Deploying Vision AI Assistant for anomaly detection in HMI / SCADA and AVEVA™ Insight

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Vision AI Assistant applies image processing models to real-time camera feeds automatically identifying and reporting anomalies or inconsistencies from learned image states.

Monitor real-time image streams
Employs deep learning to train and deploy machine learning models
Provides alerts and notifications to operators
Easy-to-use web-based interface
Designed for low latency industrial environments
Helps operators maintain attention on their tasks
What is Vision AI Assistant?

Visual Anomaly Detection in HMI/SCADA

Vision AI Assistant applies image processing models to real-time camera feeds automatically identifying and reporting anomalies or inconsistencies from learned image states.

- Monitor real-time image streams
- Employs deep learning to train and deploy machine learning models
- Provides alerts and notifications to operators
- Easy-to-use web-based interface
- Designed to work in low latency industrial environments
- Helps operators maintain attention on their tasks without having to continuously monitor live camera feeds, enhancing their situational awareness
- Integrated with AVEVA System Platform & OMI and AVEVA Insight

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Analytic modes – Vision AI Assistant skill types

Use images from existing general-purpose cameras and convert them into image classification-based analytics

### Anomaly Detection Model
Use when there are plenty of images available to represent the ‘normal’ state, and a vast array of negative states for which images are not readily available.

### Discrete State Detection Model
Use when two states are known and identifiable to train the learning algorithm.

### User Defined Pipeline
Self-specify a series of automated steps in a chain for pre-processing and transformation of desired images. Powerful for a range of use cases: measuring dimensions, determining color, finding defects, and more.
Configuration – Skill Workflow

Create Skill
Load Images
Train
Link Camera
Preview (optional)
Deploy
Review
Deploying Vision AI Assistant within AVEVA System Platform

**AVEVA System Platform - Vision AI Assistant OMI App**
(On Premise)

- Operational view of anomalies/classifications
- Review image classification results

**AVEVA Insight – Vision AI Assistant OMI App**
(Cloud)

Operational view with data and visual anomaly results shown in a consolidated list to investigate root cause

**Vision AI Assistant Web Client**
(On Premise)

- Configure, train, preview, deploy models
- Review image classification results
- Retrain and compare model results
Discrete State Detection

Binary Status Detection and Reporting
Choose Skill Type

- Discrete State Detection
- Anomaly Detection
- User Defined Pipeline

Learn More

Skill Info

Create New

Discrete State Detection

This skill uses a Supervised Deep Learning algorithm to distinguish between two known states. This detection model is useful when both states are known and images for both are available to train the learning algorithm.

1. Create and Train the skill
2. Review and Retrain the skill
3. Deploy the skill
Training and Testing Data Sets

Flare OFF Training Video

Flare ON Training Video

Flare OFF Testing Video

Flare ON Testing Video
Use Case

• Detect and report the operational state of the flare used in upstream oil and gas operations.

• Environmental significance:
  • Record and report the amount of time the flare is ‘ON’ for Environmental Protection Agency (EPA) and internal company goal purposes.
  • Determining if combustion is taking place or if environmentally harmful emissions are being released.
  • Record and report KPIs regarding flare color, height, width, etc. to monitor combustion efficiency and emissions.
Results in Insight

Numeric data

1/11/2022 5:26:37 pm - 1/11/2022 5:35:04 pm

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Anomaly Detection

Unsupervised Machine Algorithm to learn what normal is, and then applies a statistical test to determine if a specific data point is an anomaly
Choose Skill Type

- Discrete State Detection
- Anomaly Detection
- User Defined Pipeline

Skill Info
Name
Description
Anomaly Detection

This skill is trained to learn what ‘normal’ is, and then apply a statistical test to determine if the current image represents an anomaly. This is useful when there are plenty of images used to represent the ‘normal’ state, and a vast array of negative states for which images are not readily available.

1. Create and Train the skill
2. Review and Retrain the skill
3. Deploy the skill
Example of Overhead Chain/Monorail System

Overhead monorail system used to move parts from one area of the plant to another.
Chain Breakage Detection

• Preventative Maintenance activity is currently performed on 3rd shift.

• The Main Highway chain takes a little over 22 minutes to complete a revolution.

• Goal is to detect the problem in real time during production and have a higher level of accuracy than a human
  • which could have difficulty due to ‘hypnosis’.
Example Catch #1

Good/Normal

Bad/Failure
Example Catch #2

Good/Normal

Bad/Failure
Anomaly Score in Insight
User Defined Pipeline

Create custom, engineered workflows by using out-of-the-box blocks to identify or achieve a specific image related to anomaly detection.
Choose Skill Type

Discrete State Detection
Learn More

Anomaly Detection
Learn More

User Defined Pipeline
Learn More

Skill Info

Create New
Copy Existing

Name

Description
User Defined Pipeline

SmartVision enables you to teach your AI new visual skills - such as visual anomaly detection. The AI can let you know when a camera sees something that deviates from what is normal or expected, effectively turning that camera into a visual sensor.

1. Create and Train the skill
2. Review and Retrain the skill
3. Deploy the skill
User Defined Pipeline - Overview

• A toolbox of image processing objects which can be daisy chained together to create a pipeline.
• Possible tools/objects are:
  • Anomaly Detection and Classifier
  • Region of Interest
  • Align
  • Contrast Threshold
  • Measurement (distance, angle, concavity, etc.)
  • Object Detection (people, equipment, etc.)
Questions?
Please wait for the microphone.
State your name and company.

Please remember to...
Navigate to this session in the mobile app to complete the survey.

Thank you!
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