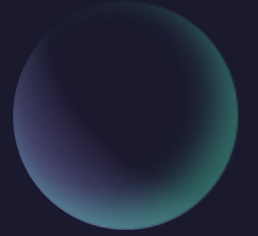
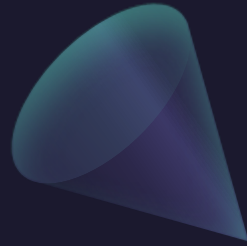




More research on
anomaly detection

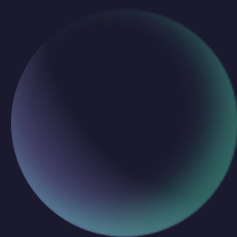
Case study

- Surface Defects Detection in Chrome plating
- Characteristics:
 - High reflection
 - Challenging image acquisition

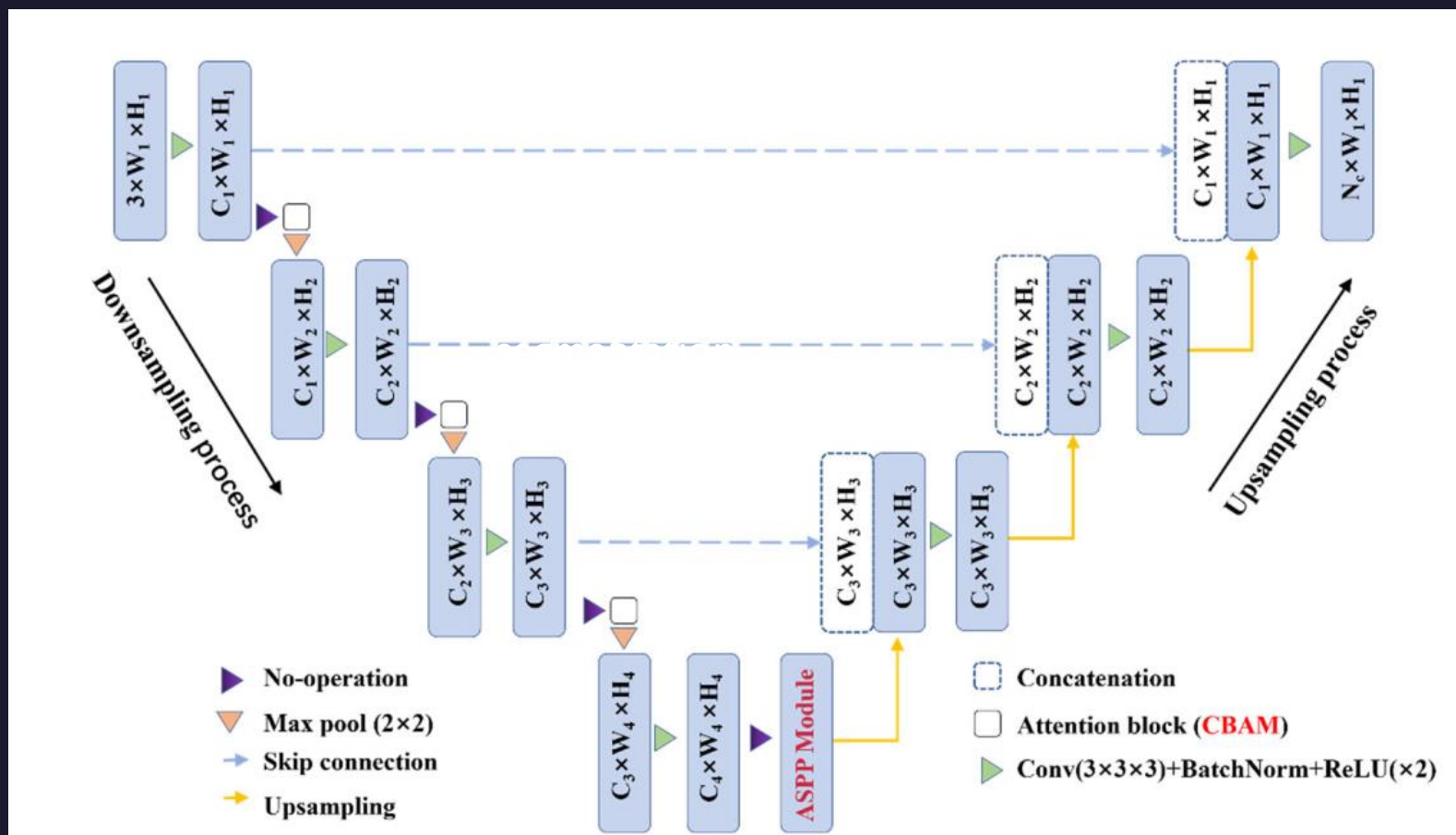


Baru-Net

- Supervised learning method
- Localize the defective parts
- Based on Unet
 - Widely used in defect segmentation
 - Need small amount of data

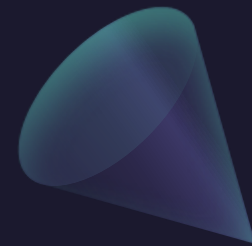
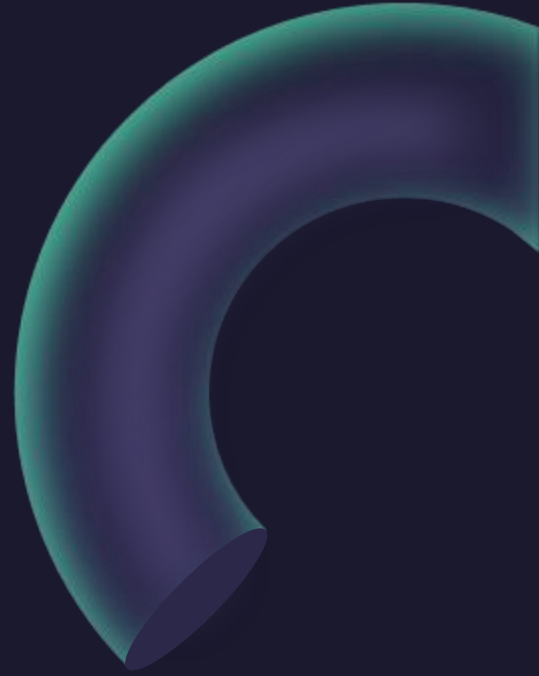


Baru-Net network structure



Changes in compare to Unet

- Bilinear interpolation in upsampling
 - Fast calculation
 - Fast running speed
 - Strong ability to retain image details
- CBAM
- ASSP

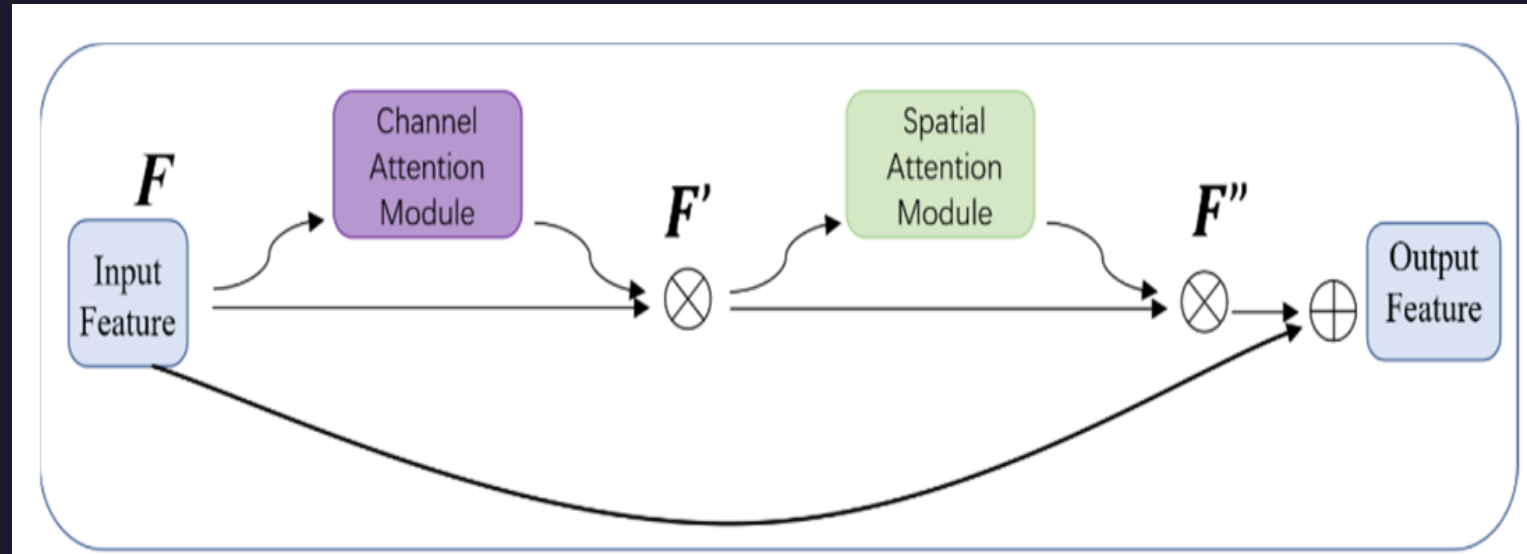


CBAM Module

Feature map pass into CBAM during the down-sampling

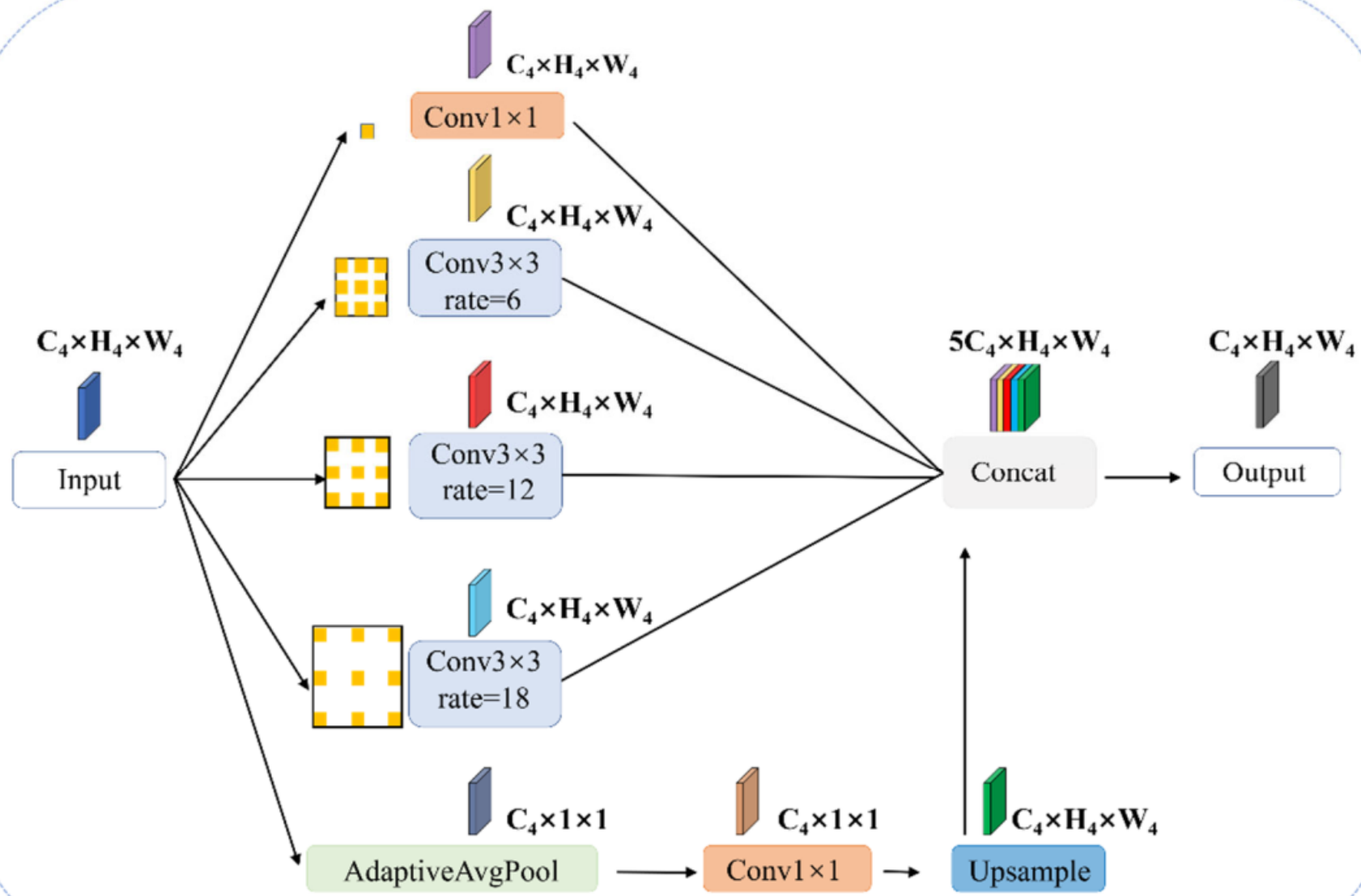
Two sub-modules:

- CAM (Channel Attention Module):
 - focuses on important feature map
- SAM (Spatial Attention Module)
 - focuses on important spatial regions



ASPP Module

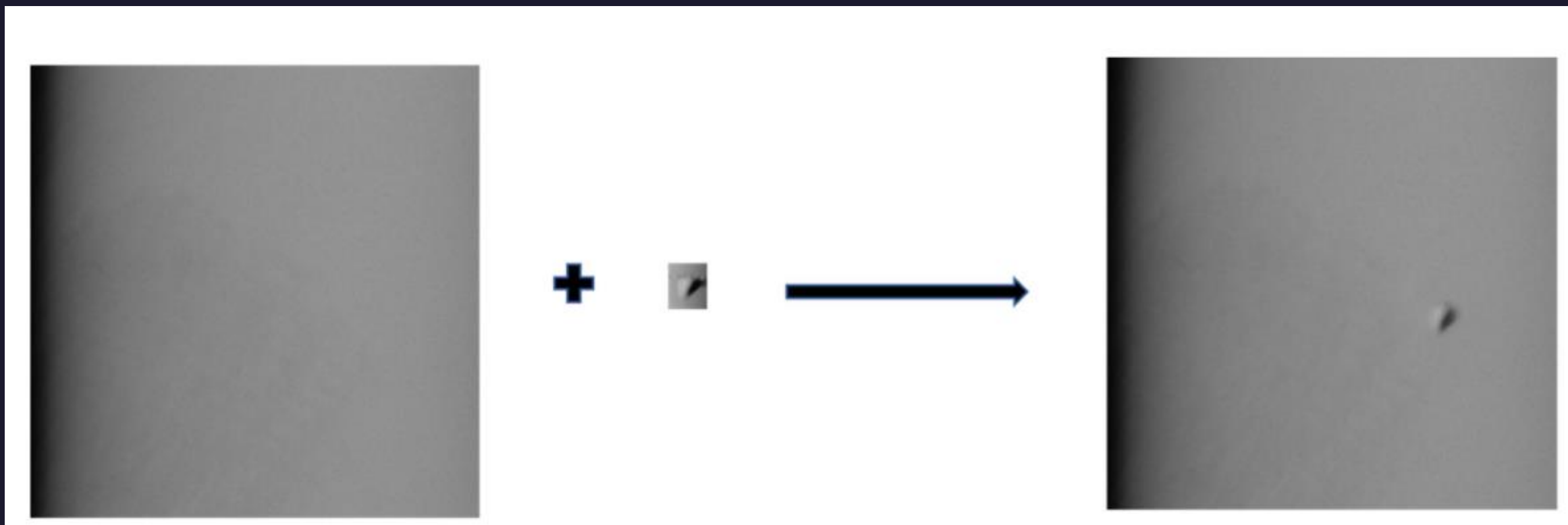
- In segmentation having a large receptive field is crucial
- The Idea is use multiple parallel convolutions
- Pass the final downsampling layer of Unet to ASPP for further processing:
 - Multi-scale Feature Extraction(three convolutions)
 - Combine convolutions output to have multi-scale information
 - Dimensionality Reduction to use the feature map as the input for the next layer
- ASPP capture features at different scales



Dataset

- Use Labelme software
- Expand Dataset with photoshop
- copy the defect areas from the original images and paste them into the non-defect image
- No combination of multiple defects
- increase dataset size with:
 - random rotation, cropping, shifting
- Size:
 - Total 1000
 - Original 100
 - Artificial detected 300
 - Data enhanced 600

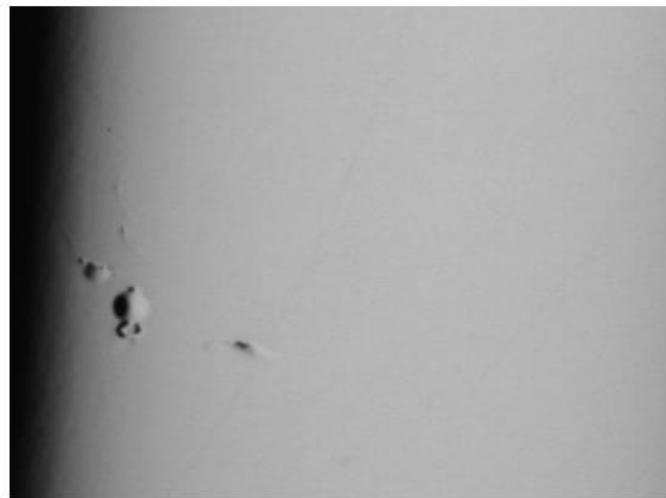
Data enhanced



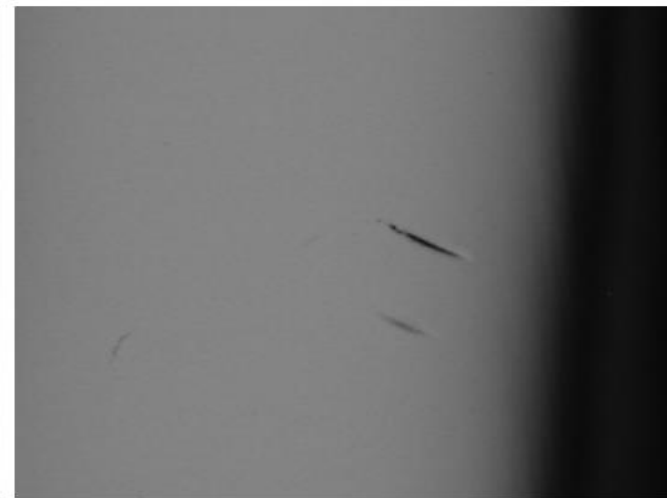
Example



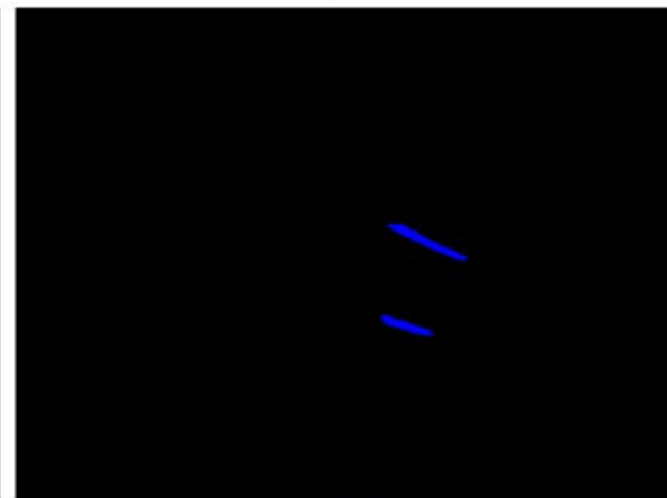
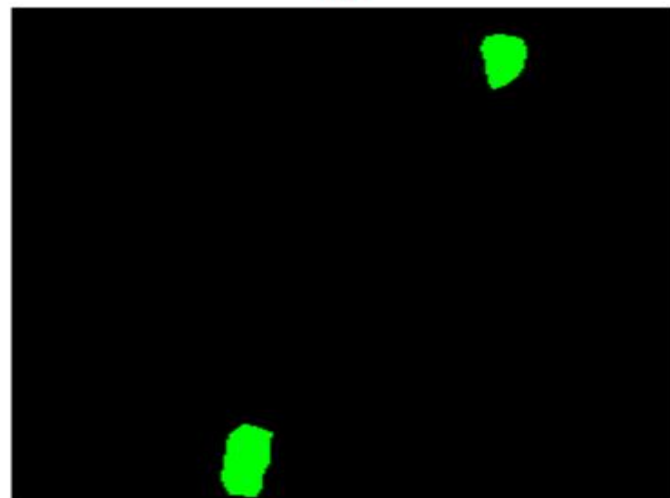
(a)



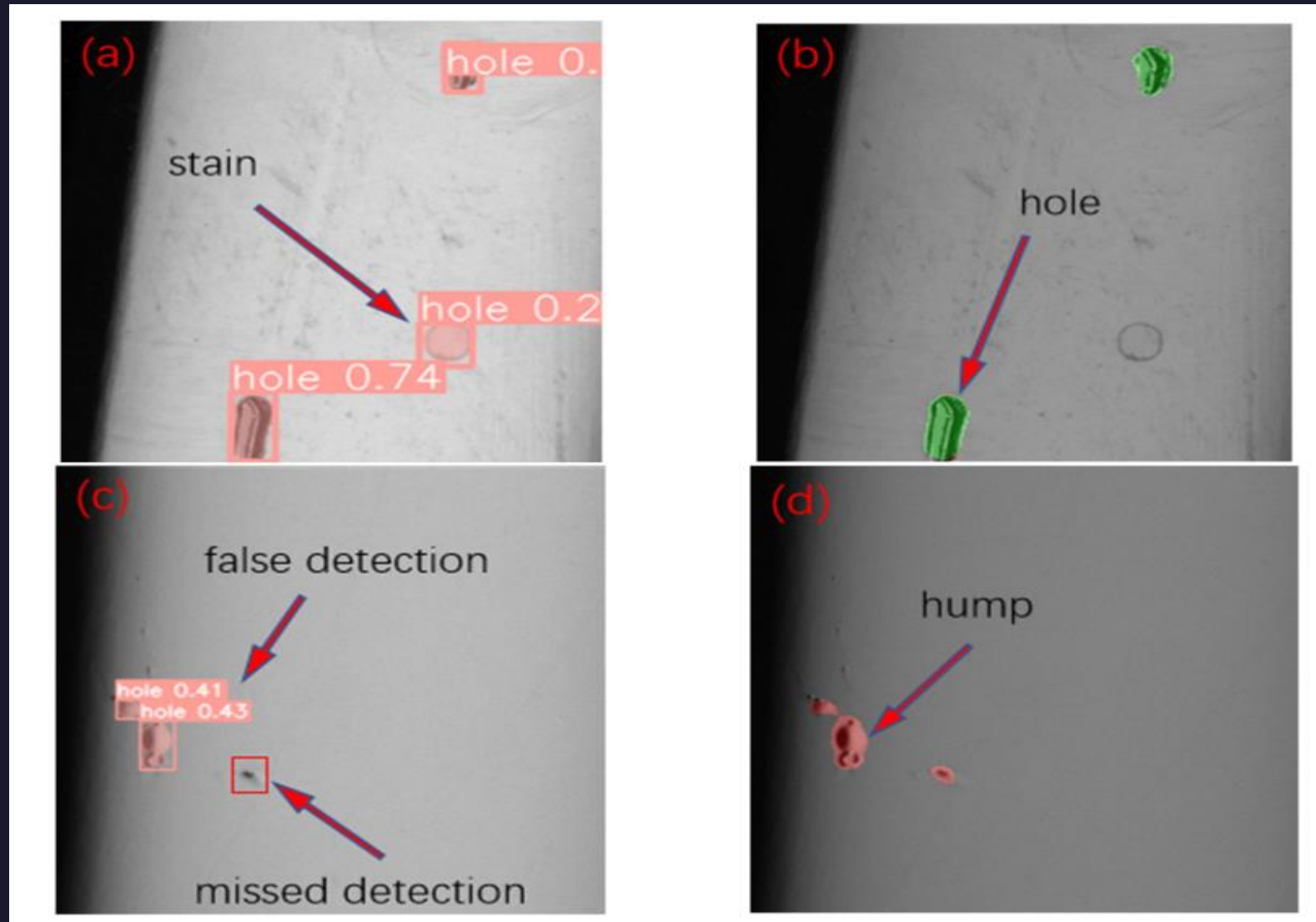
(b)



(c)



Baru-Net VS YOLO-8



Accuracy result

Table 2. Accuracy of different network models.

Model	Accuracy (%)	Macro-F1 (%)
UNet++	96.1	89.9
UNet	91.4	89.4
AttentionUNet	97.8	90.1
Res_UNet	89.3	88.4
Baru-Net	98.3	91.3