Bio-Inspired Sensory Maturation

Most living systems, including humans, perceive their environment with a variety of senses (vision, touch, hearing, etc.). When different senses are used simultaneously, a fine-tuned sensory integration (fusion) plays an essential role in ensuring correct perception. However, in human infants and toddlers, for example, sensory organs develop at different rates (maturation of the senses). With that in mind, the aim of this research project is to investigate whether bio-inspired sensory maturation can benefit sensor fusion in AI-equipped robots. Closely related to this study is the question of whether sensory maturation in living systems could be beneficial for developing certain skills.

Image of the Webots simulation environment

In prior work, a visuo-haptic dataset (images and touching poses) was created using a "TIAGo Titanium" robot with a humanoid robotic hand in a "Webots" simulation environment. This dataset can be used for training various multimodal deep learning architectures, for example, and can be extended by adding new objects to the simulation environment. The study can also be transferred from simulation to the real world by utilizing a humanoid robotic hand provided by the professorship. Alternatively, an "iCub" robot can be used to collect visuo-haptic data. Furthermore, the study can be expanded to other sensory modalities like auditory perception.
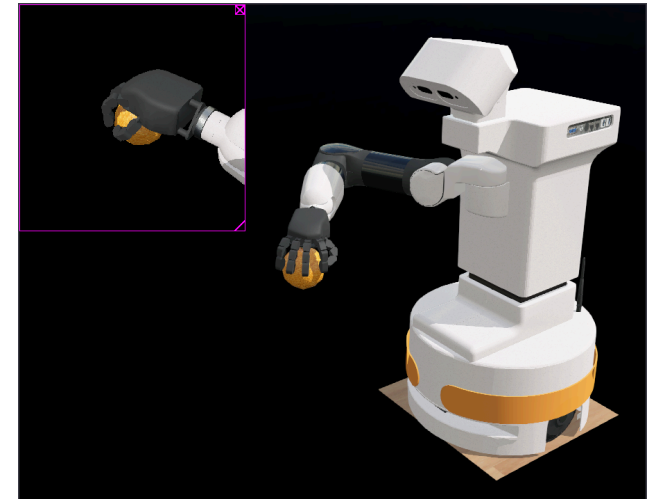
Requirements:

- Machine learning fundamentals
- Basic knowledge in Webots (optional)