1. Functional genomics (the ENCODE project): high-throughput CRISPR/Cas9 screening of functional regulatory elements.

We are using high-throughput CRISPR/Cas9-mediated genetic screening to interrogate the biological significance of a large number of non-coding regulatory sequences in the mammalian genome in both embryonic stem cells and iPSC-derived neural cell types.

2. Charting the regulatory landscape of human brain development and function.

We are utilizing integrative, unbiased, and high-throughput genomic and genetic tools (ATAC-seq, RNA-seq, ChIP-seq, 4C-seq, Hi-C, and CRISPR) to identify and functionally characterize cis-regulatory elements in human brain cells.

3. Investigating the functions of non-coding genetic variation associated with neurological diseases.

Putative regulatory regions harbor a disproportionately large number of sequence variants associated with human traits and diseases, leading to the notion that genetic lesions in the cis-regulatory elements contribute substantially to common human diseases. We are using functional genomics tools to investigate how non-coding variants associated with complex neurological disorders (e.g., autism spectrum disorders (ASD), Alzheimer diseases (AD), and Parkinson disease (PD)) contribute to disease.