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The Human Brain Project

Abstract

Understanding the human brain is one of the greatest scientific challenges of our time. Such an understanding will lead to fundamentally new computing technologies, transform the diagnosis and treatment of brain diseases, and provide profound insights into our humanity. Today, for the first time, exponential improvements in the capabilities of modern ICT open up new opportunities to investigate the complexity of the brain. The goal of the Human Brain Project (HBP) is thus to build an integrated ICT infrastructure enabling *a global collaborative effort* to address this grand challenge, and ultimately to emulate the computational capabilities of the brain. The infrastructure will consist of a tightly linked network of six ICT platforms, which, like current large-scale physics facilities, will operate as a resource both for core HBP research and for external projects, chosen by competitive call. The HBP will drive innovation in ICT, creating new technologies for i) interactive supercomputing, visualisation and big data analytics; ii) federated analysis of globally distributed data; iii) simulation of the brain and other complex systems; iv) objective classification of disease; v) scalable and configurable neuromorphic computing systems, based on the brain's principles of computation and cognition and its architectures. Expected outputs include simulations of the brain that reveal the chains of events leading from genes to cognition; simulations of diseases and the effects of drugs; early diagnoses and personalised treatments; and a computing paradigm that overcomes bottlenecks in power, reliability and programmability, captures the brain's cognitive capabilities, and goes beyond Moore's Law. Overall, the HBP will help to reach a unified understanding of the brain, reduce the economic and social burden of brain disease, and empower the European pharmaceutical and computing industries to lead world markets with enormous potential for growth.