September 2025 – FEI STU

http://matlab.sk/

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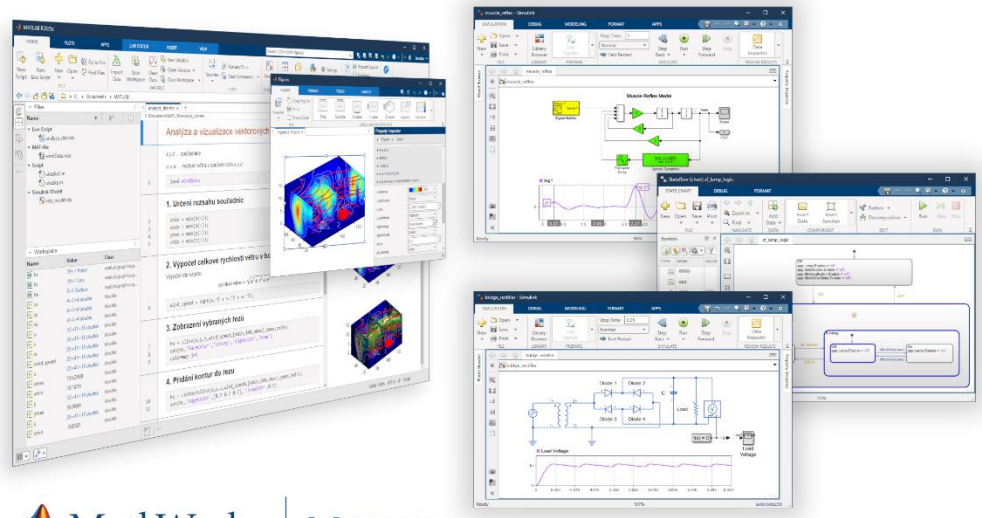

MathWorks® Authorized Reseller | MATLAB® & SIMULINK®

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info@humusoft.cz

www.mathworks.com

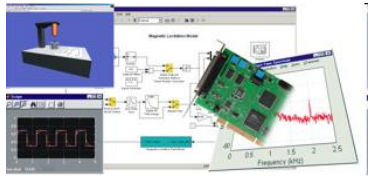
HUMUSOFT s.r.o.

The MathWorks

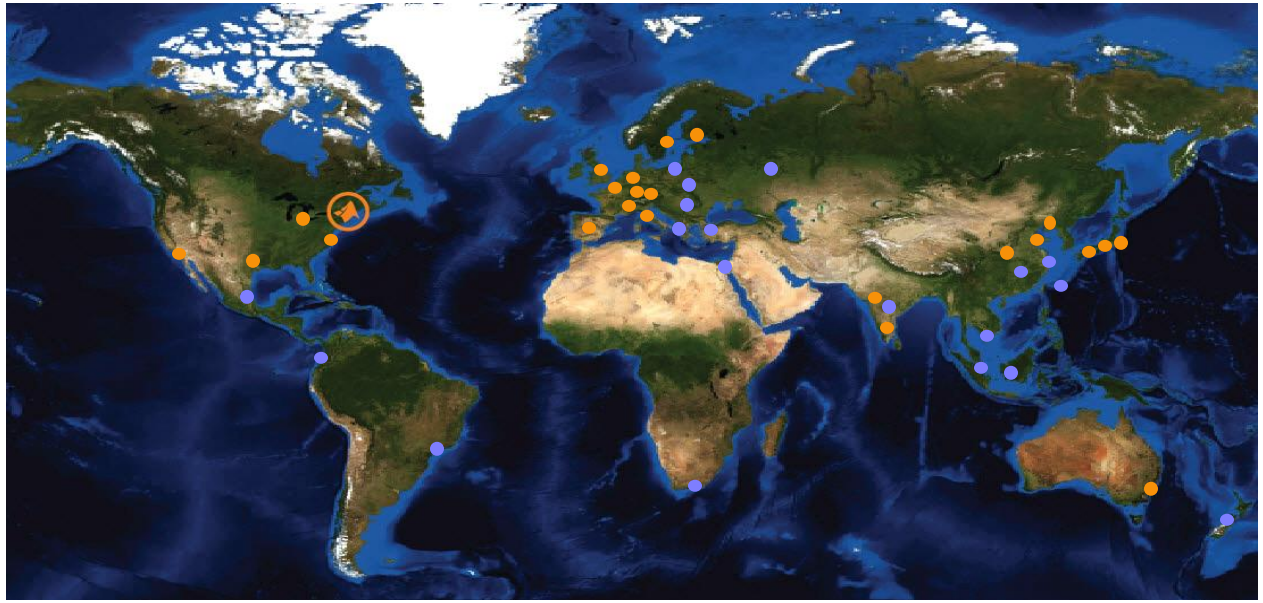
dSPACE

COMSOL

- Založené v roku 1990, sídlo v Prahe, pobočka v Bratislave
- MATLAB, Simulink, Stateflow
  - Inžinierske výpočty, simulácia dynamických systémov
  - The MathWorks, Inc.
- dSPACE - vývojové systémy
  - dSPACE GmbH.
- COMSOL Multiphysics
  - Multifyzikálna analýza (metóda FEM)
  - Comsol AB
- Vývoj vlastného softvéru a hardvéru
  - Simulink 3D Animation, Simulink Desktop Real Time
  - Meracie karty, modely pre výučbu
- Výkonné pracovné stanice HeavyHorse



MathWorks®



Topografie Země v cylindrické projekci, vytvořeno s použitím programu MATLAB a Mapping Toolboxu.

- **Sídlo:**
  Natick, Massachusetts U.S.
- **Kancelárie v USA:**
  California; Michigan;
  Texas; Washington, D.C.

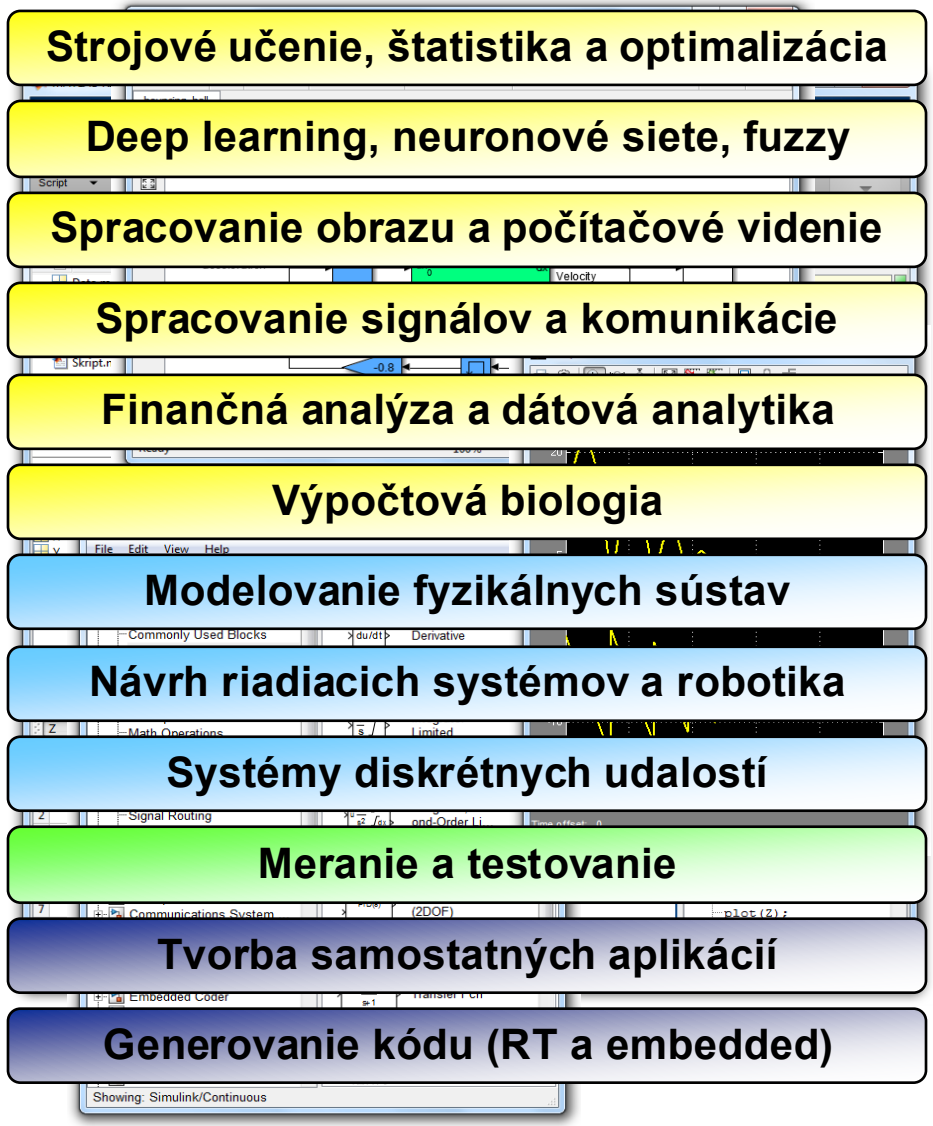
- **Európa:**
  Francúzsko, Nemecko, Taliansko, Holandsko, Španielsko, Švédsko, Švajčiarsko, Veľká Británia
- **Ázia / Pacifik:**
  Austrália, Čína, India, Japonsko, Kórea

- Distribútori v 20 krajinách

Interakcia
Instagram & Discord & LinkedIn

Čo je MATLAB a Simulink

- MATLAB
  - Inžiniersky nástroj a interaktívne prostredie pre vedecké a technické výpočty
  - Grafické a výpočtové nástroje
  - Grafické aplikácie (GUI, APPS)
  - Otvorený systém
- Simulink
  - Nadstavba MATLABu
  - Modelovanie, simulácia a analýza dynamických systémov
  - Prostredie blokových schém
  - Platforma pre Model Based Design
- Aplikačné knižnice



MATLAB v priemysle


Letecký


Automobilový


Biotech


Farmaceutický


Telekomunikácie


Oceány a zem


Elektronika


Energetika


Automatizácia


Medicína


Ťažobný


Neurológia


Aplikovaná fyzika

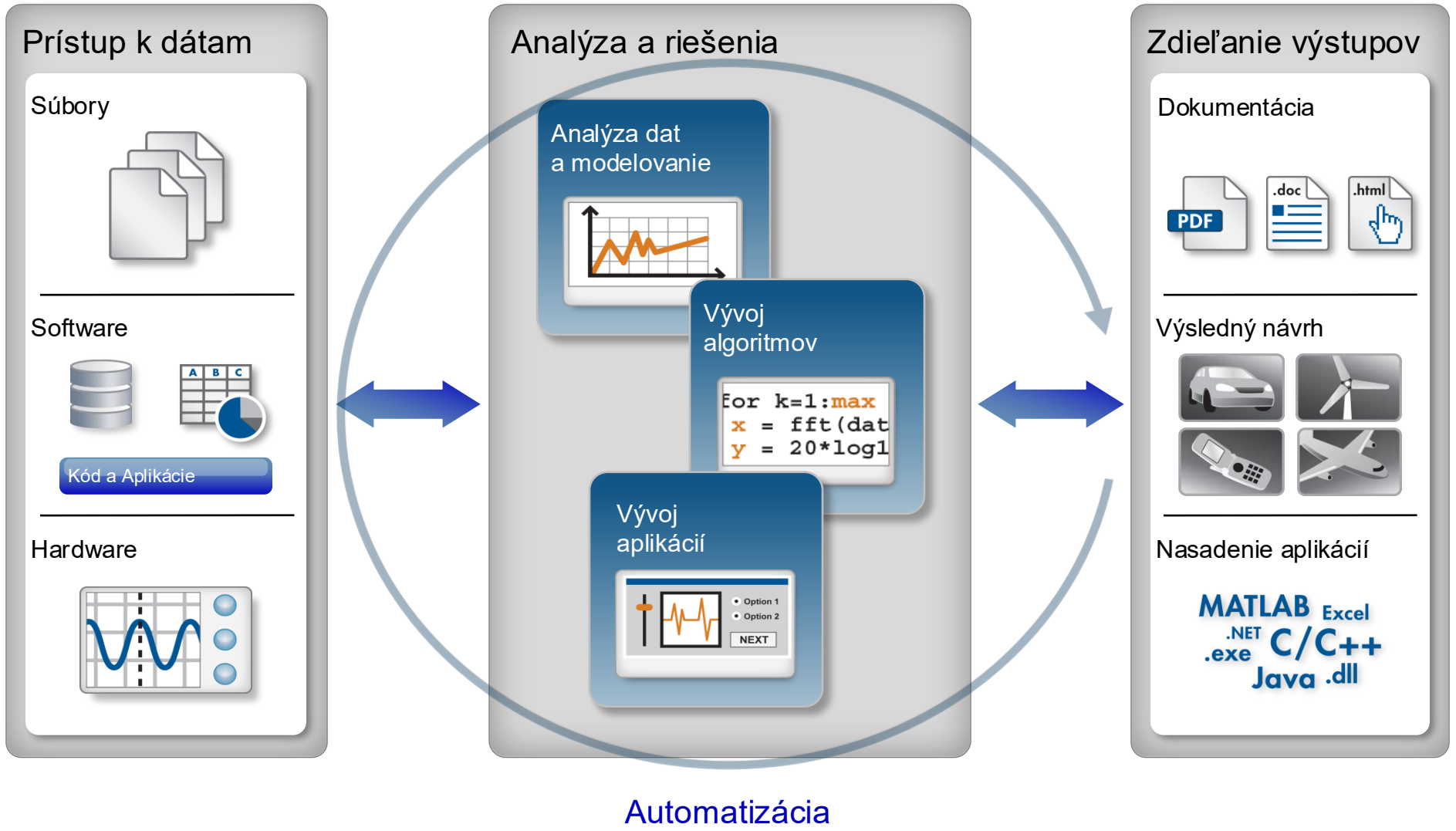

Železnice


Finančný


Informatika

https://www.mathworks.com/solutions.html#industries

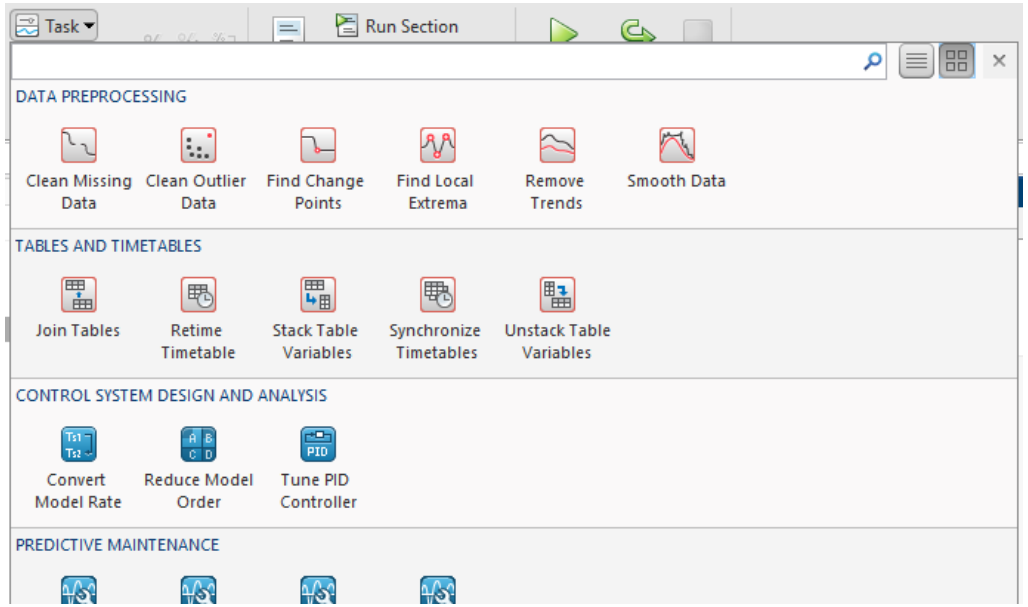
Technické výpočty v MATLABe

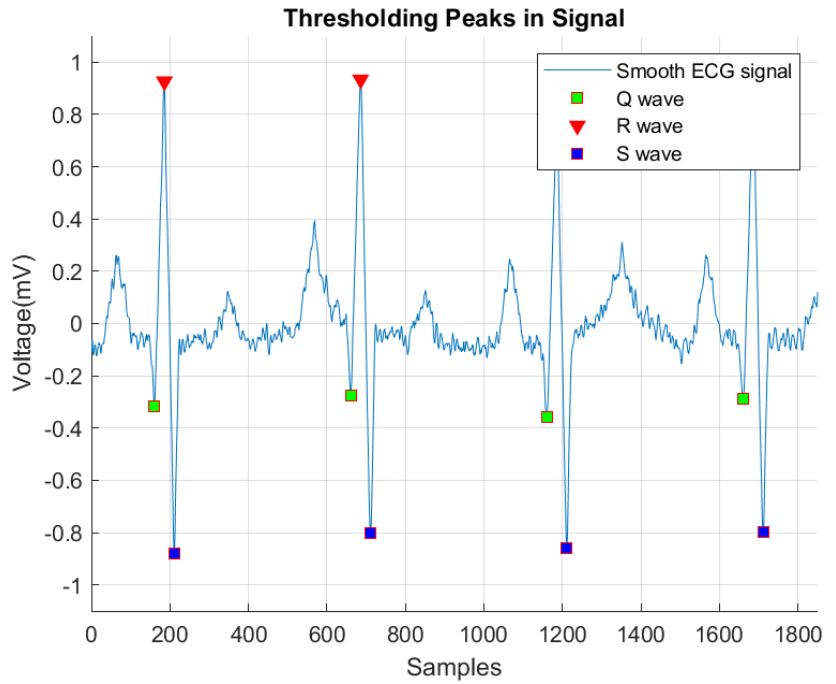


Príklad: Analýza ECG signálu

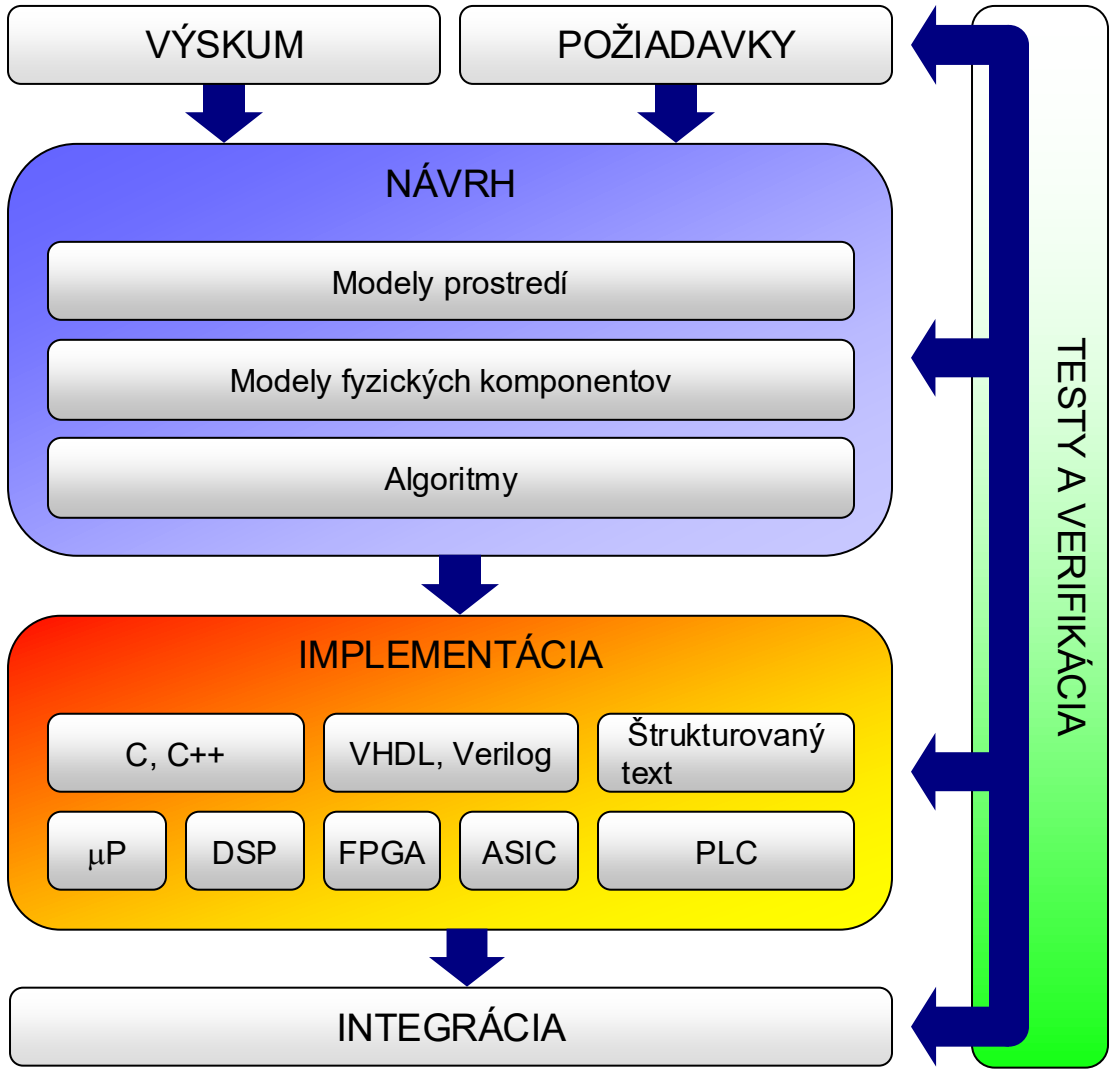
- Cieľ:
  - Analýza ECG signálu zo zašumených a posunutých dát

- Postup:
  - Načítať dáta
  - Odstránenie trendu
  - Vyhladenie dát
  - Nájdenie extrémov
  - Zdokumentovať výsledky





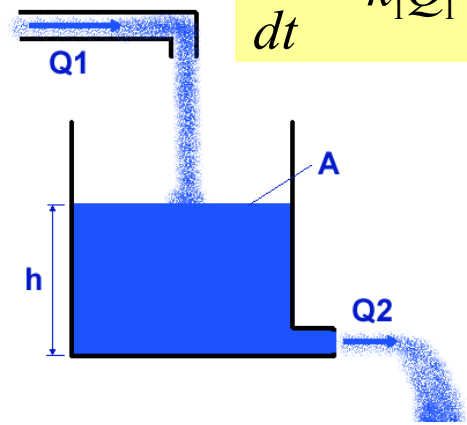
Vývoj metodou Model-Based Design

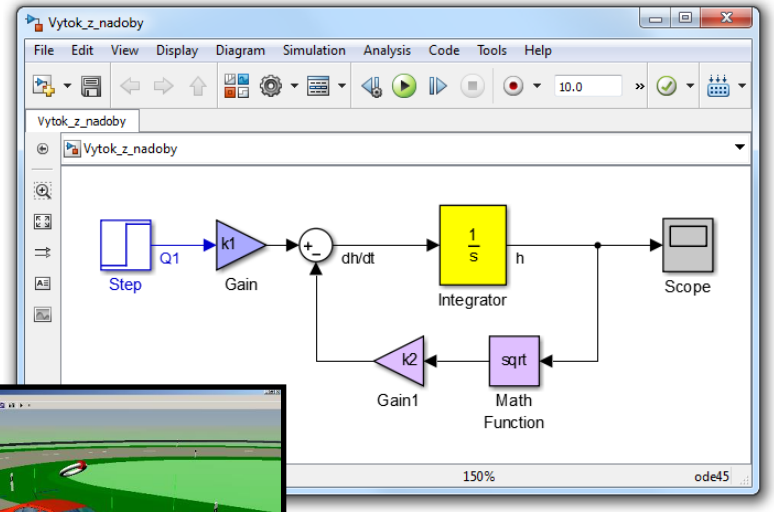


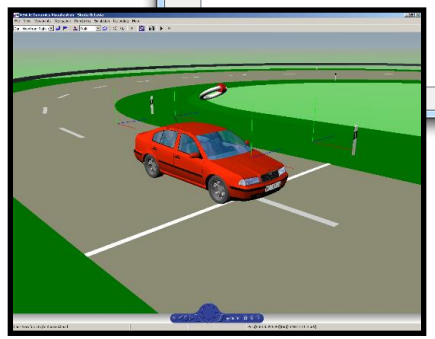
Matematické modelovanie sústav

- Simulink
- Opis sústav – algebraické, diferenciálne alebo diferenčné rovnice
- Modelovanie v grafickom prostredí
  - prvky pre spojité a diskrétne systémy
  - knižnica matematických operácií
  - knižnica nelineárnych prvkov
  - knižnica vstupov a výstupov
- Jednoduché prepojenie s ďalšími blokmi
- Toolboxy
  - Vlastné sady blokov

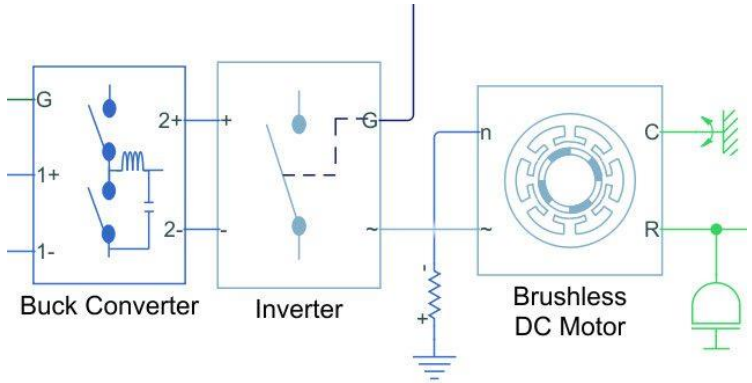
$$\frac{dh}{dt} = k_1 Q_1 - k_2 \sqrt{h}$$



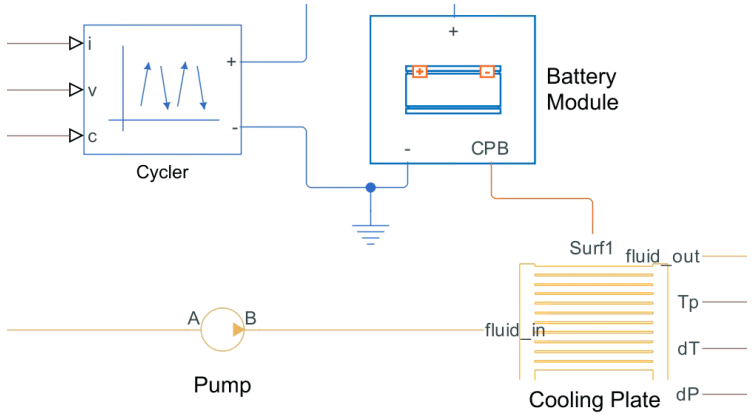




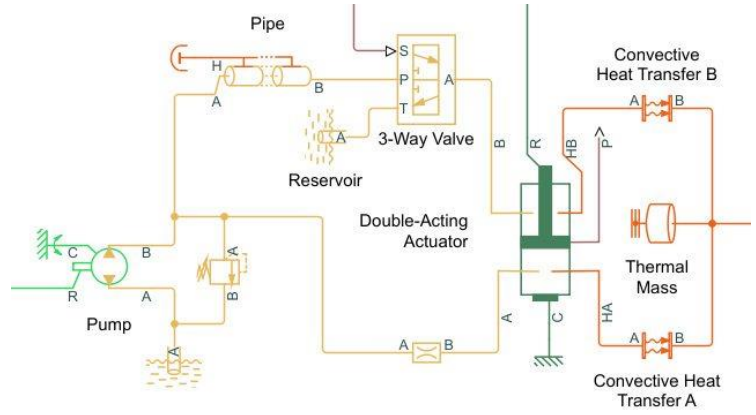
Fyzikálne modelovanie sústav



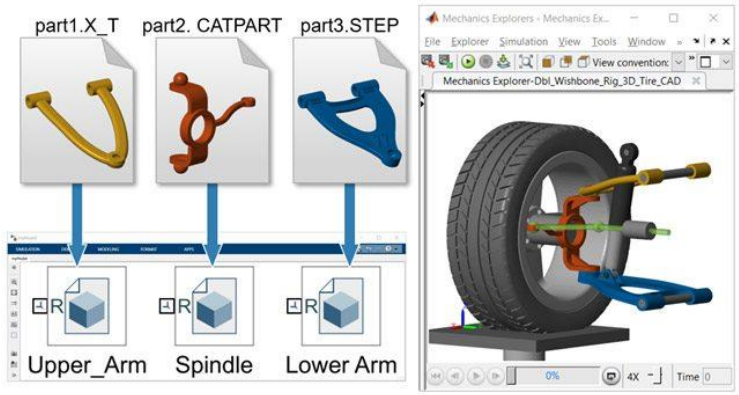
Simscape Electrical



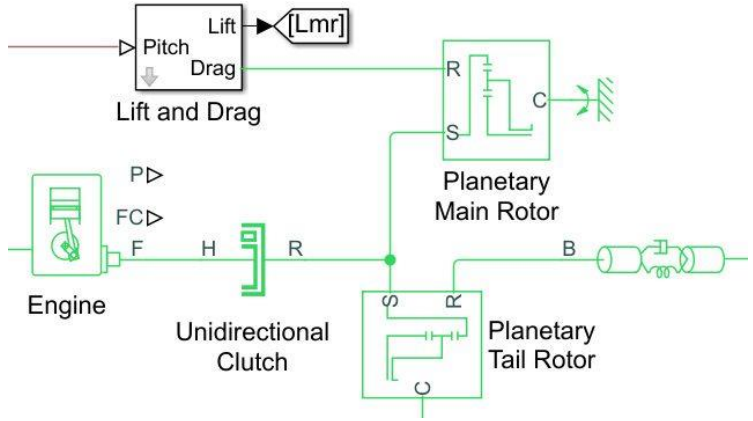
Simscape Battery



Simscape Fluids



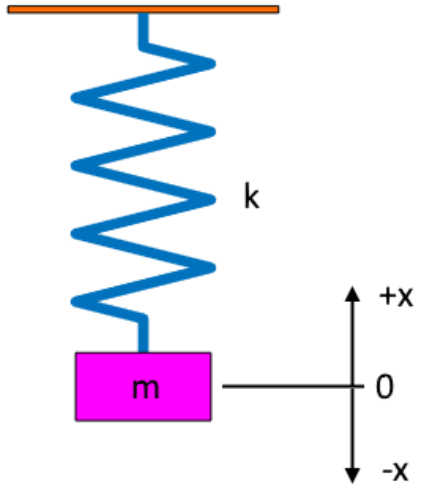
Simscape Multibody

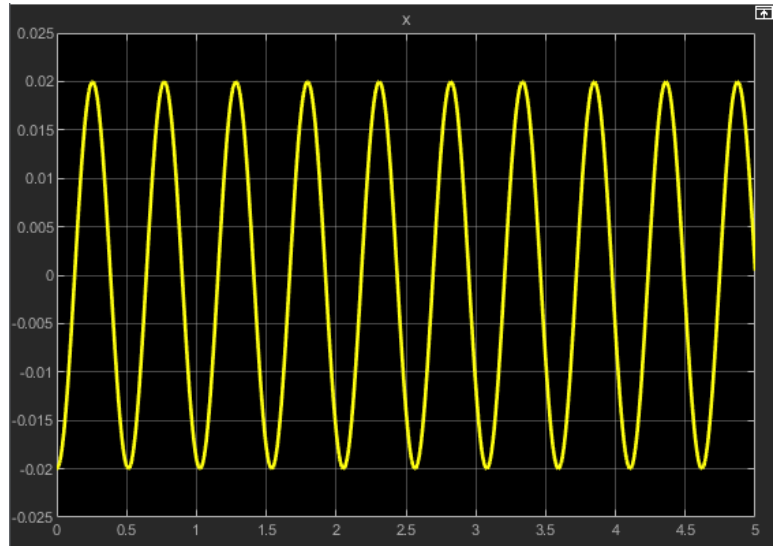


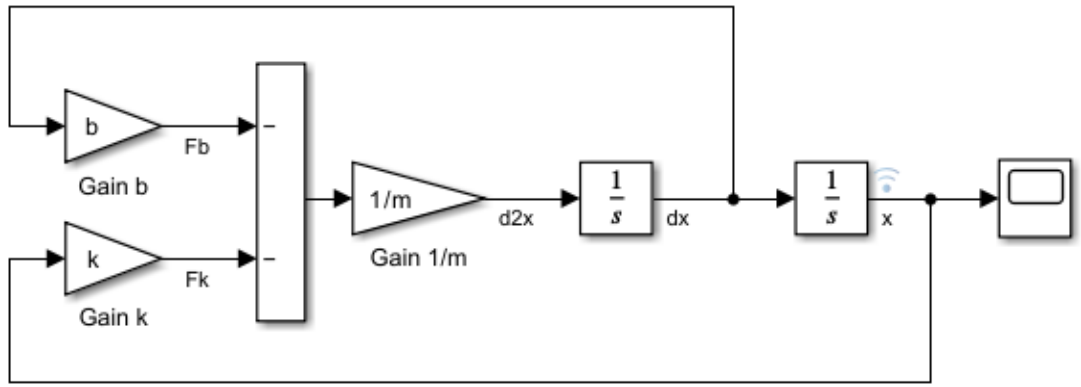
Simscape Driveline

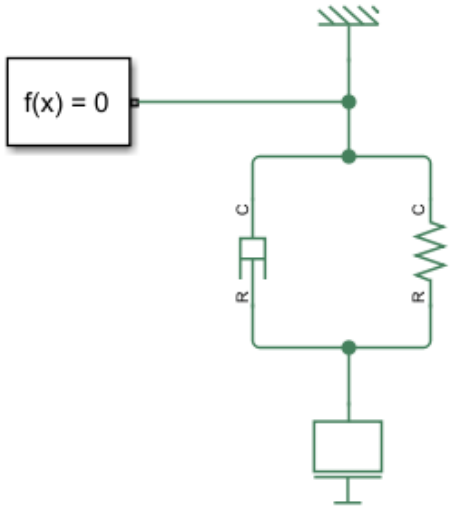
Príklad: Závažie na pružine

- Cieľ:
  - Analýza ECG signálu zo zašumených a posunutých dát
- Postup:
  - Načítať parametre
  - Model v Simulinku
  - Model v Simscape
  - Analýza výsledkov



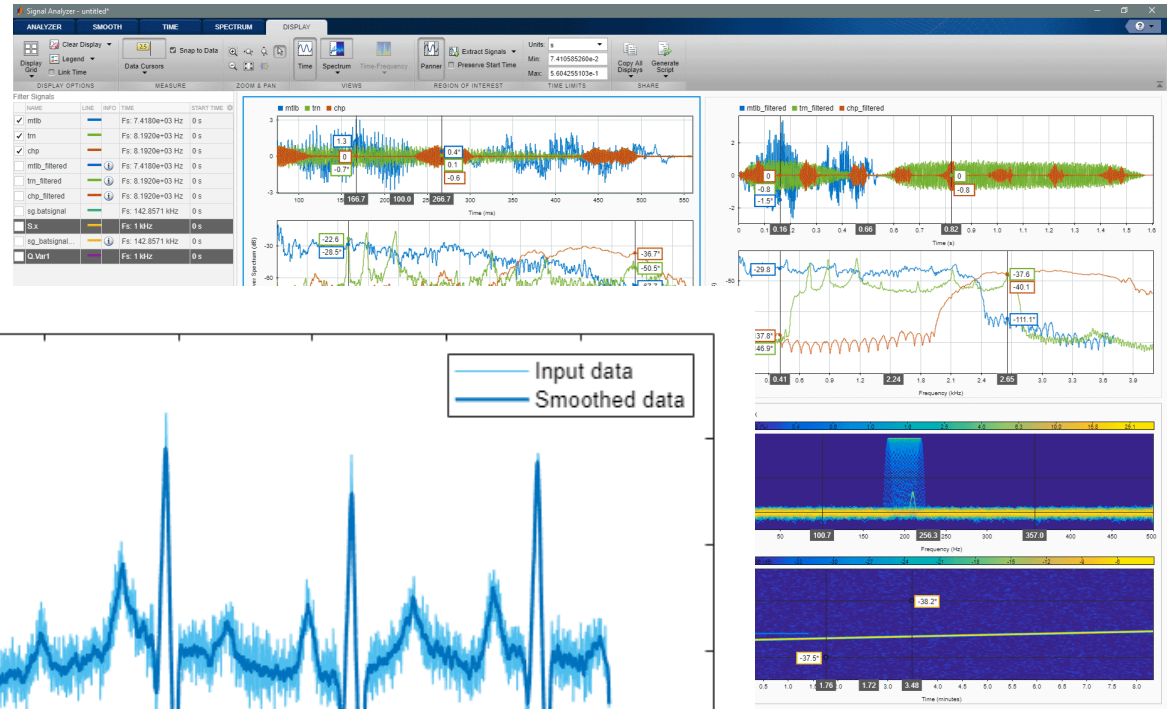


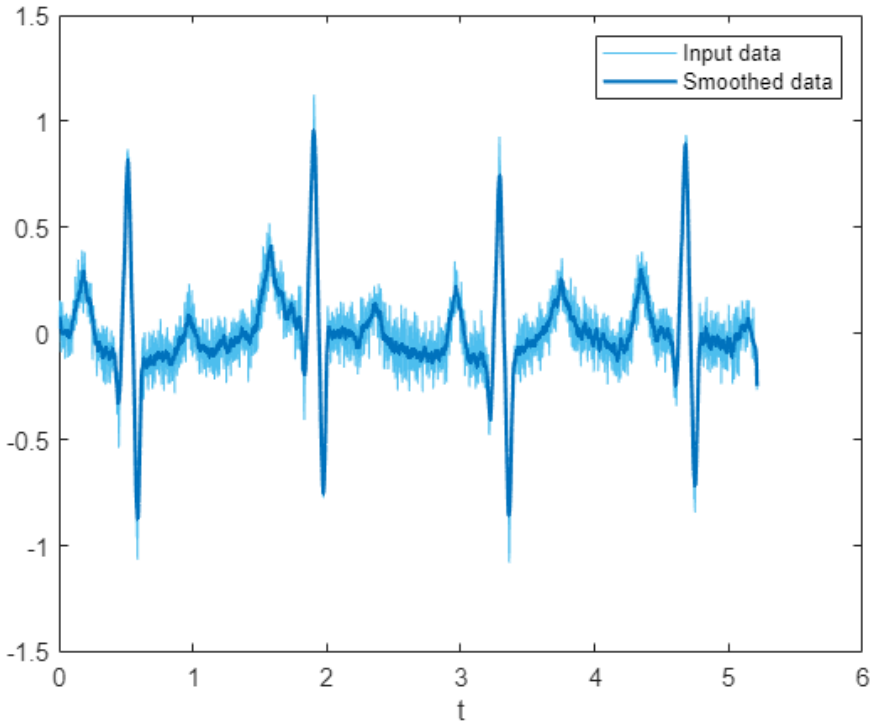




Informačné a komunikačné technológie

- Spracovanie signálov
  - analýza signálov a meranie
  - filtrácia, DSP

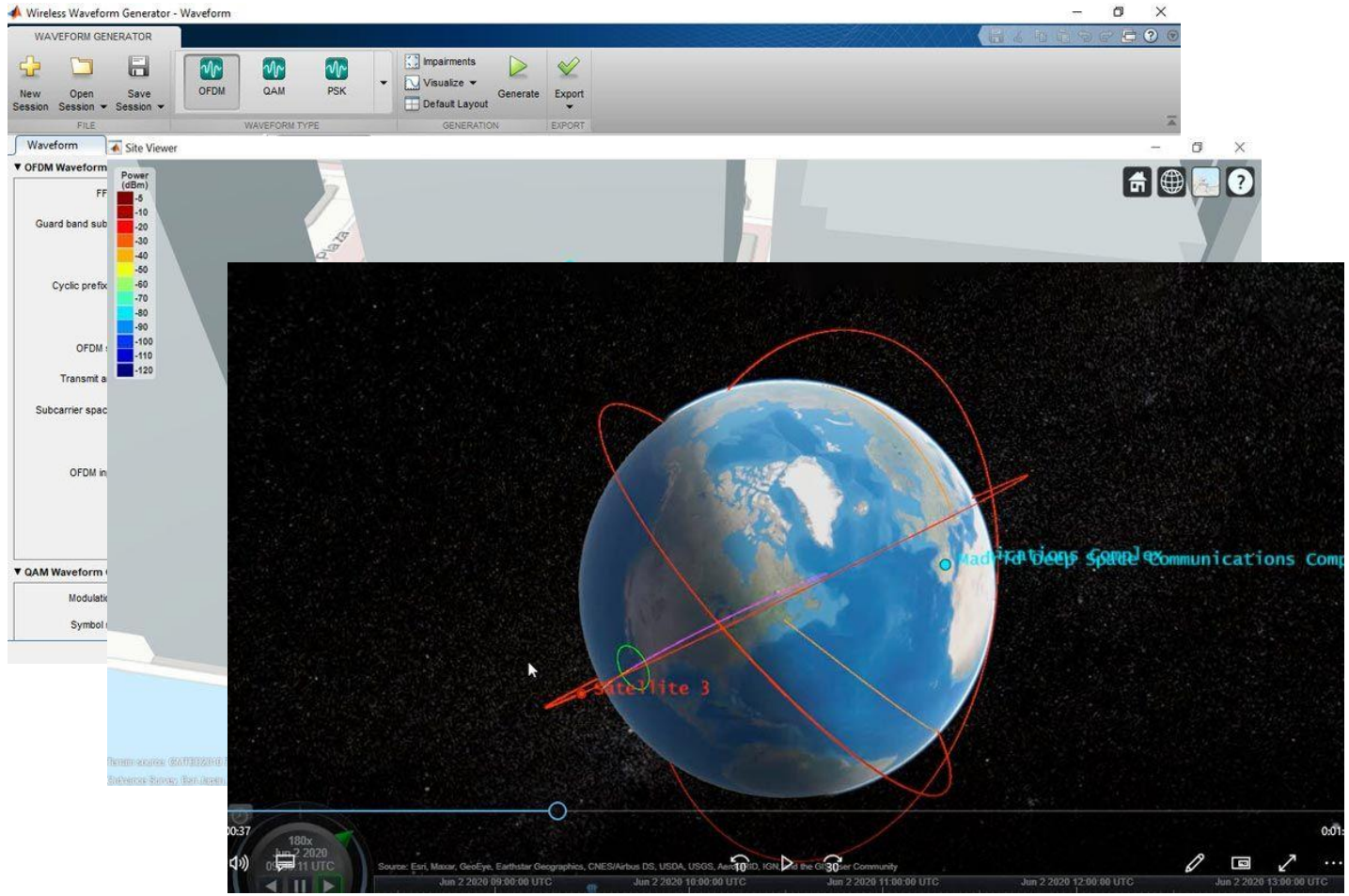




MATLAB, Simulink, Signal Processing Toolbox, DSP System Toolbox, WLAN Toolbox, 5G Toolbox, Antenna Toolbox, Satellite Communications Toolbox, Bluetooth Toolbox, Wireless Testbench, Statistics and Machine Learning Toolbox, Deep Learning Toolbox

Informačné a komunikačné technológie

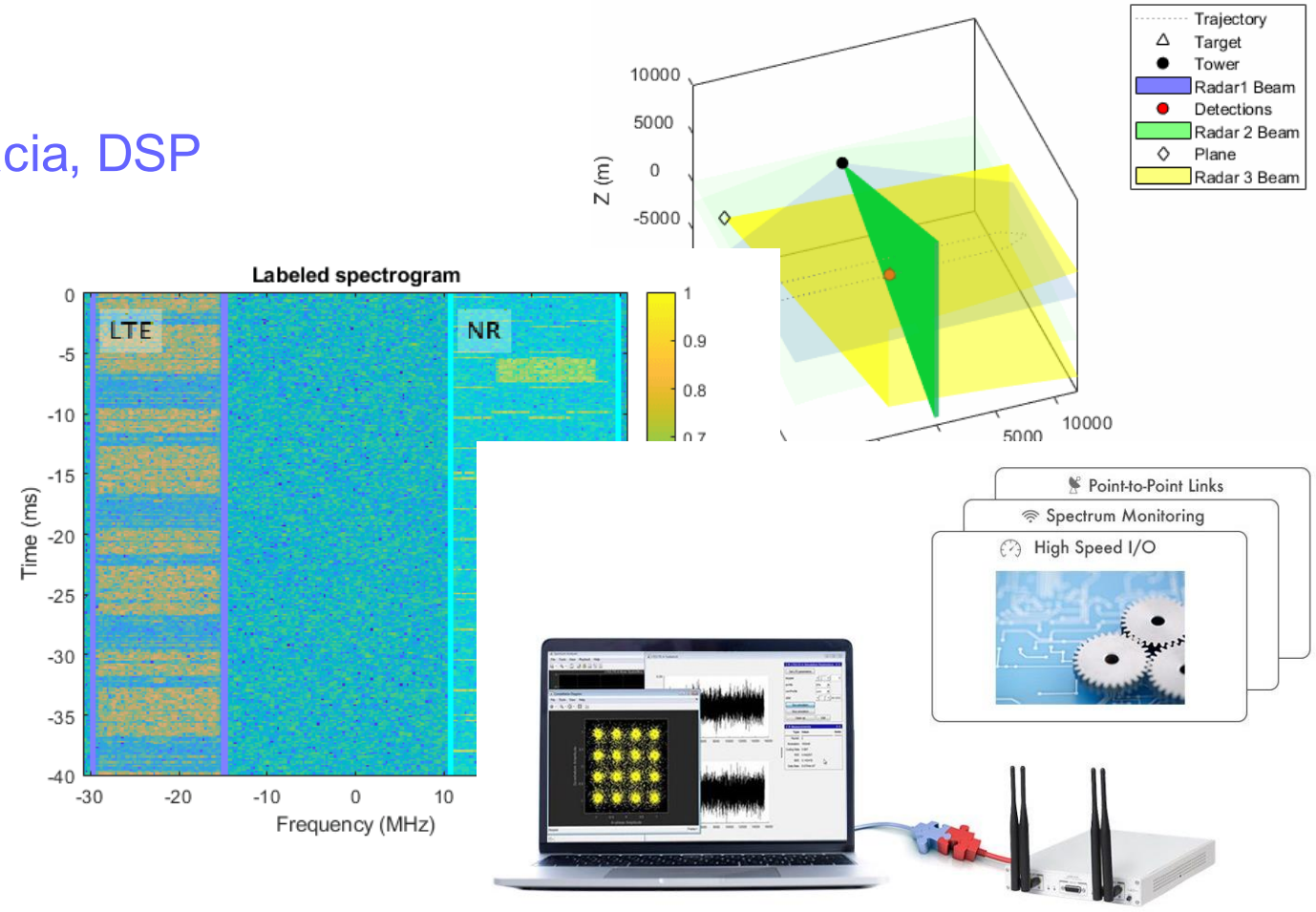
- Spracovanie signálov
  - analýza signálov a meranie
  - filtrácia, DSP
- Modelovanie komunikácie
  - WLAN, 5G, Bluetooth
  - Radar, Satelit, RF



MATLAB, Simulink, Signal Processing Toolbox, Wavelet Toolbox, DSP System Toolbox, WLAN Toolbox, 5G Toolbox, Antenna Toolbox, Satellite Communications Toolbox, Bluetooth Toolbox, RF Toolbox, Wireless Testbench, Deep Learning Toolbox, HDL Coder

Informačné a komunikačné technológie

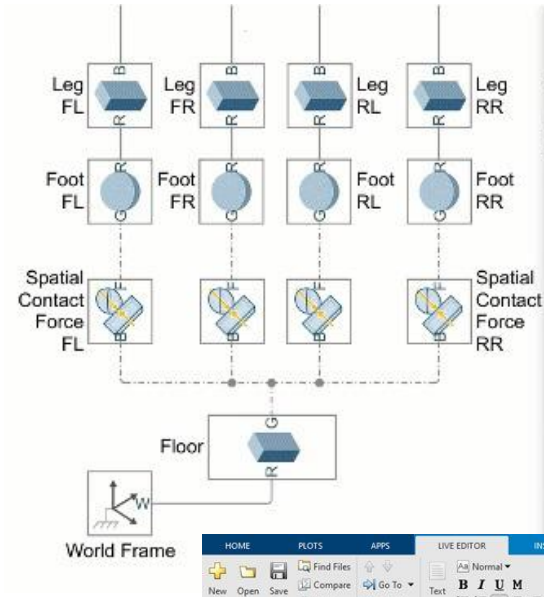
- Spracovanie signálov
  - analýza signálov a meranie, filtrácia, DSP
- Modelovanie komunikácie
  - WLAN, 5G, Bluetooth
  - Radar, Satelit, RF
- Algoritmy
  - fúzia a trackovanie
  - audio, umelá inteligencia
- Overovanie
  - generovanie kódu, SDR, HDL

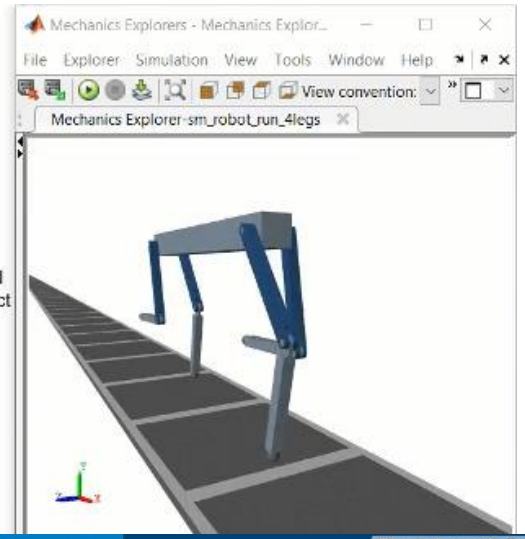


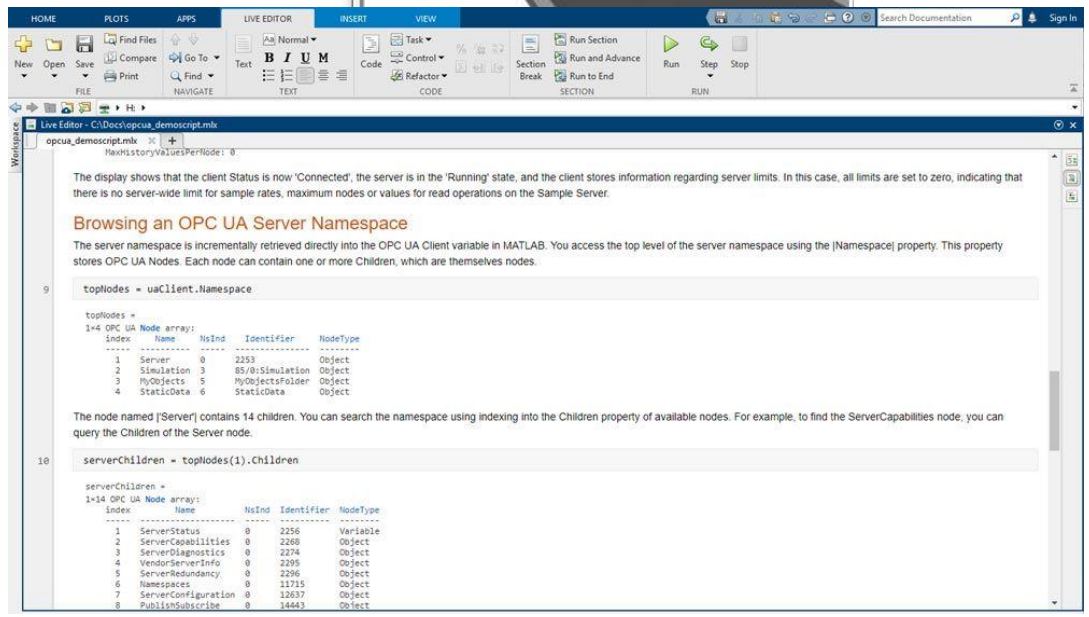
MATLAB, Simulink, Signal Processing Toolbox, DSP System Toolbox, WLAN Toolbox, 5G Toolbox, Antenna Toolbox, Satellite Communications Toolbox, Bluetooth Toolbox, Wireless Testbench, Statistics and Machine Learning Toolbox, Deep Learning Toolbox

Robotika a kybernetika

- Modelovanie systémov
  - mechanické, elektrické, ...
- Priemyselné štandardy
  - Logické automaty, OPC







Simulink, Simscape Multibody, Statistics and Machine Learning Toolbox, Deep Learning Toolbox, Industrial Communication Toolbox, Robotics System Toolbox, Navigation Toolbox, ROS Toolbox, RoadRunner, Control System Toolbox, System Identification Toolbox

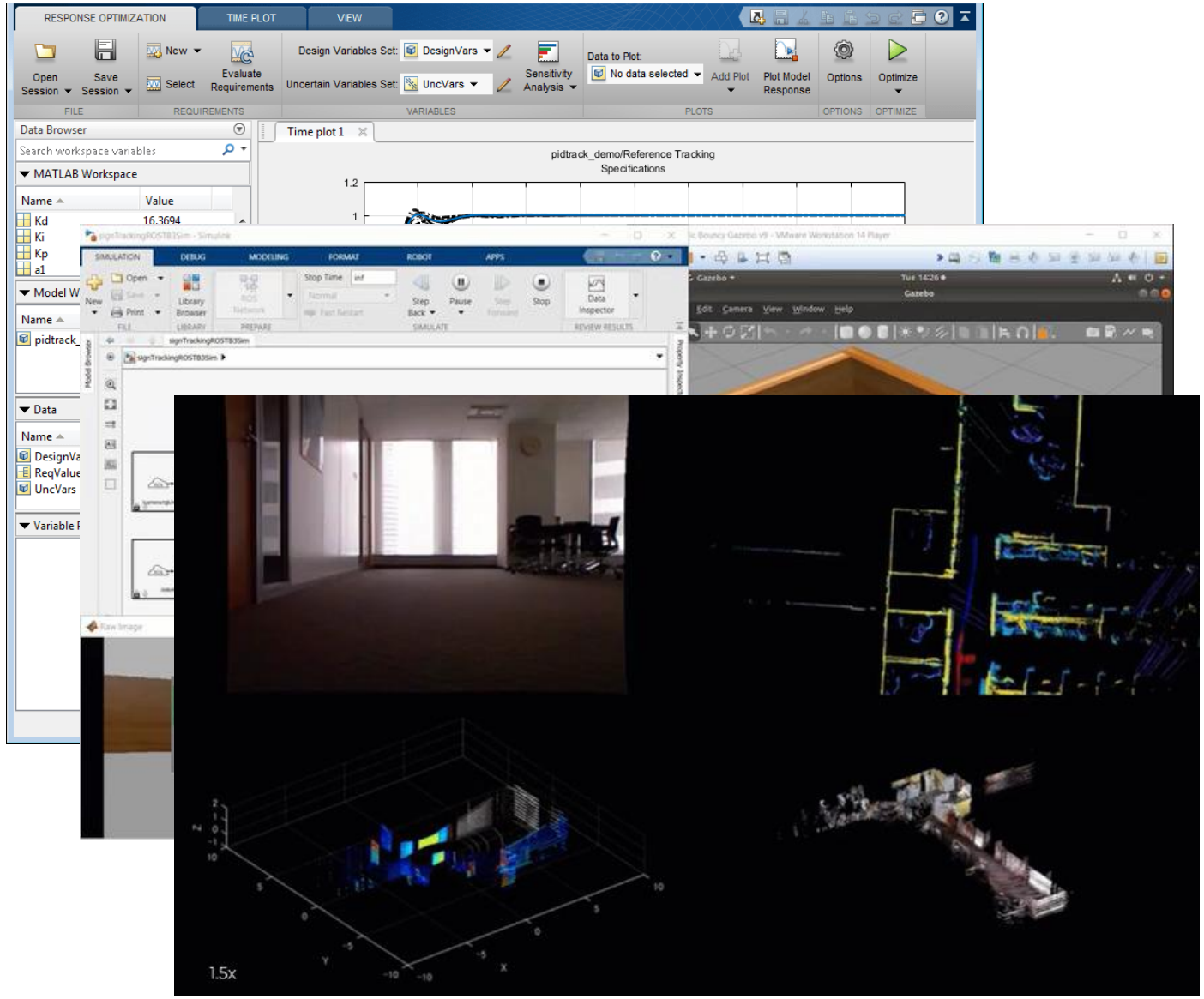
Robotika a kybernetika

- Modelovanie systémov
  - mechanické, elektrické, ...
- Priemyselné štandardy
  - Logické automaty, OPC
- Robotické aplikácie
  - Manipulátory
  - Mobilné roboty
  - UAV

Simulink, Simscape Multibody, Statistics and Machine Learning Toolbox, Deep Learning Toolbox, Industrial Communication Toolbox, Robotics System Toolbox, Navigation Toolbox, ROS Toolbox, RoadRunner, Control System Toolbox, System Identification Toolbox

Robotika a kybernetika

- Modelovanie systémov
  - mechanické, elektrické, ...
- Priemyselné štandardy
  - Logické automaty, OPC
- Robotické aplikácie
  - Manipulátory, Mobilné roboty, UAV
- Algoritmy
  - identifikácia a riadenie
  - počítačové videnie, lidar, AI
  - navigácia, plánovanie



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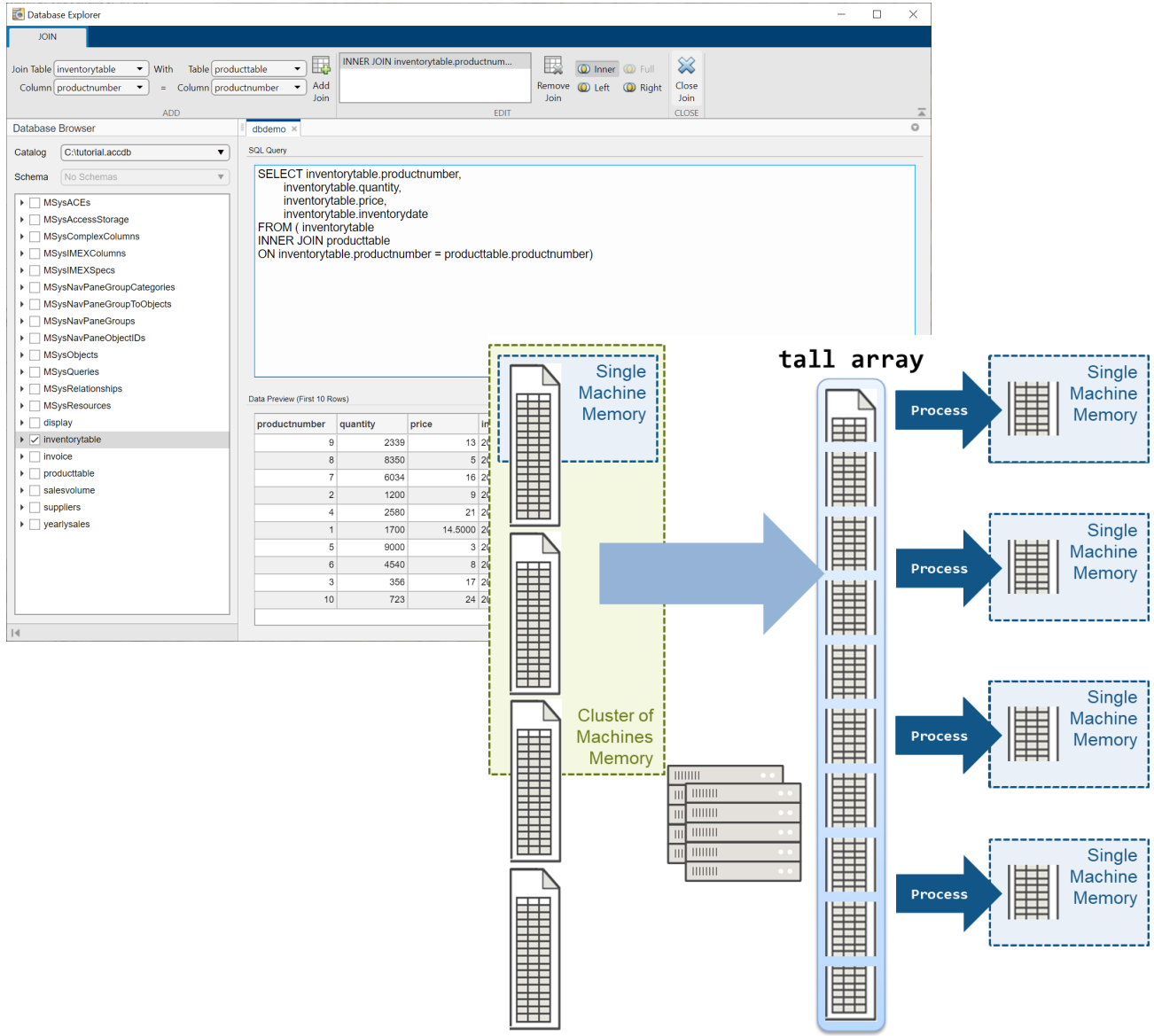
Aplikovaná informatika

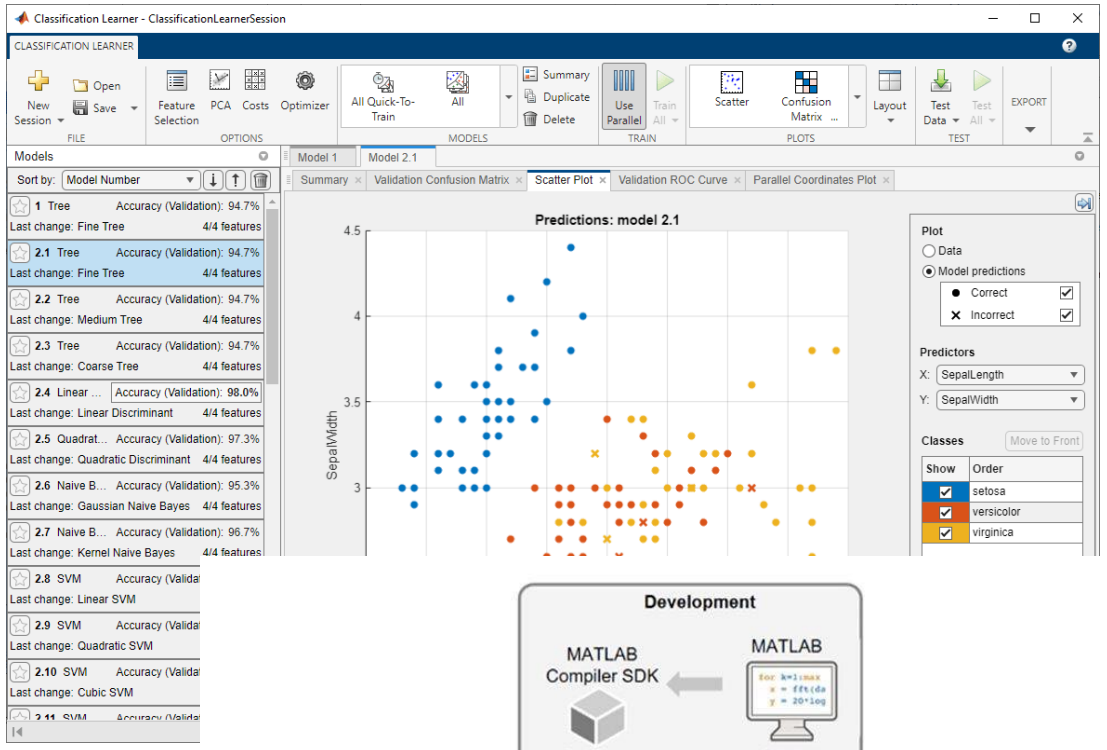
- Práca s dátami
  - Databázy, Big Data

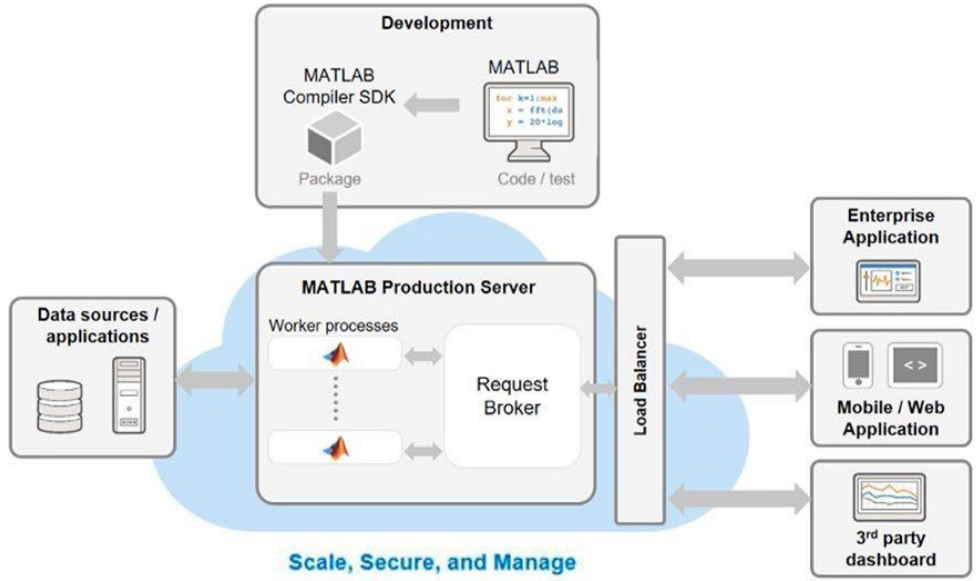


MATLAB, Database Toolbox, Statistics and Machine Learning Toolbox, Deep Learning Toolbox, MATLAB Coder, Simulink Coder, Embedded Coder, MATLAB Compiler, MATLAB Compiler SDK, ThingSpeak, Stateflow

Aplikovaná informatika

- Práca s dátami
  - Databázy, Big Data
- Tvorba algoritmov
  - Deep learning, Machine learning
- Implementácia algoritmov
  - Podnikové systémy, integrácia kódu





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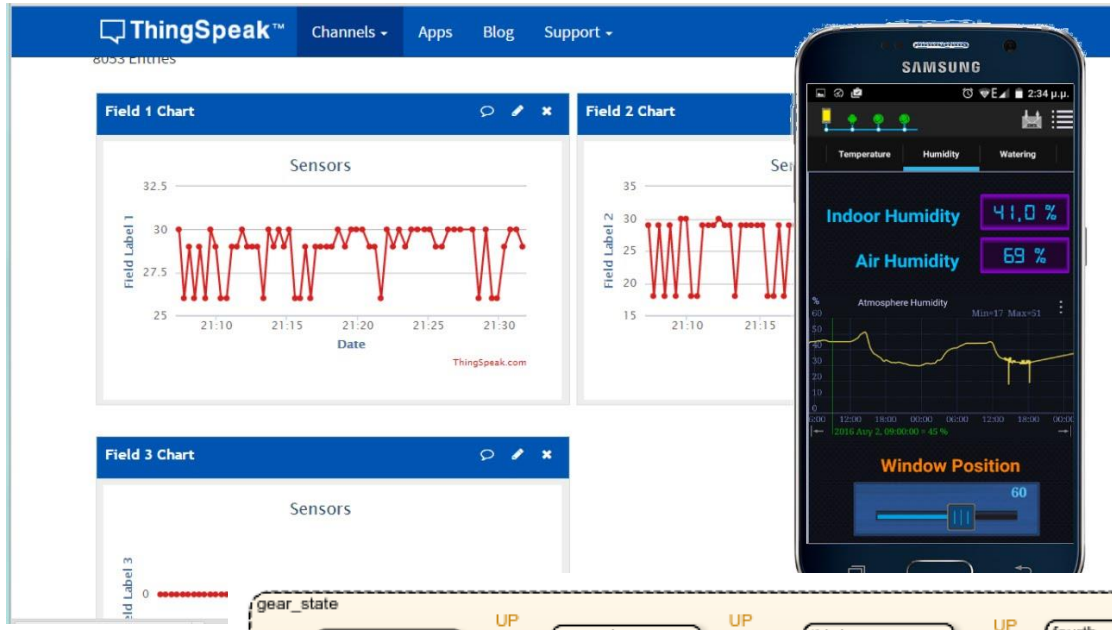
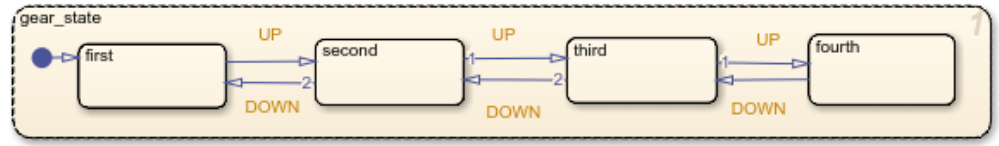
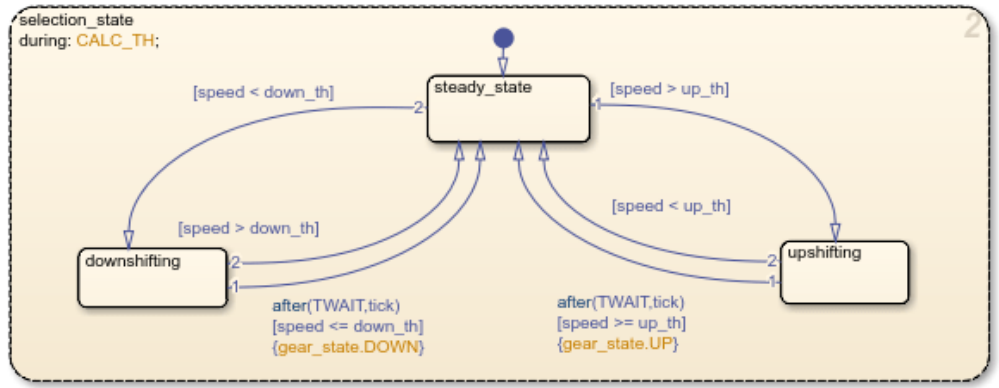
Aplikovaná informatika

- Práca s dátami
  - Databázy, Big Data
- Tvorba algoritmov
  - Deep learning, Machine learning
- Implementácia algoritmov
  - Podnikové systémy, integrácia kódu
- Internet of Things
- Udalostné systémy



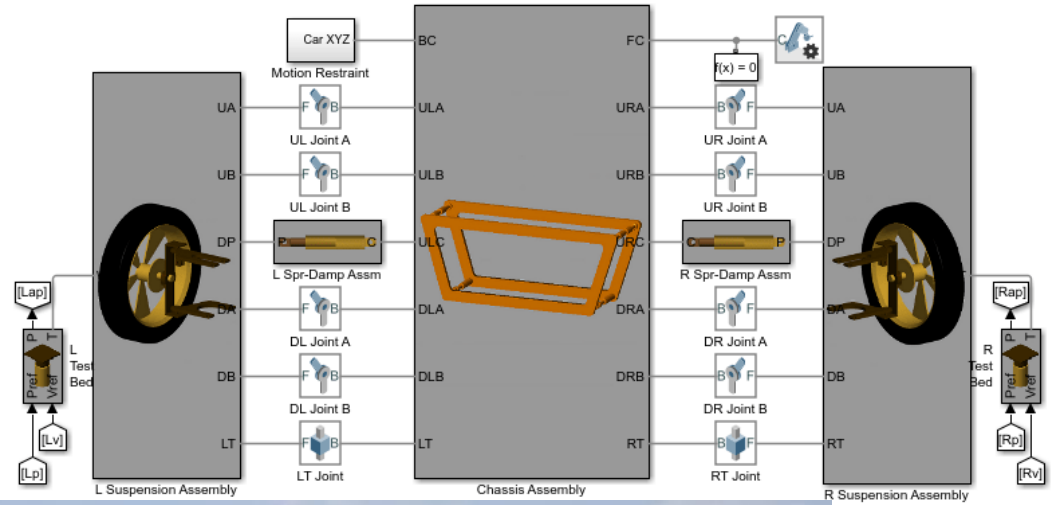


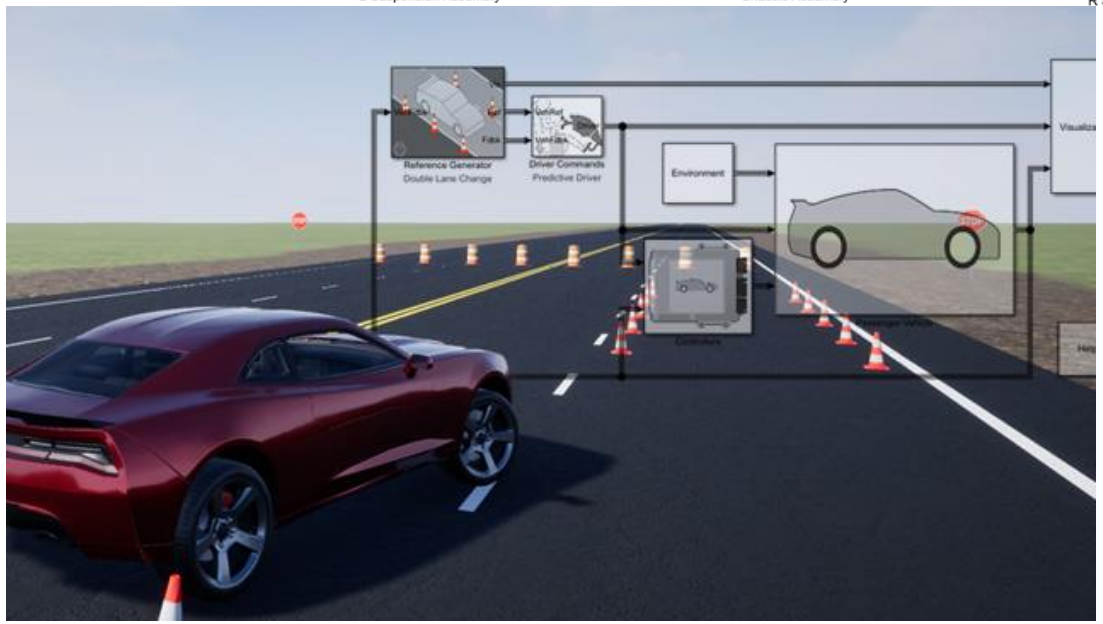


MATLAB, Database Toolbox, Statistics and Machine Learning Toolbox, Deep Learning Toolbox, MATLAB Coder, Simulink Coder, Embedded Coder, MATLAB Compiler, MATLAB Compiler SDK, ThingSpeak, Stateflow

Automobilová mechatronika

- Modelovanie systémov
  - mechanické, elektrické, ...
- Modelovanie vozidiel
  - virtuálne, elektrické vozidlo

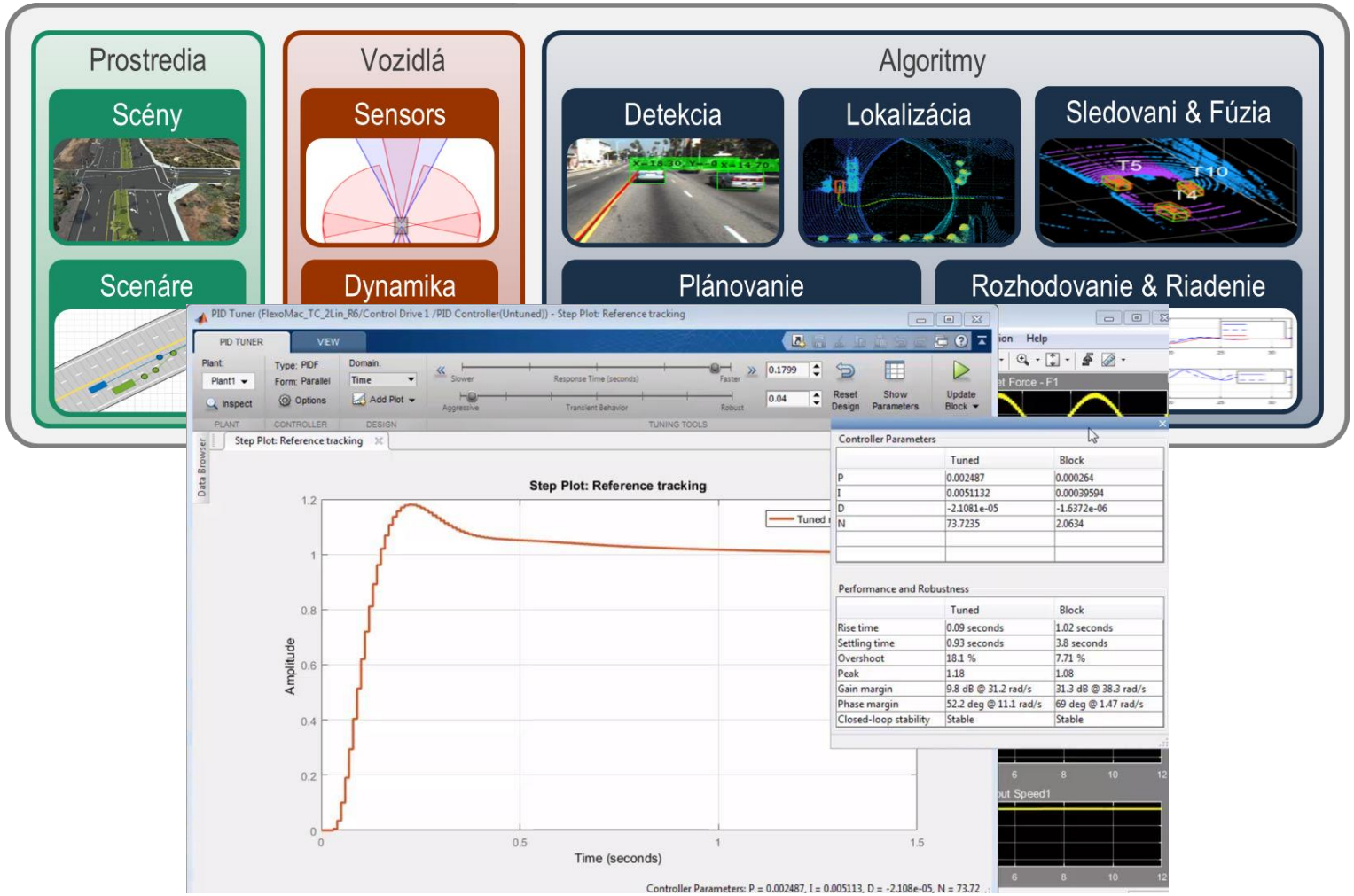




Simscape, Simscape Multibody, Simscape Electrical, Powertrain Blockset, Vehicle Dynamics Blockset, Automated Driving Toolbox, RoadRunner, Control System Toolbox, Model Predictive Control Toolbox, Navigation Toolbox, Sensor Fusion and Tracking Toolbox, Statistics and Machine Learning Toolbox, Deep Learning Toolbox

Automobilová mechatronika

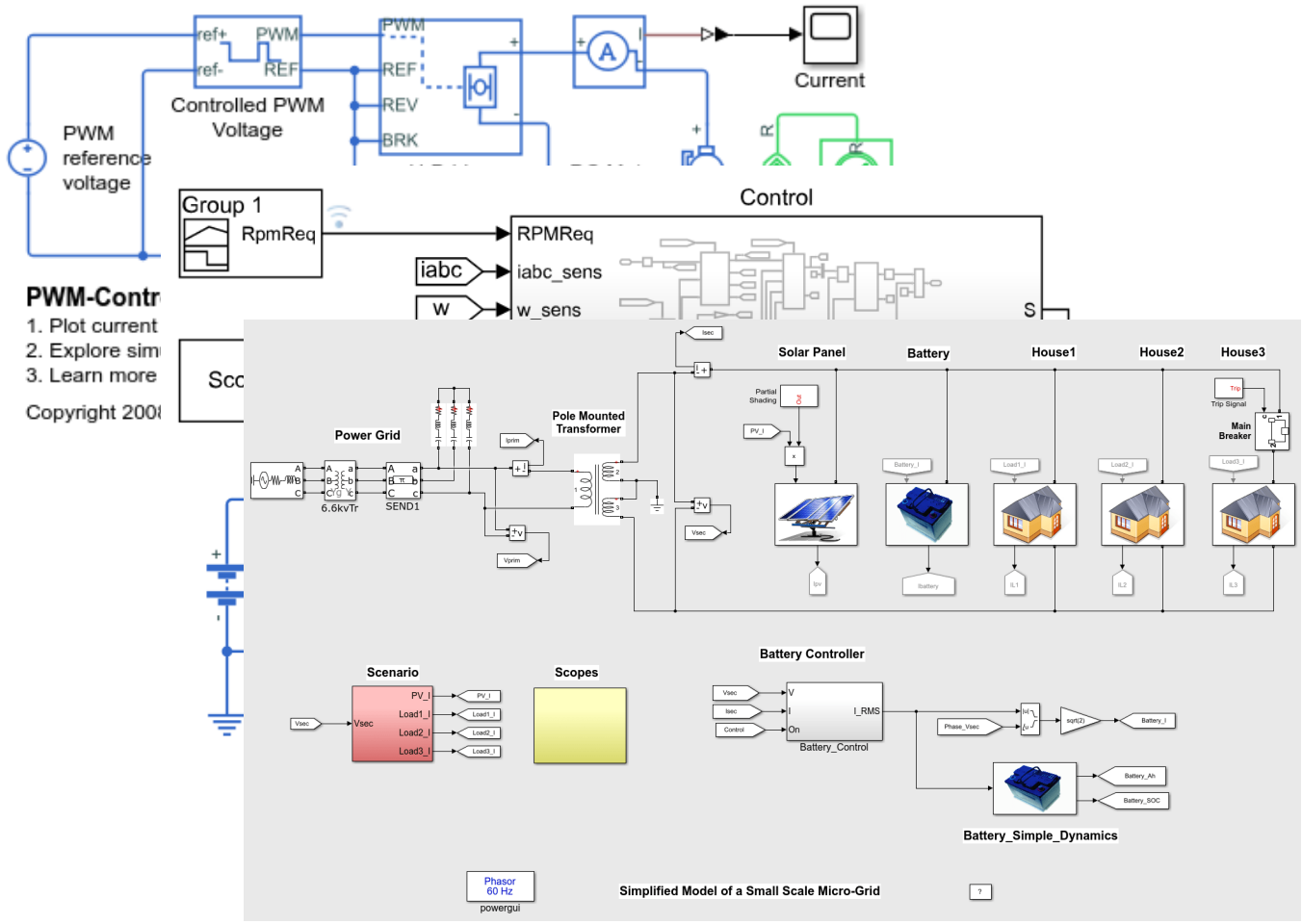
- Modelovanie systémov
  - mechanické, elektrické, ...
- Modelovanie vozidiel
  - virtuálne, elektrické vozidlo
- Autonómne systémy
  - virtuálne svety
  - algoritmy, AI
  - generovanie kódu
- Riadiace systémy



Simscape, Simscape Multibody, Simscape Electrical, Powertrain Blockset, Vehicle Dynamics Blockset, Automated Driving Toolbox, RoadRunner, Control System Toolbox, Model Predictive Control Toolbox, Navigation Toolbox, Sensor Fusion and Tracking Toolbox, Statistics and Machine Learning Toolbox, Deep Learning Toolbox

Elektroenergetika, Elektronika, Elektrotechnika

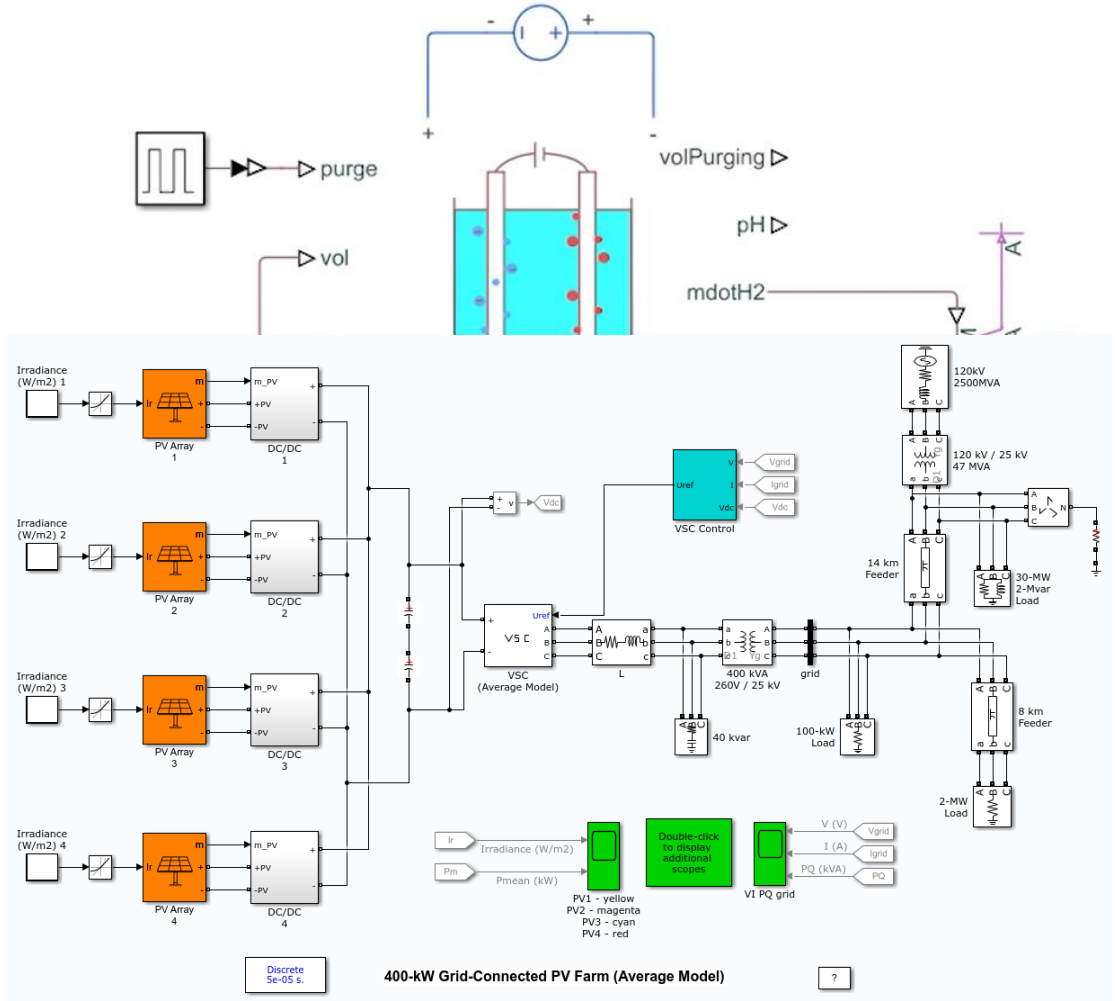
- Modelovanie
  - elektrické obvody, polovodiče
  - motory, elektrizačné sústavy



Simscape, Simscape Electrical, Signal Processing Toolbox, Predictive Maintenance Toolbox, Computer Vision Toolbox, Statistics and Machine Learning Toolbox, Deep Learning Toolbox, Optimization Toolbox, SoC Blockset, Mixed-Signal Blockset, SerDes Toolbox

Elektroenergetika, Elektronika, Elektrotechnika

- Modelovanie
  - elektrické obvody, polovodiče
  - motory, elektrizačné sústavy
- Udržateľná energia
  - solárne panely, výroba vodíka, mikrogrid



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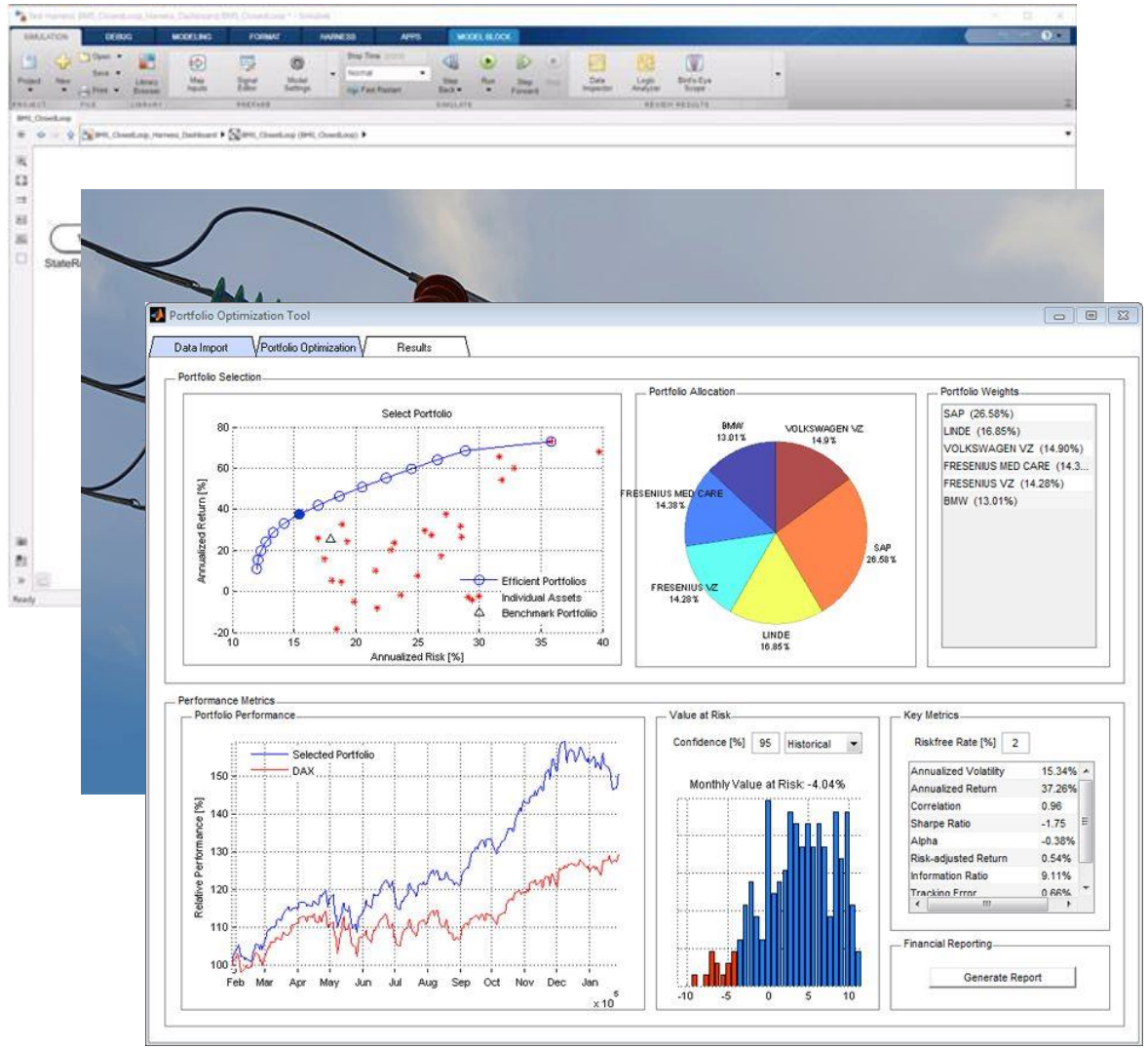
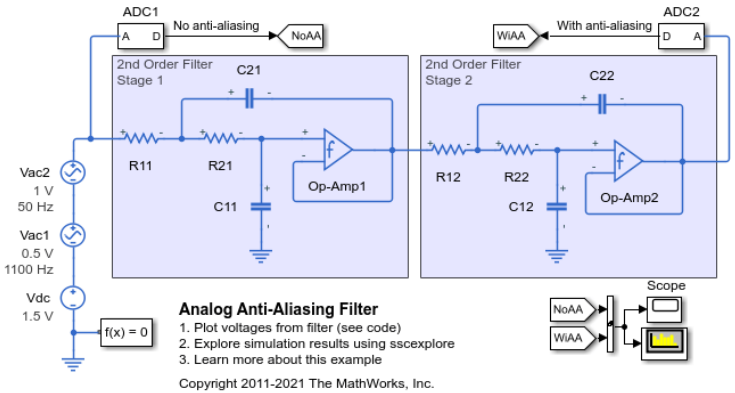
- Modelovanie
  - elektrické obvody, polovodiče
  - motory, elektrizačné sústavy
- Udržateľná energia
  - solárne panely, výroba vodíka, mikrogrid
- Riadenie
  - motorov, meničov, baterií
- Algoritmy
  - prediktívna údržba, monitorovanie
  - obchodovanie z energiou

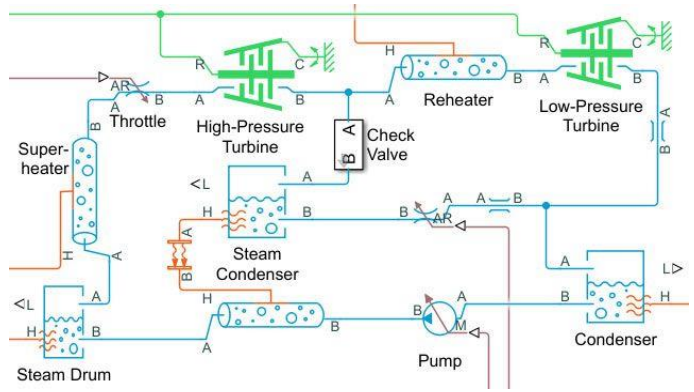


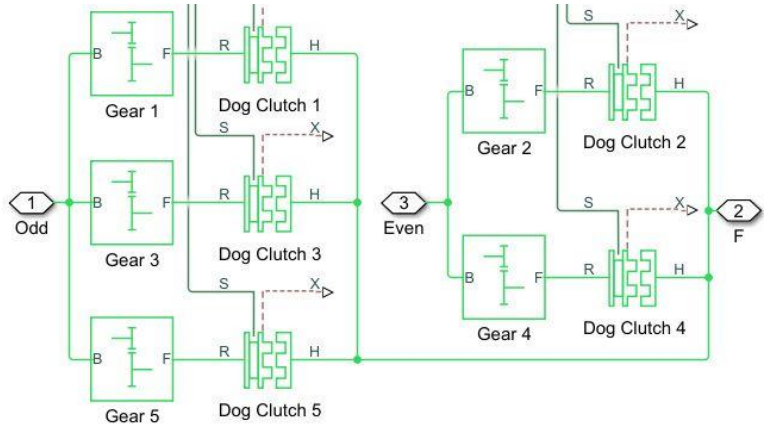
Simscape, Simscape Electrical, Signal Processing Toolbox, Predictive Maintenance Toolbox, Computer Vision Toolbox, Statistics and Machine Learning Toolbox, Deep Learning Toolbox, Optimization Toolbox, SoC Blockset, Mixed-Signal Blockset, SerDes Toolbox

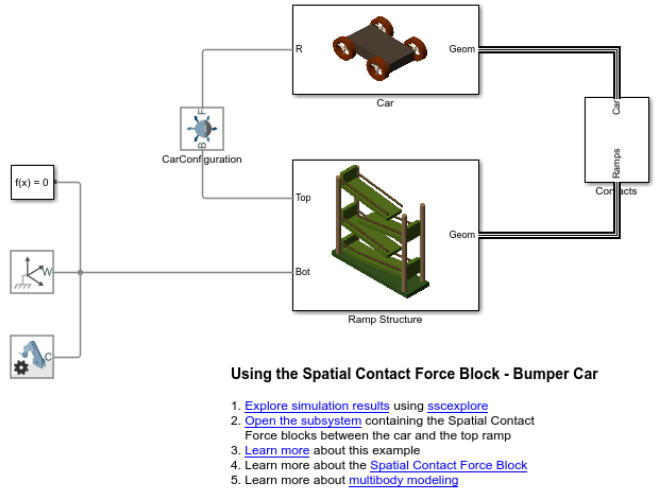
Jadrové a fyzikálne inžinierstvo

- Fyzikálne modelovanie
  - mechanika, elektrika
  - hydraulika, prevodovky









Simulink, Simscape, Simscape Driveline, Simscape Electrical, Simscape Fluids, Simscape Multibody, Data Acquisition Toolbox, Statistics and Machine Learning Toolbox, Deep Learning, Symbolic Math Toolbox, Signal Processing Toolbox

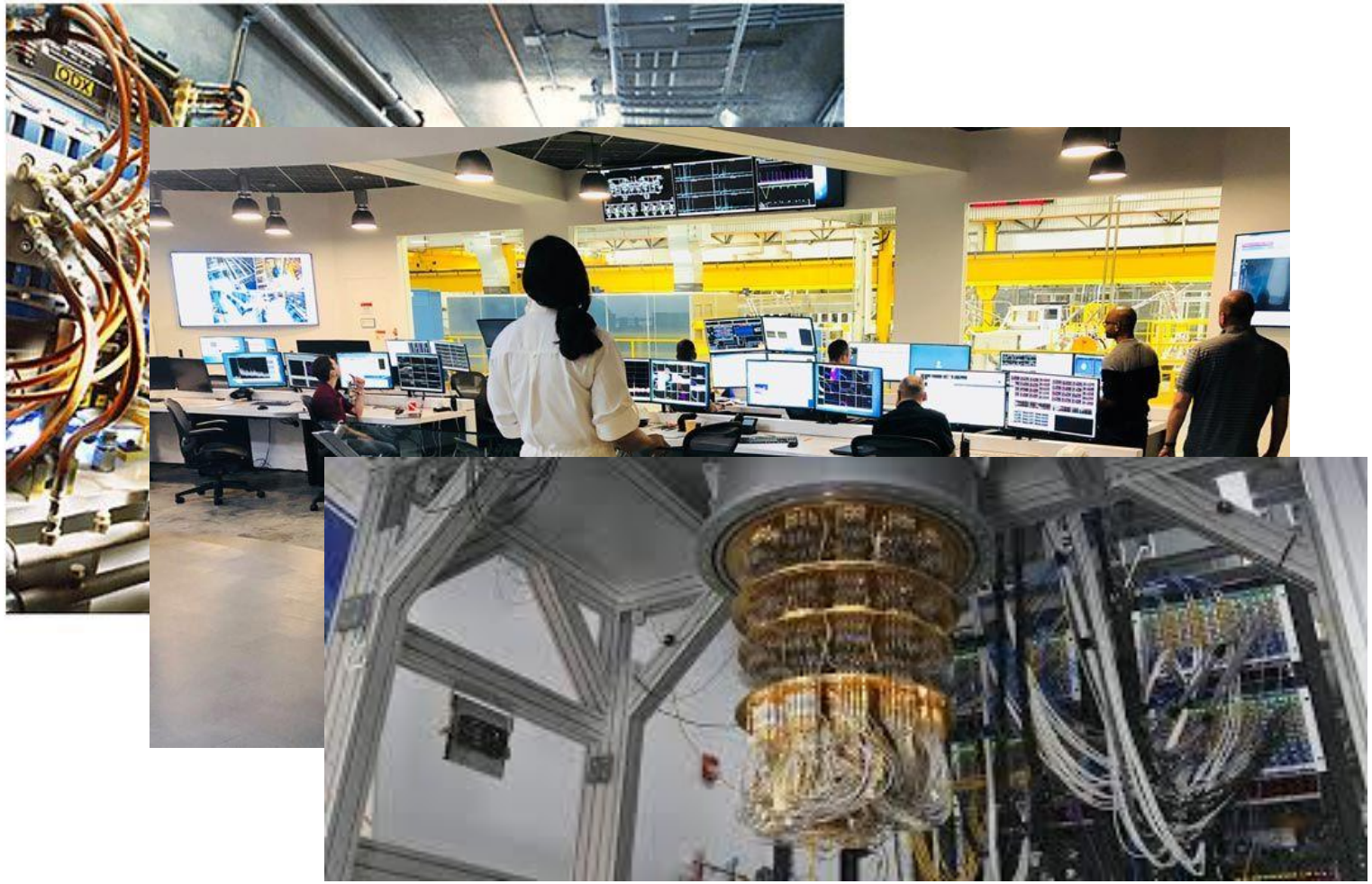
Jadrové a fyzikálne inžinierstvo

- Fyzikálne modelovanie
  - mechanika, elektrika
  - hydraulika, prevodovky
- Zariadenia
  - komunikácia, analýza dát
  - riadenie experimentov

Simulink, Simscape, Simscape Driveline, Simscape Electrical, Simscape Fluids, Simscape Multibody, Data Acquisition Toolbox, Statistics and Machine Learning Toolbox, Deep Learning, Symbolic Math Toolbox, Signal Processing Toolbox

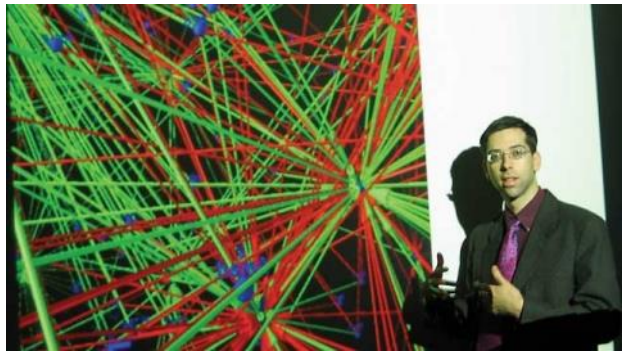
Jadrové a fyzikálne inžinierstvo

- Fyzikálne modelovanie
  - mechanika, elektrika
  - hydraulika, prevodovky
- Zariadenia
  - komunikácia, analýza dát
  - riadenie experimentov
- Simulácie
  - urýchľovače častíc
  - nukleárna fúzia
  - Quantum Computing
- Analýza astronomických objektov



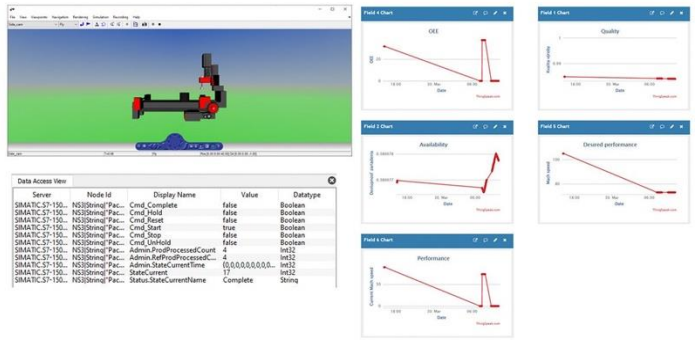
Simulink, Simscape, Simscape Driveline, Simscape Electrical, Simscape Fluids, Simscape Multibody, Data Acquisition Toolbox, Statistics and Machine Learning Toolbox, Deep Learning, Symbolic Math Toolbox, Signal Processing Toolbox

Univerzity poháňajú priemysel



Massachusetts Institute of Technology Integrates Cancer Research in the Lab and Classroom

Mondragon University Students Build Practical Engineering Skills Through Project-Based Learning



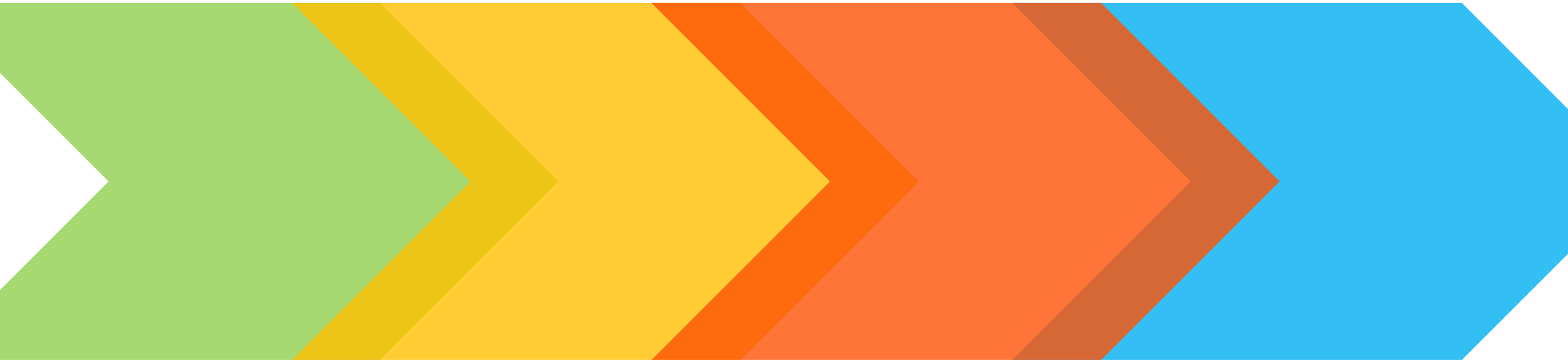
[Project-Based Learning Using MATLAB and ThingSpeak at Slovak University of Technology]

Cornell Bioacoustics Scientists Develop a High-Performance Computing Platform for Analyzing Big Data

https://www.mathworks.com/company/user_stories/search.html

MATLAB

– využitie počas celého štúdia ... aj potom



MATLAB – nasadenie v rôznych oblastiach

- **Matematika** – symbolická matematika, numerická matematika, vizualizácia funkcií
- **Fyzika** – spracovanie dát z experimentov, štatistika, grafická reprezentácia
- **Dátová analytika** – machine learning, regresné modely
- **Spracovanie obrazu** – fotografia, videozáznam
- **Dynamické systémy** – analýza, návrh riadiacich algoritmov, prepojenie s reálnymi objektami
- **Spracovanie signálov** – filtrácia
- **Fyzikálne modelovanie** – hydraulika, mechanika, elektrotechnika

MATLAB – nasadenie v rôznych oblastiach

- **Umelá inteligencia** – fuzzy, neurónové siete, deep learning
- **Ekonomické vedy** – risk management, ekonometria, prepojenie s Bloomberg a Yahoo finance
- **Implementácia na HW** – IoT, PLC, Arduino, Raspberry Pi, LEGO, Xilinx, Intel ...
- **Udalostné systémy** – návrh riadiacich algoritmov, prepojenie s PLC
- **Big Data**
- **Paralelné výpočty**

MATLAB – nie je len „hračka pre vedcov“

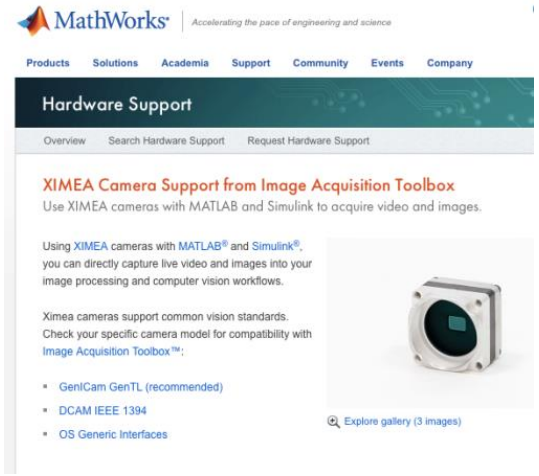
- Profesionálny nástroj pre inžinierov
- Žiadaná zručnosť u zamestnávateľov ... áno aj v SR a ČR
- Nedostatok absolventov so znalosťou MATLABu
- Zamestnávatelia:
  - Schaeffler
  - Siemens
  - Honeywell
  - Continental
  - IEE
  - ON Semiconductor
  - Porsche
  - B/S/H
  - ...

MATLAB – úspešné slovenské firmy

- Ximea
- VONSCH
- R-SYS
- Podpora začínajúcich firiem
  - StartUp program
  - TOMARK, Zuri, Photoneo, CEIT …

Na rozdiel od predchádzajúcich vývojových procesov sa v tomto prípade veľmi zjednodušil celkový proces výskumu a vývoja, ktorý v konečnom dôsledku viedol k výraznému skráteniu času potrebnému na uvedenie produktu na trh.

Jakub Vonkomer - VONSCH



Kde sa používa MATLAB

SIEMENS

NÁRODNÁ BANKA SLOVENSKA
EUROSYSTÉM

Univerzity s licenciou Campus-Wide License

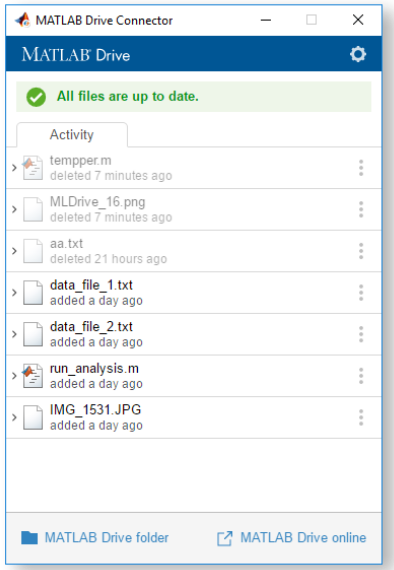
Čo prináša CWL

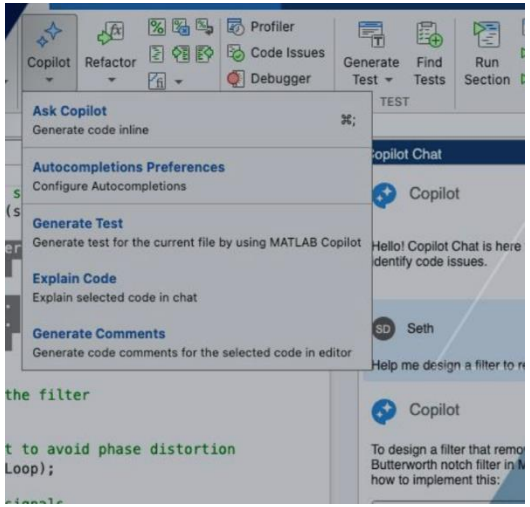
- Študenti
  - Úplný prístup k MATLABu a všetkým Toolboxom na univerzite
  - Možnosť inštalácie na vlastné počítače
  - Možnosť inštalovať na počítače v spoločných priestoroch (internáty, knižnica, klubovne, ...)
  - Overenie algoritmov na low cost hw (Arduino, LEGO, Raspberry Pi, micro:bit ...)
  - Odpadá pokušenie používania nelegálneho softvéru
  - Vznik komunity študentov (kluby, makerzone, ...)
  - Zapájanie sa do súťaží (aj medzinárodných)
  - Kooperácia so študentami z iných univerzít

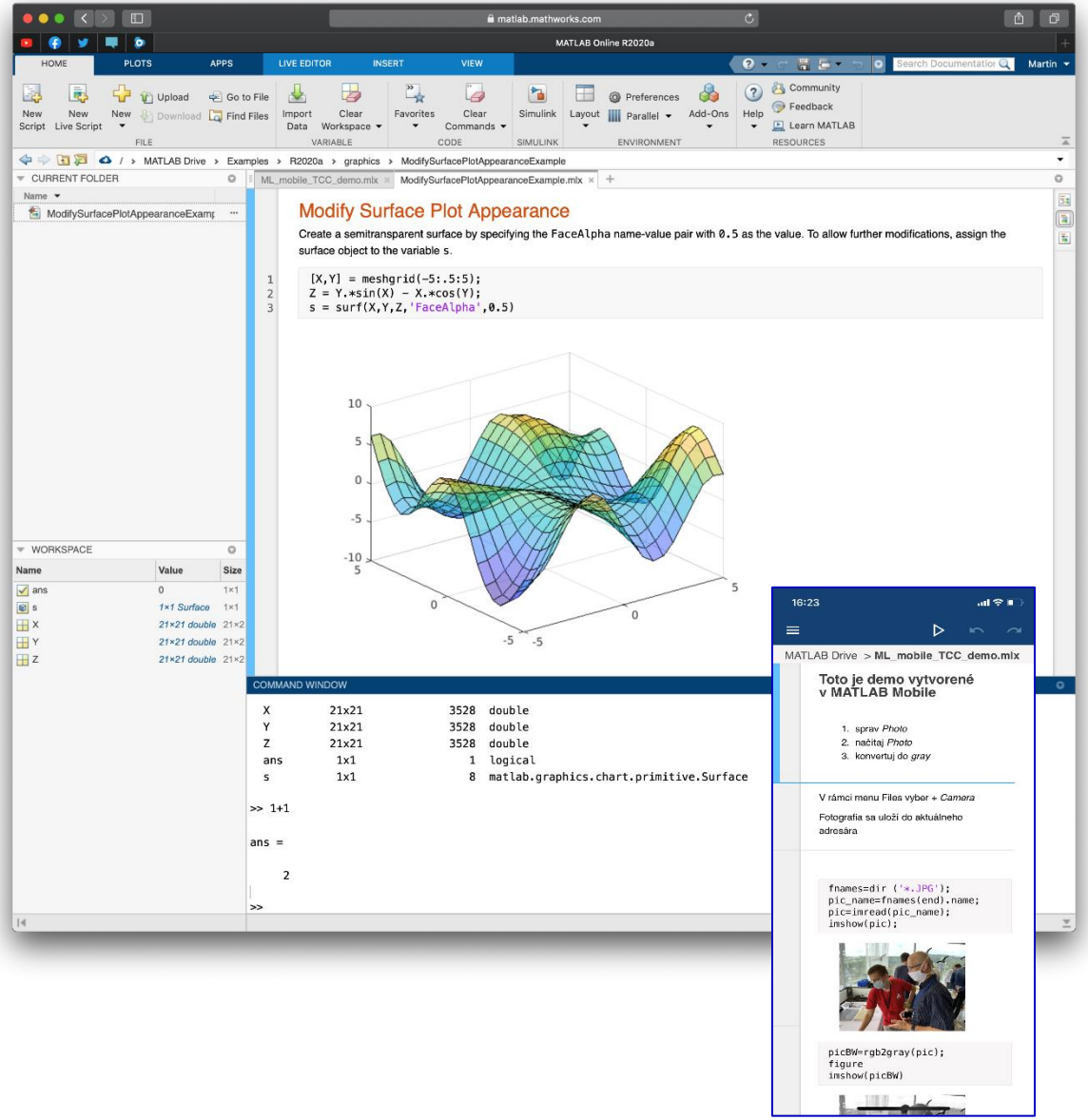
Jednotný dorozumievací jazyk

Čo prináša CWL

- Prístup k online službám
  - MATLAB Copilot
  - MATLAB Online
  - MATLAB Mobile
  - MATLAB Drive (20GB)







Campus-Wide License

Prístup pre všetkých!

MATLAB, Simulink, 100+ toolboxov

http://stuba.sk/matlab

Ako inštalovať?

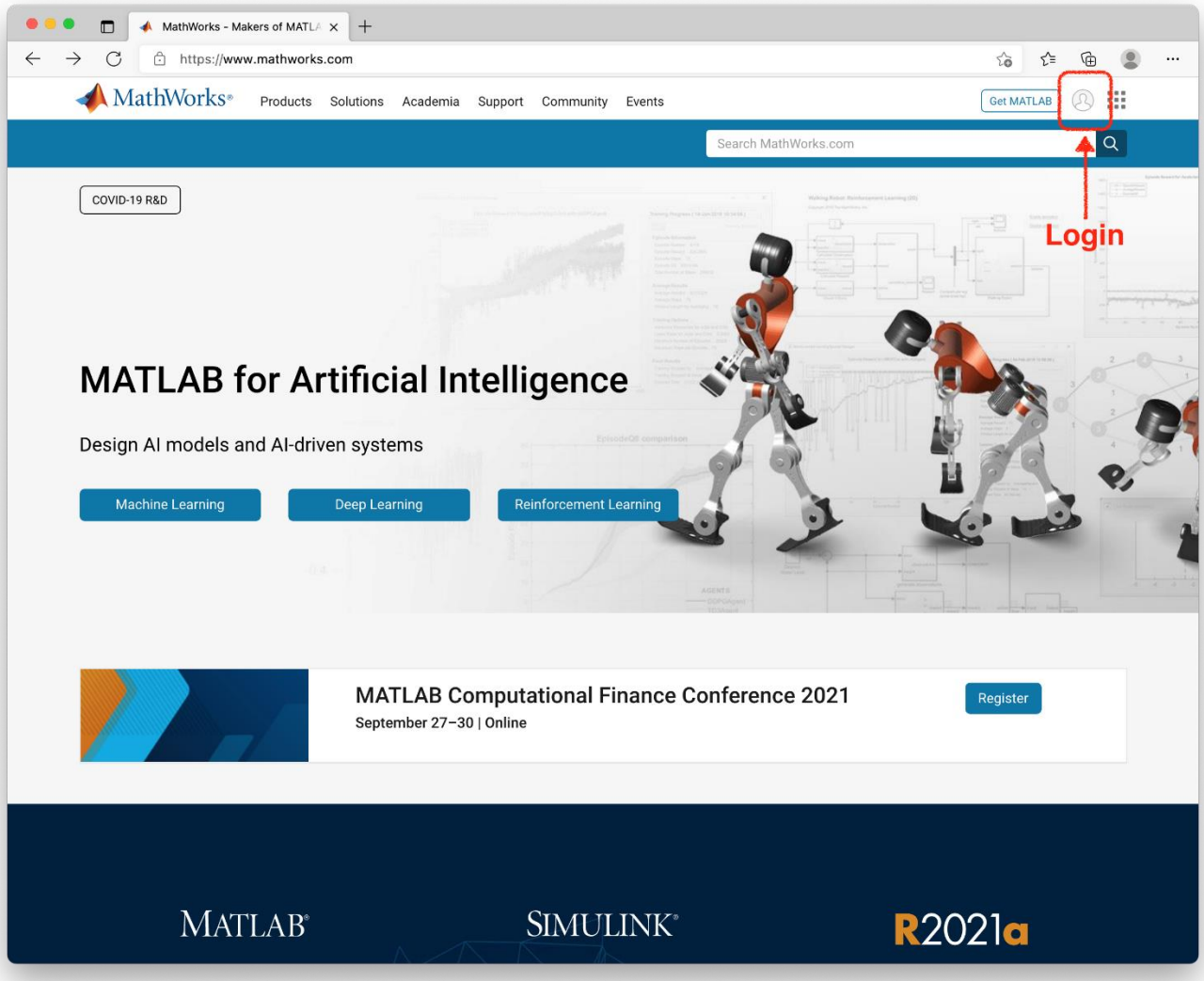
- www.stuba.sk/matlab

- Vytvoriť si konto na www.mathworks.com

- Stiahnuť
- Inštalovať
- Aktivovať
- Používať

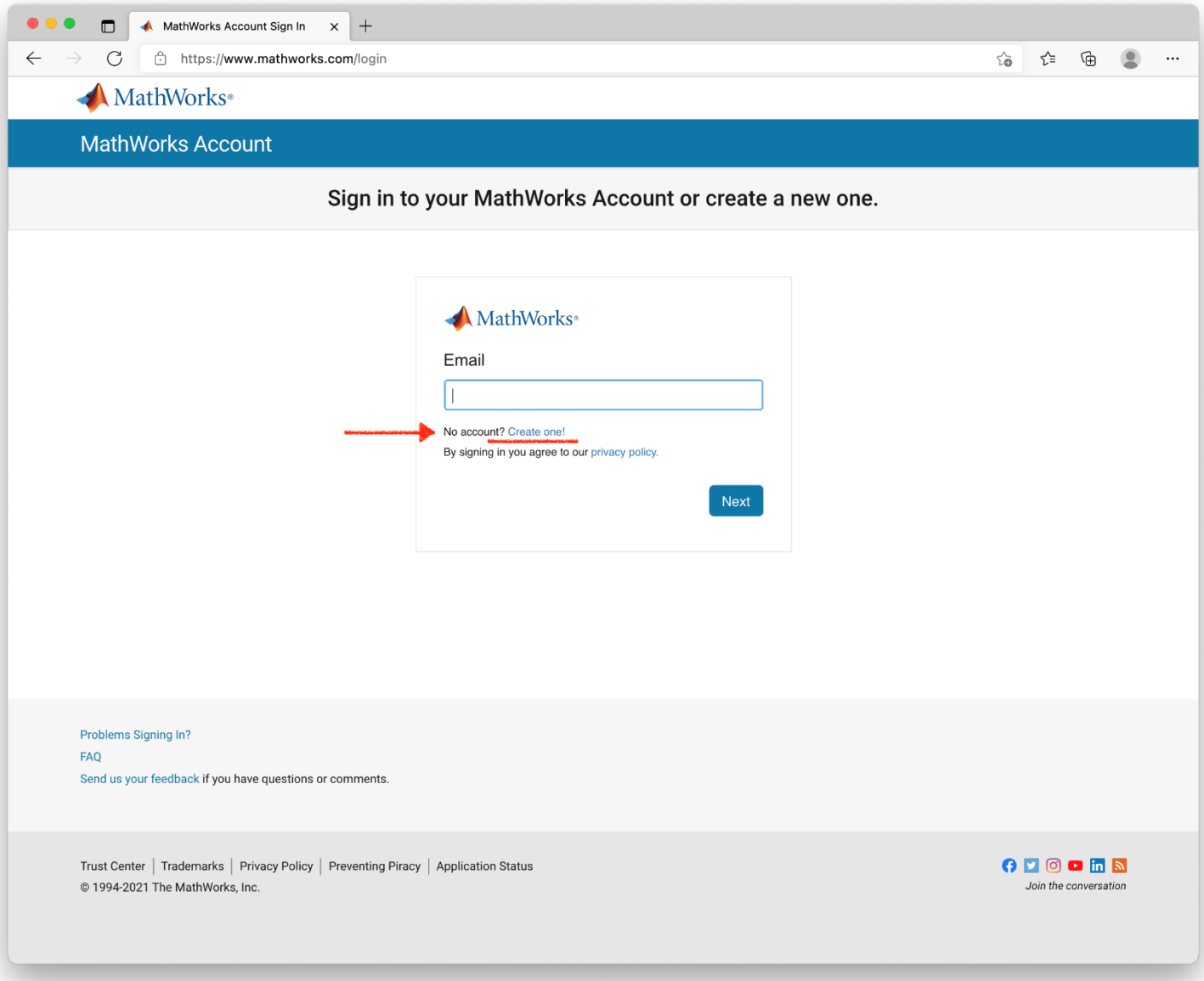
Vytvor si konto

- Login



Vytvor si konto

- Create Account



Vytvor si konto

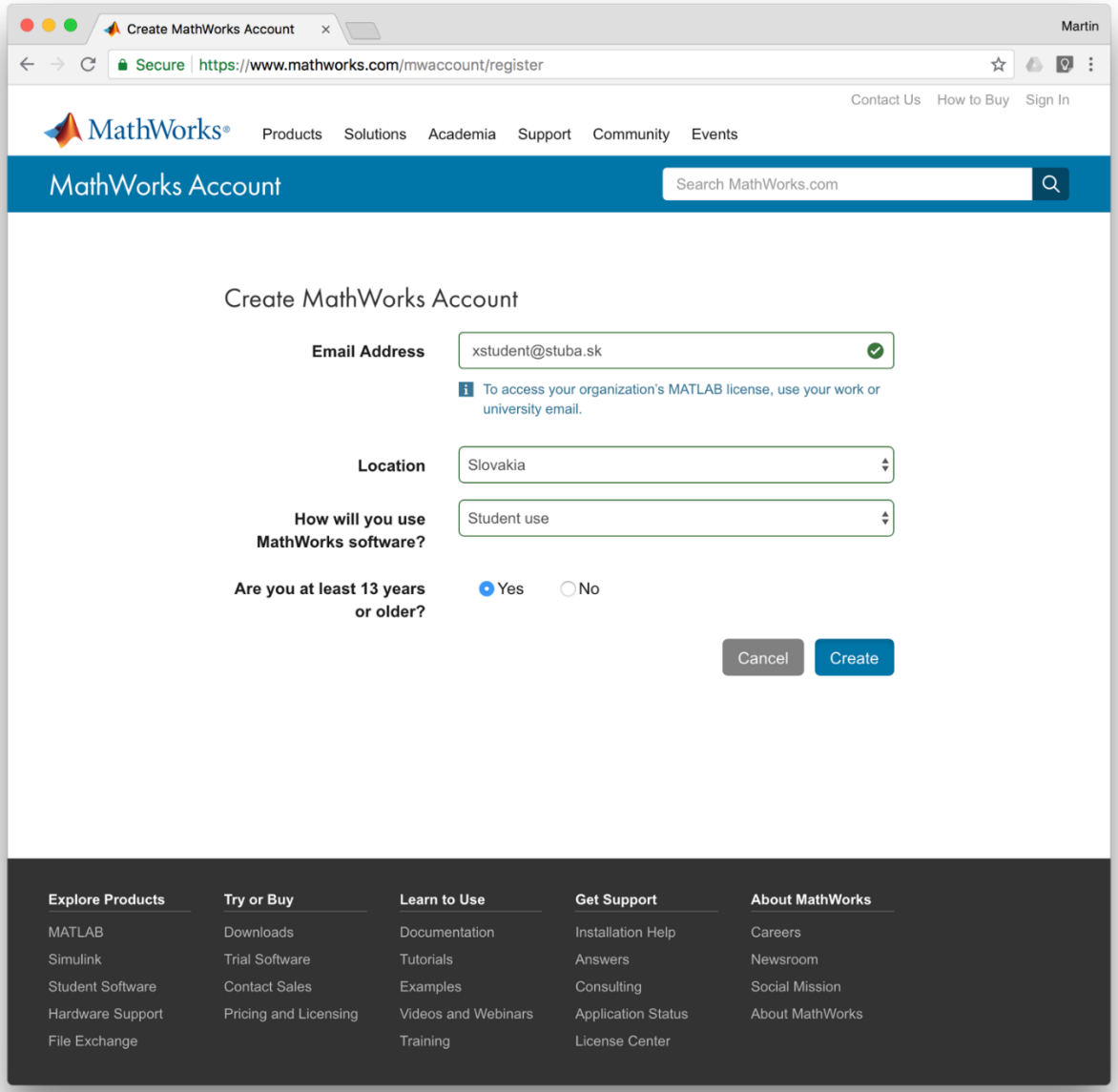
- Create Account

Váš e-mail stuba.sk

Slovakia

Student use

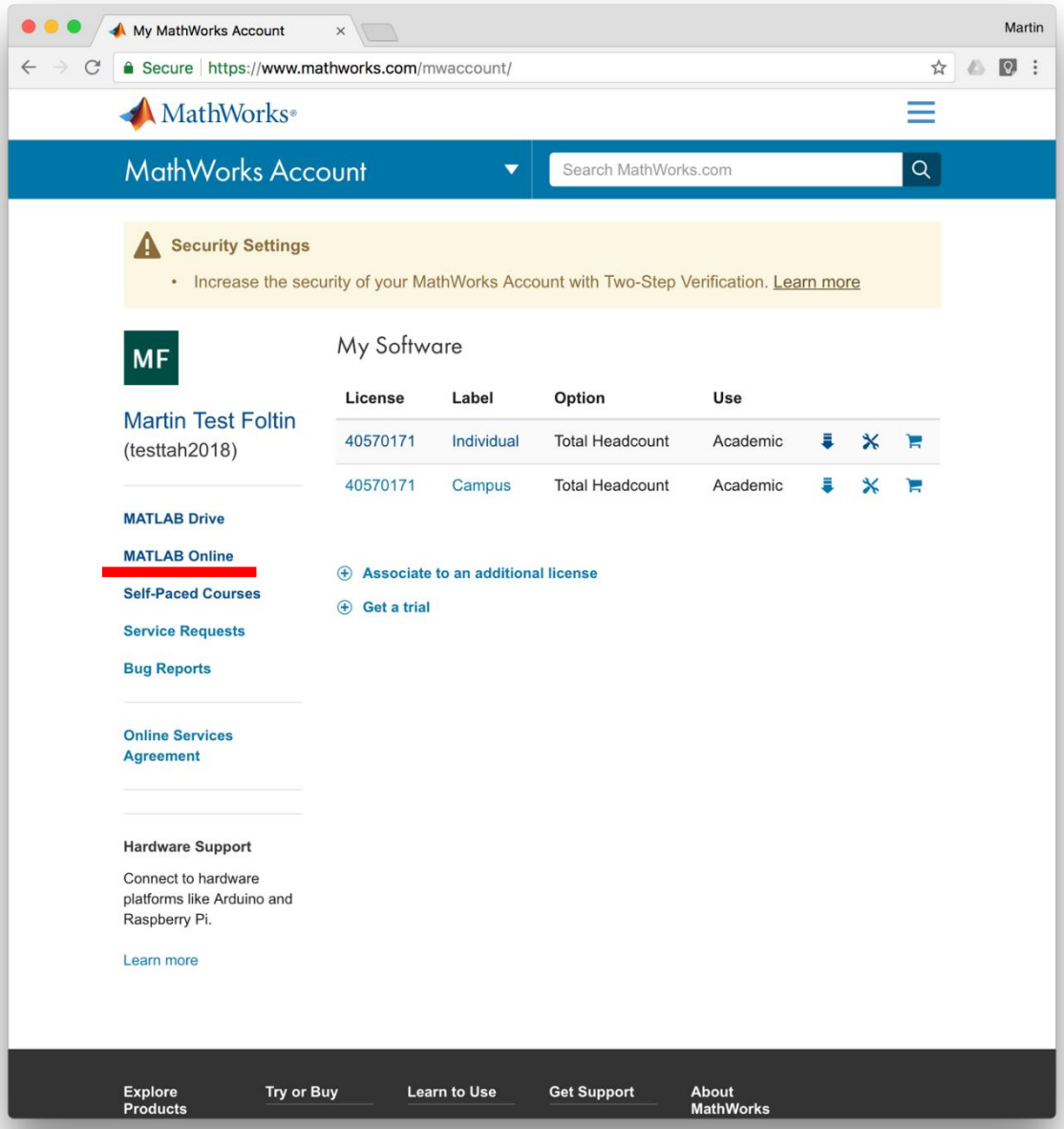
Yes



- Po vyplnení príde overovací e-mail
- Potvrdiť e-mail
- Zadať heslo
- Vyplniť ostatné informácie

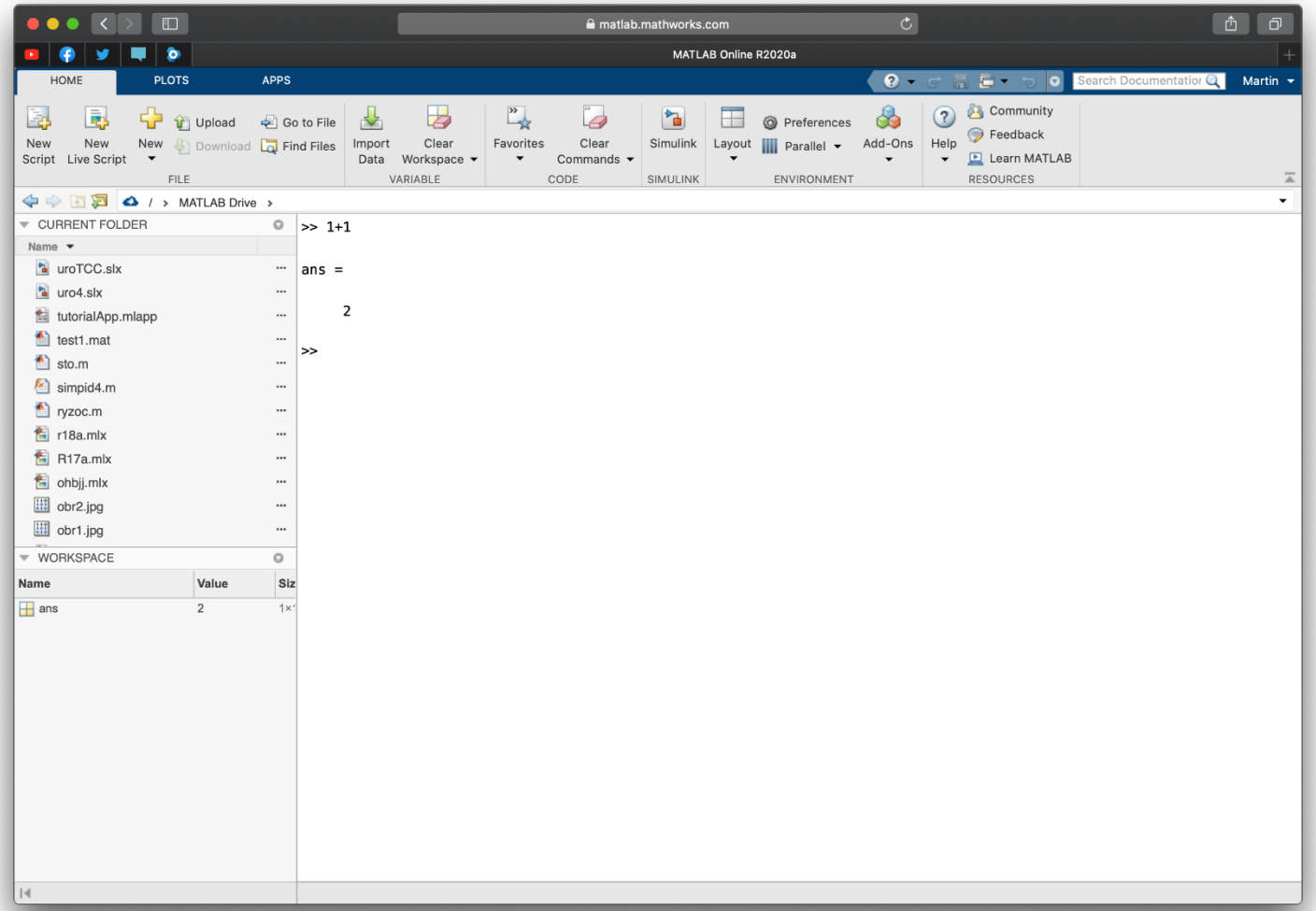
Funguje to?

- Preveríme funkčnosť
- MATLAB Online



MATLAB Online

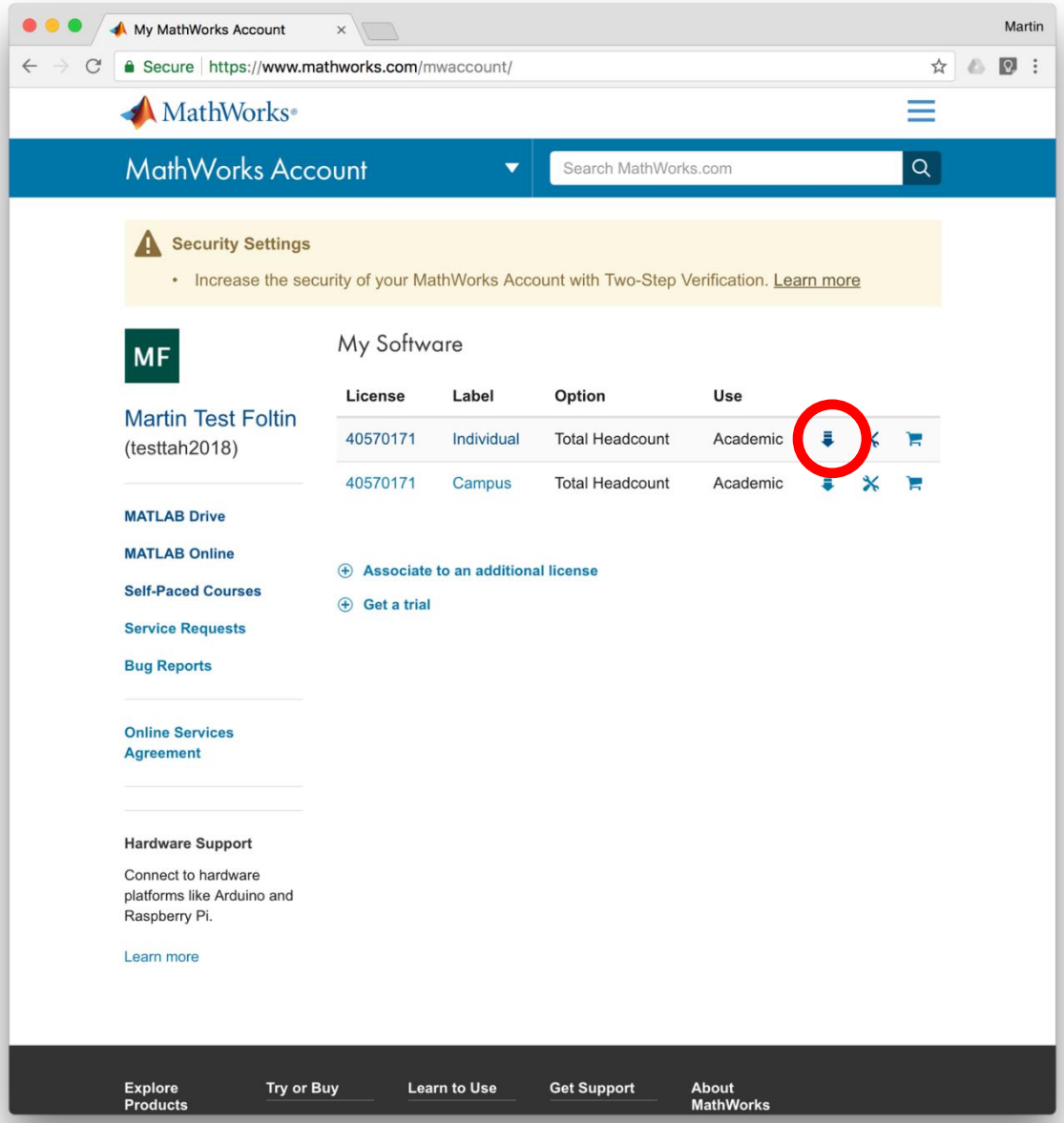
- MATLAB Online



Inštalujeme na vlastné PC

- Download
- Zvoľte verziu (R2025a)
- Zvoľte OS
  - Windows
  - macOS
  - Linux
  - Všetko 64bit

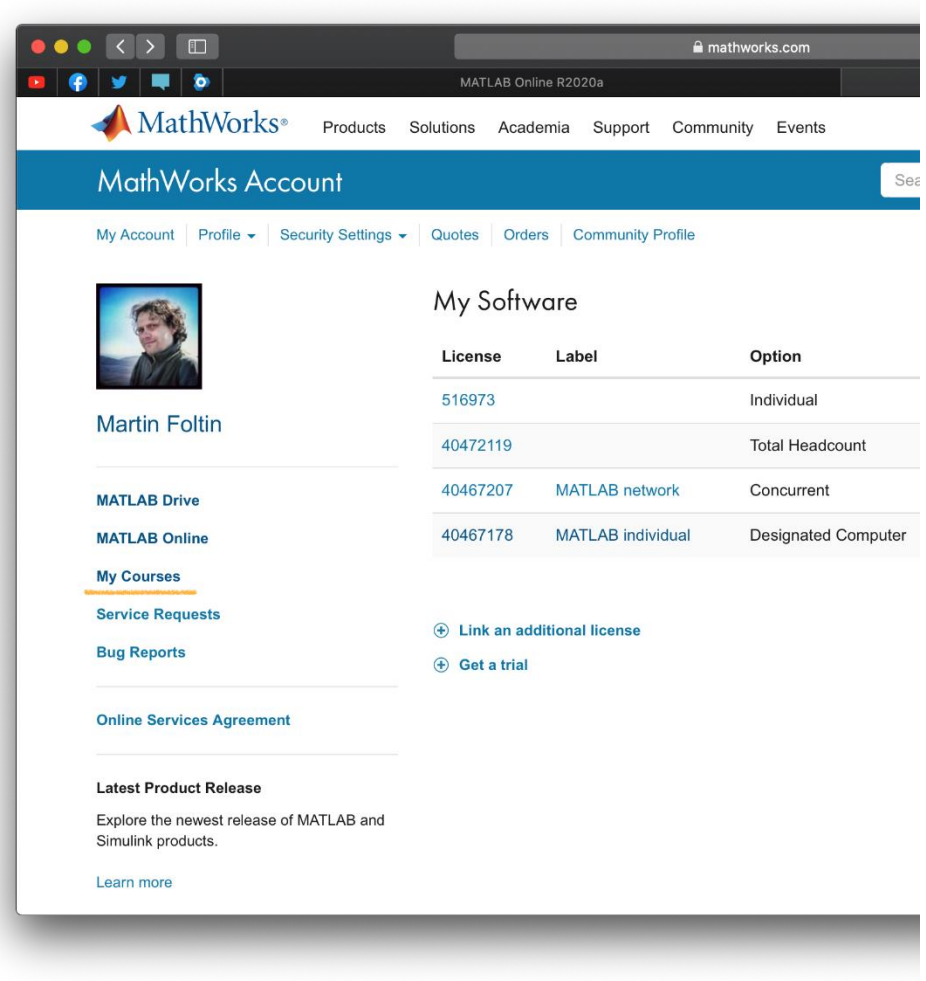
Download



Online kurzy

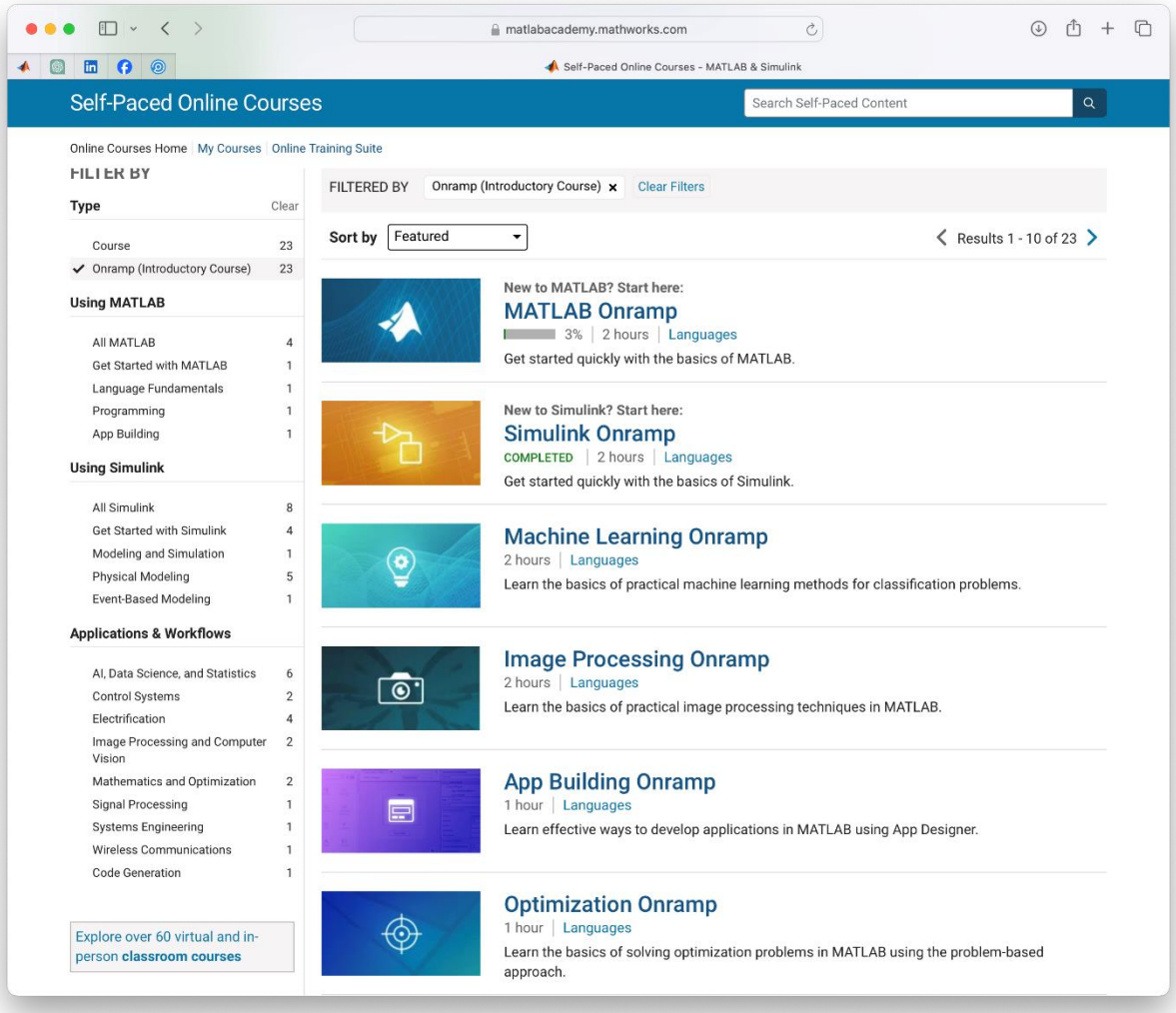
- My Courses

- Začnite s MATLAB Onramp
  - Za 2h máte 1. certifikát



Self-Paced Online Course

Onramp (Introductory Course)



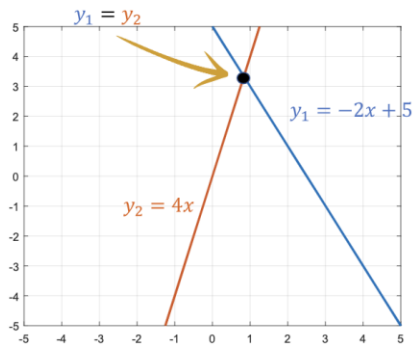
Course Certificate

Self-Paced Online Course – Math & Optimization

#OTS_math

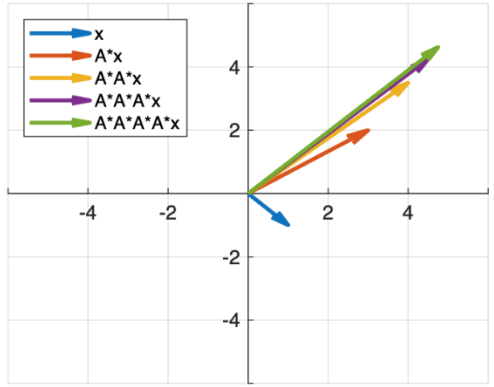
Solutions to Linear Systems

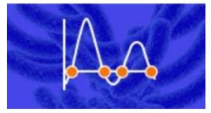
The solution of a system of linear equations refers to the x/y pair that makes both equations equal. In other words, the x/y pair that corresponds to the intersection of two lines.




```
A = 2x2
     2.0000   -1.0000
     1.5000   -0.5000

x = 2x1
     1
    -1
```



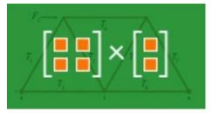


Solving Nonlinear Equations with MATLAB
3 hours | Languages
Use root finding methods to solve nonlinear equations.

Statistics Onramp
1 hour | Languages
Get started using statistical methods for analysis in MATLAB.

Optimization Onramp
1 hour | Languages
Learn the basics of solving optimization problems in MATLAB using the problem-based approach.

Introduction to Symbolic Math with MATLAB
2 hours | Languages
Get started quickly with an introduction to symbolic math.



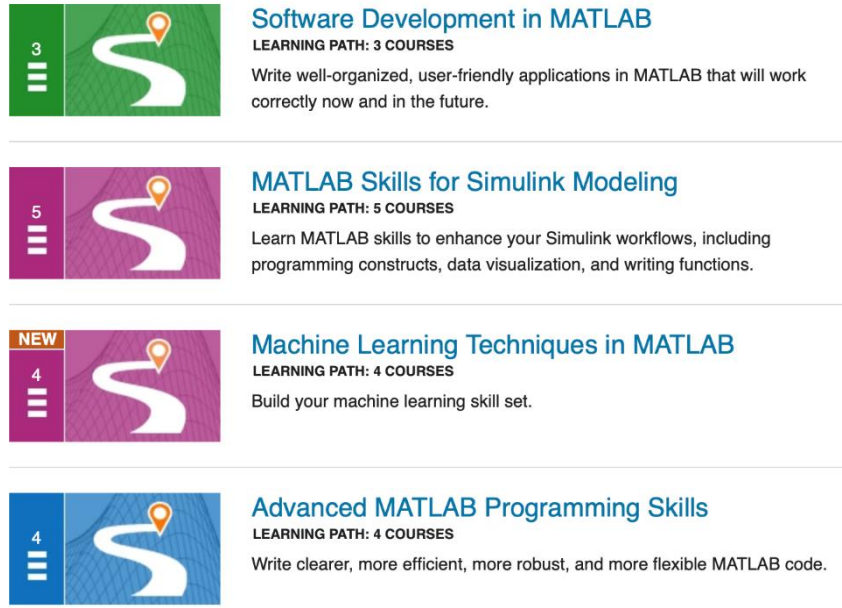
Introduction to Linear Algebra with MATLAB
COMPLETED | 3 hours | Languages
Use matrix methods to solve systems of linear equations and perform eigenvalue decomposition.

Solving Ordinary Differential Equations with MATLAB
4 hours | Languages
Use MATLAB ODE solvers to numerically solve ordinary differential equations.

Introduction to Finite Element Analysis with MATLAB
45% | 1 hour | Languages
Learn to solve real-world engineering problems with finite element analysis.

Self-Paced Online Course – Learning Path (PROFI)

- Online Training Suite (OTS)
  - Profi Learning Path
    - Core MATLAB Skills
    - Build MATLAB Proficiency
    - Visualization in MATLAB
    - Programming in MATLAB
    - Data Analysis in MATLAB
    - MATLAB for the MathWorks Certified MATLAB Associate Exam
    - Deep Learning Techniques in MATLAB for Image Applications
    - Core Signal Processing Techniques in MATLAB
    - Organize Tabular Data in MATLAB
    - Handle Inconsistent and Unstructured Data Files
    - Software Development in MATLAB
    - MATLAB Skills for Simulink Modeling
    - Machine Learning Techniques in MATLAB
    - Advanced MATLAB Programming Skills
    - Control System Design with MATLAB and Simulink
    - Deep Learning Techniques in MATLAB for Image Applications



- Cena OTS 590€ na osobu a rok
- s CWL **zadarmo**
- Prístup pre každého
- Certifikát
- LinkedIn
- Credly

MATLAB Campus-Wide License

- Online Training Suite (OTS)
- Learning Path
- [Digital Credentials - Credly]

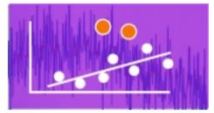
Explore Convolutional Neural Networks
1 hour | Languages
Gain a deeper understanding of how convolutional neural networks process images.

Tune Deep Learning Training Options
1 hour | Languages
Learn about the deep network training process to make inform decisions about your training algorithm options.

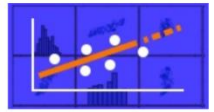
Regression with Deep Learning
0.5 hours | Languages
Learn
tasks.

Obje
1 hou
Use d
pretra

Tables
2 hours | Languages
Import, manage, and ma



Clean and Prepare Data for Analysis
1.5 hours | Languages
Perform common data cleaning techniques.



Common Data Analysis Techniques
1 hour | Languages
Analyze relationships between variables and model patterns in data.

Find and Extract Subsets of Data
1 hour | Languages
Use logical indexing to filter data and count elements.

Calculations on Grouped Data
1 hour | Languages
Perform calculations on groups of data.

Control System Modeling Essentials
1 hour | Languages
Create control system objects in MATLAB and Simulink and simulate their behaviors.

Linearization of Nonlinear Systems
0.5 hours | Languages
Linearize nonlinear systems at the appropriate operating points.

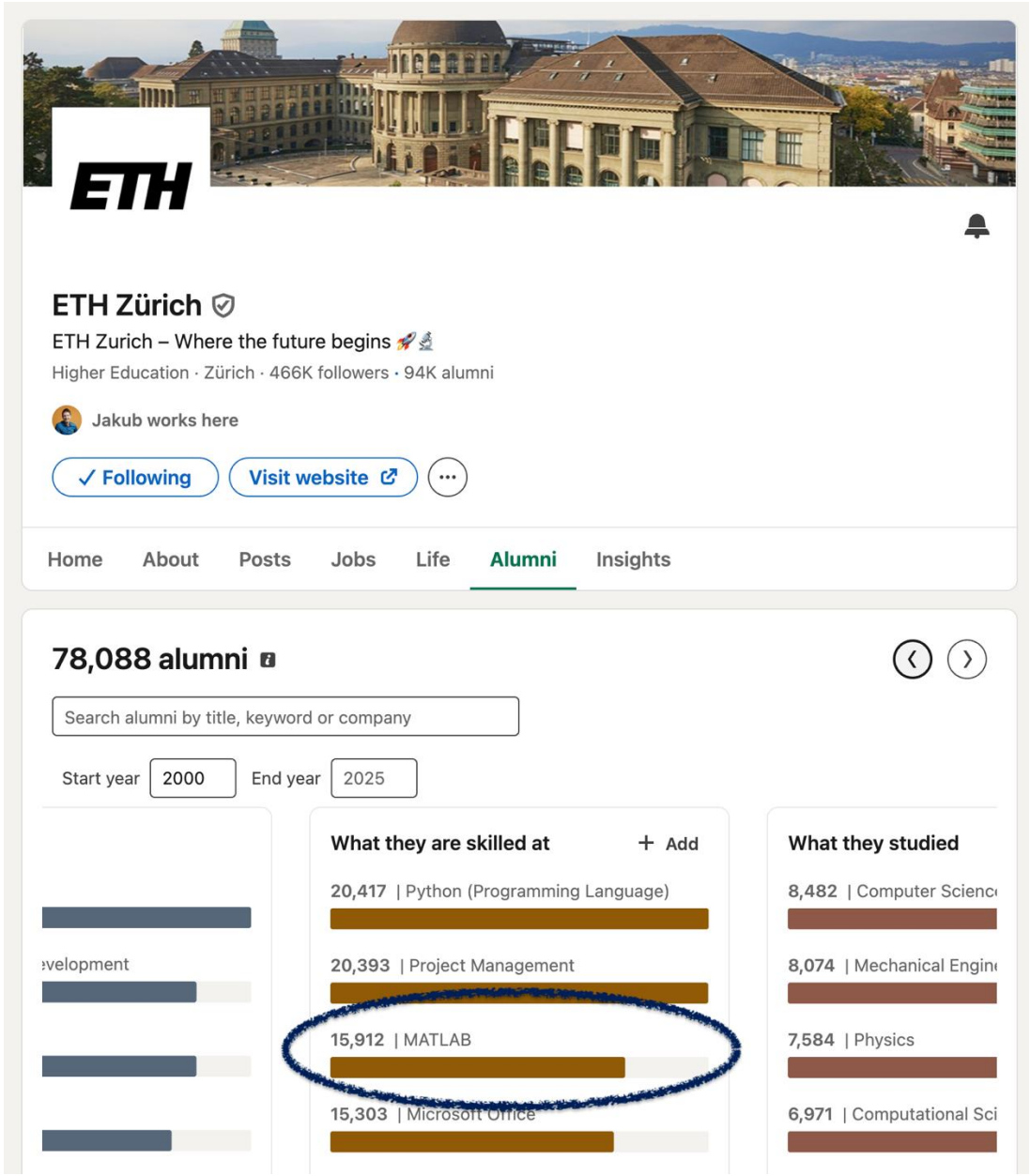
Control System Analysis Techniques
1 hour | Languages
Analyze control systems to explore their critical properties.

PID Control Techniques
0.5 hours | Languages
Design PID controllers for real-world systems.

Classical Controller Design Techniques
0.5 hours | Languages
Learn controller design using classical design methods.

Linkedin

- Profi sociálna sieť
- Váš profi životopis
- Spravte si konto na Linkedin
  - https://www.linkedin.com/



Kam za informáciami

- Web
  - www.humusoft.sk
  - www.mathworks.com
  - www.mathworks.com/matlabcentral/answers/
- Instagram
  - https://www.instagram.com/humusoft/
- Discord
  - https://discord.gg/yG6Ew9pU8k
- GitHub - awesome-matlab-students
  - https://github.com/mathworks/awesome-matlab-students
- Webinare
  - Live
  - Archív
  - SK&CZ / ENG

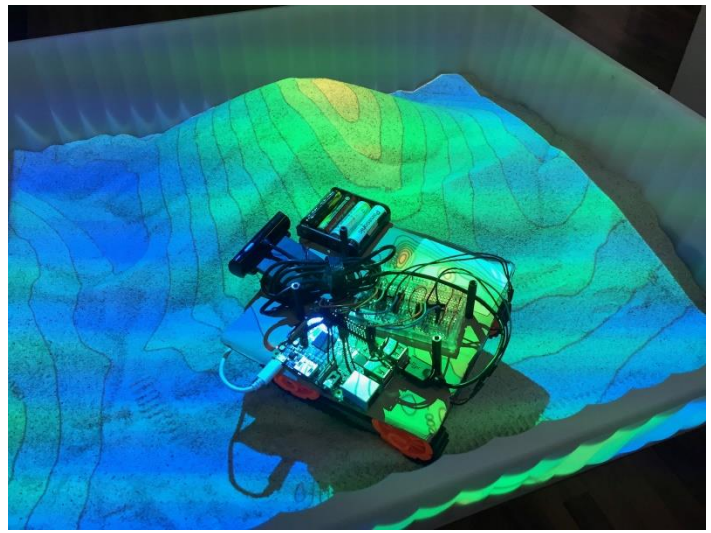
Instagram

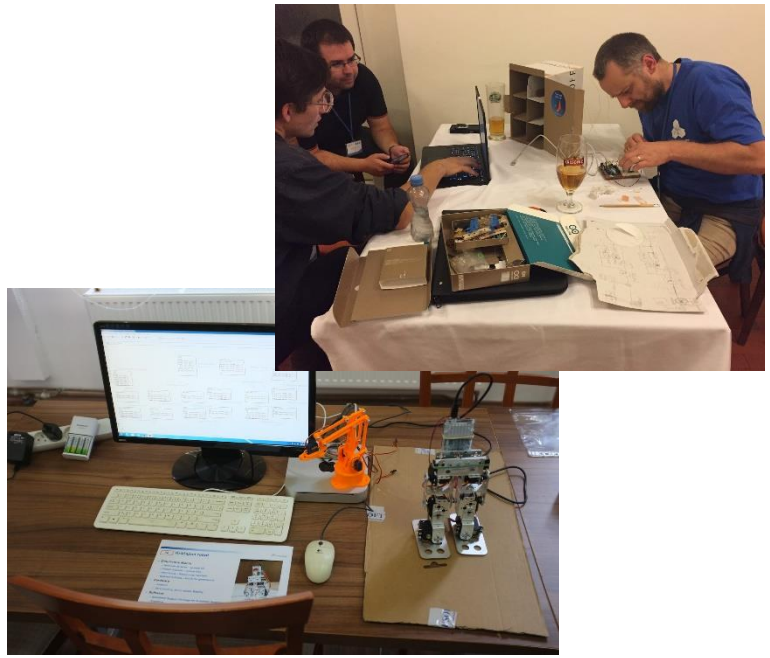
Discord

GitHub

Kam za informáciami

- Technical Computing Camp
  - Brno
  - Neformálne stretnutie
- Technical Computing Prague
  - Medzinárodná konferencia
- Semináre
- Školenia

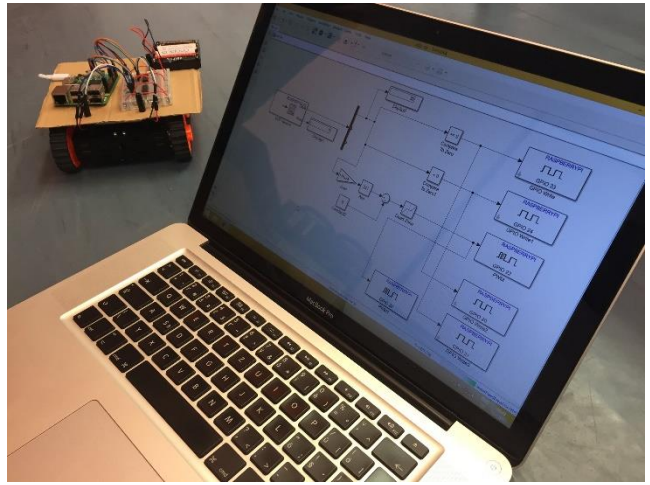




foltin@humusoft.sk
blaho@humusoft.sk
support@humusoft.sk

MATLAB Campus-Wide License

NEBOJTE SA TVORIŤ



Ďakujeme za pozornosť