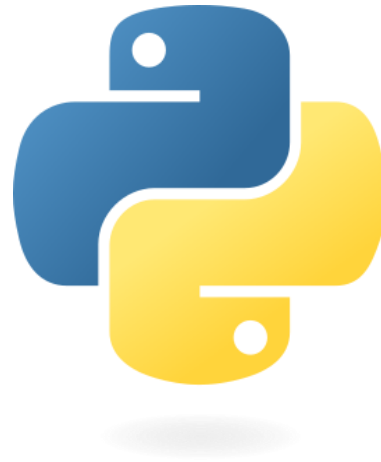


Python Programming for the Movement Sciences



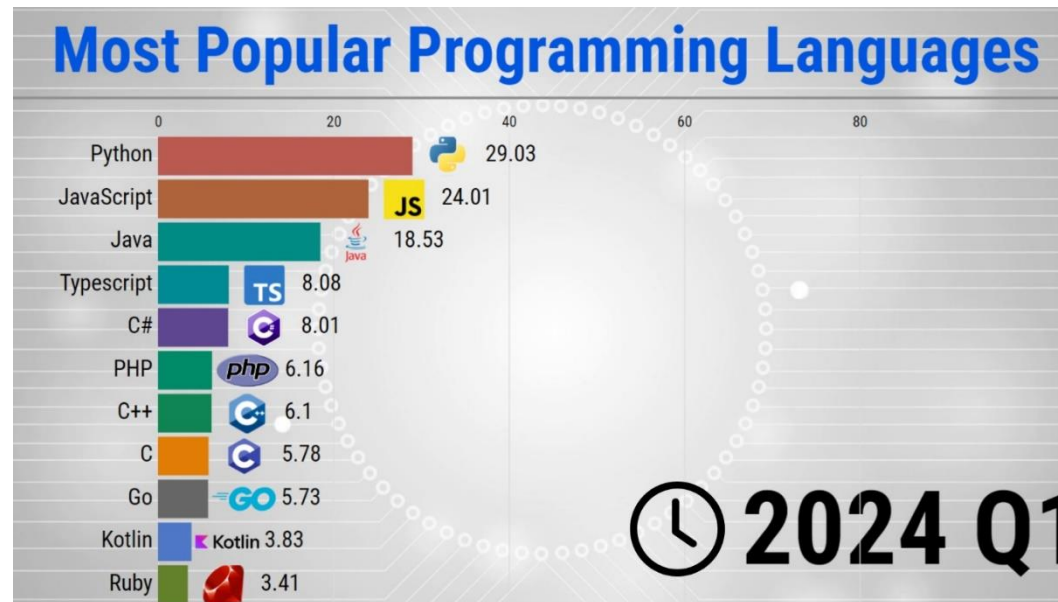
M. Abedinifar, C. Hansen, R Romijnders, J. Welzel, K. Saegner, W. Maetzler

Neurogeriatrics, Department of Neurology, University Hospital Schleswig-Holstein, Kiel



Introduction to Python

- Invented in the Netherlands at the beginning of the 90s by Guido van Rossum
- Named after Monty Python (British comedy troupe)
- Originally seen as a scripting language, but it is much more than that
- Used by major companies such as Google
- Gaining popularity



<https://statisticsanddata.org/>

Introduction to Python

“Python is often described as a 'batteries included' language, meaning it has a rich and versatile standard library that is immediately available to users.”

- Guido van Rossum

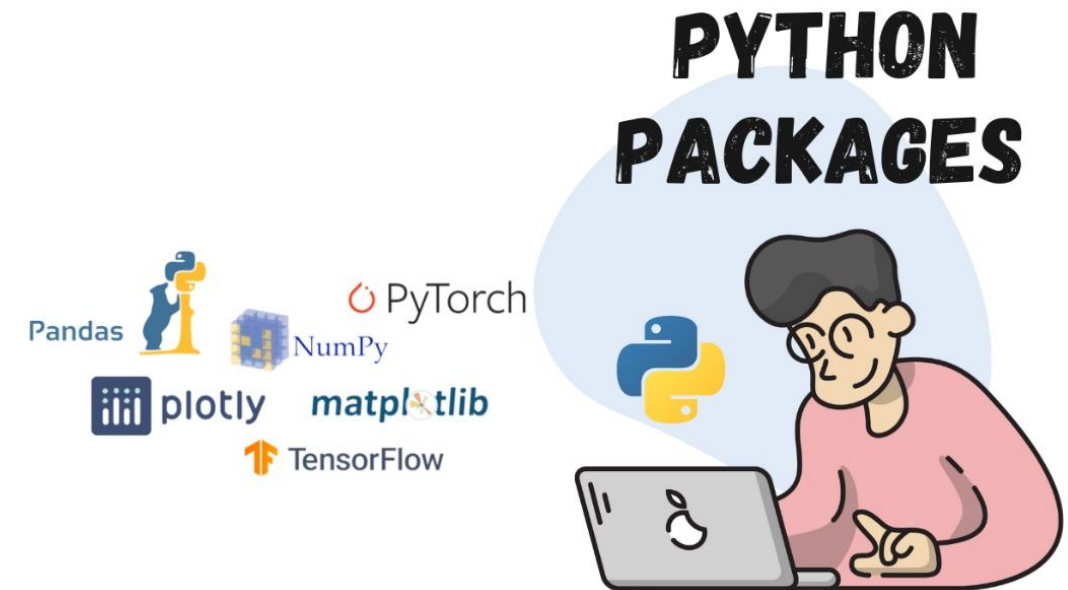


<https://www.flickr.com/photos/niallkennedy/310814303>

Python Packages

Commonly used packages:

- **NumPy:**
For numerical computing and handling data in arrays.
- **Pandas:**
For data manipulation and analysis, using data frames.
- **Matplotlib:**
For creating visualizations like plots and charts.
- **SciPy:**
For scientific computing with advanced mathematical functions.
- **So on...**



<https://www.naukri.com/code360/library/python-packages>

Applications in Movement Science

- Load and analyze movement data.
- Simulate movement patterns.
- Visualize data to gain insights.
- Develop algorithms for tracking movements.

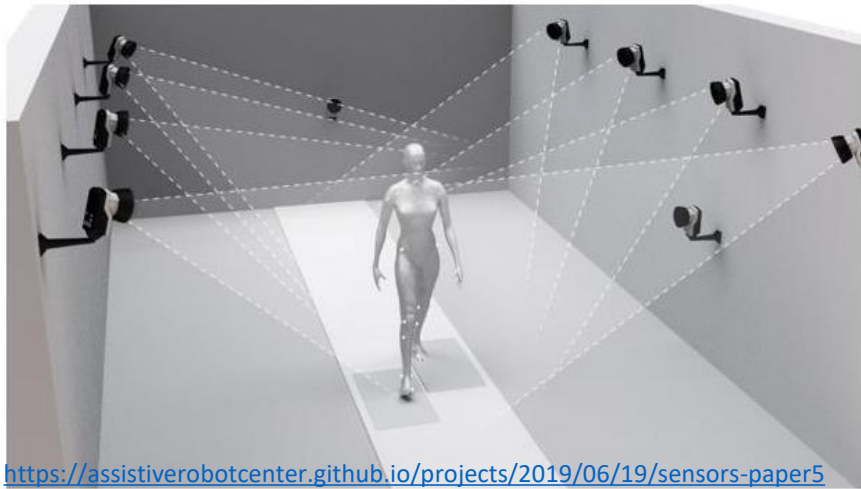


<https://github.com/mad-lab-fau/gaitmap>

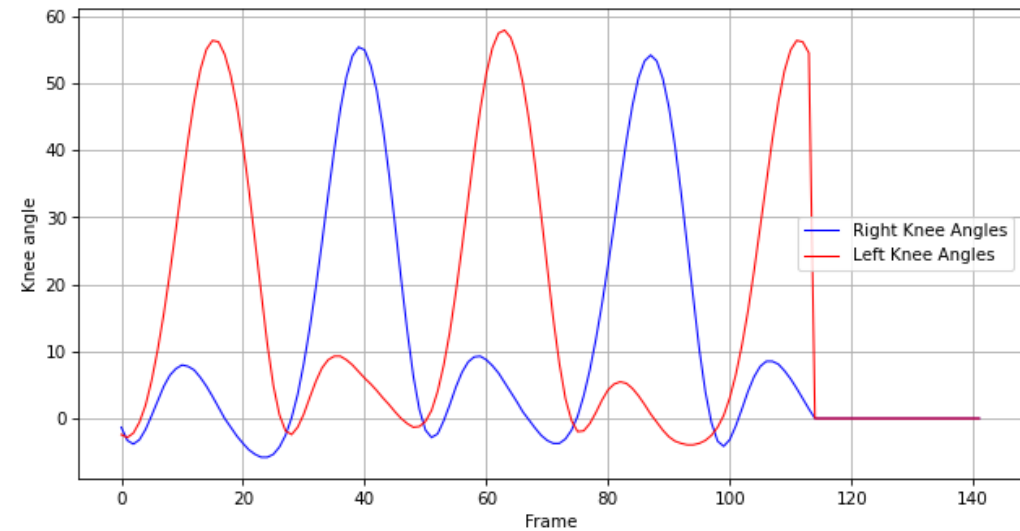
What does the movement data look like?

Sample recording from a C3D file obtained using a motion capture (MOCAP) system:

- **File Type:** A C3D file is used to store three-dimensional motion data.



Data recorded using
a MOCAP system

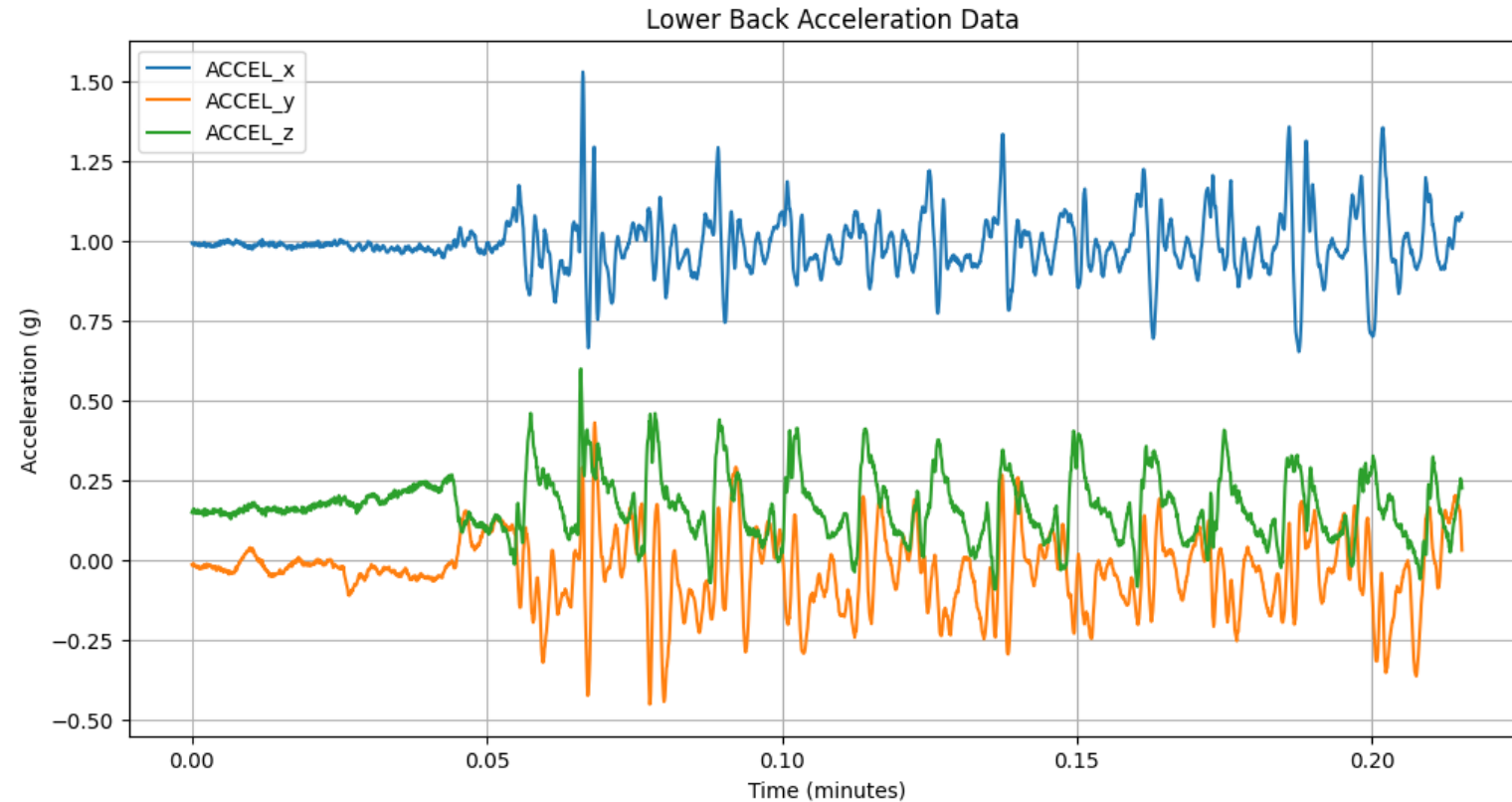
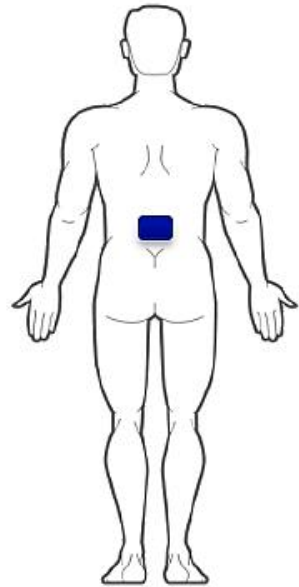


Data loaded and plotted from
a C3D file

What does the movement data look like?

Sample recording from an inertial measurement unit (IMU) sensor:

Data acquired using a wearable IMU sensor placed on the lower back while performing slow walking (Warmerdam et al., 2022).



What is coming up next:

- Basics of Python scripting
- Essential packages for movement data analysis
- Loading and visualizing different types of movement data
- Analyzing movement data using open-source tools like Kiel Motion Analysis Toolbox (KielMAT)

To access the workshop materials, please visit the **GAMMA** workshop repository:

https://github.com/neurogeriatricskiel/gamma_2024



GAMMA Workshop – Kiel 2024

Welcome to the GAMMA 2024 Workshop on Python Programming for Movement Sciences. This repository provides the materials and guidance for participants to get hands-on experience with Python programming for movement data analysis.

Python for Movement Sciences

In this workshop, we will cover essential programming concepts tailored to analyzing movement data using Python. The workshop is designed to be beginner-friendly and will guide you through setting up the environment and running your first analyses.

Before Getting Started

To follow along with this workshop, you'll need access to Google Colab. Below are the steps to get you set up and ready for the exercises:

Access Google Colab

1. Sign in to Google Colab
Go to [Google Colab](#) and sign in with your Google account. If you don't have an account, you can create one for free.
2. Create a New Notebook
Once signed in, click on "File" in the top-left corner and select "Open notebook."
3. Open the GitHub Tab
In the dialog, select the GitHub tab and paste the following repository URL:
https://github.com/neurogeriatricskiel/gamma_2024
4. Open the Notebook
In the repository, find the notebook named `gamma_vx3_python_programming.ipynb` and open it. This notebook contains the core exercises and instructions for the workshop.

Running Jupyter Notebooks Locally

For those who prefer to run the notebooks on their local machines:

1. Navigate to the Notebooks Folder
Inside this repository, you will find a `notebooks` subfolder containing all workshop materials.
2. Launch Jupyter
Start Jupyter Notebook by navigating to the folder in your terminal or command prompt and running:

```
jupyter notebook
```