

# Final Presentation Dec 18

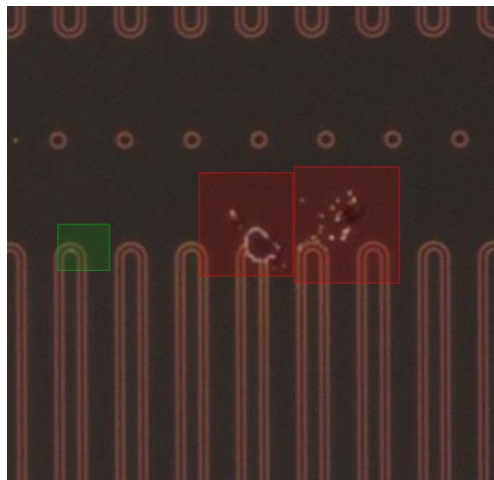
ML4Science - Defects Detection

# Goals

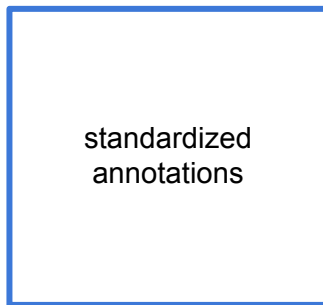
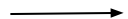
- ❑ Improving the model instead of building a architecture from scratch
- ❑ 2 stages of relabelling
- ❑ P2-Architecture
- ❑ **Slicing Aided Hyper Inference (SAHI)**
- ❑ Results
- ❑ Demo

# Labelling

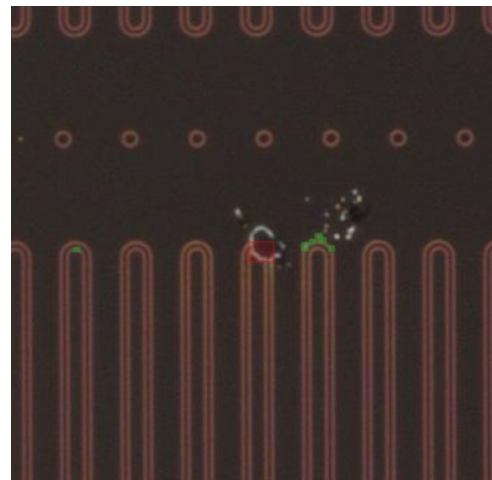
~400 images used



loose, inconsistent bounding boxes



standardized  
annotations



tighter, standardized annotations

Green bounding boxes denote **Dirt-Wire**, while red indicates **Critical** defects.

# Not Satisfactory Results

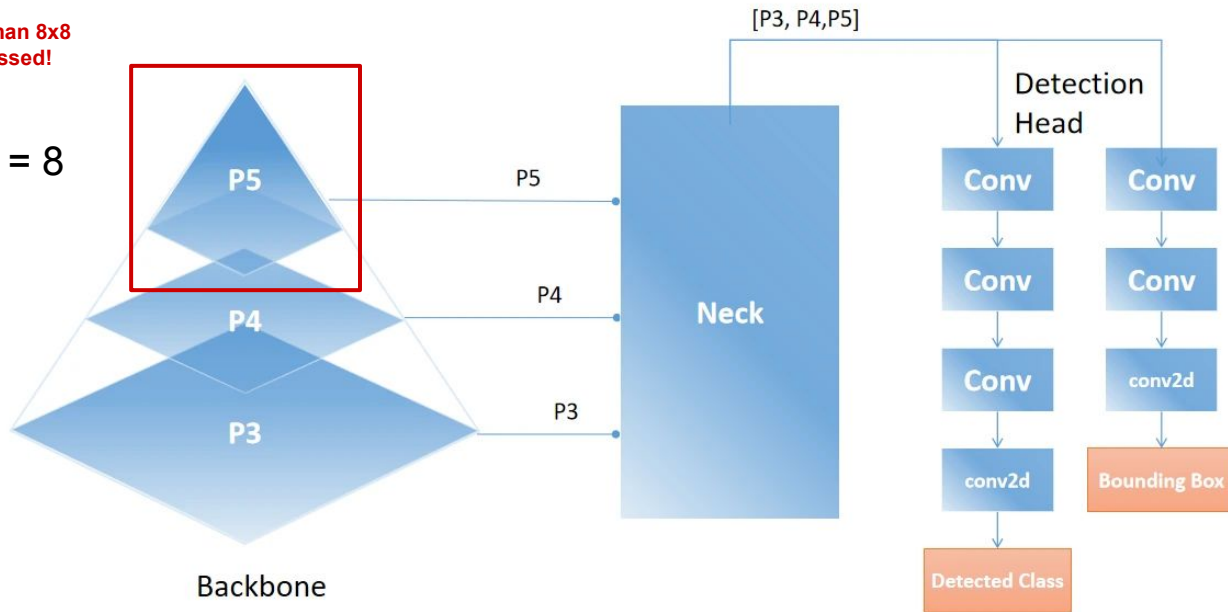
Configuration	Critical			Dirt-Wire			Global Summary		
	P	R	F1	P	R	F1	mAP <sub>50</sub>	mAP <sub>50:95</sub>	Mean F1
<i>Initial Baselines</i>									
Baseline (Full Image)	0.302	0.174	0.221	0.000	0.000	0.000	0.070	0.024	0.110
Baseline + Augmentations	0.003	0.130	0.005	0.000	0.000	0.000	0.012	0.001	0.003

# P2 Head - Improve Model Architecture

Our images usually have small defects!

Only defects bigger than 8x8 pixels can be processed!

Stride = 8



P2 Head

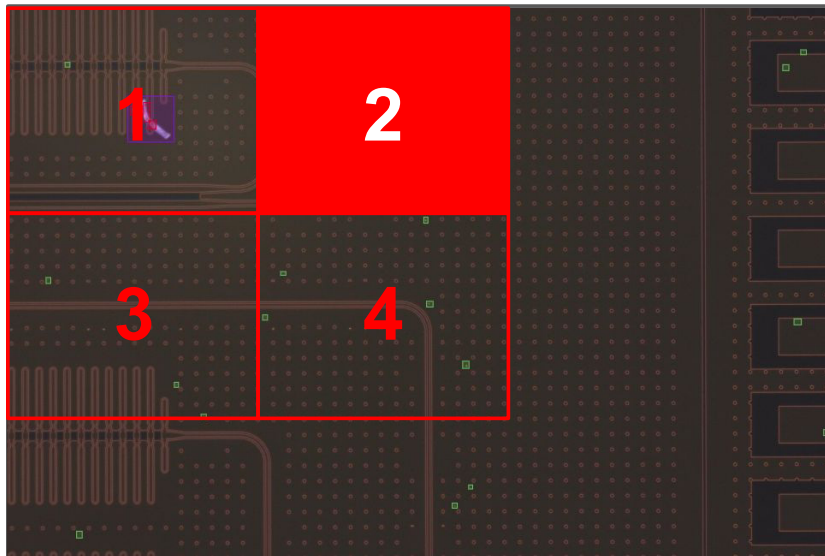
NEW

# Decent Results

Configuration	Critical			Dirt-Wire			Global Summary		
	P	R	F1	P	R	F1	mAP <sub>50</sub>	mAP <sub>50:95</sub>	Mean F1
<i>Initial Baselines</i>									
Baseline (Full Image)	0.302	0.174	0.221	0.000	0.000	0.000	0.070	0.024	0.110
Baseline + Augmentations	0.003	0.130	0.005	0.000	0.000	0.000	0.012	0.001	0.003
Baseline + P2 Head	0.410	0.130	0.198	0.365	0.041	0.074	0.087	0.017	0.136

# Slicing Aided Hyper Inference (SAHI)

Smaller Input Size



We lose on inference time but completely doable on GPU laptop

# Results

Configuration	Critical			Dirt-Wire			Global Summary		
	P	R	F1	P	R	F1	mAP <sub>50</sub>	mAP <sub>50:95</sub>	Mean F1
<i>Initial Baselines</i>									
Baseline (Full Image)	0.302	0.174	0.221	0.000	0.000	0.000	0.070	0.024	0.110
Baseline + Augmentations	0.003	0.130	0.005	0.000	0.000	0.000	0.012	0.001	0.003
Baseline + P2 Head	0.410	0.130	0.198	0.365	0.041	0.074	0.087	0.017	0.136
<i>SAHI 128px (Oversampling + Aug)</i>									
+ 50% Background	0.243	0.391	0.300	0.284	0.489	0.360	0.243	0.101	0.330
<i>SAHI 256px (Oversampling + Aug)</i>									
+ 10% Background	0.185	0.435	0.260	0.486	0.571	0.525	<b>0.368</b>	<b>0.152</b>	0.393
+ 30% Background	0.171	0.522	0.258	0.573	0.473	0.518	0.336	0.138	0.388
+ 50% Background*	0.435	<b>0.435</b>	<b>0.435</b>	0.674	<b>0.478</b>	<b>0.560</b>	0.323	0.126	<b>0.497</b>
+ 70% Background	0.412	0.304	0.350	<b>0.723</b>	0.401	0.516	0.238	0.092	0.433
<i>SAHI 256px (Downsampling + Aug)</i>									
+ 10% Background	0.217	0.435	0.290	0.352	0.462	0.399	0.303	0.130	0.345
+ 30% Background	0.320	0.348	0.333	0.396	0.302	0.343	0.164	0.069	0.338
+ 50% Background	0.364	0.348	0.356	0.497	0.434	0.463	0.236	0.104	0.409
+ 70% Background	<b>0.600</b>	0.261	0.364	0.516	0.363	0.426	0.231	0.098	0.395



Data is the biggest problem...

Demo