Neuerungen bei MATLAB/Simulink

MATLAB Seminar – HTL Leonding

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Prof. Dr. Mario Huemer **JKU Linz, Institut für Signalverarbeitung**

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Graz University of Technology Develops AI to Identify Drowsy Drivers

Challenge

Determine driver drowsiness from the heart's electrical activity

Solution

Apply deep learning to find subtle patterns in ECG data from rested and fatigued drivers. Create wavelet scalograms with Wavelet Toolbox to transform ECG signals into time-frequency representations. Feed the resulting images into a convolutional neural network using MATLAB and Deep Learning Toolbox.

Key Outcomes

- The deep learning neural network achieved 77% and 79% accuracy when detecting drowsiness, outperforming current state-of-the-art machine learning methods
- The neural network identifies differences between alert and moderately drowsy drivers, paving the way for car functionality that alerts a driver that they are drowsy before they are aware of it

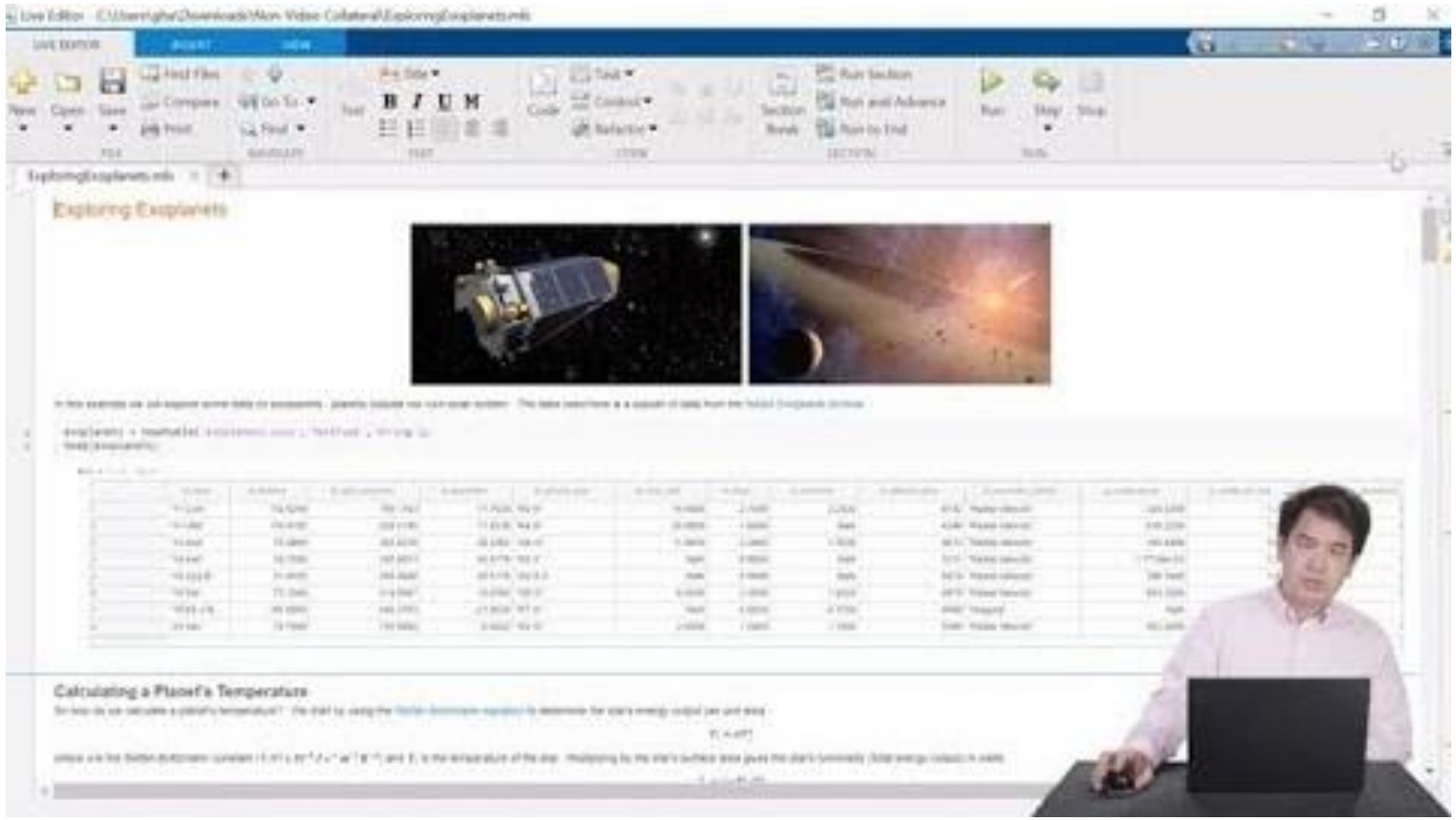
A study participant with monitoring equipment in a Mini Cooper. (Image Credit: Eichberger et al., TU Graz)

"[MATLAB and Deep Learning Toolbox were] very user-friendly. I could add different types of layers and easily make my own neural net." — Sadegh Arefnezhad, Graz University of Technology

Link to feature story

INSTRUCTION

Interaktives Programmieren mit dem Live Editor



Features

- Lehren Sie mit interaktiven Dokumenten
- Beschleunigen von explorativem Programmieren
- Erstellen Sie eine interaktive Erzählung um Konzepte
- Veröffentlichen einheitlicher Berichte

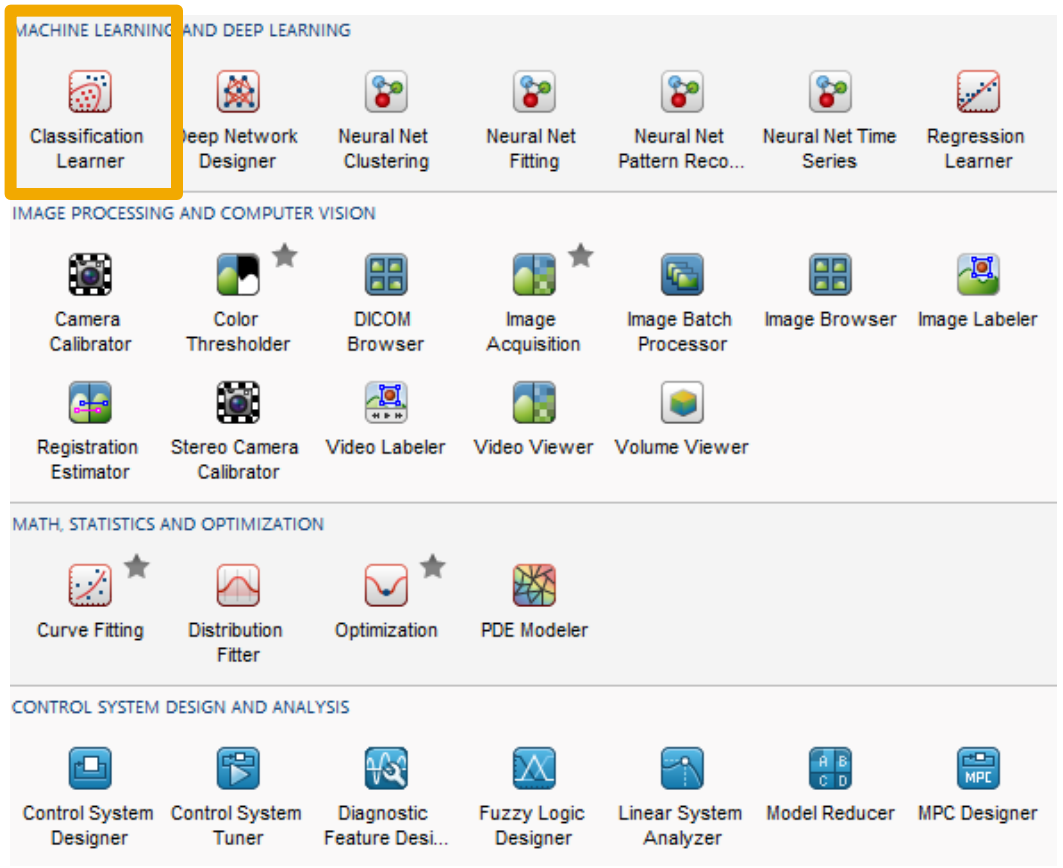
Live-Demo:

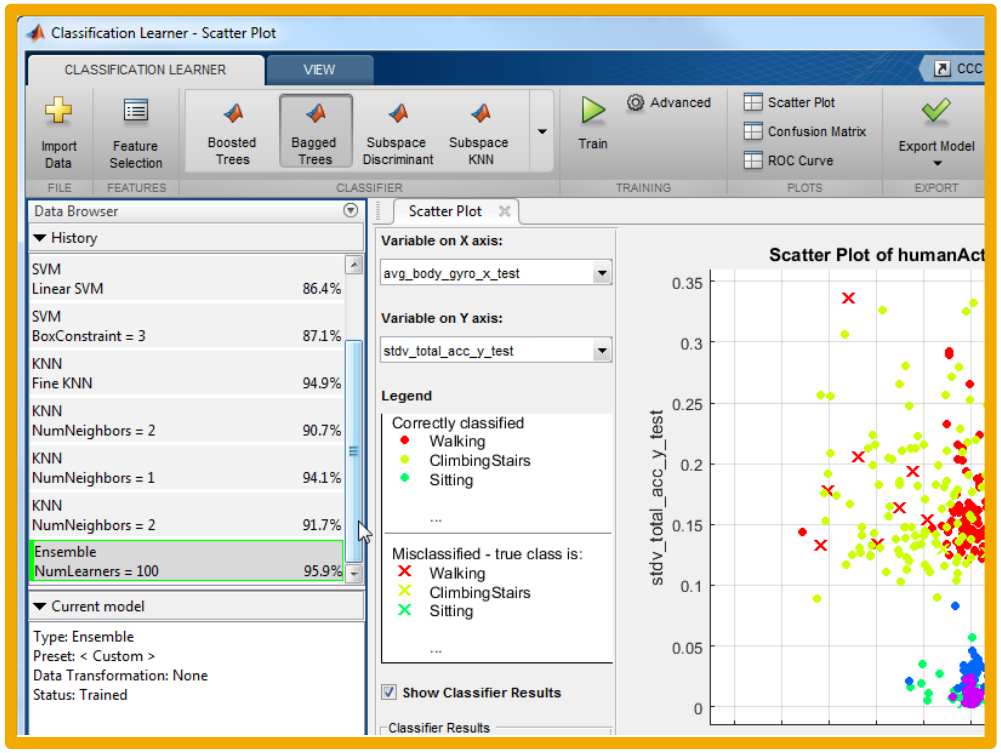
Interaktivität in (Live) Skripten: Vorher („.m“) – Nachher („.mlx“)

`cosMovAvgFilter.m` `cosMovAvgFilter_Interactive.mlx`

INSTRUCTION

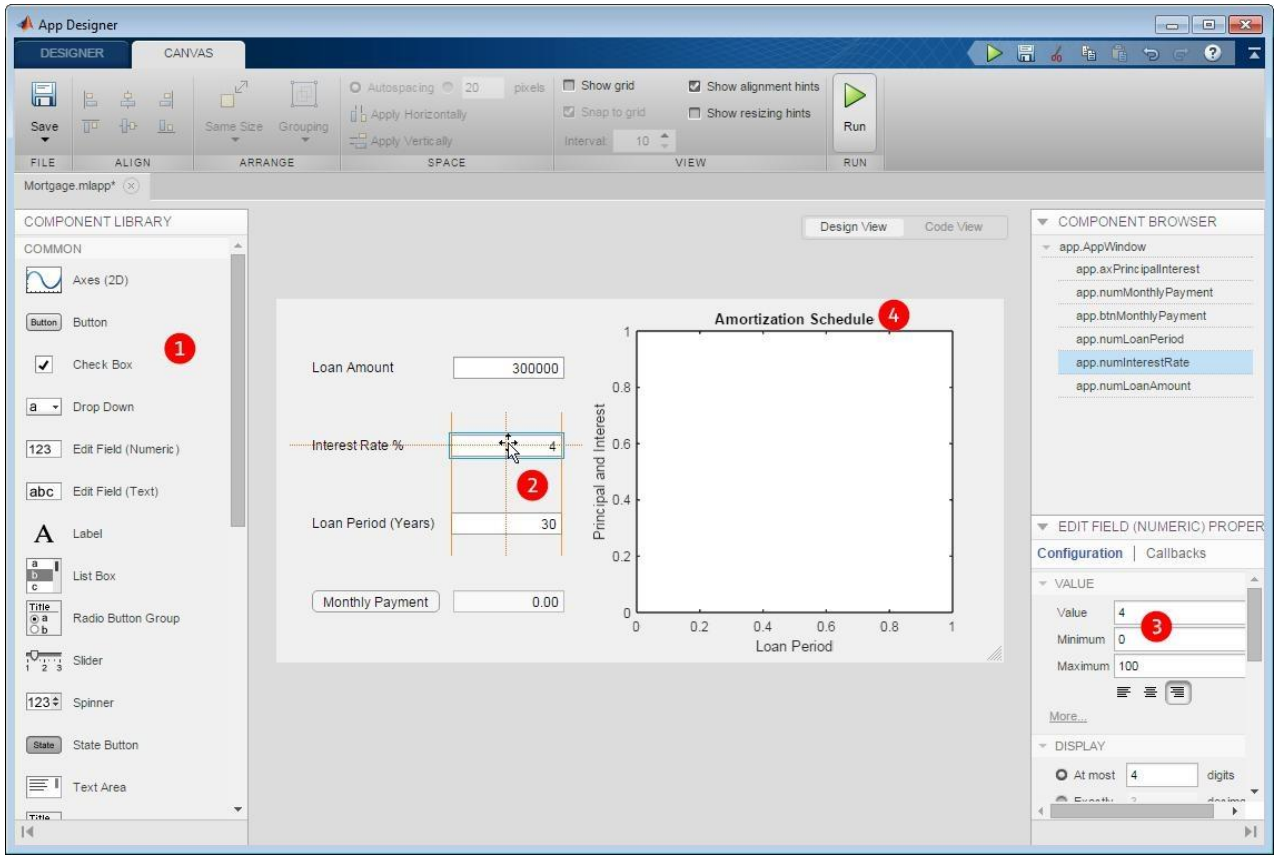
MATLAB Apps





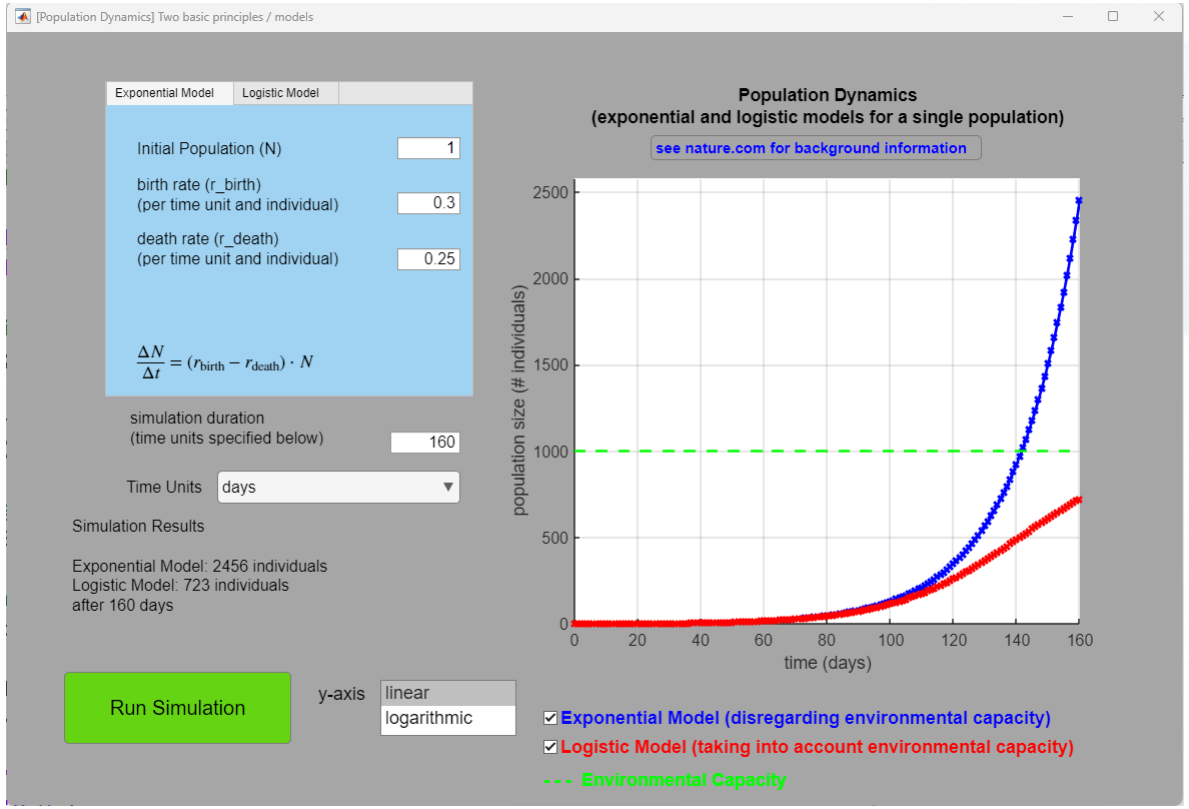
INSTRUCTION

MATLAB App Designer



INSTRUCTION

Demo: MATLAB Apps & eigene MATLAB Apps – Beispiel: Populationsdynamik*



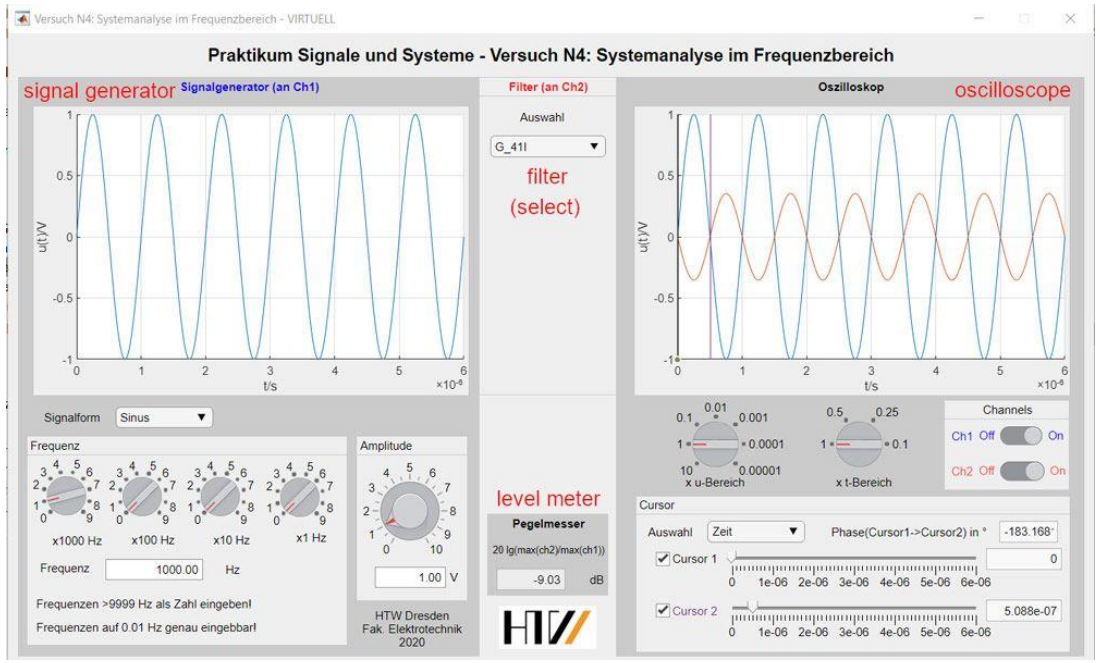
*Datengenerierung auch möglich in Simulink-Modellen, die im Hintergrund laufen

INSTRUCTION

Interaktive Apps für ein eindrückliches Lernerlebnis

HTW Dresden Virtualizing Electrical Engineering Teaching Labs

- Virtuelle Laborgeräte (als Apps): die Studierende können zuhause das im Labor erlebte Revue passieren lassen (Artikel)
- Graphische Benutzeroberflächen zur einfachen Bedienung, darunter MATLAB Code und/oder Simulink Modelle
- Die interaktiven Apps (vgl. rechts) auf File Exchange

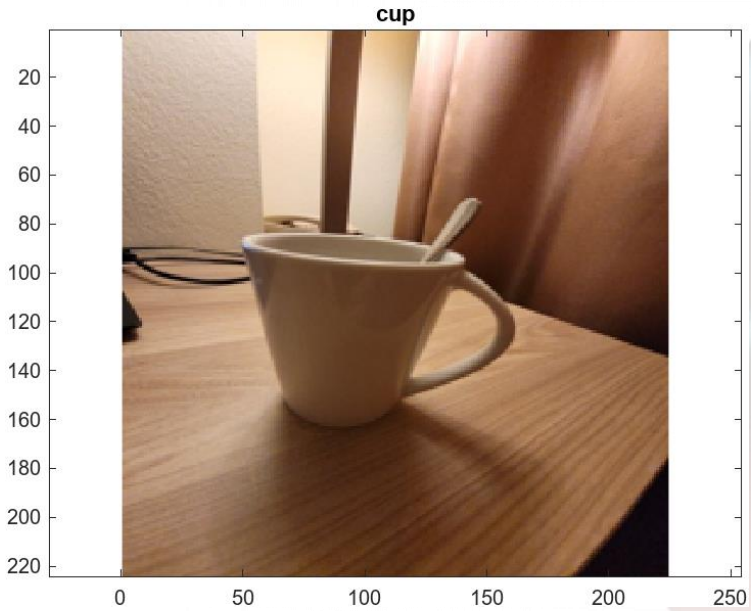


INSTRUCTION

MATLAB Mobile

INSTRUCTION

MATLAB Mobile: Live Demo – Klassifizierung von Photos von der Handykamera



Files:

`ClassifyCameraImage.m` (Handy)
`ClassifyCameraImage_desktop.mlx` (Desktop)
`camnet.m` (benötigte Funktion)

Erstellen von Handy- und Web Apps

Handy-Apps

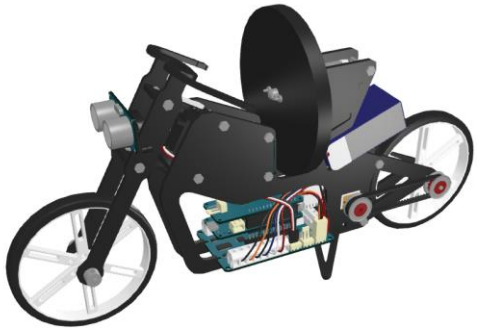
- Es gibt die Möglichkeit zur C-Codegen und Integration in Apps
- Zugeschnittene Lösungen für
  - Android
  - iOS

Web Apps

- Allgemeine Information in der Dokumentation

INSTRUCTION

Project-based learning with low-cost hardware



Self-balancing robots using
Arduino

Edge Detection using
Raspberry Pi

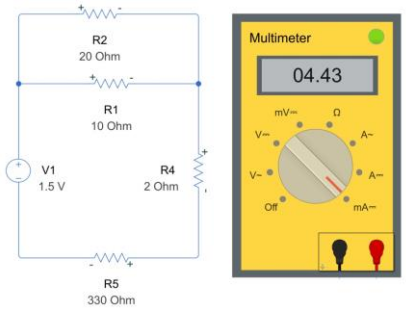
"I really enjoyed, 'Edge AI with Raspberry Pi using MATLAB' to deploy face detection and age prediction algorithms on a Raspberry Pi. I have no experience in hardware, but I completed the tutorial and now have a strong curiosity."

-Katie Amrine, PhD
Decision Scientist, Facebook

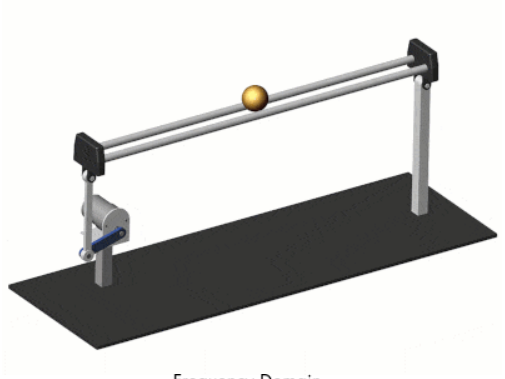
INSTRUCTION

Modulare Lehrmaterialien

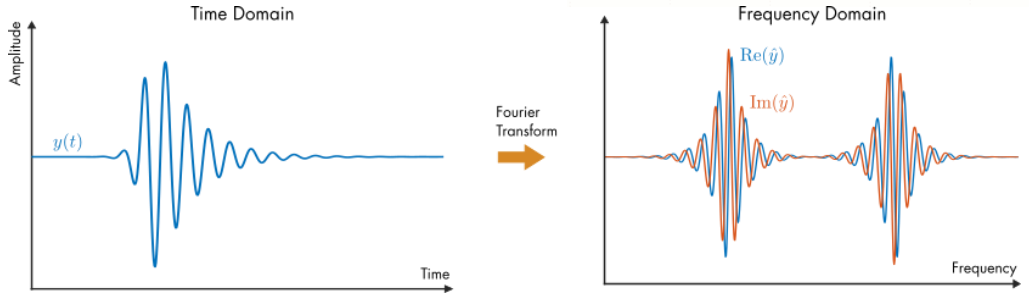
- Beispiele:
  - DC Circuit Analysis



  - Virtual hardware and labs for controls

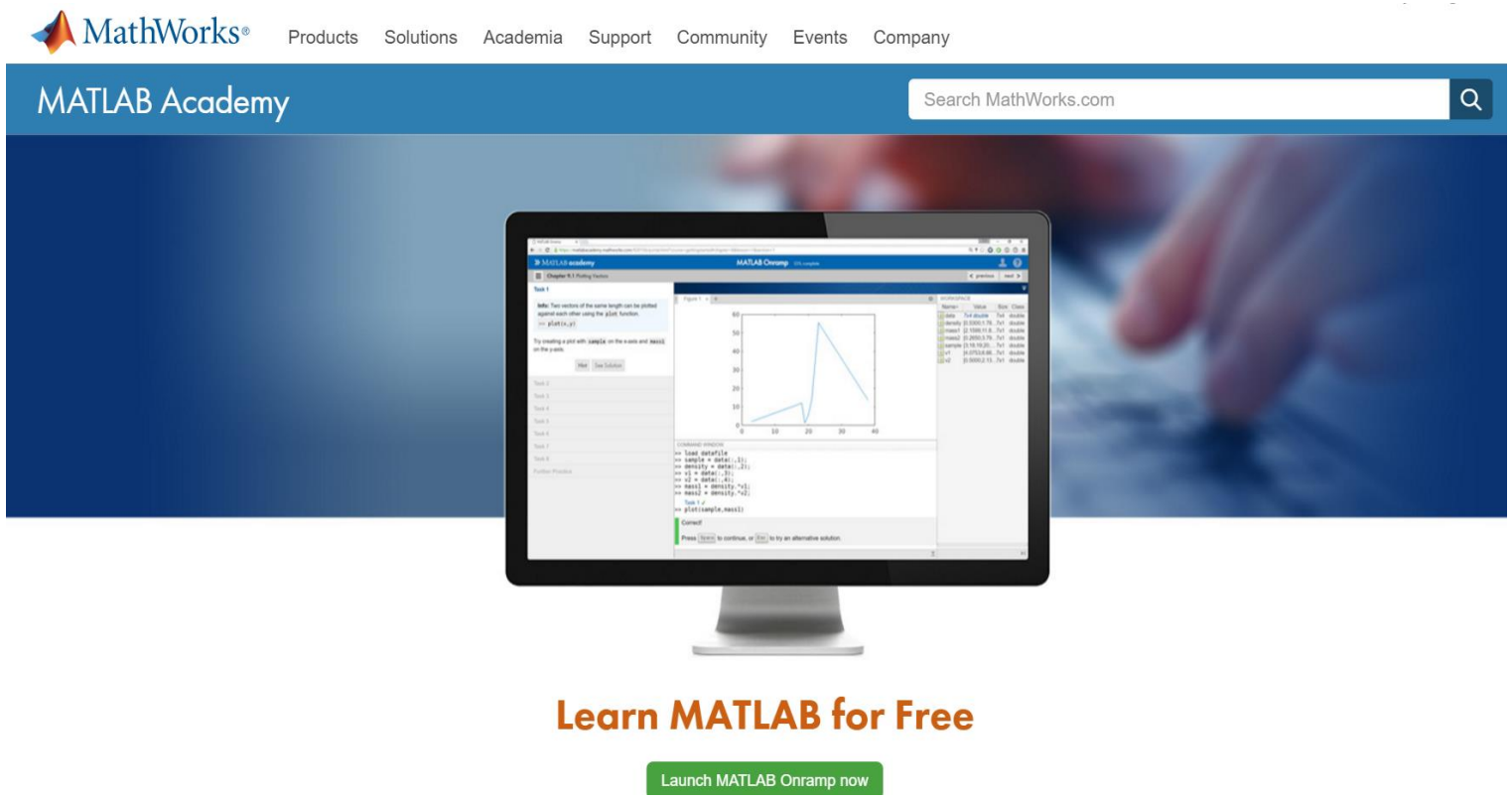


  - Fourieranalyse



INSTRUCTION

Kurse zum Selbsstudium



"The interactive MATLAB tutorials were perfect for engaging students and getting them up to speed quickly."

–Dr. Yu-li Wang, Carnegie Mellon University

FREE COURSES (2-3 hours)

- MATLAB Onramp
- Simulink Onramp
- Stateflow Onramp
- Machine Learning Onramp
- Deep Learning Onramp

FOCUSED COURSES

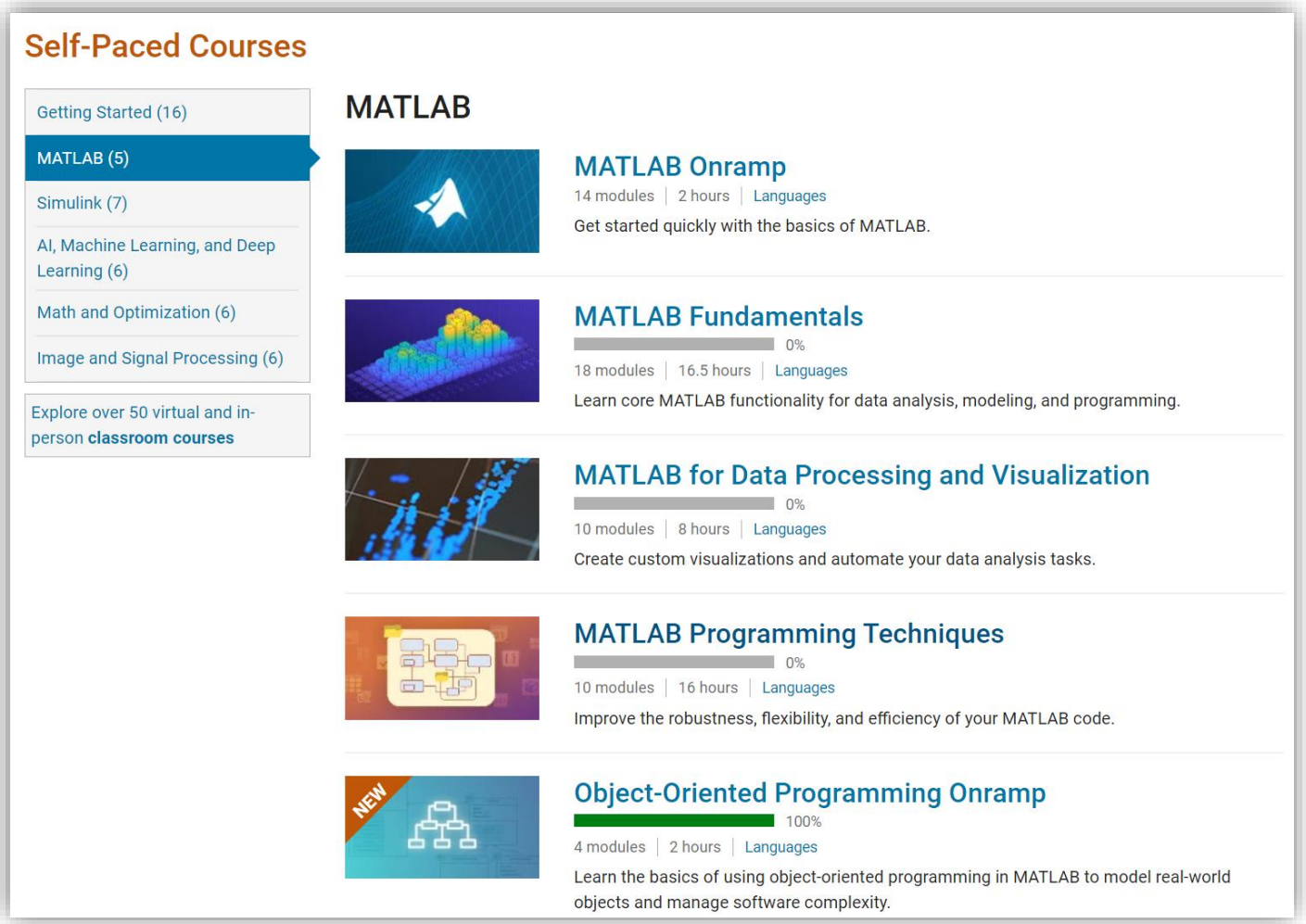
FOUNDATIONAL COURSES (17-21 hours)

- MATLAB Fundamentals
- MATLAB Programming Techniques
- MATLAB for Financial Applications
- MATLAB for Data Processing and Viz
- Machine Learning with MATLAB
- Deep Learning with MATLAB

COMPUTATIONAL MATH COURSES (2-3 hours)

- Introduction to Linear Algebra
- Solving Ordinary Differential Equations
- Introduction to Statistical Methods
- Solving Non-Linear Equations
- Introduction to Symbolic Math

Online Trainings



Danke für die Aufmerksamkeit!

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