

Gait Event Detection Using an LSTM Network

10-701 Project Presentation

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Introduction

- ▶ Goal: detect gait events (heel strike, toe off) in motion capture data
- ▶ Necessary to measure changes in gait that arise from training, disease or aging

Data

- ▶ Time series data
- ▶ 54 features (18 motion capture markers \times 3 dimensions)
- ▶ 240 000 samples (8 subjects \times 3 trials \times 10 000 samples)
- ▶ Groundtruth from force plates

Baseline Methods

- ▶ Signal processing approach [O'Connor et al., 2007]
 - ▶ Heuristic based on speed of heel and toe markers
 - ▶ No learning
 - ▶ Sensitive to threshold value
- ▶ Feed-forward Neural Network [Miller, 2009]
 - ▶ Sliding window centered around the desired marker
 - ▶ Requires heavy preprocessing (dimensionality reduction, variable window size based on foot speed)

Our Approach: LSTM

- ▶ LSTM = Recurrent Neural Network with memory cells
- ▶ Motivation
 - ▶ Detect long-range dependencies
 - ▶ No windowing required
- ▶ Network architecture
 - ▶ TODO
- ▶ Implementation
 - ▶ Torch/Lua
 - ▶ LSTM cell by de Freitas (Oxford University, Google Deepmind)
 - ▶ AWS EC2 GPU instance (g2.2xlarge)

Results

Thank you for your attention!