Severe brain-injuries lead in many cases to disorders of consciousness (DOC). Assessing the exact level of consciousness, and thus a predictor for future recovery, is a complex task, as patients are typically not able to communicate. At the same time it seems to be purely clinical but also ethical and social challenge.

Patients may be diagnosed as vegetative state (VS), what indicates that their body retains basic functional level (e.g. it is able to breath), while their cerebral cortex is severely damaged that they are devoid of consciousness (both of themselves and the environment). They may be also classify as minimally consciousness state (MCS), where a certain degree of awareness is preserved and it is associated with higher possibility for recovery or as lock-in syndrome (LIS) when consciousness is preserved while patient remain totally paralyzed. Recent reports continue to inform that the level of misdiagnosis of vegetative state patients which in fact remains conscious is still around 40% and the main issue here is the ambiguity of the symptoms manifested by patients themselves. It results in certain rehabilitation approach and further treatment for the patient.

The main aim of this project is the development of a measurement protocol that base on electroencephalographic measurements from cerebral cortex and would be able to determine the current level of consciousness among those patients. We propose to test autitory textures method where natural texture stimuli like rain, wind or fire are presented. This textures are characterized by their special pattern which can be detected by the consciouss brain. During data analysis we will compare responses between conscious (wakefulness, MCS, LIS) and unconscious states (deep NREM sleep, VS patients).

The characteristic feature of this project is its interdisciplinary nature and comprehensive approach. It is planned to use the same textures method and perform experiment on awake and unconscious mice under certain level of surgical anesthesia. This will allow to specify how both kinds of tested sounds perform on the level of single neurons from selected regions of auditory cortex. Further, the project would broaden scientific knowledge about the representation of auditory stimuli in the brain, especially in certain situations in which consciousness is lost fully or partially.