# Intelligent Supervision

2021 / 2022

## Lab Assignment 3

### Data-driven Dispatcher with Machine Learning

Duration: 3 Weeks (to be submitted on 10/01/2022)

## General Description

In the last assignment of the Intelligent Supervision course, we will take a look at some concepts of Machine Learning, framing them in the context of our supervision architecture.

The goal will be to develop a simple data-driven dispatcher module (goto_x, goto_y, goto_z) using machine learning, meaning that the behaviour of the dispatcher will not be explicitly programmed, but instead derived from the data.

## Required Software

The list of material to be used during this assignment is as follows:

- **Anaconda Navigator**
- **VS Code**
- **Simulation from Lab 2**
- **Base project provided in CLIP**

## 1. Objectives

The base **source files required for this assignment are available on CLIP**. The end result should look similar to Figure 1.

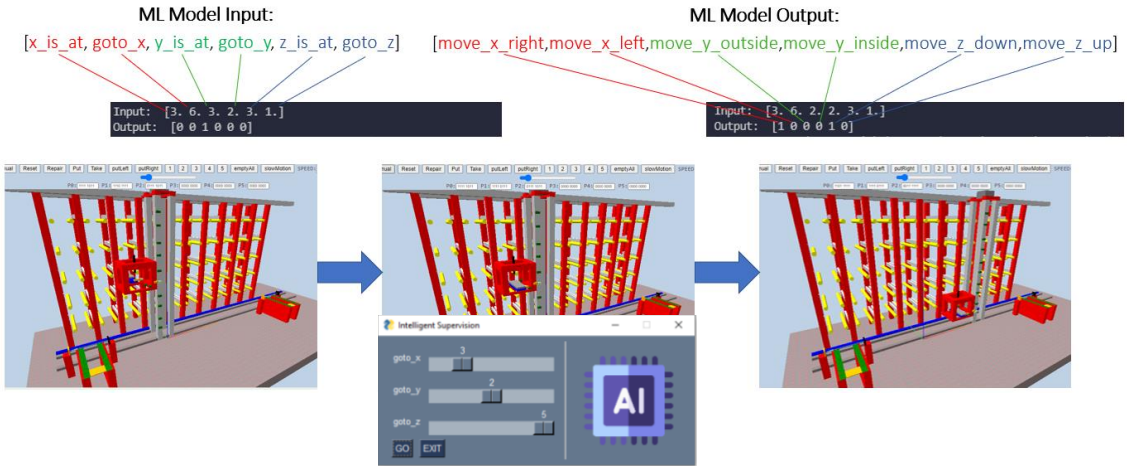


*Figure 1 - Overview of the assignment*

The main goals can be summarized as:

1. Generating an adequate dataset for model training.

2. Training a machine learning model to serve as the dispatcher. It receives the X, Y, Z positions from the warehouse state and the goal positions, then outputs the corresponding actions (e.g., move_x_right).

3. Integrating the approach with the simulation from Lab 2.

Each week supporting slides will be provided to guide the students in achieving these objectives.

## 2. Submission Deadline and Guidelines

- Completed projects should be submitted via the course's **Moodle page** before the end of the deadline.
- Projects should be executed in groups of 2 or 3 (maximum) students.
- The project folder (encompassing all relevant files) should be submitted as a single archive file (e.g., .rar, .zip), named following the template "studentNumber1_studentNumber2_studentNumber3.rar".
- **Deadline is 10th of January, 23:59 GMT**.

## 3. Evaluation Criteria

All of the goal/value pairs listed below are based on the assumption that a correct implementation is submitted.

| Goal | Value |
|---|---|
| Generate dataset (for 1 axis) | 1 |
| Load and prepare data | 2 |
| Train-test split | 2 |
| Train different (at least 2) models | 4 |
| Test/Validate models in a separate notebook (ipynb) | 3 |
| Test with the Python GUI | 1 |
| Integrate with the simulation / C webserver | 1 |
| Adapt for all 3 axes | 6 |

## 3. Lab Planning

- Week 1 – Generating the dataset and base implementation for 1 axis.
- Week 2 – Validate the models and finalize base implementation. Begin extending for 3 axes.
- Week 3 – Finalize the assignment. Implementation of any bonus functionalities.

## Additional Reference Material

- Scikit-Learn Package Documentation: https://scikit-learn.org/0.21/documentation.html
- Pandas Package Documentation: https://pandas.pydata.org/docs/
- Weekly slides provided for the lab classes in CLIP