# Physical Therapy Dataset

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This dataset contains wearable inertial and magnetic sensor data during the execution of physical therapy exercises [1–4]. We consider eight types of physical therapy exercises, and three execution types (correct, fast, and low-amplitude) for each. Each execution type of each type of exercise was performed multiple times by five subjects. The subjects wore five MTx sensor units manufactured by XSens [5]. Each unit contains three tri-axial sensors: an accelerometer, a gyroscope, and a magnetometer, sampled at 25 Hz.

More information about the dataset and the experimental procedure can be found in [1]. Reference [1] also includes a study on automated detection and evaluation of physical therapy exercises. Refer to [2] and [3] for more brief versions of [1].

The data acquisition procedure was approved by Bilkent University Ethics Committee for Research Involving Human Participants. All participants gave informed consent and their identities are anonymous.

## Folder Structure

The data are stored in `.txt` files that are organized in folders as follows:

- `s1`, …, `s5`: subject 1–5
- `e1`, …, `e8`: exercise type 1–8
- `u1`, …, `u5`: sensor unit 1–5

## Data Files

Each `.txt` file contains numerical values separated by semicolon (`;`) and a header row.

- **Template sessions:** For each subject, each exercise type, and each sensor unit, the file **`template_session.txt`** contains data acquired during a template recording session. Such a session contains three executions for each of the three execution types. For each execution type, a single template is selected in [1–4]. The time intervals of the selected templates are available in `template_times.txt` files (see below).
- **Time intervals of selected templates:** For each subject and exercise type, the file **`template_times.txt`** contains the start and end time indices of the templates for the three execution types. The time indices correspond to the `template_session.txt` files. As an example, Figure 6(a) in [1] highlights the three templates for exercise type 1 of subject 3.

- **Test sessions:** For each subject, each exercise type, and each sensor unit, there is a **`test.txt`** file that correspond to a test session that contains 10 repetitions for each execution type. See Figure 6(b) in [1] as an example.

Each row of the files named `template_session.txt` and `test.txt` contains the time index ($n = 1, 2, \dots, N$) as well as the measurements along the $x$, $y$, $z$ axes of accelerometer (acc), gyroscope (gyr), and magnetometer (mag) sensors, where the order is provided in the header rows. The sampling rate is $f_s = 25$ Hz; hence, time can be calculated as $t = (n-1)/f_s = 0.04\,(n-1)$ seconds.

# References


[1] A. Yurtman and B. Barshan, "Automated evaluation of physical therapy exercises using multi-template dynamic time warping on wearable sensor signals," *Computer Methods and Programs in Biomedicine*, 117(2):189–207, November 2014 (DOI: 10.1016/j.cmpb.2014.07.003).

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[5] Xsens Technologies B.V., Enschede, The Netherlands, MTi and MTx User Manual and Technical Documentation, 2014, http://www.xsens.com.