Fachpraktikum „Artificial Intelligence“
Wintersemester 2020/2021

**Topic: Object motion estimation**

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Erstes Treffen: Friday July 17, 9am, room tbd
Weitere Termine: To be defined

**Target Group**
This seminar targets master students interested in Artificial Intelligence and Machine Learning who already have a background in machine learning.

**The Topic**
Estimating the motion of an object is the process of determining its position at each timestamp w.r.t a predefined coordinate system. Objects can be divided into two categories: active and passive objects. Active objects can move freely in the space as they control motions (i.e velocity, direction, etc) and can change it any time. Examples include human bodies and animal bodies. Passive objects are stationary by default and can move only if an external force is applied on them such as billiard balls. The motion of these objects is subject to several characteristics such as the applied force, the weight of the object and the coefficient of friction, the spin of the ball, etc. In this lab, we focus on passive objects whose motion can be estimated from measurable characteristics by using laws of motion.

Object’s motion can also be estimated by learning from examples. Neural networks have shown great learning performance for various applications. By feeding the neural network model with a lot of examples of moving passive objects, the parameters of the model can be learnt. Consequently, the model can estimate the motion of objects in unseen image sequences.

In this Lab, we will tackle the problem of estimating the motion of objects such as billiard balls, drones and ships using two different methods. In the first one, we will use the first few frames to estimate the initial motion characteristics (i.e. applied force, velocity and direction). These characteristics will be used to calculate the positions of every object at each timestamp considering possible collision between multiple objects. The second method will also use the first few frames and the initial position of every object to estimate their positions at each timestamp using a neural network model.

**Procedure**
Participants will report and discuss their progress weekly. At the end of the Lab, students give their final presentations. At the beginning of the lab, the structure of their presentations and reports will be discussed with the lecturers. Before the final presentations and before the end of the winter term, the reports must be handed in.