As the birthplace of artificial intelligence and cognitive psychology, Carnegie Mellon University has been a leader in the study of brain and behavior for more than 50 years. The university has created cognitive tutors which demonstrably improve learning outcomes, helped to develop the Jeopardy-winning Watson computer, founded a groundbreaking doctoral program in neural computation, and completed cutting-edge work in understanding the genetics of autism. Building on its strengths in biology, computer science, psychology, statistics and engineering, CMU’s BrainHub focuses on how the structure and activity of the brain give rise to complex behaviors and is creating new computational tools to understand brain activity.

How are we doing it?

BrainHub brings together scientists from different disciplines and from across the CMU campus and research institutions around the world with a bold research agenda that connects biological, computational and behavioral approaches to studying the brain. Research teams are engaged in exploring the interconnectivity of the brain and behavior; developing tools to collect, organize and analyze data about brain activity; and working basic science that will underpin clinical interventions to improve lives for people with developmental disorders or neurological diseases.

Recent examples of BrainHub discoveries include:

- Computational biologist Ziv Bar-Joseph and neurobiologist Alison Barth determined the rate at which the developing brain prunes unneeded connections among neurons during early childhood; these newfound insights will not only help us to understand the developing brain, but can be used to improve the robustness and efficiency of distributed computational networks.
- Psychologist Marlene Behrmann and her colleagues investigated the cognitive processes of individuals with autism spectrum disorder (ASD), and their findings have implications for teaching ASD children.
- Human beings, unlike robots, rarely perform physical movements in exactly the same way twice. Electrical and computer engineers Steve Chase and Byron Yu are studying the neural connections that allow this variability in human movement and how this variability contributes to learning and performance.
ECONOMIC COST:

$524 Billion
Addiction and Alcoholism

$350 Billion
Mental Illness
(depression, schizophrenia)

$215 Billion
Alzheimer’s

$11 Billion
Parkinson’s

U.S. COST: $1.1 TRILLION annually

GLOBAL COST: $5 TRILLION

HUMAN COST:

The human costs of brain diseases are incalculable when you look at the effects that Alzheimer’s, autism, depression and addiction have on our communities and our families.

- Americans have a 50% chance of developing Alzheimer’s by age 85
- 1 out of 68 children in the U.S. are diagnosed with an Autism Spectrum Disorder
- 16 million Americans report experiencing major depression each year
- Worldwide, 3 people commit suicide each minute
- Alcohol abuse and addiction is the 5th leading risk factor for premature death and disability, and the first for those ages 15-49, worldwide