MATLAB for Medicine

A very powerful and a crucial technological support for medical career

Matlab with the Campus-wide Licence is nowadays a crucial technological support for thousands of well-renowned universities around the world. To use the University of Messina Campus Licence just log-in Unime website and click on the icon MATLAB **You will be directly connected to the Mathworks website where logging in using the Unime e-mail credentials to access all the resources. Download the software and as many toolboxes are needed, or use Matlab online without downloading and work on shared folders with colleagues; follow self-paced introductory as well as advanced courses on many different applications. Matlab can be used in teaching, for instance using the Live Editor to produce interactive lectures with theory and coding or Matlab Grader to give automated feedback on exercises to students (this feature has been integrated into Unime e-learning). Matlab (and Simulink which is also integrated in the licence) can support both basic statistics and math courses as well as advanced courses. Students can use Matlab in the process of learning by accessing to numerous tutorials and resources of the community of Matlab Exchange.**

Matlab is a crucial tool in research. For some hints on specific applications and use in Medicine see the scheme below.

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Toolbox	Info	Applications	Useful Links
Image Acquisition Toolbox	Explore problems		https://it.mathworks.com/videos/series/introduction-to-medical-image-processing-using-matlab-96600.html

Image Processing Toolbox Instrument Control Toolbox	related to CT, MRI images and fluorescein angiographies.	Analysis of microscopic images to quantify parasitic infections.	https://it.mathworks.com/solutions/biological-sciences/microscopy-biomedical-imaging.html https://it.mathworks.com/products/instrument.html
Computer Vision Toolbox	Analysis, automation and images classification.	Solving problems of biological imaging analysis. Medical diagnoses and segmentation of medical images.	https://it.mathworks.com/videos/machine-learning-and-computer-vision-for-medical-imaging-applications-108028.html https://it.mathworks.com/videos/deep-learning-for-computer-vision-with-matlab-121070.html https://it.mathworks.com/matlabcentral/fileexchange/66448-medical-image-segmentation-using-segnet https://it.mathworks.com/matlabcentral/fileexchange/29344-read-medical-data-3d?s_tid=srchtitle https://it.mathworks.com/help/images/segment-3d-brain-tumor-using-deep-learning.html https://it.mathworks.com/help/images/deep-learning.html https://blogs.mathworks.com/deep-learning/2019/07/24/deep-learning-for-medical-imaging/
Statistics and Machine Learning Toolbox	Used to support medical devices (Pacemaker, Infusion Pump, Scanner)	Arrhythmia detection from ECG data, Data exploration, Data transformation, etc)	https://it.mathworks.com/videos/using-matlab-in-medical-device-research-and-development-82001.html https://it.mathworks.com/matlabcentral/fileexchange/53745-medical-image-reader-and-viewer?s_tid=srchtitle https://it.mathworks.com/matlabcentral/fileexchange/51174-dicom-medical-image-to-nrrd-medical-image?s_tid=srchtitle
Bioinformatics Toolbox™	Algorithms for NGS, microarray analysis, mass spectrometry. And gene ontology.	Analysis and visualization of genomic and proteomic from standard data files SAM, FASTA, CEL and CDF.	https://it.mathworks.com/products/bioinfo.html

Simscape (Simulink)	For physical modelling.	Medical ventilators with lung model	https://it.mathworks.com/help/physmod/simscape/example/medical-ventilator-with-lung-model.html
SimBiology (Simulink)	Modelling, simulatind and analysing dynamical biological systems.	Pharmaco-kinetic applications /pharmaco-dynamics (PK/PD) and applications in system biology.	https://it.mathworks.com/products/simbiology.html