-21189823a/

Twitter:
https://twitter.com/tommaso_volpi

New Haven (CT), November 24th, 2022

Tommaso Volpi
Postdoctoral Associate
Department of Radiology and Biomedical Imaging
Yale University School of Medicine
New Haven, CT, 06520-8048
Email: tommaso.volpi@yale.edu