Build scalable AI solutions with MATLAB
Production Server in Kubernetes on Azure

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at
MATLAB Expo
Aerzen Digital Systems combines Process, Automation and AI Knowledge to improve reliability and energy efficiency of process plants Worldwide.
Aerzen Digital Systems - Products and Services

AERprogress
- Cloud platform
- Condition monitoring
- Energy monitoring
- Anomaly detection

Individual Consulting
- IIoT integration
- Process monitoring & optimization
- Simulation studies
Wastewater Treatment Plant

• Every plant is unique!
• Highly configurable machines
• Different control strategies & hardware

Flexibility & efficiency is crucial!

Activated Sludge Process

Pretreated WW → Aeration Tank → Clarifier settler → treated WW

- Compressed air supply
- Sludge recycling
- Sludge treatment

Positive Displacement Blowers
Screw Blowers
Turbo blower

Biogas power generation
Fertilizer production
Monitoring Applications examples

Machine State Classification

Classification
ON – OFF
quasi stationary - dynamic

Operating states of five identical machines
Monitoring Applications examples

Anomaly Detection

- Discharge temperature
- Intake/discharge pressure
- Rotary speed

LSTM neuronal network

Visualization & Alarming
How to get Monitoring & Optimization to the plant?

Optimization

Monitoring

Development and testing

Ark Cloud

Gateway

Edge device

Field I/O

Intranet

Internet

Process

How to get Monitoring & Optimization to the plant?
Model Development

Defining model purpose

Deployment Phases
1. Runtime simulation system
2. Cloud serving
3. Edge device

Data

Exploratory data analysis

Feature selection

Model selection

Model training

Model verification

valid?

yes

Deployment

no

Cloud monitoring

Edge device

Runtime simulation

P1

P2

P3
Model runtime serving

Control application via REST-API and MetaData file

Callable function

AERZEN Kubernetes cluster

Pipeline ensemble hosted by MPS

Data extraction

Data validation

preprocessing

Model monitoring

Model serving

Model trained?

no

training

file storage

yes

Blanc or pre-trained model

Customer cloud

DB

Client

dashboard

DevOps Repo

cf

CD

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Application Organization (Autoencoder)

Access and configuration of an application via MetaData file

Layers:

- Application
- Ensemble
- Data processing

- On-premise
  - MATLAB Client
  - Struct file

- Cloud
  - Rest API
  - json file
Business model

Aquise

Dataset + Technical specification

New Development and testing

Development and testing

Local Repo

Runtime Simulation

Existing Application

Client configuration

- Application selection
- Hyperparameter
- Queries

Scaling

Visualization

available as API

Kubernetes

CD

Device Operations Repo for compiled archives

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Conclusion

**Pros**

- Minimum two experts can operate the system
- Code is protected via archive
- Integrable in 3rd party systems
- Lifecycle can be tested and simulated before deployment
- One framework for different deployment destinations

**Cons**

- Functions take about 25 - 50 % more time to create
- Need scaling to be cost-effective
- Productivity increases by reusing components
Further development targets

1. Expand library
2. Deployment to edge device via cloud
3. Integrate SIMULINK models on MATLAB Production Server
4. Automated model selection

Automated digital twin creation and deployment

Accelerate monitoring & optimization