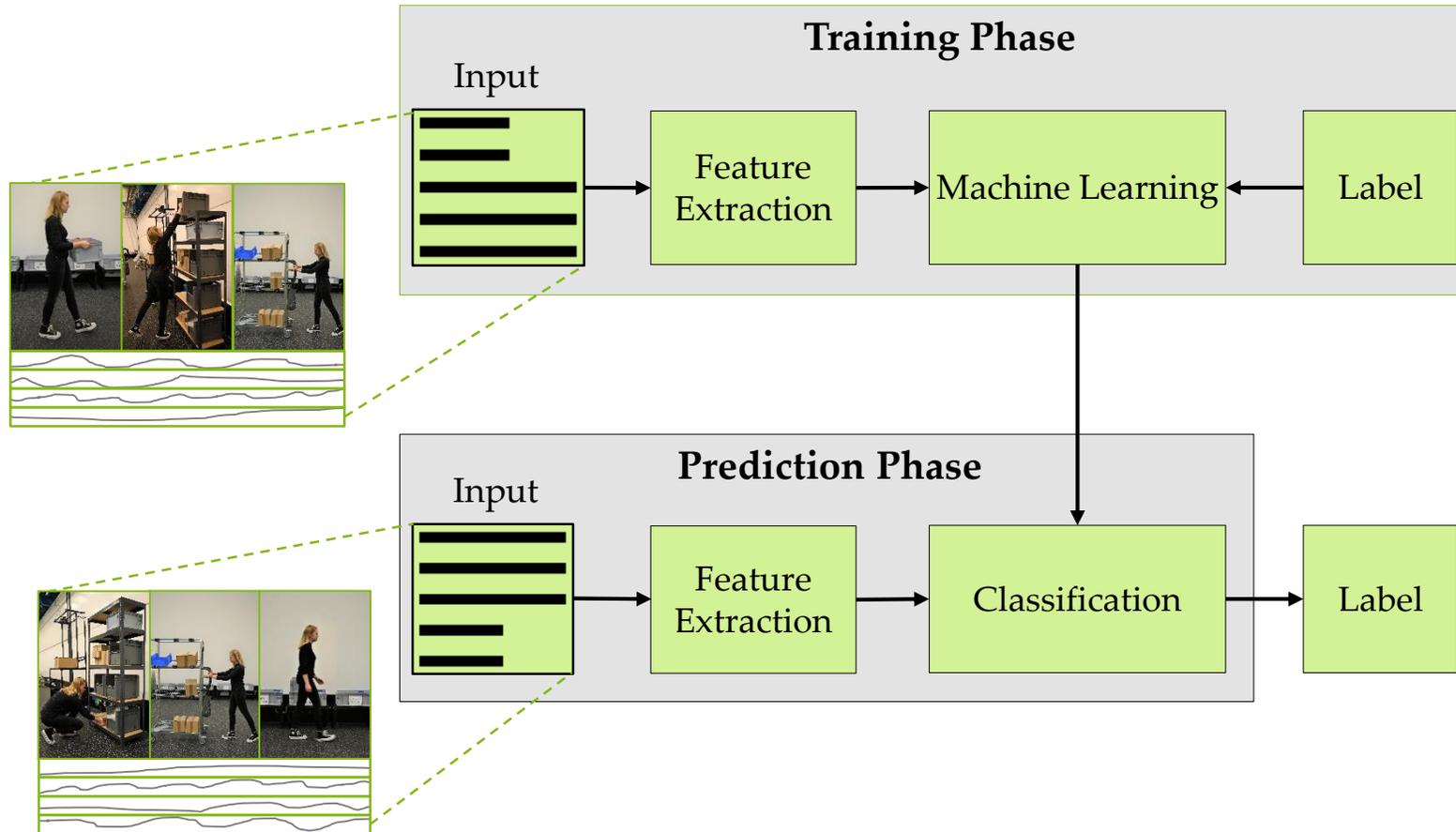


Attribute-based recognition of  
human activities in industrial facilities  
using body-worn sensors

Dr.-Ing. Christopher Reining  
30.11.2021

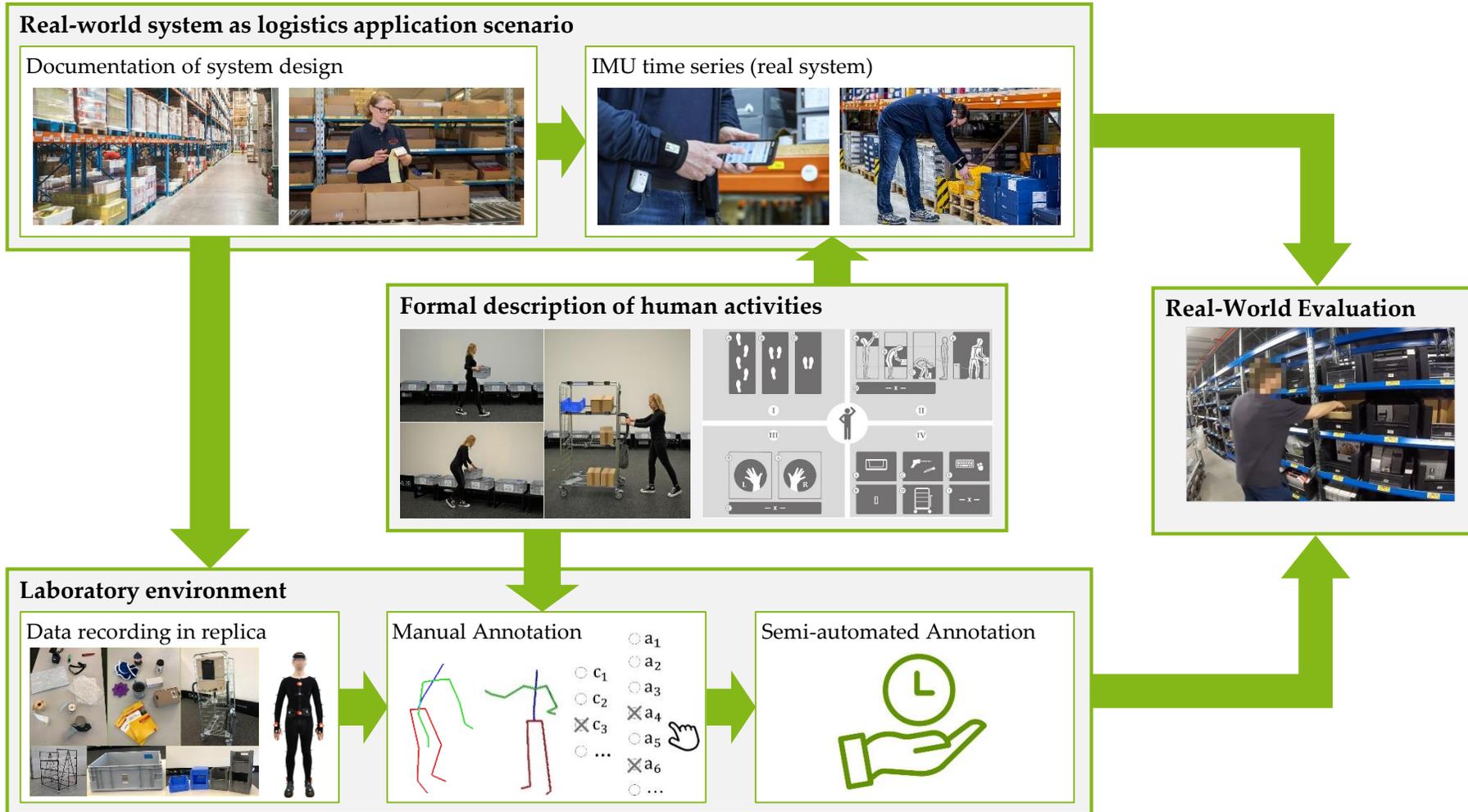


# Classification of human activities

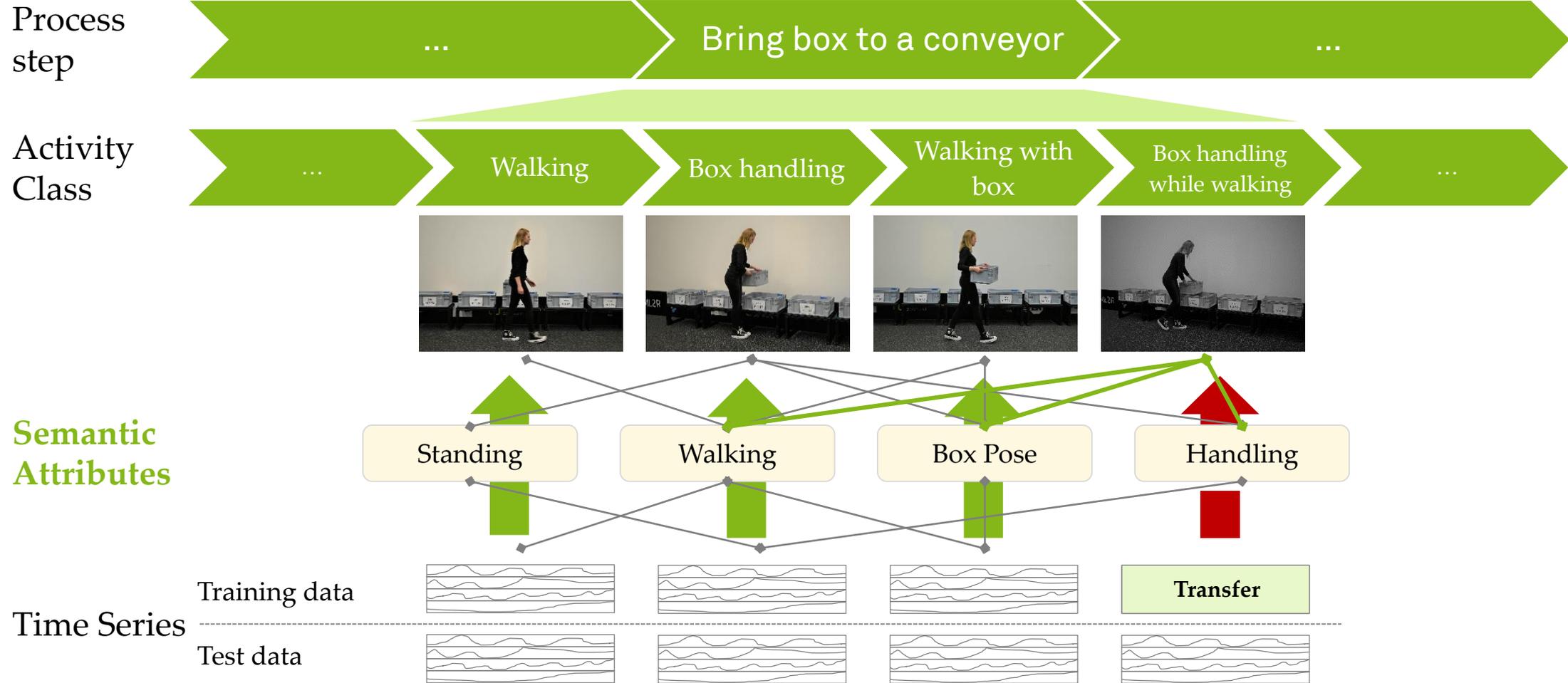


- **Challenges**
  - Inter-Class Similarity
  - Intra-Class Variability
  - Class Imbalance
  - Transitions
  - Effort and consistency of labels
  - ...

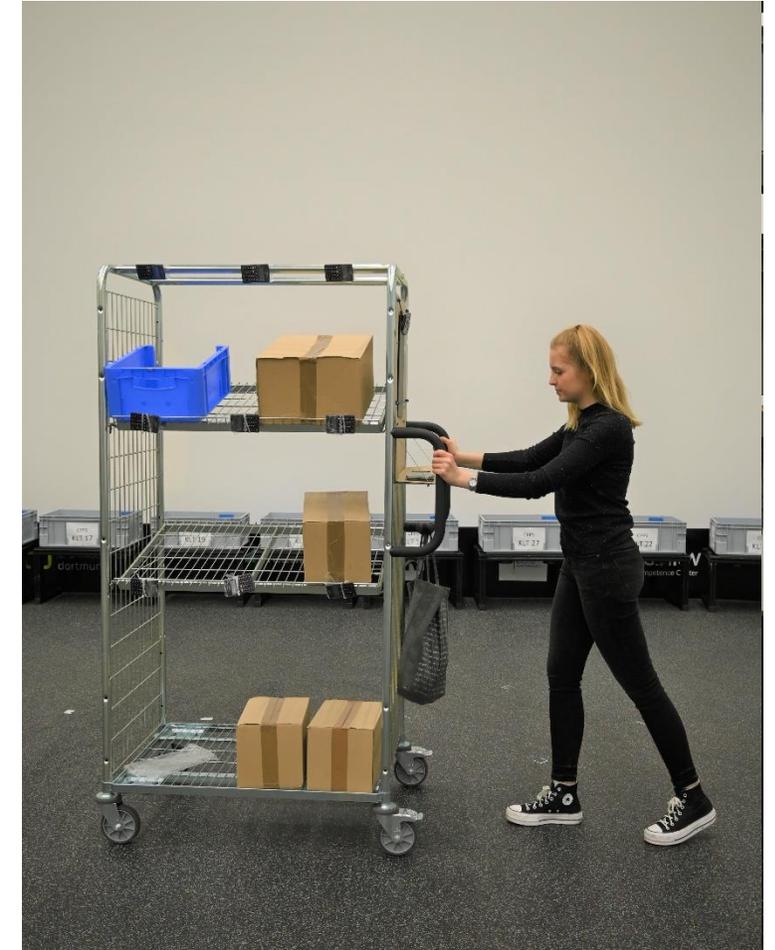
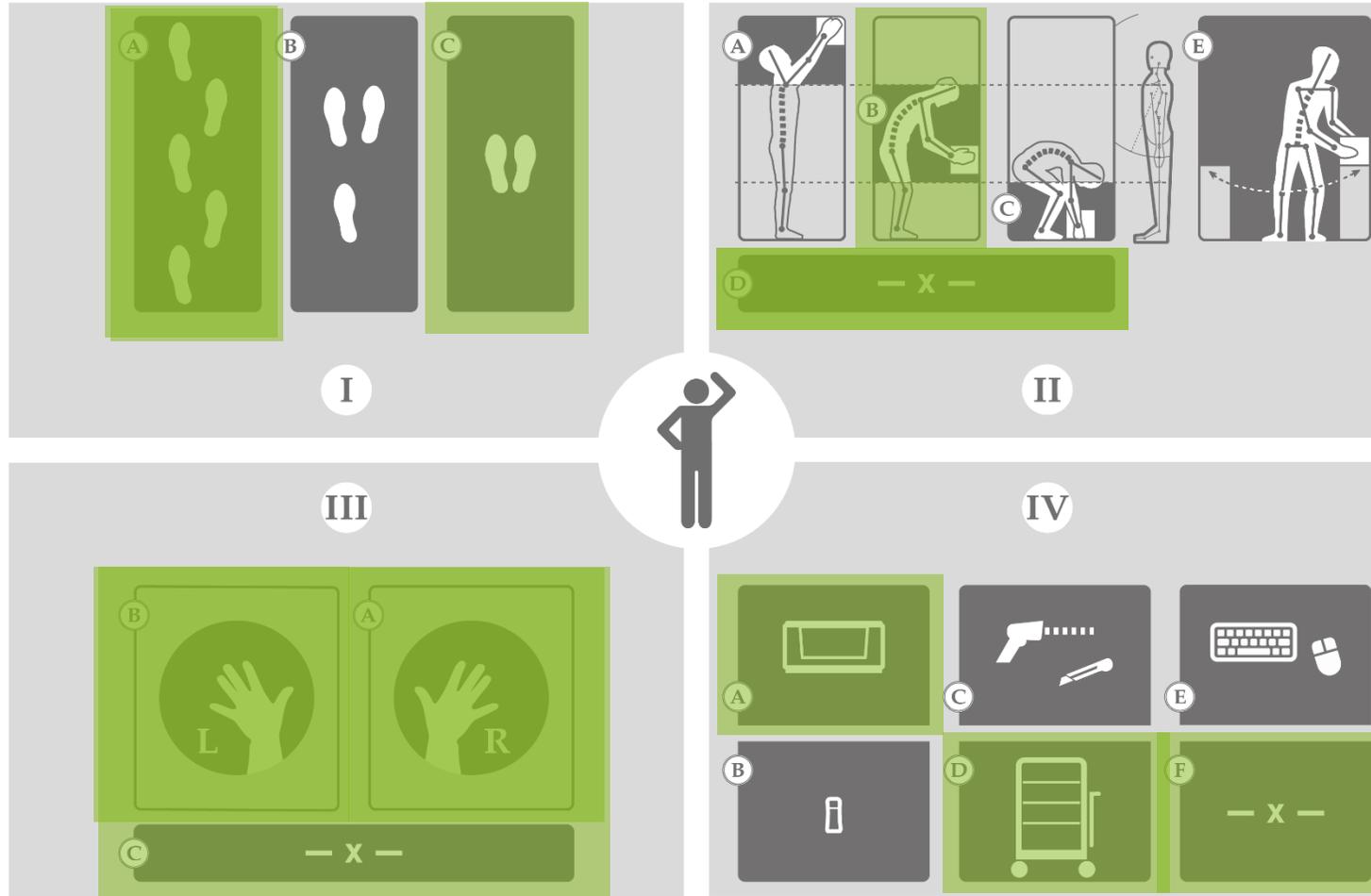
# Approach



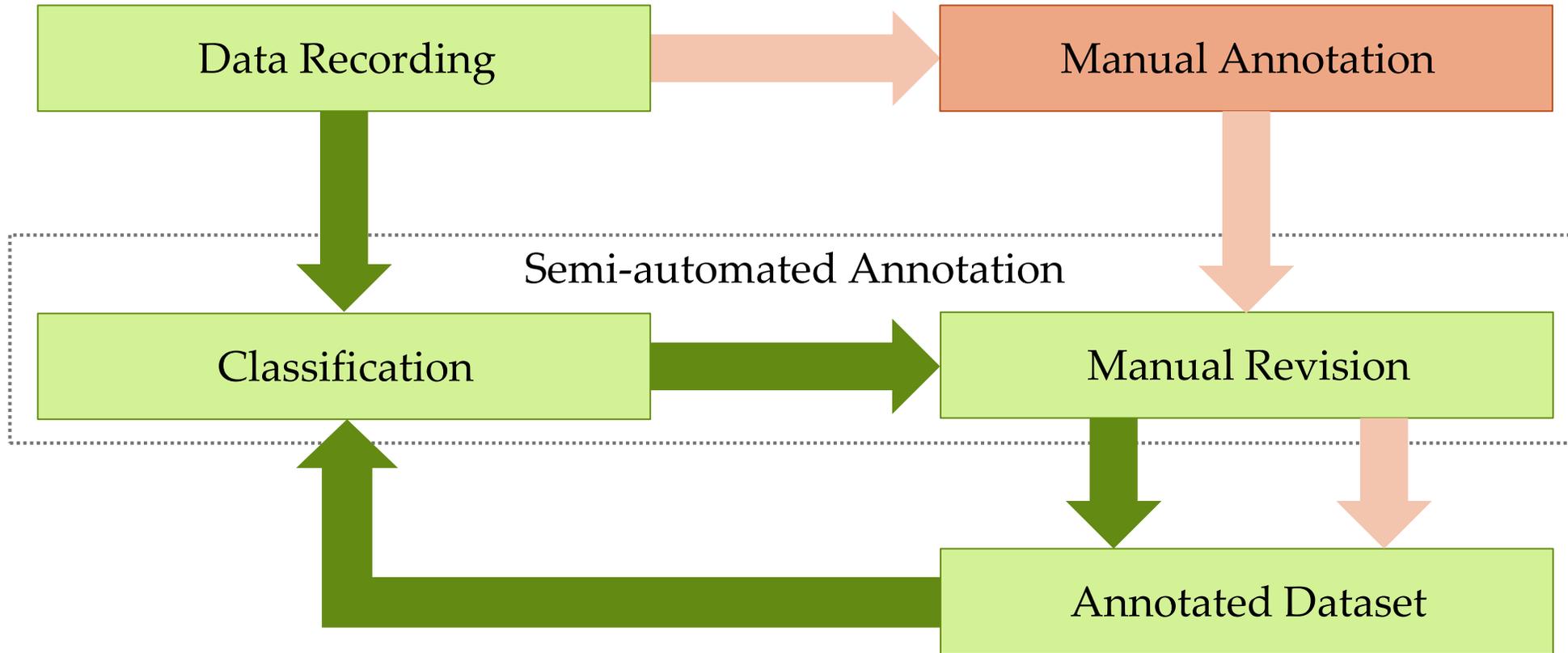
# Layer Concept



# Semantic Attributes



# Semi-automated Annotation



# Logistics Application Scenarios



# Laboratory Data Recording



- Synchronized Recording of
  - RGB-Video,
  - Marker-based Motion Capturing,
  - IMUs of varying configuration and placement.
- 16 h of recorded material in total

Check the dataset!



# Annotation Tool

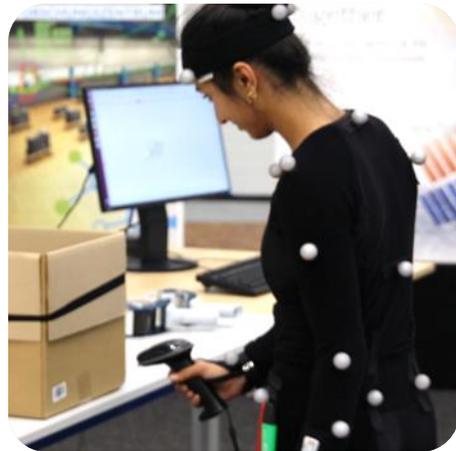
The screenshot displays the Annotation Tool interface, which is divided into several sections:

- Top Bar:** Contains menu items: Open File, Save Work, Settings, and Annotation Guide. Below this, it shows the current file path: L02\_S13\_R13\_A08\_N01\_norm\_data.csv.
- 3D Viewport:** A 3D perspective view showing a grid floor and a 3D model of a person with colored bounding boxes (red for the torso, green for the head, blue for the neck).
- Control Panel (Left):** Includes playback controls: Fast Reverse, Reverse, Slow Reverse, Play, Slow Forward, Forward, and Fast Forward. Below these are frame navigation controls: Input Frame: 23352, Set to start point, and Current Frame: 1/23996. The version is noted as Annotation Tool Version: 215 hotfix 1.
- Annotation Modes (Top Right):** Tabs for Manual Annotation Mode, Label Correction Mode, Automatic Annotation Mode, and Prediction Review. The Manual Annotation Mode is active, showing a 'Select Joint' dropdown (set to 'none'), 'Start Point: 1', and 'End Point: 1'. A 'Set to current frame' button is present. A 'Save Labels' button is highlighted. A tooltip for 'Verify Labels' reads: 'Labels are verified! You can now save your labels. Please choose the folder for labeled sequences, when saving.'
- Class Statistics (Middle Right):** A vertical stack of six line graphs showing the count of objects for different classes over time (0 to 20,000 frames). The classes are: Classes (y-axis 0-8), RX (deg) (y-axis 0-1), RY (deg) (y-axis 0-1), RZ (deg) (y-axis 0-1), TX (mm) (y-axis 0-1), and TY (mm) (y-axis 0-1). Each graph shows a single spike at the beginning of the video, labeled 'end'.
- Video Player (Right):** A VLC media player window showing a video of a person in a warehouse holding a card. The video title is 'L2\_S13\_R13.mp4 - VLC media player'. The playback controls at the bottom show a progress bar from 00:00 to 02:12 and a volume indicator at 49%.

Check the tool!

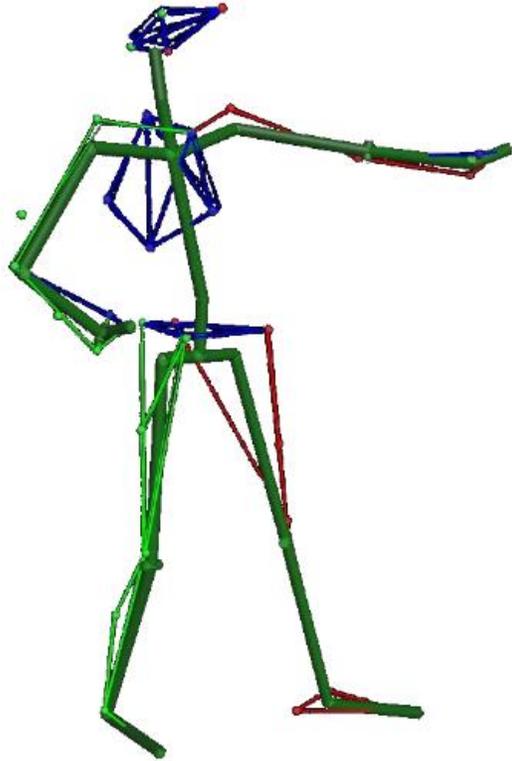


# Summary



- ✓ First time definition of semantic attributes for transferable activity recognition in industrial settings
- ✓ Mode of data generation in a laboratory environment
- ✓ Motion patterns are proven to be sufficiently close to reality
- ✓ Novel, publicly available dataset (FAIR)
- ✓ Semi-automated Annotation using a reference

# Contact



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