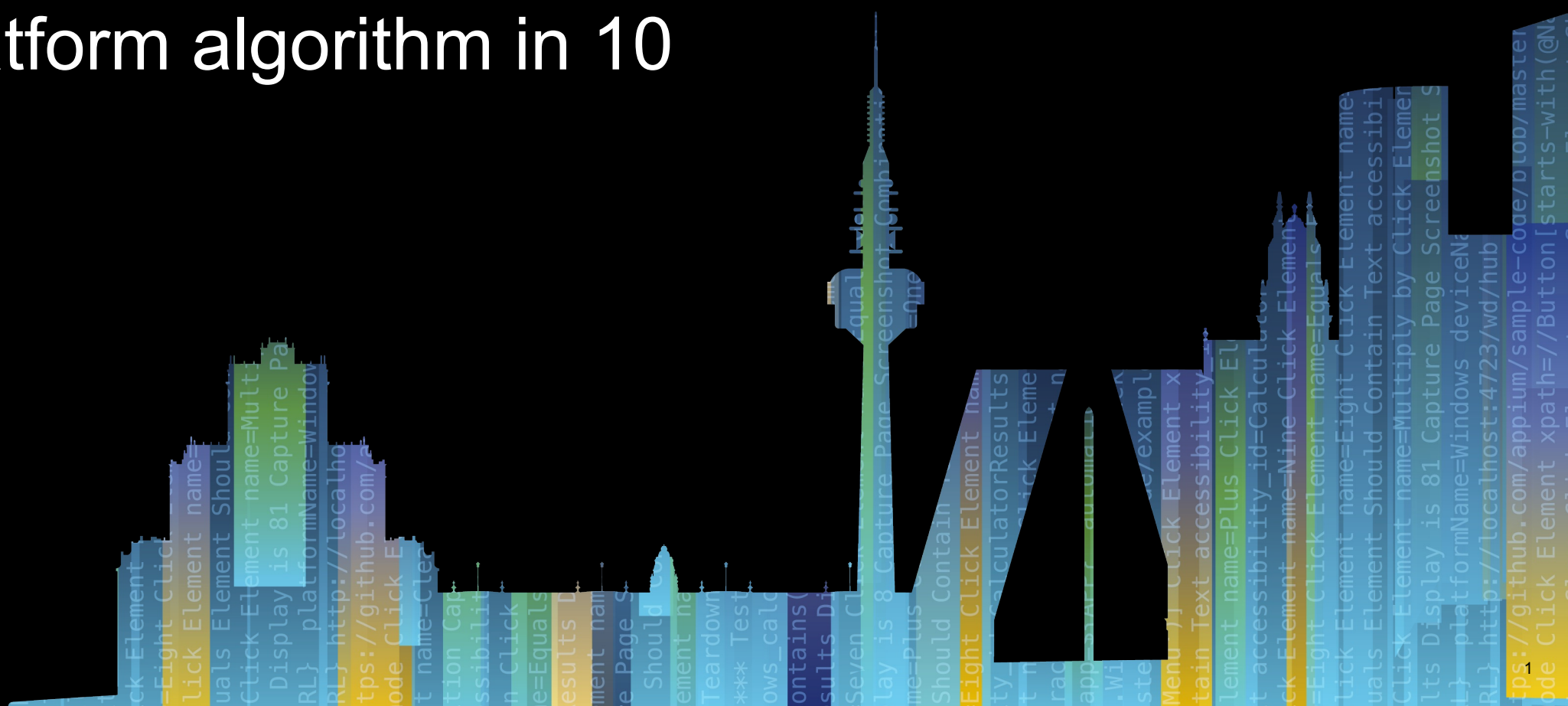


# Deep Learning OCR: Create a cross-platform algorithm in 10 minutes

Jakub Cieplak  
Application Engineer





# Product portfolio

Aurora Vision offers a comprehensive range of software products for image analysis

## Studio

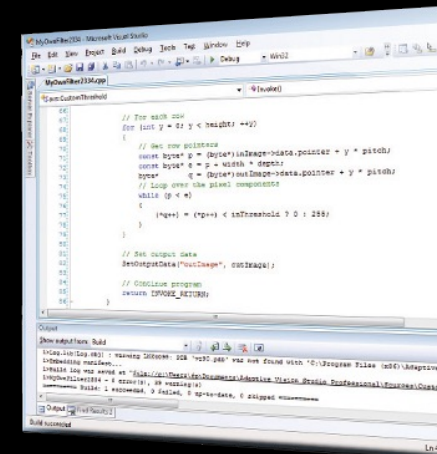
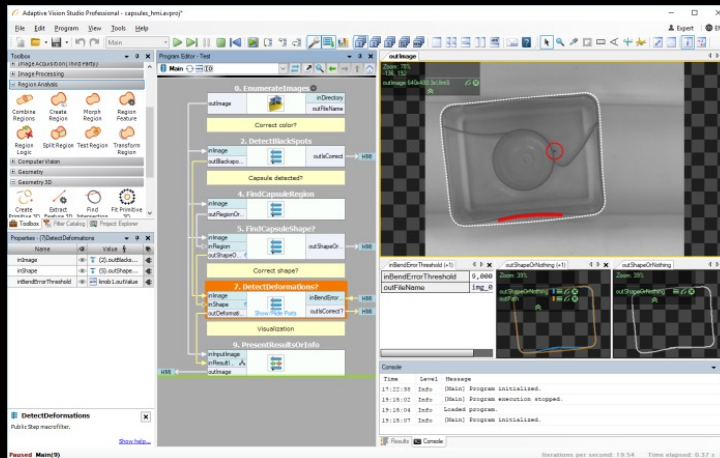
Graphical, dataflow-based environment for rapid development

## Library

For C++ and .NET

## Deep Learning

Sample-based training



Designed for the needs of machine vision engineers. Highly powerful and intuitive at the same time.

A set of ready-to-use functions for C++ and .NET programming. Simple, modern and highly optimized for multi-threaded execution.

A set of seven ready-made tools based on deep learning technology.

No programming skills are required.

# Value Proposition

## Why Zebra Aurora Vision?

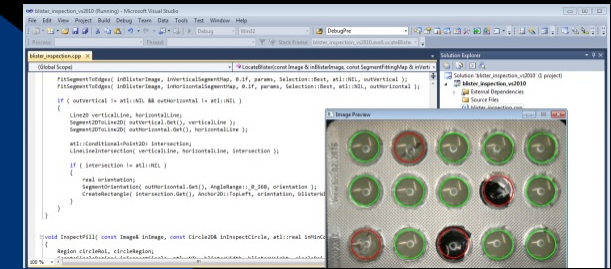
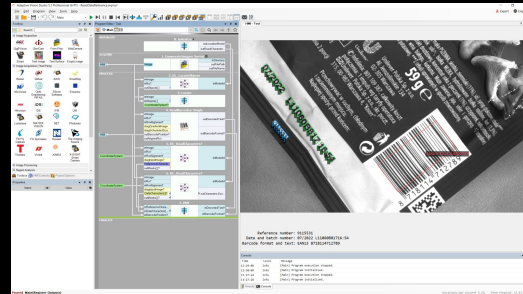
- Rapid development – significantly faster compared to low-level programming
- Easy-to-use, graphical programming environment
- But still so powerful - over 3000 reliable, field-tested tools optimized for demanding applications
- Mature solution – all tools have been implemented and developed for the last 16 years
- Hardware-agnostic – support for most cameras available on the market as well as 3D scanners
- Available for multiple platforms

**GiG**  
VISION



# All-in-one development platform

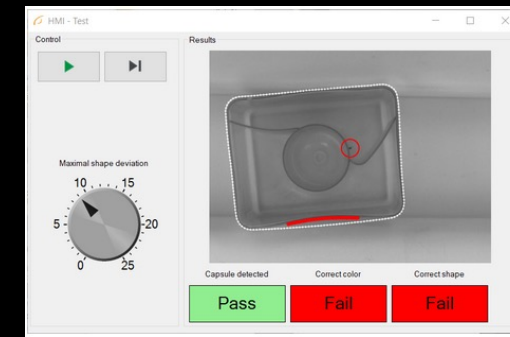
Reduce your time to market by taking advantage of user-friendly and hardware-agnostic software



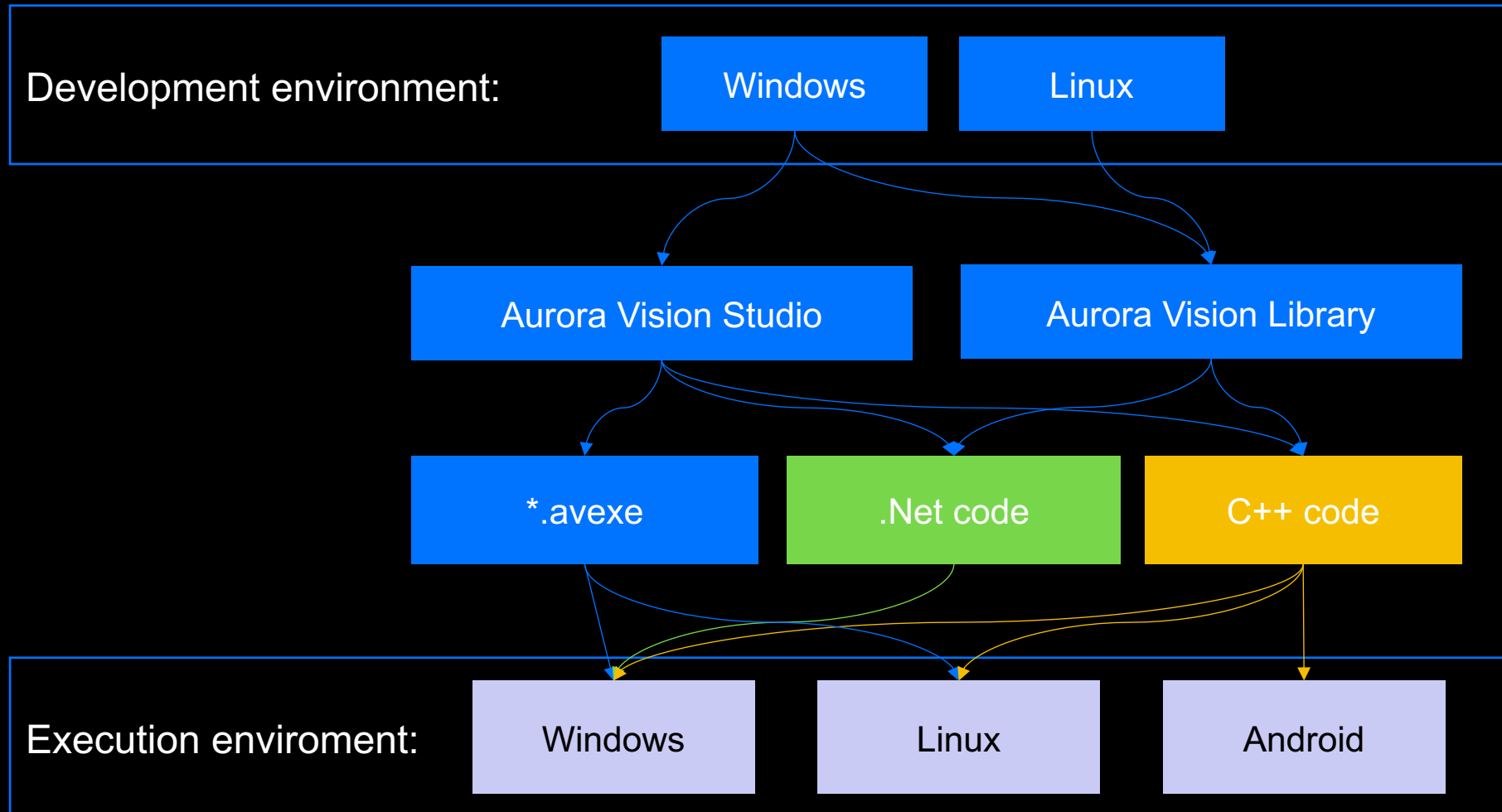
Generate code or design user interface

Develop an algorithm or train AI-based tools

Select hardware

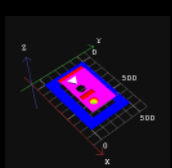
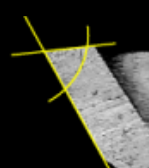
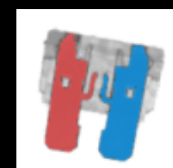
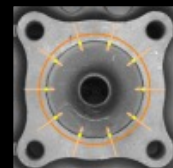
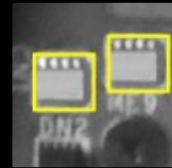
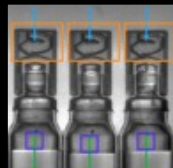
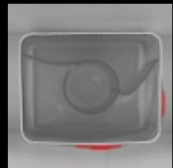
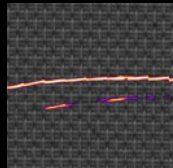
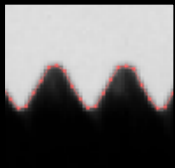
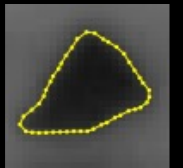
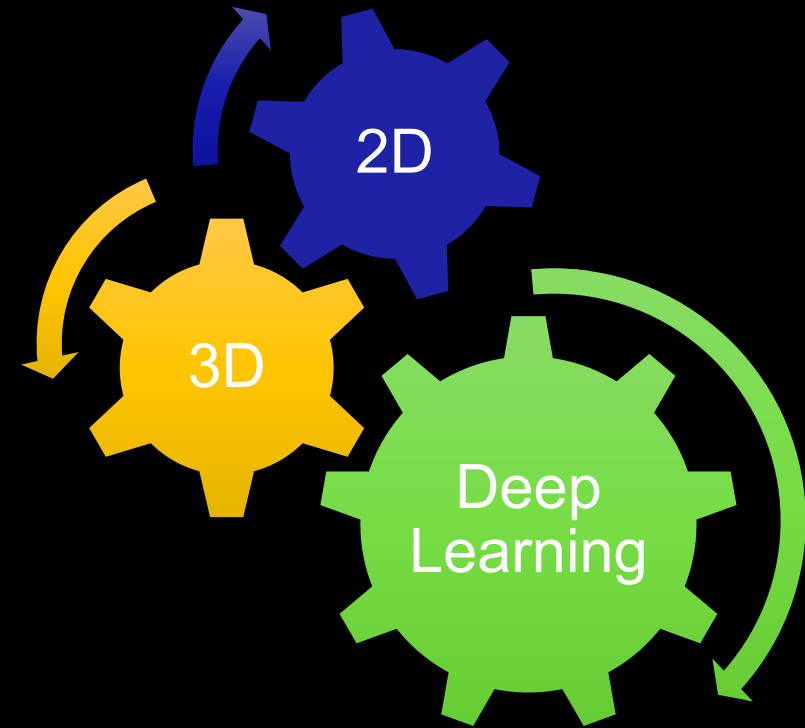


# Multiple platforms supported



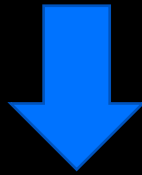
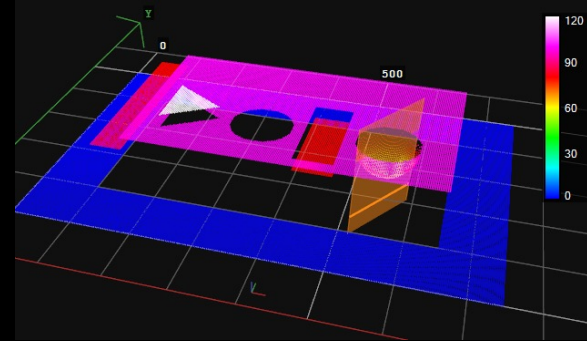
# Multiple technologies in one environment

- Traditional 2D inspections
- Tools to analyse 3D data
- Powerful deep learning algorithms
- All those technologies can be easily connected to work together

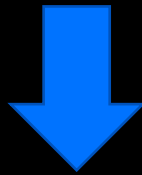
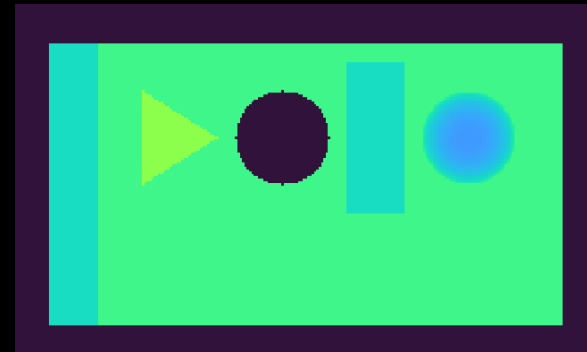


Different data types  
can be easily  
converted and used  
interchangeably

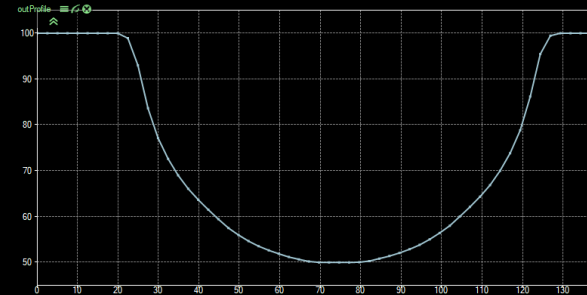
3D



2D



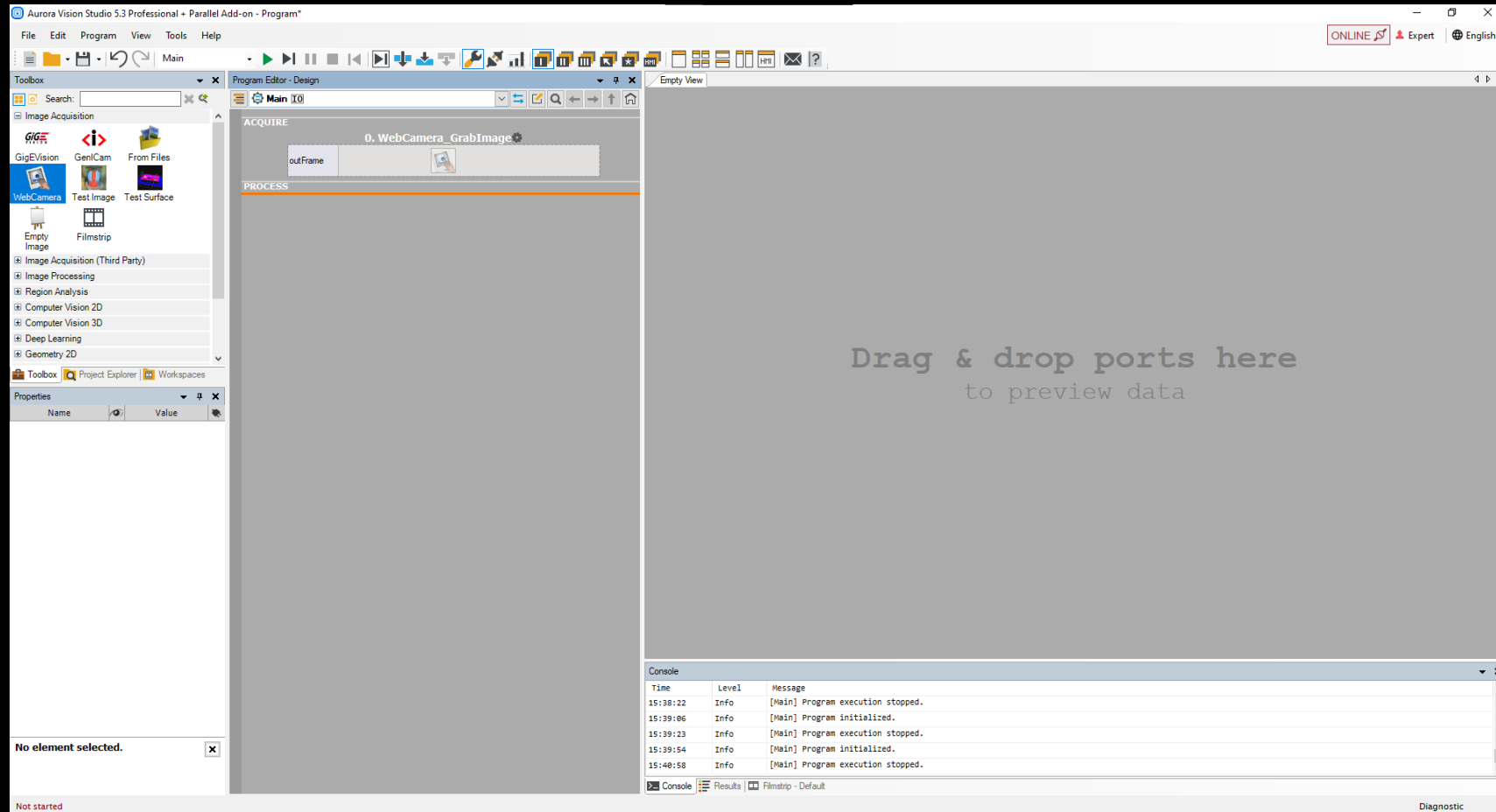
1D





# Aurora Vision Studio

## Overview – hands on



# Zebra DevCon 2023



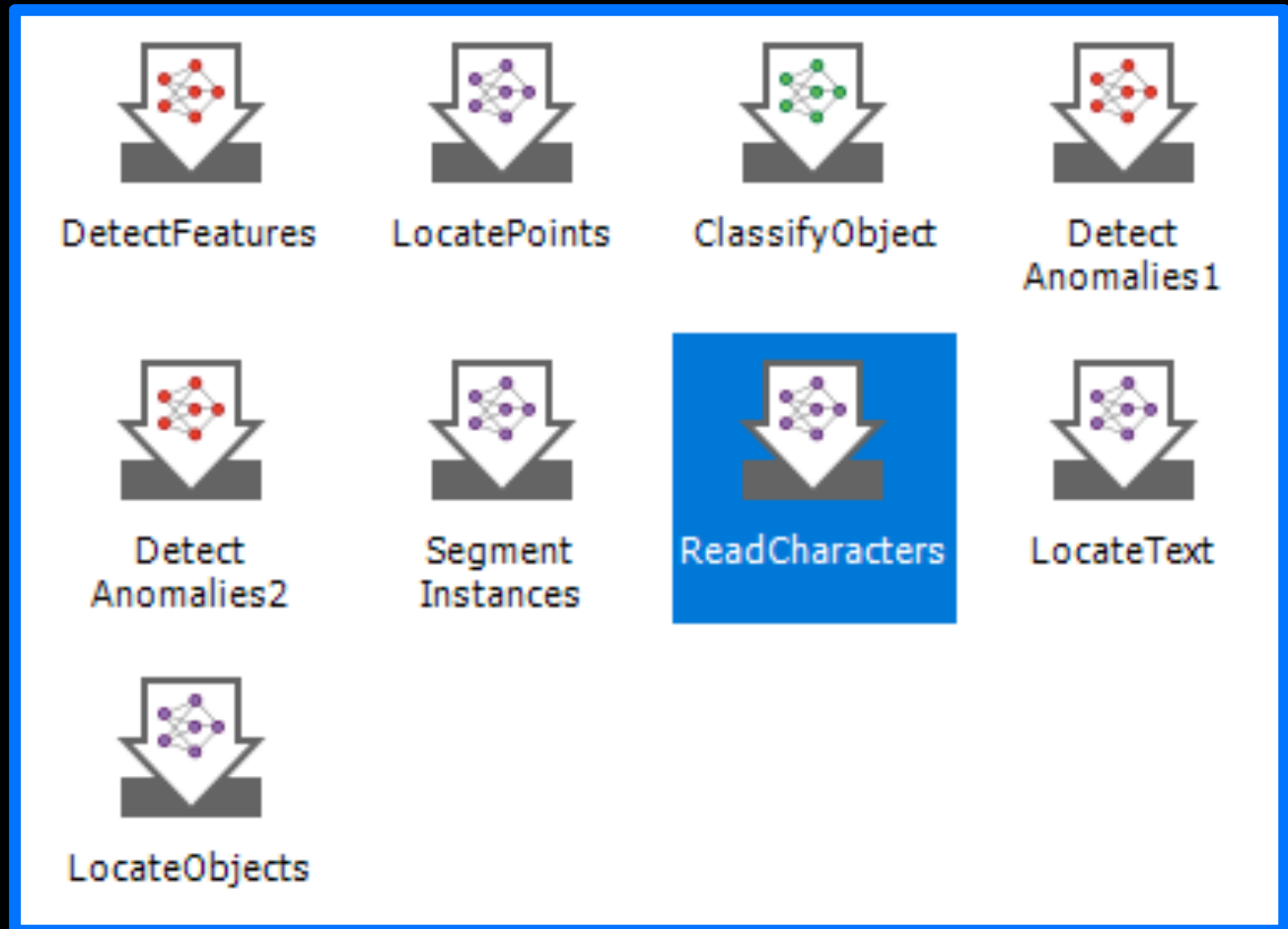
## Deep Learning



# Deep Learning

## Available Deep Learning tools:

- Detect Features
- Locate Points
- Classify Object
- Detect Anomalies
- Segment Instances
- Locate Objects
- Locate Text
- Read Characters



# Detect Features

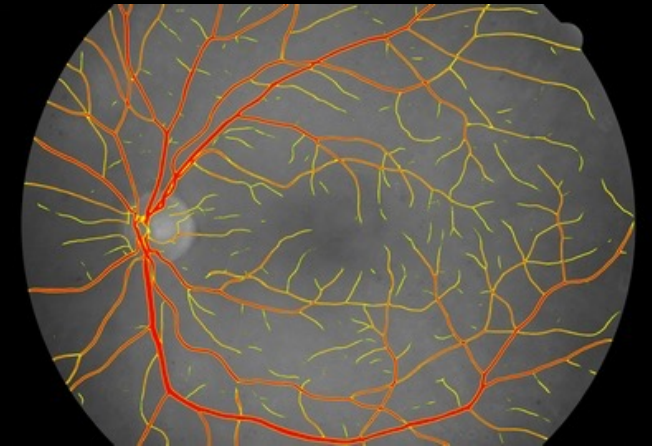
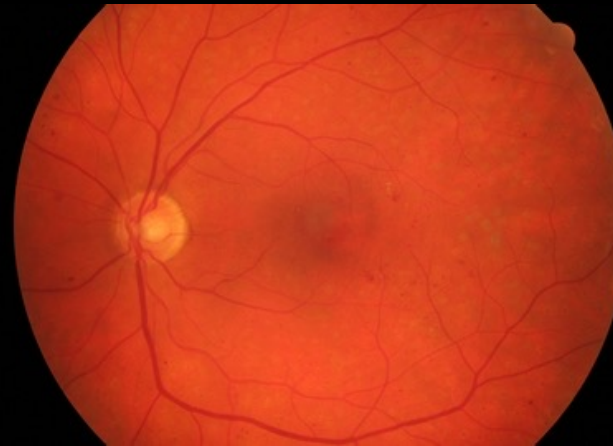
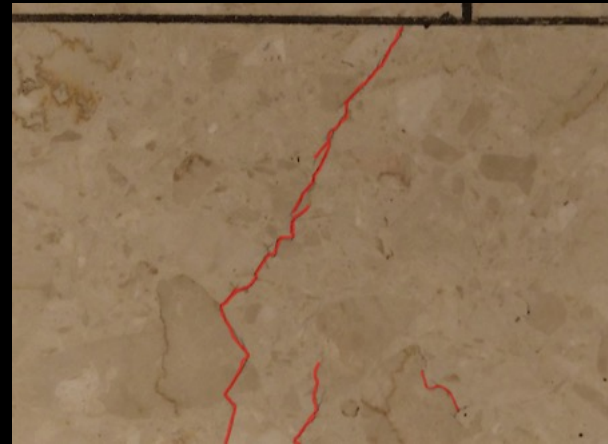
## Feature Detection

Also known as *supervised* defect detection.

The user carefully marks pixels corresponding to defects on the training images. The tool then learns to distinguish defects or other specific features by looking for their key characteristics automatically extracted with convolutional layers of the neural network that works under the hood.

### Key features:

- Very good accuracy
- Laborious labelling process



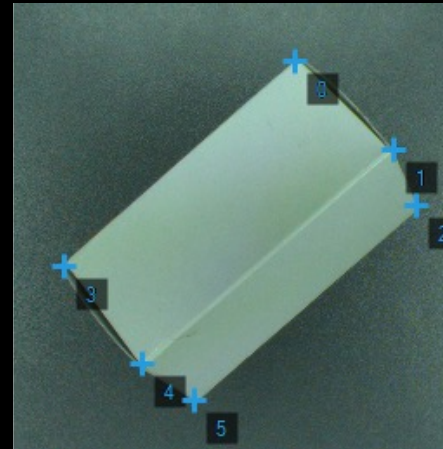
# Locate Points

## Point Location

Quick and easy object detection tool that looks for characteristic points on the input image.

### Key features:

- Data labeling is easy (one click per object)
- Detects a point, not a region
- Relatively fast execution



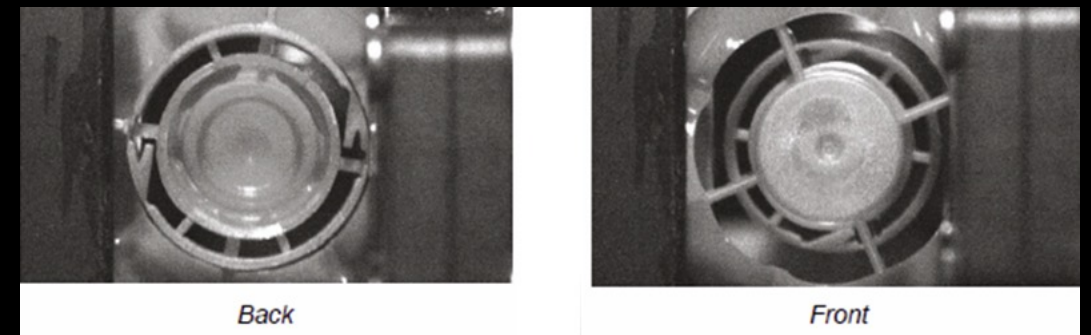
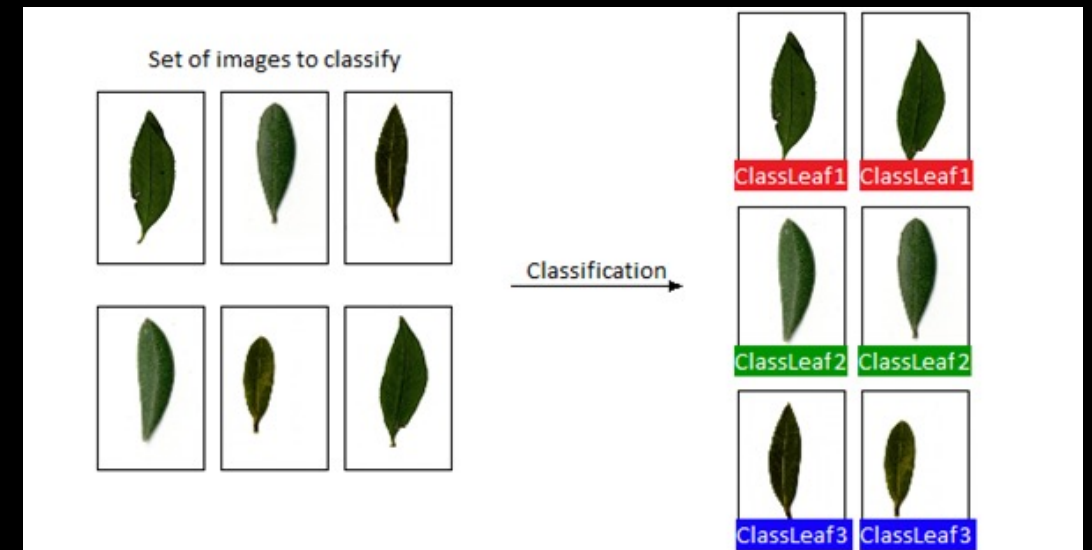
# Classify Object

## Object Classification

Whole image classification is the most basic deep learning tool. The tool analyzes an entire image and provides a name for the most prominent object in the scene.

### Key features:

- Simple and very easy to use
- Separates up to 50 object classes in industrial applications effectively



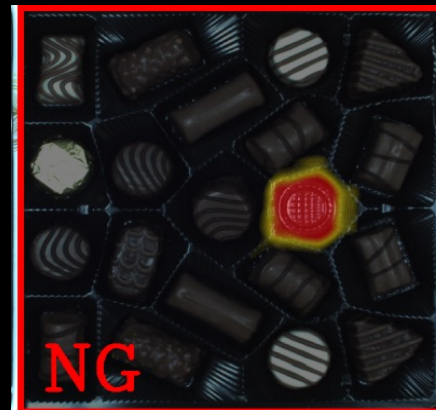
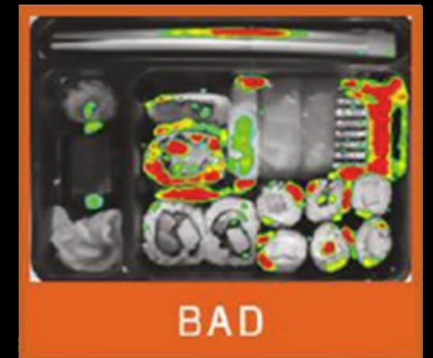
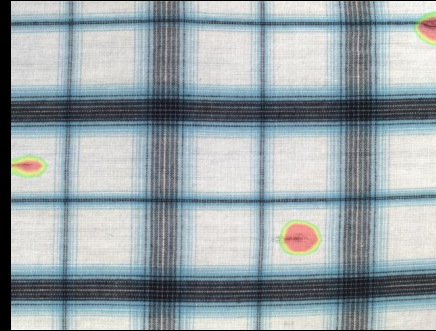
# Detect Anomalies

## Anomaly Detection

In Anomaly Detection there is no specific definition of a defect—the tool is trained with Good samples and then looks for deviations of any kind. From the machine learning point of view it is a more difficult task as the neural network is not able to infer knowledge from sample defects.

### Key features:

- Very easy to use
- Users do not need to provide definitions of defects
- Detects any unexpected product deviations



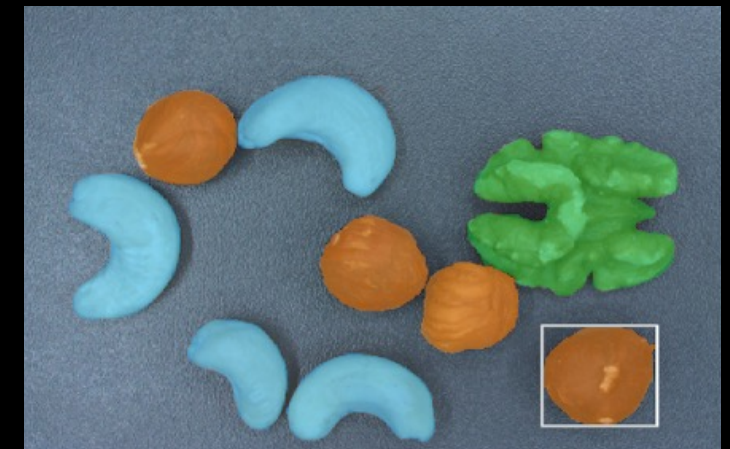
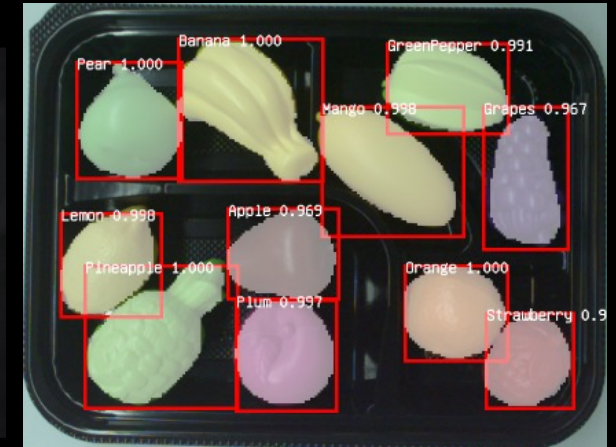
# Segment Instances

## Instance Segmentation

This tool simultaneously detects and classifies several objects on the input image. And it is not only a bounding rectangle of an object that is detected but a complete mask which then can be used for further processing.

### Key features:

- Laborious labeling process
- Robust against touching and intersecting objects
- Highly effective for a wide variety of object types





# Locate Objects

## Object location

This tool is used to locate and classify one or multiple objects within an image. The result of this technique is a list of rectangles bounding the predicted objects with corresponding class predictions and confidence scores.

### Key features:

- Allows to train multiple classes
- Provides object location and orientation



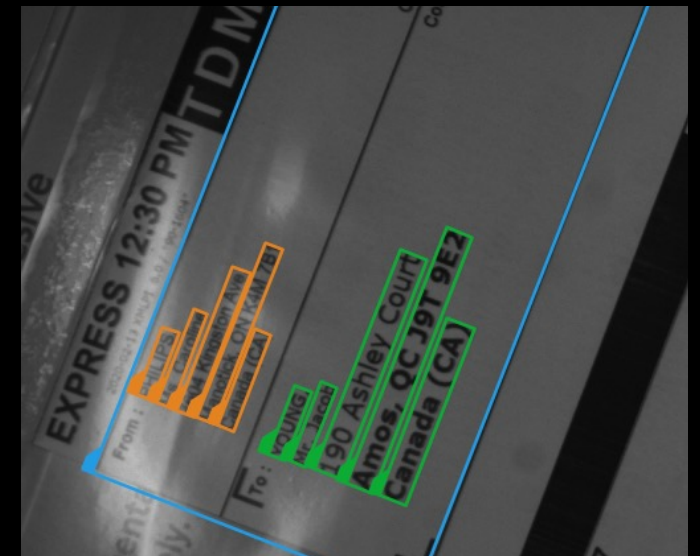
# Locate Text

## Text location

This tool is used to locate text on images. The result is a list of rectangles bounding text characters. Often used to detect character orientation before reading the actual writing.

## Key features:

- Pre-trained, ready-to-use without any training
- A good starting point for OCR algorithms



# Read Characters

## Character identification

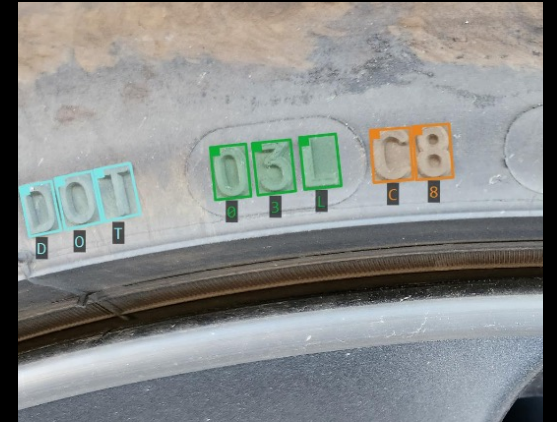
This tool is used to locate individual characters and detect appropriate symbols.

### Key features:

- Pre-trained, ready to use without any training
- Extremely robust



Complex backgrounds



Blurred text



Reflective surfaces



Low quality prints



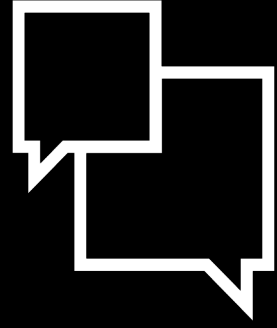
# Aurora Vision Studio

## Deep learning OCR - hands on

The screenshot displays the Aurora Vision Studio Professional interface. The main window shows a workflow with three steps: 0. DL\_Deploy: ReadCharacters, 1. ReadFilmstrip(Image), and 2. DL\_ReadCharacters. The Properties window for the '2. DL\_ReadCharacters' block is open, showing various input and output parameters. The main image view displays a filmstrip with OCR results overlaid on the text. The OCR results are as follows:

Index	Character
0	1B4332D00REVA
1	15051-T1w210611W

The bottom status bar shows the program is Paused, with Main(Register Outputs) selected. The status bar also displays Iterations per second: 3.06, Time elapsed: 8.99 s, and Diagnostic: Offline.



# Questions



# Zebra DevCon 2023



# Thank You

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