

Pose Classification from 2D/3D Skeletons

Level: Bachelor/Master (1-2 students possible)

Duration: 3 months

Start: By agreement

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Institution: ETF Robotics

Overview and Technology: This project focuses on **pose classification** (recognizing discrete postures from human keypoints) using **2D keypoints** and **3D skeletons**. A typical pipeline estimates 2D keypoints from an RGB+D image/video (e.g., with MMPose or MediaPipe), optionally lifts them to 3D (e.g., VideoPose3D or MeTRAbs), and then performs classification with a deep model such as graph neural networks, an MLP/Transformer, or a spatio-temporal GCN. Students will implement and compare 2D-vs-3D features, study normalization/invariance (scale, translation, camera view), and deliver a small real-time demo on a PC workstation.

Platforms / hardware <ul style="list-style-type: none"> PC Workstation (GPU recommended) RGB+D camera and/or public pose datasets 	Software & tools <ul style="list-style-type: none"> Python (NumPy, OpenCV) PyTorch + OpenMMLab (MMPose, MMDetection) scikit-learn + visualization (Matplotlib/3D viewer)
Project options (projects can be modified based on student interests) <ul style="list-style-type: none"> Train a pose classifier for static postures (e.g., sport, safety poses, simple gestures) Compare 2D skeleton features vs lifted 3D skeleton features Explore deep models for skeletons (MLP/Transformer, ST-GCN-style baselines) and optimize for real time 	
Expected outcomes <ul style="list-style-type: none"> Literature review Project code and documentation/video Final report in IEEE research paper form 	Recommended background <ul style="list-style-type: none"> Digital image processing basics and camera geometry Python programming (NumPy/OpenCV) and basic software engineering Basics of machine learning / deep learning
Literature <ul style="list-style-type: none"> MMDetection model zoo: mmdetection.readthedocs.io/en/latest/model_zoo/recognition.html (also skeleton.html) MMPose (OpenMMLab) documentation and repository ST-GCN paper; PySKL toolbox for skeleton-based action/pose classification Graph-based pose classification methods (GCN-based models) OpenPose / MediaPipe for pose extraction 	