The central nervous system (CNS) is composed of the brain and spinal cord and it constitutes a part of the vertebrate nervous system. The main function of the CNS is to register, analyze and react to the stimuli coming from outside and from inside the body. The CNS is also responsible for complex cognitive processes like thinking, learning and memory. Neurons are the fundamental units of the nervous system. Single neuron consists of a cell body and two types of extensions: single long projection – axon and numerous short extensions – dendrites. Axons conduct information from the neuronal cell body to other neurons or executive organs, while dendrites transmit signals from neighboring neurons to the cell body. Neurons are connected by synapses that mediate signal transduction.

Proper formation and organization of synaptic connections and dendritic tree is important for the transmission of information in the CNS. Abnormalities in those processes are often associated with numerous severe neurological disorders like schizophrenia, epilepsy, Alzheimer's disease or autism. Unfortunately, despite the decades of studies there is still little known about the molecular machinery that controls synapses remodeling and orchestrates dendritic tree growth and patterning.

In the proposed research we aim to study the molecular machinery that regulates neuronal organization and synapse formation in the CNS. The project will focus on the role of the Hippo signaling pathway in those processes. The Hippo signaling pathway has been discovered in fruit fly (Drosophila melanogaster) and appears to be highly conserved. The Hippo pathway has been shown to regulate cellular polarity, cancerogenesis and organ size during development. However, there is so far no evidence implicating the Hippo pathway signaling in synapse remodeling and neuronal polarity. In the proposed project we will study the distribution and function of the main components of the Hippo pathway (Yap, Taz, Mst1 and Lats1) in the CNS. The experiments will be conducted using cultured neuronal cells (in vitro) and mouse brains (in vivo).

Proposed study aims to dissect the molecular mechanism of synapse remodeling and neuronal networks organization in the brain. It is particularly important for development of new treatment modalities for numerous neurological and mental disorders commonly present in society. Experiments proposed in this grant have the potential to be a substantial contribution to the field of neurobiology and by extension might impact various disciplines of biology and medicine.