

# Automated Evaluation of Physical Therapy Exercises by Multi-Template Dynamic Time Warping of Wearable Sensor Signals



Aras Yurtman and Billur Barshan



We have developed a system to automatically detect and classify the individual executions of physical therapy exercises and evaluate them to provide feedback to the patient and the physician.

The patient wears 5 motion sensors containing 3-D accelerometers, gyroscopes, and magnetometers.

We consider 8 exercises. Each exercise is assumed to have 3 execution types: one correct and two erroneous. We record one template for each execution type of each exercise for each subject.

We have developed a method based on dynamic time warping to detect and classify the templates in a physical therapy session.

The system detects 1,125 executions out of 1,200 with 88.7% accuracy in classifying the exercise and execution type.

The false alarm and misdetection rates are 4.9% and 8.6%.

