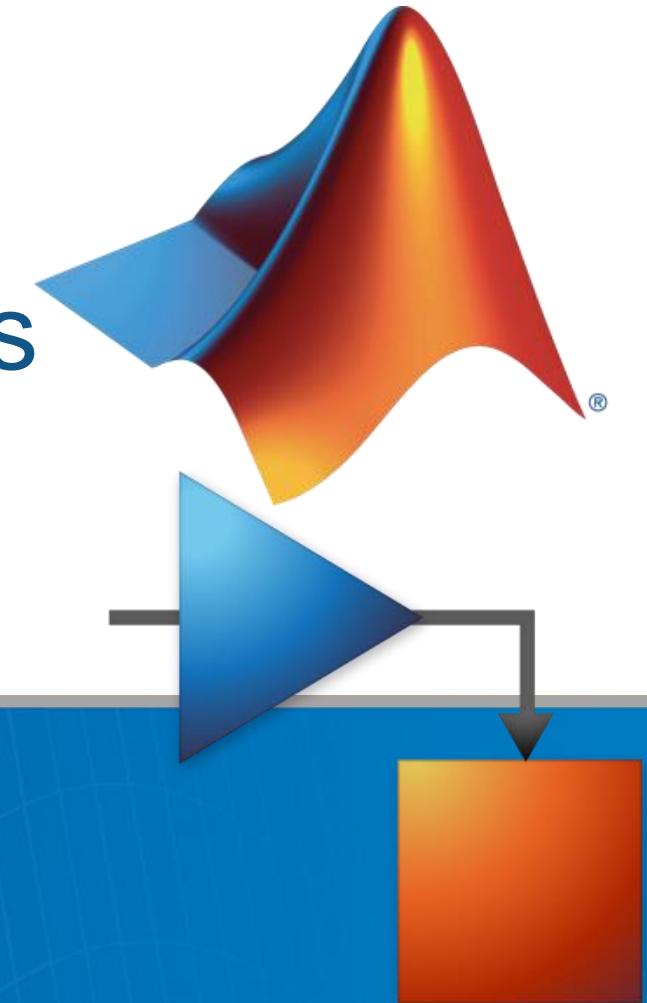


MATHACK 2022 Training Sessions



Contact

- Arturo Fernández
 - 4th year Bachelor Telecom Eng.
 - Polytechnic University of Valencia (UPV)
- Giulio Mattera
 - Phd in Intelligent Robotics
 - University of Naples Federico II
- Alessio Tumminello
 - 2th year Master's Degree Robotics Eng.
 - University of Pisa
- Javier Crespo
 - 2nd year Aerospace Engineering
 - Carlos III University



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FEDERICO II



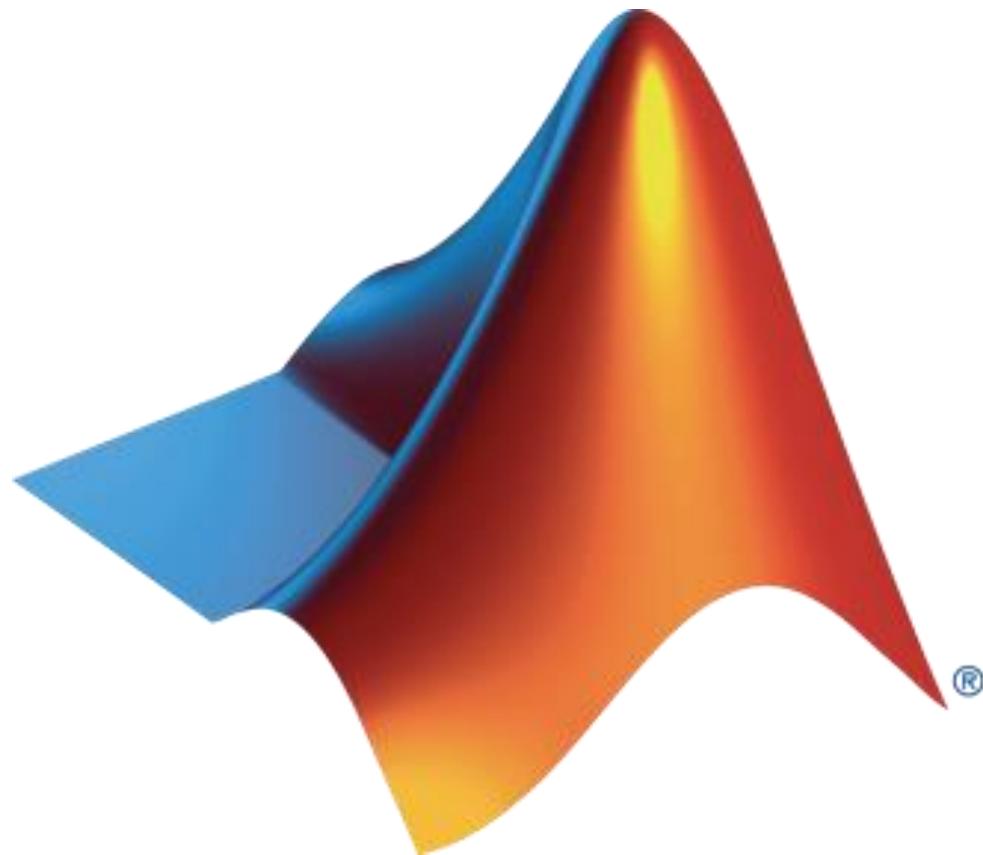
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Today:

- 19.00 – 19.25 : Set-up
 - Welcome presentation
 - Introduction to the MATHACK Challenge
 - MATHACK Challenge resources
- 19.25 – 19.45 : MATLAB Mobile Data Acquisition and Processing Demo
 - Log data locally and load on MATLAB Drive
 - Stream data from MATLAB Mobile to MATLAB
 - Fitness Tracker Demo with steps counter
- 19.45 – 20.05 : Machine Learning Mobile Data Demo
 - Using data collected from your phone for Run or walking application
 - Development of neural network in MATLAB
- 20.05 – 20.30 : Greetings
 - Git Fundamentals
 - Submissions and Judging Criteria



MATHACK 2022 Training Sessions

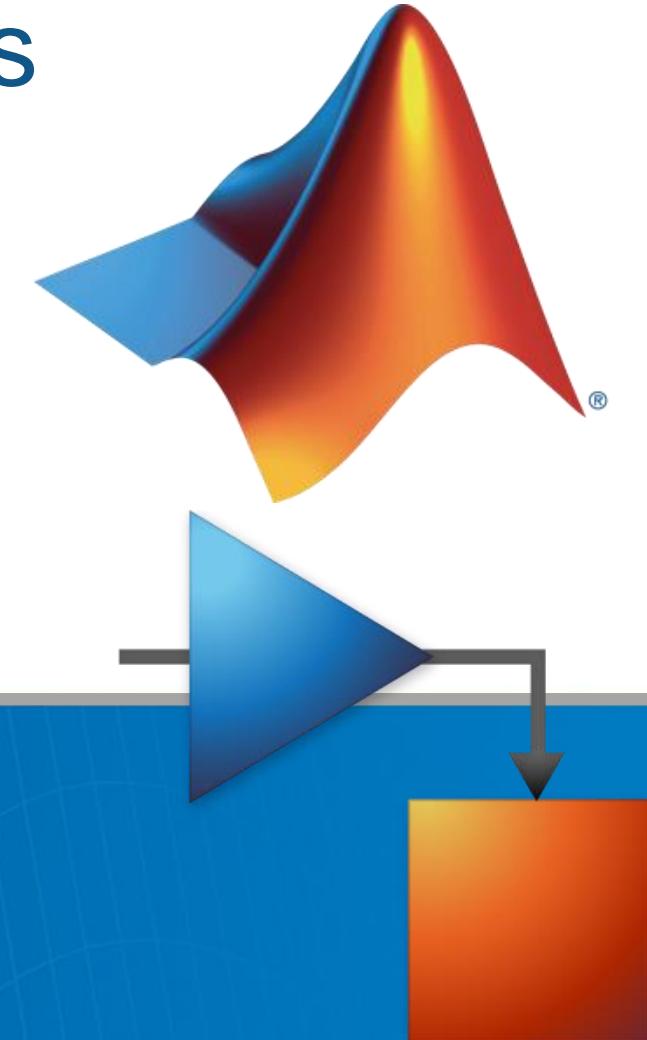
MATHACK Challenge Resources



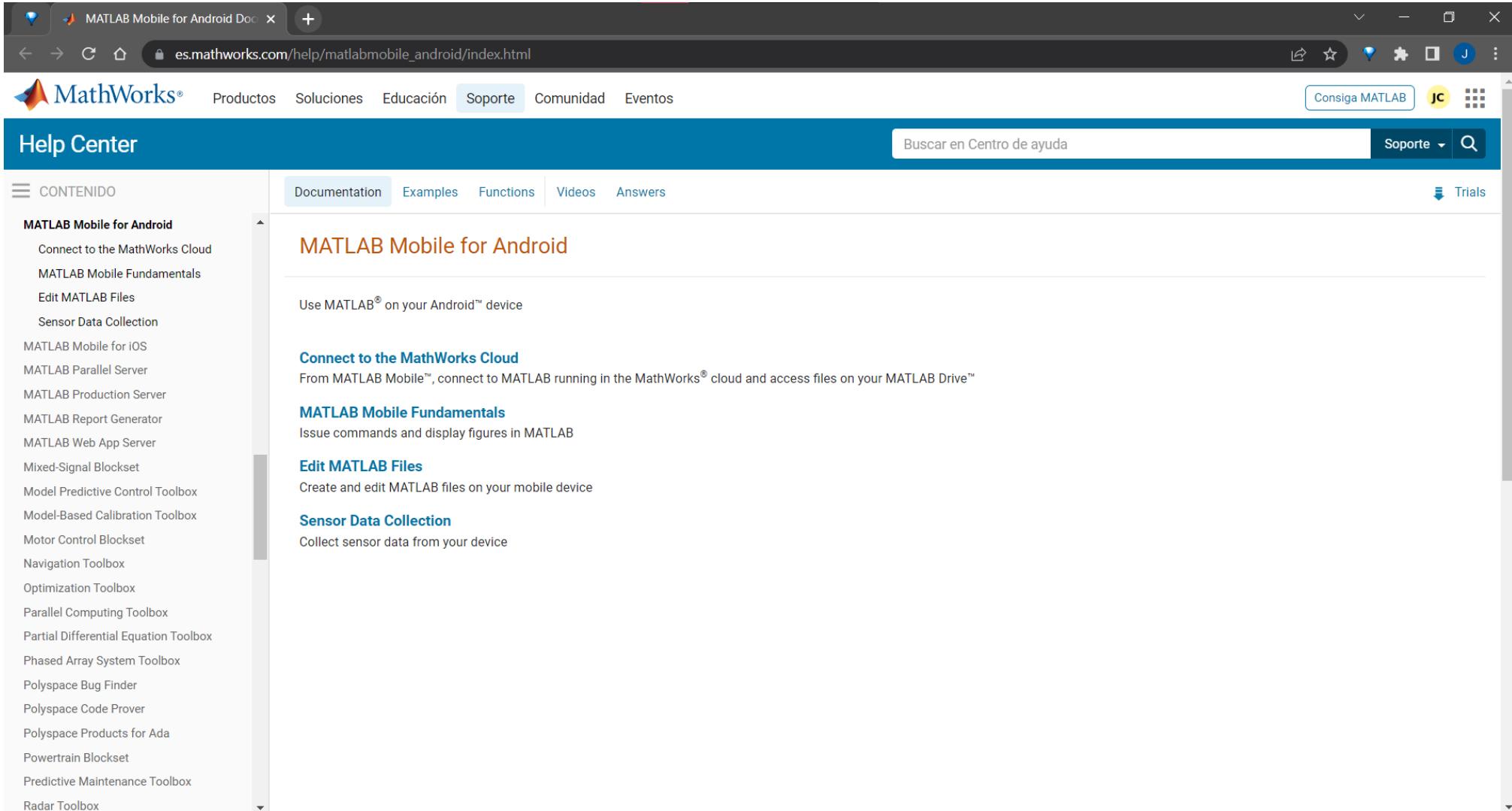
JAVIER CRESPO
UC3M Ambassador



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MATLAB Mobile Android documentation



The screenshot shows a web browser displaying the MATLAB Mobile for Android documentation. The URL in the address bar is es.mathworks.com/help/matlabmobile_android/index.html. The page is titled "MATLAB Mobile for Android". The left sidebar lists various MATLAB products under "CONTENIDO", including "MATLAB Mobile for Android", "MATLAB Mobile for iOS", "MATLAB Parallel Server", "MATLAB Production Server", "MATLAB Report Generator", "MATLAB Web App Server", "Mixed-Signal Blockset", "Model Predictive Control Toolbox", "Model-Based Calibration Toolbox", "Motor Control Blockset", "Navigation Toolbox", "Optimization Toolbox", "Parallel Computing Toolbox", "Partial Differential Equation Toolbox", "Phased Array System Toolbox", "Polyspace Bug Finder", "Polyspace Code Prover", "Polyspace Products for Ada", "Powertrain Blockset", "Predictive Maintenance Toolbox", and "Radar Toolbox". The main content area features several sections: "MATLAB Mobile for Android" (described as "Use MATLAB® on your Android™ device"), "Connect to the MathWorks Cloud" (described as "From MATLAB Mobile™, connect to MATLAB running in the MathWorks® cloud and access files on your MATLAB Drive™"), "MATLAB Mobile Fundamentals" (described as "Issue commands and display figures in MATLAB"), "Edit MATLAB Files" (described as "Create and edit MATLAB files on your mobile device"), and "Sensor Data Collection" (described as "Collect sensor data from your device"). A search bar at the top right says "Buscar en Centro de ayuda".

MATLAB Mobile IOS documentation

The screenshot shows a web browser window displaying the MATLAB Mobile for iOS Documentation. The URL in the address bar is es.mathworks.com/help/matlabmobile/. The page has a dark header with the MathWorks logo and navigation links for Productos, Soluciones, Educación, Soporte (which is selected), Comunidad, and Eventos. A "Consiga MATLAB" button and a user profile icon are also present. The main content area has a teal header "Help Center" with a search bar and a "Soporte" dropdown. On the left, a sidebar titled "CONTENIDO" lists various MATLAB products under "MATLAB Mobile for iOS". The main content area features a section titled "MATLAB Mobile for iOS" with a sub-section "Connect to the MathWorks Cloud" which describes connecting to MATLAB running in the cloud. Other sections include "MATLAB Mobile Fundamentals", "Edit MATLAB Files", "Sensor Data Collection", and "Model Predictive Control Toolbox". At the bottom right, there is a rating scale from 1 to 5 stars with the text "How useful was this information?".

MATLAB Mobile for iOS Documentación

es.mathworks.com/help/matlabmobile/

MathWorks® Products Soluciones Educación Soporte Comunidad Eventos Consiga MATLAB JC

Help Center Buscar en Centro de ayuda Soporte Trials

CONTENIDO

MATLAB Mobile for iOS

- Connect to the MathWorks Cloud
- MATLAB Mobile Fundamentals
- Edit MATLAB Files
- Sensor Data Collection
- MATLAB Parallel Server
- MATLAB Production Server
- MATLAB Report Generator
- MATLAB Web App Server
- Mixed-Signal Blockset
- Model Predictive Control Toolbox
- Model-Based Calibration Toolbox
- Motor Control Blockset
- Navigation Toolbox
- Optimization Toolbox
- Parallel Computing Toolbox
- Partial Differential Equation Toolbox
- Phased Array System Toolbox
- Polyspace Bug Finder
- Polyspace Code Prover
- Polyspace Products for Ada
- Powertrain Blockset
- Predictive Maintenance Toolbox
- Radar Toolbox
- Reinforcement Learning Toolbox

MATLAB Mobile for iOS

Use MATLAB® on your iPhone or iPad.

Connect to the MathWorks Cloud

From MATLAB Mobile™, connect to MATLAB running in the MathWorks® cloud and access files on your MATLAB Drive™.

MATLAB Mobile Fundamentals

Issue commands and display figures in MATLAB

Edit MATLAB Files

Create and edit MATLAB files on your mobile device

Sensor Data Collection

Collect sensor data from your device

How useful was this information?

☆ ☆ ☆ ☆ ☆

Acquire Data from Android Device Sensors with MATLAB Mobile

Screenshot of a web browser displaying a blog post titled "Acquire Data from Android Device Sensors with MATLAB Mobile" on the MathWorks Blogs website.

The browser window shows the URL: blogs.mathworks.com/community/2014/10/06/acquire-data-from-device-sensors-with-matlab-mobile/?s_tid=blogs_rc_3&doing_wp_cron=1645022423.1221868991851806640625

The page header includes the MathWorks logo, navigation links for Products, Solutions, Academia, Support, Community (selected), Events, and a "Get MATLAB" button. The main navigation bar has "Blogs" selected.

The blog post title is "Acquire Data from Android Device Sensors with MATLAB Mobile". It was posted by Pradeep Ramamoorthy on October 6, 2014. The post has 84 views (last 30 days), 1 Like, and 6 comments.

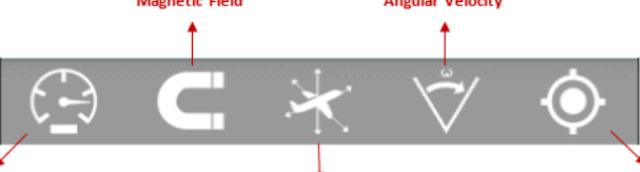
The post content discusses the new MATLAB® Support Package for Android™ Sensors, which allows users to acquire data from motion sensors like the accelerometer and positional sensors like the GPS on their Android device, and send it to a MATLAB session for analysis and visualization.

The sidebar on the left features a "Recent Posts" section with links to various blog posts, a "Categories" section showing counts for MATLAB Mobile (26), Cody (11), Community (26), and MATLAB Central (30), and a "Community Treasure Hunt" section with an illustration of a treasure chest.

The main content area includes a "Contents" section with links to "What data, you ask?", "Viewing Sensor Data", "Analyze Data with MATLAB", "Example: Counting Steps by Capturing Acceleration Data", and "Try it out!".

A "What data, you ask?" section explains that MATLAB Mobile supports data acquisition from motion sensors like the accelerometer and positional sensors like the GPS. A list of all sensors is shown below, each with a red arrow pointing to it:

- Magnetic Field
- Angular Velocity



Community Treasure Hunt

Data Filtering

The screenshot shows a web browser displaying the MATLAB & Simulink documentation for 'Filtrar datos'. The URL is es.mathworks.com/help/matlab/data_analysis/filtering-data.html#responsive_offcanvas. The page is part of the 'Centro de ayuda' (Help Center) for MATLAB R2022a. The left sidebar contains navigation links for 'CONTENIDO' (Content), '« Inicio de Documentación' (Documentation Home), '« MATLAB', '« Matemáticas', '« Análisis y filtrado de Fourier', and 'Filtrar datos' (selected). Other links include 'EN ESTA PÁGINA' (On This Page) with items like 'Filtrar ecuación diferencial', 'Filtro de media móvil de datos de tráfico', 'Modificar la amplitud de datos', 'Referencias', 'Consulte también', and 'Temas relacionados'. The main content area has tabs for 'Documentación', 'Ejemplos', 'Funciones', 'Vídeos', and 'Respuestas'. The 'Filtrar datos' section is currently active. It includes a sub-section 'Filtrar ecuación diferencial' with a mathematical formula for a digital filter:

$$y(n) = b(1)x(n) + b(2)x(n - 1) + \dots + b(N_b)x(n - N_b + 1) \\ - a(2)y(n - 1) - \dots - a(N_a)y(n - N_a + 1)$$

Text below explains the equation: 'En esta ecuación, a y b son vectores de coeficientes del filtro, N_b es el orden del filtro feedback y N_a es el orden del filtro feedforward. n es el índice del elemento actual en x . El resultado $y(n)$ es una combinación lineal de los elementos actuales y anteriores de x e y '. It also notes that the 'filter' function uses these coefficients to filter the input data x . A reference link [1] is provided. The 'Filtro de media móvil de datos de tráfico' section is also shown with its own formula:

$$y(n) = \frac{1}{4}x(n) + \frac{1}{4}x(n - 1) + \frac{1}{4}x(n - 2) + \frac{1}{4}x(n - 3)$$

Below the formulas, there are instructions to import traffic flow data and assign the first column to vector x , followed by a code snippet to load the data:

```
load count.dat
x = count(:,1);
```

A callout box on the right side of the page provides options to 'Open in MATLAB Online' or 'Copy Command'.

MATLAB Plots

Tipos de gráficas de MATLAB - M es.mathworks.com/help/matlab/creating_plots/types-of-matlab-plots.html

MathWorks® Productos Soluciones Educación Soporte Comunidad Eventos Consiga MATLAB JC

Centro de ayuda Buscar en Centro de ayuda Soporte Q

CONTENIDO Documentación Ejemplos Funciones Vídeos Respuestas Trials Actualizaciones de productos

« Inicio de Documentación

« MATLAB

« Importación y análisis de datos

« Exploración visual

Tipos de gráficas de MATLAB EN ESTA PÁGINA Temas relacionados

La traducción de esta página está obsoleta. Haga clic aquí para ver la última versión en inglés.

Tipos de gráficas de MATLAB R2021b

Existen diferentes funciones que puede utilizar para representar datos en MATLAB®. Esta tabla clasifica y muestra las funciones comunes de las gráficas.

Gráficas de líneas	Gráficas de dispersión y de burbujas	Gráficas de distribución de datos	Gráficas de datos discretos	Gráficas geográficas	Gráficas polares	Diagramas de contorno	Campos de vectores	Gráficas de superficie y de malla	Visualización de volúmenes	Animación	Imágenes
<code>plot</code>	<code>scatter</code>	<code>histogram</code>	<code>bar</code>	<code>geoplot</code>	<code>polarplot</code>	<code>contour</code>	<code>quiver</code>	<code>surf</code>	<code>streamline</code>	<code>animatedline</code>	<code>image</code>
<code>plot3</code>	<code>scatter3</code>	<code>histogram2</code>	<code>barh</code>	<code>geoscatte</code>	<code>polarhistogram</code>	<code>contourf</code>	<code>quiver3</code>	<code>surfc</code>	<code>streamslice</code>	<code>comet</code>	<code>imagesc</code>
<code>stairs</code>	<code>bubblechart</code>	<code>pie</code>	<code>bar3</code>	<code>geobubble</code>	<code>polarscatter</code>	<code>contour3</code>	<code>feather</code>	<code>surf1</code>	<code>streamparticles</code>	<code>comet3</code>	
<code>errorbar</code>	<code>bubblechart3</code>	<code>pie3</code>	<code>bar3h</code>		<code>polarbubblechart</code>	<code>contourslice</code>		<code>ribbon</code>	<code>streamribbon</code>		
<code>area</code>	<code>swarmchart</code>	<code>scatterhistogram</code>	<code>pareto</code>		<code>compass</code>	<code>fcontour</code>		<code>pcolor</code>	<code>streamtube</code>		
<code>stackedplot</code>	<code>swarmchart3</code>	<code>swarmchart</code>	<code>stem</code>		<code>ezpolar</code>			<code>fsurf</code>	<code>coneplot</code>		
<code>loglog</code>	<code>spy</code>	<code>swarmchart3</code>	<code>stem3</code>					<code>fimplicit3</code>	<code>slice</code>		

Example: Road profile and traffic analysis using MATLAB mobile

The screenshot shows a web browser displaying a MATLAB Central File Exchange page. The URL in the address bar is es.mathworks.com/matlabcentral/fileexchange/69513-road-profile-and-traffic-analysis-using-matlab-mobile?s_tid=srchtile. The page title is "Road profile and traffic analysis using MATLAB mobile". The project was created by Darshan Ramakant Bhat (STAFF) and has a rating of ★★★★☆ (2). It has been downloaded 239 times and updated on 04 Mar 2019. The file size is 2.52 MB. The description states: "MATLAB mobile is used to collect the sensor data while traveling along a road which is used to analyze road profile and congestion." Below the description, there are buttons for "+Follow" and "Download". The page includes tabs for "Overview", "Functions", "Reviews (2)", and "Discussions (0)". The "Overview" tab is selected. The "Reviews" section contains two reviews. The "Discussions" section is currently empty. The "Requires" section lists MATLAB, Mapping Toolbox, and Signal Processing Toolbox. It also notes that Google Earth app should be installed in the windows machine. The "MATLAB Release Compatibility" section indicates it was created with R2018b and is compatible with any release. The "Platform Compatibility" section shows checkboxes for Windows (checked), macOS (unchecked), and Linux (unchecked). The "Categories" section lists MATLAB > Additional MATLAB Products and Services > MATLAB Mobile for iOS > Sensor Data Collection.

Road profile and traffic analysis using MATLAB mobile

version 1.0.0 (2.52 MB) by Darshan Ramakant Bhat **STAFF**

MATLAB mobile is used to collect the sensor data while traveling along a road which is used to analyze road profile and congestion.

+Follow Download

Overview Functions Reviews (2) Discussions (0)

Position and accelerometer sensor data are captured using MATLAB mobile app while traveling along a particular route. These sensor values are processed to analyze the profile of the road.

The coordinates are plotted in Google Earth app with the different color to indicate the road profile and the congestion.

The documentation file with this submission gives more details about the project.

Cite As

Darshan Ramakant Bhat (2022). Road profile and traffic analysis using MATLAB mobile (<https://www.mathworks.com/matlabcentral/fileexchange/69513-road-profile-and-traffic-analysis-using-matlab-mobile>), MATLAB Central File Exchange. Retrieved April 4, 2022.

Requires

MATLAB
Mapping Toolbox
Signal Processing Toolbox

Google Earth app should be installed in the windows machine.

MATLAB Release Compatibility

Created with R2018b
Compatible with any release

Platform Compatibility

Windows macOS Linux

Categories

MATLAB > Additional MATLAB Products and Services > MATLAB Mobile for iOS > Sensor Data Collection

Example: Real Time GPS and data tracker application

The screenshot shows a MATLAB File Exchange page for a submission titled "Real Time GPS and data tracker application for the #matlab4mobile contest".

File Details:

- Name:** Real Time GPS and data tracker application for the #matlab4mobile contest
- Version:** 1.0.0.0 (339 KB)
- Author:** Jesper van Wordragen
- Downloads:** 575 Downloads
- Last Updated:** Updated 31 May 2017
- View License:** View License

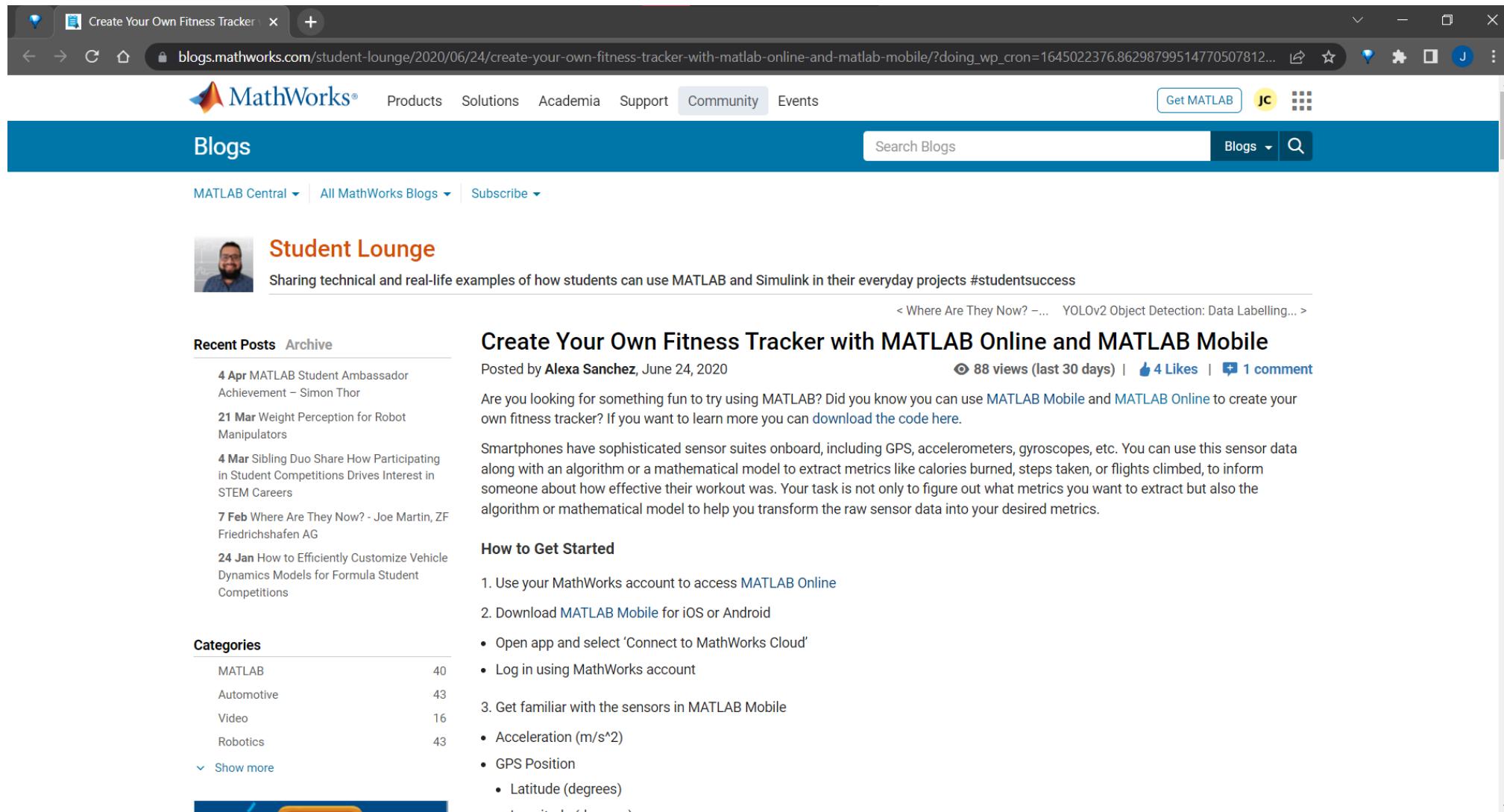
User Interaction:

- Buttons: Follow, Download
- Links: Overview, Functions, Reviews (4), Discussions (0)

Content:

- A video thumbnail showing a Formula 1 race car on a track with a GPS map overlay.
- Text: Check out our video for explanation: <https://youtu.be/370eZP0odCg>
- Section: MATLAB Release Compatibility
- Text: Created with R2015b, Compatible with any release
- Section: Platform Compatibility
- Checkboxes: Windows (checked), macOS (checked), Linux (checked)
- Section: Categories
- Text: MATLAB > Language Fundamentals > Data Types > Dates and Time
- Section: Tags
- Tags: gps, matlab4mobile, tracker
- Section: Others Also Downloaded
- Text: Kinect and IMU data to Android App, 8 Downloads

Example: Fitness Tracker with MATLAB Mobile



The screenshot shows a web browser window displaying a blog post on the MathWorks Blogs page. The URL in the address bar is blogs.mathworks.com/student-lounge/2020/06/24/create-your-own-fitness-tracker-with-matlab-online-and-matlab-mobile/?doing_wp_cron=1645022376.86298799514770507812....

The page header includes the MathWorks logo, navigation links for Products, Solutions, Academia, Support, Community, Events, and a "Get MATLAB" button. The main content area features a sidebar with "Recent Posts" and "Categories" sections, and the main article title is "Create Your Own Fitness Tracker with MATLAB Online and MATLAB Mobile".

Blogs

Search Blogs | Blogs | 

MATLAB Central | All MathWorks Blogs | Subscribe

 **Student Lounge**
Sharing technical and real-life examples of how students can use MATLAB and Simulink in their everyday projects #studentsuccess

< Where Are They Now? -... YOLOv2 Object Detection: Data Labelling... >

Create Your Own Fitness Tracker with MATLAB Online and MATLAB Mobile

Posted by Alexa Sanchez, June 24, 2020 | 88 views (last 30 days) | 4 Likes | 1 comment

Are you looking for something fun to try using MATLAB? Did you know you can use MATLAB Mobile and MATLAB Online to create your own fitness tracker? If you want to learn more you can [download the code here](#).

Smartphones have sophisticated sensor suites onboard, including GPS, accelerometers, gyroscopes, etc. You can use this sensor data along with an algorithm or a mathematical model to extract metrics like calories burned, steps taken, or flights climbed, to inform someone about how effective their workout was. Your task is not only to figure out what metrics you want to extract but also the algorithm or mathematical model to help you transform the raw sensor data into your desired metrics.

How to Get Started

1. Use your MathWorks account to access [MATLAB Online](#)
2. Download [MATLAB Mobile](#) for iOS or Android
 - Open app and select 'Connect to MathWorks Cloud'
 - Log in using MathWorks account
3. Get familiar with the sensors in MATLAB Mobile
 - Acceleration (m/s²)
 - GPS Position
 - Latitude (degrees)

Recent Posts

- 4 Apr MATLAB Student Ambassador Achievement – Simon Thor
- 21 Mar Weight Perception for Robot Manipulators
- 4 Mar Sibling Duo Share How Participating in Student Competitions Drives Interest in STEM Careers
- 7 Feb Where Are They Now? - Joe Martin, ZF Friedrichshafen AG
- 24 Jan How to Efficiently Customize Vehicle Dynamics Models for Formula Student Competitions

Categories

Category	Count
MATLAB	40
Automotive	43
Video	16
Robotics	43

Show more

MATLAB Academy

Self-Paced Online Courses

matlabacademy.mathworks.com/es/#getting-started

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Simscape Onramp



25%

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Introducción (13)

- MATLAB (4)**
- Simulink (6)**
- IA, machine learning y deep learning (5)**
- Matemáticas y optimización (6)**
- Procesamiento de imágenes y señales (5)**

Explore más de 50 [cursos en clase](#) presenciales y virtuales

Introducción

MATLAB Onramp



100%

15 módulos | 2 horas | Idiomas

Comience rápidamente con las nociones básicas de MATLAB.

Simulink Onramp



100%

14 módulos | 2 horas | Idiomas

Comience rápidamente con las nociones básicas de Simulink.

Circuit Simulation Onramp

MATLAB Help

The screenshot shows a web browser displaying the MATLAB Documentation website at es.mathworks.com/help/matlab/. The page title is "Centro de ayuda". The navigation bar includes links for "Productos", "Soluciones", "Educación", "Soporte" (which is highlighted), "Comunidad", and "Eventos". There are also buttons for "Consiga MATLAB", "JC", and a grid icon. A search bar at the top right contains the placeholder "Buscar en Centro de ayuda". Below the header, a blue navigation bar has tabs for "Documentación", "Ejemplos", "Funciones", "Vídeos", and "Respuestas". On the left, a sidebar titled "CONTENIDO" lists various MATLAB topics under "MATLAB" and "Toolboxes". The main content area features a section about MATLAB, its history, and its applications. It also includes sections for "Introducción a MATLAB", "Aspectos fundamentales del lenguaje", "Importación y análisis de datos", "Matemáticas", "Gráficas", "Programación", "Creación de apps", "Herramientas de desarrollo de software", "Interfaces de lenguaje externas", "Entorno y configuración", "Simulink", "5G Toolbox", "Aerospace Blockset", "Aerospace Toolbox", "Antenna Toolbox", "Audio Toolbox", "Automated Driving Toolbox", "AUTOSAR Blockset", "Bioinformatics Toolbox", "Bluetooth Toolbox", "Communications Toolbox", "Computer Vision Toolbox", and "Control System Toolbox". A "R2021b" badge is visible in the top right corner.

La traducción de esta página está obsoleta. Haga clic aquí para ver la última versión en inglés.

MATLAB

El lenguaje del cálculo técnico

Millones de ingenieros y científicos en todo el planeta utilizan MATLAB® para analizar y diseñar los sistemas y productos que transforman nuestro mundo. El lenguaje de MATLAB, basado en matrices, es la forma más natural del mundo para expresar las matemáticas computacionales. Las gráficas integradas facilitan la visualización de los datos y la obtención de información a partir de ellos. El entorno de escritorio invita a experimentar, explorar y descubrir. Todas estas herramientas y funciones de MATLAB están probadas rigurosamente y diseñadas para trabajar juntas.

MATLAB le ayuda a llevar sus ideas más allá del escritorio. Puede ejecutar sus análisis en conjuntos de datos de mayor tamaño y expandirse a clusters y nubes. El código de MATLAB se puede integrar con otros lenguajes, lo que le permite implementar algoritmos y aplicaciones en sistemas web, empresariales o de producción.

Introducción a MATLAB

Aprender los aspectos básicos de MATLAB

Aspectos fundamentales del lenguaje

Sintaxis, indexación y manipulación de arreglos, tipos de datos, operadores

Importación y análisis de datos

Importar y exportar datos, incluidos archivos de gran tamaño; preprocesar datos, visualizar y explorar

Matemáticas

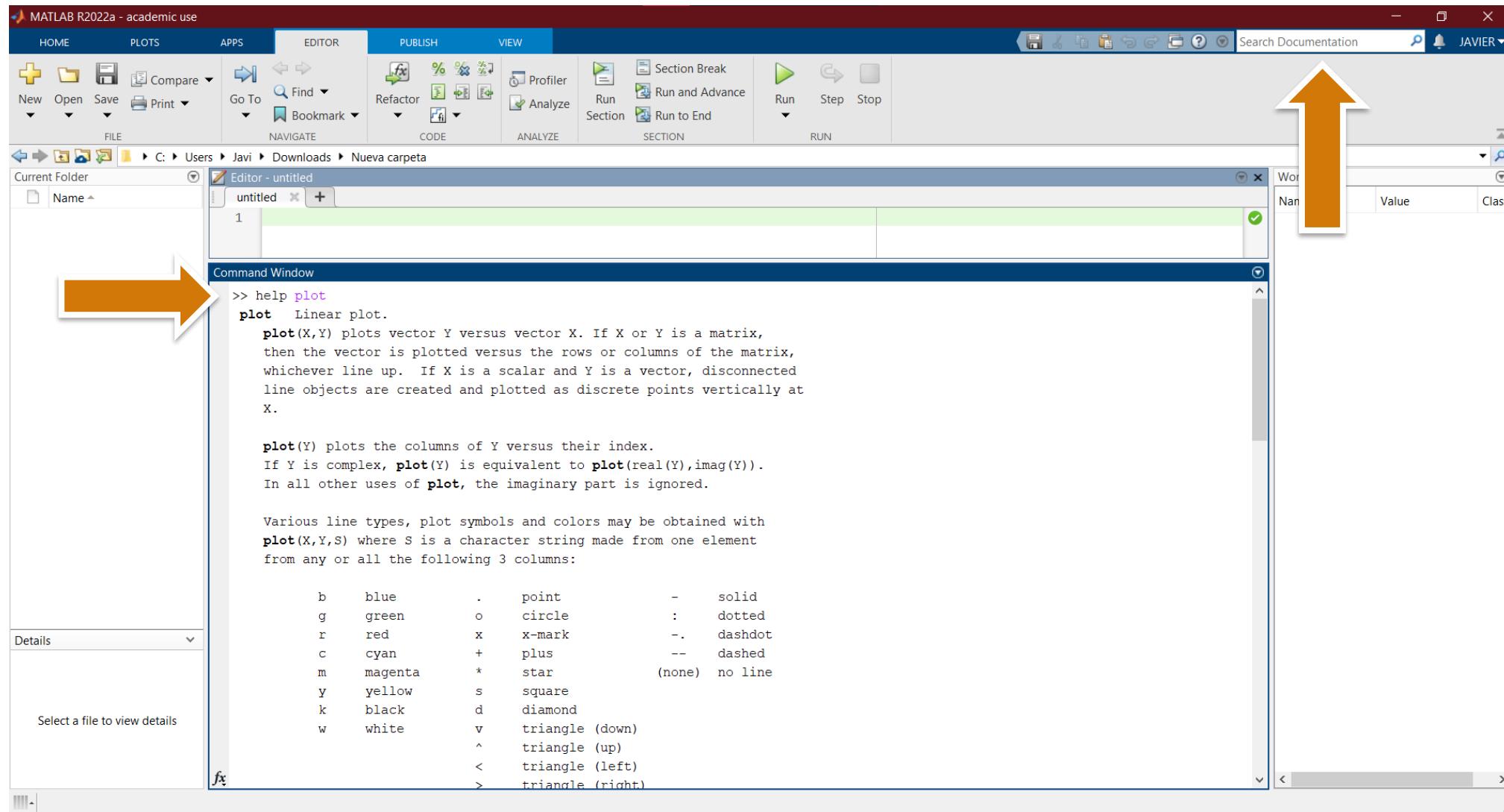
Álgebra lineal, diferenciación e integrales, transformadas de Fourier y otras matemáticas

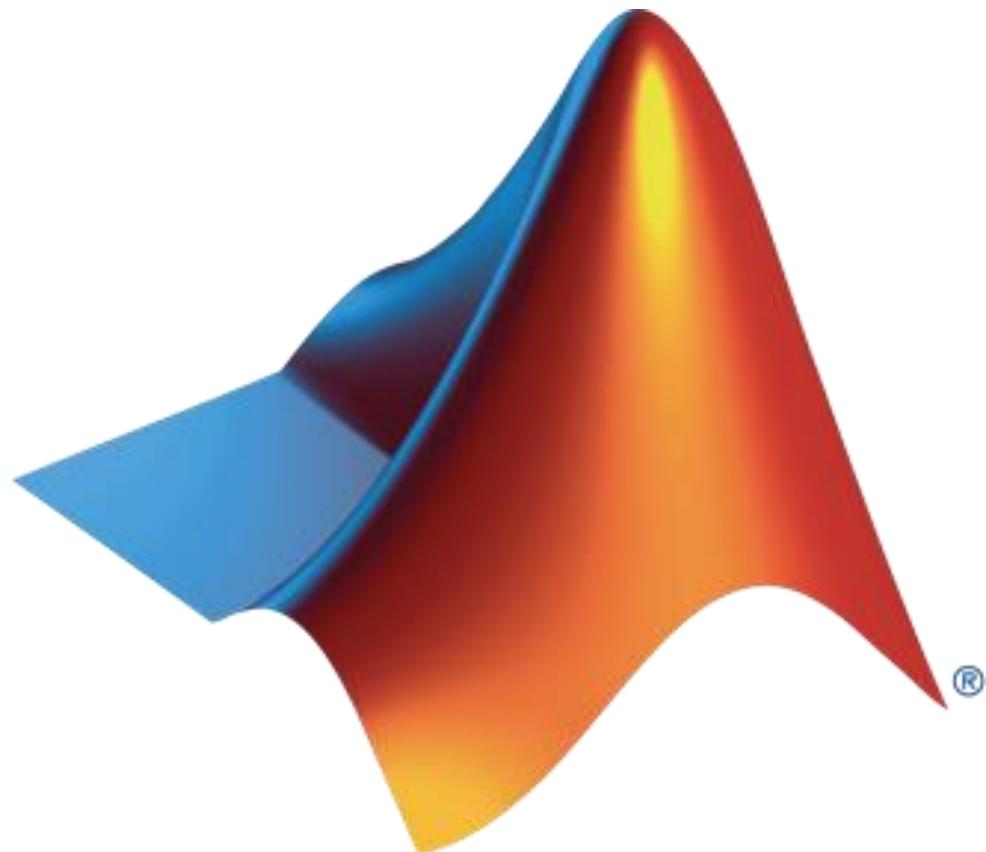
Gráficas

Imágenes, animación y gráficas bidimensionales y tridimensionales

Programación

MATLAB Help





MATHACK 2022 Training Sessions

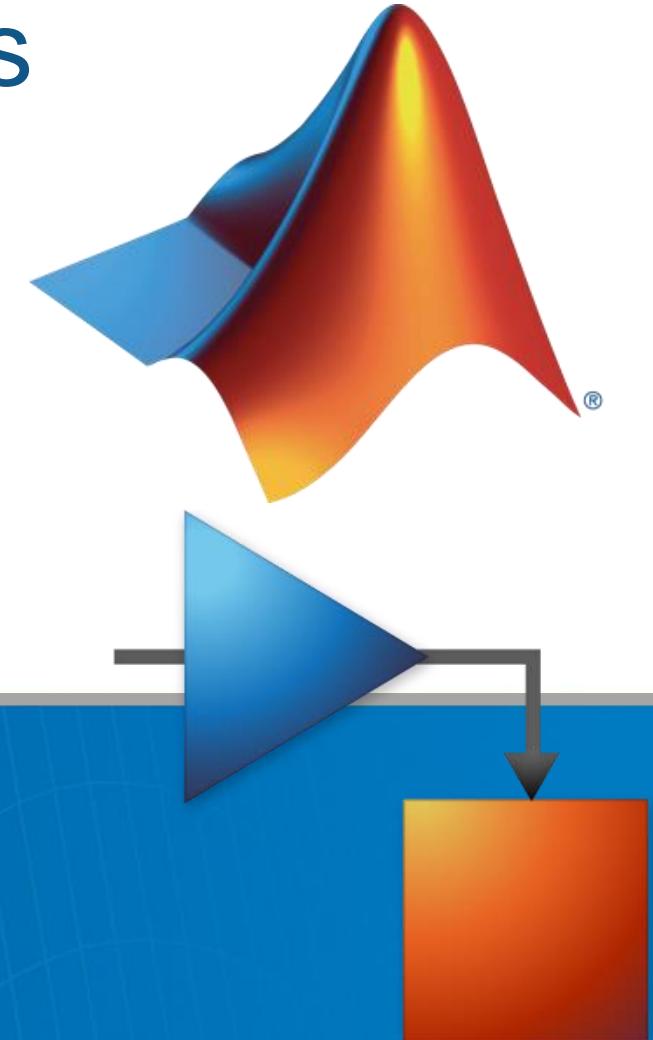
MATLAB Mobile Data Acquisition



ALESSIO TUMMINELLO
UNIPI Ambassador



UNIVERSITÀ DI PISA



MATLAB Mobile Data Acquisition

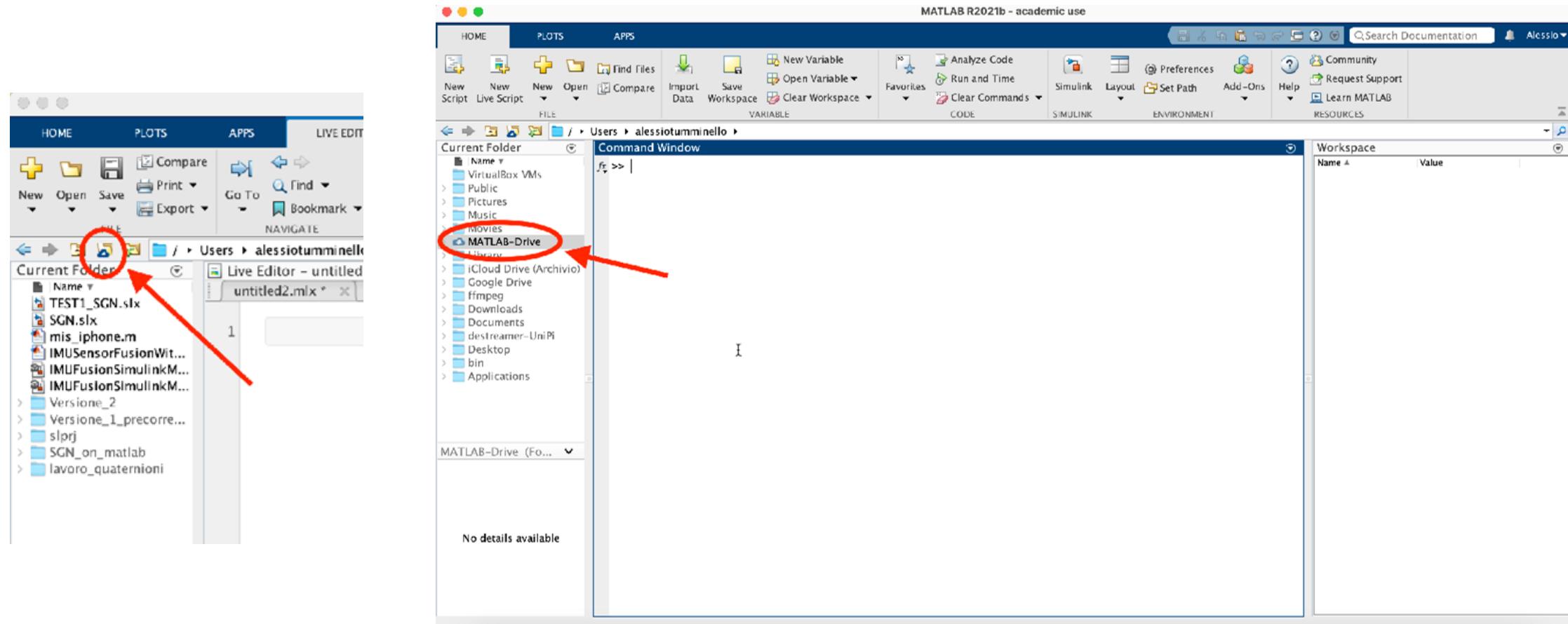
The idea of this MATLAB and MATLAB Mobile example is count the steps as a fitness tracker using the data acquired from smartphone.

To realize our task we have 2 options:

- Log data locally on your smartphone and load automatically on MATLAB Drive, after that we can move on MATLAB laptop app and load file with all the measurements from MATLAB Drive folder
- Stream data from MATLAB Mobile to MATLAB and acquire immediately the data

MATLAB Mobile Data Acquisition – Logging Data

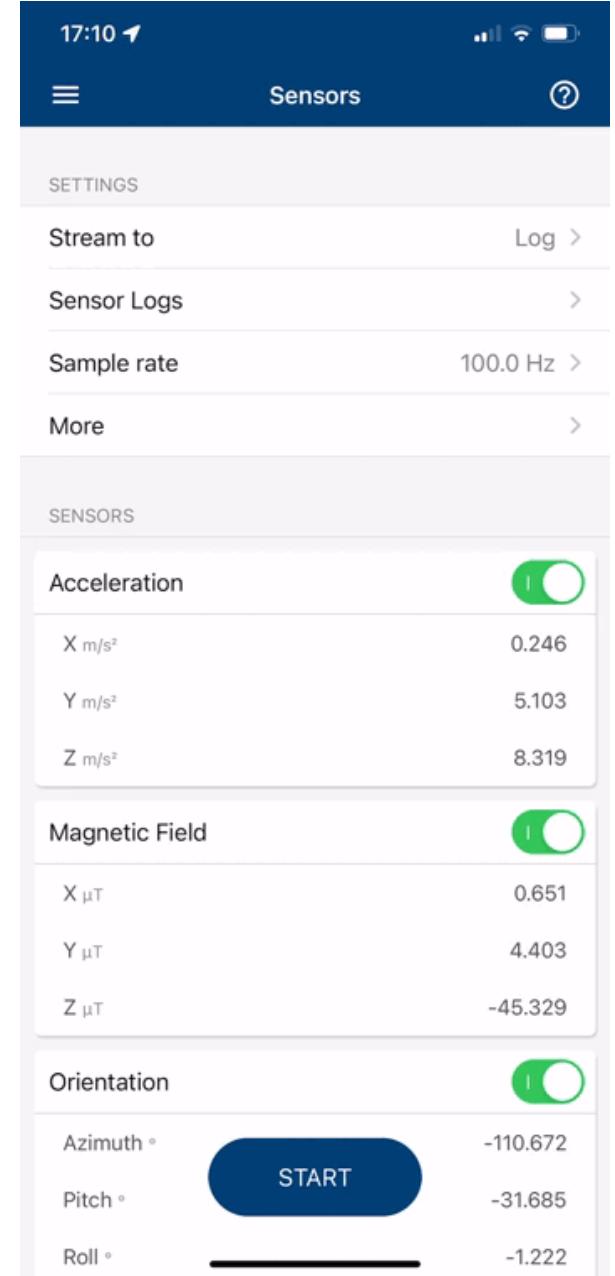
1) MATLAB Drive Connector



MATLAB Mobile Data Acquisition – Logging Data

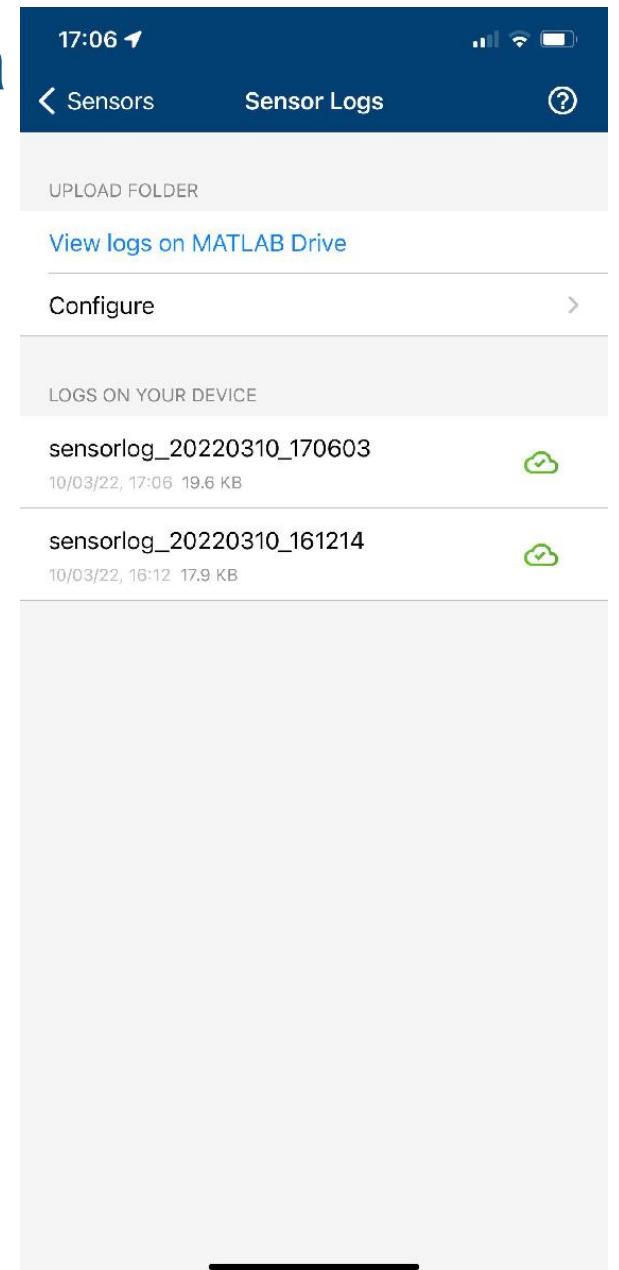
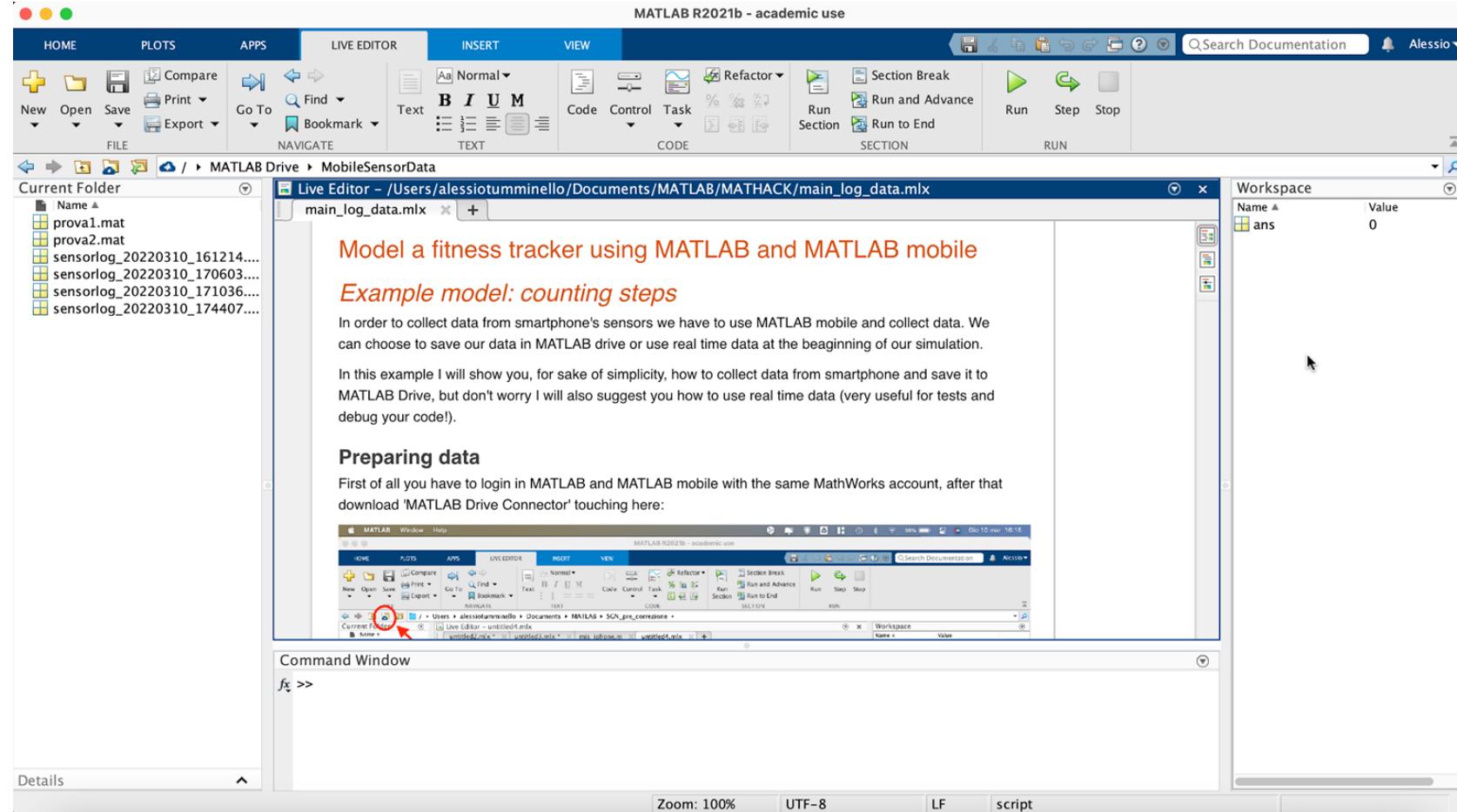
2) Let's move to MATLAB Mobile !

- In the sensor tab you have to decided where you want to **stream your data** (log locally in your smartphone and automatically load to MATLAB Drive folder) and also choose the sensor's **sample rate** (usually 100Hz for a realistic IMU and GPS).



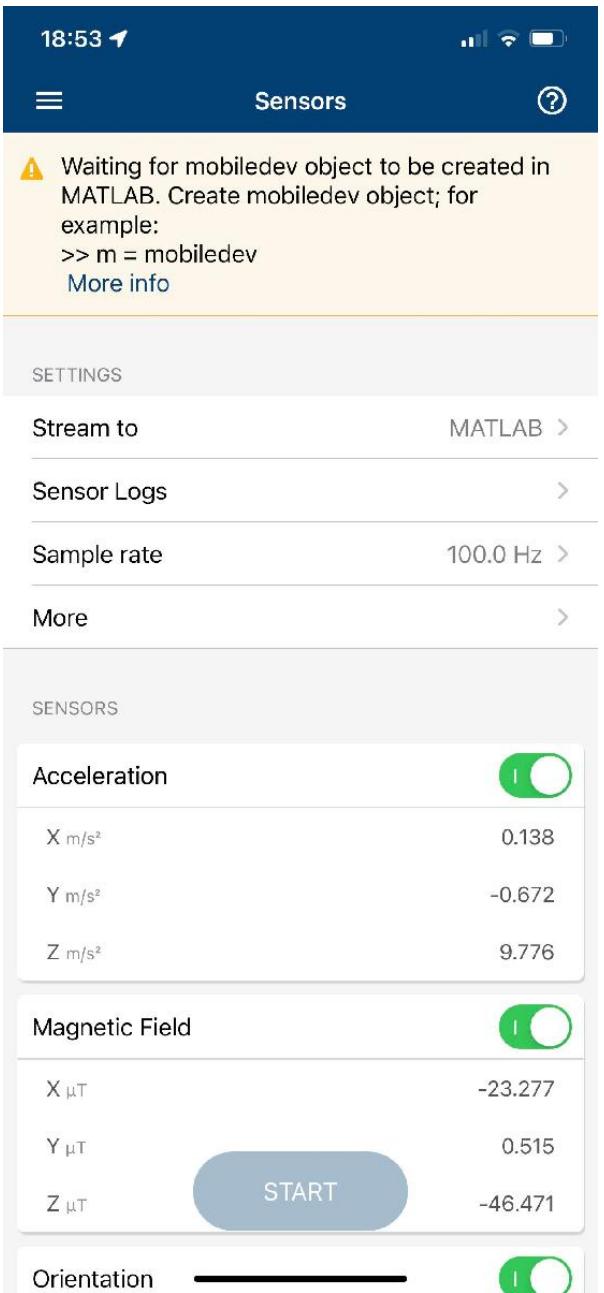
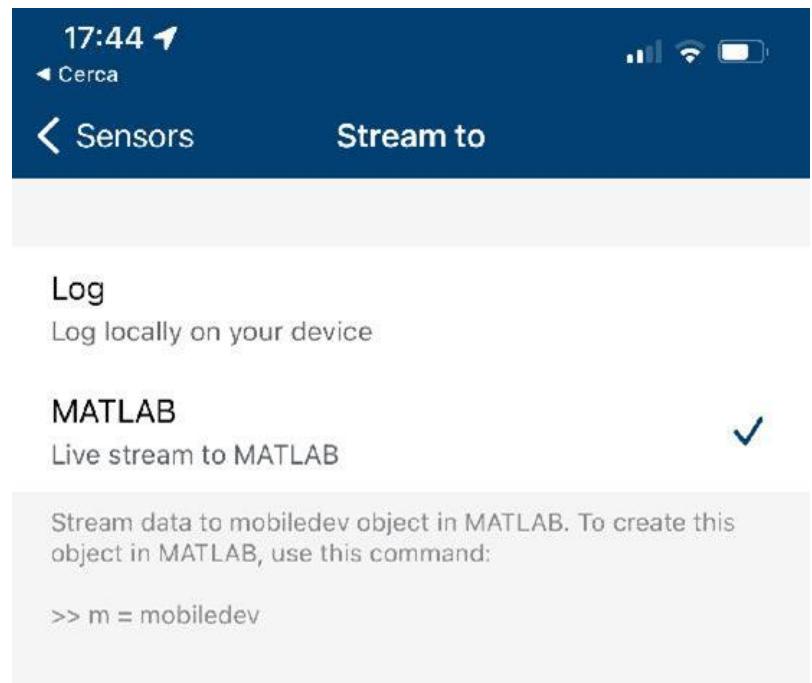
MATLAB Mobile Data Acquisition – Logging Data

3) Save data on MATLAB Drive folder



MATLAB Mobile Data Acquisition – Stream Data

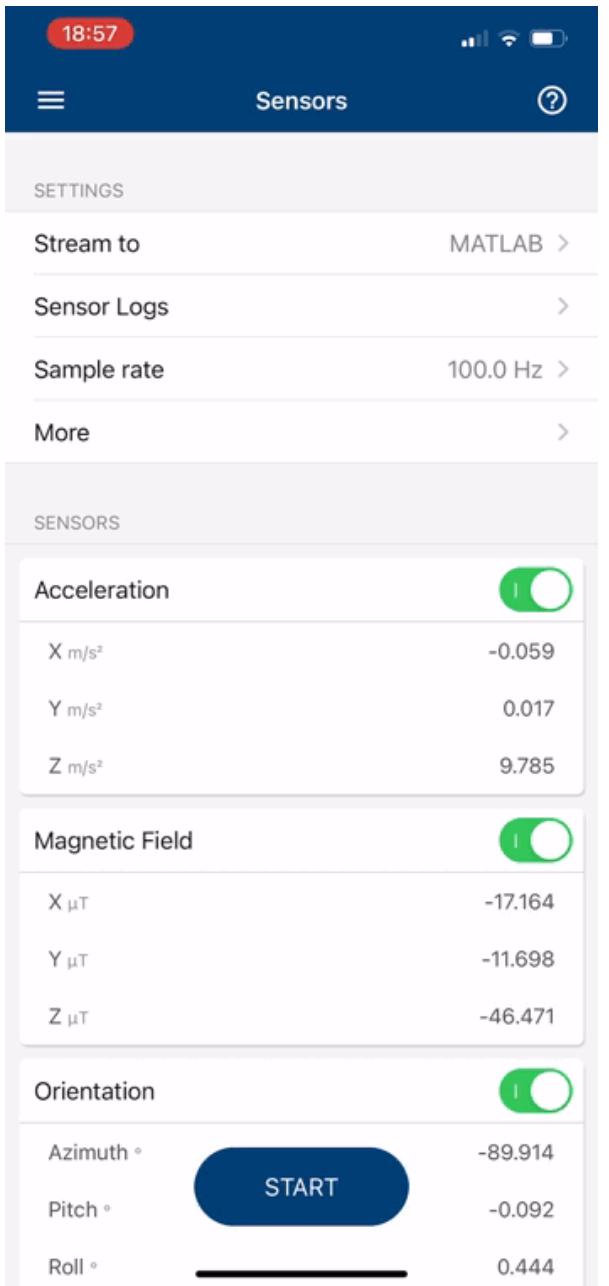
1) Choose to stream data



MATLAB Mobile Data Acquisition – Stream Data

2) Create a 'mobiledev object' on MATLAB

```
1 iPhonediAlessio = mobiledev;
2 iPhonediAlessio.SampleRate = 100; %Sets sample rate at which device will acquire the data
3
4 %%Flag which sensor you want to use
5 iPhonediAlessio.AngularVelocitySensorEnabled = 1;
6 iPhonediAlessio.OrientationSensorEnabled = 1;
7 iPhonediAlessio.AccelerationSensorEnabled = 1;
8 iPhonediAlessio.PositionSensorEnabled = 1;
9 iPhonediAlessio.MagneticSensorEnabled = 1;
10
11 loggingTime = 10; % seconds
12
13 iPhonediAlessio.Logging = 1; % start the transmission of data from all selected sensors
14 pause(loggingTime);
```



Processing Demo

Fitness Tracker Demo with steps counter

$$\text{totalDistance(ft)} = \frac{\text{ft}}{\text{step}} = \frac{\text{ft}}{\text{ft}} * \frac{\text{step}}{\text{ft}} = \text{steps}$$

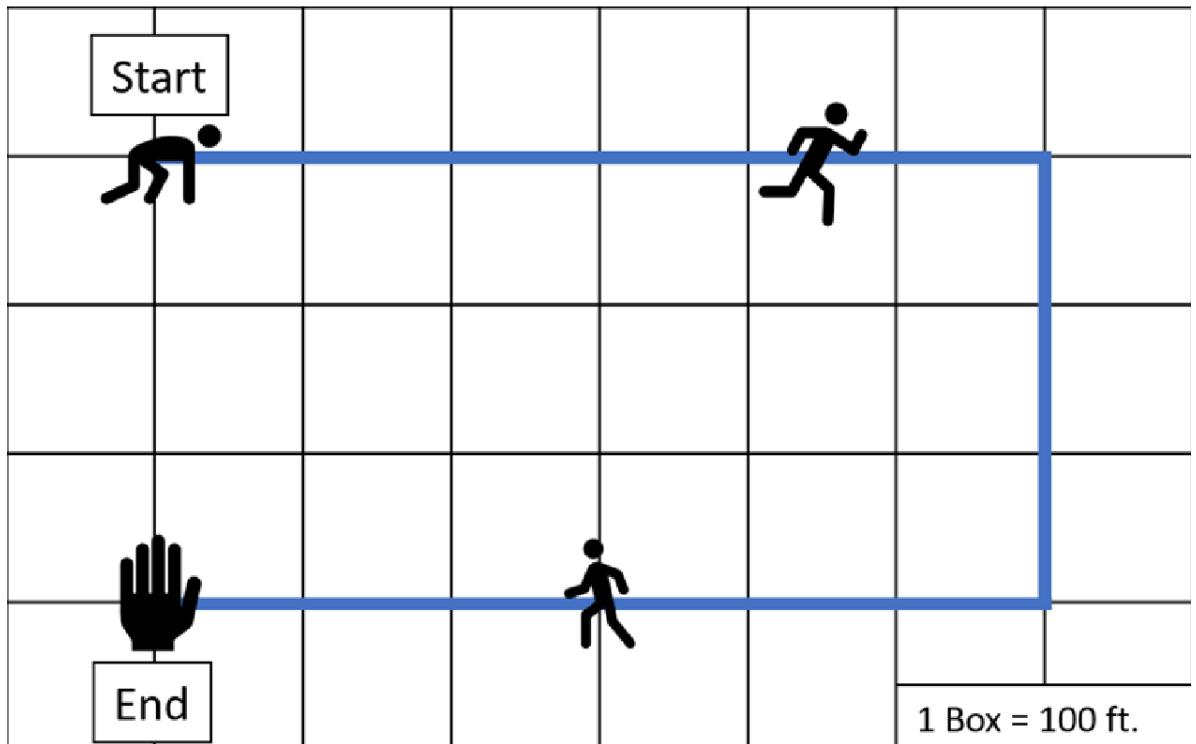
stride $(\frac{\text{ft}}{\text{step}})$

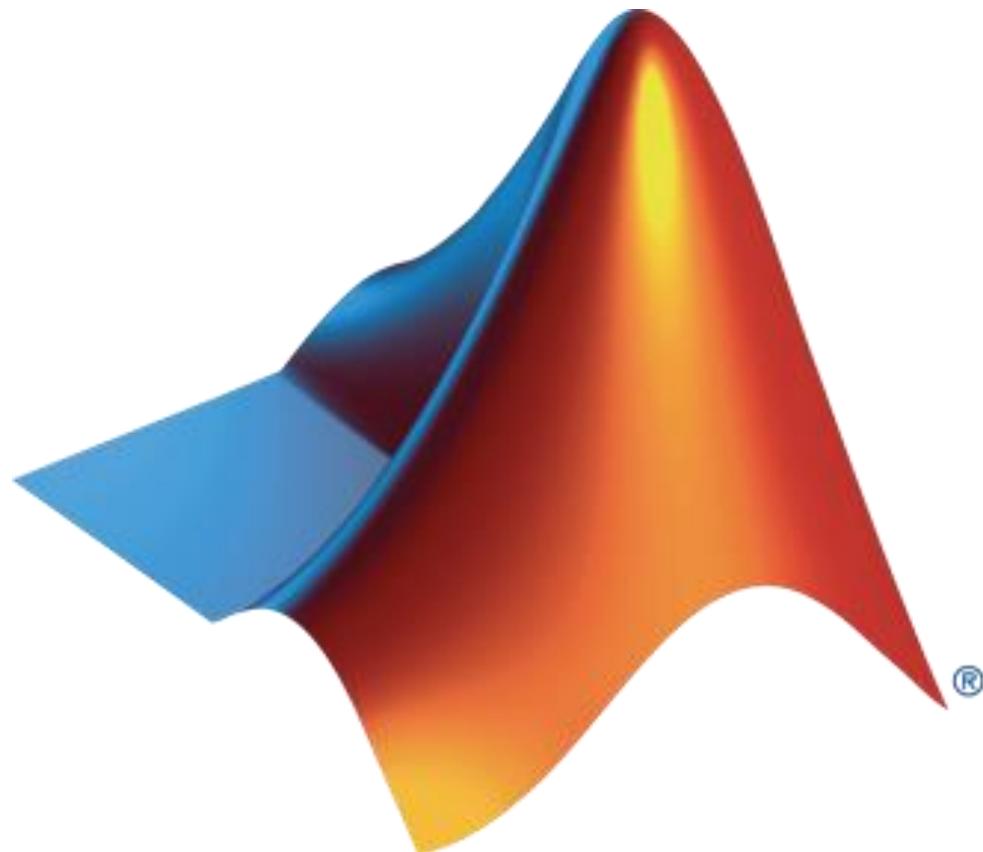
$$\frac{\text{traveledDistance}}{\text{earth'sCircumference}} = \frac{\text{degreesTraveled}}{\text{earth'sDegrees}}$$

```

1 for i = 1:(length(lat)-1)
2
3     lat1 = lat(i);      %The first latitude
4     lat2 = lat(i+1);    %The second latitude
5     lon1 = lon(i);
6     lon2 = lon(i+1);
7
8     diff = distance(lat1, lon1, lat2, lon2);
9     dis = (diff/360)*earthCirc;
10
11    totaldis = totaldis + dis;
12
13 end

```





MATHACK 2022 Training Sessions

DNN in MATLAB - Running detection



GIULIO MATTERA
UNINA Ambassador



UNIVERSITÀ DEGLI STUDI DI NAPOLI
FEDERICO II

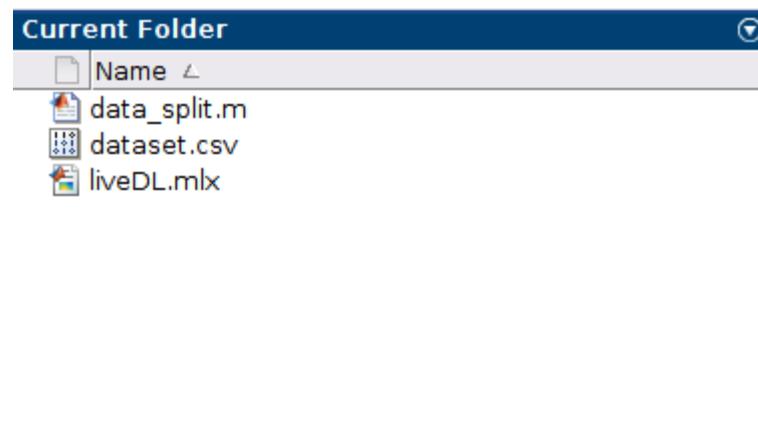


DNN application (I) : Dataset

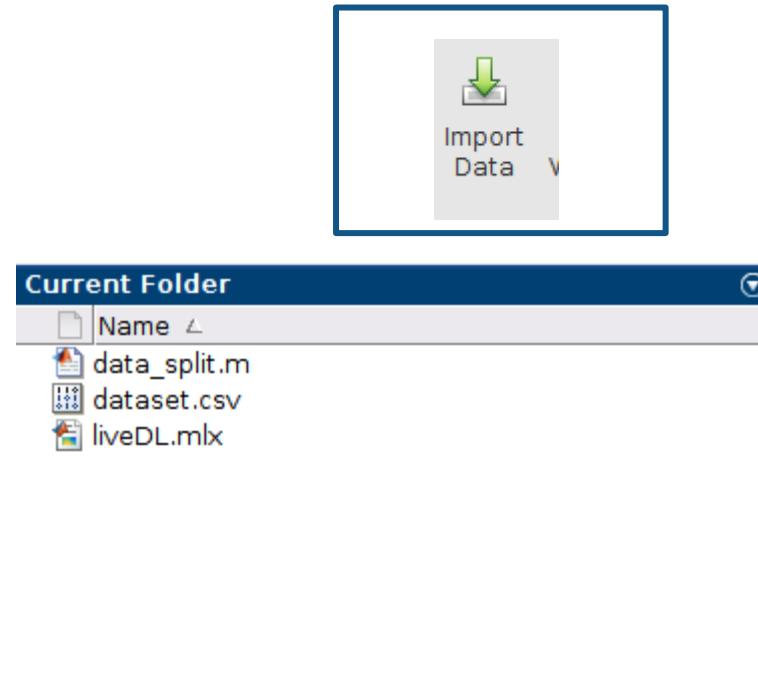


- Download Dataset form **Kaggle**: 
 - <https://www.kaggle.com/datasets/vmalyi/run-or-walk>
- This dataset contain:
 - Gyro x,y,z
 - Accelerometer x,y,z
 - Filtered
 - Scaled
 - Normalized
 - Run is labeled as 1, otherwise 0 (walking)

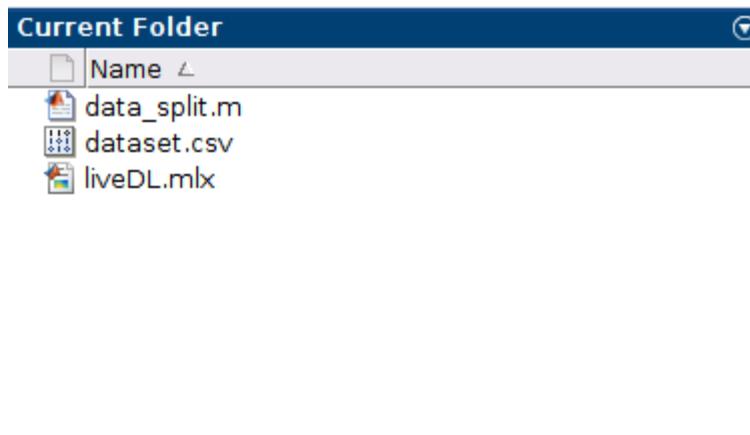
DNN application (II) : Dataset importing



DNN application (II) : Dataset importing



DNN application (II) : Dataset importing



Import - /home/giulio/Scrivania/dataset.csv

IMPORT VIEW DELIMITERS SELECTION IMPORTED DATA UNIMPORTABLE CELLS

Column delimiters: Comma Range: E2:K85... Output Type: Numeric Matrix

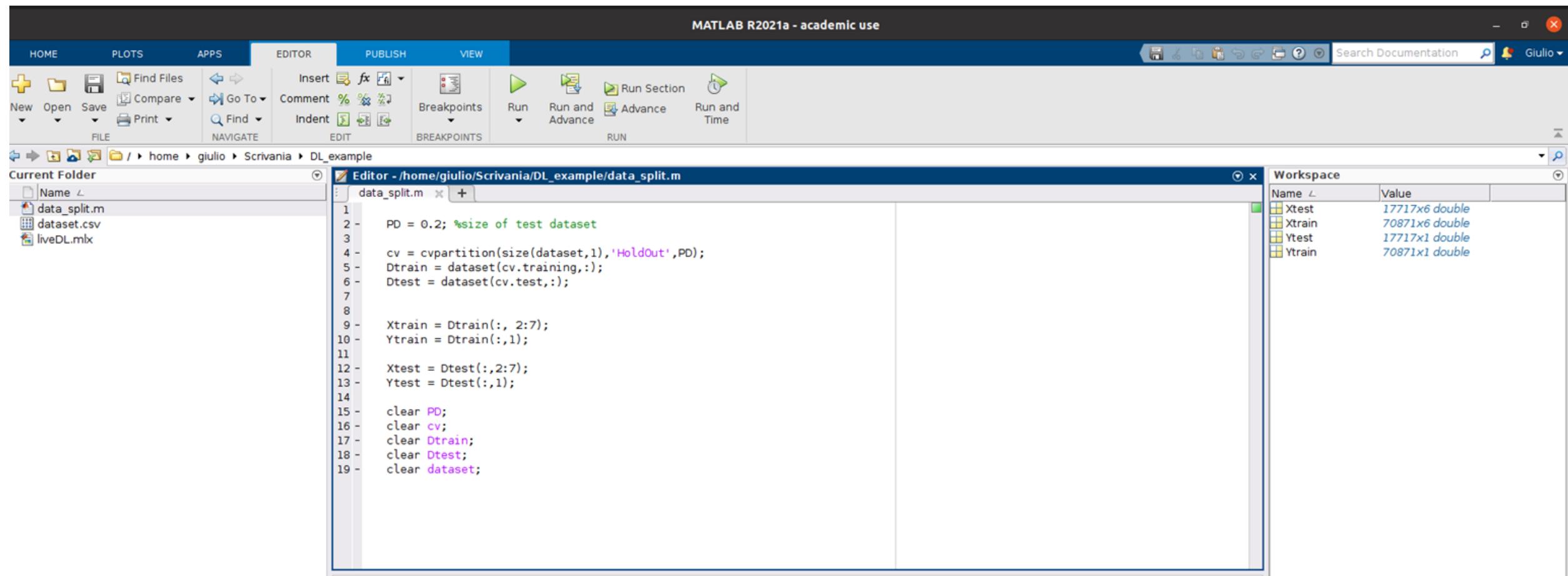
Fixed Width Delimiter Options Variable Names Row: 1 Replace unimportable cells with NaN

Import Selection Import

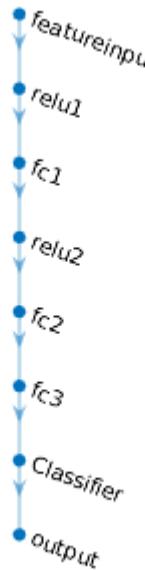
dataset.csv

	A	B	C	D	E	F	G	H	I	J	K
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
1	date	time	username	wrist	activity	accelera...	accelera...	accelera...	accelera...	accelera...	Click here to change the data type for this column.
2	2017-6-30	13:51:15...	viktor	0	0	0.2650	-0.7814	-0.0076	-0.0590	0.0325	-2.9296
3	2017-6-30	13:51:16...	viktor	0	0	0.6722	-1.1233	-0.2344	-0.1757	0.0208	0.1269
4	2017-6-30	13:51:16...	viktor	0	0	0.4399	-1.4817	0.0722	-0.9105	0.1063	-2.4367
5	2017-6-30	13:51:16...	viktor	0	0	0.3031	-0.8125	0.0888	0.1199	-0.4099	-2.9336
6	2017-6-30	13:51:16...	viktor	0	0	0.4814	-0.9312	0.0359	0.0527	0.4379	2.4922
7	2017-6-30	13:51:17...	viktor	0	0	0.4044	-0.8056	-0.0956	0.6925	-0.2179	2.5750
8	2017-6-30	13:51:17...	viktor	0	0	0.6320	-1.1290	-0.2982	0.0548	-0.1896	0.4473
9	2017-6-30	13:51:17...	viktor	0	0	0.6670	-1.3503	-0.0880	-0.8094	-0.7938	-1.4348
10	2017-6-30	13:51:17...	viktor	0	0	0.2704	-0.8633	0.1293	-0.4173	-0.1904	-2.6759
11	2017-6-30	13:51:17...	viktor	0	0	0.4690	-1.0740	0.0219	0.0388	1.1491	1.6982
12	2017-6-30	13:51:18...	viktor	0	0	0.2985	-0.7172	-0.0693	0.2326	0.4321	2.1009
13	2017-6-30	13:51:18...	viktor	0	0	0.6364	-1.0452	-0.2400	0.1163	-0.1033	1.0822
14	2017-6-30	13:51:18...	viktor	0	0	0.5683	-1.2486	-0.1310	-0.4556	-0.5281	-1.2407
15	2017-6-30	13:51:18...	viktor	0	0	0.2911	-0.7748	0.0163	-0.2345	-0.0148	-2.5884
16	2017-6-30	13:51:18...	viktor	0	0	0.4477	-1.1574	-0.0172	-0.1081	0.4016	0.6700
17	2017-6-30	13:51:19...	viktor	0	0	0.2424	-0.7421	-0.0549	0.5714	-0.0506	2.1356
18	2017-6-30	13:51:19...	viktor	0	0	0.6028	-1.0966	-0.3046	0.1674	-0.5065	1.0156
19	2017-6-30	13:51:19...	viktor	0	0	0.4852	-1.3397	-0.0763	-0.8579	0.0096	-1.4015
20	2017-6-30	13:51:19...	viktor	0	0	0.3017	-0.8366	0.0718	-0.2701	-0.4678	-2.7010
21	2017-6-30	13:51:19...	viktor	0	0	0.4082	-1.0859	-0.0375	0.0848	-0.1050	0.2870
22	2017-6-30	13:51:20...	viktor	0	0	0.3720	-0.8190	-0.2379	0.3006	0.1531	2.6873
23	2017-6-30	13:51:20...	viktor	0	0	0.6363	-0.7532	-0.2972	-0.0726	-0.1945	1.4530
24	2017-6-30	13:51:20...	viktor	0	0	0.7090	-1.1893	-0.2303	-0.1418	-1.4683	-1.2643

DNN application (III) : Dataset splitting

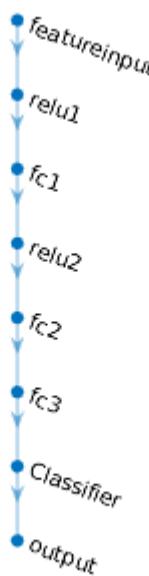


DNN application (IV) : Architecture



```
layers = [
    featureInputLayer(6, "Name", "featureinput")
    reluLayer("Name", "relu1")
    fullyConnectedLayer(128, "Name", "fc1")
    reluLayer("Name", "relu2")
    fullyConnectedLayer(64, "Name", "fc2")
    fullyConnectedLayer(1, "Name", "fc3")
    sigmoidLayer("Name", "Classifier")
    regressionLayer("Name", "output")
];
```

DNN application (V) : Options

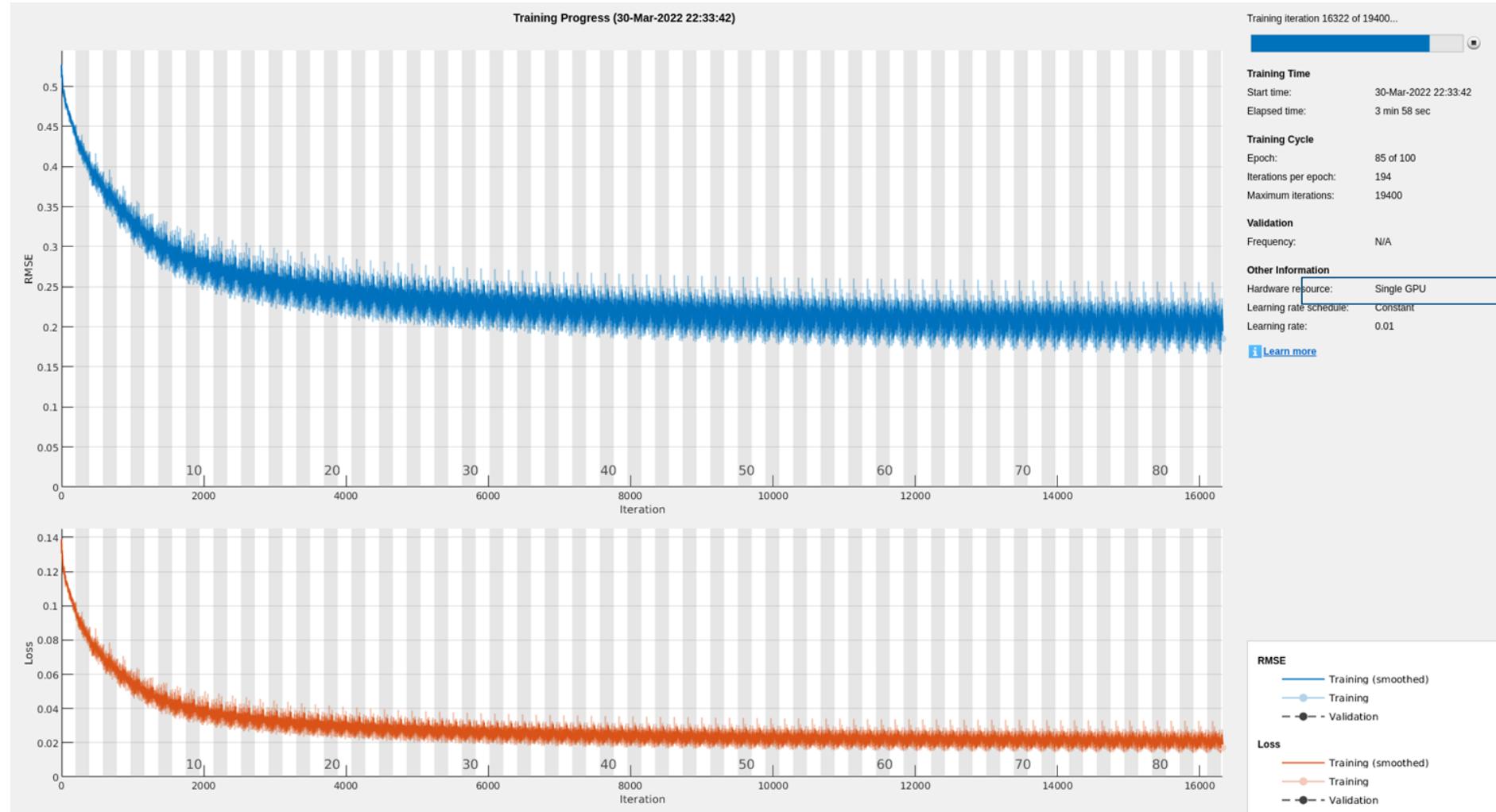


```
layers = [  
    featureInputLayer(6, "Name", "featureinput")  
    reluLayer("Name", "relu1")  
    fullyConnectedLayer(128, "Name", "fc1")  
    reluLayer("Name", "relu2")  
    fullyConnectedLayer(64, "Name", "fc2")  
    fullyConnectedLayer(1, "Name", "fc3")  
    sigmoidLayer("Name", "Classifier")  
    regressionLayer("Name", "output")  
];
```

```
options = trainingOptions("sgdm", ...  
    MaxEpochs=100, ...  
    InitialLearnRate=0.01, ...  
    Plots="training-progress", ...  
    MiniBatchSize=364, ...  
    Verbose=1)
```

DNN application (VI) : Training

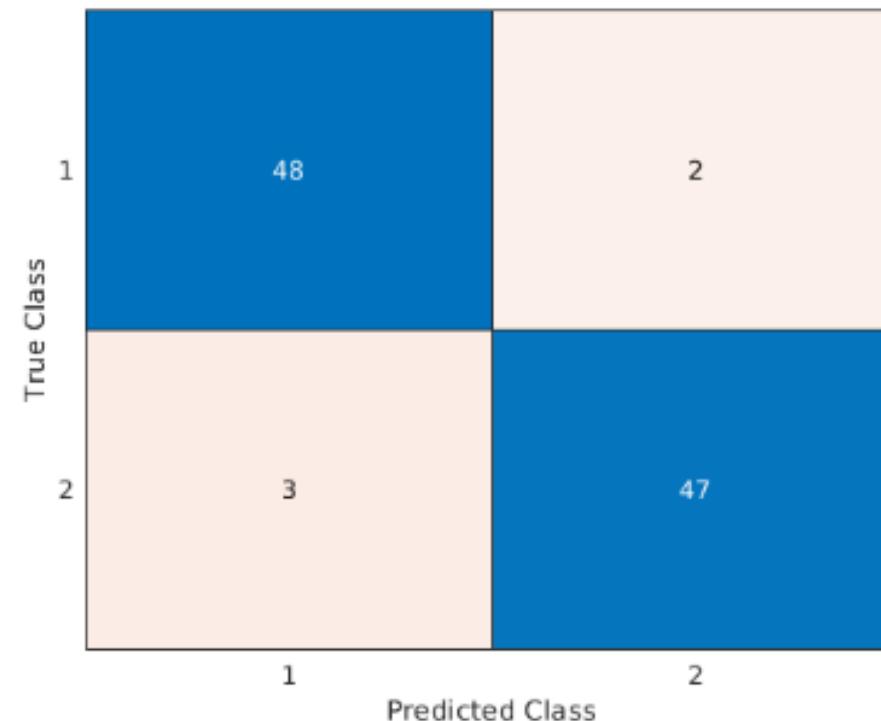
```
net = trainNetwork(Xtrain,Ytrain,layers,options);
```



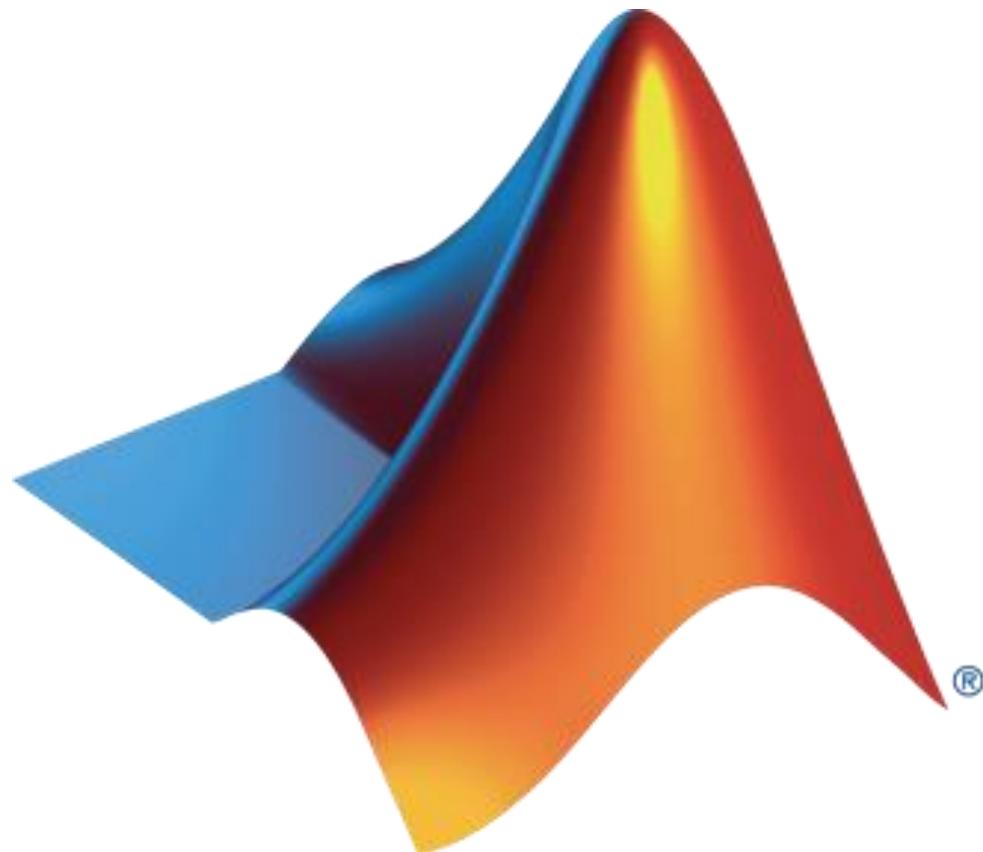
DNN application (VII) : Testing and measuring performance

```
Y = predict(net,Xtest);
for i=1:size(Y,1)
if Y(i,1) > 0.5
    Y(i,1) = 1;
else
    Y(i,1) = 0;
end
end

c = confusionmat(Ytest, double(Y));
c = (c/size(Y,1).*100);
c = round(c)
confusionchart(c)
acc = (c(1,1)+c(2,2))
disp('Classification accuracy is in percent: ')
disp(acc)
```



```
acc = 95
Classification accuracy is in percent:
95
```



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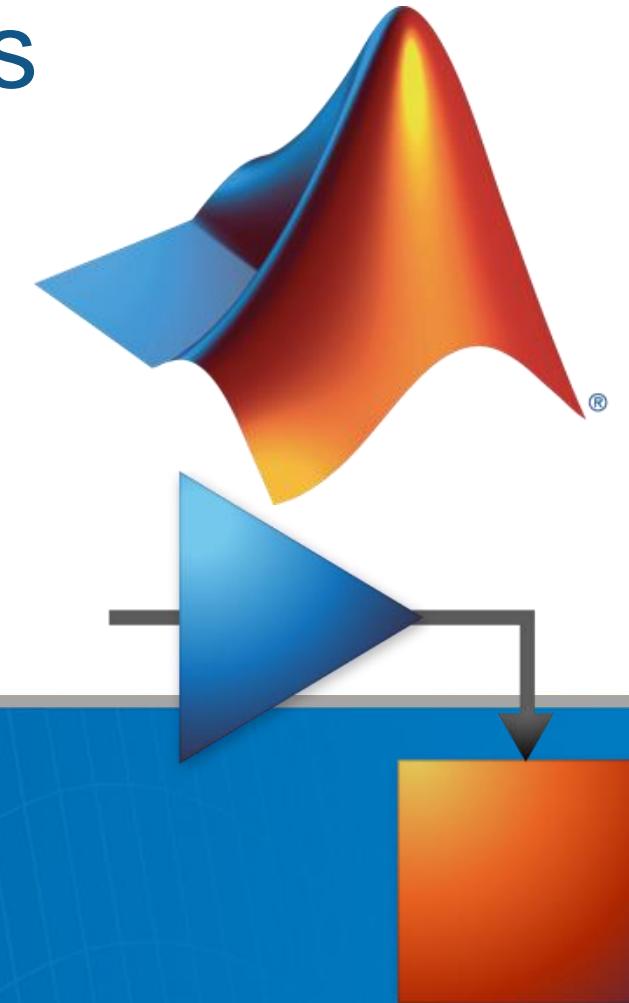
Intro to Git and Code Submission



ARTURO FERNÁNDEZ
UPV Ambassador



UNIVERSITAT
POLITÈCNICA
DE VALÈNCIA



Project Submission

- **Submission Deadline → 7/04 19:30h CEST**
- **What to Submit?**
 - URL to your Code Repository (e.g., GitHub) or File Exchange



git

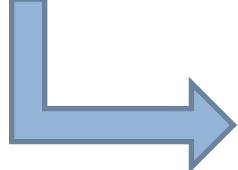


File Exchange

What is Git?



git



“Free and open-source distributed version control system (**VCS**)”



Purpose: Share code and collaborate on Software Projects

Git's core functionality can be simplified into 3 basic parts:

1. Allow developers to keep track of updates to their code over time
2. Allow developers to easily combine their code updates with previous updates or new updates made by other people
3. Allow developers to easily share code over the Internet

What is NOT Git

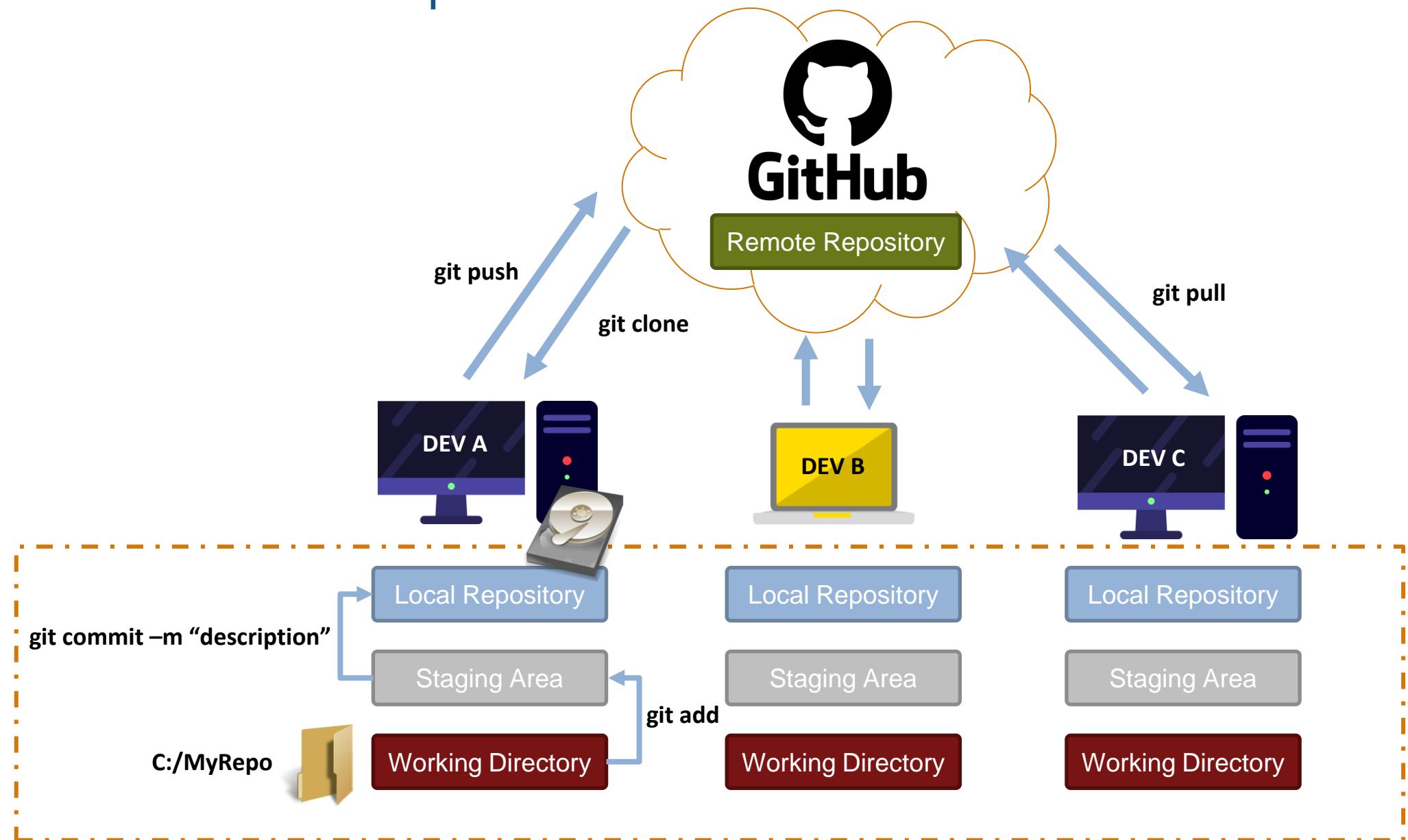


¿Are there other alternatives to Git?



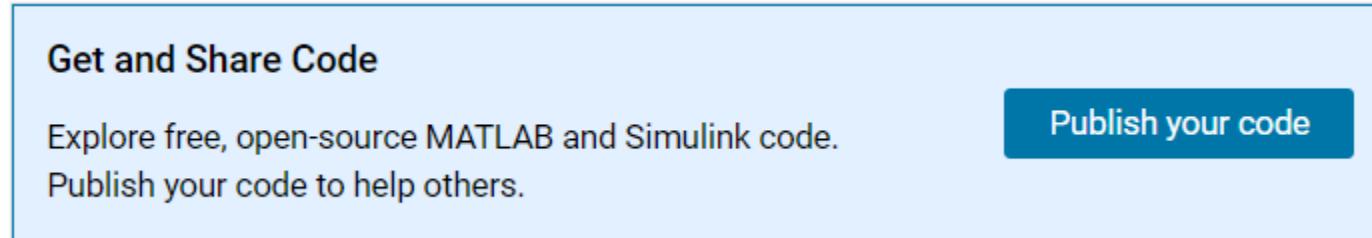
PERFORCE

Basic Git Concepts and Commands



File Exchange Code Submission

- Steps:
 1. Login to www.mathworks.com
 2. Access to File Exchange
 3. Click Publish your Code Button →



The screenshot displays the MathWorks website for Artificial Intelligence. The top navigation bar includes links for Products, Soluciones, Educación, Soporte, Comunidad, and Eventos. A search bar is located at the top right. The main content area features a large banner with the text "MATLAB para inteligencia artificial" and "Diseño de modelos de Inteligencia Artificial y sistemas dirigidos por Inteligencia Artificial". Below the banner are three buttons: "Machine Learning", "Deep Learning", and "Reinforcement Learning". The background of the page is filled with various MATLAB and Simulink plots, including a walking robot simulation and reinforcement learning progress graphs.

File Exchange Code Submission



Contribute



Connect to GitHub

Make code in your GitHub repos accessible from File Exchange and Add-On Explorer



Upload Files

Share your code on File Exchange and Add-On Explorer



Link to an External Website

Share your code hosted on another website with the MathWorks community

File Exchange Code Submission



Connect to GitHub

GitHub repository name *

`https://github.com/`

Submit only GitHub repositories that you own or administer.

Connect to GitHub **Cancel**

** Indicates required fields*

File Exchange Code Submission



AP

Contribute

Image

Title* search_zeros_Zhao_FPF Characters remaining: 39

Summary* Characters remaining: 140

Version* 1.0.0 **Project Website**

Description *

Required MathWorks Products

MATLAB Release Compatibility

Created With R2022a

Compatible With Any to Any

Image

Summary*

Version* 1.0.0 **Project Website**

Description *

Required MathWorks Products

MATLAB Release Compatibility

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Compatible With Any to Any

