SWADESH, WORLD'S FIRST MULTIMODAL BRAIN IMAGING DATA AND ANALYTICS, DEVELOPED AT DBT-NATIONAL BRAIN RESEARCH CENTRE, HARYANA

Relevant for: Science & Technology | Topic: Indigenization of technology and developing new technology

DBT-National Brain Research Centre (DBT-NBRC) have recently developed project SWADESH, a unique brain initiative focusing on certified neuroimaging, neurochemical, neuropsychological data and analytics that are made accessible to researchers for managing brain disorders. SWADESH is the first large-scale multimodal neuroimaging database designed specifically for Indian population with big-data architecture and analytics for various disease categories (Fig. 1) under one platform.



SWADESH was inaugurated by Dr. Jitendra Singh, Union Minister of State (Independent Charge) for the Ministry of Science and Technology on 19th November 2021.

To strengthen Alzheimer's disease (AD) research and help scientific community come up with promising treatments. SWADESH proposes a big-data architecture that manages and analyzes six modules, namely neurodegenerative [AD, mild cognitive impairment (MCI), and Parkinson's disease (PD)], neuropsychiatric (schizophrenia and bipolar disorder), neurodevelopmental (autism and epilepsy), COVID-19-related disorders, other disorders, and healthy subjects.

SWADESH is supported by JAVA-based workflow environment and Python. Backed by a dedicated storage system, it provides quality control, data analysis reports, and data backups. Its development will facilitate the integration of multi-site data and collaborative research worldwide. Presently, SWADESH has data of 500 AD and MCI patients and 70 PD patients. It also includes data of 600 healthy old individuals and 800 healthy young individuals in the control group.

DBT-NBRC has developed several clinical research tools through SWADESH. GAURI system uses adaptive pattern recognition and learning schemes for predictive single or differential diagnosis, designed with MRI modalities and neuropsychological batteries. NINS-STAT is a high-performance state-of-the-art automated statistical test selection and execution software package with high applicability in clinical research. KALPANA is an integrative package for visualization, preprocessing, and quantitation of MRS data. PRATEEK analyzes multimodal neuroimaging data that minimizes the need for expertise in handling different neuroimaging tools for processing and analyzing multimodal data. Stimulus Timing Integrated Module (STIM) includes a versatile paradigm design system, presentation system, and real-time participant response-collection system for functional MRI-related purposes, mapping brain activity non-invasively in normal healthy condition and clinical evaluation of various brain disorders. Dr. Mandal's team in DBT-NBRC subsequently launched BHARAT, a big-data analytic model for early diagnostic biomarkers of AD. The design included a Hadoop-based big-data framework integrating MRI, MRS, and neuropsychological test scores. The team is working to expand the project to include rich multimodal neuroimaging datasets for healthy and diseased cases.

Congratulating NBRC on the initiative, Dr Rajesh Gokhale, Secretary, Department said, "The brain is a complex organ, and detailed functionality in health and diseases remains to be fully recognized. Databases like SWADESH should be useful in conducting multimodal brain studies to understand Alzheimer's disease and several neurological disorders."

About DBT

The Department of Biotechnology (DBT), under the Ministry of Science and Technology, promotes and improves biotechnology development in India through its development and implementation in agriculture, healthcare, animal sciences, the environment, and industry.

About NBRC

National Brain Research Centre is the only institute in India dedicated to Neuroscience Research and Education. Scientists and students at NBRC come from diverse academic backgrounds, including biological, computational, mathematical, physical, engineering and medical sciences, and use multidisciplinary approaches to unravel secrets of the brain.

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