BIOMEDICAL INFORMATICS RESEARCH NETWORK (BIRN): BUILDING A NATIONAL COLLABORATORY FOR BIOMEDICAL AND BRAIN RESEARCH

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The Biomedical Informatics Research Network (BIRN) is an initiative within the National Institutes of Health (US) that fosters large-scale collaborations in biomedical science by utilizing the capabilities of the emerging national cyberinfrastructure (high-speed networks, distributed high-performance computing and the necessary software and data integration capabilities). Currently, the BIRN involves a consortium of 20 universities and 30 research groups participating in three test bed projects centered around brain imaging of human neuropsychiatric disease and associated animal models. These groups are working on large scale, cross-institutional imaging studies on Alzheimer's disease, depression, and schizophrenia using structural and functional magnetic resonance imaging (MRI). Others are studying animal models relevant to multiple sclerosis, attention deficit disorder, and Parkinson's disease through MRI, whole brain histology, and high-resolution light and electron microscopy. These test bed projects present practical and immediate requirements for performing large-scale bioinformatics studies and provide a multitude of usage cases for distributed computation and the handling of heterogeneous data. The promise of the BIRN is the ability to test new hypotheses through the analysis of larger patient populations and unique multi-resolution views of animal models through data sharing and the integration of site independent resources for collaborative data refinement.

The BIRN Coordinating Center (BIRN-CC) is orchestrating the development and deployment of key infrastructure components for immediate and long-range support of the scientific goals pursued by these test bed scientists. These components include high bandwidth inter-institutional connectivity via Internet2, a uniformly consistent security model, grid-based file management and computational services, software and techniques to federate data and databases, data caching and replication techniques to improve performance and resiliency, and shared processing, visualization and analysis environments. As a core component of the BIRN infrastructure, Internet2 provides a solid foundation for the future expansion of the BIRN as well as the stable high performance network required by researchers in a national collaboratory. Researchers within BIRN are also benefiting directly from the connectivity to high performance computing resources, such as TeraGrid. Currently researchers are performing advanced shape analyses of anatomical structures to gain a better understanding of diseases and disorders. These analyses run on TeraGrid have produced over 10TB of resultant data which were then transferred back to the BIRN Data Grid.

BIRN intertwines concurrent revolutions occurring in biomedicine and information technology. As the requirements of the biomedical community become better specified through projects like the BIRN, the national cyberinfrastructure being assembled to enable large-scale science projects will also evolve. As these technologies mature, the BIRN is uniquely situated to serve as a major conduit between the biomedical research community of NIH-sponsored programs and the information technology development programs, mostly supported by other government agencies (e.g., NSF, NASA, DOE, DARPA) and industry.