Machine Learning Group

**Supervisor:** Prof. Dr. Barbara Hammer

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Bielefeld University
Faculty of Technology
The research group Machine Learning (ML):

- **Supervisor**: Prof. Dr. Barbara Hammer
- **Homepage**: [https://www.cit-ec.de/en/ml](https://www.cit-ec.de/en/ml)
- **CITEC, Techfak**
The research group **Machine Learning (ML):**

- Research focus: all aspects of machine learning and related problems

- In particular:
  - incremental learning, learning with drift, transfer learning
  - dimensionality reduction and data visualization
  - learning with structured data
  - metric and relevance learning
  - applications for myoelectric control
  - applications for intelligent tutoring systems
  - applications in industry 4.0
  - applications for the analysis of motion data

- More information:
  - ML Homepage: [https://www.cit-ec.de/en/ml](https://www.cit-ec.de/en/ml)
Analysis of Motion Data:

- Applications for the analysis of motion data:
  - PhD student: Babak Hosseini

- Data from different types of motions

- Kinect/vicon data:
  - Multi-dimension time-series
Analysis of Motion Data:

- Applications for the analysis of motion data:
  - PhD student: Babak Hosseini

- Categorizing the motion data
- Finding the characteristics of the motions
- Supervised / unsupervised

- One MS and one BS thesis
MS Project:

- Open MS Thesis:
  - **Subject**: Unsupervised segmentation of motion data using slow feature analysis
  - **Segments**: Walking → Running → jumping → etc.
MS Project:

- **Open MS Thesis:**
  - **Subject:** Unsupervised segmentation of motion data using slow feature analysis
  - **Segments:** Walking → Running → jumping → etc.
  - **Goal:** Finding the cutting points between segments without having the data labels
MS Project:

- Automatic segmentation of motion data using slow feature analysis

  - **Goal**: Finding the cutting points between segments.
  - **Approach**:
    - Apply **online Slow-Feature-Analysis** (code available)
    - Check self-similarity measures
MS Project:

- Automatic segmentation of motion data using slow feature analysis

  - **Goal**: Finding the cutting points between segments.
  
  - **Approach**:
    - Apply **online Slow-Feature-Analysis** (code available)
    - Check self-similarity measures

  - **Data**:
    - Available Vicon motion datasets (CMU, Bonn, CITEC,..)

  - **Programming language**:
    - Matlab, Python
BS Project:

• Open BS Thesis:
  – **Subject:** Averaging motion data for prototyping
  – Different examples form the same type of motion
  – **Goal:** Augment them into one representative (same motion)

  – **Mathematically:**
    – Combine **SOME** multi-dimension time-series
      → **ONE** multi-dimension time series
    ! Preserving the shared characteristics of the input motions
BS Project:

- Open BS Thesis:
  - **Subject:** Averaging motion data for prototyping
  - **Goal:** Augment them into one representative
  - **Algorithm:**
    - DBA averaging algorithm based on DTW (code available):
  - **Data:**
    - Available Vicon motion datasets (CMU, Bonn, CITEC,..)
  - **Programming language:**
    - Matlab, Python

- **Task:**
  - Implement the algorithm on the given dataset and evaluate the output prototype.
  - **Optional:** Improving the averaging algorithm to achieve more interpretable result.
    - **Ex:** If the averaged output is not a satisfactory prototype for walking.
Contact:

- Interested?
- Have any questions?

- Please contact us!
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• Thank you very much!