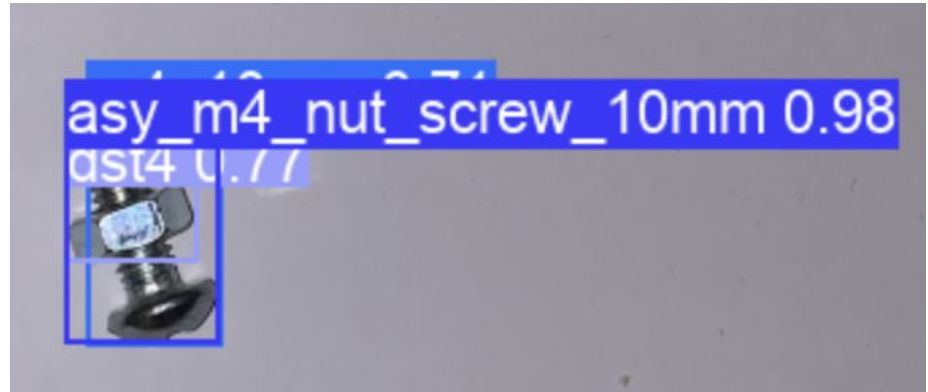# Assembly Object Detection From 3D Cad Models in Manufacturing Environments

Technische Hochschule Würzburg-Schweinfurt
Rodolfo Cacacho, Mohammad Moradi, Marius Oechslein
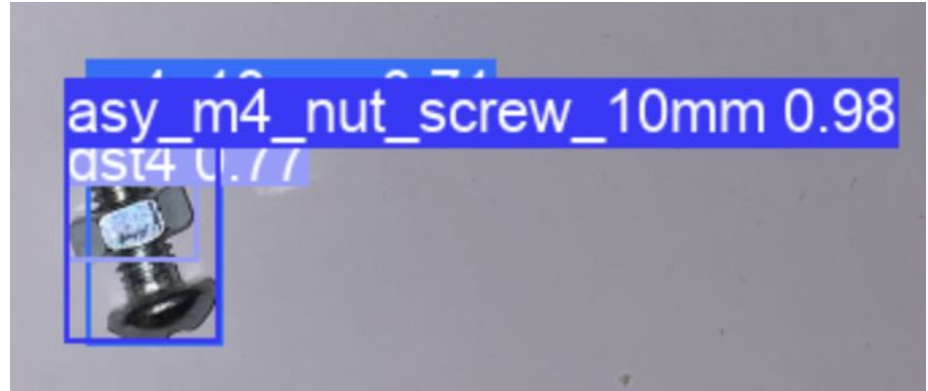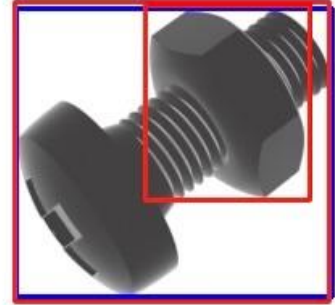
Problem statement

- Object detection of assemblies in manufacturing environment
- Synthetic training data created from 3D Cad Models
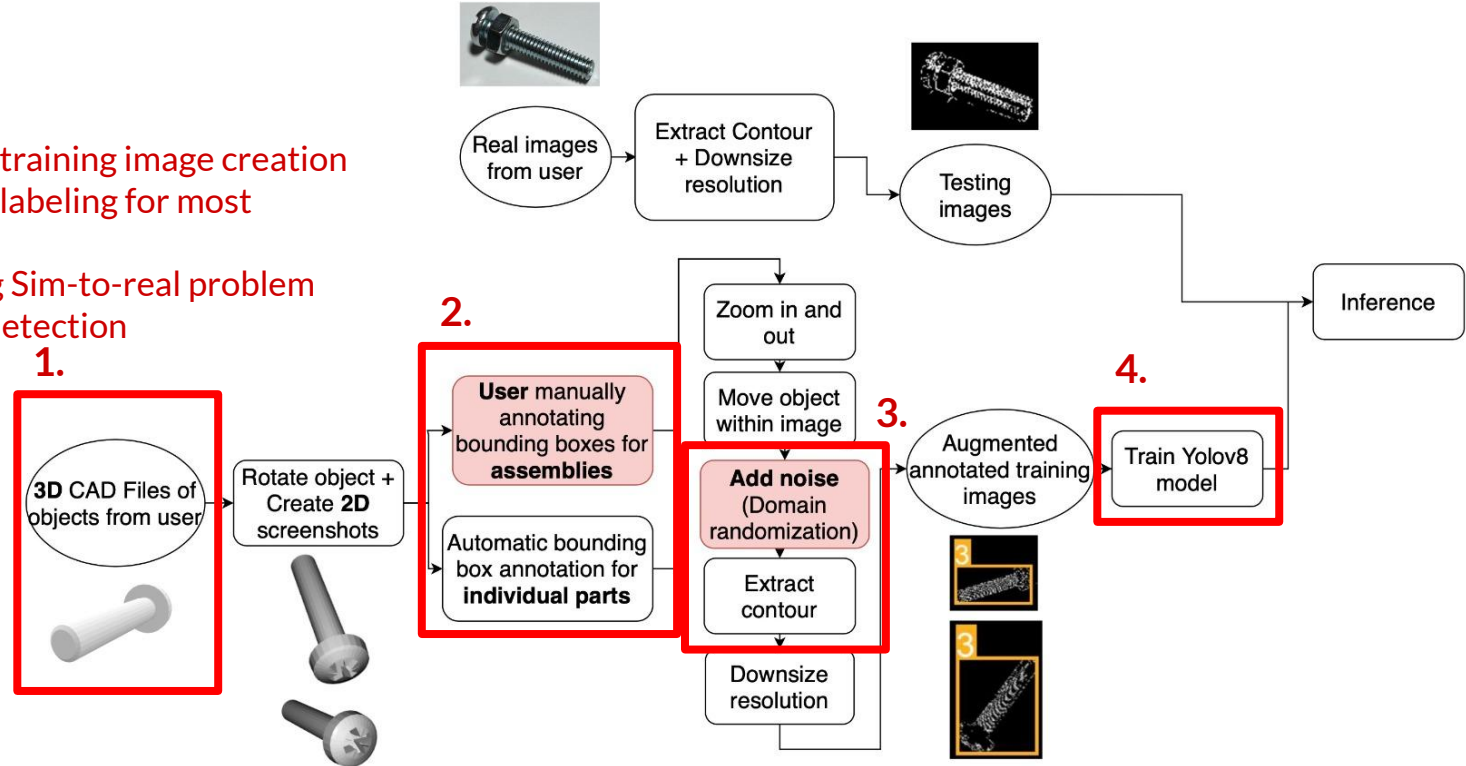- Application with automated workflow

Challenges

- Assemblies: Overlaying parts
- Simulation to reality
- Reducing human involvement
- Robustness of the model

Solution Architecture

Main points:
1. Automatic training image creation
2. Automatic labeling for most images
3. Addressing Sim-to-real problem
4. Real time detection

1.

2.

3.

4.

Real images from user → Extract Contour + Downsize resolution → Testing images

3D CAD Files of objects from user → Rotate object + Create 2D screenshots

User manually annotating bounding boxes for assemblies

Automatic bounding box annotation for individual parts

Zoom in and out

Move object within image

Add noise (Domain randomization)

Extract contour

Downsize resolution

Augmented annotated training images → Train Yolov8 model

Inference

Application demo