Modern technology depends on "tools" that process and store information, such as computers, smartphones, and many other electronic devices. All these devices use semiconductor components such as transistors, diodes or lasers for their operation. Therefore, semiconductor technologies are one of the pillars of our civilization development. Modern electronics are dominated by silicon technology, which, however, approaches the performance limits resulting from the physical properties of silicon itself. Therefore, scientists makes efforts to further develop semiconductor technologies. In particular, new semiconductor materials are sought after with properties allowing for more efficient processing of information. Transition metal dichalcogenides belong to the group of materials that will potentially allow further dynamic development of information processing technology. By using the unique features of the transition metal dichalkogenide band structure, it will be possible to encode eight bits of information instead of two using a single electron due to the additional degrees of freedom: spin and pseudospin. This will enable more efficient information processing, with less energy consumption. The use of additional degrees of electron freedom in these materials gives hope for the development of electronics beyond the limits set by Moor's law.

However, before this happens, the properties of these materials must be thoroughly understood together with development of deterministic modification of their properties. One of the promising directions bases on transition metal dichalkogenides heteorstucture, i.e. a combination of two different mono-layers of these materials. This combination creates structures with crucial monolayer properties and many other beneficial features that will potentially allow for effective spin and pseudospin control. The properties study and control of internal degrees of freedom of electrons in such heterostructures is the subject of this project.