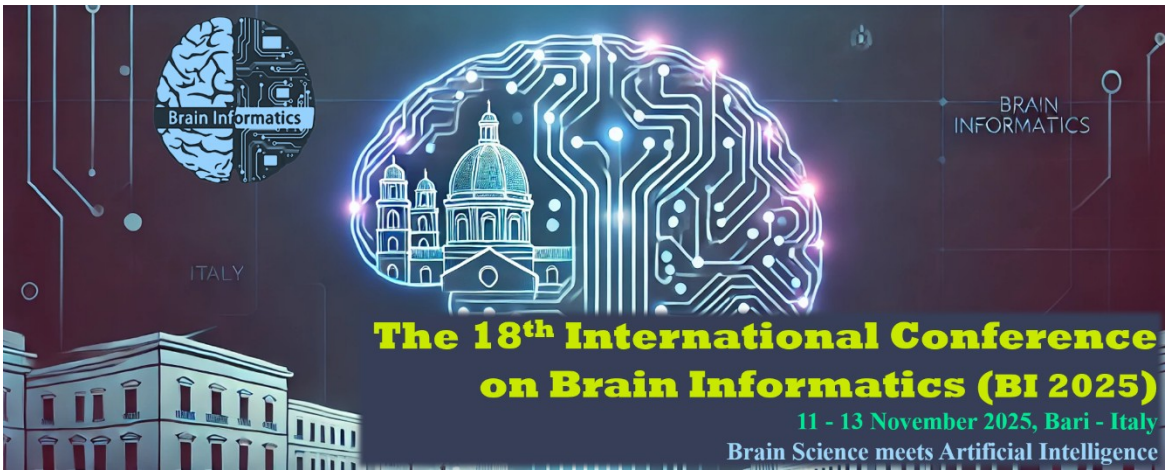

Heading

- Title of the workshop/special-session and acronym
- **The International Workshop on Multiomics and Multimodal Data Integration for Brain Informatics**
- Proposed duration (**half-day** or **full-day**)
    - **half-day**

Call for Papers: Multiomics and Multimodal Data Integration Workshop

The 18th International Conference on Brain Informatics (BI 2025)

November 11-13, 2025 | Bari, Italy

"Brain Science meets Artificial Intelligence"

Workshop Overview

The convergence of high-throughput omics technologies, advanced neuroimaging, and AI-driven analytics has created unprecedented opportunities to understand complex biological systems. Yet, the integration of these diverse data streams remains one of the most pressing challenges in computational biology and precision medicine.

Join us for a cutting-edge workshop that bridges the gap between molecular discoveries and clinical applications, featuring the latest advances in AI-powered multimodal data integration.

Introduction

Abstract (185 words)

Revolutionary advances in high-throughput omics technologies, advanced neuroimaging, and AI-driven analytics have created unprecedented opportunities to understand the molecular foundations of brain function and dysfunction. The integration of genomics, proteomics, metabolomics with neuroimaging, electrophysiology, and clinical data represents the next frontier in brain informatics.

This workshop addresses the critical challenge of integrating heterogeneous biological data streams—from molecular omics to brain imaging to clinical phenotypes—into unified computational frameworks that can decode the complexity of brain disorders. We showcase breakthrough AI methodologies for cross-modal data fusion, causal inference, and interpretable integration that bridge molecular mechanisms with systems-level brain phenotypes.

Designed for the BI 2025 community of computational neuroscientists, AI researchers, and clinical investigators, we invite transformative contributions on scalable integration algorithms, joint representation learning, and precision applications in brain health—with particular emphasis on neurological disorders, psychiatric conditions, and cognitive aging. By uniting algorithmic innovation with neuroscientific discovery, this session will accelerate the development of predictive, personalized brain healthcare solutions that leverage the full spectrum of biological information.

Scope and topics of the workshop/special session

This workshop highlights cutting-edge advances in computational integration of multiomics and multimodal biomedical data specifically for brain informatics applications. Topics include:

Computational Methods:

- Novel algorithms for multiomics fusion (early/intermediate/late fusion, tensor decomposition)
- Deep learning for cross-modal representation learning (genomics + neuroimaging, proteomics + digital pathology)
- Network medicine and causal inference from integrated brain data
- Explainable AI (XAI) for interpretable multiomics models
- Cloud-native pipelines for scalable brain data integration
- Dynamic modeling of longitudinal multiomics profiles

Brain-Focused Applications:

- Neurological disorders: Multiomics signatures for Alzheimer's, Parkinson's, epilepsy, and stroke
- Psychiatric conditions: Integrating genomics with neuroimaging for depression, schizophrenia, and bipolar disorder

- Cognitive aging: Molecular markers of brain aging combined with longitudinal neuroimaging
- Brain-computer interfaces: Genomic factors influencing neural interface performance and adaptation
- Neurodevelopmental disorders: Multi-scale data integration for autism, ADHD, and learning disabilities

Technical Infrastructure:

- Ethical AI and privacy-preserving federated learning for sensitive brain data
- Reproducible workflows and open-source tools for brain multiomics
- Standards for multimodal brain data sharing and integration

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Motivation and Rationale

Why the workshop/special session is related to BI 2025

This workshop exemplifies the conference theme *"Brain Science meets Artificial Intelligence"* by demonstrating how AI-driven integration of molecular omics data with neuroimaging and clinical phenotypes creates unprecedented insights into brain function and dysfunction. Our focus on multiomics-multimodal fusion directly supports BI 2025's mission to advance brain informatics through computational innovation.

Strategic Alignment with BI 2025 Tracks:

- **Brain-Machine Intelligence**: Integrating genomic/proteomic profiles with neural interface data
- **Informatics for Brain/Mental Health**: Multimodal biomarker discovery for psychiatric and neurological conditions
- **Human Information Processing Systems**: Understanding molecular foundations of cognitive processes
- **Computational Neuroscience Methods**: Novel algorithms for multi-scale brain data integration

Why the topic is timely and important

Addressing Critical Brain Informatics Challenges:

- Multi-scale integration: Connecting molecular omics data with macro-scale brain imaging and cognitive phenotypes
- Temporal dynamics: Understanding how genetic and proteomic changes relate to brain development, aging, and disease progression

- Clinical translation: Moving from computational discoveries to actionable insights for brain health
- AI innovation: Leveraging transformers, graph neural networks, and multimodal models for brain data integration

The convergence of high-throughput omics technologies with advanced brain imaging creates unprecedented opportunities to understand neurological and psychiatric disorders at multiple biological scales. Recent advances in single-cell sequencing, spatial omics, and AI-driven analysis enable integration of molecular profiles with brain structure, function, and clinical outcomes.

Why the workshop/special session may attract a significant number of submissions of good quality

This workshop targets the rapidly growing intersection of AI, omics technologies, neuroimaging, and clinical neuroscience. The broad scope—including genomics/neuroimaging fusion, multimodal deep learning, brain network analysis, and precision psychiatry—positions the session to attract both theoretical contributions and applied research papers.

Expected submission quality drivers:

- Active research communities in computational neuroscience, brain informatics, and precision medicine
- Strong industry interest from neurotech, pharma AI, and diagnostics companies
- Funded research initiatives in brain health (NIH BRAIN Initiative, EU Human Brain Project)
- Growing availability of large-scale multimodal brain datasets

Why the workshop/special session may attract a large number of attendees, in addition to the authors

Multiomics and multimodal brain data integration represents a vibrant interdisciplinary field with broad appeal across the BI 2025 community. The session will engage not only authors but also:

Expected to attract the diverse BI 2025 community:

- 35% Computational neuroscientists and brain informaticians
- 30% AI/ML researchers working on brain data
- 25% Clinical neuroscientists and translational researchers
- 10% Industry professionals from neurotech and diagnostics

The combination of cutting-edge computational methods with clinically relevant brain applications makes the session particularly relevant to researchers, practitioners, and students across neuroscience, computer science, and biomedical engineering.

Why the workshop/special session differs from others

This workshop uniquely focuses on **multiomics-multimodal integration specifically for brain informatics**, distinguishing it from general computational biology or medical AI workshops. Key differentiators:

Integrated Brain Focus: Unlike conferences that address either omics OR neuroimaging, we specifically target their computational integration for brain science applications.

Multi-scale Approach: Bridges molecular (genomics, proteomics) to systems-level (neuroimaging, cognition) data integration.

Clinical Translation Emphasis: Strong focus on translating computational discoveries into actionable insights for brain health and neurological/psychiatric care.

AI Innovation: Showcases latest advances in multimodal AI specifically applied to brain data challenges.

Related workshops and conferences of similar topics

Distinguished from Related Events:

- **OHBM Annual Meeting**: Neuroimaging-focused, limited molecular integration
- **ISMB COSI Multiomics**: General biology focus, minimal brain-specific applications
- **NeurIPS ML4H**: Broader health scope, less emphasis on brain-specific multiomics
- **MICCAI**: Imaging-centric, limited integration with omics data
- **SfN Annual Meeting**: Experimental focus, fewer computational integration methods

A draft call for papers

Call for Papers: MMDI-BI 2025 Workshop

We invite original contributions on AI-driven integration of multiomics and multimodal data specifically for brain informatics applications. We seek papers that advance computational methods for integrating molecular omics data (genomics, proteomics, metabolomics) with neuroimaging, electrophysiology, and clinical brain phenotypes.

Submission Categories:

- **Full Papers** (8 pages + references): Mature research with rigorous validation on brain data
- **Short Papers** (4 pages + references): Preliminary findings, tools, or focused contributions
- **Abstracts** (2 pages): Early-stage work, demonstrations, or position papers

Key Topics:

- Multiomics integration algorithms for brain applications
- Cross-modal learning between molecular and imaging data
- AI methods for brain disorder classification and prediction
- Clinical translation of integrated biomarkers
- Privacy-preserving approaches for sensitive brain data

Submission Requirements: Manuscripts should be formatted according to BI 2025 guidelines and submitted via the conference portal. All submissions undergo double-blind peer review evaluating technical novelty, brain science relevance, and clinical impact potential.

Publication: Accepted full papers will be published in the BI 2025 proceedings. Outstanding contributions may be invited for journal special issues.

A description of the publicity and promotion plan

Multi-channel Promotion Strategy:

- **Academic Networks**: Targeted outreach via computational neuroscience, bioinformatics, and AI mailing lists (OHBM, INCF, ISMB communities)
- **Social Media**: LinkedIn, Twitter campaigns targeting #NeuroAI, #BrainInformatics, #Multiomics communities
- **Conference Cross-promotion**: Partnerships with related conferences (OHBM, MICCAI, ISMB) for session announcements
- **Institutional Outreach**: Direct contact with leading neuroinformatics centers, AI institutes, and clinical neuroscience departments
- **Industry Engagement**: Outreach to neurotech companies, pharma AI divisions, and biotech firms

Workshop/special session format planned

Half-Day Format (4 hours):

- **Opening Keynote** (45 min): "The Future of Multimodal Brain Data Integration" by internationally recognized expert
- **Technical Session 1** (60 min): Computational Methods (3-4 presentations)
- **Coffee Break** (15 min): Networking opportunity
- **Technical Session 2** (60 min): Clinical Applications (3-4 presentations)
- **Panel Discussion** (30 min): "From Algorithms to Clinical Impact" featuring speakers and invited experts
- **Closing & Networking** (10 min): Future collaborations and next steps

Interactive Elements:

- Live demonstrations of integration tools and platforms

- Poster session for short papers and abstracts
- Structured networking time for cross-disciplinary connections