

What we do

Medicine producing an unprecedented level of valuable medical data at a gigantic pace around the world, with thousands of brain images and terabytes of associated medical data every day. The Medical Informatics Platform (MIP) aims to federate this information and provide appropriate tools to the experts to analyse this data to advance understanding of neurological and psychiatric diseases. Analyses will lead to identification of patterns of biological abnormality and their underlying biological changes that in turn opens real possibilities for early diagnosis and personalised medicine, addressing one of the major healthcare challenges facing the EU.

The MIP has three main goals,

- Build the tools to federate clinical data, currently inaccessible outside the hospital and research archives,
- recruit hospitals to contribute data and benefit from platform use,
- develop tools to extract biological signatures of diseases from the multi-level data.

The MIP provides methods to analyse federated data from hospitals, research centres and biobanks. Clinical scientists can develop, share and release results of their research. The MIP will bring together people across professional and scientific fields, encouraging them to contribute actively to the design and development of the services that the MIP provides.

Representing fusion of medicine and computer science, SP8 aims to break down the traditional barriers of patient care, brain science and clinical research to minimize the delays in diagnosis of brain diseases and institute the most effective treatments.

Data security is a top priority for SP8. The Subproject's platform design will preserve hospital ownership and control of data by providing federated access to analysis tools across hospitals, without moving patient data from original servers and ensuring patient privacy.

How we are organised

WP8.1 FEDERATED CLINICAL DATA INFRASTRUCTURE (FCDI).

This WP develops tools for harmonizing heterogeneous clinical databases; tools for data anonymization, ontology based query interfaces, and federated search and intensive distributed analysis of clinical data. These form the Hospital Bundle that will run at every hospital participating in the MIP.

WP8.2 DATA SELECTION AND COMMUNITY ENGAGEMENT. We

coordinate data selection across the MIP federated network, develop unified data governance and ensure that quality data are delivered securely, and liaise with participating hospitals and users (clinicians and researchers).

WP8.3 DATA FEATURES, TOOLS AND BIOLOGICAL SIGNATURES OF DISEASE. This WP uses all available hospital and medical datasets to identify and define replicable disease signatures. The analysis of data from different domains will require the tailoring of existing tools and the development of new analysis tools and methods.

WP8.4 THEORY, DISEASE MODELS & BIG DATA ENGINEERING. Here, we provide a theoretical framework for querying, analysing and integrating existing data into a model-based approach for discovery of brain disease signatures. It builds on data features obtained in WP8.1-8.2 and uses mathematical and statistical methods developed in WP8.3 to predict disease characteristics.

WP8.5 THE MEDICAL INFORMATICS PLATFORM. We provide online evidence-based medicine tools via a web portal to users such as neuroscientists, computational scientists, epidemiologists, and the pharmaceutical industry. Its analyses integrate open-access research data repositories with brain disease features generated in participating hospitals using MIP tools.

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WORK PACKAGE LEADERS

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- WP8.2 Data Selection and Community Engagement: Bogdan DRAGANSKI
- WP8.3 Data Features, Tools and Biological Signatures of Disease: Mira MARCUS KALISH
- WP8.4 Theory, Disease Models & Big Data Engineering: Andrew POCKLINGTON
- WP8.5 The Medical Informatics Platform: Ferath KHERIF

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Publication highlights

Zufferey V., Donati A., Popp J., Meuli R., Rossier J., Frackowiak R., Draganski B., Von Gunten A., Kherif F. *Neuroticism, depression, and anxiety traits exacerbate the state of cognitive impairment and hippocampal vulnerability to Alzheimer's disease*. Alzheimer's & Dementia: Diagnosis, Assessment & Disease Monitoring, 2017.

Frackowiak R., Ailamaki A., Kherif F. *Federating and Integrating What We Know About the Brain at All Scales: Computer Science Meets the Clinical Neurosciences*. Buzsáki G, Christen Y, editors, Cham (CH): Springer; 2016.

Dragan Gamberger, Bernard Ženko, Alexis Mitelpunkt, Netta Shachar, Nada Lavrač. (2016) *Clusters of male and female Alzheimer's disease patients in the Alzheimer's Disease Neuroimaging Initiative (ADNI) database*. *Brain Informatics*. In press.

Cui Jing, Zufferey Valérie, Kherif Ferath, 2015/08/01. *In-vivo brain neuroimaging provides a gateway for integrating biological and clinical biomarkers of Alzheimer's disease*. Current Opinion in Neurology, DOI 10.1097/WCO.0000000000000225.

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<https://www.humanbrainproject.eu/en/about/project-structure/subprojects/>

