Deep Learning for Microscopy Image Analysis in Materials Science: Advancing Research and Education Workshop

Data Labeling and Demonstration

Dr. Shradha Agarwal, Tommy Wong

To do (Shradha and Tommy):

10:50 AM - 11:10 AM (20 minutes)

Labeling Data Overview and Label Box Demonstration
Tommy and Shradha : Lead my Tommy entirely (20 minutes)

11:10 AM - 11:30 AM
Data Augmentation Techniques : Just 5 slides that should cover oview view what you are showing in the code (5 minutes overview by SA and 15 minutes by TW doing hand-on practice)

11:30 AM - 1:00 PM
Hands-on Tutorial on Using U-Net, Mask R-CNN, and YOLO
Shradha and Tommy: (1.5 hour)

→ 40 minutes presentation by SA on overview and leave it to TW after I discuss general U-Net (SA): basics on CNN +diference instance and semantic+ Introducing Mask R CNN, U-Net and YOLO+ epochs (discuss briefly about filters, padding, activation function) - try to be in 30- 35 minutes, be brief on the code architecture

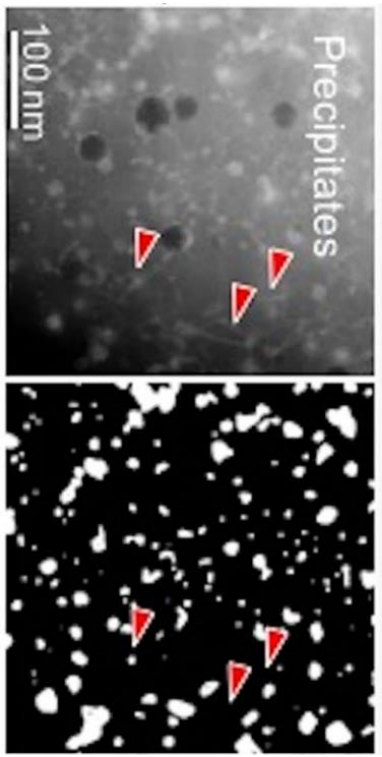
→ 20 minutes U-Net practice with TW including training (TW)

→ 10-12 minutes Mask R CNN overview (SA)

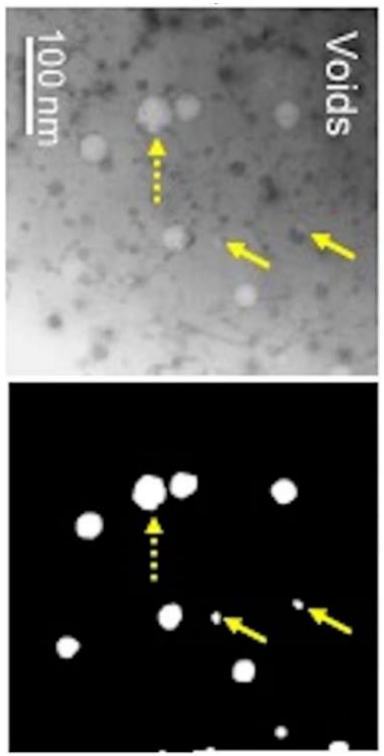
→ 15-20 minutes Mask R CNN practice

Common defects can be labeled for pixel-wise segmentation

- Segmentation: associating each pixel in an image with a class

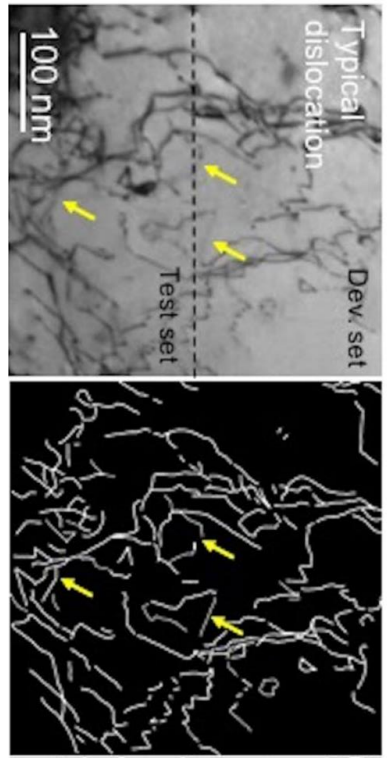


Cavities (bubbles & voids)



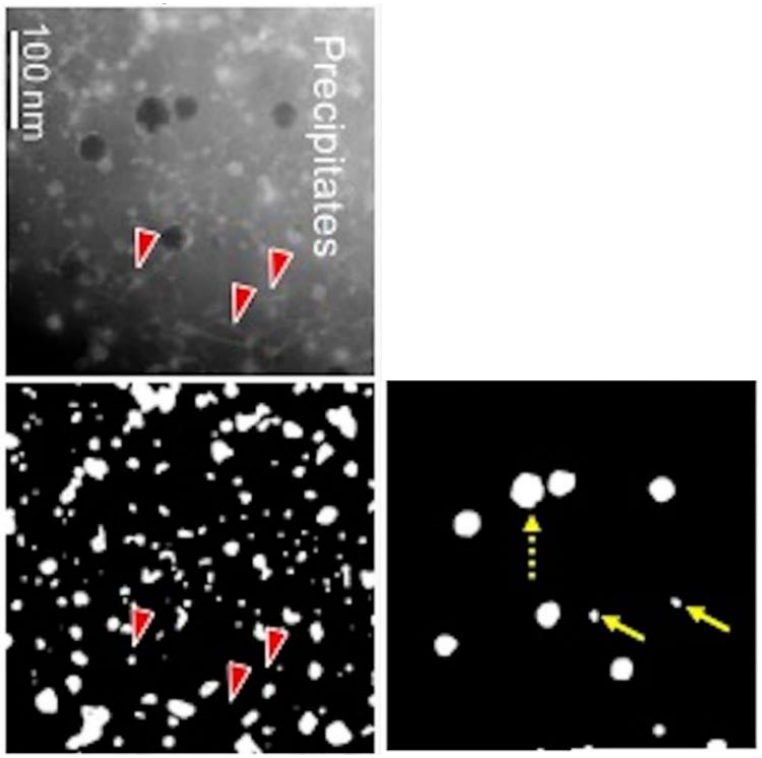
Precipitates

Dislocation loops



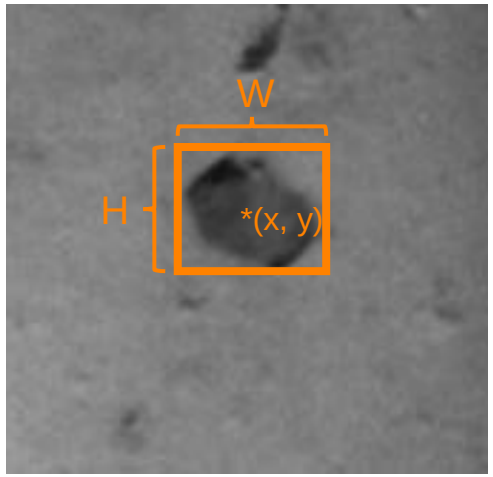
Dislocation lines

Different labeling systems are required for different segmentation algorithms



Precipitates Voids

Semantic segmentation: one-hot encoding (U-Net)



[Class x y W H]

Object identification: bounding box (YOLO)

Instance segmentation: label encoding (Mask R-CNN)

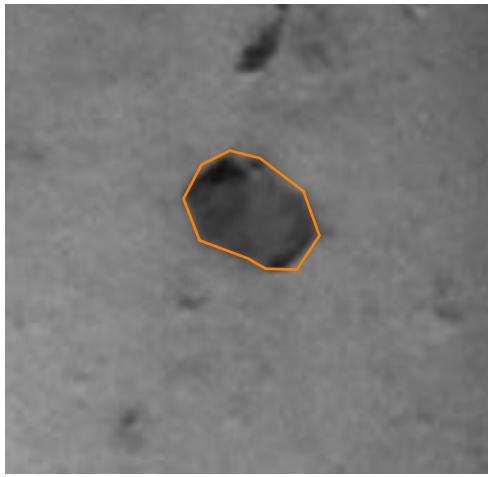
Special conventions for labeling cavities and loops

Cavities

- Label the area within the *inner* edge

Loops

- Label the area within the *outer* edge



Labeling using Computer Vision Annotation Tool (CVAT)

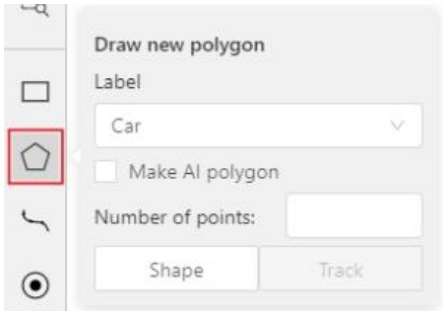
CVAT labeling workflow

Creating a project and labeling tasks

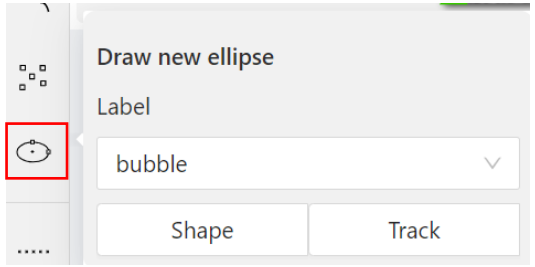
Labeling using polygon and ellipse tools

Polygon tool

- Hold **Shift** to draw



Ellipse tool



Exporting and parsing labels

add an overview of slide of common tools that researchers currently use :

label box

roboflow

oxford one

challenges while labelling

– image J (conversion to JSON file or txt file) depending on the code

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https://docs.google.com/document/d/1J0EzEl6SKjdnXUD-x2kp6SHFcJWsPUbTB0z1CI4QEcY/edit?usp=sharing