

PERSONAL INFORMATION

Giovanni Granato



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Sex M | Date of birth 02/10/1992 | Nationality Italian

PROFILE

I'm a **researcher in "Computational Neuropsychology/Psychiatry"** at the Italian **National Research Council (CNR), Institute of Cognitive Science and Technologies (ISTC)**. My training includes **Cognitive Sciences, Neuroscience, Machine Learning, Computational Modeling, Cognitive Robotics**. My research focuses on the **neurocognitive processes underlying human goal-directed flexible cognition** (e.g. Executive Functions). In particular I proposed the concept of **"goal-directed manipulation of internal representations at the basis of flexible cognition"** supported by the "Three-components theory of flexible cognition" (Granato et al., 2022; Granato and Baldassarre, 2021; Granato et al., 2020). In short, I investigate **how artificial and biological agents manipulate their representations to flexibly achieve their goals**. Overall, I adopt the integrated top-down / bottom-up method of **Computational Neuroscience/Neuropsychology/Psychiatry**, thus developing simulated neuro-inspired agents and comparing their cognition and behavior with that of humans. My research is extended to the investigation of goal-directed representations manipulation at the basis of **Consciousness** (Granato and Baldassarre, 2024) and **Metacognition**. At last, my research studies show **applications in AI-based healthcare systems and Human Resources** (e.g. model-based profiling tools), **Machine Learning** (Neuro-inspired ML, Generative Models, etc), **Robotics** (e.g., Machine Consciousness).

WORK EXPERIENCE

June 2023 - Present **Researcher Ivl. III (fixed-term)** at "Institute of Sciences and Technologies of Cognition" (ISTC), "Laboratory of Embodied Natural and Artificial Intelligence" (LENAI) at "National Research Council" (CNR).

Research focus: "Computational models of brain and behavior, with particular reference to higher cognition, executive functions, metacognition, and consciousness. Study and validation of computational models with data collected in experiments with normo-typical or pathological human participants. Implementation of machine learning pipelines for data analysis with particular reference to EBRAINS research infrastructure. Contribution to the training and innovation activities of the "EBRAINS-Italy Training and Innovation Centre (ETIC)" based in Rome.

October 2022 - May 2023 **Post-doc research Fellowship** at "Institute of Sciences and Technologies of Cognition" (ISTC), "Laboratory Of Computational Embodied Neuroscience" (LOCEN) at "National Research Council" (CNR).

Research focus: "Computational models of the brain system supporting flexible goal-directed behaviour"

- September 2022 - Present** **Research consultancy** for the project “Terza missione” at the Social and Cognitive Neuroscience laboratory (ISCNL), Dept. of Psychology, “Sapienza, University of Rome”
- Topic:** “Participatory research in Autism”
- November 2022** **Consultancy/teaching** in Educational Robotic for “Italiacamp srl”
- Topic:** “Impact and elements of Autonomous Robotics” (target: *Middle adults*)
- October 2022** **Consultancy/teaching** in Educational Robotic for “Italiacamp srl”
- Topic:** basic elements of Robotics (target: *Middle school teenagers*)
- June 2022 - July 2022** **Consultancy and collaboration** as “STEAM Training Specialist in Educational Robotics” at “Italiacamp srl”
- June 2019 - September 2022** **Research Fellowship** at “Institute of Sciences and Technologies of Cognition”, laboratory of “Computational Embodied Neuroscience” at “National Research Center”.
- Research focus:** “Computational models of the brain system supporting flexible goal-directed behaviour”
- January 2019 - May 2019** **Research collaboration** at “Institute of Sciences and Technologies of Cognition”, laboratory of “Computational Embodied Neuroscience” at “National Research Center”.
- Research focus:** “Computational models of goal-directed behaviour and cognitive flexibility”
- October 2016 - December 2017** **Research consultancy** at the social and cognitive neuroscience laboratory (SCNL), Dept. of Psychology, “Sapienza, University of Rome”
- Topic:** “Virtual reality and Autism”
- April 2016 - July 2018** **Experimental thesis** at “Institute of Sciences and Technologies of Cognition”, laboratory of “Computational Embodied Neuroscience” at “National Research Center”
- Title:** “Consciousness and Goal-directed Behavior: from theoretical neuroscience to computational models”

PROJECTS

- June 2023 - Present** **EBRAINS-Italy (European Brain ReseArch INfrastructureS-Italy)**
- Activities:** management and training activities, and scientific production (“Computational models of brain and behavior, with particular reference to higher cognition, executive functions, metacognition, and consciousness”)
- September 2022 - Present** **Project “Terza Missione: Ascoltare la comunità autistica per migliorare la conoscenza dell’autismo, l’accessibilità degli studenti autistici all’università e la ricerca scientifica sull’autismo” (La Sapienza, University of Rome)**

Activities: autistic research consultancy and participation in the workgroup “participatory research in Autism”

April 2019 - April 2021 **GOAL Robots (Goal-based Open-ended Autonomous Learning Robots)**

Activities: scientific production (“Neuro-inspired computational models of goal-directed behavior with potential applications in Robotics/Cognitive Robotics”)

PARTICIPATION IN SCIENTIFIC COMMITTEES, COMMISSIONS AND OTHER POSITIONS

20 May 2024 **ISTC-CNR, Senior research fellow grant (notice n. ISTC-AdR-400-2024-RM)**

Roles: member of the commission (secretary)

March 2024 - Present **“EBRAINS-Italy Training and Innovation Committee (ETIC)”**

Roles: Definition of the ETIC training offer, management of the training and technological transfer activities

November 2023 - Present **“Italiacamp association”**

Roles: Teaching and dissemination in the AI/Robotics fields

20 July 2023 **University of Rome “La Sapienza” (“Cognitive Neuroscience”), MA graduation commission**

Roles: External supervisor

EDUCATION AND TRAINING

April 2019 - October 2022 **PhD in “Computer science” (“Computational Neuropsychology”) at “School of Computer Science, Electronics and Mathematics”, University of Plymouth, United Kingdom**

Project title: “Flexible goal-directed manipulation of representations: computational models of healthy and pathological human cognition”

Topics: Machine learning, Deep learning, Generative models, Artificial neural networks, Clinical Neuropsychology, Computational Neuroscience/Neuropsychology, Neuro-robotics

October 2018 - April 2019 **Advanced School in Artificial Intelligence at “CNR-ISTC”**

Project title: “Flexible goal-directed behavior and internal attention: building blocks for consciousness ”

Topics: Machine learning, Artificial neural networks, Agent-based models, Computational Neuroscience/Neuropsychology

October 2015 - July 2018 **Master's degree in “Cognitive Neuroscience and Psychological Rehabilitation” at University of Rome “La Sapienza”, Dept. of Medicine and Psychology, Faculty of Psychology**

Thesis title: “Consciousness and Goal-directed Behavior: from theoretical neuroscience to computational models”

Topics: Cognitive Neuroscience, Neuropsychology, Systemic Neuroscience, Neurobiology, Computational Neuroscience/Neuropsychology

October 2012 - July 2015

Bachelor's Degree in "Psychological Sciences and Techniques" (curriculum: "Cognitive Processes") at "University of Florence", Faculty of Psychology

Thesis title: "Emergence of a consciousness from a hyper-connected neuronal system: neurobiological models and hypotheses "

Topics: General psychology, Psychobiology, Developmental psychology, Work psychology, Psychodynamics, Psychometrics, Physiological psychology, Research methodology, Developmental psychobiology, Cognitive neuropsychology

RESEARCH CONTRIBUTIONS

Publications

- Mattera A., Alfieri V., **Granato G.**, Baldassarre G. (2024). **Chaotic Recurrent Neural Networks: A Review.** "Under consideration" in Neural Networks.
- **Granato, G.**, Costanzo, R., Borghi A. M., Carruthers, S., Mattera, A., Rossell, S., & Baldassarre, G. (2024). **Flexible Goal-directed Cognition and Inner-speech in Schizophrenia Spectrum Disorders: from Clinical Data to Computational Modeling, and Backward.** "Under review" in Scientific Reports. Pre-print: <https://www.researchsquare.com/article/rs-3611379/v1>
- **Granato, G.**, & Baldassarre, G. (2024). **Bridging flexible goal-directed cognition and consciousness: The Goal-Aligning Representation Internal Manipulation theory.** Neural Networks, 106292.
- Cavallo A., Mattera A., **Granato G.**, Baldassarre G. (2023). **Emergence of neuronal ensembles in a chaotic corticostriatal circuit.** In 2023 Conference on Cognitive Computational Neuroscience.
- **Granato, G.** (2022). **Flexible goal-directed manipulation of representations: computational models of healthy and pathological human cognition** (Doctoral dissertation, University of Plymouth).
- **Granato, G.**, Borghi, A. M., Mattera, A., & Baldassarre, G. (2022). **A computational model of inner speech supporting flexible goal-directed behaviour in Autism.** Scientific reports, 12(1), 1-15.
- **Granato G.**, Cartoni E, Da Rold F, Mattera A, Baldassarre G (2022) **Integrating unsupervised and reinforcement learning in human categorical perception: A computational model.** PLoS ONE 17(5): e0267838.
- Mattera, A., Cavallo, A., **Granato, G.**, Baldassarre, G., & Pagani, M. (2022). **A Biologically Inspired Neural Network Model to Gain Insight Into the Mechanisms of Post-Traumatic Stress Disorder and Eye Movement Desensitization and Reprocessing Therapy.** Frontiers in Psychology, 3681.
- **Granato G.**, Baldassarre G. (2022). **Manipulation of internal representations underlying flexible human goal-directed behaviour: supporting Computational Psychiatry and towards Machine Consciousness.** Poster session presented at "The symposium: from cortical microcircuits to consciousness (CORTICON)"

- **Granato, G., & Baldassarre, G. (2021). Internal manipulation of perceptual representations in human flexible cognition: A computational model.** Neural Networks, 143, 572-594.
- **Granato, G., Borghi, A. M., & Baldassarre, G. (2020). A computational model of language functions in flexible goal-directed behaviour.** Scientific reports, 10(1), 1-13.
- **Baldassarre, G., & Granato, G. (2020). Goal-Directed Manipulation of Internal Representations Is the Core of General-Domain Intelligence.** Journal of Artificial General Intelligence, 11(2), 19-23.
- **Granato, G., & Baldassarre, G. (2019). Goal-directed top-down control of perceptual representations: A computational model of the Wisconsin Card Sorting Test.** In 2019 Conference on Cognitive Computational Neuroscience (pp. 2019-1168).
- **Baldassarre, G., Lord, W., Granato, G., & Santucci, V. G. (2019). An embodied agent learning affordances with intrinsic motivations and solving extrinsic tasks with attention and one-step planning.** Frontiers in neurorobotics, 13, 45.
- **Granato G., Baldassarre G. (2018). Goal-directed imagination and cognitive flexibility: A computational model of the Wisconsin Sorting Card Test.** Poster session presented at "The Eighth International Symposium on Biology of Decision Making (SBDM)"

Seminars and Speeches

- (08/03/2024; Rome, Italy) **"Project Terza Missione: Ascoltare la comunità autistica per..."**, workshop on **"Autismo e Ricerca Partecipativa - Online Workshop"**.

Speaker presentation: "The italian autism participatory research working group"

- (26/09/2023; Palermo, Italy) **Research Infrastructure EBRAINS-Italy**, workshop on **"The EBRAINS-Italy Research Infrastructure for Neuroscience challenges"**.

Speaker presentation: "Modeling Flexible goal-directed cognition: an automated research toolbox."

- (18/07/2023; Rome, Italy) **"Poste Italiane"**, seminar on **"Transizioni di vita, disabilità e vulnerabilità nell'organizzazione come comunità"**.

Invited speaker presentation: "Autism/Asperger in organizations: from disability to life changes"

- (28/06/2019; Rome, Italy) **"Fondazione Mondo Digitale"**, seminar on **"Vagone FMD. da 01 a 100: aperitivo con l'innovazione"**.

Speaker presentation: "Flexible goal-directed behaviour and internal attention"

Reviewing activity

- **International journals:**

- **"Neural Networks"** (topic: neuro-inspired Machine Learning)
- **"Scientific Reports"** (topic: Neuro-robotics, Neuroscience)
- **"Frontiers in Artificial Intelligence"** (topic: linguistics, computational modeling)
- **"Frontiers in Psychiatry"** (topic: executive functioning, computational modeling)
- **"Journal of Cognitive Psychology"** (topic: experimental psychology, inner-speech, theory of mind, emotion recognition)
- **International conferences:**
 - **"Cognitive Computational Neuroscience conference 2023"** (topics: Various)
 - **"Cognitive Computational Neuroscience conference 2019"** (topics: Various)

Project evaluations

- **Evaluation for italian projects:**
 - "La Sapienza, university of Rome" (2023)

Collaborations

- **Centre for Mental Health at Swinburne University of Technology** (PI: Susan Rossell)
Country: Australia
Referent: Sean Carruthers

Topic: "Computational models of flexible cognition in Schizophrenia"
- **Consciousness, Cognition, and Computation Group** (CO3, PI: Axel Cleeremans)
Country: Belgium
Referent: Axel Cleeremans

Topic: "Metacognition and flexible goal-directed behavior"
- **ItaliaCamp, srl**
Country: Italy
Referent: Riccardo Santilli

Topic: "Educational Robotics"
- **Social and Cognitive Neuroscience Laboratory** (SCNL, PI: Salvatore Aglioti)
Country: Italy
Referent: Ilaria Minio Paluello

Topic: "Participatory research in Autism"

Supervisions

- **Body Action Language Lab** (BALLAB, PI: Anna Borghi)
 Country: Italy
 Referent: Anna Borghi

Topic: "Inner speech and Flexible goal-directed Behaviour in healthy, pathological and divergent conditions".
- **Social and Cognitive Neuroscience Laboratory** (SCNL, PI: Salvatore Aglioti)
 Country: Italy
 Referent: Ilaria Minio Paluello

Topic: "Participatory research in Autism", "Virtual reality and Autism"
- Di Giulio J. (2024/2025). **Post-lauream internship** at "Laboratory of Natural and Artificial Intelligence" (ISTC-CNR).

Topics: "Experimental and computational neuropsychology of higher-order cognition: development of experimental protocols and neuropsychological tests to probe Executive Functions and Metacognition".
- Manzi G. (2024/2025). **Pre-lauream internship** at "Laboratory of Natural and Artificial Intelligence" (ISTC-CNR).

Topics: "Experimental and computational neuropsychology of higher-order cognition: development of experimental protocols and neuropsychological tests to probe Executive Functions and Metacognition".
- Costanzo R. (2022/2023). **MA thesis** at "University of Rome La Sapienza, Department of Medicine and Psychology".

Topics: "Models of Executive Functions and Inner-Speech in Computational Psychiatry".
- Tortora L., De Bei F., Biris I. (2020). **Advanced research project** at "Advance School of Artificial Intelligence" (ASAI).

Topics: "ML applications in Computational Psychiatry (DNN supporting clinical diagnosis of Autism)".
- Fabrizio Carlo (2020). **Advanced research project** at "Advance School of Artificial Intelligence" (ASAI).

Topics: "Models human working memory with ML methods (LSTM)".
- Buttinelli Alessandro (2019). **Advanced research project** at "Advance School of Artificial Intelligence" (ASAI).

Topics: "Models of Inner-Speech in human flexible cognition"
- Muratore Paolo (2019). **Advanced research project** at "Advance School

of Artificial Intelligence” (ASAI).

Topics: “Development of Neuro-inspired algorithms in Machine Learning”

PERSONAL SKILLS

Mother tongue Italian

Other languages

	COMPARED		PARLATO		WRITTEN PRODUCTION
	Listening	Reading	Interaction	Production	
English	B 2	C 1	B 2	B 2	C 1

Levels: A1 / A2: Basic user - B1 / B2: Intermediate user - C1 / C2: Advanced user
[Common European Framework Reference of Languages](#)

Computer skills

- General:
 - European Computer Driving License ECDL “Advanced” level
 - PC Assembly
- Operating systems used:
 - Windows
 - Linux
- Programming languages used:
 - Python
 - Scratch for Educational Robotics
 - MatLab
 - C ++
 - R
 - Latex
 - PHP
 - SQL
 - VBA

Personal interests

- Consciousness
- Humans interactions
- Neuropsychology/Psychiatry
- Technology:
 - Applied Sciences
 - Robotics
 - Domotics
- Videogames (Real Time Strategy, RTS)
- PC Assembling

Personal data

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