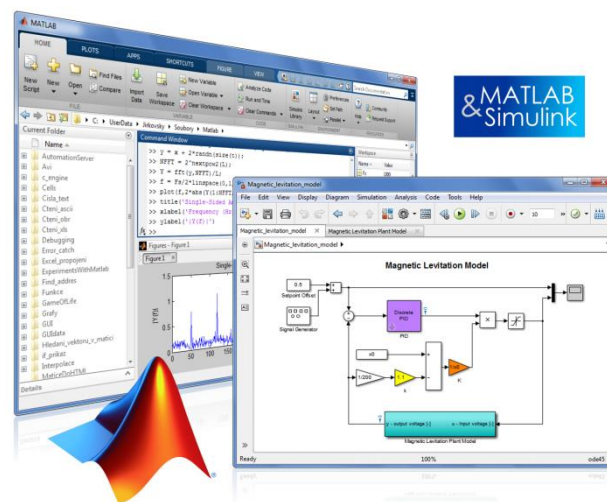


5.9.2018 Brno

# TCC 2019

## Novinky v prostředí MATLAB v roku 2019



Michal Blaho

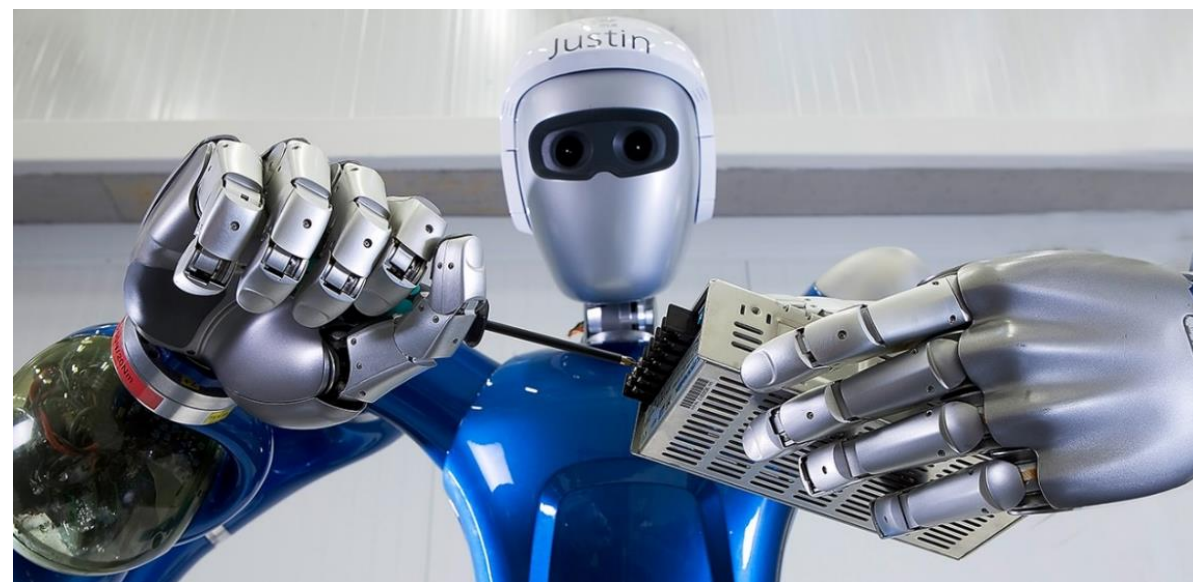
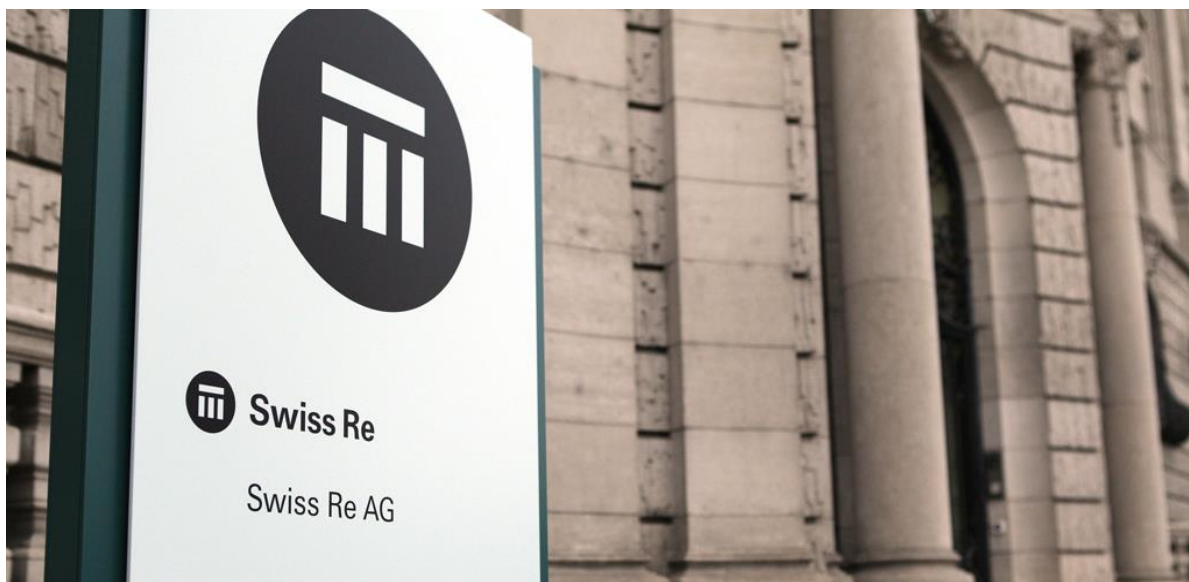
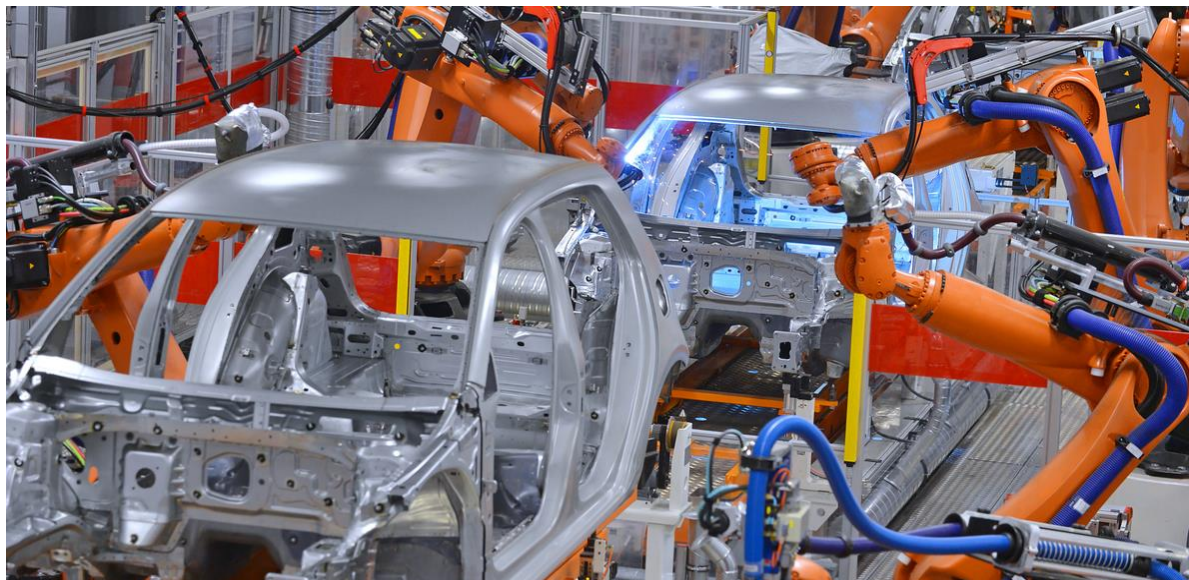
[blaho@humusoft.cz](mailto:blaho@humusoft.cz)

[www.humusoft.cz](http://www.humusoft.cz)

[info@humusoft.cz](mailto:info@humusoft.cz)

[www.mathworks.com](http://www.mathworks.com)

# Algoritmy sú všade



# Využitie MATLABu a Simulinku na tvorbu algoritmov

**Zjednodušenie práce...**

**... často s využitím vyššej abstrakcie.**



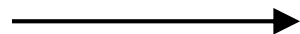
**MATLAB® & SIMULINK®**



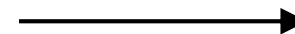
# Využitie MATLABu a Simulinku na tvorbu algoritmov



Vstupy



Návrh



Výstupy



MATLAB® & SIMULINK®

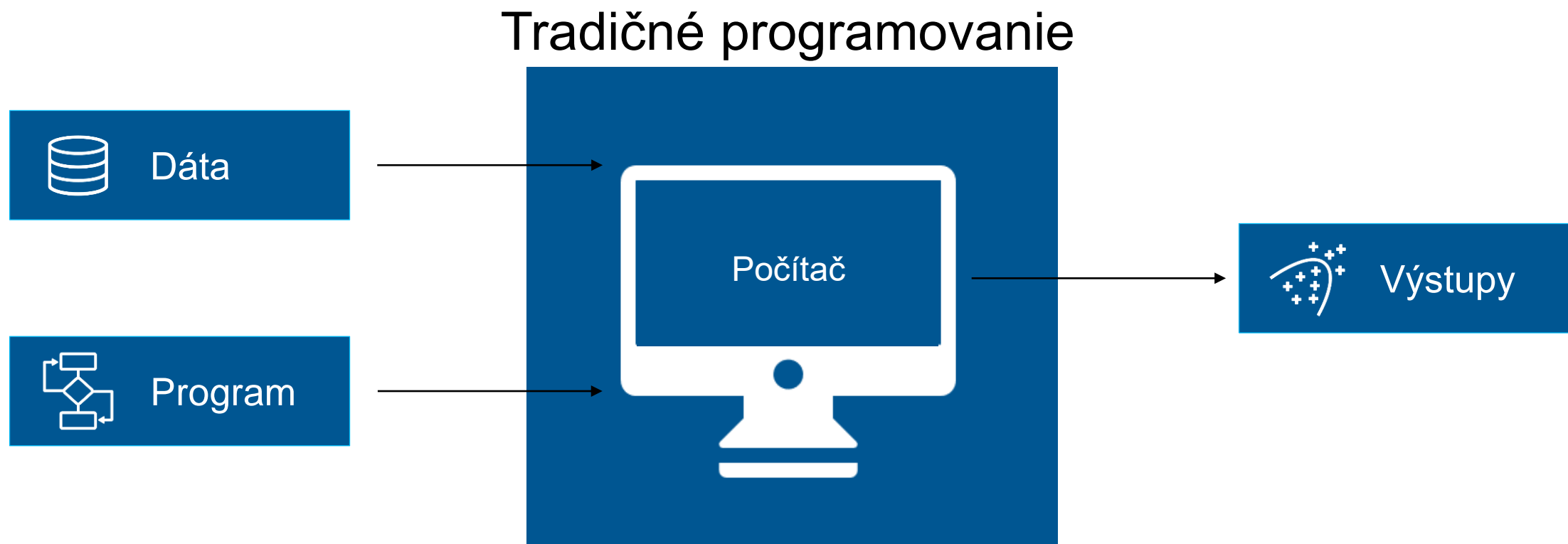




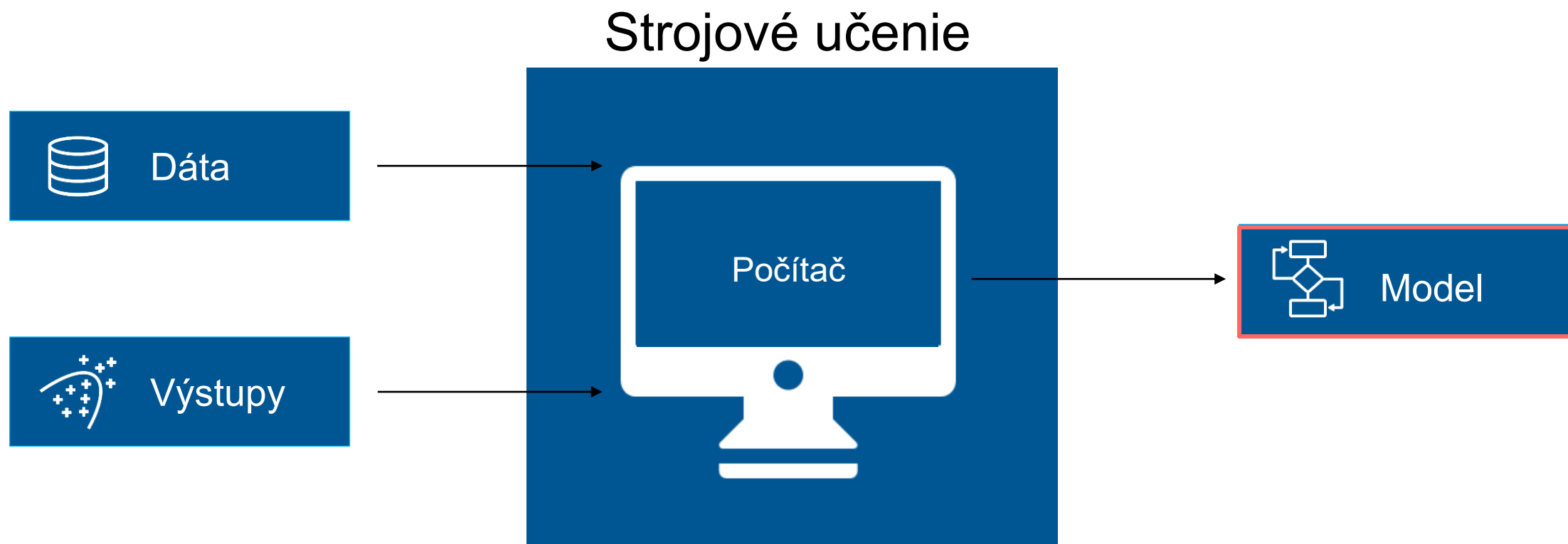
# Umelá inteligencia

*Schopnosť zariadenia  
vyrovnať alebo prekonať ľudské správanie  
**trénovaním zariadenia,  
aby sa naučilo požadované správanie***

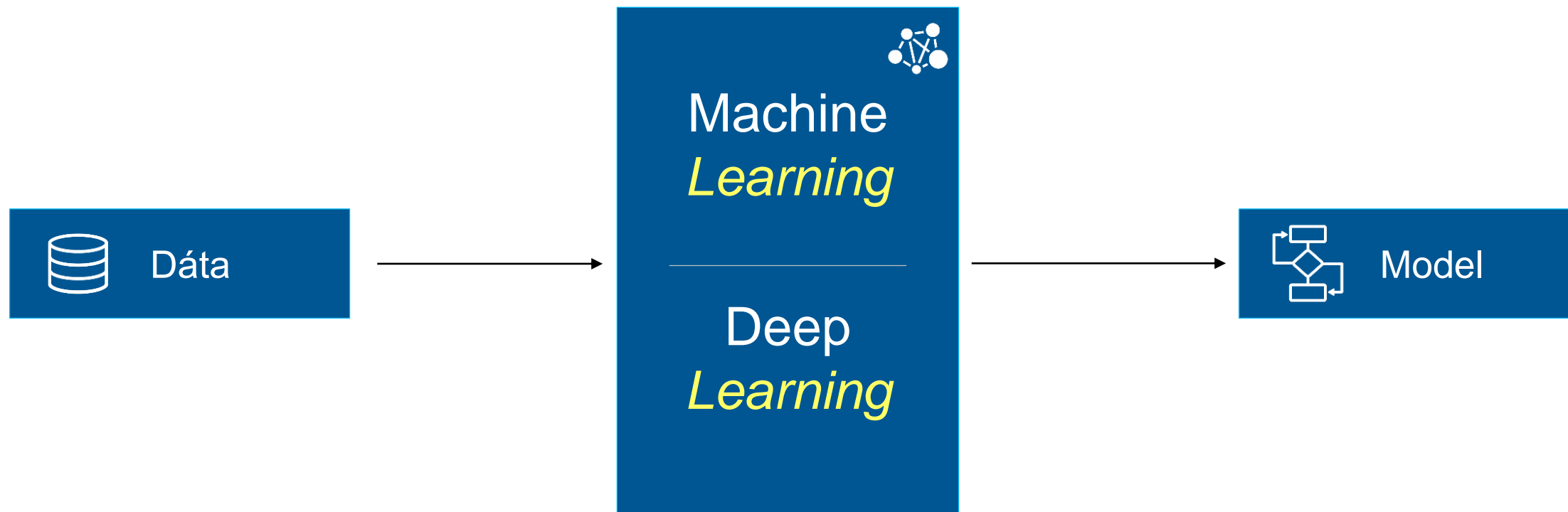
# Dva spôsoby tvorby algoritmu



# Dva spôsoby tvorby algoritmu

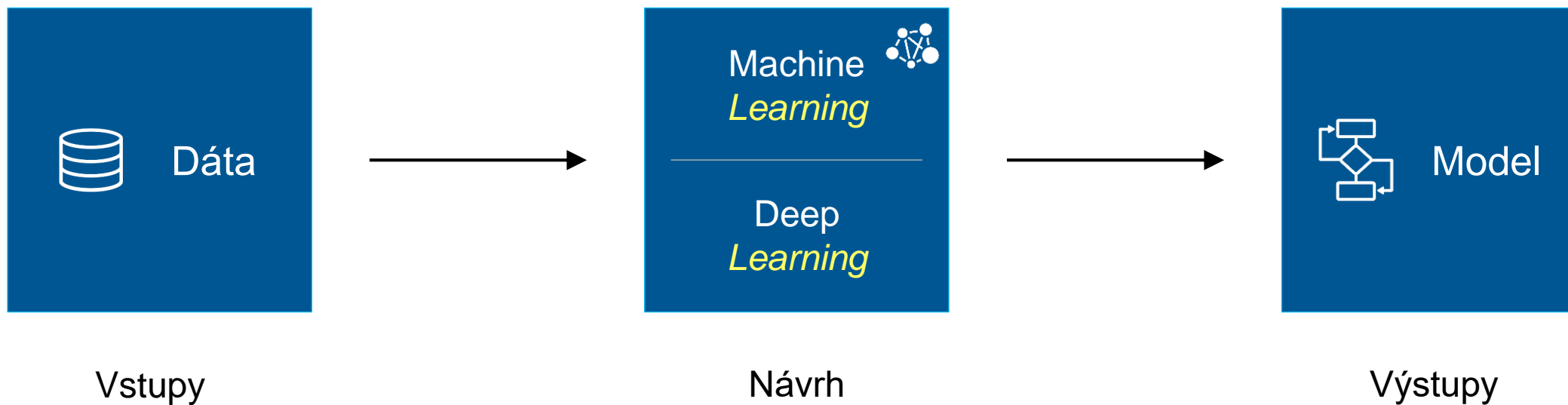


# Umelá inteligencia

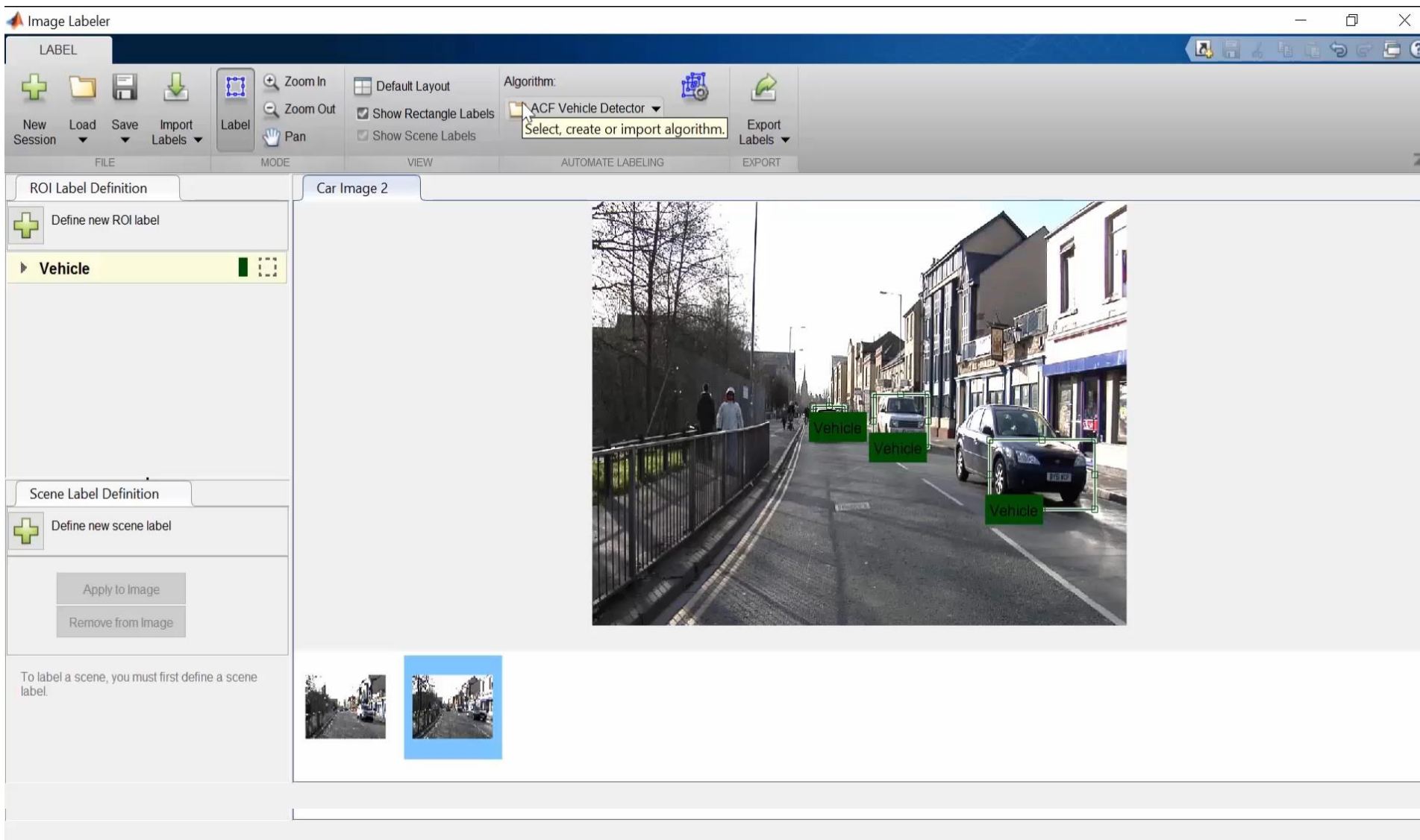




# MATLAB a Simulink na tvorbu modelov **Deep Learningu**



# Ground Truth Labeling – obrázky a video



# Ground Truth Labeling – signály

**LABEL**    **DISPLAY**    **TIME**

Point Name:     Description:     Value:

Parent Name:

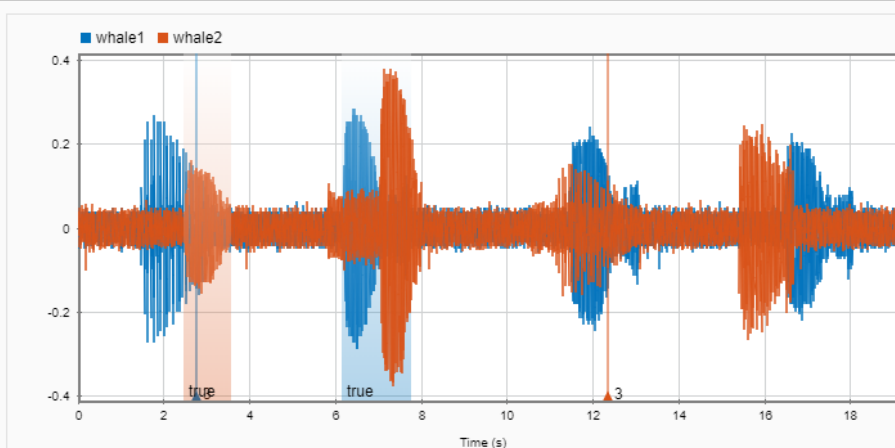
LABEL DEFINITION    SELECTED DEFINITION    SET VALUE    CLOSE

**Label Definitions**

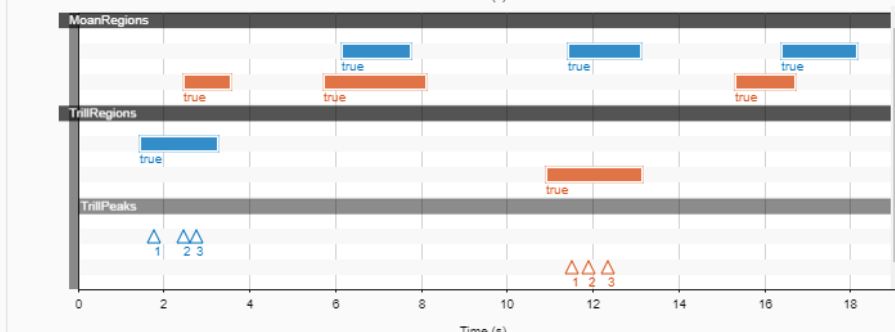
- WhaleType
- MoanRegions
- TrillRegions
  - TrillPeaks

**Labeled Signal Set**

Name	Plot	Value	Location (Min)	Location (Max)
whale1	<input checked="" type="checkbox"/>	blue		
WhaleType		blue		
MoanRegions				
	<input checked="" type="checkbox"/>	true	6.13604115...	7.763
	<input type="checkbox"/>	true	16.37525	18.153984...
	<input type="checkbox"/>	true	11.4020000...	13.120148...
TrillRegions				
	<input type="checkbox"/>	true	1.4357724...	3.275
TrillPeaks				
	<input type="checkbox"/>	1	1.77425	
	<input type="checkbox"/>	2	2.44375	
	<input checked="" type="checkbox"/>	3	2.74225	
whale2	<input checked="" type="checkbox"/>	blue		
WhaleType		blue		
MoanRegions				
	<input checked="" type="checkbox"/>	true	2.44511966...	3.5605
	<input type="checkbox"/>	true	5.7136928...	8.113
	<input type="checkbox"/>	true	15.3215	16.712880...
TrillRegions				
	<input type="checkbox"/>	true	10.91475	13.152470...
TrillPeaks				
	<input type="checkbox"/>	1	11.50975	
	<input type="checkbox"/>	2	11.88	
	<input checked="" type="checkbox"/>	3	12.32975	



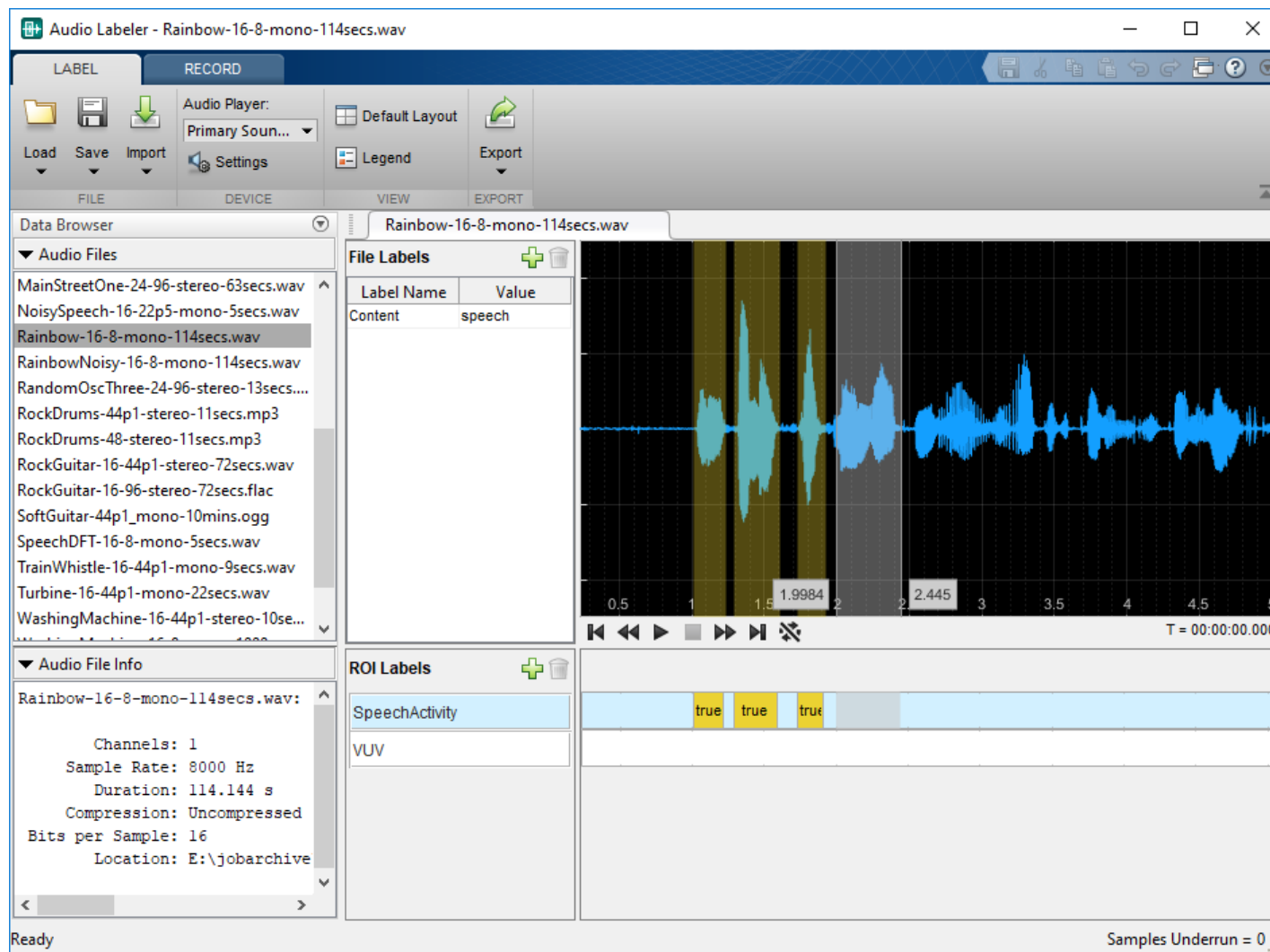
Time (s)



Time (s)

WhaleType	Value
blue	blue
blue	blue

# Ground Truth Labeling – zvuk



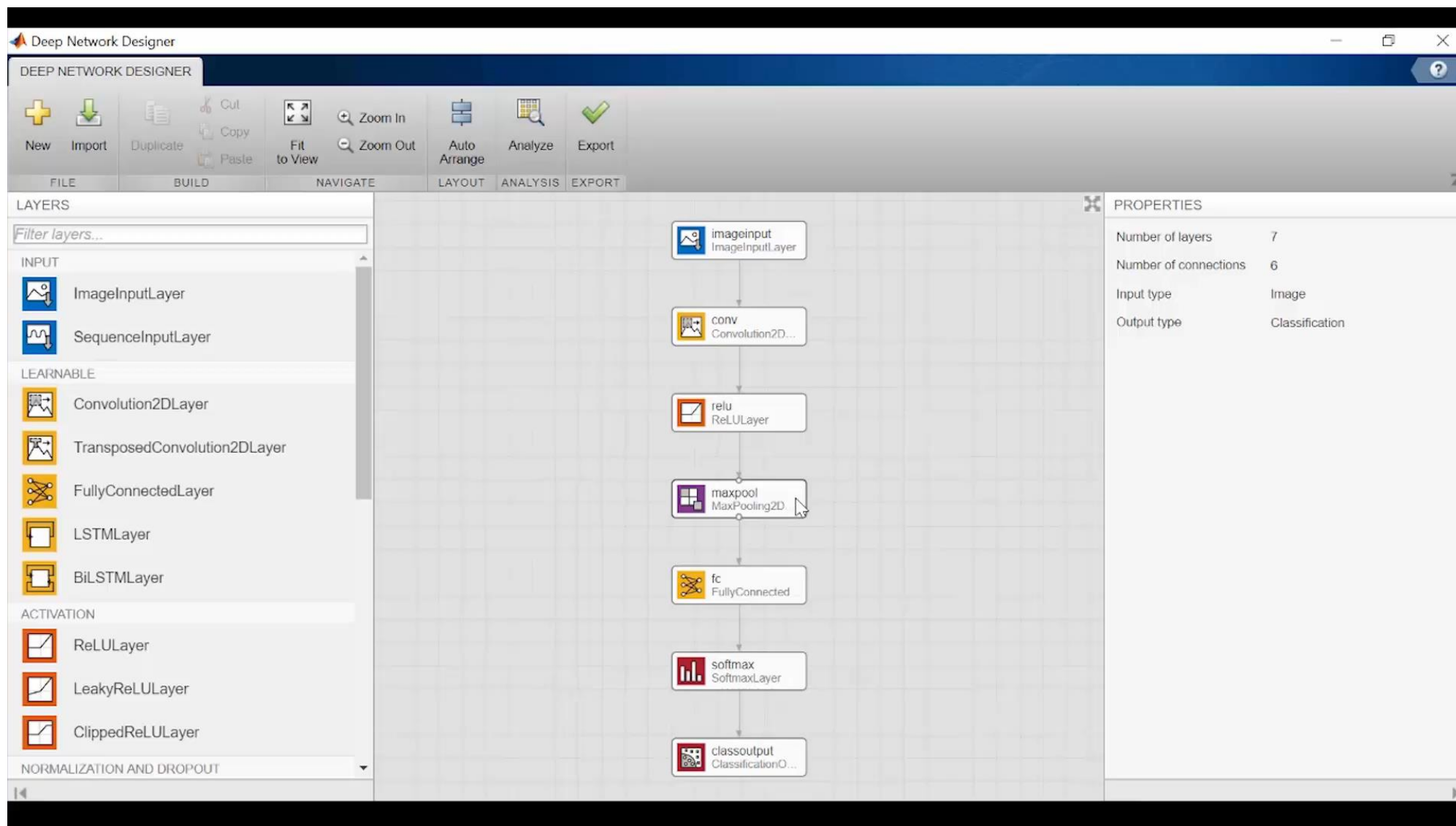
The screenshot shows the 'Audio Labeler' application window. The title bar reads 'Audio Labeler - Rainbow-16-8-mono-114secs.wav'. The interface is divided into several panels:

- Top Panel:** Contains tabs for 'LABEL' and 'RECORD'. Below these are icons for 'Load', 'Save', 'Import', 'Settings', 'Default Layout', 'Legend', and 'Export'.
- Data Browser:** A list of audio files. The selected file is 'Rainbow-16-8-mono-114secs.wav'. Other files include 'MainStreetOne-24-96-stereo-63secs.wav', 'NoisySpeech-16-22p5-mono-5secs.wav', etc.
- Audio File Info:** Displays metadata for the selected file:
  - Channels: 1
  - Sample Rate: 8000 Hz
  - Duration: 114.144 s
  - Compression: Uncompressed
  - Bits per Sample: 16
  - Location: E:\jobarchive
- File Labels:** A table with columns 'Label Name' and 'Value'. It contains one entry: 'Content' with the value 'speech'.
- ROI Labels:** A timeline visualization showing 'SpeechActivity' with three yellow bars labeled 'true' at approximately 1.5, 2.0, and 2.5 seconds. Below it is a 'VUV' section.
- Waveform:** A blue waveform plot on a black background. The x-axis is labeled from 0.5 to 5.0. Time markers are shown at 1.9984 and 2.445. Playback controls and a time display 'T = 00:00:00.000' are at the bottom of the waveform area.

At the bottom left, the status is 'Ready'. At the bottom right, it shows 'Samples Underrun = 0'.



# Aplikácia na návrh Deep Learning sietí



The screenshot displays the Deep Network Designer application window. The interface includes a menu bar with options: FILE, BUILD, NAVIGATE, LAYOUT, ANALYSIS, and EXPORT. Below the menu is a toolbar with icons for New, Import, Duplicate, Cut, Copy, Paste, Fit to View, Zoom In, Zoom Out, Auto Arrange, Analyze, and Export.

The main workspace shows a vertical flowchart of a neural network architecture with the following layers:

- imageinput (ImageInputLayer)
- conv (Convolution2D...)
- relu (ReLU Layer)
- maxpool (MaxPooling2D)
- fc (FullyConnected)
- softmax (Softmax Layer)
- classoutput (ClassificationO...)

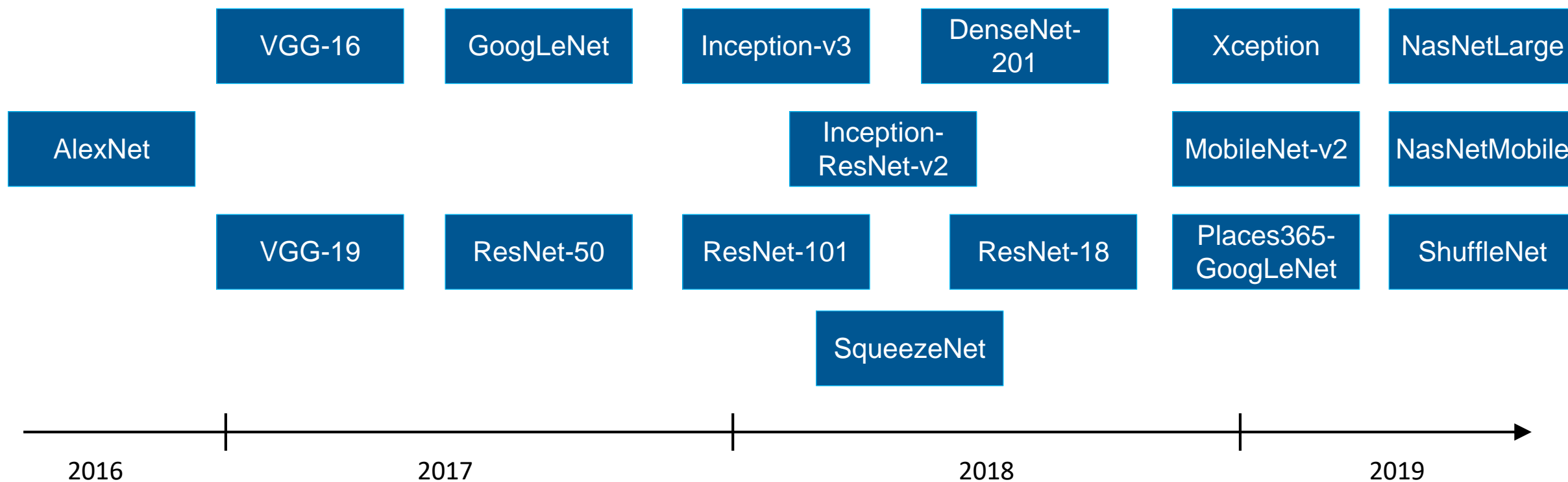
On the left side, there is a 'LAYERS' panel with a search filter and several categories of layers:

- INPUT:** ImageInputLayer, SequenceInputLayer
- LEARNABLE:** Convolution2DLayer, TransposedConvolution2DLayer, FullyConnectedLayer, LSTMLayer, BiLSTMLayer
- ACTIVATION:** ReLULayer, LeakyReLULayer, ClippedReLULayer
- NORMALIZATION AND DROPOUT:** (dropdown menu)

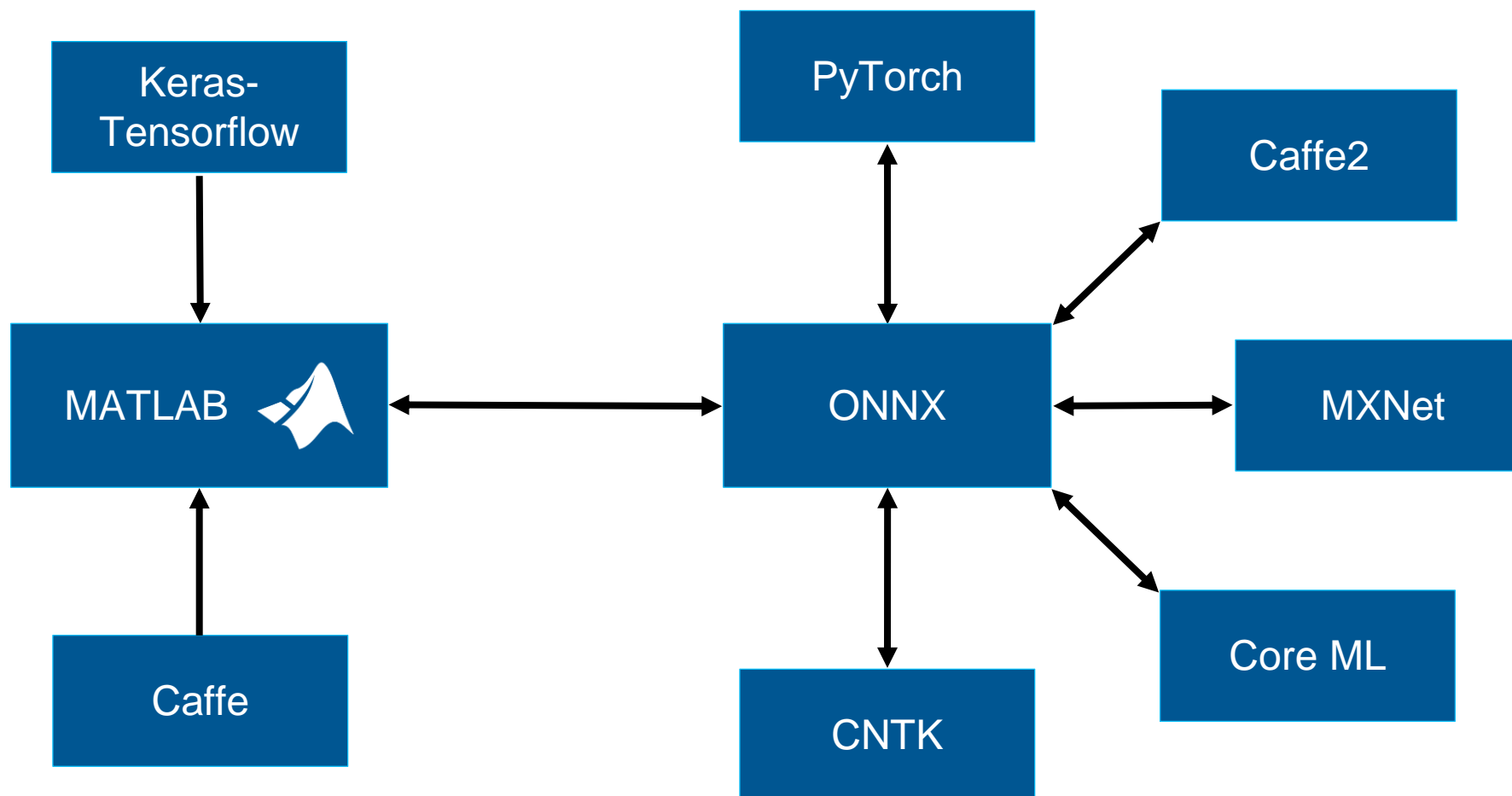
On the right side, there is a 'PROPERTIES' panel showing the following details for the current network:

- Number of layers: 7
- Number of connections: 6
- Input type: Image
- Output type: Classification

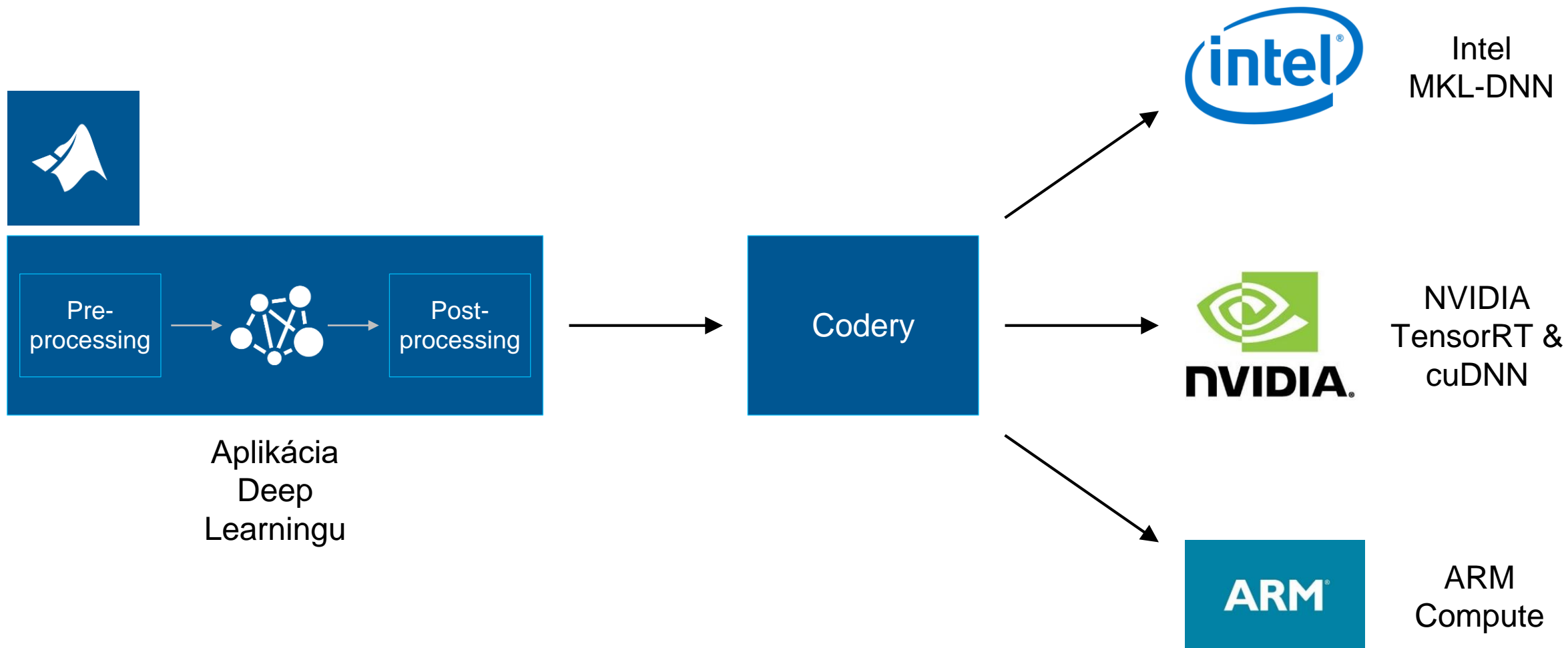
# Transfer Learning s predtrénovanými modelmi



# Modely z iných nástrojov

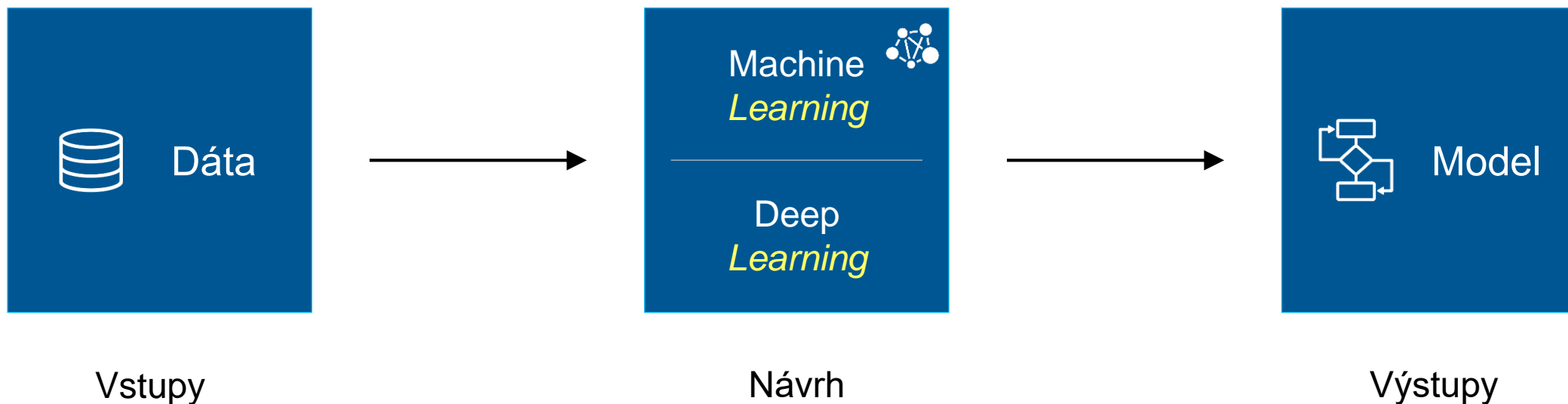


# Nasadenie aplikácií – Deep Learning

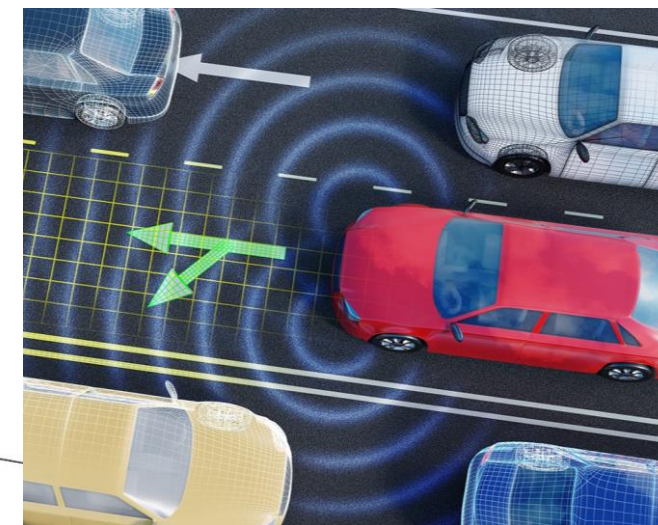




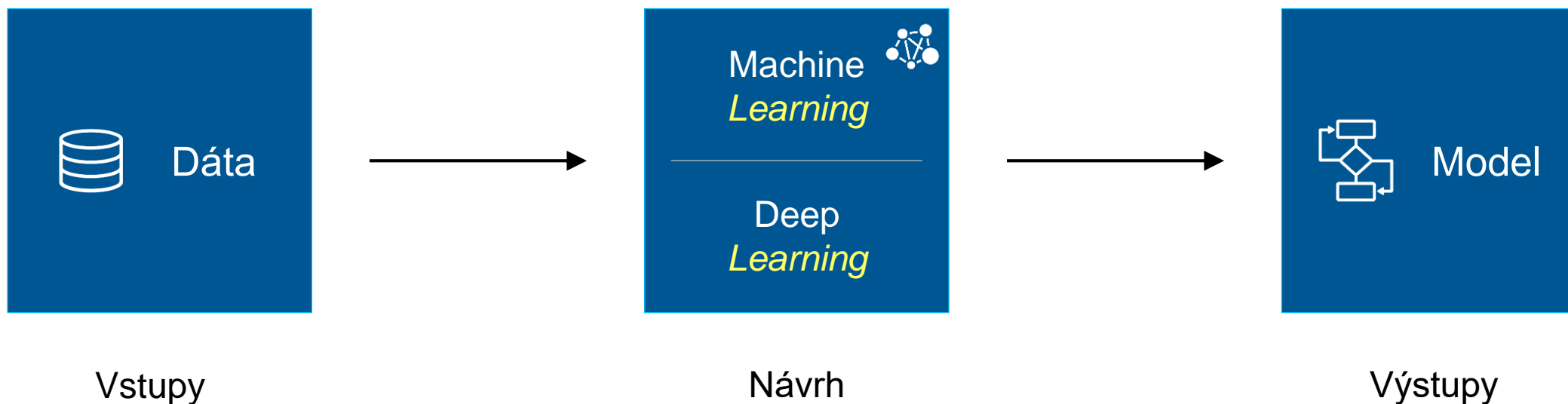
# MATLAB a Simulink na Reinforcement Learning



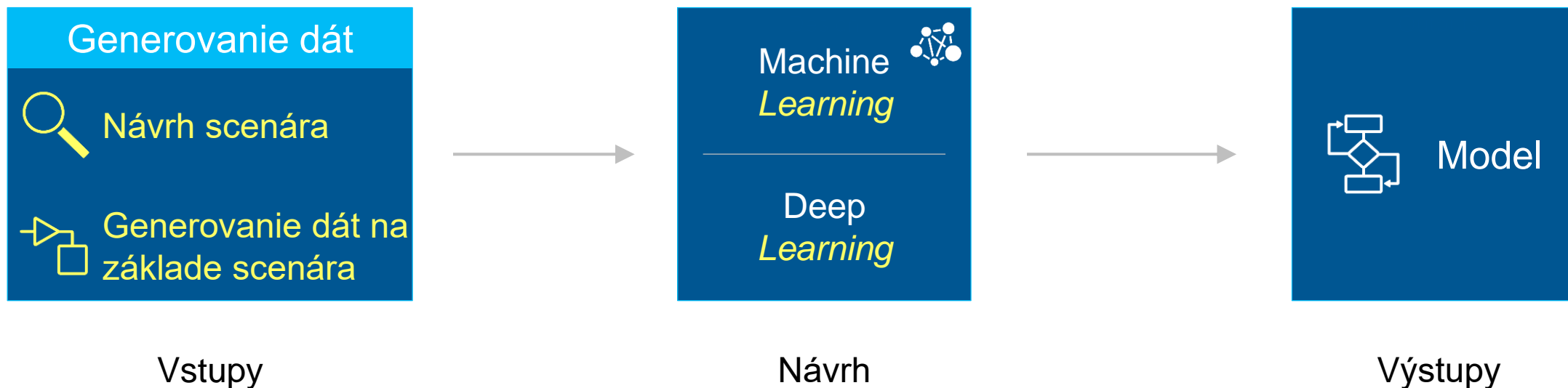
# MATLAB a Simulink na Reinforcement Learning



# MATLAB a Simulink na Reinforcement Learning

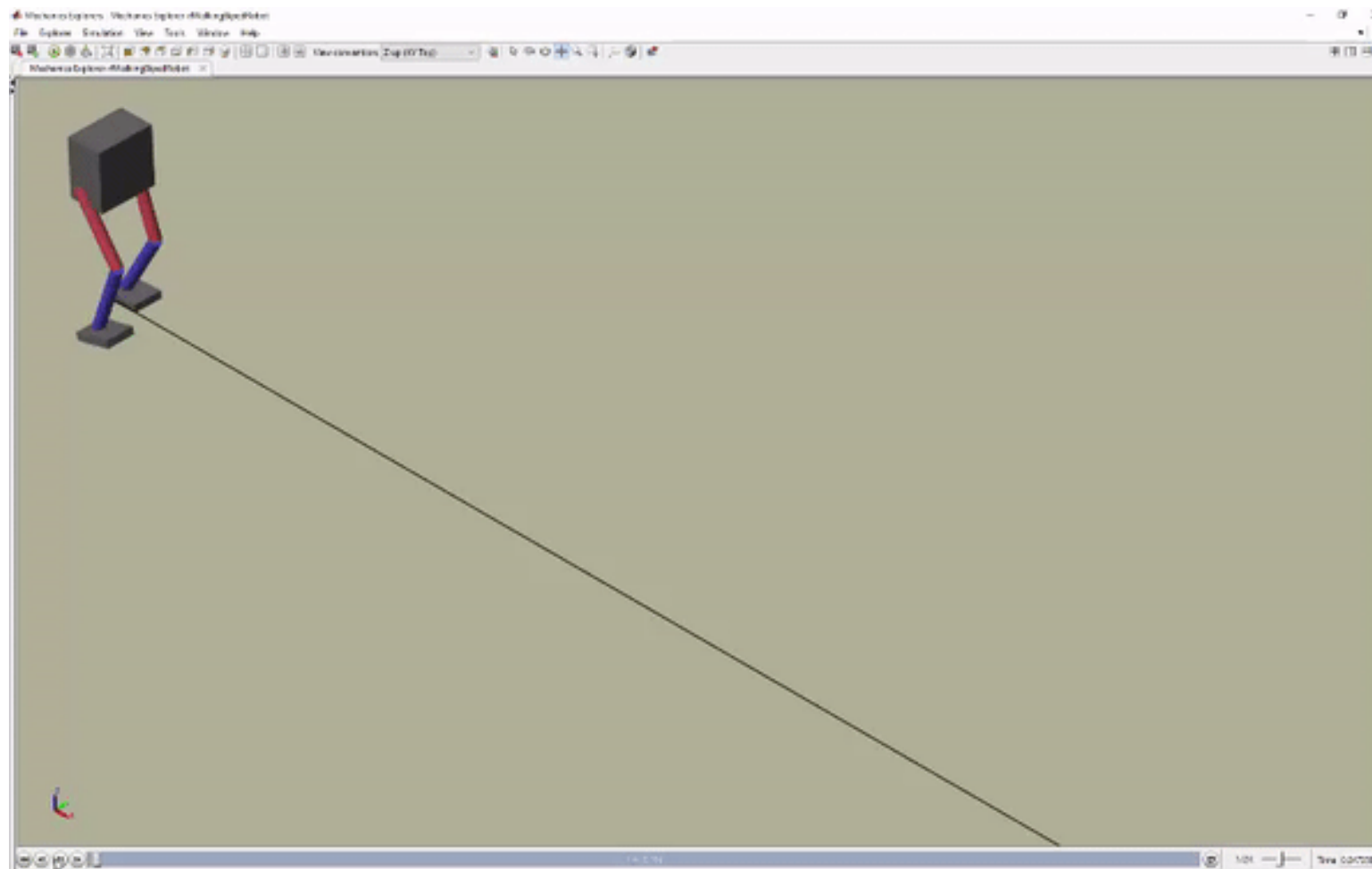


# MATLAB a Simulink na Reinforcement Learning





# MATLAB a Simulink na Reinforcement Learning



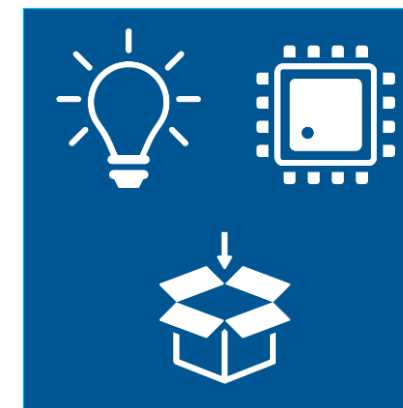
# Využitie MATLABu a Simulinku na tvorbu algoritmov



Vstupy



Návrh



Výstupy



MATLAB® & SIMULINK®



# Práca s textom

```

Vehicle_Repairs.csv x +
Dept,JobDate,jobno,Vehicleid,UnitNo,Reason,Notes,CostParts,CostLabor,CostTotal
1020,01/06/2015 12:00:00 AM,14073,118743,14,04 DRIVER'S REPORT,"PM SERVICE, CHECK TURN SIGNAL, CLUNKING NOISE WHEN DRIVING",493.85,0,493.85
1020,01/14/2015 12:00:00 AM,14232,230973,13,08 PM SERVICE ***,"SERVICEROB,EXT,5604",38.869999999999997,0,38.869999999999997
2111,01/02/2015 12:00:00 AM,14006,1243,116,04 DRIVER'S REPORT,NEED 4 PLOW PINS,45,0,45
2111,01/02/2015 12:00:00 AM,14140,B39109 ,178,04 DRIVER'S REPORT,INSTALL SPINNER ASSY,0,0,0
2111,01/03/2015 12:00:00 AM,14163,574950,215,13 SNOW BREAKDOWN,DONT START,0,0,0
2111,01/05/2015 12:00:00 AM,14169,A00413 ,283,04 DRIVER'S REPORT,DOG BONE PIN BROKEN,20,0,20
2111,01/06/2015 12:00:00 AM,14000,766153,248,08 PM SERVICE ***,"NEED SERVICE, CHECK BRAKES",387.17,0,387.17
2111,01/06/2015 12:00:00 AM,14155,525670,232,04 DRIVER'S REPORT,HYD CAP CHECK ENGINE LIGHT ON,12.95,0,12.95
2111,01/06/2015 12:00:00 AM,14157,621909,213,40 NEGLIGENCE,TARP VALVE STICKINGRIGHT SIDE MIRROR BRACKET BROKEN,50.02,0,50.02
2111,01/06/2015 12:00:00 AM,14164,1226,117,13 SNOW BREAKDOWN,HANDLES IN CAB LOOSE,0,0,0
2111,01/06/2015 12:00:00 AM,14165,525999,114,04 DRIVER'S REPORT,NO PLOW LIGHTS,0,0,0
2111,01/06/2015 12:00:00 AM,14172,B34632 ,276,10 ROADCALL,WILL NOT START,0,0,0
2111,01/06/2015 12:00:00 AM,14174,1469,122,10 ROADCALL,WILL NOT START,0,0,0
2111,01/06/2015 12:00:00 AM,14175,68932,147,10 ROADCALL,WILL NOT START,0,0,0
2111,01/06/2015 12:00:00 AM,14176,68933,148,10 ROADCALL,WILL NOT START,0,0,0
2111,01/06/2015 12:00:00 AM,14177,621907,208,10 ROADCALL,WILL NOT START,0,0,0
2111,01/06/2015 12:00:00 AM,14181,337657,218,04 DRIVER'S REPORT,CONVEORY NOT WORKING,0,0,0
2111,01/06/2015 12:00:00 AM,14182,D-1920 ,164,10 ROADCALL,DONT START,0,0,0
2111,01/06/2015 12:00:00 AM,14183,525998,217,10 ROADCALL,DONT START,0,0,0
2111,01/06/2015 12:00:00 AM,14184,526000,225,10 ROADCALL,DONT START,0,0,0
2111,01/06/2015 12:00:00 AM,14185,621921,214,04 DRIVER'S REPORT,CONVORY NOT WORKING,0,0,0
2111,01/07/2015 12:00:00 AM,14188,001469 ,201,04 DRIVER'S REPORT,needs def/jim f,0,0,0
2111,01/07/2015 12:00:00 AM,14190,337656,219,04 DRIVER'S REPORT,NEEDS FLOOR MATTS,65.069999999999993,0,65.069999999999993
2111,01/07/2015 12:00:00 AM,14191,B34632 ,276,10 ROADCALL,DONT START,0,0,0
2111,01/07/2015 12:00:00 AM,14196,1222,118,04 DRIVER'S REPORT,HARDWARE FOR REAR SPRINGS,14.32,0,14.32
2111,01/07/2015 12:00:00 AM,14199,52565,626,04 DRIVER'S REPORT,WASHER FLUIDDEF,28.88,0,28.88
2111,01/09/2015 12:00:00 AM,14107,1467,121,08 PM SERVICE ***,"REMOVE & REPLACE REAR SPRINGS, CHECK COOLANT TUBESPM SERVICE",4697.55,0,4

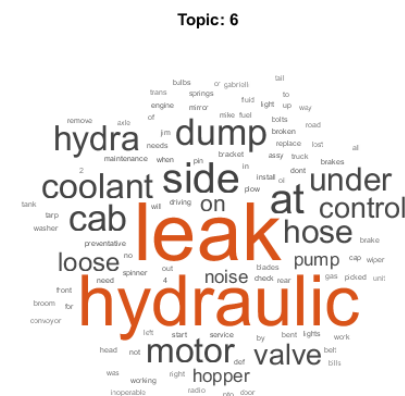
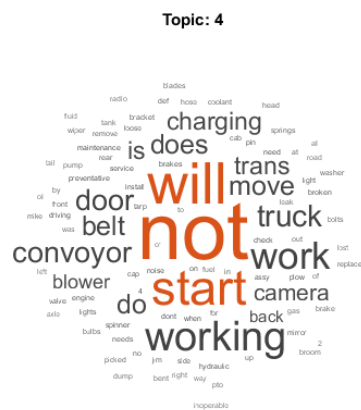
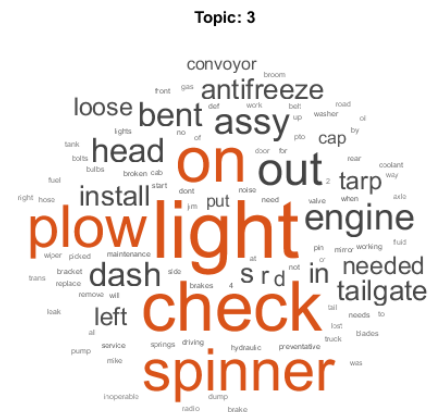
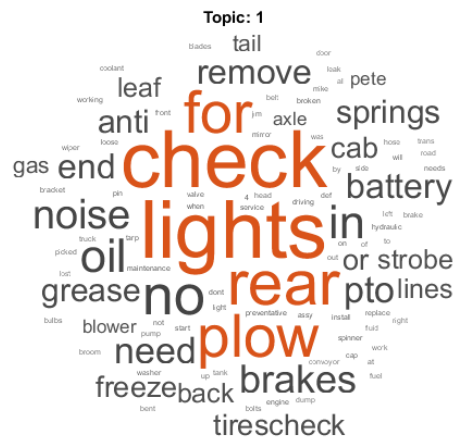
```

# Práca s textom

```
t = readtable(filename, 'TextType', 'string');
disp(t(1:20,6:7))
```

	Reason		Notes
"04	DRIVER'S REPORT"		"PM SERVICE, CHECK TURN SIGNAL, CLUNKING NOISE WHEN DRIVING"
"08	PM SERVICE	***"	"SERVICEROB,EXT,5604"
"04	DRIVER'S REPORT"		"NEED 4 PLOW PINS"
"04	DRIVER'S REPORT"		"INSTALL SPINNER ASSY"
"13	SNOW BREAKDOWN"		"DONT START"
"04	DRIVER'S REPORT"		"DOG BONE PIN BROKEN"
"08	PM SERVICE	***"	"NEED SERVICE, CHECK BRAKES"
"04	DRIVER'S REPORT"		"HYD CAP CHECK ENGINE LIGHT ON"
"40	NEGLIGENCE"		"TARP VALVE STICKINGRIGHT SIDE MIRROR BRACKET BROKEN"
"13	SNOW BREAKDOWN"		"HANDLES IN CAB LOOSE"
"04	DRIVER'S REPORT"		"NO PLOW LIGHTS"
"10	ROADCALL"		"WILL NOT START"
"10	ROADCALL"		"WILL NOT START"
"10	ROADCALL"		"WILL NOT START"
"10	ROADCALL"		"WILL NOT START"
"10	ROADCALL"		"WILL NOT START"
"04	DRIVER'S REPORT"		"CONVEORY NOT WORKING"
"10	ROADCALL"		"DONT START"
"10	ROADCALL"		"DONT START"
"10	ROADCALL"		"DONT START"

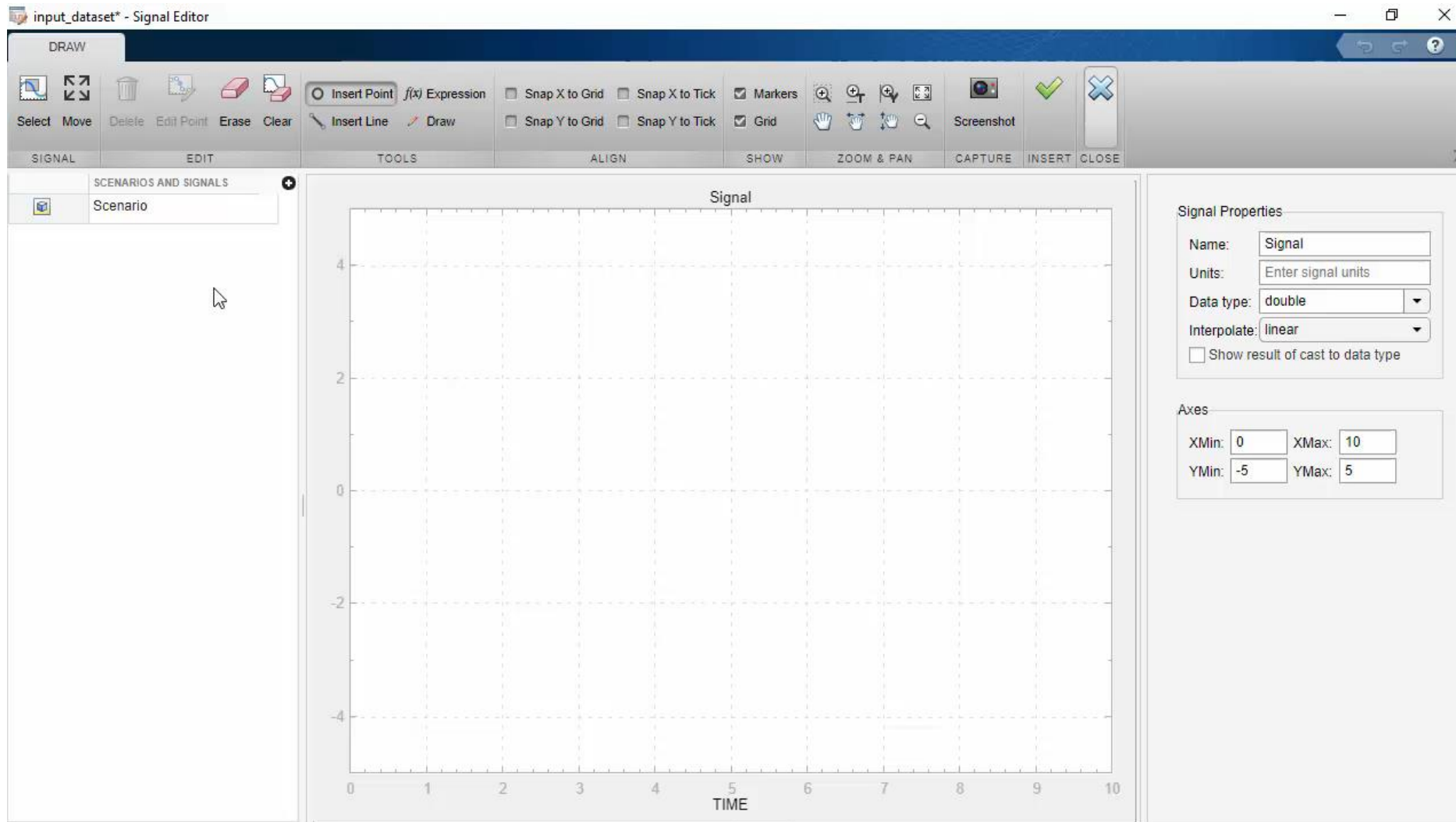
# Práce s textom



Deep Learning Toolbox  
 Statistics and Machine Learning Toolbox  
 Text Analytics Toolbox  
 MATLAB



# Tvorba vlastných dát



The screenshot shows the 'Signal Editor' window for 'input\_dataset\*'. The interface includes a toolbar with various drawing and editing tools, a central plot area, and a properties panel on the right.

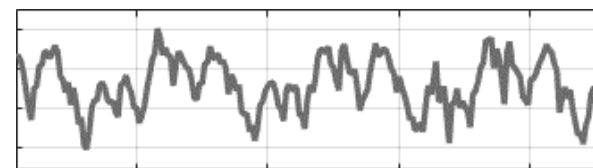
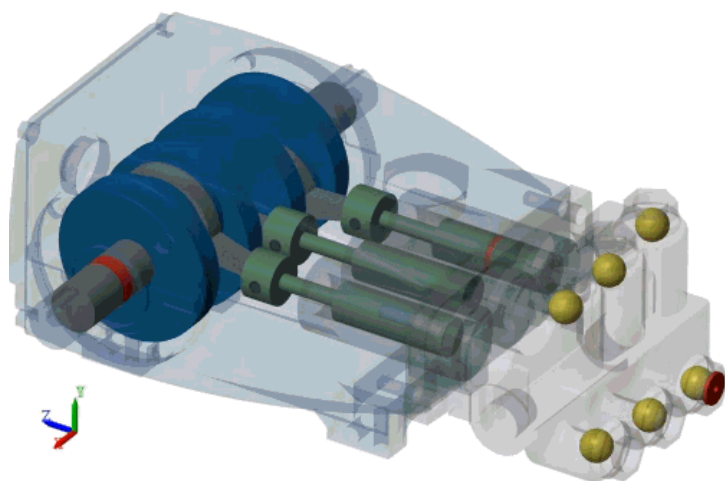
**Signal Properties:**

- Name: Signal
- Units: Enter signal units
- Data type: double
- Interpolate: linear
- Show result of cast to data type

**Axes:**

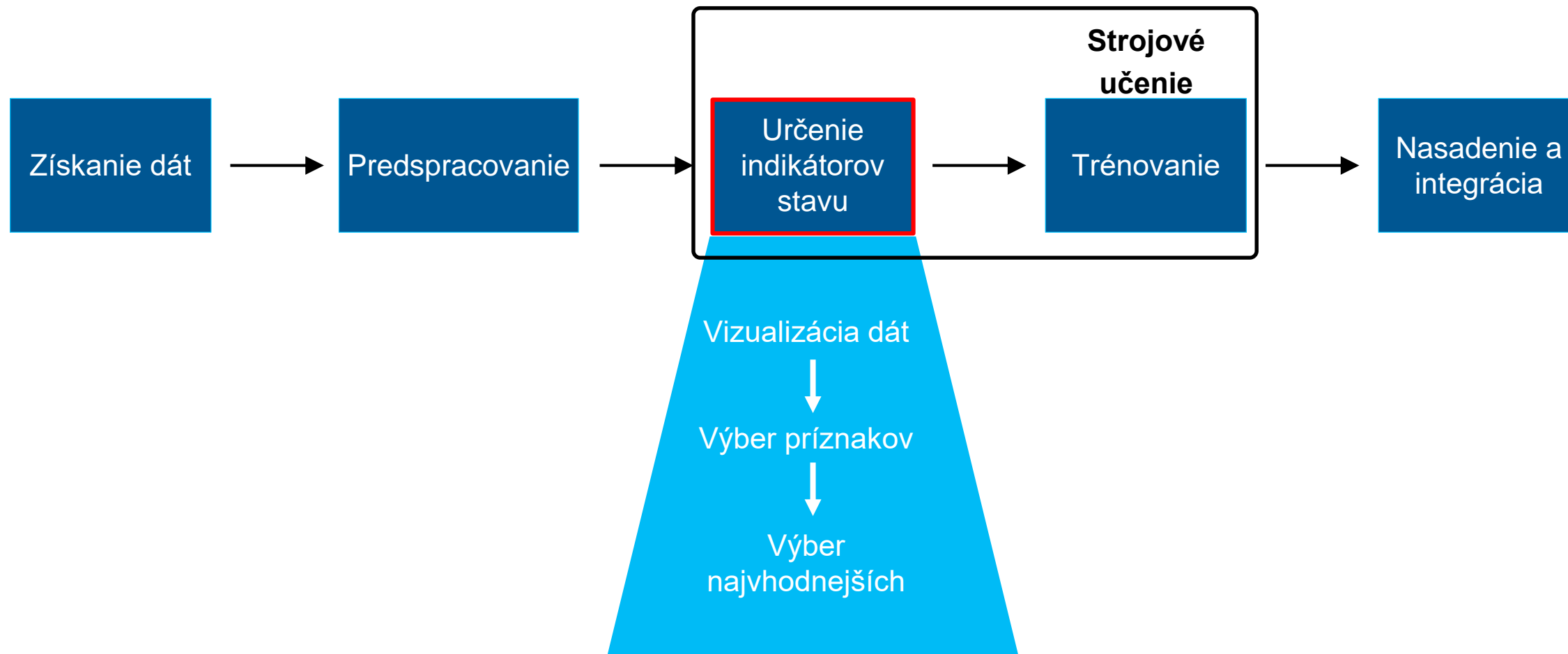
- XMin: 0, XMax: 10
- YMin: -5, YMax: 5

The central plot area is titled 'Signal' and shows a grid with the x-axis labeled 'TIME' ranging from 0 to 10 and the y-axis ranging from -4 to 4.

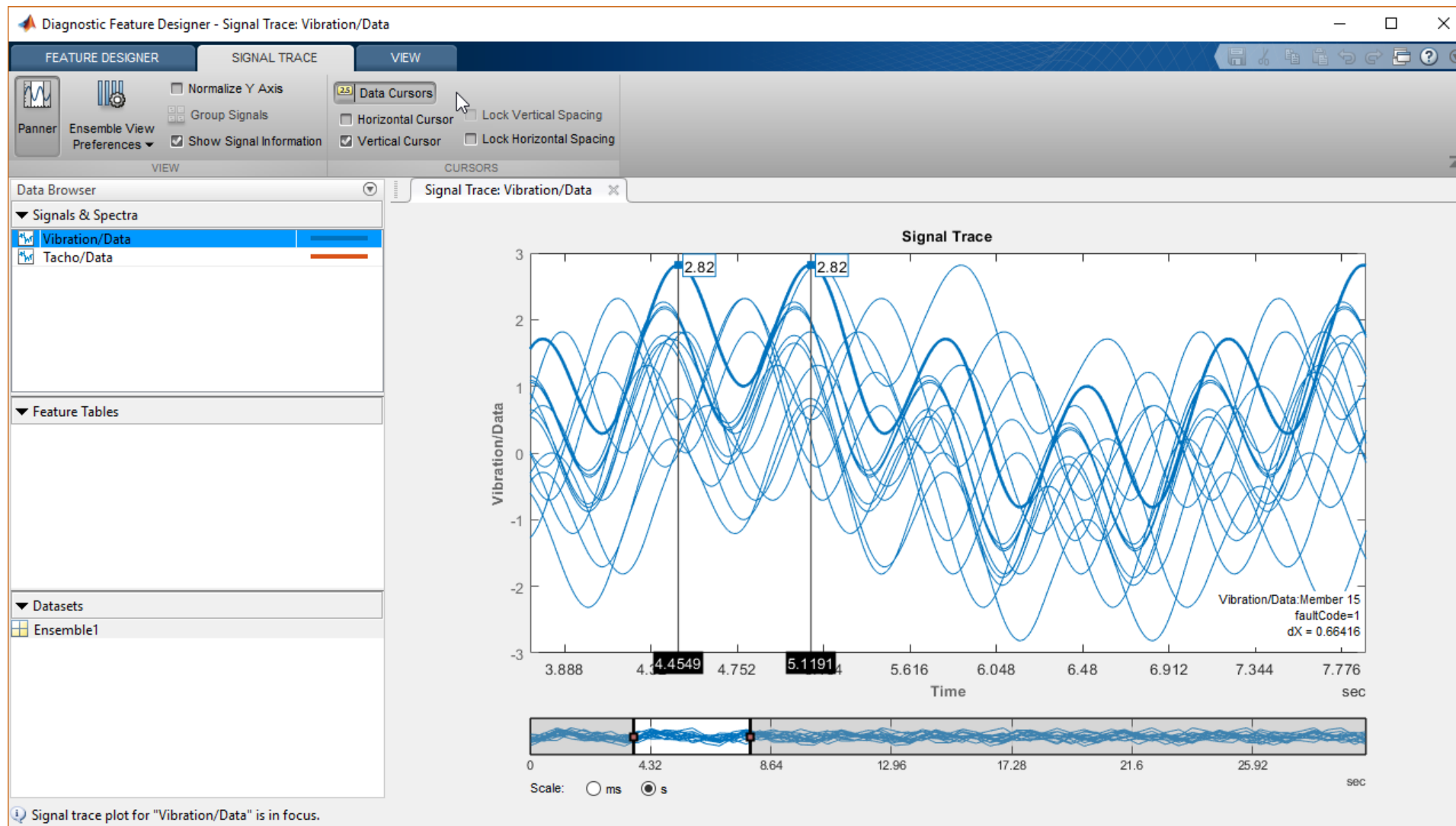




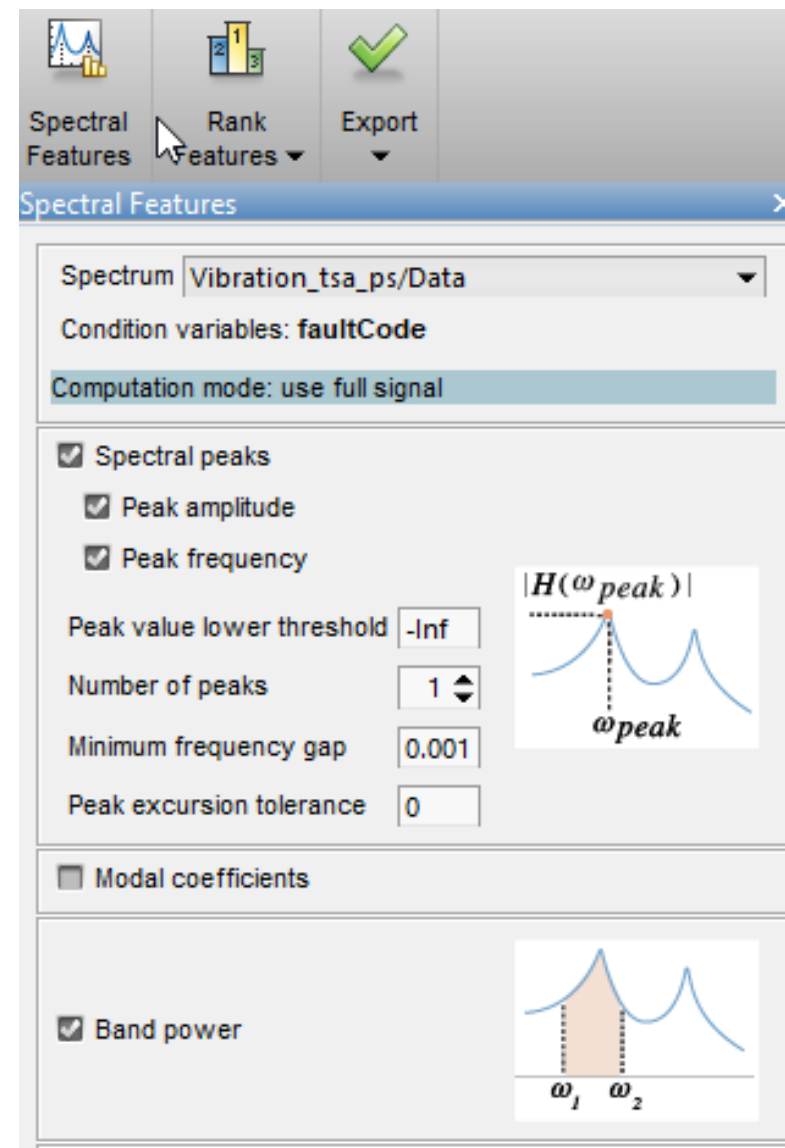
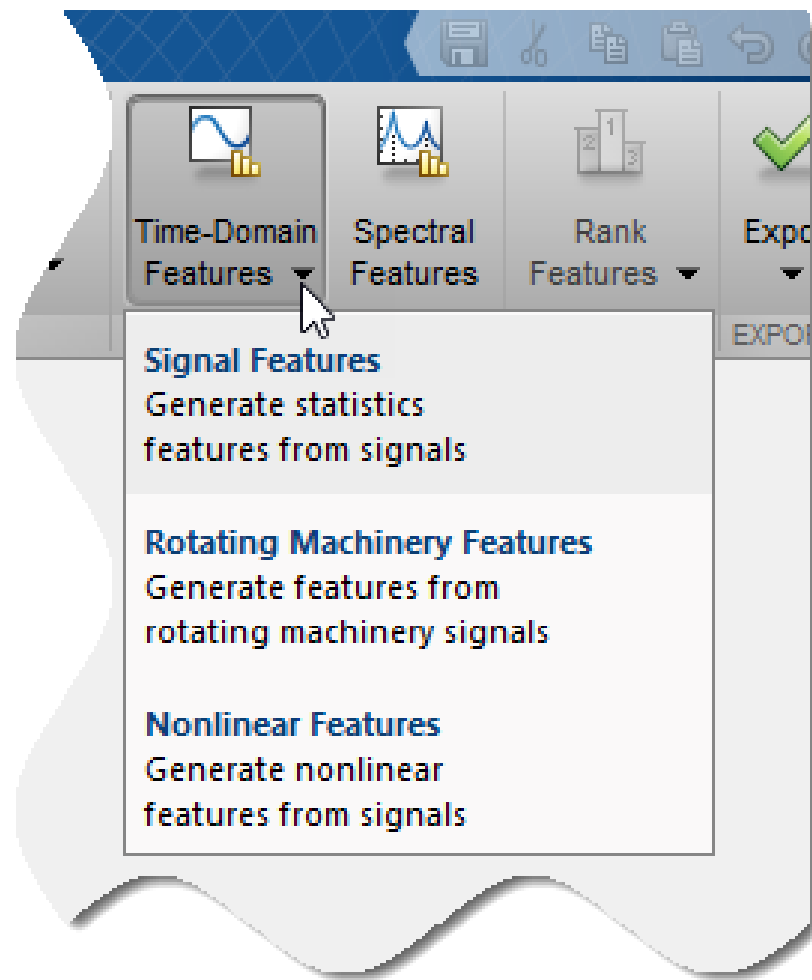
# Identifikácia užitočných dát



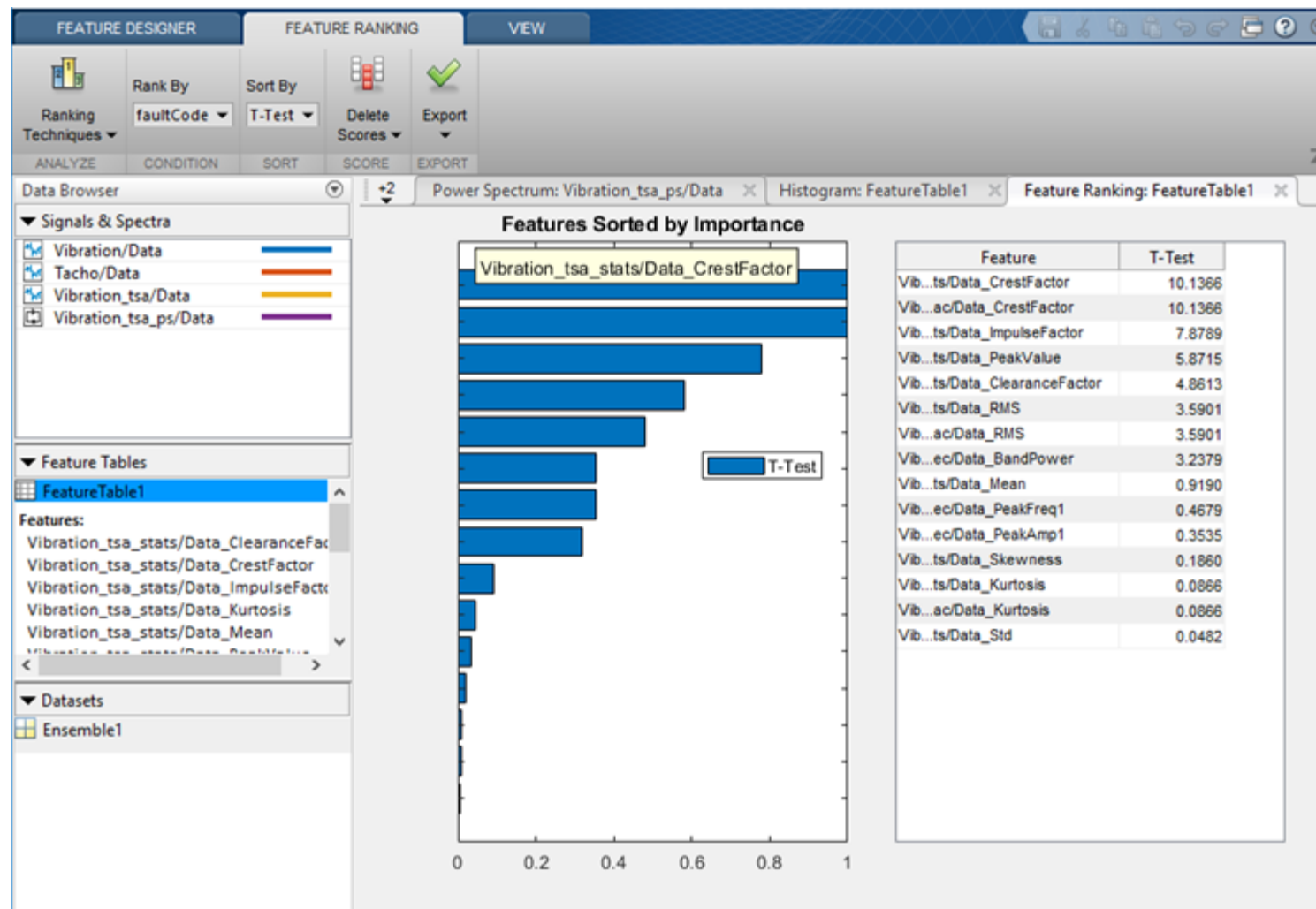
# Identifikácia užitočných dát



# Identifikácia užitočných dát



# Identifikácia užitočných dát

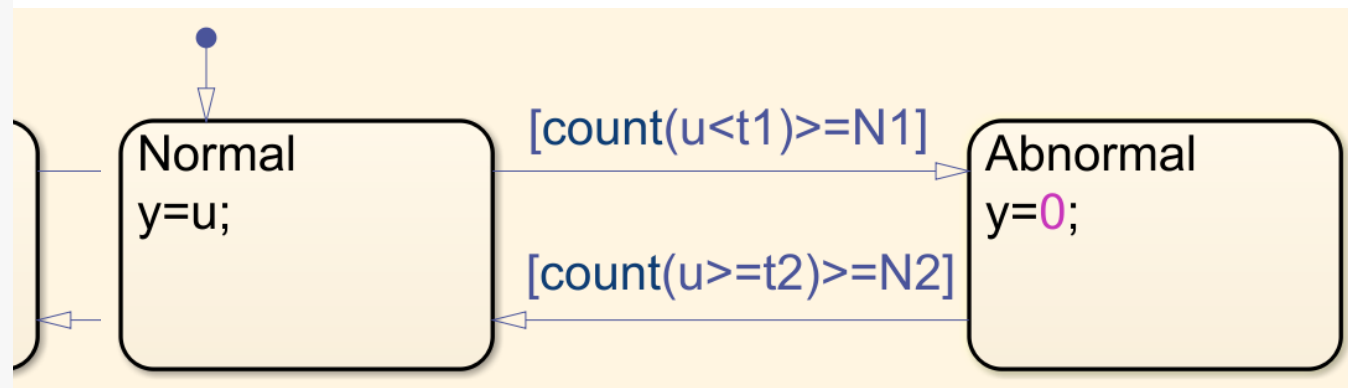


# Návrh rozhodovacej logiky v MATLABe (Stateflow)

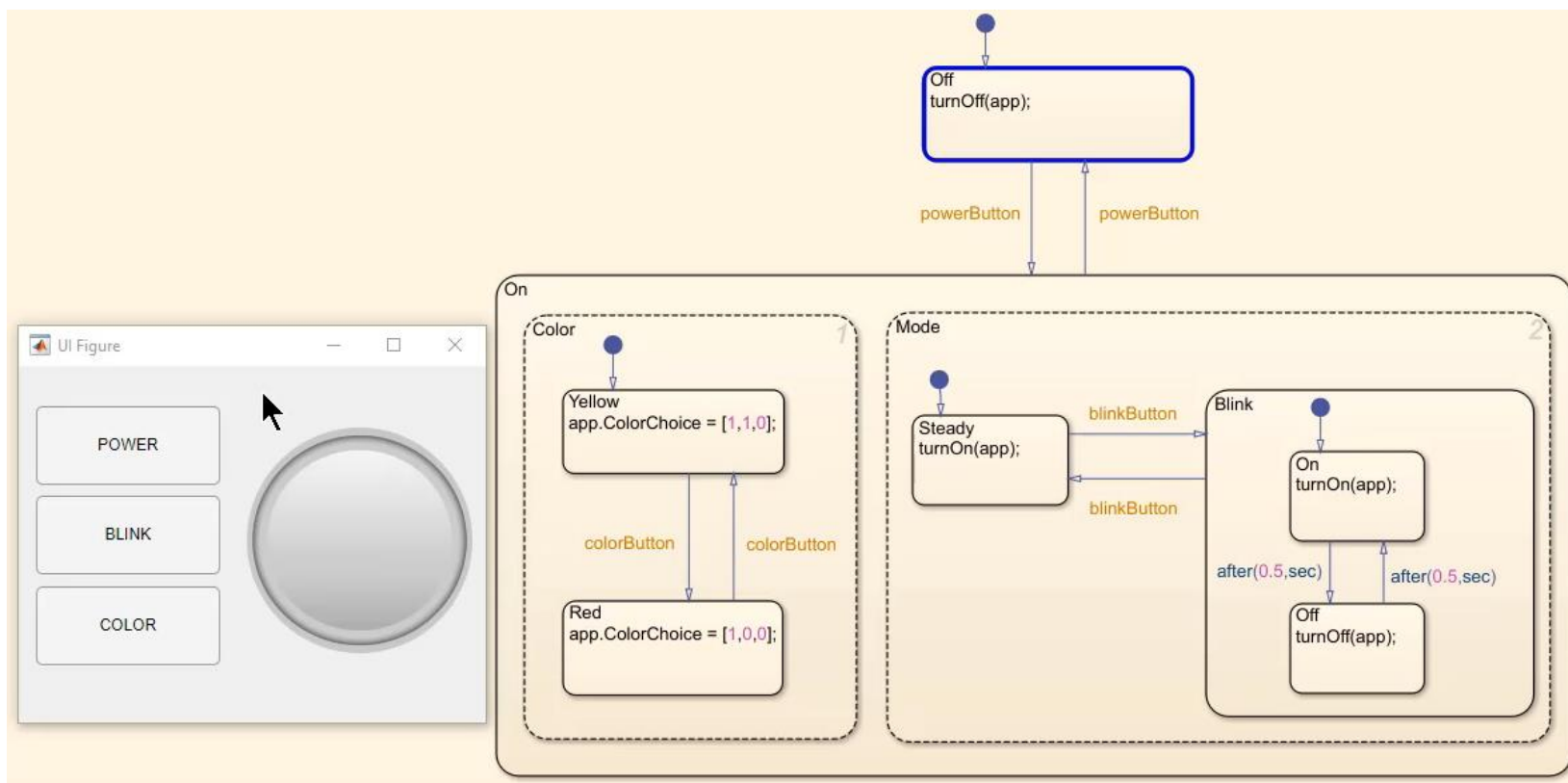
```

inNormalRegion = true;
counter = 0;
for i=1:length(inData)
    if(inNormalRegion)
        if(inData(i)<t1)
            counter = counter+1;
            if(counter>=N1)
                inNormalRegion = false;
            end
        else
            counter = 0;
        end
    else
        if(inData(i)>=t2)
            counter = counter+1;
            if(counter>=N2)
                inNormalRegion = true;
            end
        else
            counter = 0;
        end
    end
    if(inNormalRegion)
        outData(i) = inData(i);
    else
        outData(i) = 0;
    end
end
end

```



# Návrh rozhodovacej logiky v MATLABe (Stateflow)



```

% Callbacks that handle component events
methods (Access = private)

% Code that executes after component creation
function startupFcn(app)
    app.LanternLogic = BlinkLanternLogic('app',app);
end

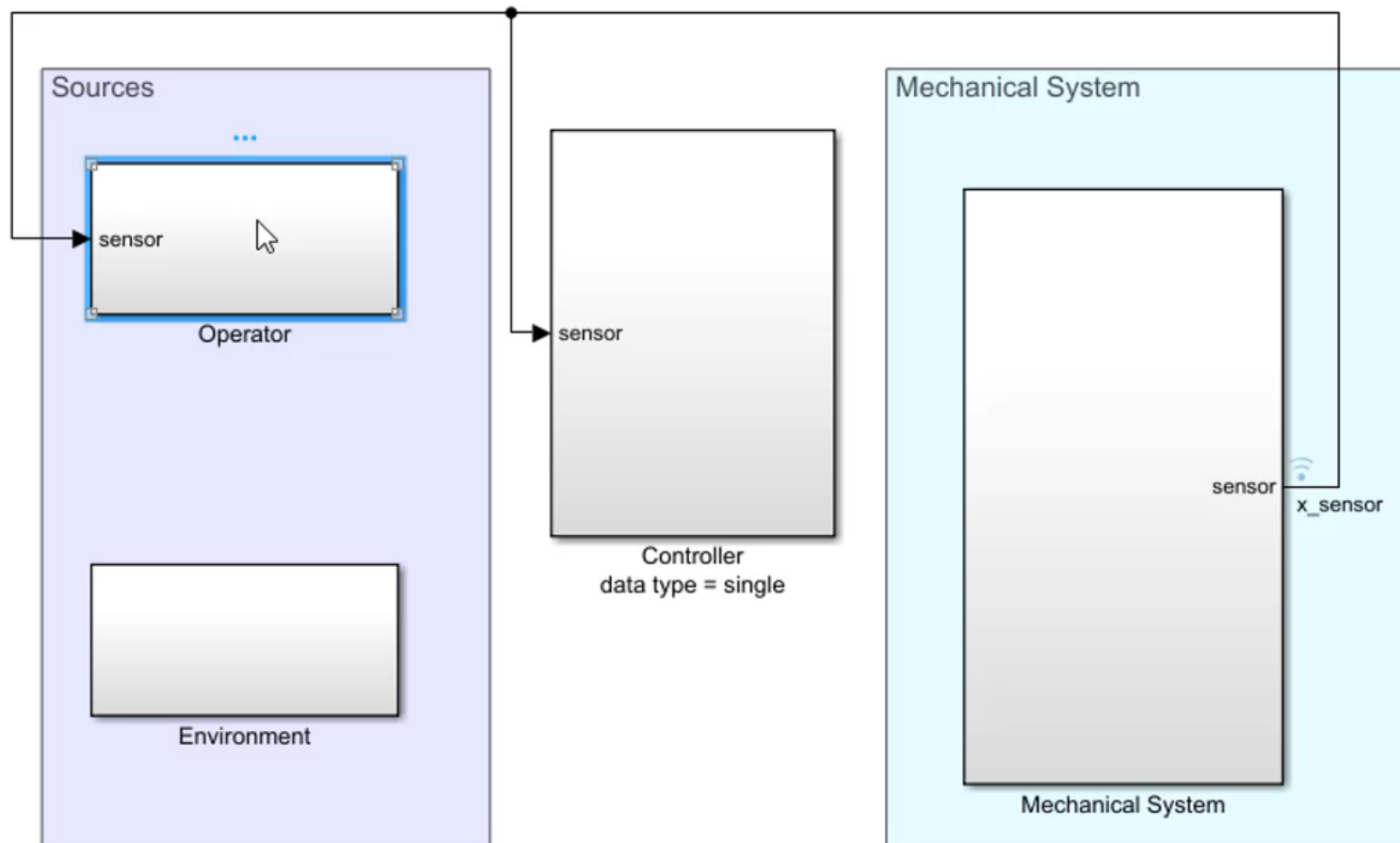
% Button pushed function: POWERButton
function POWERButtonPushed(app, event)
    app.LanternLogic.powerButton();
end

% Button pushed function: COLORButton
function COLORButtonPushed(app, event)
    app.LanternLogic.colorButton();
end

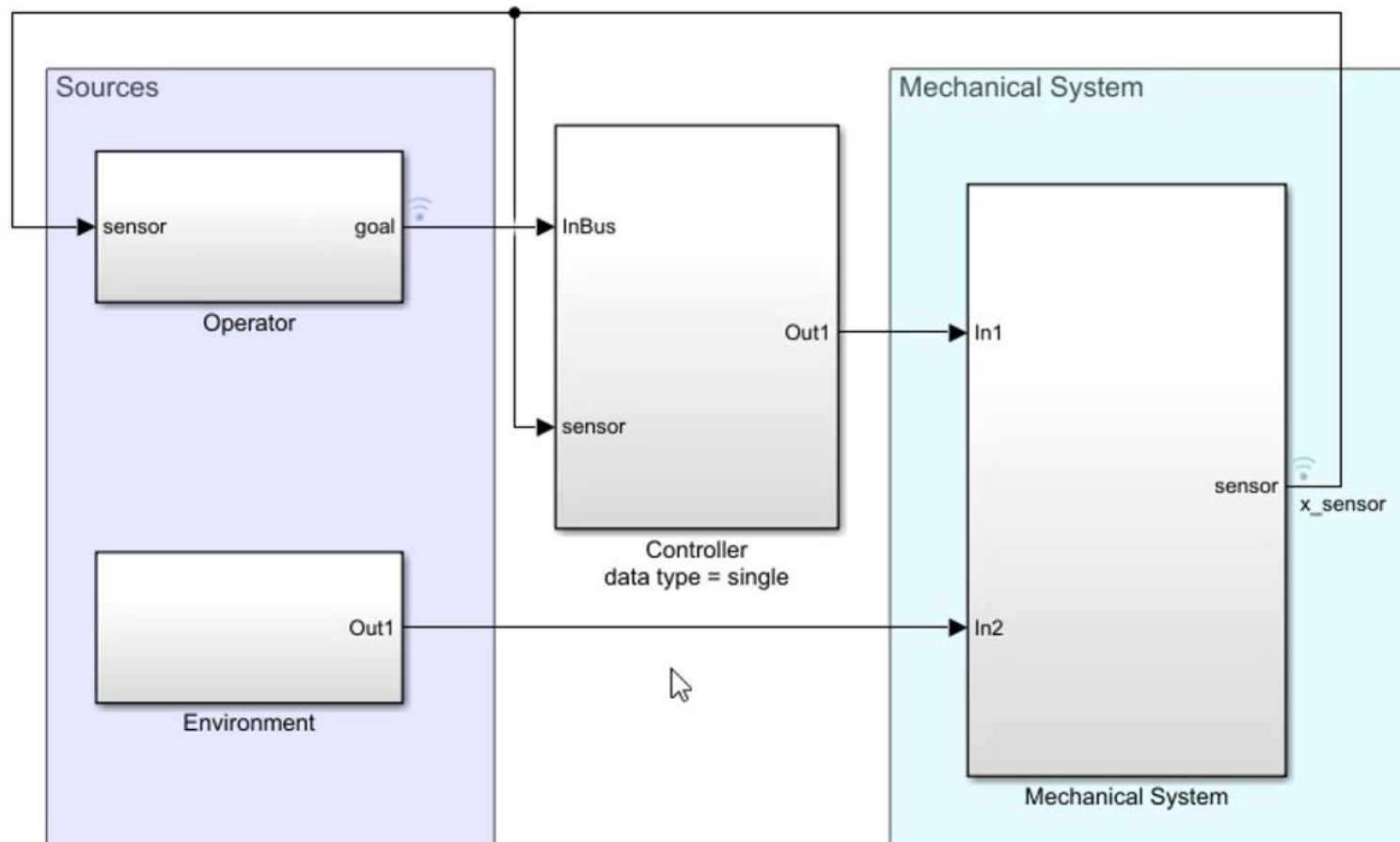
% Close request function: UIFigure
function UIFigureCloseRequest(app, event)
    delete(app.LanternLogic);
    delete(app);
end

% Button pushed function: BLINKButton
function BLINKButtonPushed(app, event)
    app.LanternLogic.blinkButton();
end
end
    
```

# Rýchle editovanie

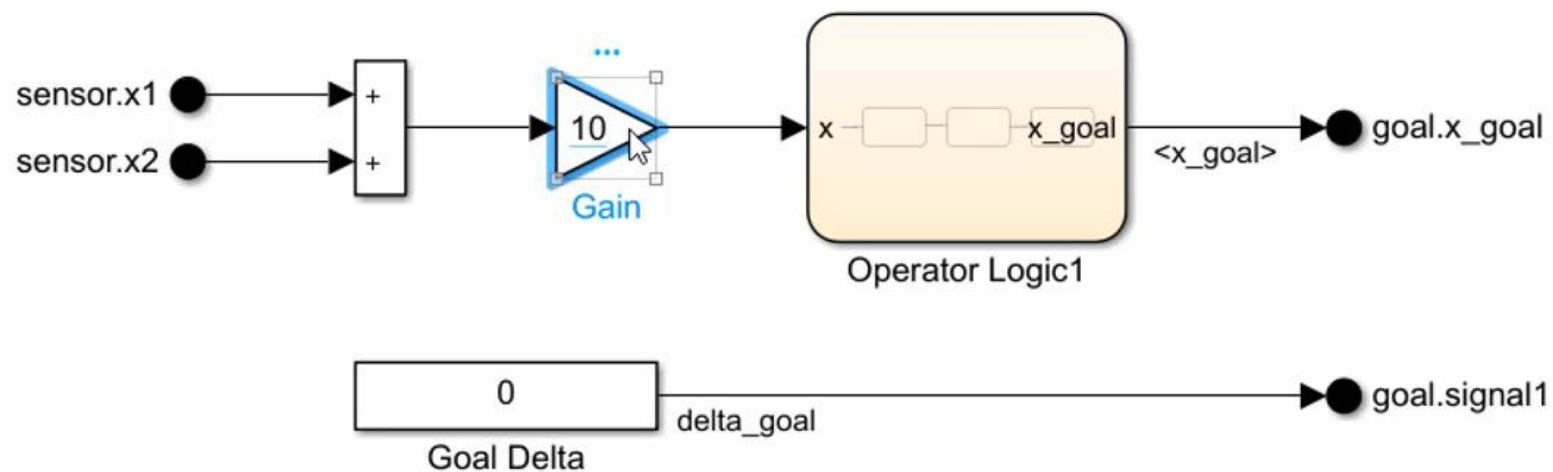


# Rýchle editovanie

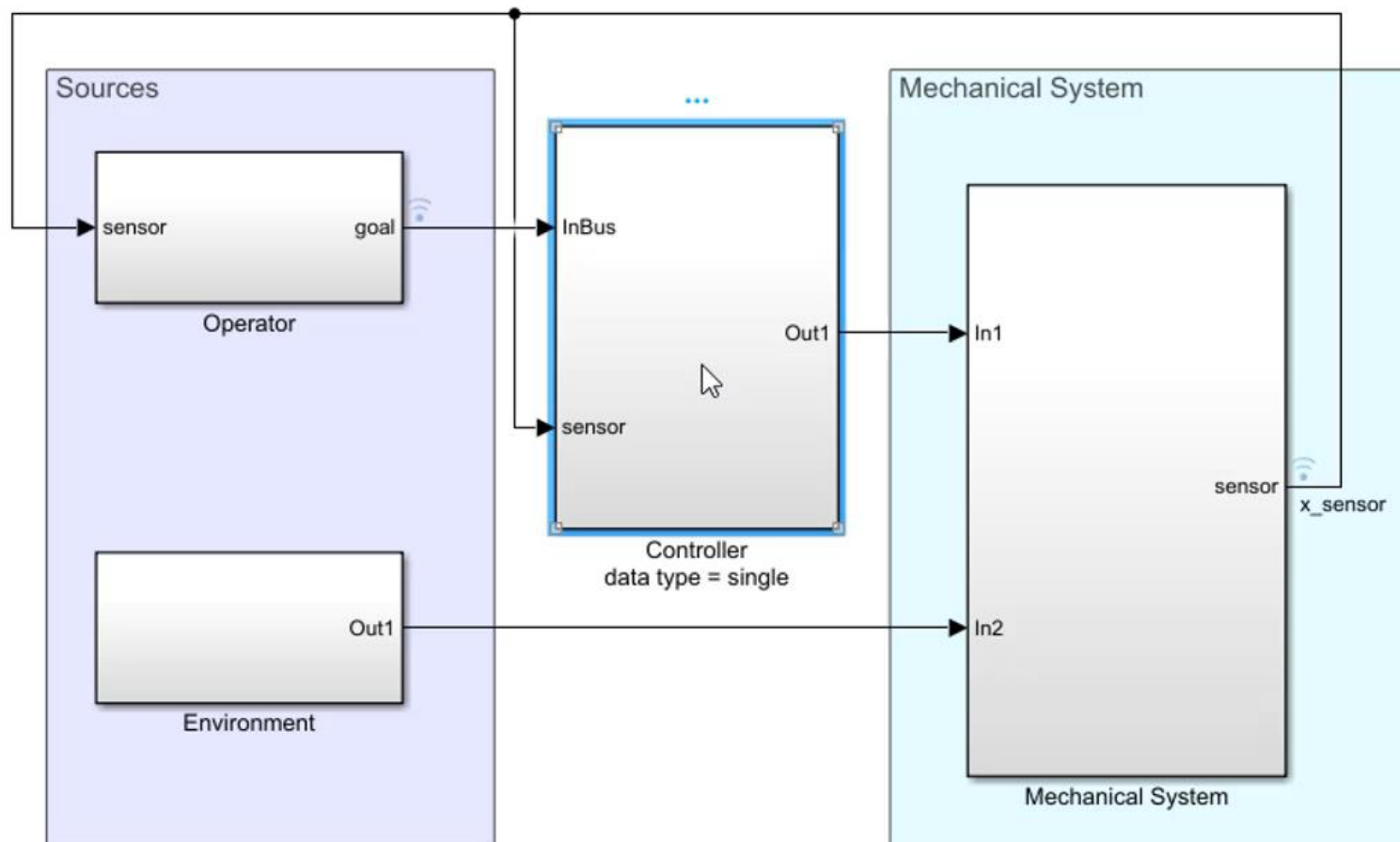




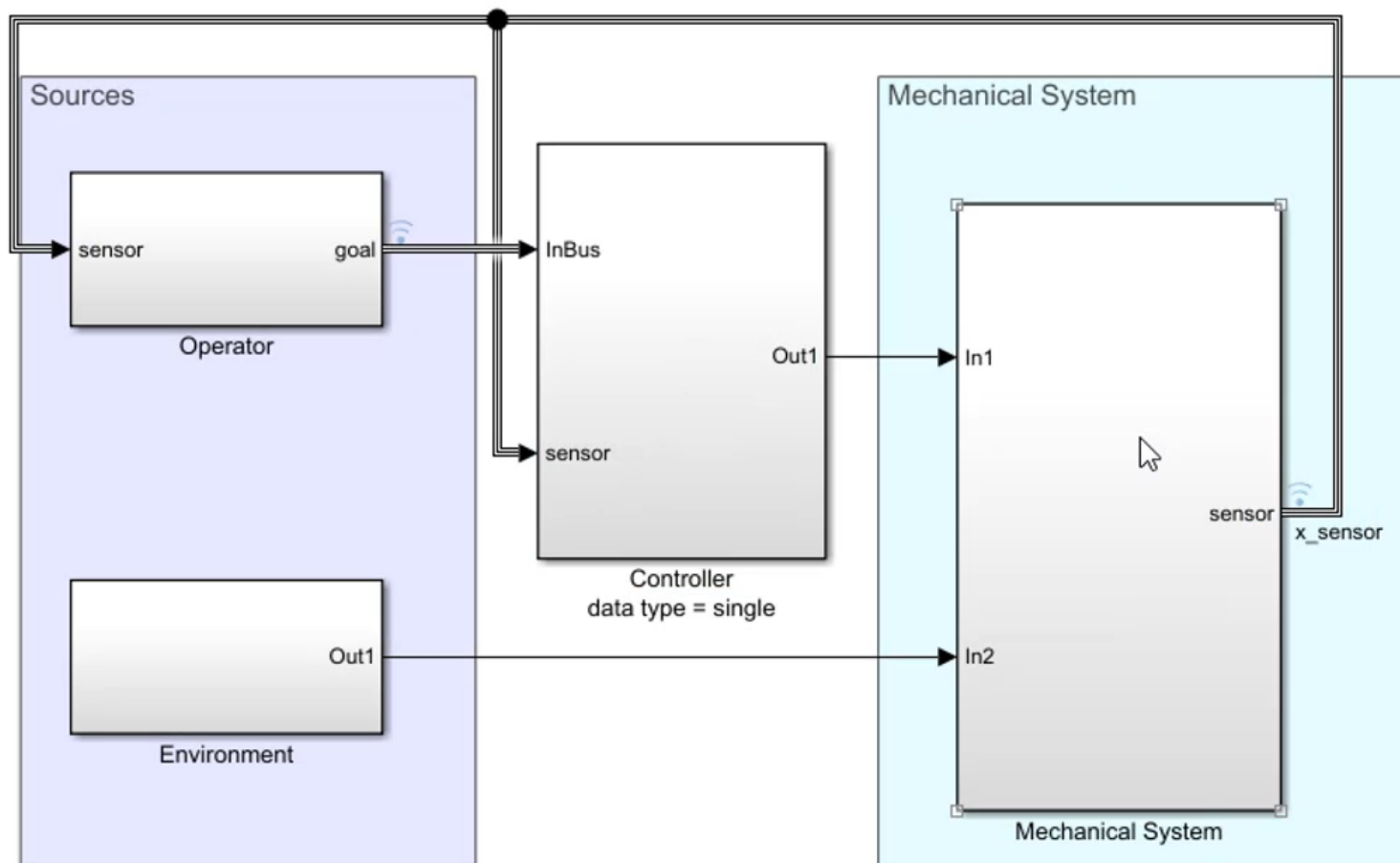
# Rýchle editovanie



# Rýchle editovanie

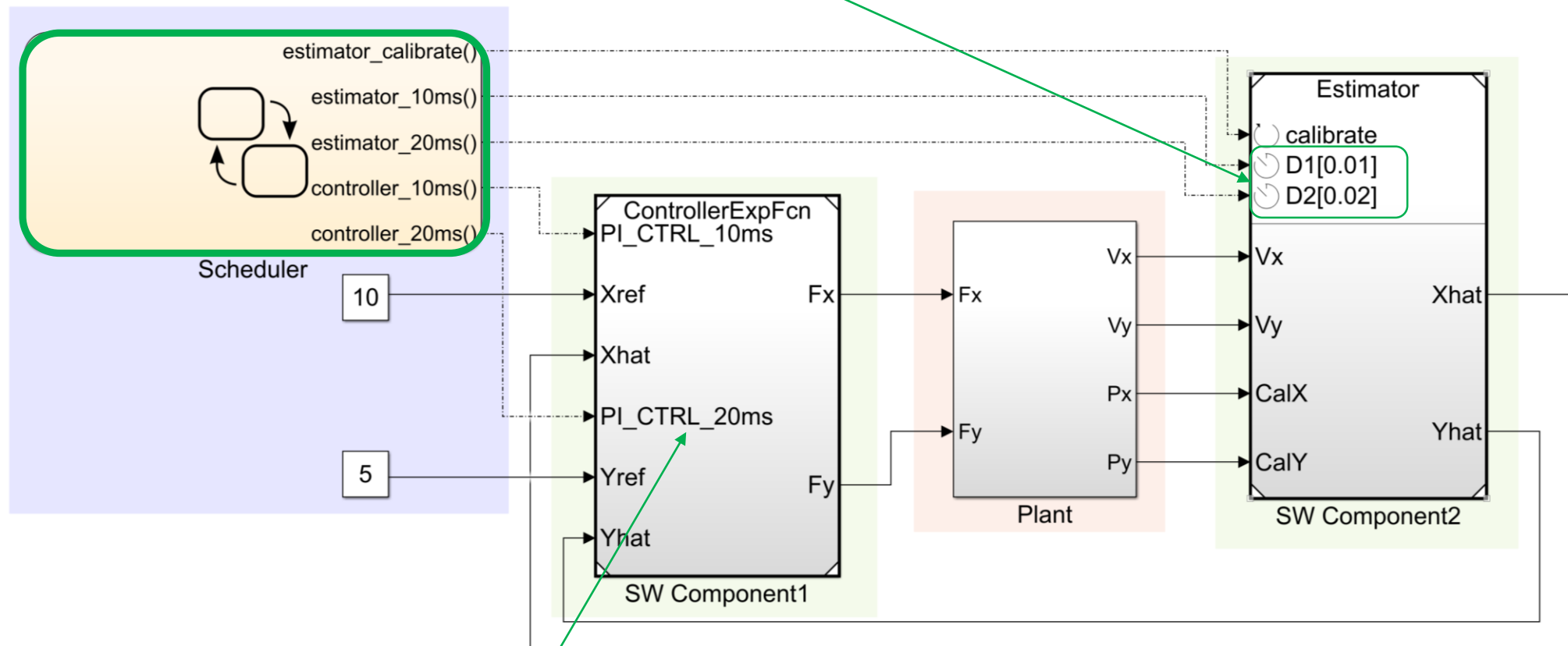


# Rýchle editovanie



# Riadenie vykonávania komponentov

## Schedulable Rate-Based Model



## Export Function Model

# Riadenie vykonávania komponentov

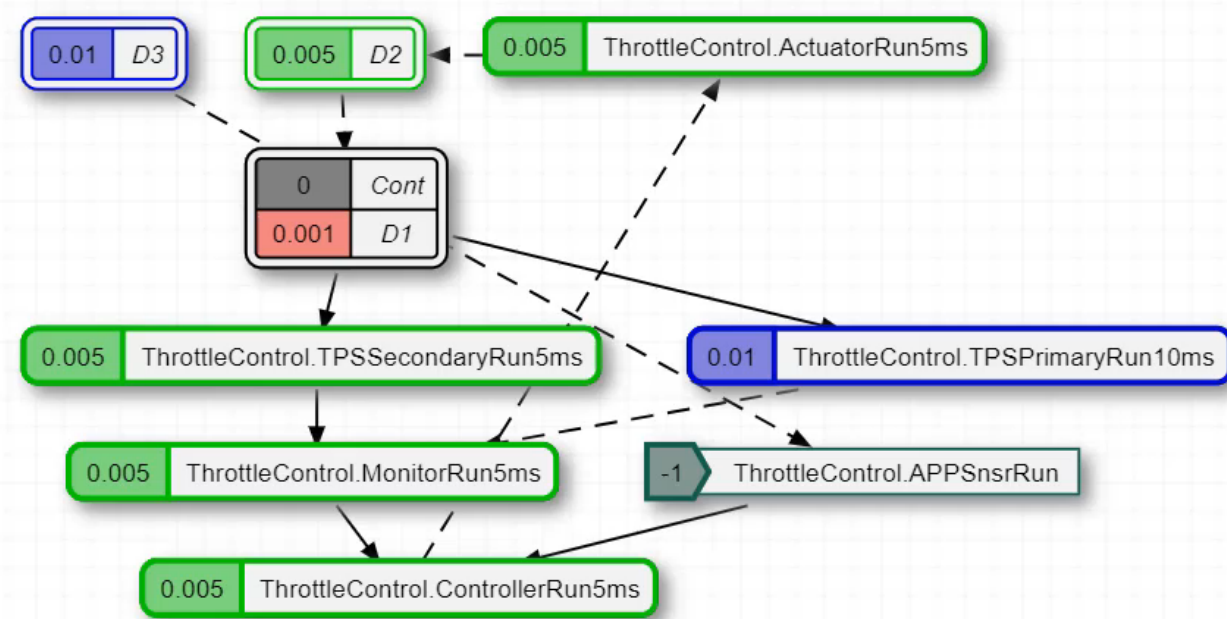
ThrottlePositionControlTop: Schedule Editor

SCHEDULE EDITOR

Manage Partitions Execution Order Update Diagram Highlight Arrange Timing Legend Layout

PARTITIONS EXECUTION MODEL DISPLAY VIEW

LEGEND



EXECUTION ORDER

Order	Name	Rate
1	Cont	0
	D1	0.001
2	D2	0.005
3	ThrottleControl.APPSnsrRun	-1
4	ThrottleControl.ActuatorRun5ms	0.005
5	ThrottleControl.TPSSecondaryRun5ms	0.005
6	ThrottleControl.MonitorRun5ms	0.005
7	ThrottleControl.ControllerRun5ms	0.005
8	D3	0.01
9	ThrottleControl.TPSPrimaryRun10ms	0.01

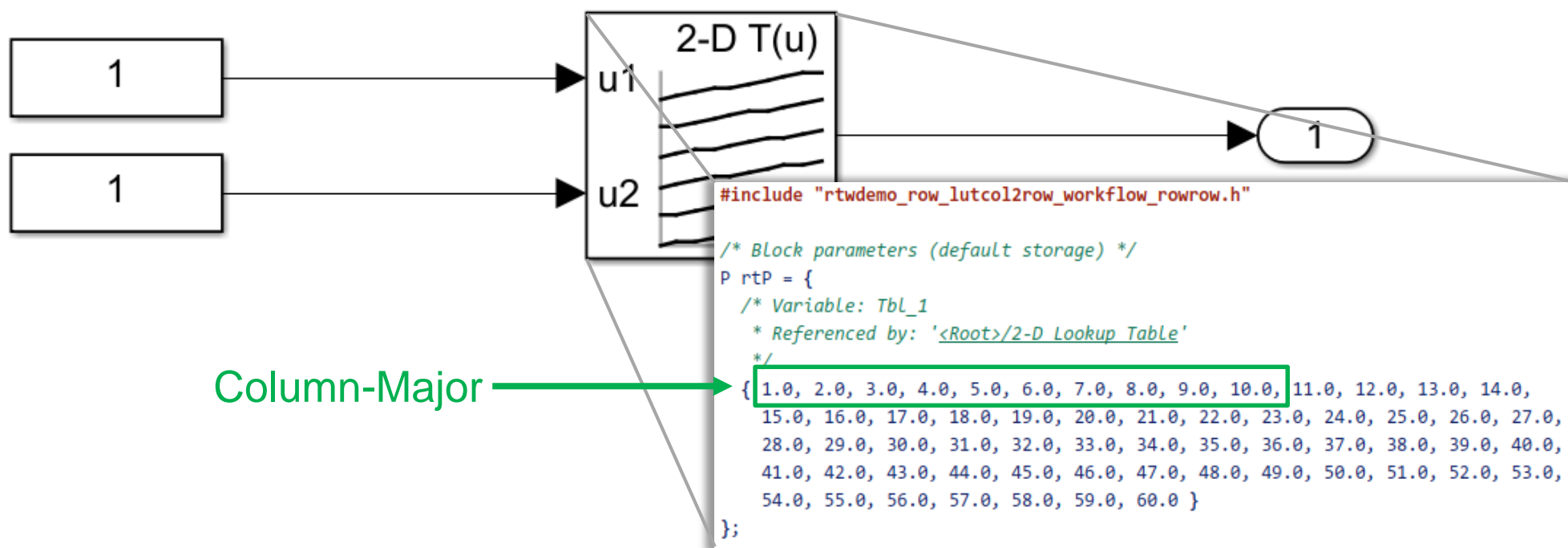
PROPERTY INSPECTOR

Partition

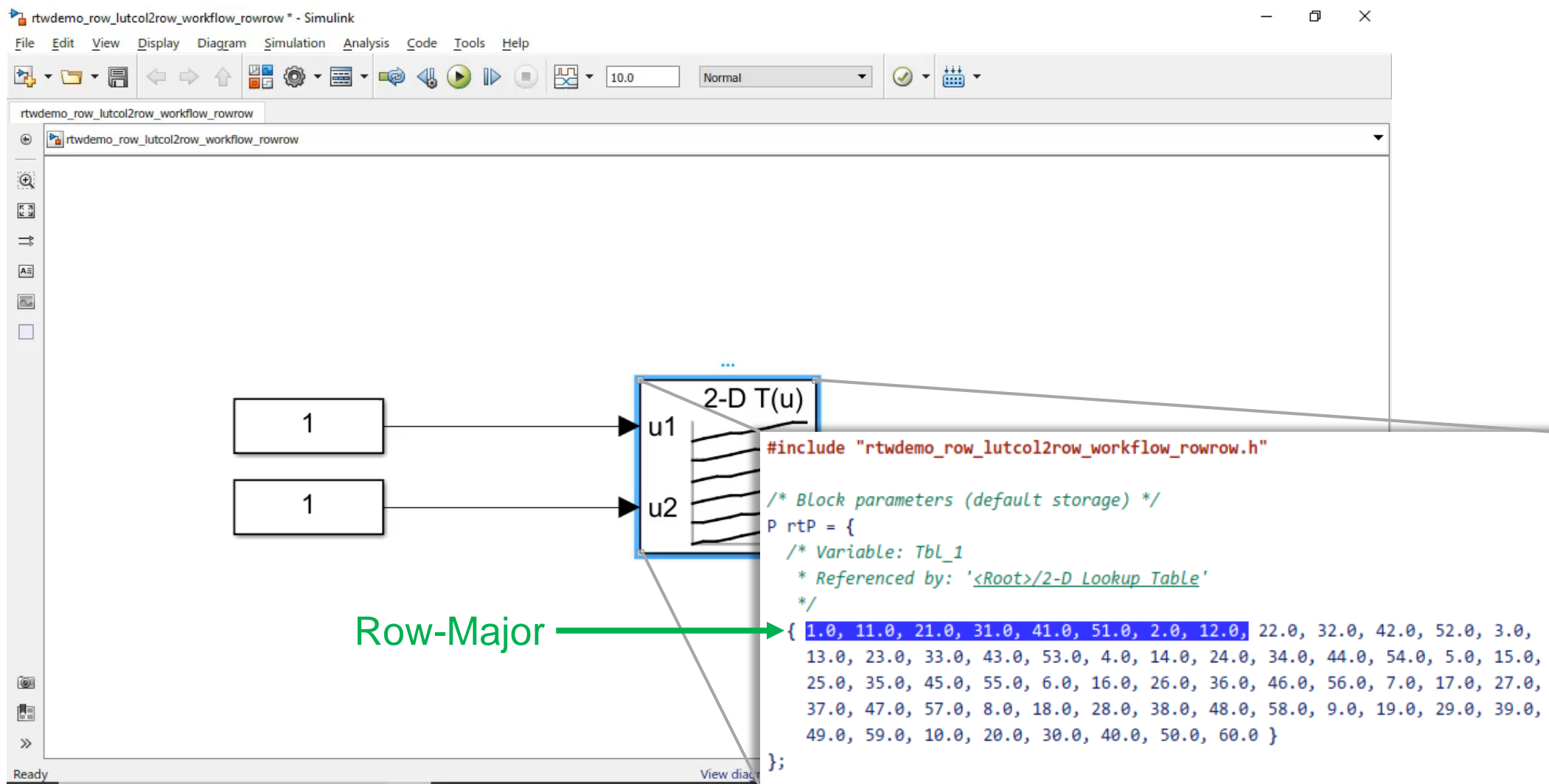
Name	D3
Rate	0.01
Type	Implicit periodic partition

MANAGE PARTITIONS

# Zjednodušená integrácia s externým C/C++ kódom



# Zjednodušená integrácia s externým C/C++ kódom



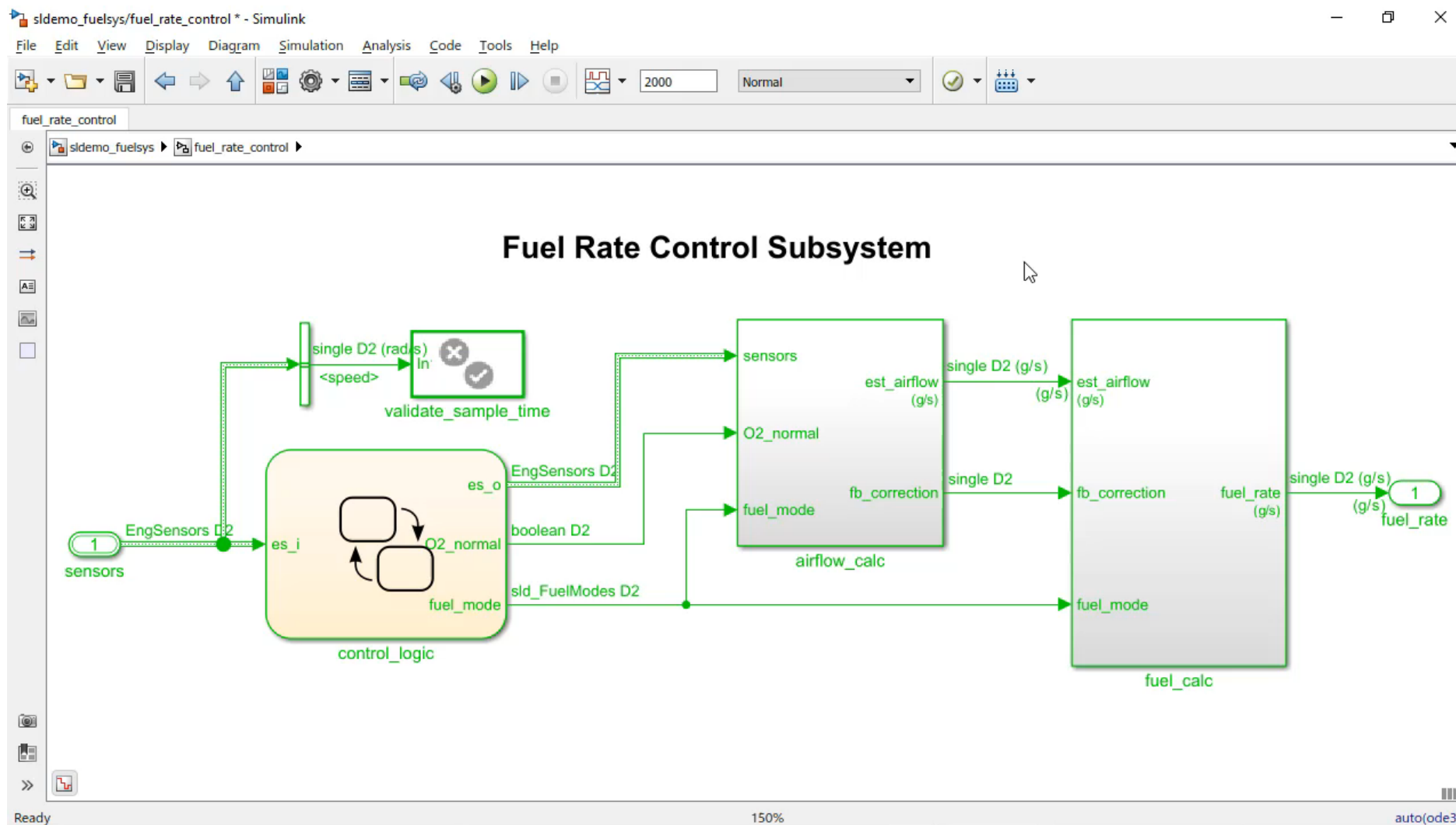
The screenshot shows the Simulink Coder interface for a 2-D Lookup Table block. The block is labeled "2-D T(u)" and has two input ports, "u1" and "u2", each with a value of "1". The generated C code is displayed in a window, showing the following structure:

```
#include "rtwdemo_row_lutcol2row_workflow_rowrow.h"

/* Block parameters (default storage) */
P rtP = {
  /* Variable: Tbl_1
   * Referenced by: '<Root>/2-D Lookup Table'
   */
  { 1.0, 11.0, 21.0, 31.0, 41.0, 51.0, 2.0, 12.0, 22.0, 32.0, 42.0, 52.0, 3.0,
    13.0, 23.0, 33.0, 43.0, 53.0, 4.0, 14.0, 24.0, 34.0, 44.0, 54.0, 5.0, 15.0,
    25.0, 35.0, 45.0, 55.0, 6.0, 16.0, 26.0, 36.0, 46.0, 56.0, 7.0, 17.0, 27.0,
    37.0, 47.0, 57.0, 8.0, 18.0, 28.0, 38.0, 48.0, 58.0, 9.0, 19.0, 29.0, 39.0,
    49.0, 59.0, 10.0, 20.0, 30.0, 40.0, 50.0, 60.0 }
};
```

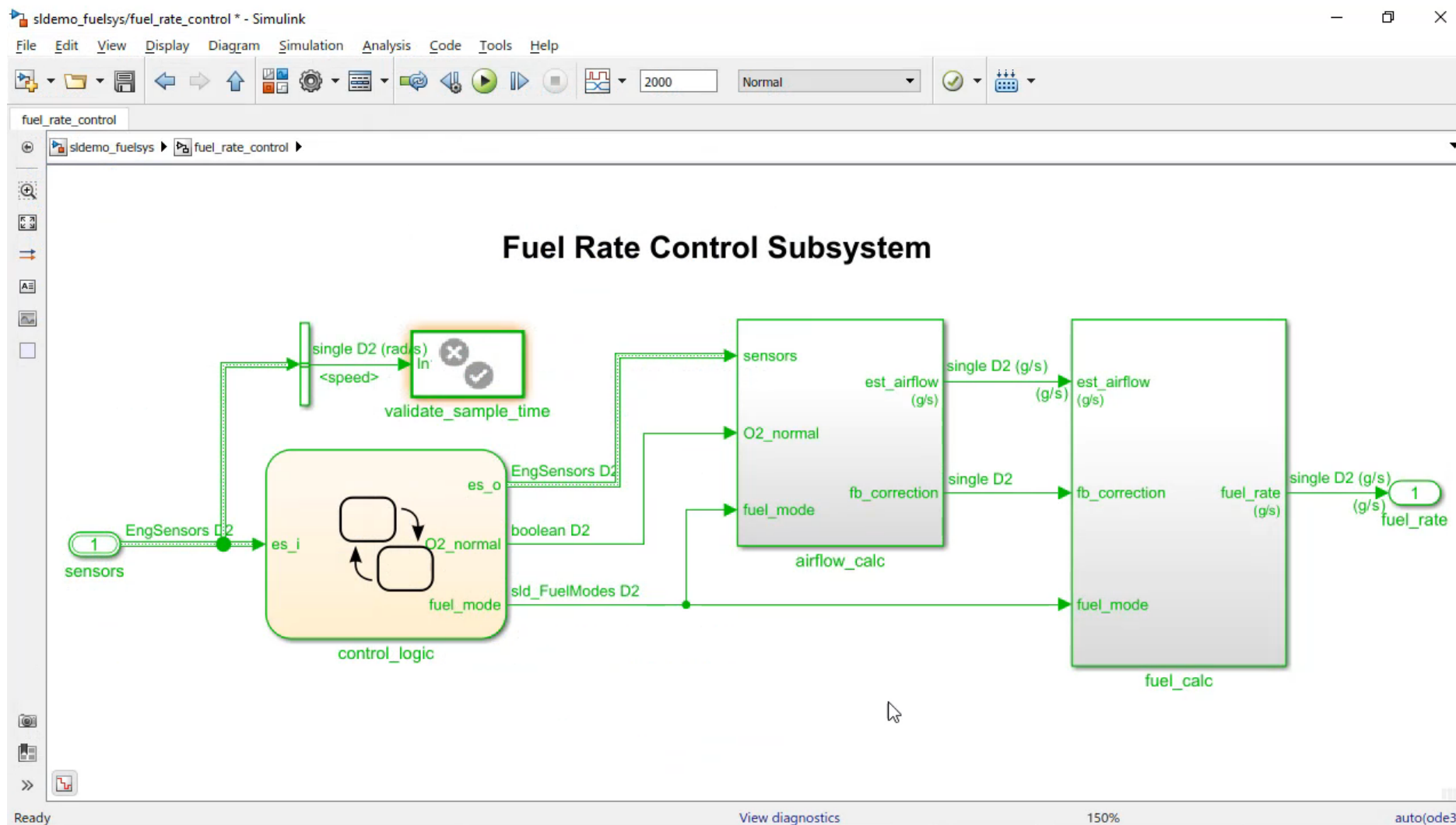
A green arrow points to the first row of the array, labeled "Row-Major".

# Generovaný kód popri modeli





# Generovaný kód popri modeli



# Zdieľanie Live Skriptov

Live Editor - C:\MATLAB\SunriseSunset\_final.mlx\*



LIVE EDITOR    INSERT    VIEW

New Open Save Find Files Compare Go To Text **B I U M** Code Control Refactor Run Section Run and Advance Run Step Stop

FILE NAVIGATE TEXT CODE SECTION RUN

SunriseSunset\_final.mlx \* +

## Estimating Sunrise and Sunset

Using the latitude ( $\phi$ ), the sun's declination ( $\delta$ ) and the solar time correction ( $SC$ ) we can calculate sunrise and sunset times.

$$\text{sunrise} = 12 - \frac{\cos^{-1}(-\tan \phi \tan \delta)}{15^\circ} - \frac{SC}{60}$$

$$\text{sunset} = 12 + \frac{\cos^{-1}(-\tan \phi \tan \delta)}{15^\circ}$$

Refer to [this page](#) for background and details on the equations used.

script

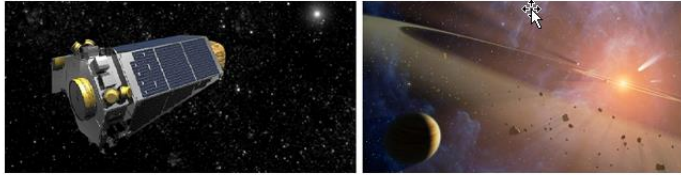
# Zdiełanie Live Skryptov

AutoSave ExploringExoplanets.docx - Compatibility Mode David Garrison

File Home Insert Design Layout References Mailings Review View Help Tell me what you want to do

Clipboard Font Paragraph Styles Editing

## Exploring Exoplanets



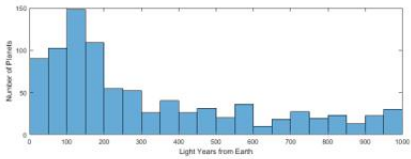
In this example we will explore some data on exoplanets - planets outside our own solar system. The data used here is a subset of data from the [NASA Exoplanet Archive](#). We will start by using the data to answer some questions about the set of exoplanets in the archive. Then we will do some calculations to try to identify planets in the archive that might be capable of supporting life.

```
exoplanets = readtable("exoplanets.xlsx");
exoplanets(1:10, :);
```

### How Far Away Are these Planets?

There are 90 exoplanets within 50 light-years of earth and 450 exoplanets within 200 light-years.

```
histogram(3.26*exoplanets.st_distance, 'BinWidth', 50)
xlim([0 1000])
ylabel 'Number of Planets'
xlabel 'Light Years from Earth'
```

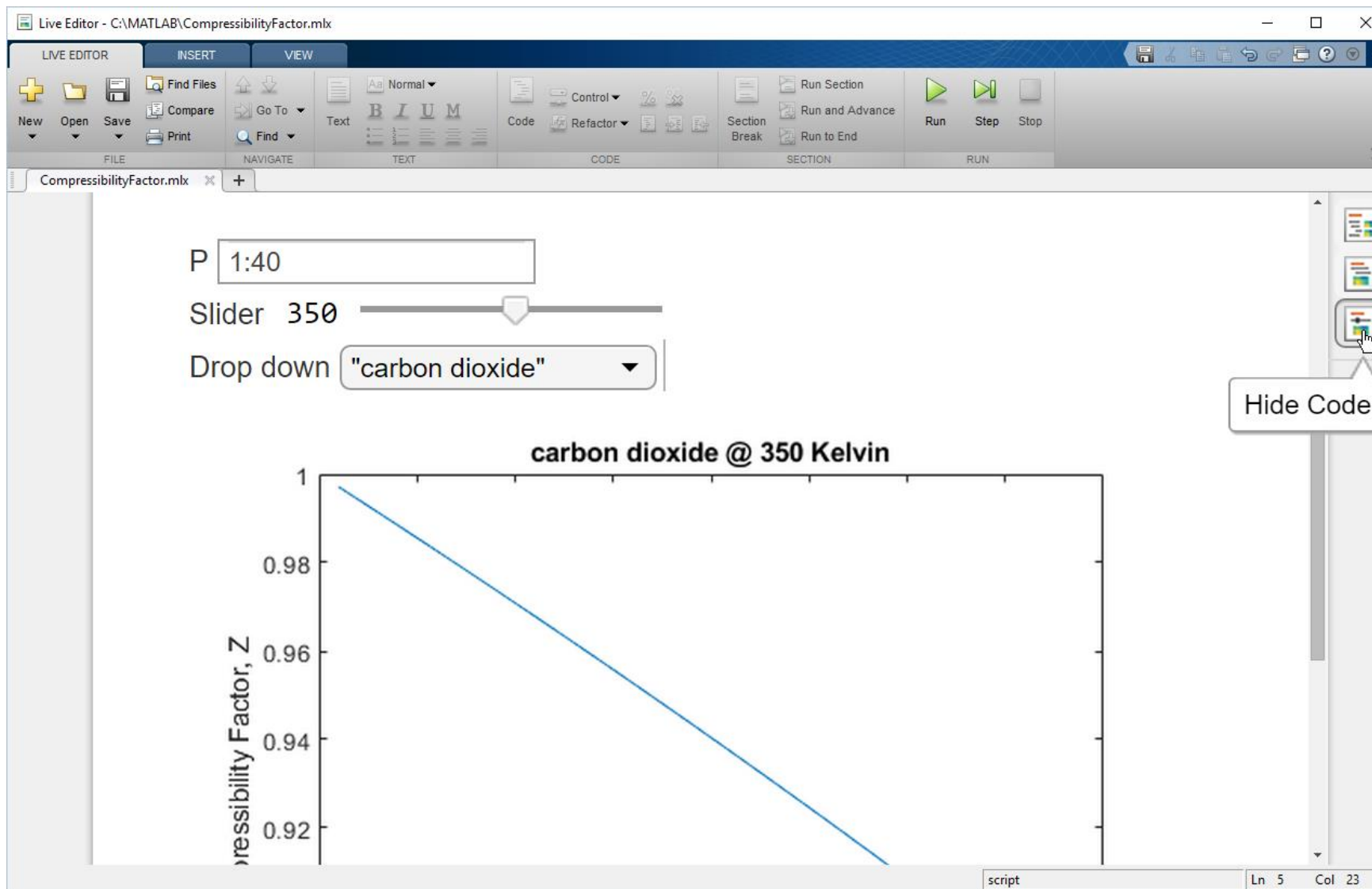


### Where is the nearest exoplanet?

```
idx = find(exoplanets.st_distance == min(exoplanets.st_distance));
name = char(exoplanets(idx, 'st_name'));
```

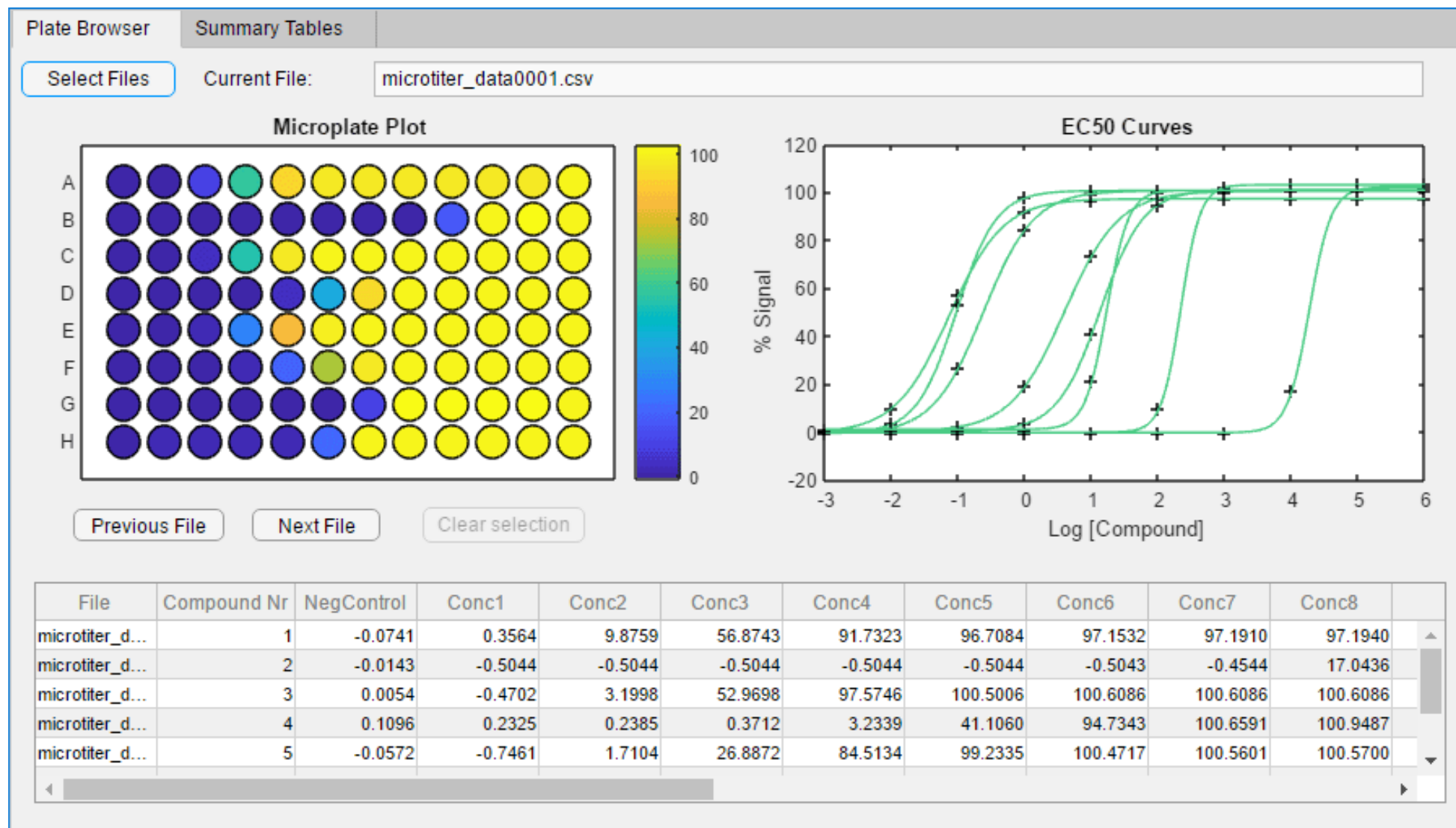
Page 1 of 7 1468 words 100%

# Zdieľanie Live Skriptov

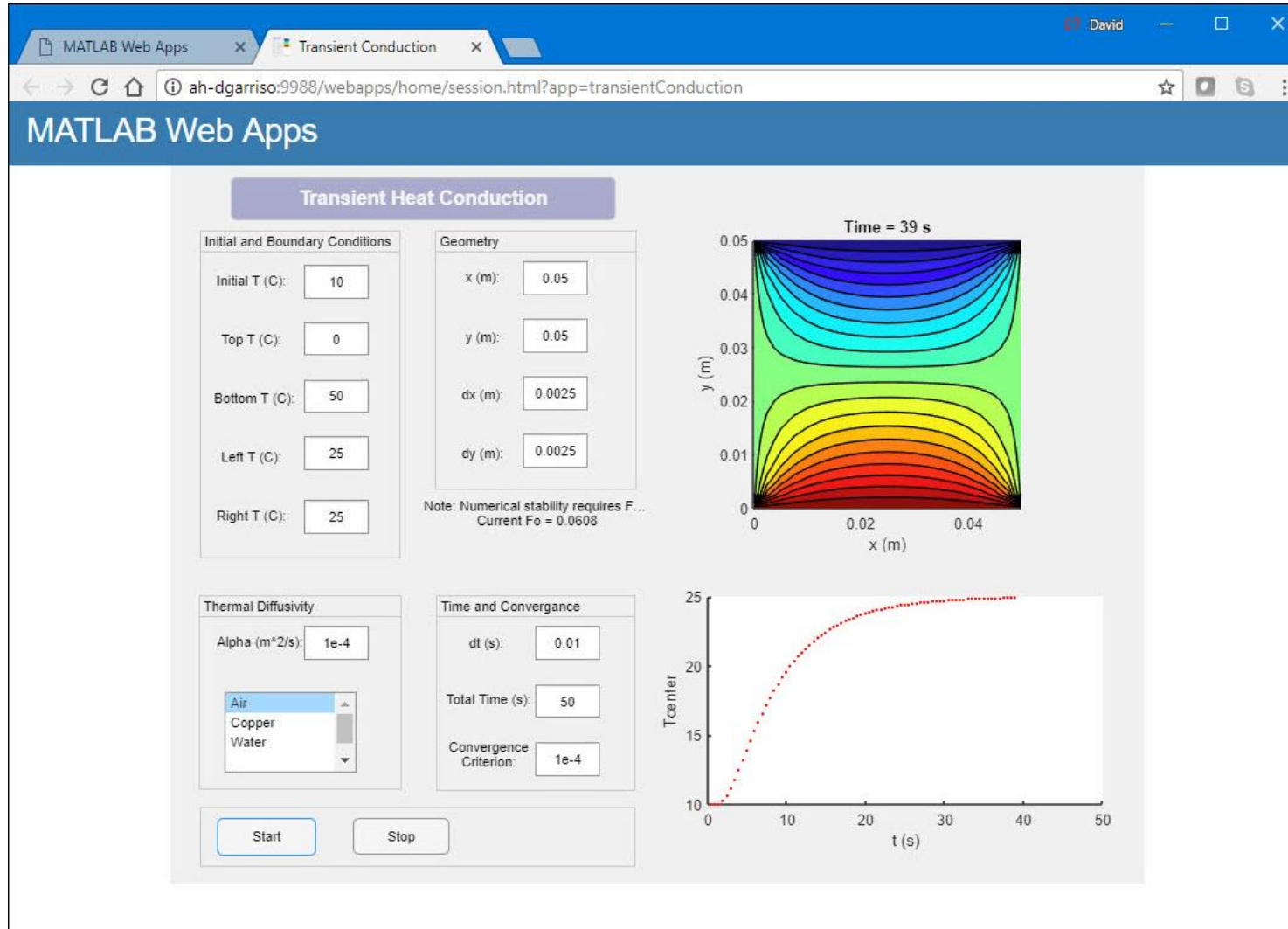


The screenshot shows the MATLAB Live Editor interface for a script named 'CompressibilityFactor.mlx'. The interface includes a menu bar with 'LIVE EDITOR', 'INSERT', and 'VIEW' tabs. Below the menu is a toolbar with various icons for file operations, text formatting, code execution, and navigation. The main workspace contains three interactive controls: a text input field for 'P' with the value '1:40', a slider for 'Slider' with the value '350', and a drop-down menu for 'Drop down' with the selected value '"carbon dioxide"'. Below these controls is a plot titled 'carbon dioxide @ 350 Kelvin'. The plot shows the Compressibility Factor, Z, on the y-axis (ranging from 0.92 to 1.0) versus an unlabeled x-axis. A single blue line starts at Z=1.0 and decreases linearly. A 'Hide Code' tooltip is visible on the right side of the plot area. The status bar at the bottom indicates 'script', 'Ln 5', and 'Col 23'.

# Tvorba aplikací



# Nasadenie na web



The screenshot shows a MATLAB Web App interface for a transient heat conduction simulation. The browser address bar indicates the URL: `ah-dgarriso:9988/webapps/home/session.html?app=transientConduction`.

**Transient Heat Conduction**

**Initial and Boundary Conditions:**

- Initial T (C): 10
- Top T (C): 0
- Bottom T (C): 50
- Left T (C): 25
- Right T (C): 25

**Geometry:**

- x (m): 0.05
- y (m): 0.05
- dx (m): 0.0025
- dy (m): 0.0025

Note: Numerical stability requires F...  
Current Fo = 0.0608

**Thermal Diffusivity:**

- Alpha (m<sup>2</sup>/s): 1e-4
- Material: Air (selected from a dropdown menu)

**Time and Convergence:**

- dt (s): 0.01
- Total Time (s): 50
- Convergence Criterion: 1e-4

Buttons: Start, Stop

**Time = 39 s**

The top plot is a 2D contour plot of temperature distribution in the x-y plane. The x-axis ranges from 0 to 0.05 m, and the y-axis ranges from 0 to 0.05 m. The temperature is highest at the bottom (red) and lowest at the top (blue).

The bottom plot is a 1D line graph showing the temperature at the center (T<sub>center</sub>) versus time (t). The x-axis ranges from 0 to 50 s, and the y-axis ranges from 10 to 25. The temperature starts at 10°C at t=0 and rises to approximately 25°C by t=40 s.



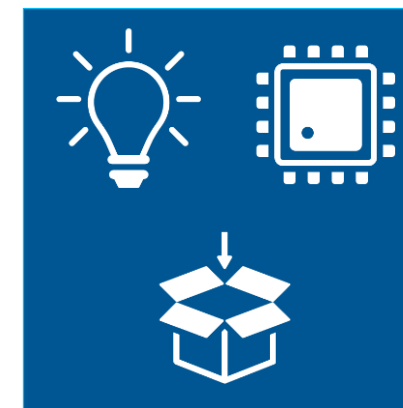
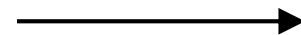
# Využitie MATLABu a Simulinku na tvorbu algoritmov



Vstupy



Návrh



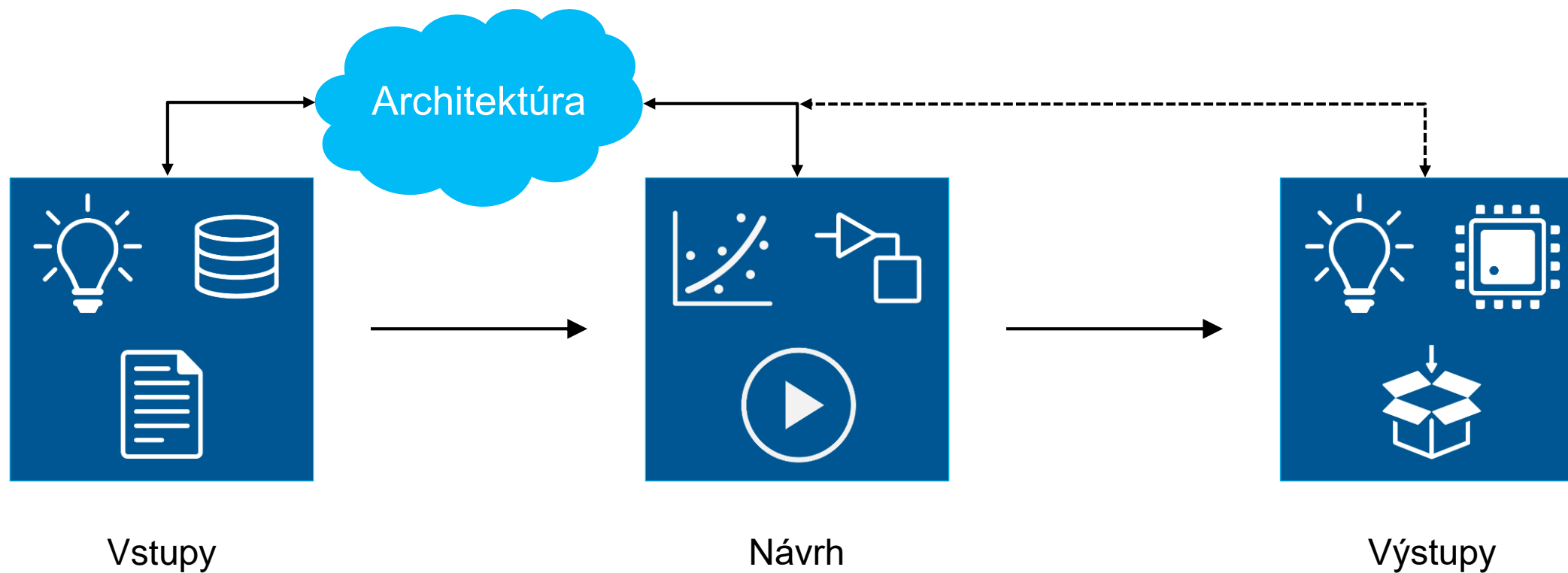
Výstupy



MATLAB® & SIMULINK®

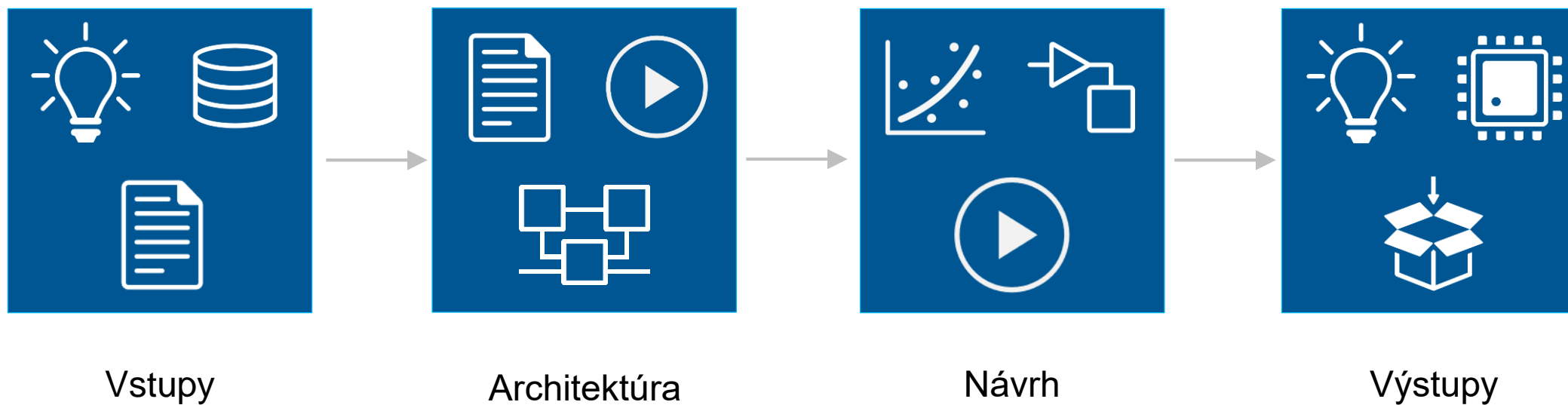


# Tvorba architektúr

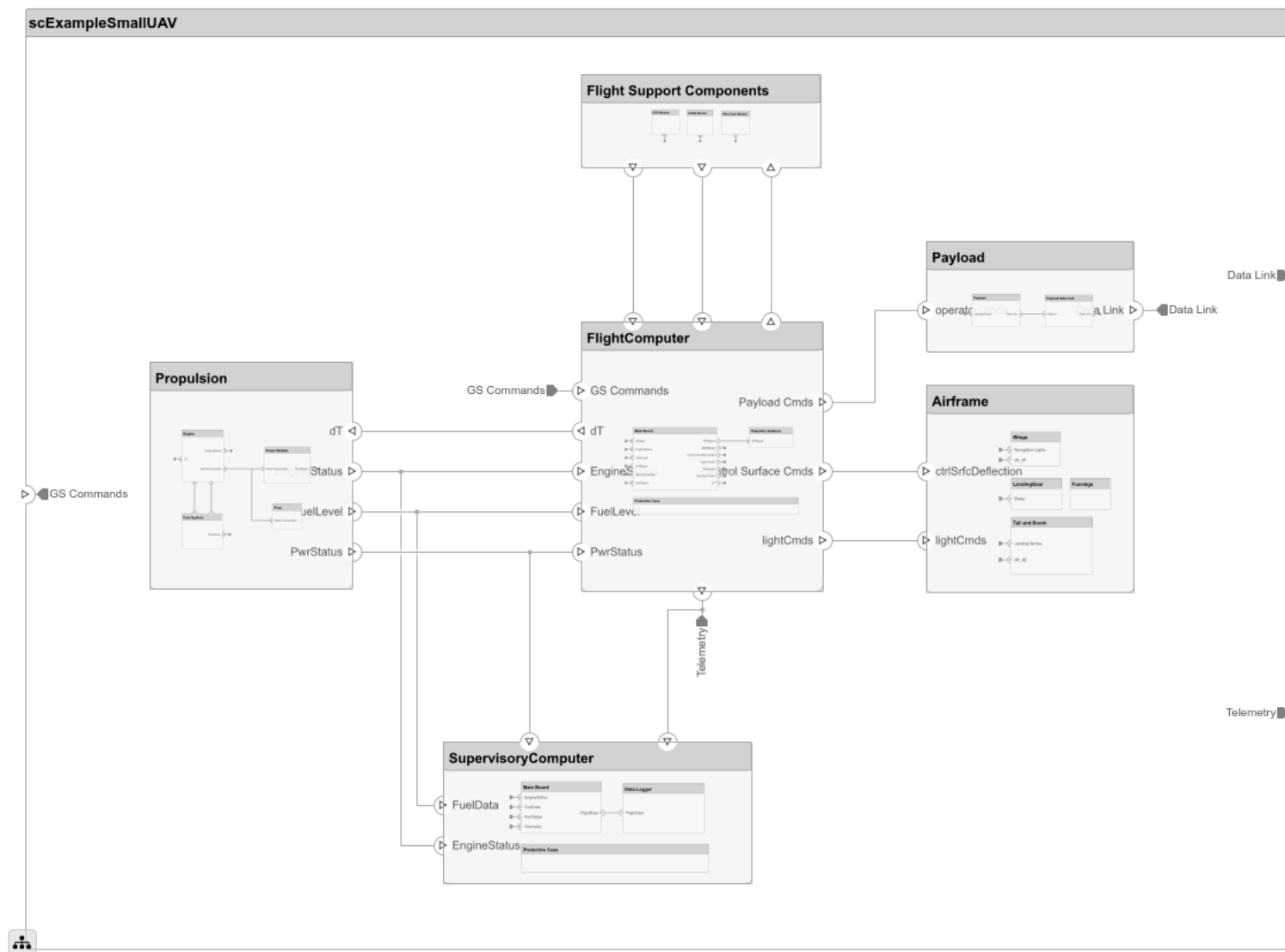




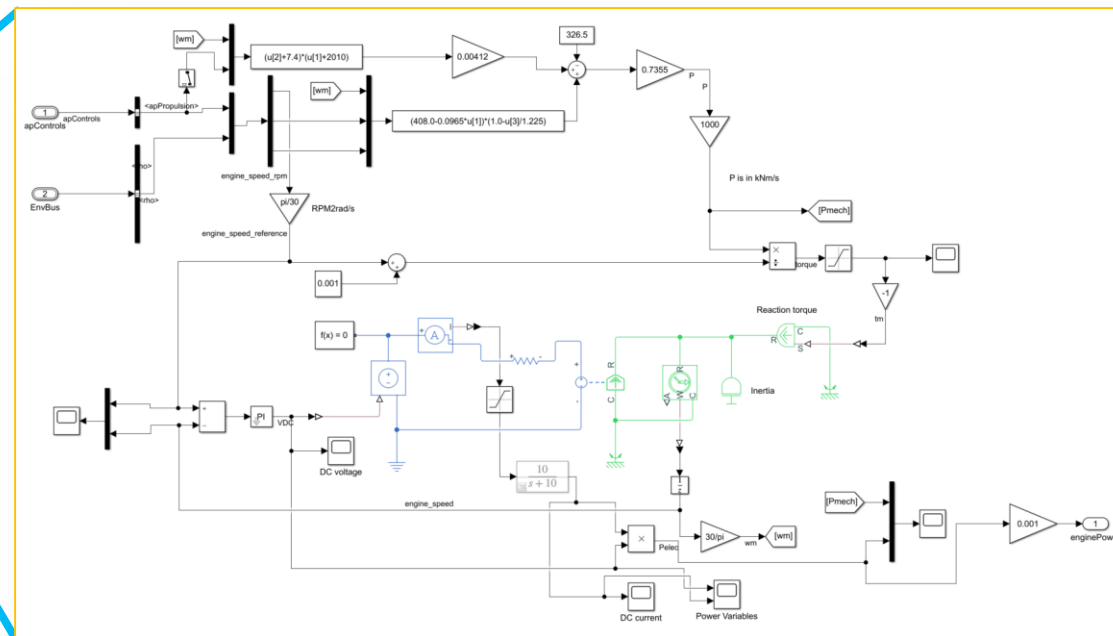
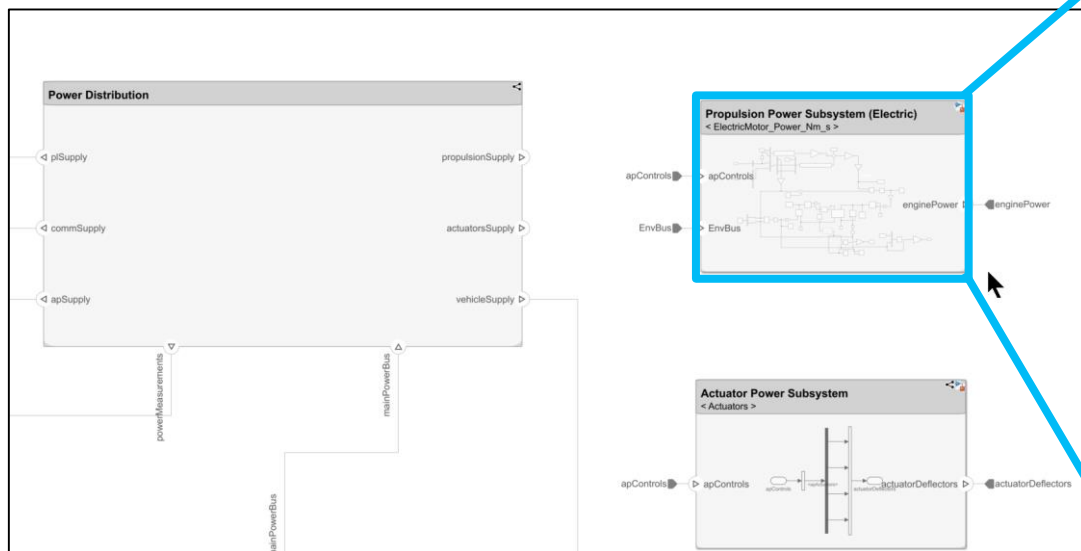
# Tvorba architektúr



# Návrh systémov a softvérových architektúr

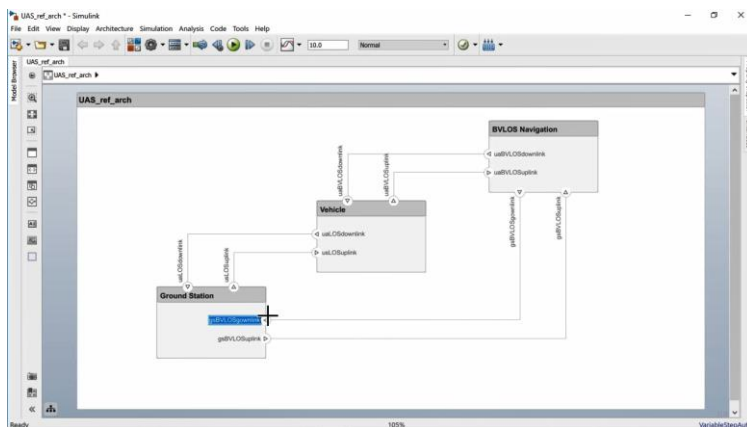


# Návrh systémov a softvérových architektúr



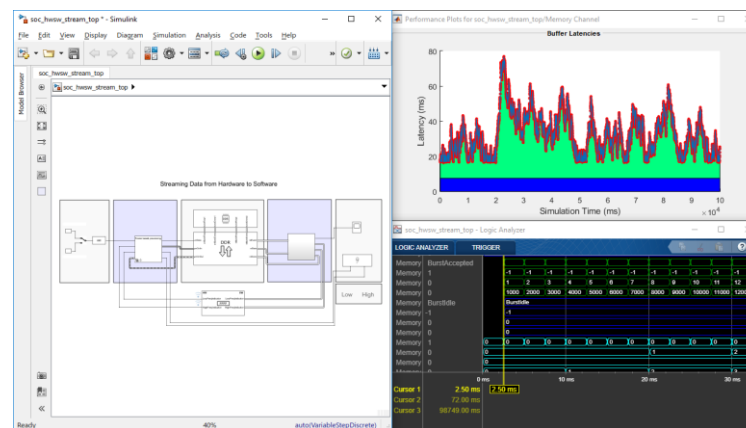
# Návrh systémů a softvérových architektur

Systemy  
a softvér



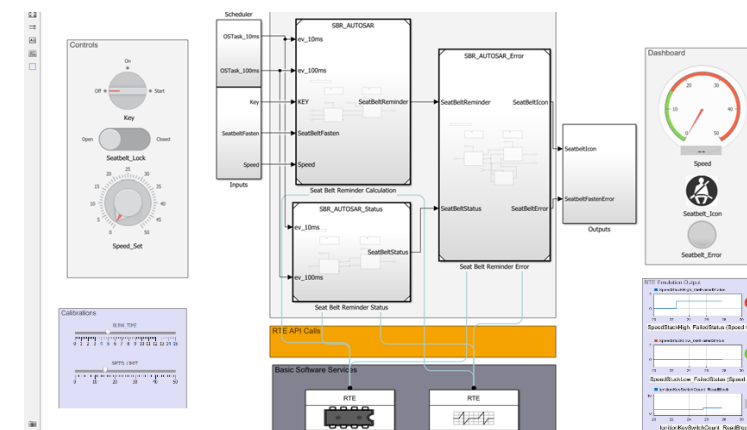
System Composer

SoC hardvér  
a softvér



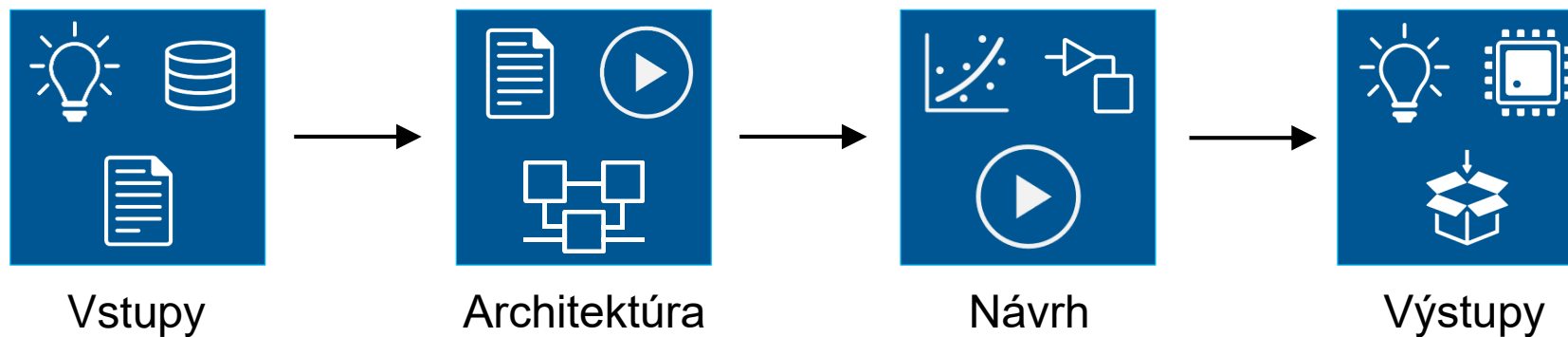
SoC Blockset

AUTOSAR softvér

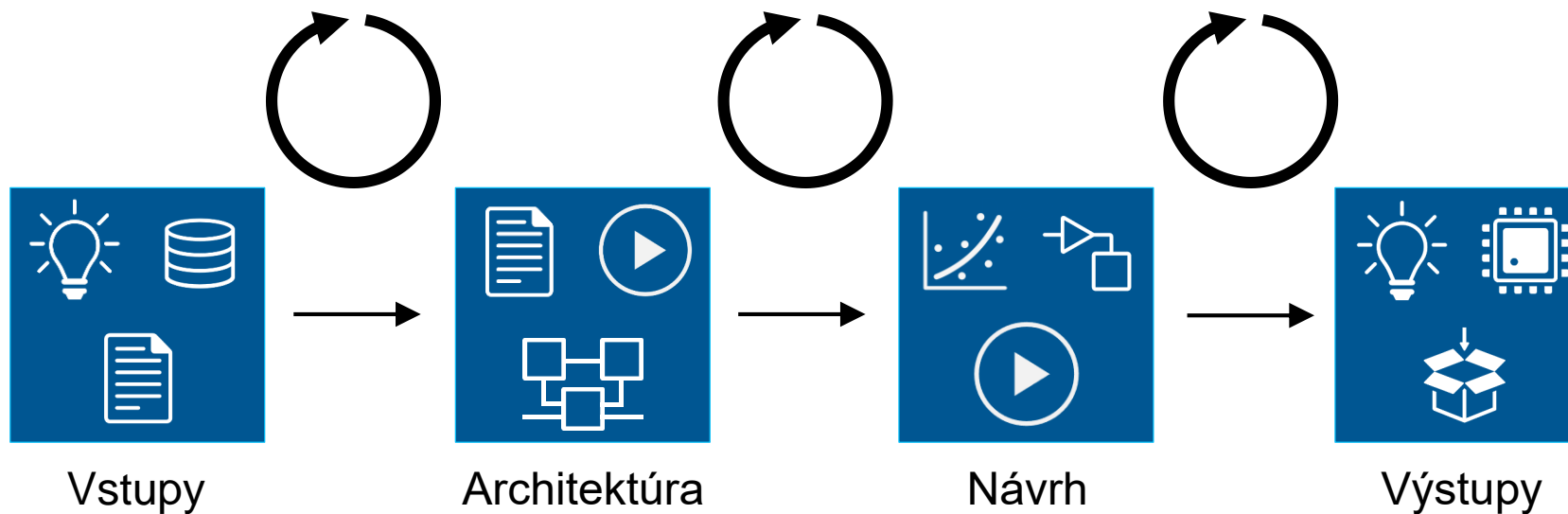


AUTOSAR Blockset

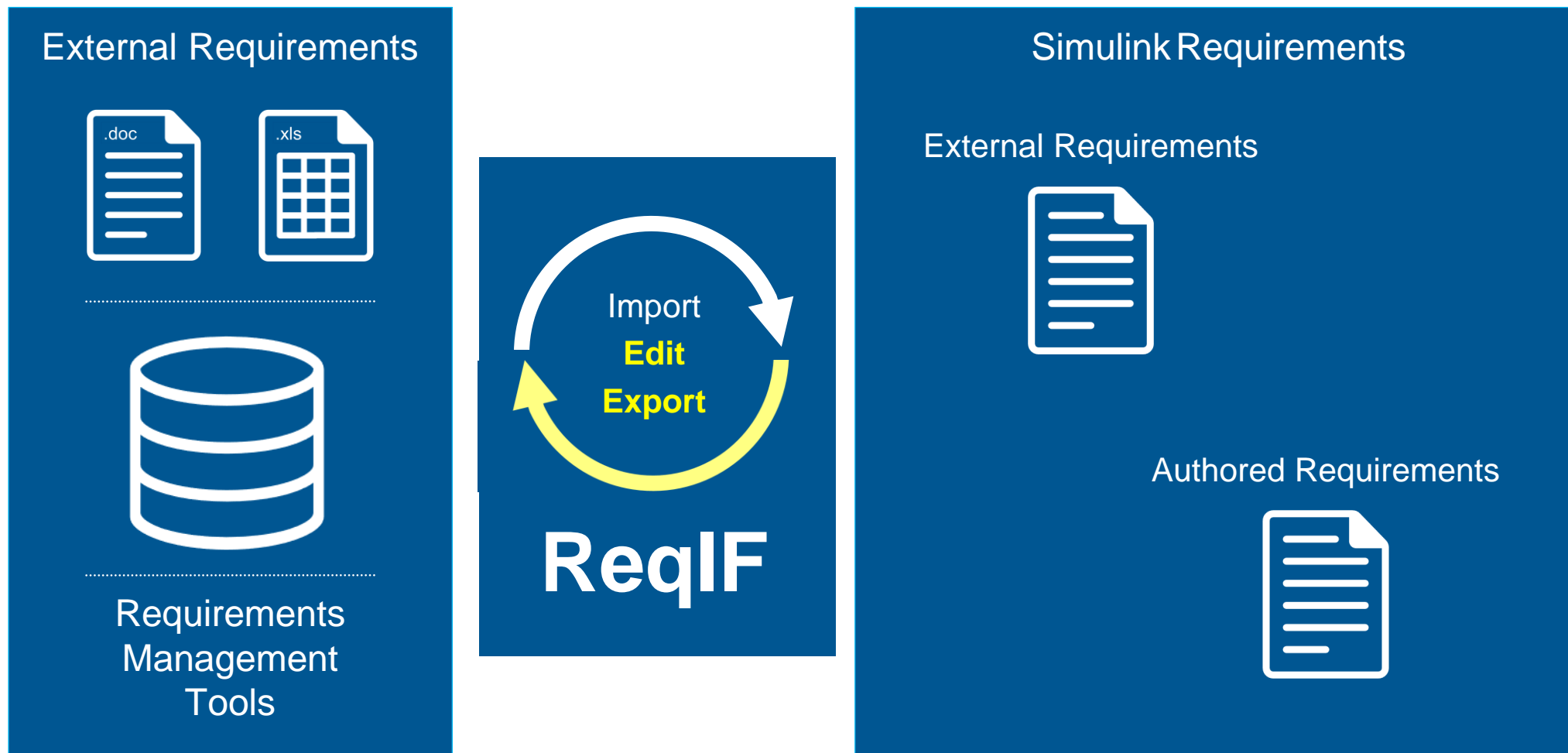
# Využitie MATLABu a Simulinku na algoritmy



# Využitie MATLABu a Simulinku na algoritmy



# Integrácia s nástrojmi tretích strán na požiadavky



# MATLAB Unit Test Framework

```
>> result.table
```

```
ans =
```

```
2×6 table
```

<b>Name</b>	<b>Passed</b>	<b>Failed</b>	<b>Incomplete</b>	<b>Duration</b>	<b>Details</b>
'test_Predictions/Test_ModelType'	true	false	false	0.12241	[1×1 struct]
'test_Predictions/Test_Prediction'	false	true	true	0.11542	[1×1 struct]

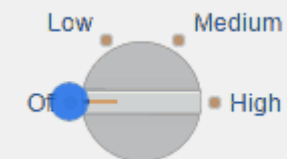


# MATLAB Unit Test Framework

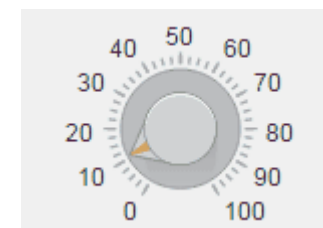
```
testCase.press(myApp.checkbox)
```



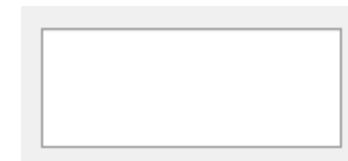
```
testCase.choose(myApp.discreteKnob, "Medium")
```



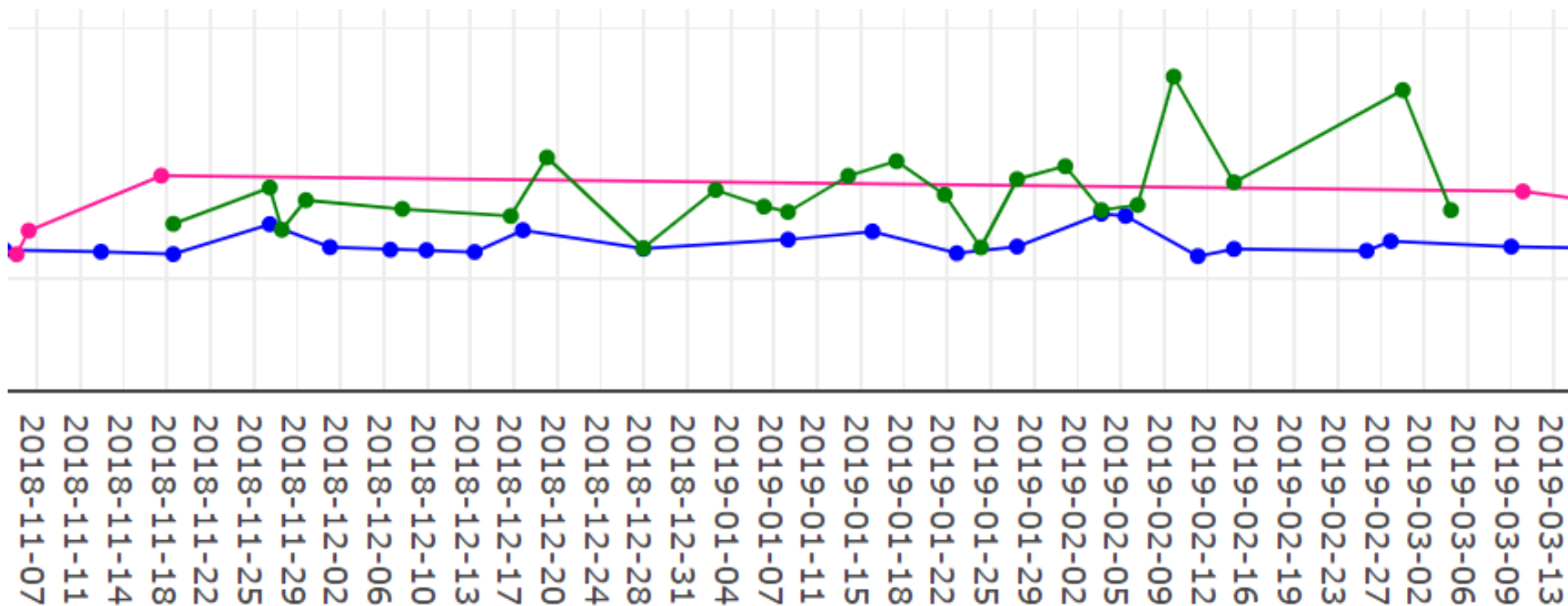
```
testCase.drag(myApp.continuousKnob, 10, 90)
```



```
testCase.type(myApp.editfield, myTextVar)
```



# MATLAB Performance Testing Framework



# Integrácia testov



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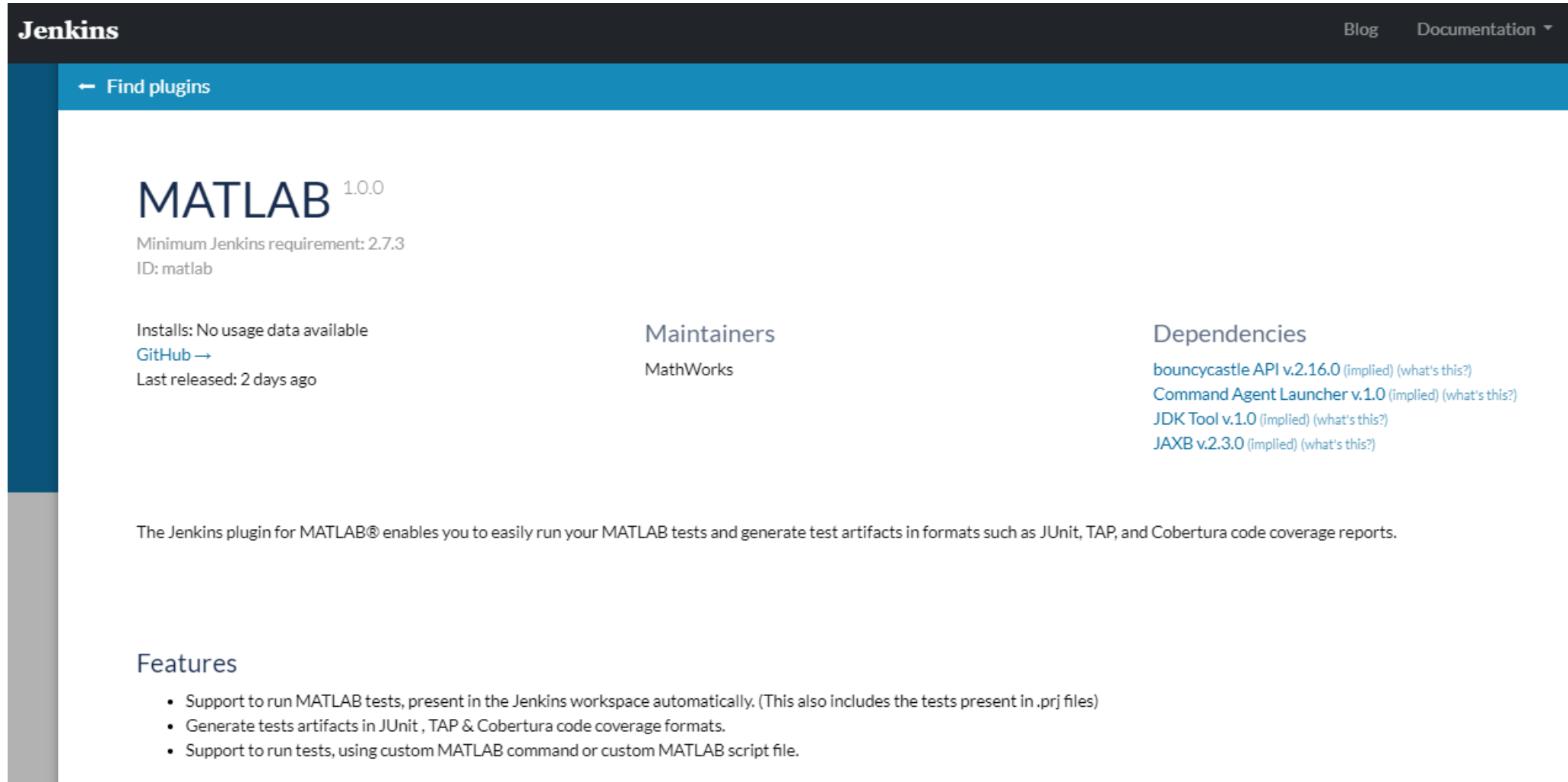
- Platforms
- User interface
- Administration
- Source code management

**New Plugins**

- QRebel
- MATLAB**
- MISRA Compliance Report
- Zoom
- VectorCAST Execution
- Klocwork Community
- jQuery
- Analysis Model API

# MATLAB

# Integrácia testov



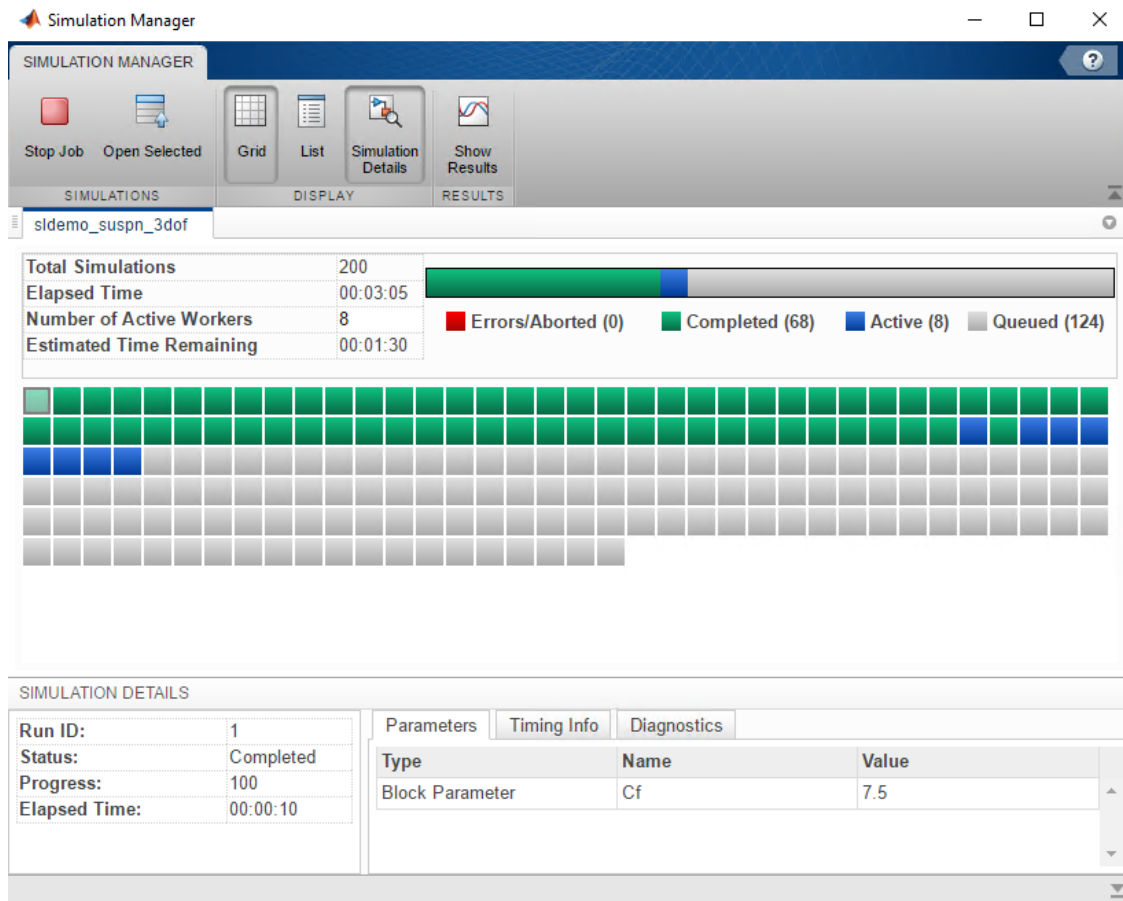
The screenshot shows the Jenkins plugin page for MATLAB 1.0.0. The page header includes the Jenkins logo and navigation links for 'Blog' and 'Documentation'. Below the header is a blue bar with a back arrow and the text 'Find plugins'. The main content area features the plugin name 'MATLAB 1.0.0' in large text, followed by 'Minimum Jenkins requirement: 2.7.3' and 'ID: matlab'. There are three columns of information: 'Installs: No usage data available' with a 'GitHub →' link and 'Last released: 2 days ago'; 'Maintainers' listed as 'MathWorks'; and 'Dependencies' including 'bouncycastle API v.2.16.0 (implied) (what's this?)', 'Command Agent Launcher v.1.0 (implied) (what's this?)', 'JDK Tool v.1.0 (implied) (what's this?)', and 'JAXB v.2.3.0 (implied) (what's this?)'. A descriptive paragraph states: 'The Jenkins plugin for MATLAB® enables you to easily run your MATLAB tests and generate test artifacts in formats such as JUnit, TAP, and Cobertura code coverage reports.' Below this is a 'Features' section with a bulleted list: 'Support to run MATLAB tests, present in the Jenkins workspace automatically. (This also includes the tests present in .prj files)', 'Generate tests artifacts in JUnit, TAP & Cobertura code coverage formats.', and 'Support to run tests, using custom MATLAB command or custom MATLAB script file.'

# Projekty v MATLABe

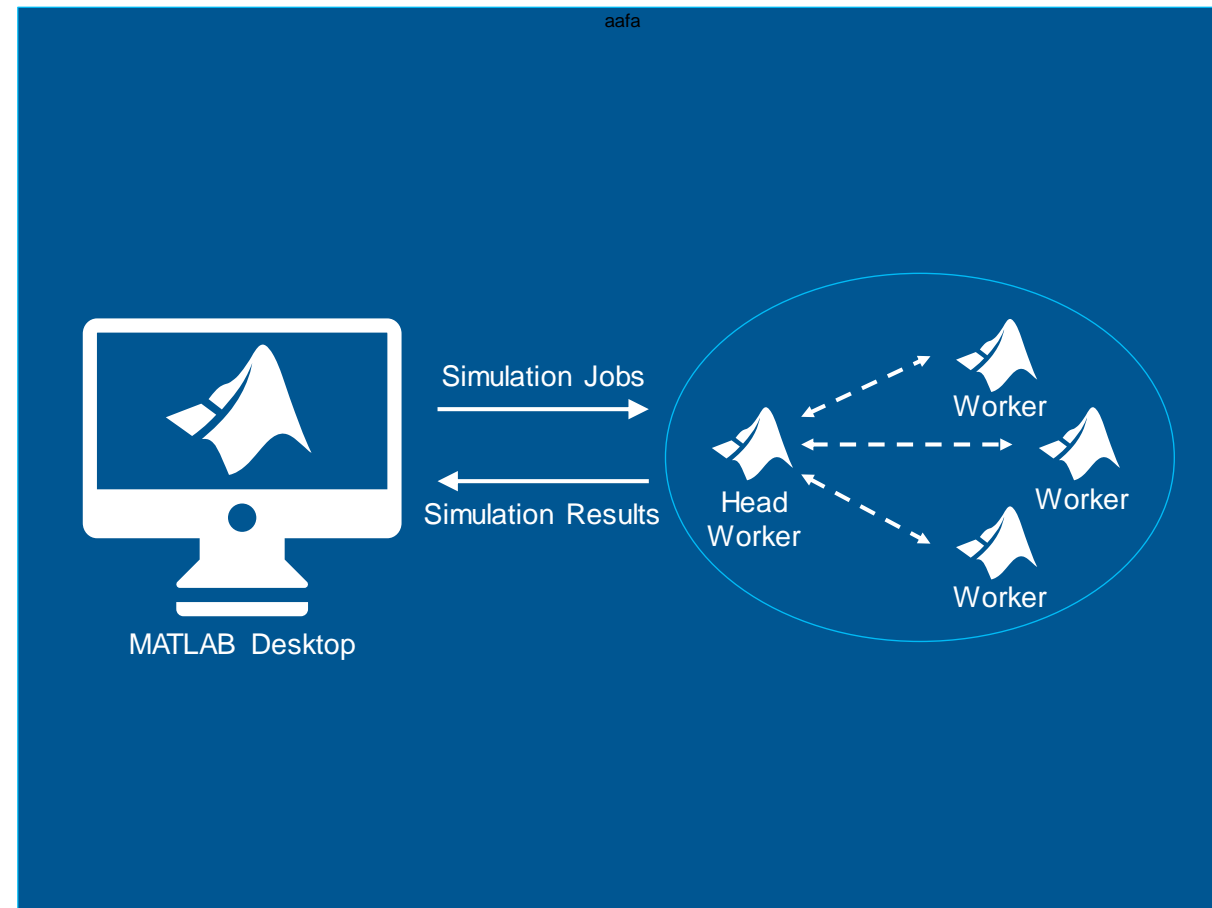
TOOLS			ENVIRONMENT			SOURCE CONTROL							
Search	Custom Tasks	Run Checks	References	Details	Project Path	Git Details	Refresh	Commit	Fetch	Push	Pull	Remote	Branches
All   <b>Project (226)</b>   Modified (344)													
Name	Status	Git	Classification										
+Test	✓	■	Test										
ACI	✓	·											
Dashboard	✓	·											
Documents	✓	·											
Elasticsearch	✓	·											
MachineLearning	✓	■											
MATLAB_Kafka_Producer_Java	✓	·											
mps_stream	✓	■											
SimExecutable	✓	·											
Simulation	✓	·											
DocExample_MultiClassFaultDetectionUsi...	✓	●	Design										
genPumpData.m	✓	●	Design										
javasetup.m	✓	+	Design										
Main_ExampleWorkflow.mlx	✓	●	Design										
MLModels.mat	✓	●	Design										
rawdata.mat	✓	●	Design										
README.md	✓	●											

# Paralelné simulácie v Simulinku

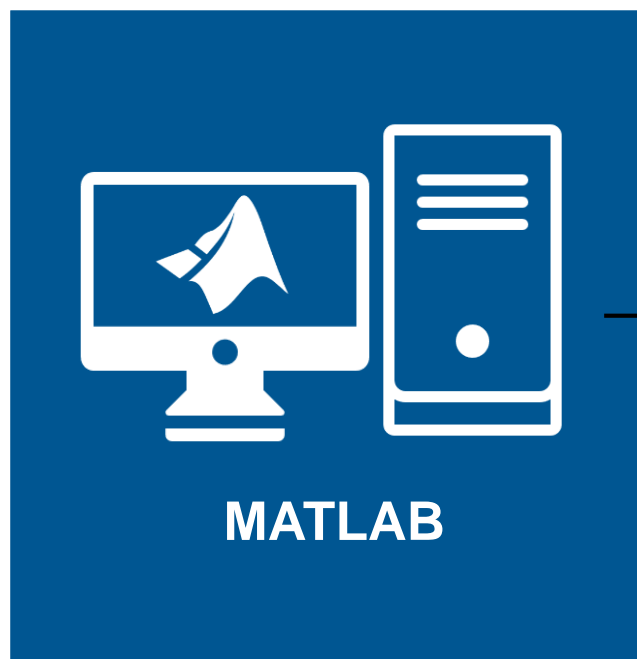
## Simulation Manager



## batchsim

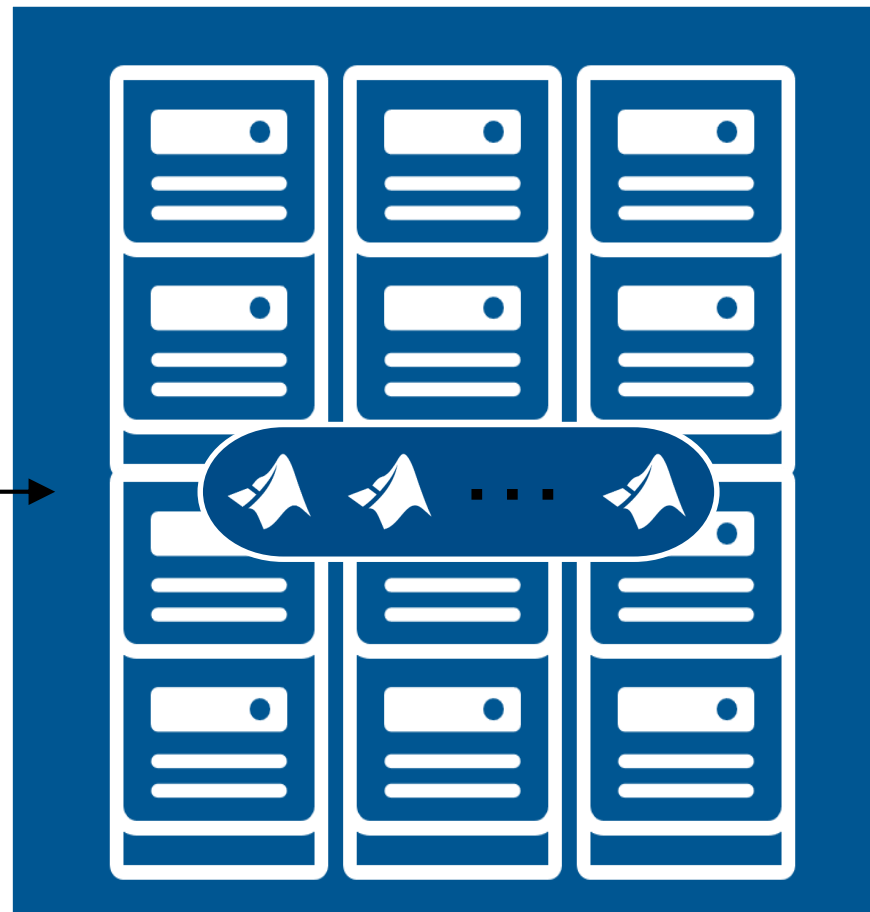


# Škálovanie výpočtov na kláster a cloud

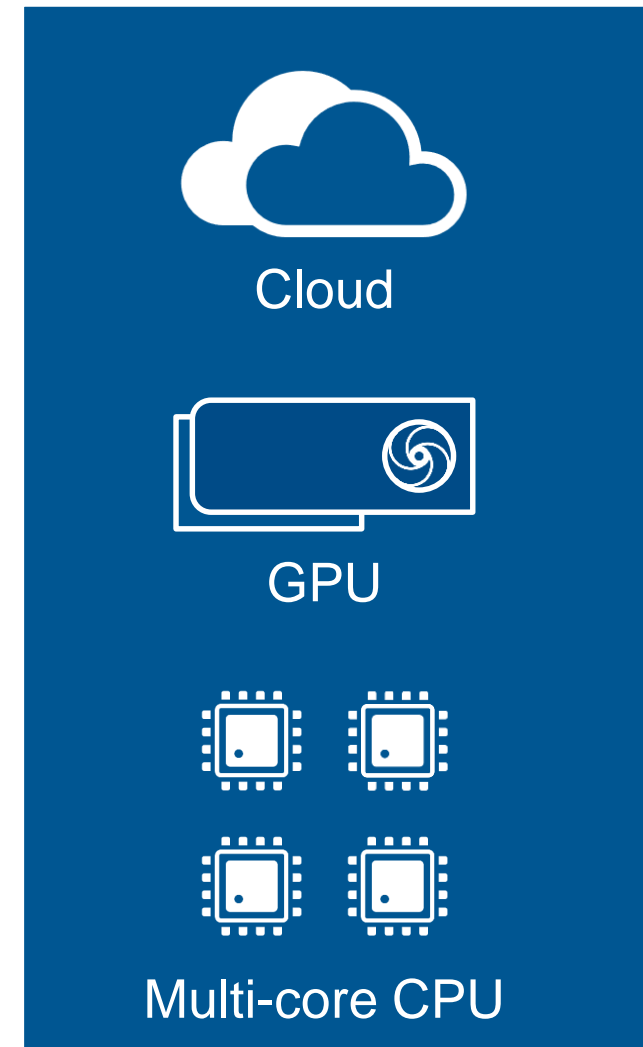


MATLAB

Parallel Computing Toolbox



MATLAB Parallel Server

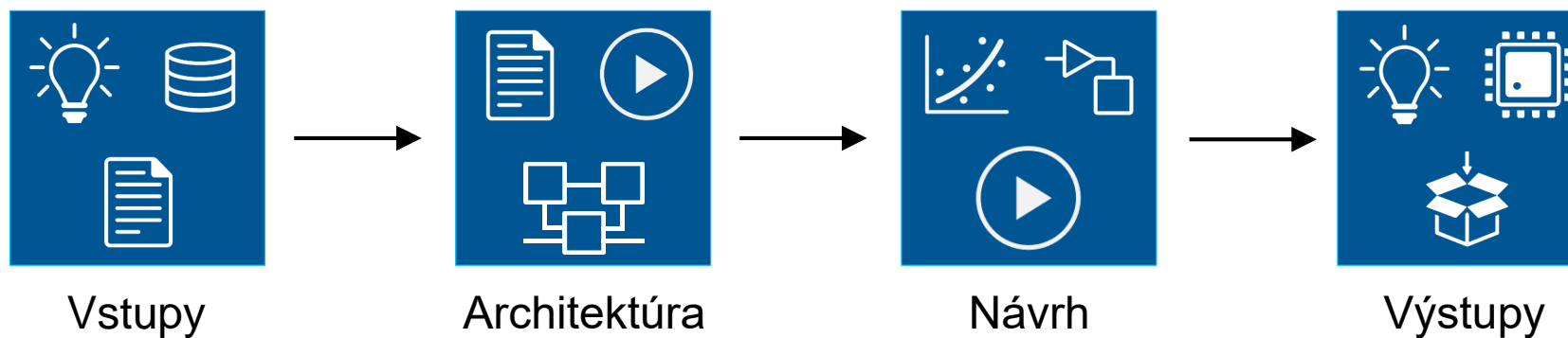


Cloud

GPU

Multi-core CPU

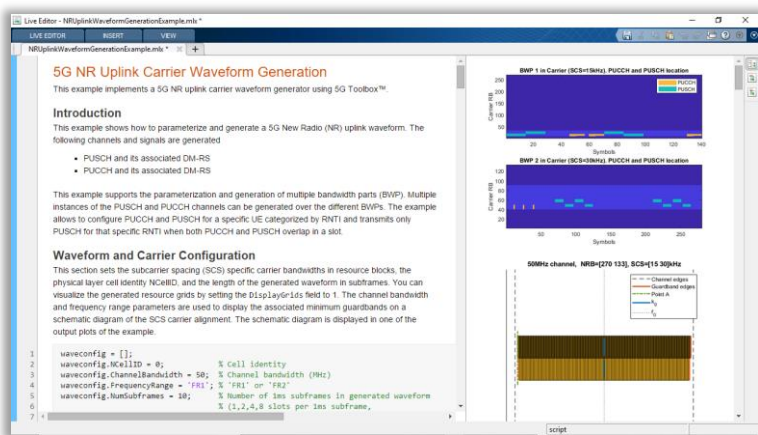
# Využitie MATLABu a Simulinku na algoritmy





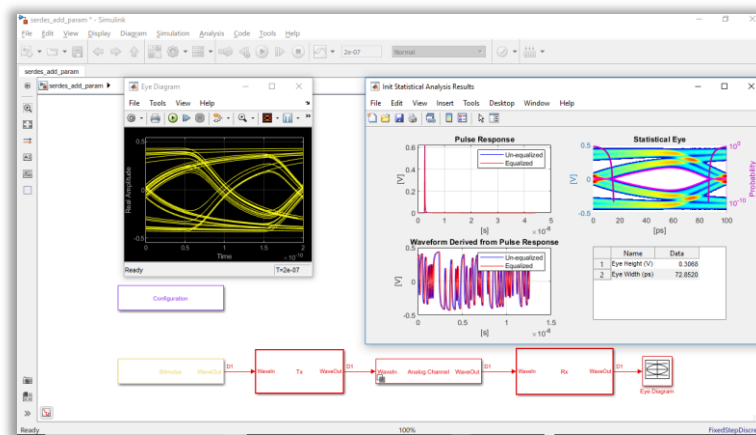
# Špecializované nástroje na tvorbu algoritmov

## Komunikácie



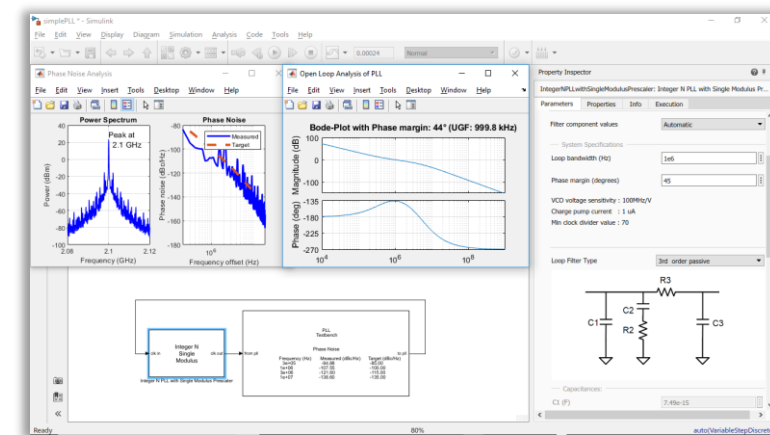
5G Toolbox

## Fyzikálne prepojenie



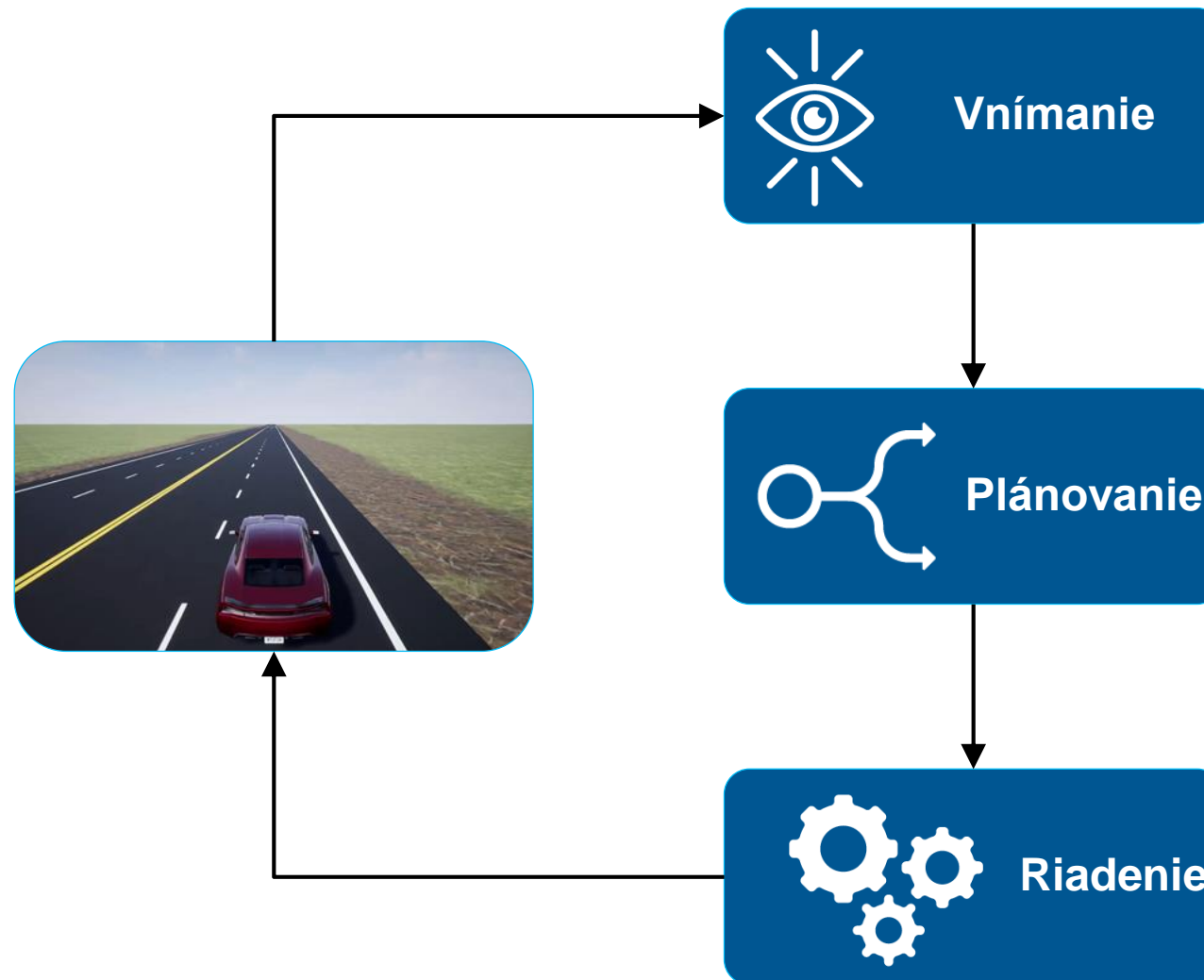
SerDes Toolbox

## Zmiešané signály

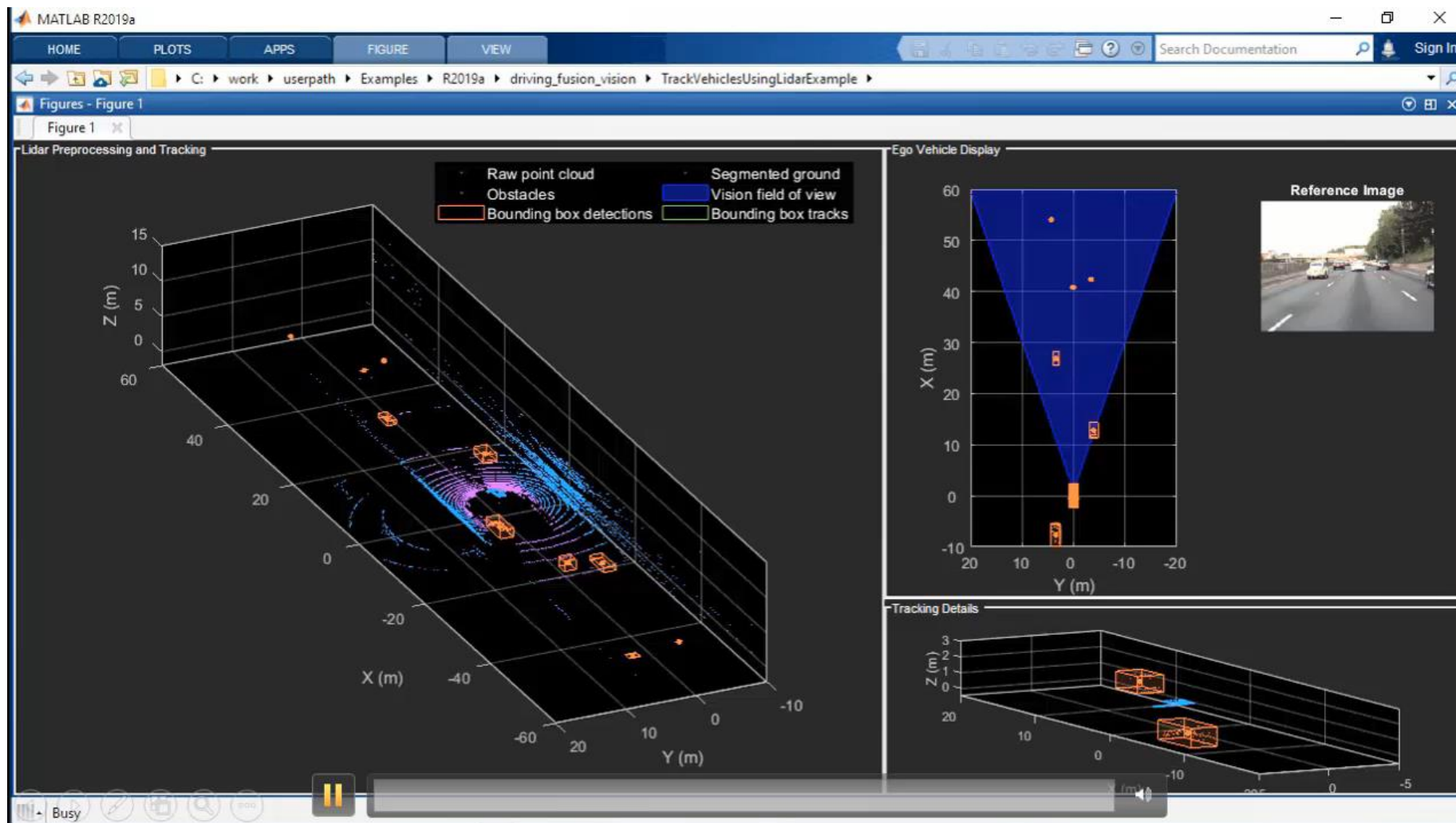


Mixed-Signal Blockset

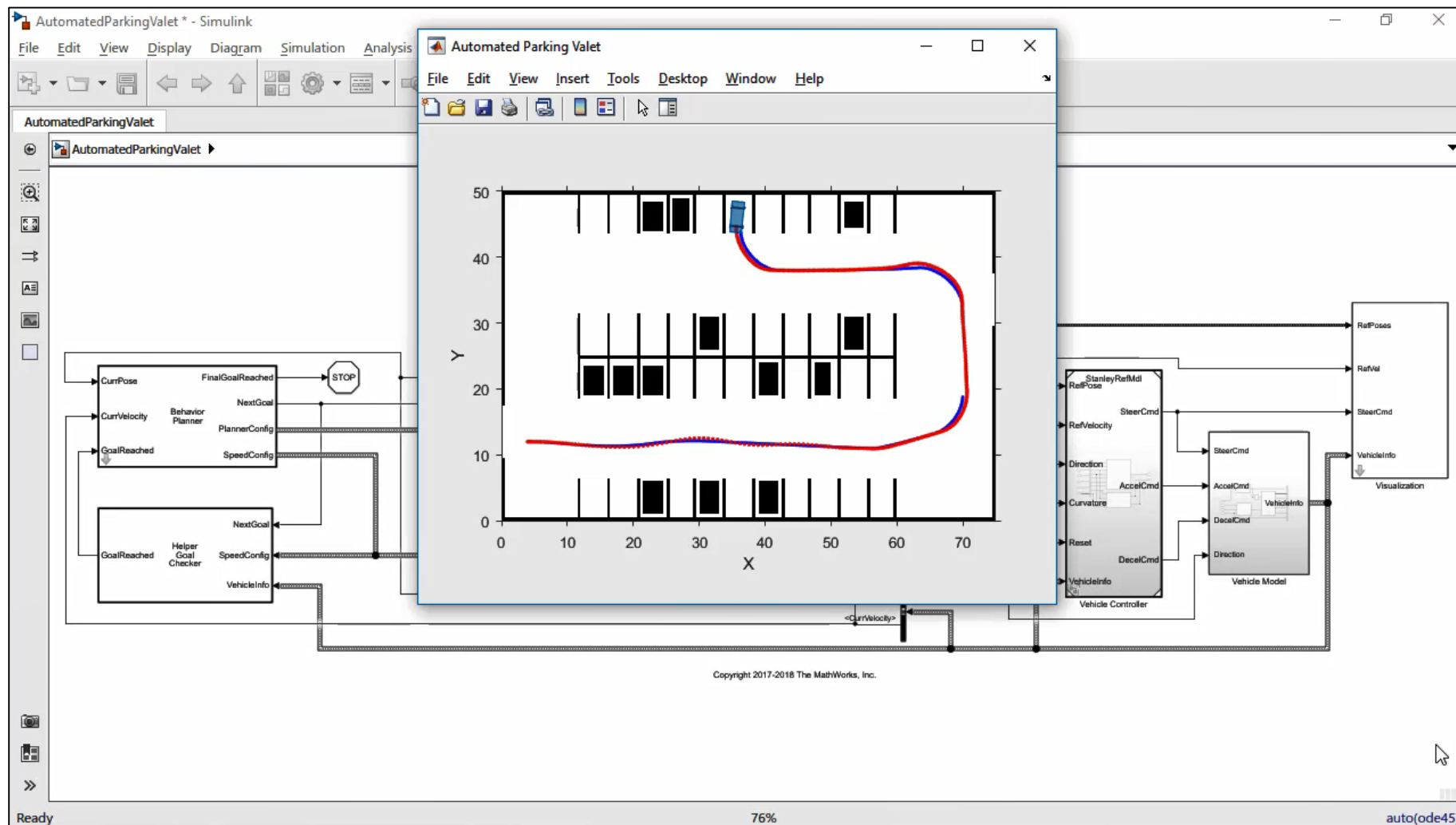
# Návrh autonómnych systémov



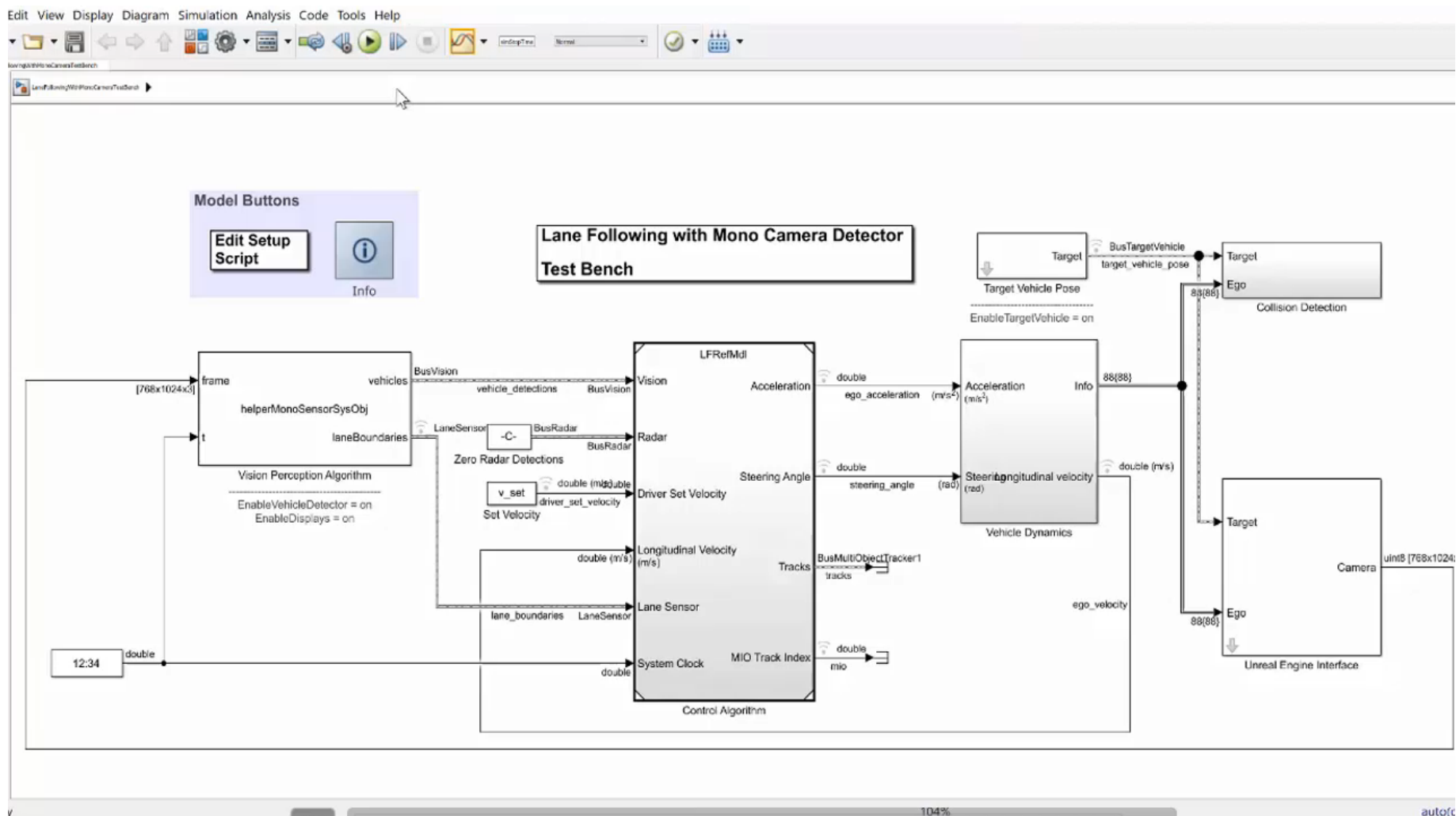
# Architektúra senzorickej fúzie



# Algoritmy plánovania

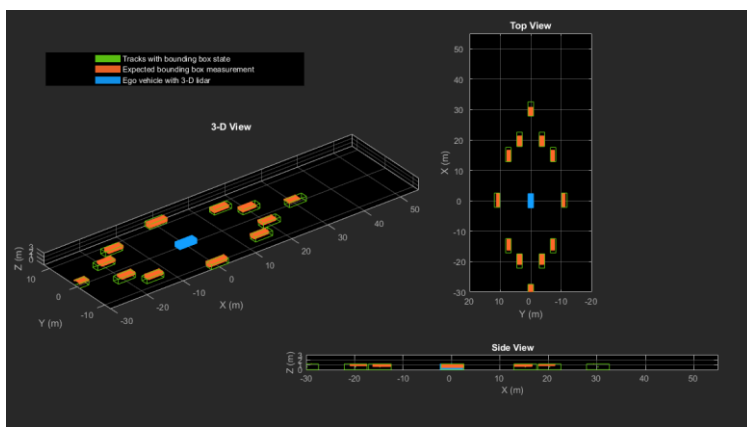


# Algoritmy pre jazdný pruh, vzdialenosť áut



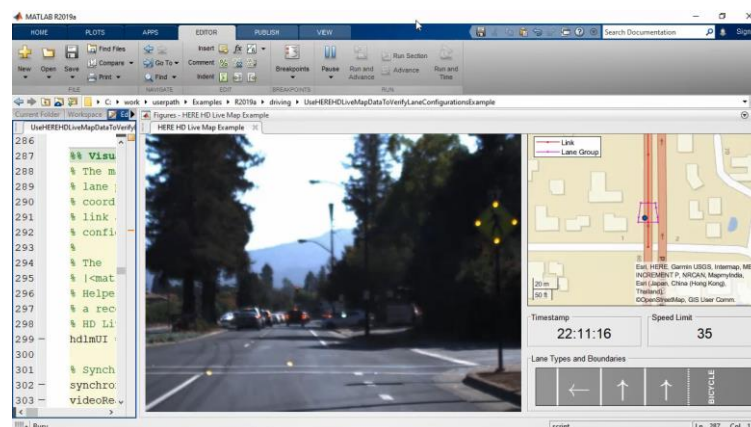
# Návrh autonómnych systémov

Spracovanie lidarů a sledovanie



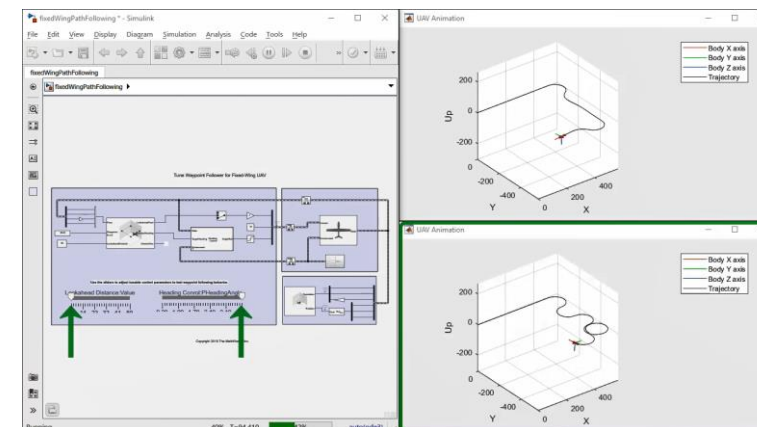
Computer Vision Toolbox

HERE HD Maps & OpenDRIVE Roads



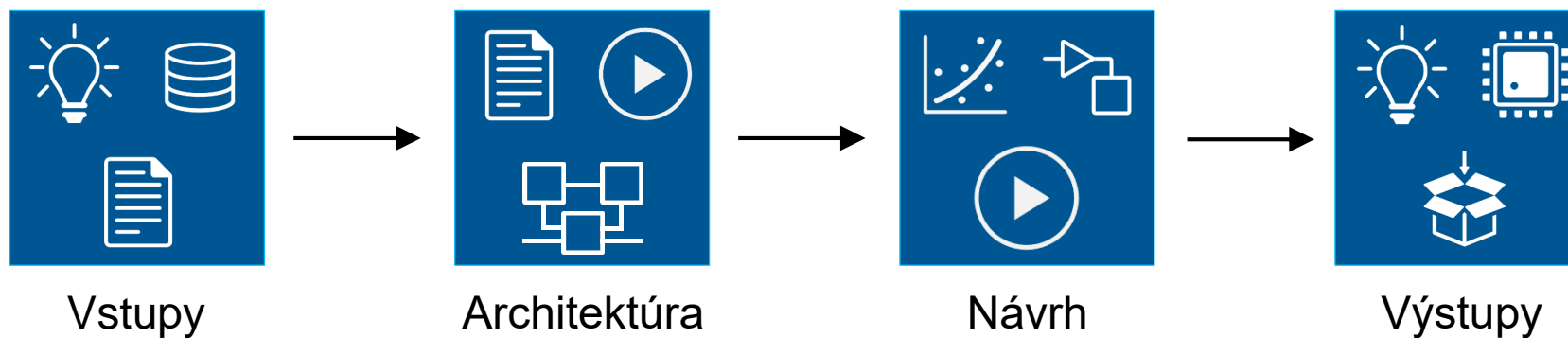
Automated Driving Toolbox

UAV Algoritmy



Robotics System Toolbox

# Využitie MATLABu a Simulinku na algoritmy






# Všetky informácie o novinkách

R2019a at a Glance Search MathWorks.com

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# R2019a

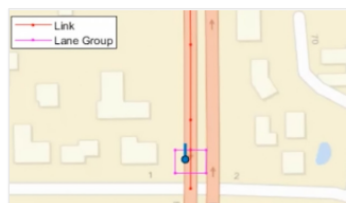
## Release Highlights



### Deep Learning

Develop controllers and decision making systems using reinforcement learning, train deep learning models on NVIDIA DGX and cloud platforms, and apply deep learning to 3-D data.

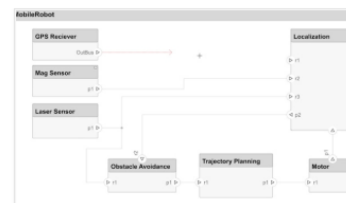
» [Learn more](#)



### Automotive

Design and simulate AUTOSAR software, interface with HERE HD maps, and generate energy balance reports.

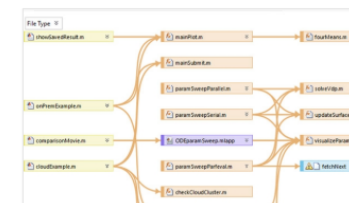
» [Learn more](#)



### Systems Engineering

Design and analyze system and software architectures with System Composer.

» [Learn more](#)



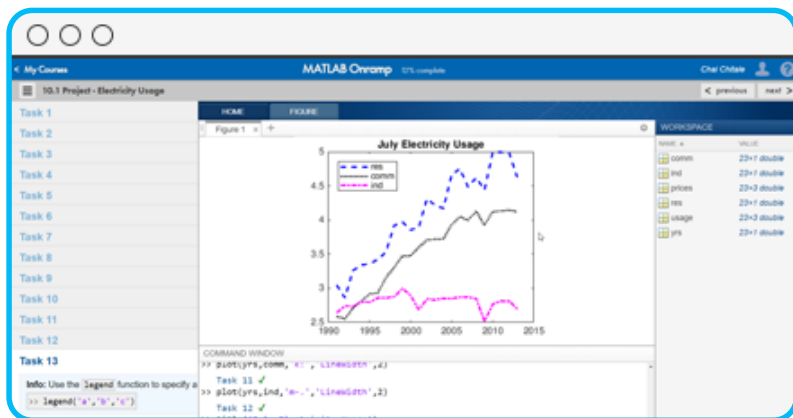
### Projects

Use projects in MATLAB and Simulink to organize, manage, and share your work.

» [Learn more](#)

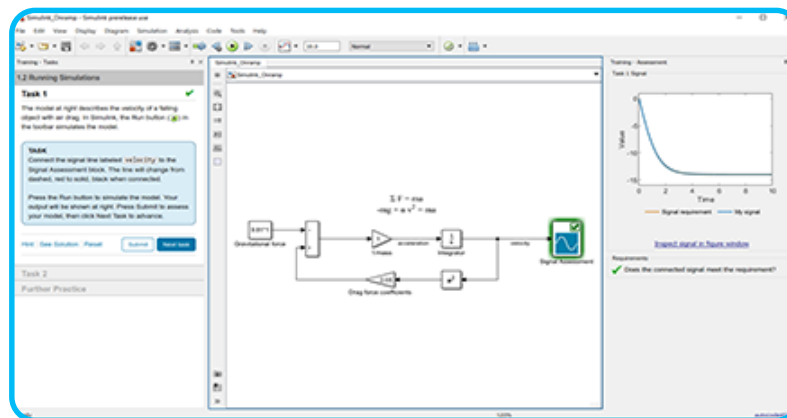


# Online kurzy zadamo



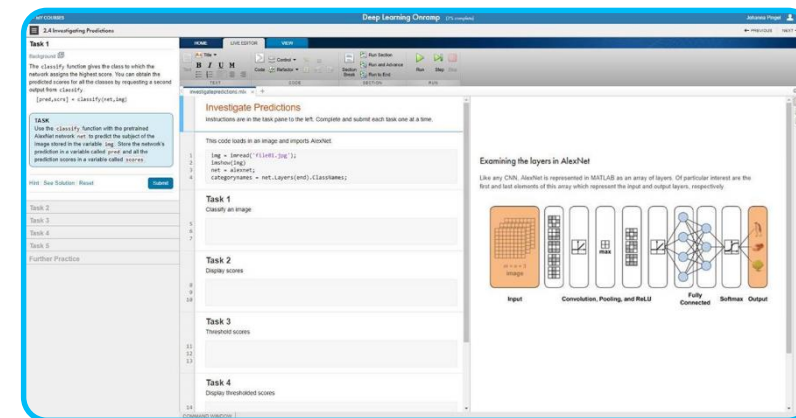
MATLAB Onramp

Základy MATLABu



Simulink Onramp

Tvorba a editácia modelov Simulinku



Deep Learning Onramp

Prístupy Deep learningu na rozpoznávanie obrazu

**Ďakujem za pozornosť**