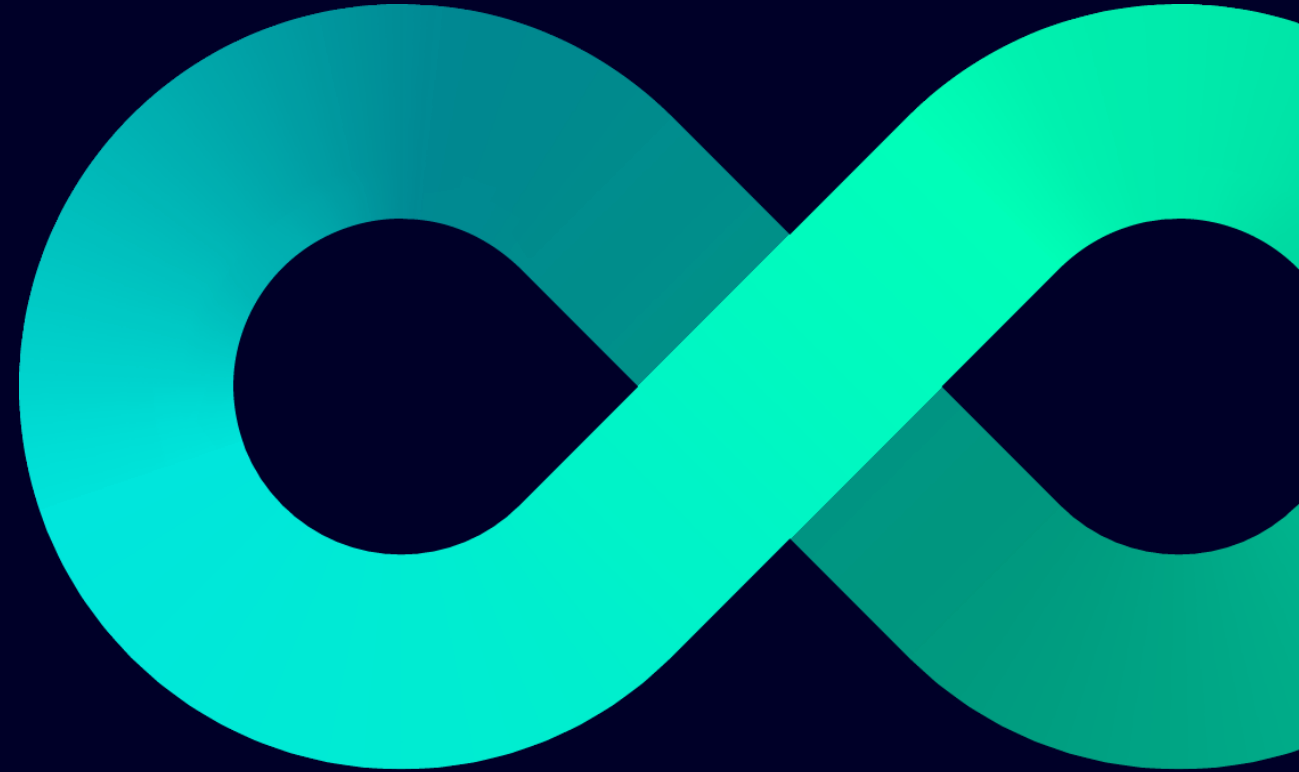


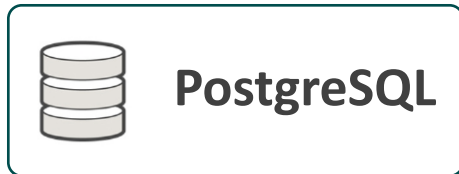
Siemens Prediktivní údržba

Webová aplikace vyvinutá na
platformě MATLAB



Analytic Services Konceptce

Condition Monitoring



Analytic Services SIEMENS

On-Premise

Web Apps

- SIEMENS** | Predictive maintenance
- SIEMENS** | Quality control
- SIEMENS** | Report service
- SIEMENS** | Supply management



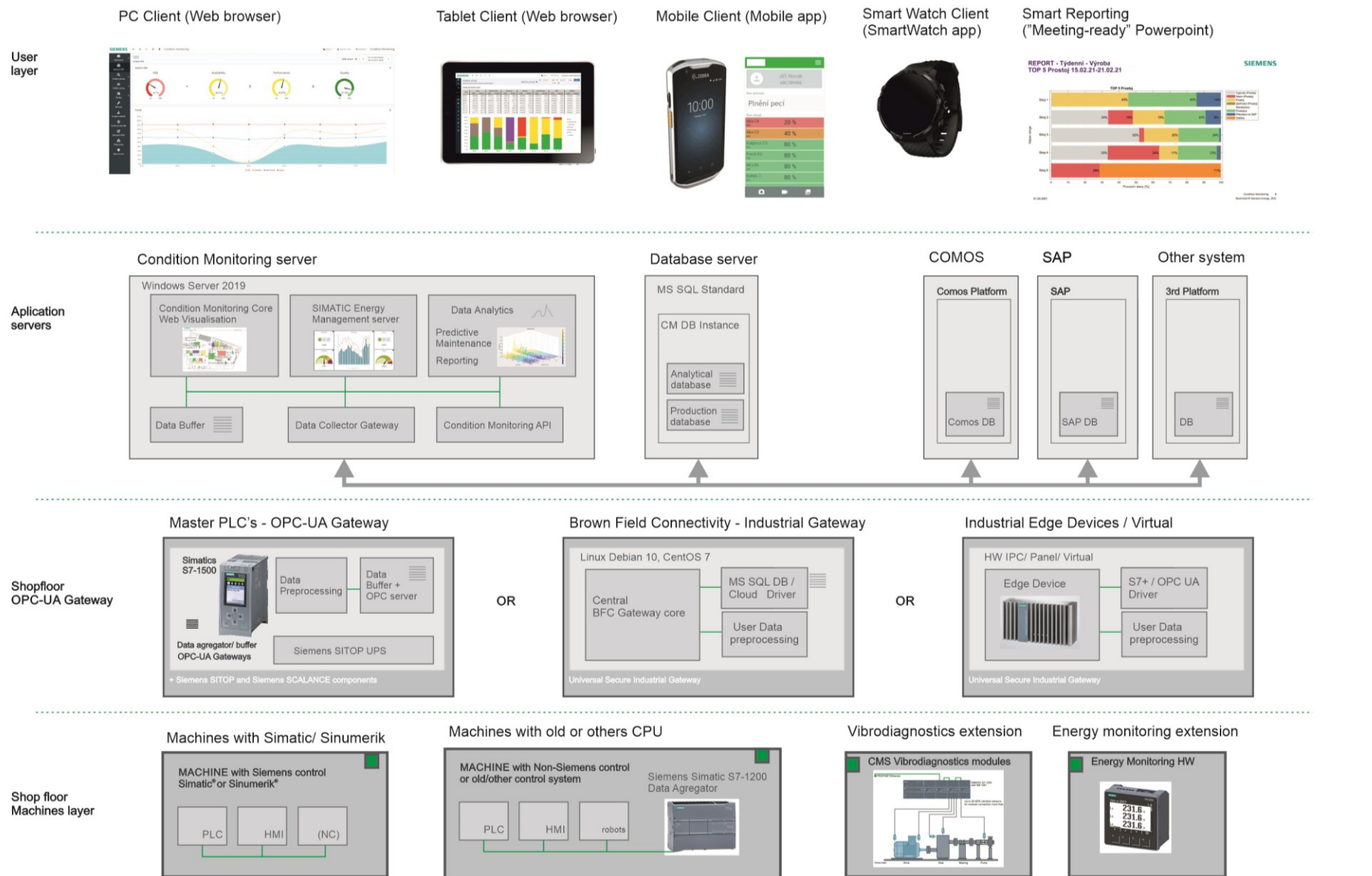
MATLAB Excel
.NET C/C++
.exe Java .dll



Tasks

Ad-hoc analysis
Mathematical/Analytical models

Architektura sběru dat



Analytic Services Konceptce

Condition Monitoring



Analytic Services SIEMENS

On-Premise

Web Apps

- SIEMENS** | Predictive maintenance
- SIEMENS** | Quality control
- SIEMENS** | Report service
- SIEMENS** | Supply management

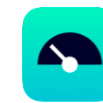


MATLAB Excel
.NET C/C++
.exe Java .dll



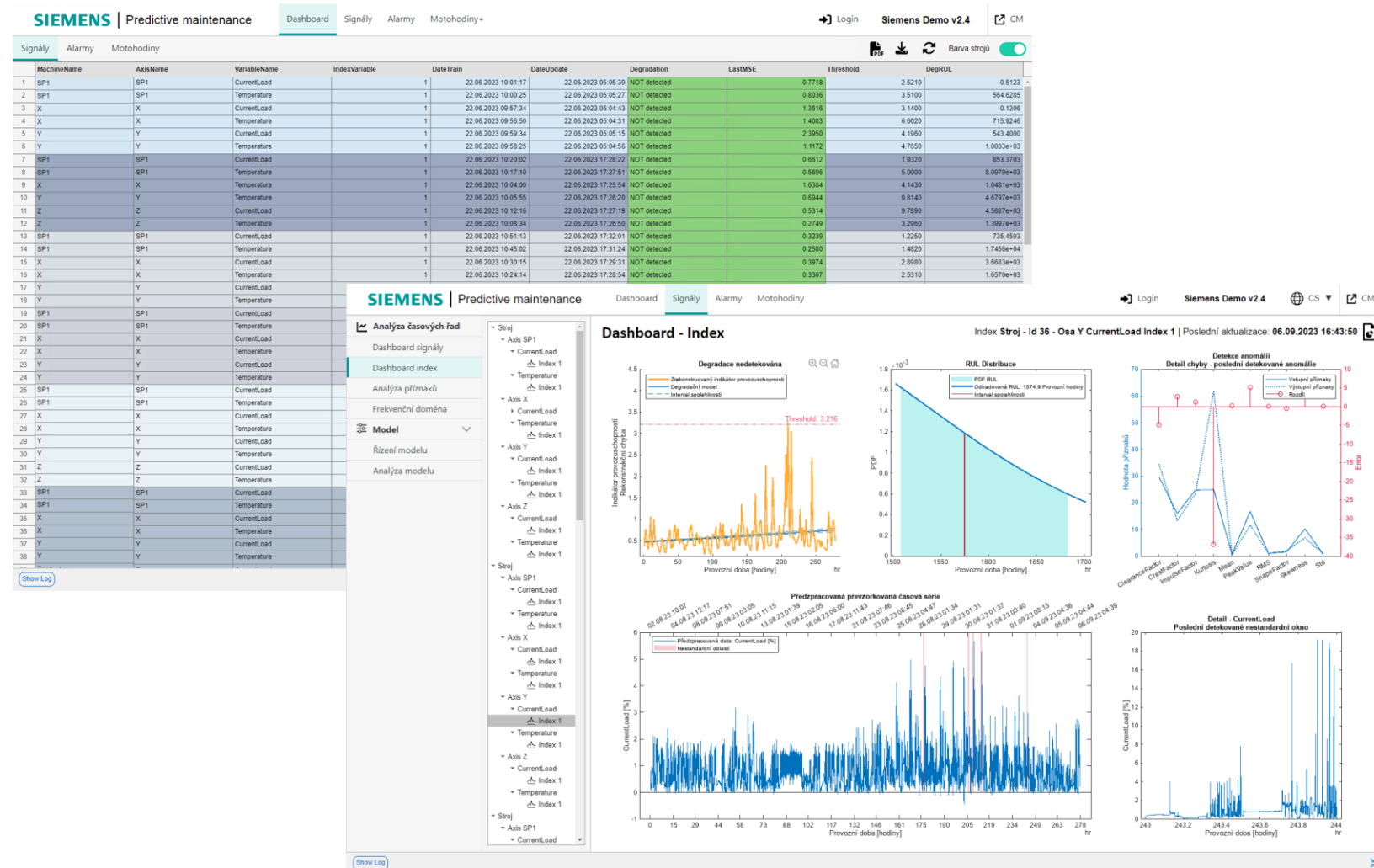
Tasks

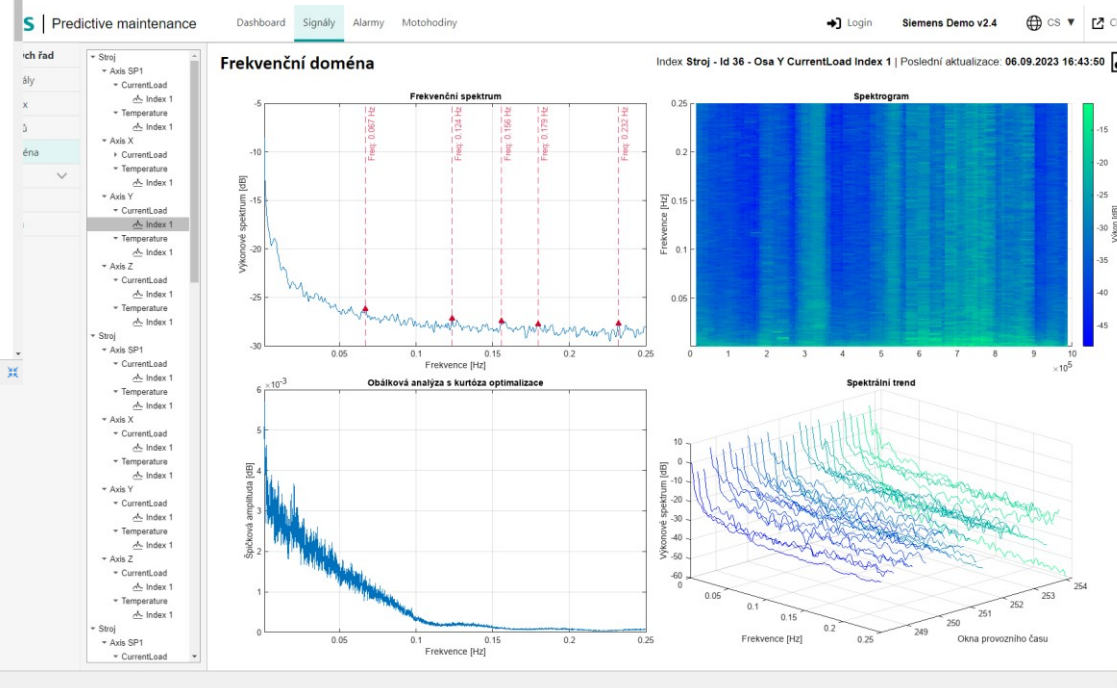
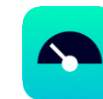
Ad-hoc analysis
Mathematical/Analytical models

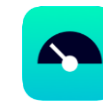


Predictive maintenance

- Processing of data from CM, other measuring systems or information enterprise softwares (SAP) in order to detect non-standard condition in time and make forecast of possible failure of machine.
- For the purpose of predictive maintenance there are used modern trends and approaches such as machine learning, neural networks, failure simulation etc.
- Targets of predictive maintenance are for example:
 - Detect non-standard behavior during operation
 - Shutdown costs reducing - Optimization of prevent maintenance, increasing of operation efficiency







SIEMENS | Predictive maintenance | Dashboard | Signály | **Alarmy** | Motohodiny+ | Login | Siemens Demo v2.4 | CM

Analýza alarmů

Dashboard alarmy
Analýza alarmů stroje
LDA analýza
Řízení alarmů

Model

LDA analýza alarmů stroje | Alarmy stroje | Poslední aktualizace: 19.06.2023 19:01:21

LDA Model Topic 1

manipulátor není základní
pozor manipulátor není
není základní poloze
není základní poloze
kritická teplota zadního
řada otáček vřetena
zadního ložiska hlavního
teplota zadního ložiska
ložiska hlavního uložení
vysoká teplota zadního
ruka manipulátoru vysunuta
nezařadila řada otáček
zasouvání ruky blokováno
zařazena žádná řada

LDA Model Topic 2

kanál blok syntaktická
při korekci poloměru
syntaktická chyba textu
n1000 nebezpečí kolize
kanál blok n1000
n850 není naprogramován
kanál blok n850
není zasunuta ruka
pozor není zasunuta
zasunuta ruka manipulátoru
kolize při korekci blok n850 není
není naprogramován posuv
blok n1000 nebezpečí
nebezpečí kolize při
korekci poloměru nástroje

LDA Model Topic 3

hladina oleje mazacím
není upnut nástroj
osy blokováno
kanál blok neexistuje
pohyb osy blokováno
nelze není upnut
nízká hladina oleje
oleje mazacím agregátů

LDA Model Topic 4

zrušena kvůli alarmu
kanál ovlivňování programu
lůžko polohy pro
není napoložováno lůžko
pozor není napoložováno
ruka manipulátoru nevyusunula
manipulátoru nevyusunula včas
napoložováno lůžko polohy
polohy pro avn
akce e33 alnx
ovlivňování programu akce
e33 alnx zrušena

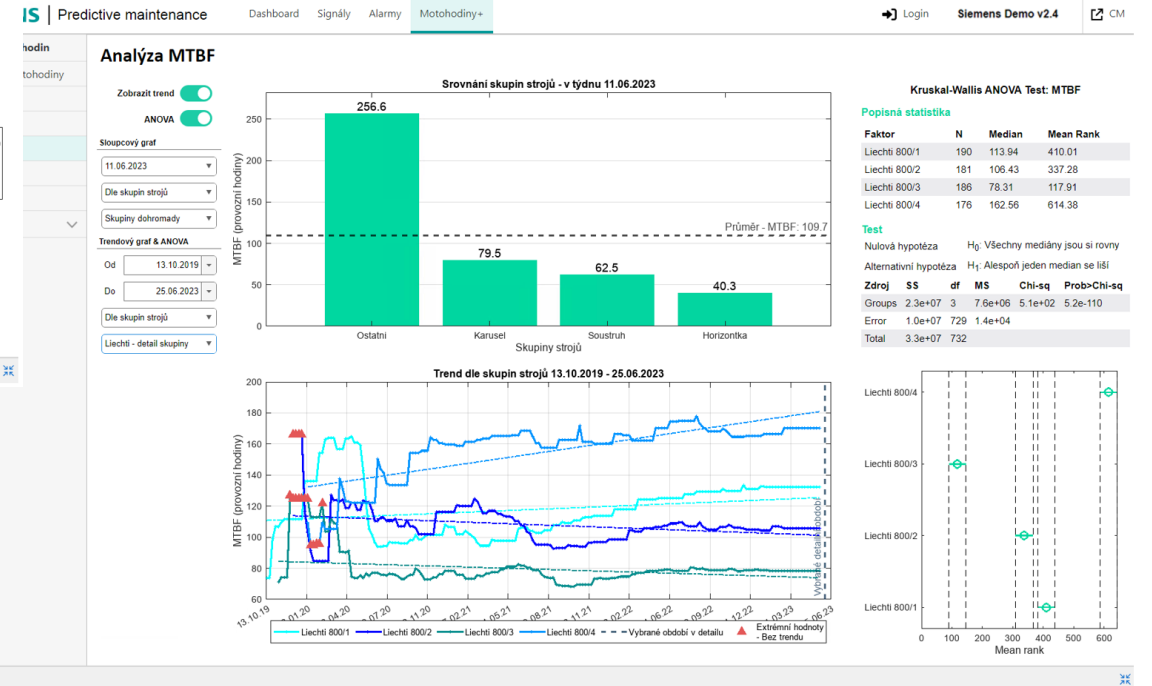
SIEMENS | Predictive maintenance | Dashboard | Signály | **Alarmy** | Motohodiny+ | Login | Siemens Demo v2.4 | CM

Analýza alarmů stroje | Alarmy stroje | Poslední aktualizace: 19.06.2023 19:01:21

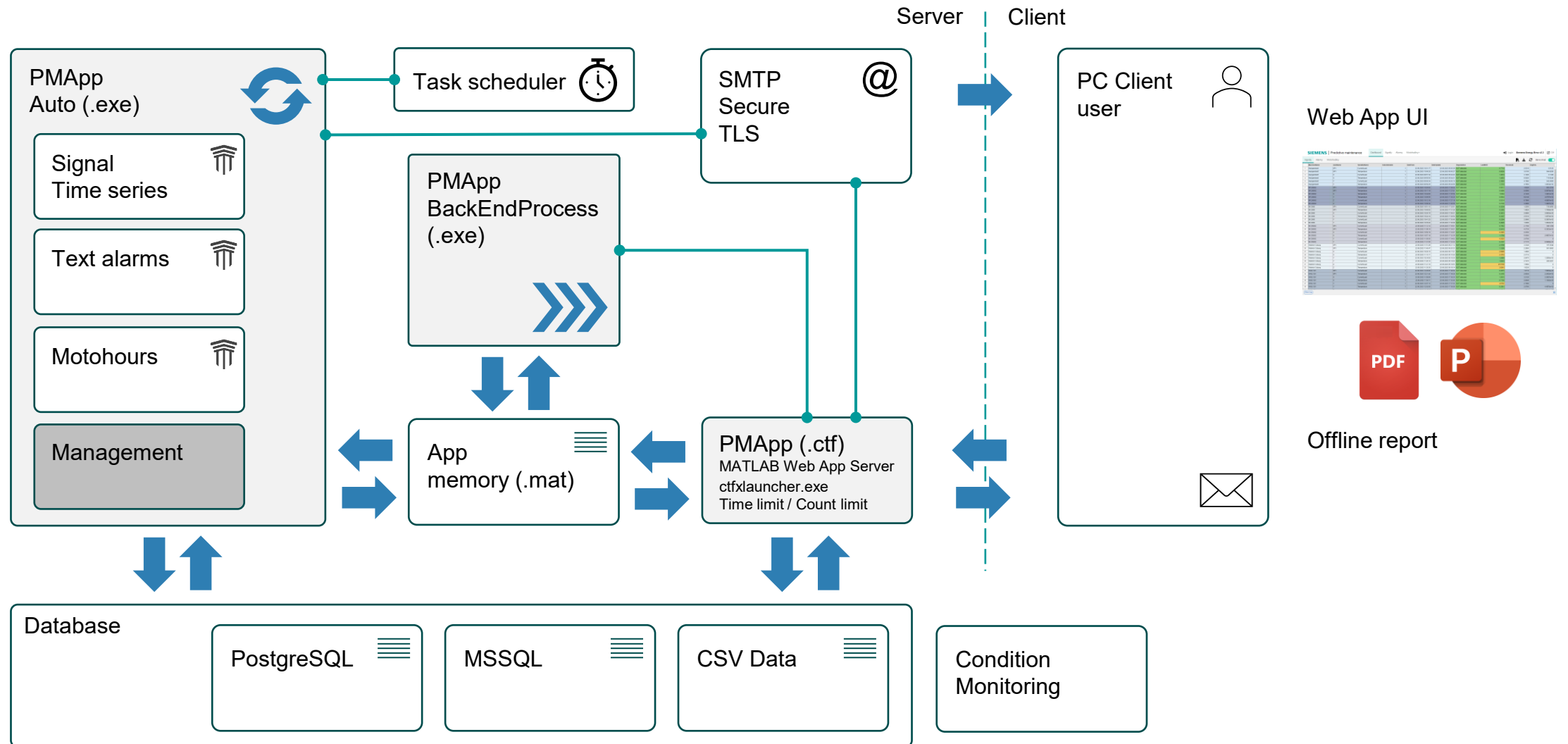
AlarmNumber	LastView	DateDuration	InNCAlarm	ProbReceive	CountsLast	CountsAll	CumSumProb	ShortText	Managed
1	700140	08.06.23 16:37	33	0	1	1	0.9998	Vysoká teplota zadního ložiska hlavního uložení	✓
2	700142	08.06.23 16:37	33	0	1	1	0.9998	Kritická teplota zadního ložiska hlavního uložení	✓
3	700452	09.06.23 09:11	4	0	1	3	0.9991	Ruka manipulátoru se nevyusunula včas	✓
4	700242	18.06.23 22:23	28	0.0100	1	5	0.9983	Nezařadila se řada otáček vřetena	✓
5	700557	11.06.23 23:17	14	0.0100	1	5	0.9986	Vysouvání/zasouvání ruky blokováno	✓
6	700435	11.06.23 23:17	2	0.0100	1	8	0.9978	Pozor - není zasunuta ruka manipulátoru	✓
7	10860	13.06.23 20:38	20	0.0100	2	11	0.9962	Kanál K1 blok N850 - není naprogramován posuv	✓
8	17181	13.06.23 21:39	20	0.0100	2	11	0.9964	Kanál K1 Blok 5 C T = %3, Z D = %4 neexistuje	✓
9	700543	18.06.23 11:34	9	0.0100	1	11	0.9968	Pozor - není napoložováno lůžko do polohy pro AVN	✓
10	700633	17.06.23 07:48	6	0.0200	4	12	0.9961	Pohyb osy Z je blokováno od AVN	✓
11	700240	15.06.23 12:18	5	0.0200	3	13	0.9954	Netže - není upnut nástroj	✓
12	700244	18.06.23 22:24	21	0.0200	2	14	0.9951	Není zařazena žádná řada otáček vřetena	✓
13	10751	17.06.23 03:39	19	0.0200	2	16	0.9947	Kanál K1 blok N1000 - nebezpečí kolize při korekci poloměru nástroje	✓
14	16906	18.06.23 06:19	19	0.0200	2	18	0.9942	Kanál K1 Ovlivňování programu: akce E33 <ALNX> zrušena kvůli alarmu	✓

Počet x Aktivní doba alarmu: 700140

Alarms Distribution
Celkově: 130 typů alarmů za posledních 365 dnů



Architektura aplikace PMAApp




Architektura aplikace PMAApp – Features

PMAApp (.ctf)
MATLAB Web App Server
ctfxlauncher.exe




MATLAB
Web App Server
Development version



Supported Functionality	MATLAB Web App Server Product	Development Version of MATLAB Web App Server in MATLAB Compiler
Authentication	✓	X
Role-based access	✓	X
Policy-based access	✓	X
Support for multiple releases of MATLAB	✓	X
Number of concurrent sessions	Unlimited ^a	32
Server setup and configuration	Command-line only	Graphical user-interface
Run MATLAB web apps in Docker [®] containers	✓	X


^a Subject to server hardware limitations.

PMAApp solve


Security 

- Installed on dedicated intern virtual server, which is not exposed to open network. It is available just for facility workers signed in intern network.
- On the host machine there are created two low-privileged user accounts who has rights to manipulate just with selected folders/files.
- Secure Connection SSL for HTTPS

Memory management

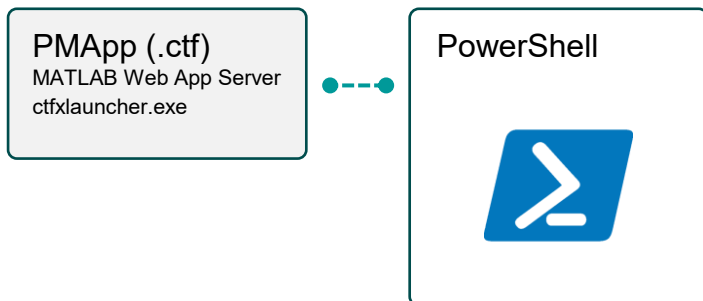
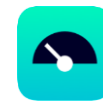


PMAApp Auto (.exe)

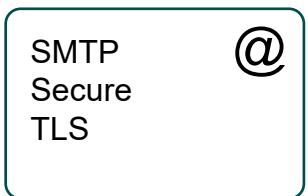


- All time-consuming processes and computational operations are executed at regular time intervals in the background on the server.
- The goal is to prepare the outputs of these operations for quick visualization by the user and to minimize the CPU and RAM load on the user while working with the application.
- For example, preparing small files with outputs according to the logic - machine - component - signal. The user loads only the prepared results of the analysis of the selected signal.

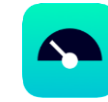
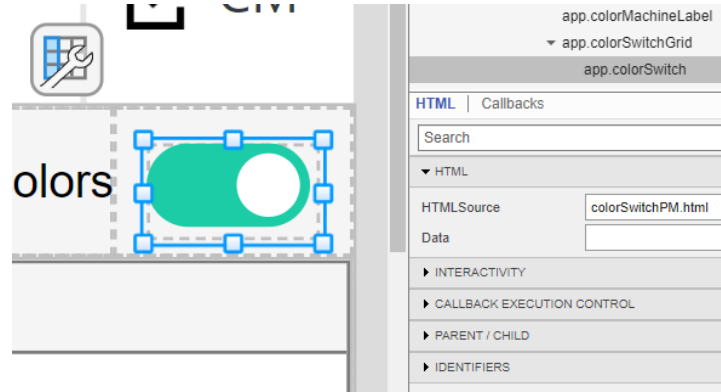
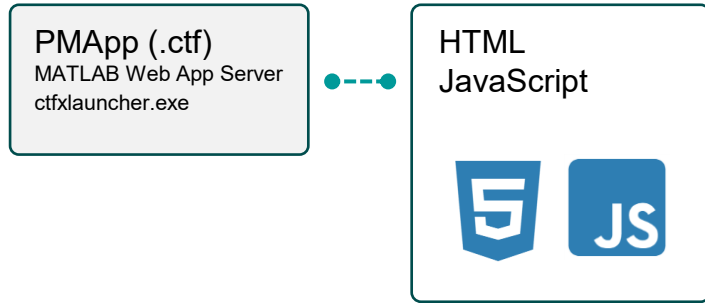
Architektura aplikace PMAApp – Features



```
1 try
2   % Email subject
3   textSubject = append("PMAApp - Dashboard report - ", ...
4     string(datetime("now","Format","dd.MM.uuuu HH:mm")));
5
6   % Email text
7   textMessage = "Automatický dashboard report aplikace Siemens PM App";
8
9   % Email attachment
10  attachmentAddress = ...
11    append(app.pathAppFolder,"/temp/",app.nameRamReportFolder,".pdf");
12
13  % Send email
14  filledPS = append("Send-MailMessage -SmtpServer 'test.tardis.cz' ", ...
15    "-Port 1234 -From 'noreply@tardis.com' -To '", ...
16    string(userForEmail.Email(1)),"' -Subject '", ...
17    textSubject,"' -Body '",textMessage, ...
18    "' -Attachments '",string(attachmentAddress), ...
19    "' -Encoding 'utf8'", ...
20    "' -Credential $cred", ...
21    "' -DeliveryNotificationOption OnSuccess, OnFailure");
22
23  completeTextSystem = append("powershell ", ...
24    "$PWD = ConvertTo-SecureString '123456789' -AsPlainText -Force;", ...
25    "$cred = New-Object System.Management.Automation.PSCredential('noreply@tardis.com', $PWD);", ...
26    "[Net.ServicePointManager]::SecurityProtocol = [Net.SecurityProtocolType]::Tls12 "; ...
27    filledPS);
28
29  % Call PowerShell string
30  system(completeTextSystem)
31 catch ME
32   disp(ME.message)
33   disp(append("ERROR: sendDashboardReportPM.m - Service cannot send a pdf report to ",...
34     string(userForEmail.Email(1))))
35 end
```

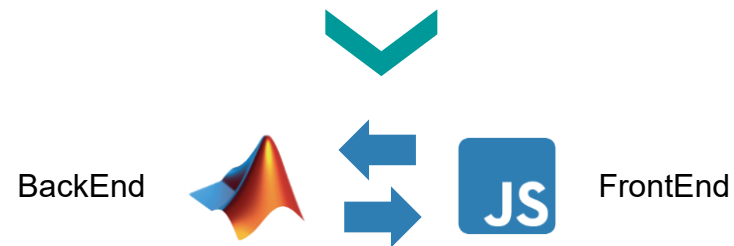
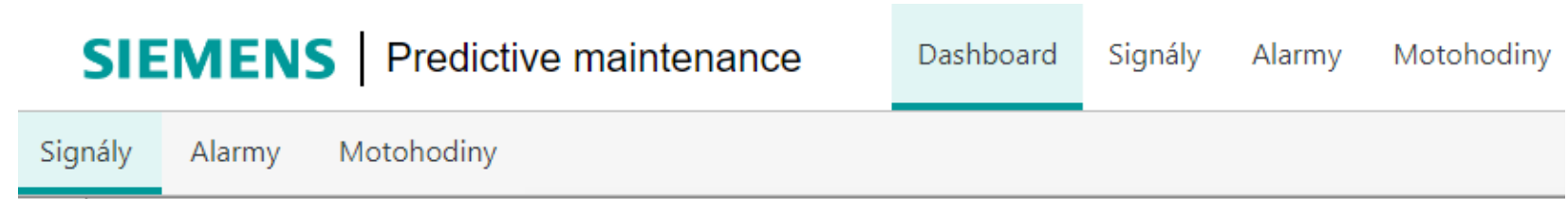


Architektura aplikace PMAApp – Features



SIEMENS | Predictive maintenance

```
1 function setup(htmlComponent) {  
2     var input = document.getElementById('toggleswitch');  
3  
4     input.addEventListener('change', function() {  
5         if (this.checked) {  
6             htmlComponent.Data = "colorSwitchOn";  
7         }  
8         else {  
9             htmlComponent.Data = "colorSwitchOff";  
10        };  
11    });  
12 };  
13
```

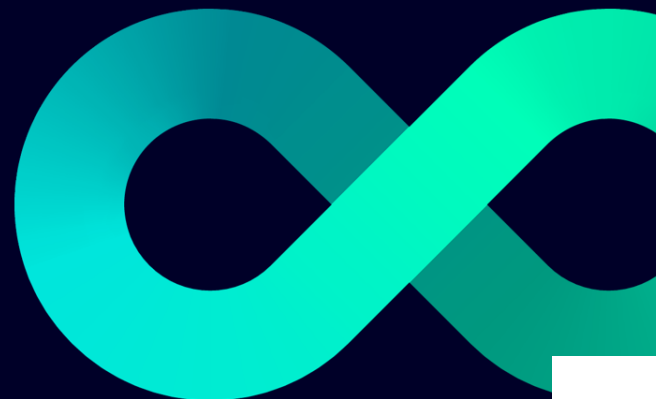


Report Siemens PM App

Zařízení: 45_Robot1 F035

Osa: 1 - Kanál 1

Proměnná: CurrentLoad - Index 1



PMAApp (.ctf)
MATLAB Web App Server
ctfxlauncher.exe

PowerPoint
PDF

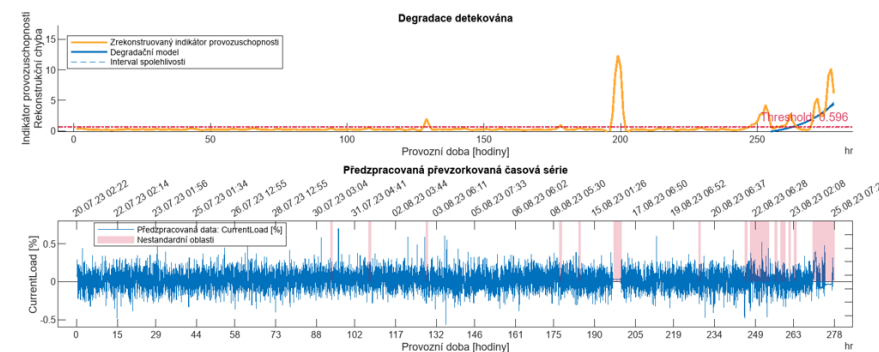


MATLAB
Report Generator

SIEMENS

45_Robot1 F035 - Osa 1 CurrentLoad Index 1 Index - Časová řada + Health indicator

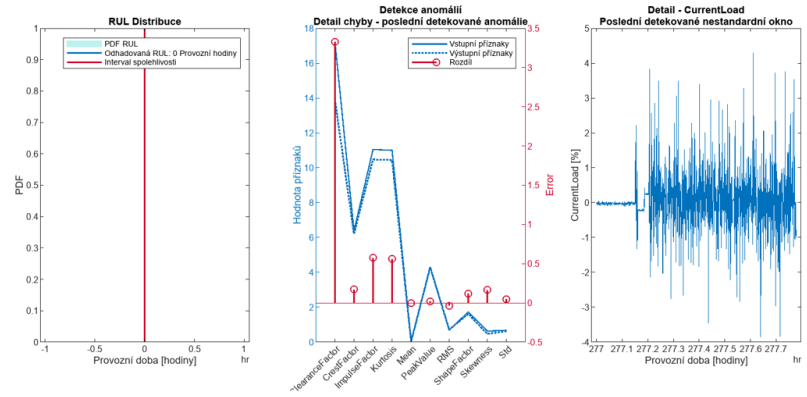
Id Stroje	Název stroje	Kanál	Osa	Proměnná	Index	Datum tréninku	Datum aktualizace
45	45_Robot1 F035	1	1	CurrentLoad	1	18.08.2023 10:41:57	18.08.2023 10:53:13



SIEMENS

SIEMENS

45_Robot1 F035 - Osa 1 CurrentLoad Index 1 Index - RUL + Poslední časové okno



Page 3

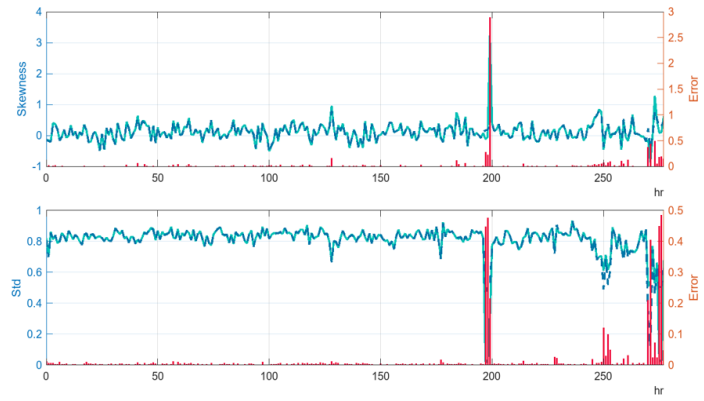
45_Robot1 F035 - Osa 1 CurrentLoad Index 1 Analýza příznaků - Detail 5

Skewness

Průměr	0.127
Std	0.32
Max	3.237
Min	-0.868

Std

Průměr	0.807
Std	0.115
Max	0.933
Min	0.021



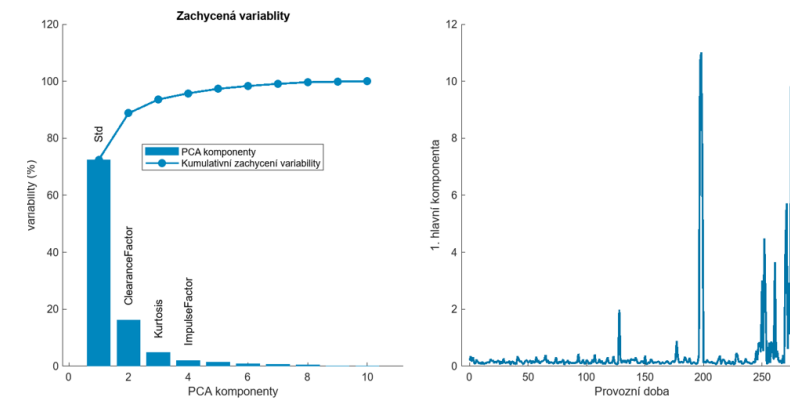
PMAApp (.ctf)
MATLAB Web App Server
ctfxlauncher.exe

PowerPoint
PDF

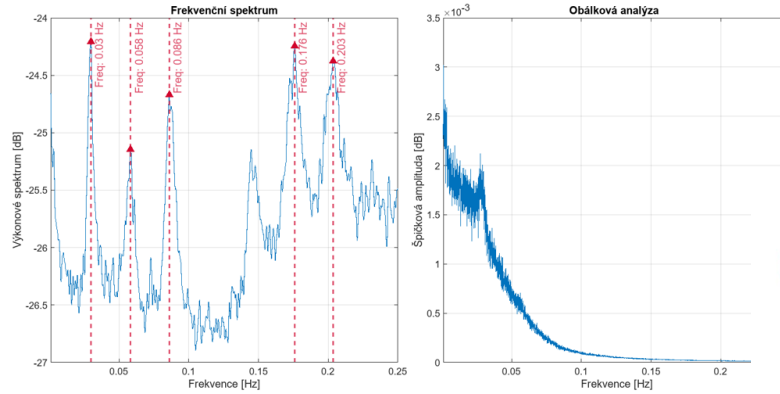


MATLAB
Report Generator

45_Robot1 F035 - Osa 1 CurrentLoad Index 1 Analýza příznaků - PCA analýza



45_Robot1 F035 - Osa 1 CurrentLoad Index 1 Frekvenční analýza - Frekvenční doména



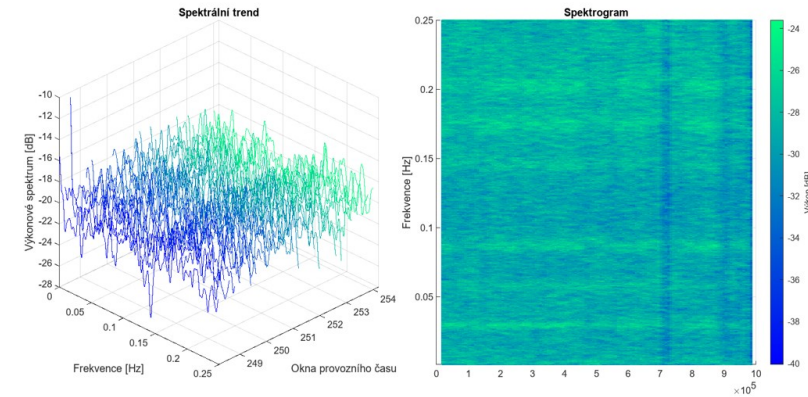
PMAApp (.ctf)
MATLAB Web App Server
ctfxlauncher.exe

PowerPoint
PDF

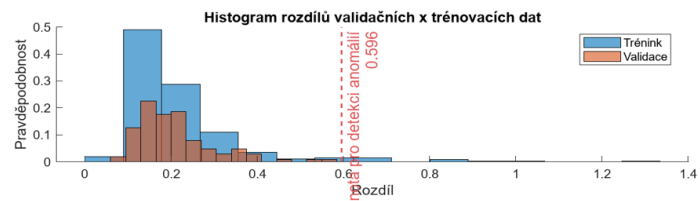
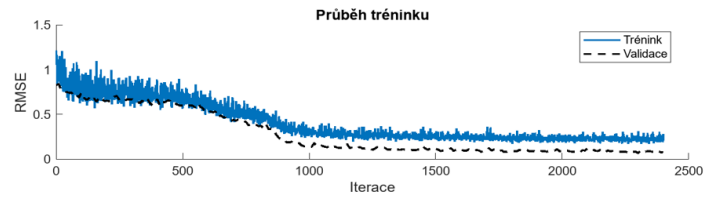


MATLAB
Report Generator

45_Robot1 F035 - Osa 1 CurrentLoad Index 1 Frekvenční analýza - Časově frekvenční doména



45_Robot1 F035 - Osa 1 CurrentLoad Index 1 Analýza modelu - Anomaly detection ANN BiLSTM model



Detekční BiLSTM model	
Přesnost (RMSE)	0.072
Metoda	BiLSTM Autoencoder
Počet vrstev	5
num1Layer	01
num2Layer	02
num3Layer	03
num4Layer	04
num5Layer	05
Počet vzorků pro trénink	1234
Počet vzorků pro validaci	123
Base Learn Rate	
Počet trénink iterací	2260
Doba tréninku (s)	215
Mini Batch Size	
Počet epoch	175

Dashboard report - Siemens Predictive maintenance App

Signály & Časové rady

MachineName	AxisName	VariableName	IndexVariable	DateTrain	DateUpdate	Degradation	LastMSE	Threshold	DegRUL
"45_Robot1 F035"	"1"	"CurrentLoad"	"1"	"06.06.2023 14:47:36"	"23.06.2023 06:52:46"	"NOT detected"	"0.99031"	"1.219"	"289.746608"
"45_Robot1 F035"	"1"	"Temperature"	"1"	"06.06.2023 14:21:55"	"23.06.2023 06:52:10"	"NOT detected"	"0.72255"	"2.445"	"2189.71018"
"45_Robot1 F035"	"2"	"CurrentLoad"	"1"	"06.06.2023 15:59:49"	"23.06.2023 06:53:37"	"NOT detected"	"3.1809"	"3.183"	"174.436122"
"45_Robot1 F035"	"2"	"Temperature"	"1"	"06.06.2023 15:35:12"	"23.06.2023 06:53:12"	"NOT detected"	"0.67034"	"4.732"	"3334.66686"
"45_Robot1 F035"	"3"	"CurrentLoad"	"1"	"06.06.2023 16:47:24"	"23.06.2023 06:54:29"	"NOT detected"	"0.99031"	"1.219"	"289.746608"
"45_Robot1 F035"	"3"	"Temperature"	"1"	"06.06.2023 16:25:45"	"23.06.2023 06:54:03"	"NOT detected"	"0.72255"	"2.445"	"2189.71018"
"45_Robot1 F035"	"4"	"CurrentLoad"	"1"	"23.06.2023 07:38:05"	"23.06.2023 06:55:19"	"NOT detected"	"3.1809"	"3.183"	"174.436122"
"45_Robot1 F035"	"4"	"Temperature"	"1"	"06.06.2023 17:12:26"	"23.06.2023 06:54:55"	"NOT detected"	"0.67034"	"4.732"	"3334.66686"
"45_Robot1 F035"	"5"	"CurrentLoad"	"1"	"08.06.2023 12:43:11"	"23.06.2023 06:56:07"	"NOT detected"	"0.99031"	"1.219"	"289.746608"
"45_Robot1 F035"	"5"	"Temperature"	"1"	"06.06.2023 18:05:54"	"23.06.2023 06:55:43"	"NOT detected"	"0.72255"	"2.445"	"2189.71018"
"45_Robot1 F035"	"6"	"CurrentLoad"	"1"	"08.06.2023 15:56:58"	"23.06.2023 06:56:53"	"NOT detected"	"3.1809"	"3.183"	"174.436122"
"45_Robot1 F035"	"6"	"Temperature"	"1"	"06.06.2023 19:32:42"	"23.06.2023 06:56:29"	"NOT detected"	"0.67034"	"4.732"	"3334.66686"
"46_Robot2 F035"	"1"	"CurrentLoad"	"1"	"19.06.2023 10:11:38"	"23.06.2023 06:57:40"	"NOT detected"	"0.99031"	"1.219"	"289.746608"
"46_Robot2 F035"	"1"	"Temperature"	"1"	"08.06.2023 13:53:41"	"23.06.2023 06:57:16"	"NOT detected"	"0.72255"	"2.445"	"2189.71018"
"46_Robot2 F035"	"2"	"CurrentLoad"	"1"	"20.06.2023 19:31:33"	"23.06.2023 06:58:27"	"NOT detected"	"3.1809"	"3.183"	"174.436122"
"46_Robot2 F035"	"2"	"Temperature"	"1"	"06.06.2023 21:59:28"	"23.06.2023 06:58:04"	"NOT detected"	"0.67034"	"4.732"	"3334.66686"
"46_Robot2 F035"	"3"	"CurrentLoad"	"1"	"06.06.2023 23:22:19"	"23.06.2023 06:59:19"	"NOT detected"	"0.99031"	"1.219"	"289.746608"
"46_Robot2 F035"	"3"	"Temperature"	"1"	"06.06.2023 22:55:14"	"23.06.2023 06:58:54"	"NOT detected"	"0.72255"	"2.445"	"2189.71018"
"46_Robot2 F035"	"4"	"CurrentLoad"	"1"	"07.06.2023 00:14:23"	"23.06.2023 07:00:09"	"NOT detected"	"3.1809"	"3.183"	"174.436122"
"46_Robot2 F035"	"4"	"Temperature"	"1"	"08.06.2023 14:25:27"	"23.06.2023 06:59:44"	"NOT detected"	"0.67034"	"4.732"	"3334.66686"
"46_Robot2 F035"	"5"	"CurrentLoad"	"1"	"21.06.2023 08:19:31"	"23.06.2023 07:00:57"	"NOT detected"	"0.99031"	"1.219"	"289.746608"
"46_Robot2 F035"	"5"	"Temperature"	"1"	"07.06.2023 00:40:41"	"23.06.2023 07:00:34"	"NOT detected"	"0.72255"	"2.445"	"2189.71018"
"46_Robot2 F035"	"6"	"CurrentLoad"	"1"	"12.06.2023 15:18:15"	"23.06.2023 07:01:45"	"NOT detected"	"3.1809"	"3.183"	"174.436122"

PMAApp (.ctf)
MATLAB Web App Server
ctfxlauncher.exe

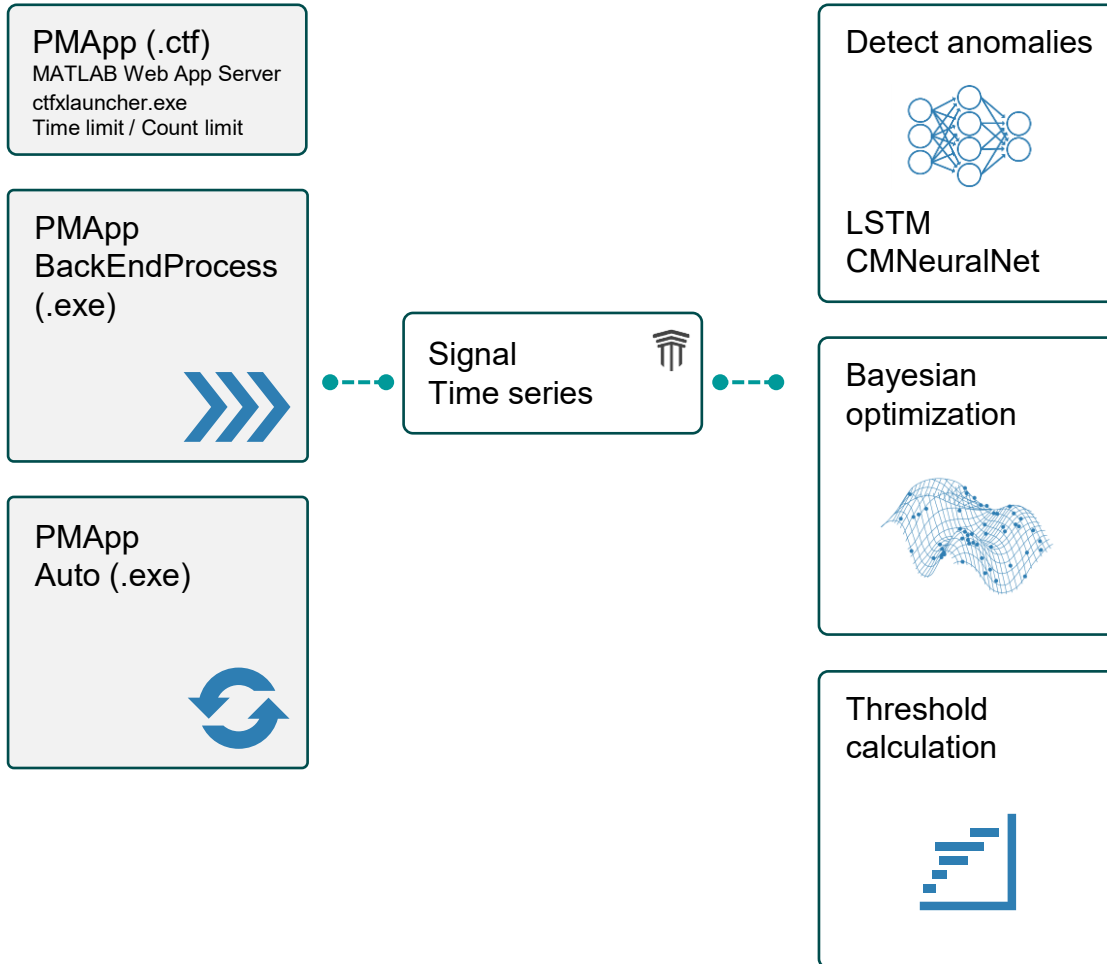
PowerPoint
PDF



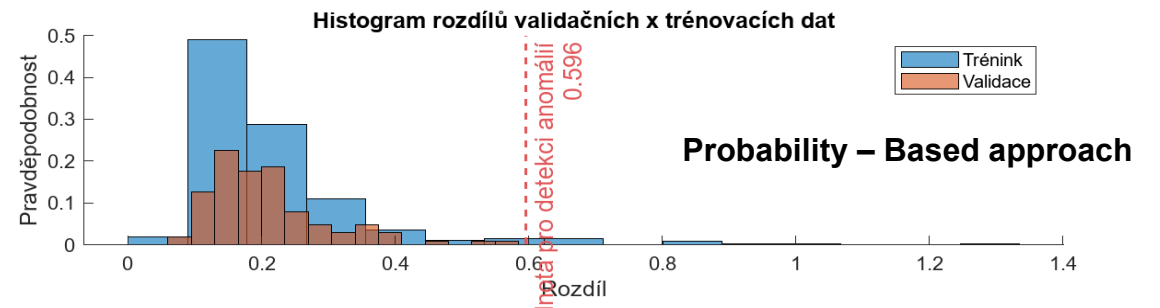
MATLAB
Report Generator

MachineName	AxisName	VariableName	IndexVariable	DateTrain	DateUpdate	Degradation	LastMSE	Threshold	DegRUL
"46_Robot2 F035"	"6"	"Temperature"	"1"	"07.06.2023 01:41:37"	"23.06.2023 07:01:21"	"NOT detected"	"0.26139"	"2.444"	"4170.59668"
"47_Robot3 F035"	"1"	"CurrentLoad"	"1"	"07.06.2023 03:13:26"	"23.06.2023 07:02:31"	"NOT detected"	"1.2242"	"2.481"	"443.142712"
"47_Robot3 F035"	"1"	"Temperature"	"1"	"07.06.2023 02:43:05"	"23.06.2023 07:02:08"	"NOT detected"	"0.15317"	"1.145"	"17652.0129"
"47_Robot3 F035"	"2"	"CurrentLoad"	"1"	"07.06.2023 04:31:39"	"23.06.2023 07:03:19"	"NOT detected"	"0.97164"	"3.276"	"1287.23941"
"47_Robot3 F035"	"2"	"Temperature"	"1"	"07.06.2023 04:05:23"	"23.06.2023 07:02:55"	"NOT detected"	"0.50158"	"2.39"	"3900.5277"
"47_Robot3 F035"	"3"	"CurrentLoad"	"1"	"07.06.2023 05:24:16"	"23.06.2023 07:04:09"	"NOT detected"	"0.98413"	"2.817"	"1042.11683"
"47_Robot3 F035"	"3"	"Temperature"	"1"	"07.06.2023 05:01:04"	"23.06.2023 07:03:44"	"NOT detected"	"1.6878"	"2.62"	"885.454916"
"47_Robot3 F035"	"4"	"CurrentLoad"	"1"	"07.06.2023 06:16:37"	"23.06.2023 07:04:57"	"NOT detected"	"0.82866"	"1.81"	"1247.75099"
"47_Robot3 F035"	"4"	"Temperature"	"1"	"07.06.2023 05:50:37"	"23.06.2023 07:04:34"	"NOT detected"	"0.40776"	"3.175"	"18651.8654"
"47_Robot3 F035"	"5"	"CurrentLoad"	"1"	"21.06.2023 11:29:26"	"23.06.2023 07:05:46"	"NOT detected"	"0.46536"	"2.259"	"1857.13236"
"47_Robot3 F035"	"5"	"Temperature"	"1"	"07.06.2023 06:45:37"	"23.06.2023 07:05:22"	"NOT detected"	"0.76128"	"2.749"	"5691.63584"
"47_Robot3 F035"	"6"	"CurrentLoad"	"1"	"12.06.2023 14:32:54"	"23.06.2023 07:06:33"	"NOT detected"	"1.2987"	"2.317"	"426.984984"
"47_Robot3 F035"	"6"	"Temperature"	"1"	"07.06.2023 07:44:02"	"23.06.2023 07:06:10"	"NOT detected"	"0.2921"	"1.098"	"3218.3176"
"48_Robot4 F035"	"1"	"CurrentLoad"	"1"	"23.06.2023 07:40:05"	"23.06.2023 07:07:20"	"NOT detected"	"1.6279"	"5"	"1183.46078"
"48_Robot4 F035"	"1"	"Temperature"	"1"	"07.06.2023 08:51:45"	"23.06.2023 07:06:56"	"NOT detected"	"0.48048"	"2.426"	"35303.0696"
"48_Robot4 F035"	"2"	"CurrentLoad"	"1"	"07.06.2023 10:20:44"	"23.06.2023 07:08:06"	"NOT detected"	"1.2173"	"3.506"	"1503.9217"
"48_Robot4 F035"	"2"	"Temperature"	"1"	"07.06.2023 09:59:47"	"23.06.2023 07:07:43"	"NOT detected"	"0.38098"	"3.985"	"4076.33858"
"48_Robot4 F035"	"3"	"CurrentLoad"	"1"	"07.06.2023 11:00:35"	"23.06.2023 07:08:57"	"NOT detected"	"1.7506"	"2.043"	"1577.56413"
"48_Robot4 F035"	"3"	"Temperature"	"1"	"07.06.2023 10:40:41"	"23.06.2023 07:08:31"	"NOT detected"	"0.68312"	"5.356"	"1471.80514"
"48_Robot4 F035"	"4"	"CurrentLoad"	"1"	"07.06.2023 11:44:22"	"23.06.2023 07:09:46"	"NOT detected"	"0.96541"	"2.375"	"1217.73954"
"48_Robot4 F035"	"4"	"Temperature"	"1"	"07.06.2023 11:20:59"	"23.06.2023 07:09:22"	"NOT detected"	"0.4115"	"1.839"	"1769.27217"
"48_Robot4 F035"	"5"	"CurrentLoad"	"1"	"23.06.2023 07:45:50"	"23.06.2023 07:10:34"	"NOT detected"	"4.3392"	"4.779"	"0"
"48_Robot4 F035"	"5"	"Temperature"	"1"	"07.06.2023 12:05:53"	"23.06.2023 07:10:10"	"NOT detected"	"0.22695"	"1.297"	"1194.6723"
"48_Robot4 F035"	"6"	"CurrentLoad"	"1"	"08.06.2023 18:41:15"	"23.06.2023 07:11:20"	"NOT detected"	"0.38664"	"2.443"	"1843.5677"
"48_Robot4 F035"	"6"	"Temperature"	"1"	"07.06.2023 13:28:54"	"23.06.2023 07:10:56"	"NOT detected"	"1.3042"	"3.201"	"3838.43159"


Architektura aplikace PMAApp – Time series - Features




- Autoencoders reconstruct input by encoding then decoding it
- BiLSTM processes data from past and future states simultaneously
- Combined, they capture and reconstruct sequences for anomaly detection
- Almost universal solution
- Parameters optimization of neural network
 - Number of hidden units in each layer– Amount of information that the layer remembers between time steps
 - Mini batch size – Size of batch to use for each training iteration
 - Initial learn rate

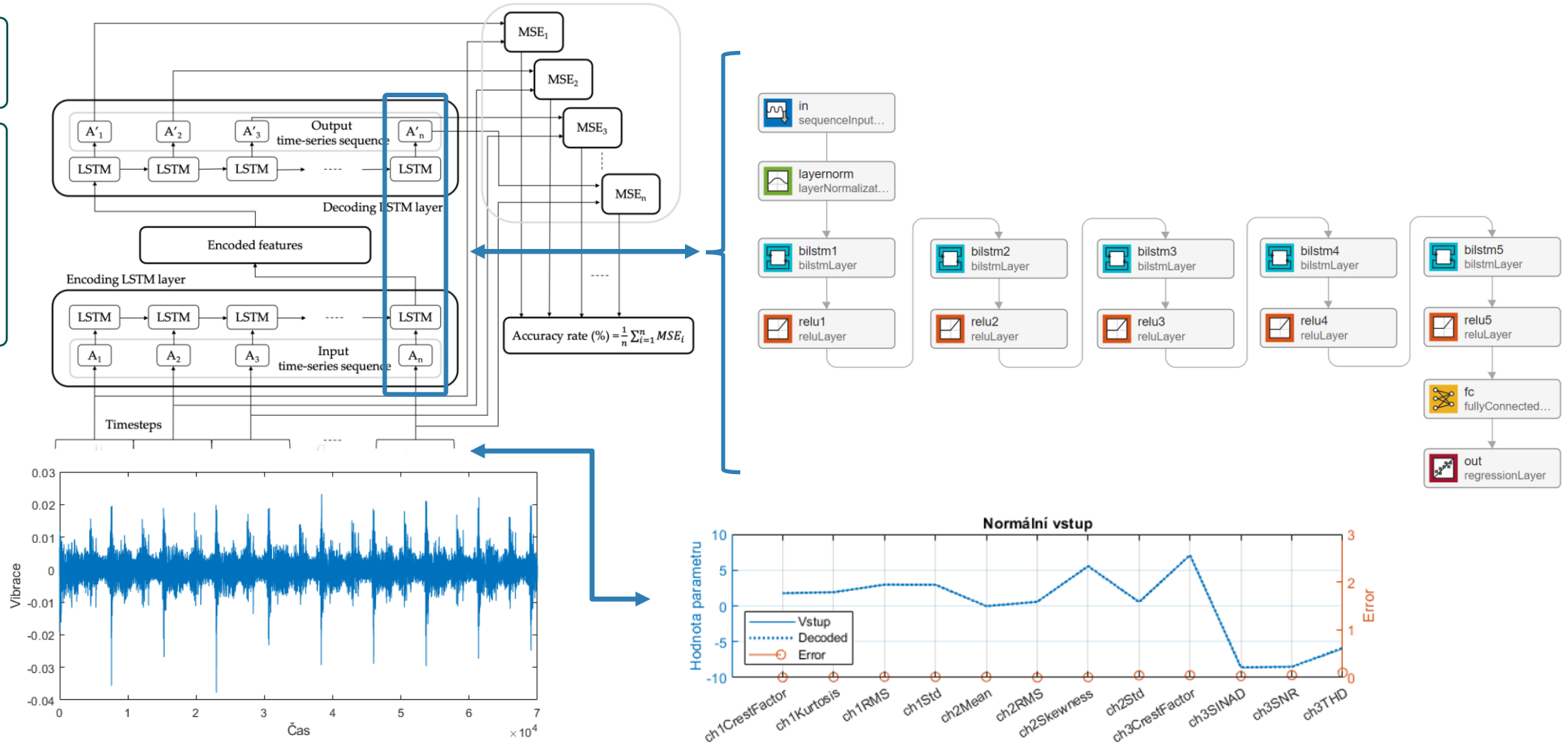


Architektura aplikace PMAApp – Time series – Feature Detect anomalies

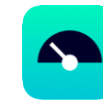
Signal Time series 

Detect anomalies 

LSTM CMNeuralNet



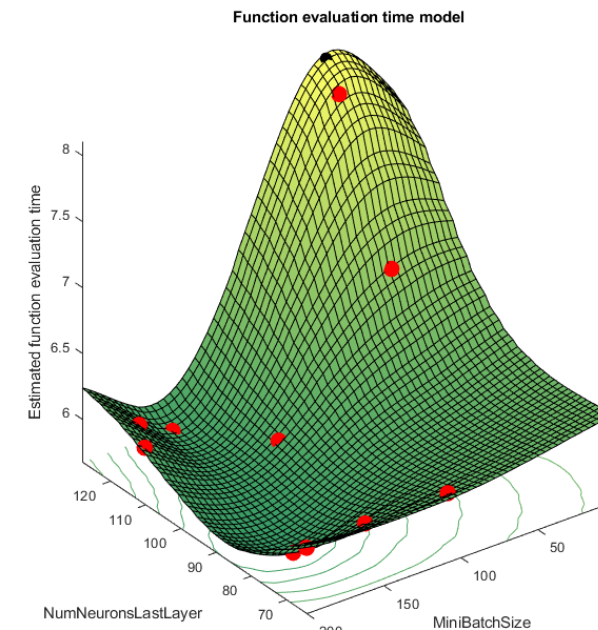
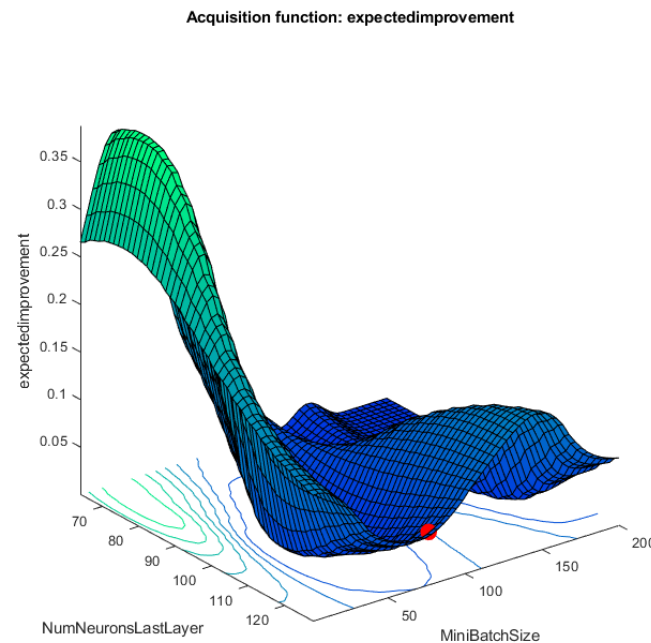
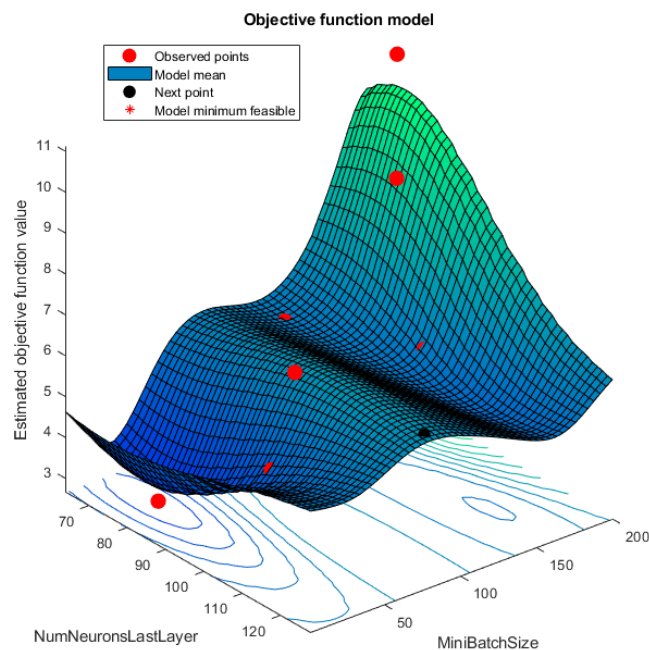
Architektura aplikace PMApp – Time series – Feature Bayesian optimization



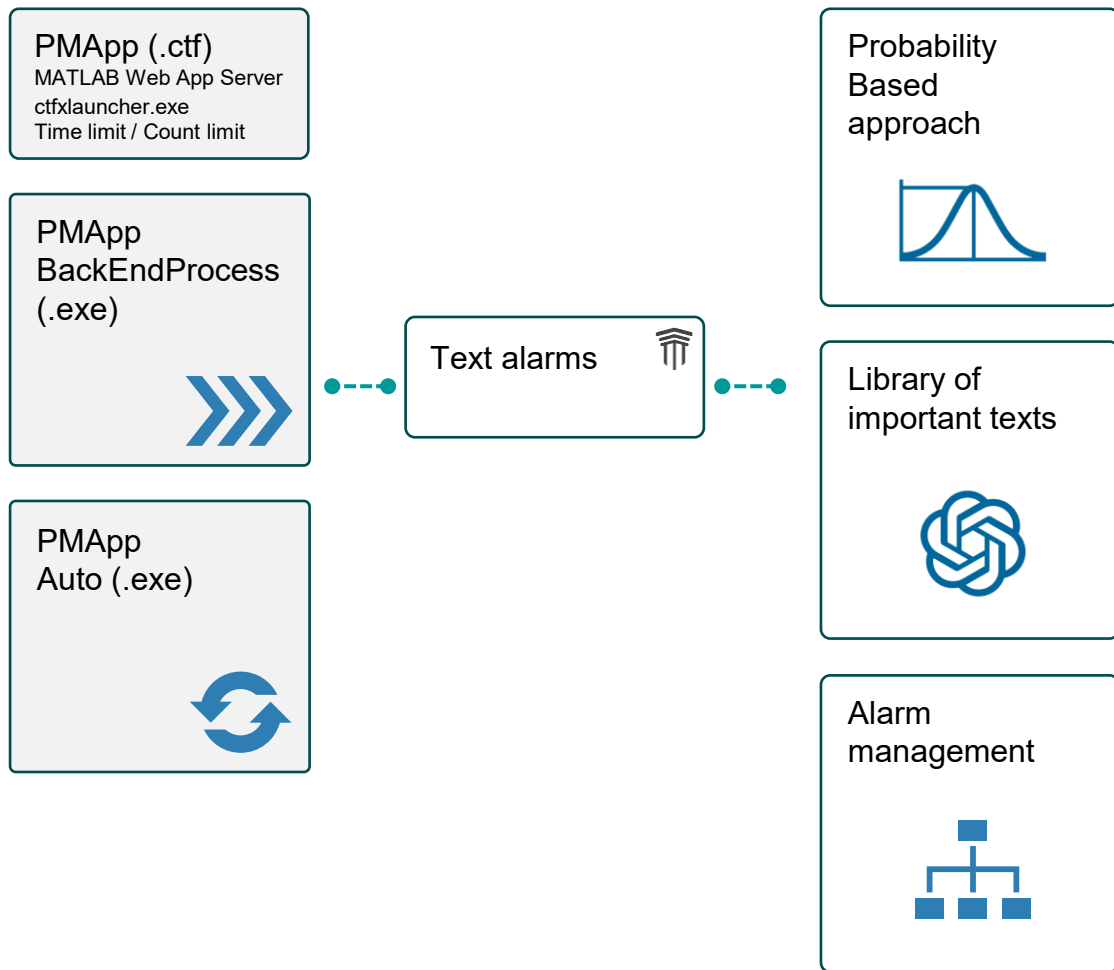
Signal
Time series



Bayesian
optimization



Architektura aplikace PMAApp – Text alarms - Features



Alarmy / hlášení
Historie alarmů / hlášení s přehledem TOP 10

SR 2000/2
Alarmy | Celková doba: 18:11:39 | Celkový počet: 2998
Hlášení | Celková doba: 329:29:16 | Celkový počet: 1982

= 4980 alarmů / 14 dnů

↓

ShortText	
2	PROFIBUS/PROFINET: Porucha sběrnice, slave/de...
4	PROFIBUS/PROFINET: Porucha pohonu , kód , hod...
4	Osa Poplašný limit skutečné rychlosti
9	Porucha nasového filtru chlazení nastroje

Analýza alarmů

- Dashboard alarmy
- Analýza alarmů stroje
- LDA analýza
- Řízení alarmů**

Model ▾

Řízení alarmů

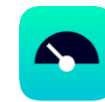
Status alarmu

Progres alarmu

Filtry

	MachineName	DateUpdate	AlarmNumber	LastView
1	SK 50 Karusel	13.03.2023	25080	01.03.2023 14:27:59.077
2	SK 50 Karusel	13.02.2023	25201	25.08.2023 09:30:10.073
3	SK 50 Karusel	13.02.2023	380500	06.02.2023 04:44:07.090
4	SK 50 Karusel	13.02.2023	380501	06.02.2023 04:47:20.083
5	SK 50 Karusel	09.05.2023	700012	30.08.2023 13:06:41.073
6	SK 50 Karusel	13.02.2023	700013	24.08.2023 17:00:32.087
7	SK 50 Karusel	13.02.2023	700230	31.01.2023 11:28:57.037

Architektura aplikace PMAp – Text alarms – Feature Library of important texts



Text alarms



Library of
important texts



```
1 # List of industrial systems
2 listSystemsString = ["hydraulic system", "electrical
  system", ...]
3
4 numSubsystemsString = len(listSystemsString)
5
6 # Number of target languages
7 numTargetLanString = 1
8
9 for i in range(numSubsystemsString):
10     systemMachineString = listSystemsString[i]
11
12     # GPT Prompt
13     query = ["GPT PROMPT"]
14
15     # Generate the text
16     generatedFailures = gpt3(query)
17
18     # Translate the text
19     for k in range(numTargetLanString):
20         targetLan = "CS"
21
22         translatedFailures = translateTextDeepL(
23             generatedFailures, targetLan)
24
```

Python

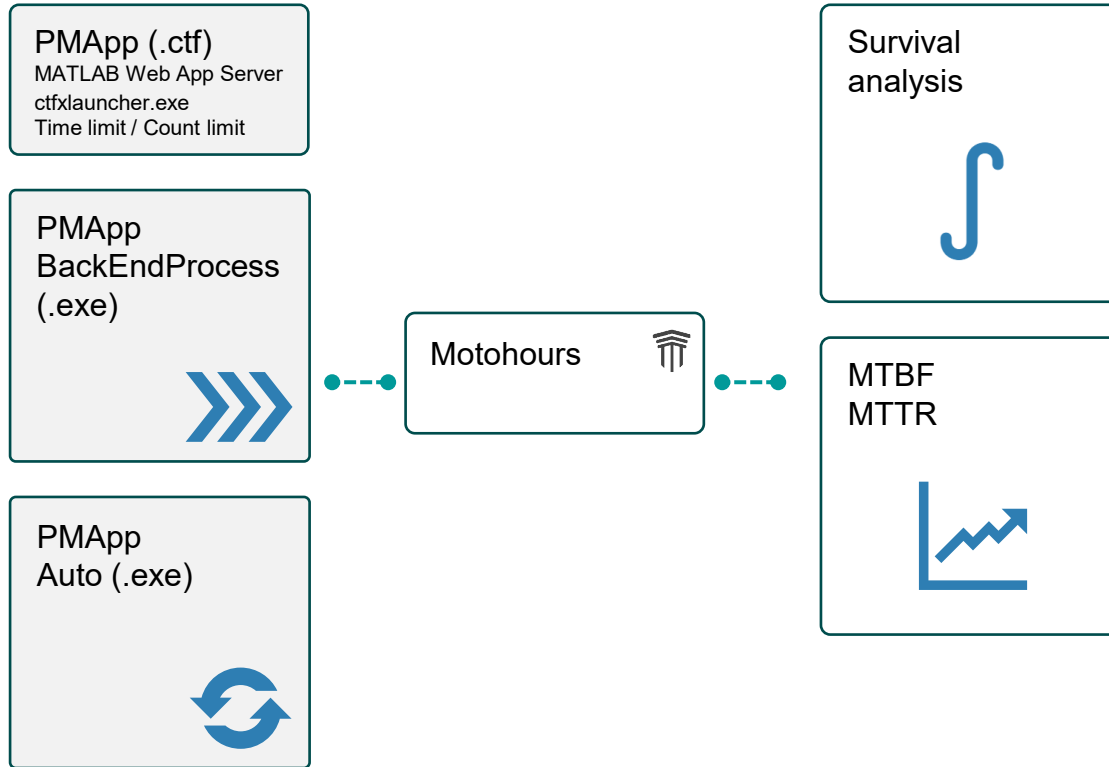
```
1 import openai
2
3 ## Generate a list of failure text
4 def gpt3(stext):
5     openai.api_key = '0000'
6     response = openai.Completion.create(
7         model="selected model",
8         prompt=stext,
9         temperature=0000,
10    )
11    return response
```

Python

```
1 import deepl
2
3 ## Translate text using DeepL
4 def translateTextDeepL(generatedFailures, targetLan):
5     auth_key = "0000"
6     translator = deepl.Translator(auth_key)
7
8     result = translator.translate_text(generatedFailures,
9         source_lang="EN", target_lang=targetLan)
10
11    toSaveText = result.text
12    return toSaveText
```

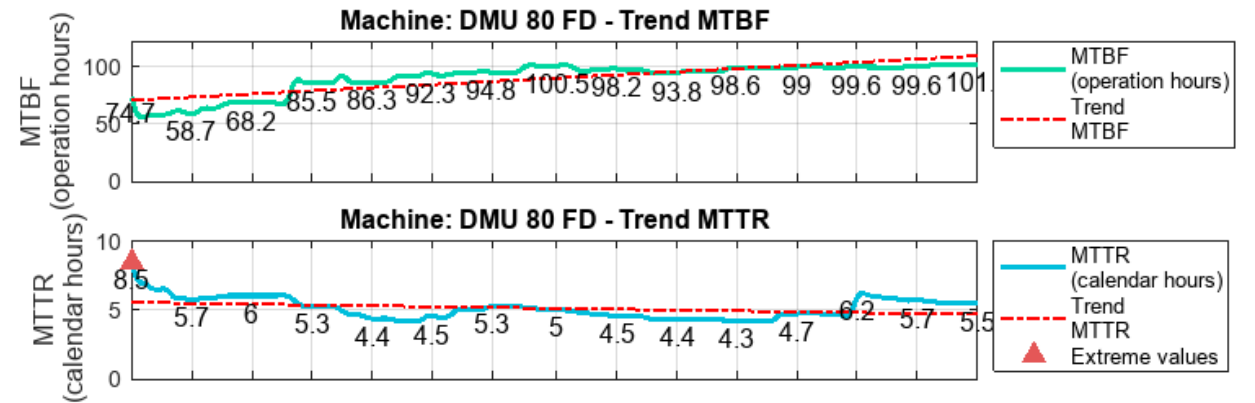
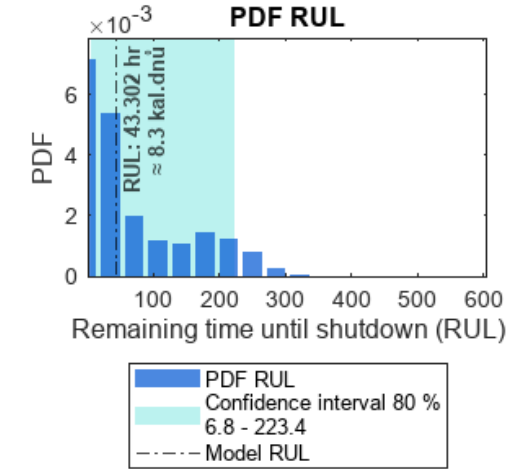
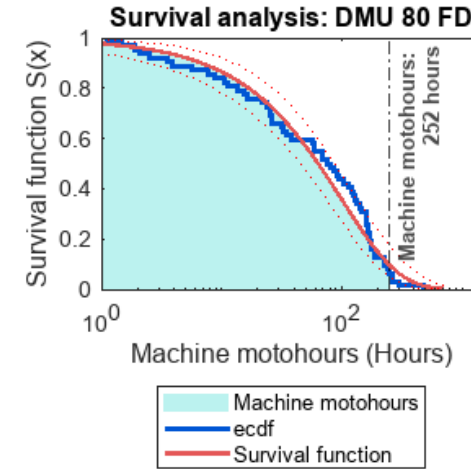
Python

Architektura aplikace PMAApp – Motohours – Features

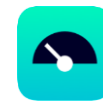


Probability of further operation:
9.6 %

Model estimation until the next shutdown:
43.3 motohours
≈ **8** calendar days

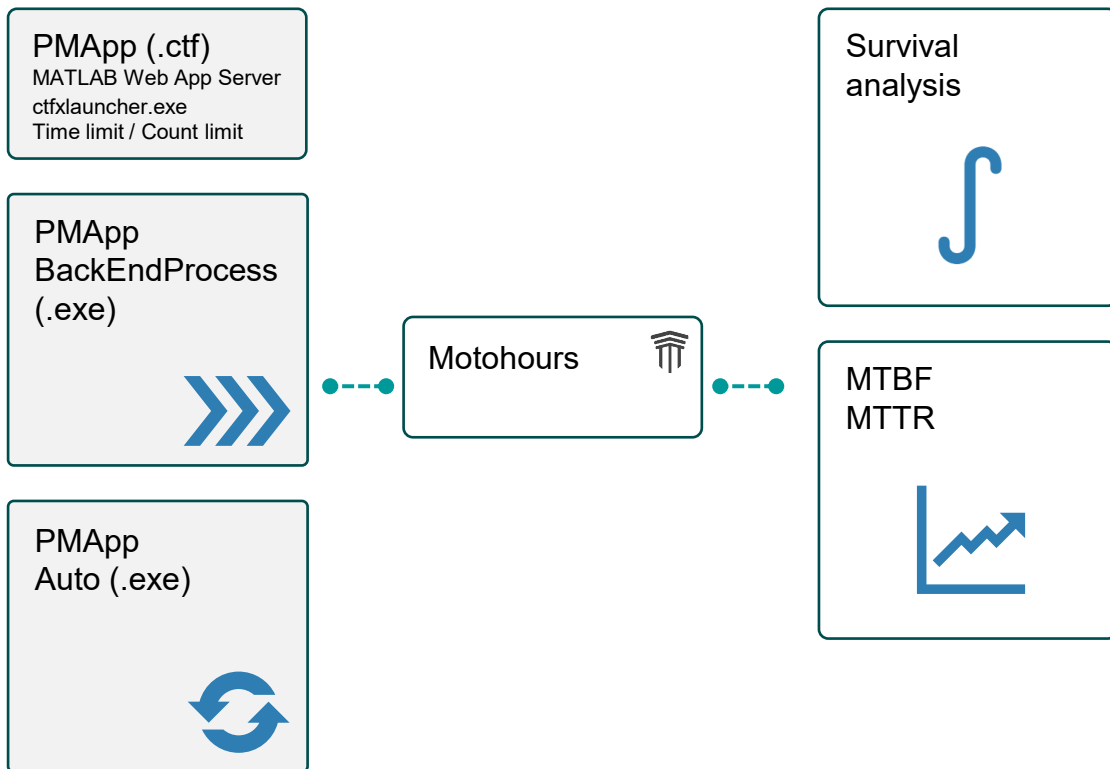


Architektura aplikace PMAApp – Motohours – Features



SIEMENS

Predictive maintenance



Petr Semotam · Vy
Datový analytik v průmyslu | MATLAB | Python | Minitab
1 r. · 6

Příklad statistické analýzy spolehlivosti a poruch v softwaru MATLAB v praxi. Ukázka zpracování záznamů servisních oprav oddělení údržby v průmyslovém podniku v kombinaci s provozními daty sbíranými systémem Condition Monitoring. Demonstrace výpočtů parametrů MTTR a MTBF a ukázka využití neparametrických statistických metod. [📄](#)

[#matlab](#) [#survivalanalýza](#) [#prediktivníúdržba](#) [#datováanalýtika](#) [#conditionmonitoring](#) [#siemens](#)

Analýza spolehlivosti a poruch v praxi (MATLAB)
Petr Semotam na LinkedIn · 10 min. čtení
Nedílnou součástí každého profesionálního chodu a řízení úseku údržby v průmyslových podnicích...

👤 Radim Krístek a 24 dalších

Reakce

👍 Líbí se 💬 Komentář ➦ Přesdílet ✉ Odeslat

📊 1 031 zobrazení [Zobrazit statistiky](#)

Přidat komentář 😊 📷



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