

Machine Learning Methods for online Gait Analysis:  
Developement and Validation of a Smartphone Application.  
Experimental Validation Procedure

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## 0.1 First trial

We wrapped the IMU on a shoe and went out in the proximity of the laboratory to test if there were problems of any kind. We saved the gyroscopic data locally (i.e. on the IMU) by setting an acquisition time of 400 s. We used Andrea's Smartphone with a metronome app to set a cadence. We walked for about 500 m and back for about 300 m, for a total of about 800 m. We tried to import the data on the IMU to the Smartphone, but then interrupted the procedure, because it was too slow. We imported the data from the IMU to a computer with the WIMU Interface software (written in Visual Basic). We had also acquired GPS data, which we transferred via *DorpBox*<sup>TM</sup> to Andrea's laptop. We needed a computer to download the WIMU and GPS data, so we installed the WIMU Interface software on a *Dell Latitude E6500* laptop. Since the bluetooth device was not working we used a Bluetooth USB key.

### Bluetooth USB configuration Procedure

1. Activate physical radio button (WiFi and Bluetooth)
2. Insert Bluetooth USB key
3. go to Control Panel > Bluetooth Device
4. Follow instructions
5. Once connection is obtained, go to Control Panel > Devices > COM
6. change to COM 2

At this point we could see the IMU from the laptop

## 0.2 At the stadium

The WIMU was tied up to a running shoe using the laces of the shoe. We took two Smartphones, one with the app, the other for the metronome.

### 0.2.1 Settings

1. Set sensors:
  - (a) Gyro frequency = 100 Hz
  - (b) Acc Bandwidth = 20 HZ
  - (c) Acc Background = 8 g
2. Start IMU data logging on Smartphone 1 for time given in tables 1, 2
3. Start GPS data logging on Smartphone 1
4. Set metronome freq on Smartphone 2 with cadence given in tables 1, 2

<b>Cadence</b>	100 bps
<b>Time</b>	420 s

Table 1: First data acquisition parameters

<b>Cadence</b>	120 bps
<b>Time</b>	600 s

Table 2: Second data acquisition parameters

### 0.2.2 Acquisition Procedure

Before starting the subject with the WIMU jumped to mark the gyro signal. Once set we walked around the running field on the innermost track for 400 *m*. One with the WIMU laced, the other holding the Smartphones.