DEEP LEARNING-BASED MEDICAL DEVICE CLASSIFICATION

FINAL PRESENTATION

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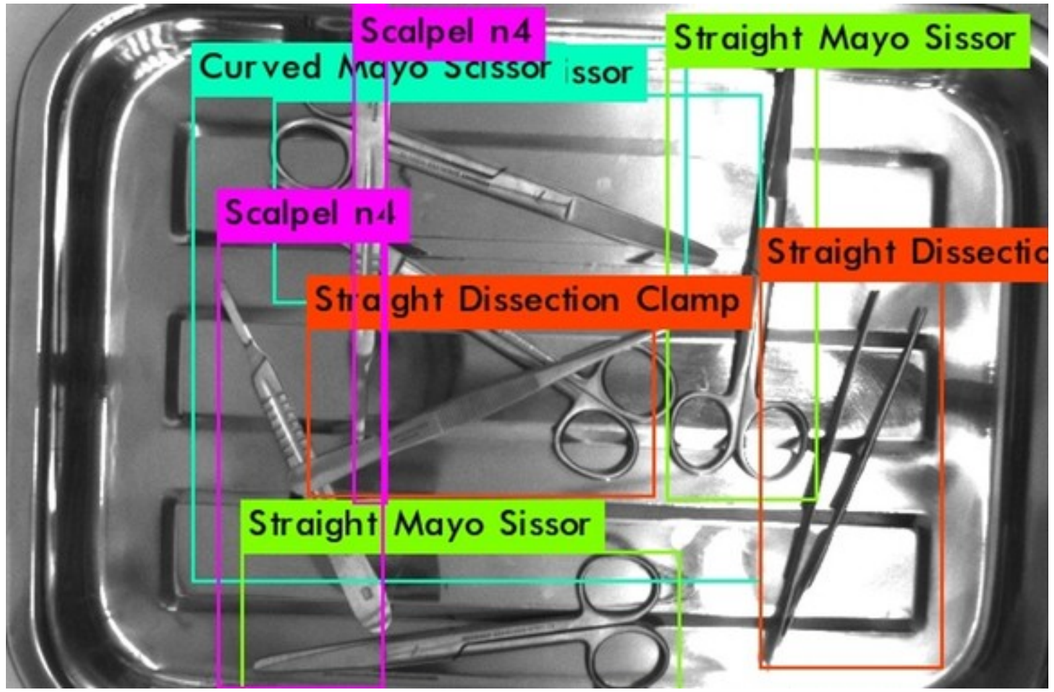
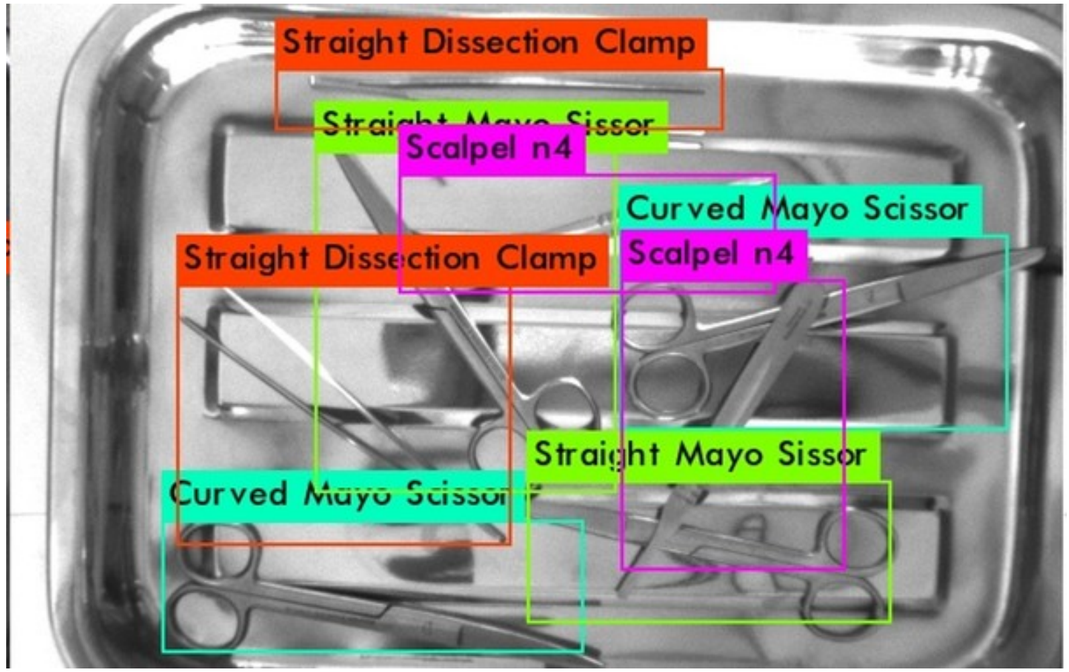
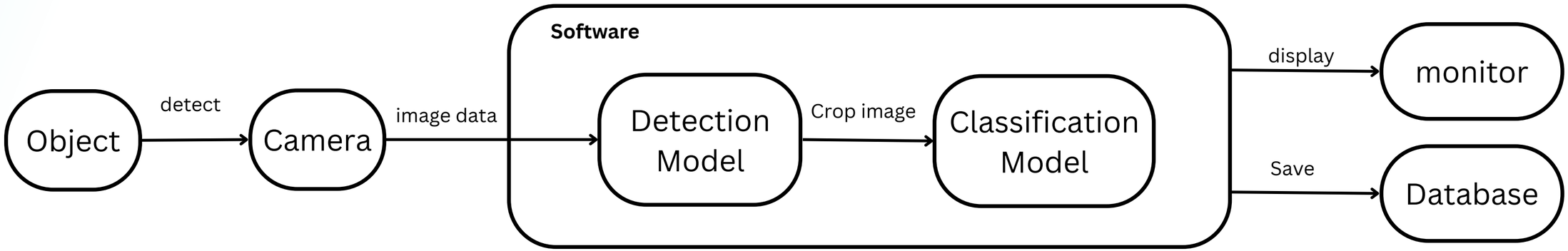
PROBLEM STATEMENT

The Bangkok Unitrade Co., Ltd. | Bangkok



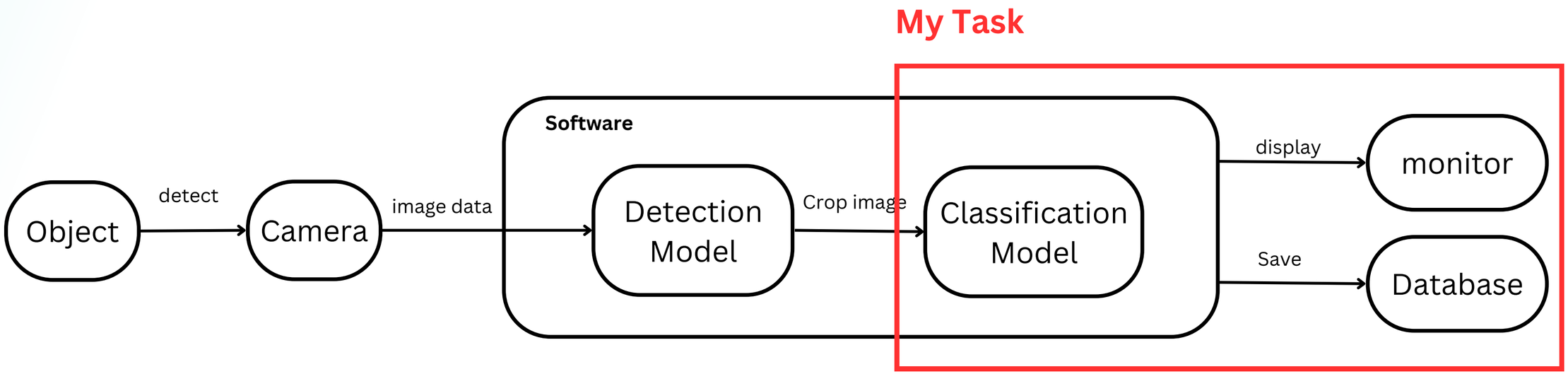


SYSTEM OVERVIEW



- **Detection model** croping image of object for reduce background and see more detail
- **Classification model** classify class of object

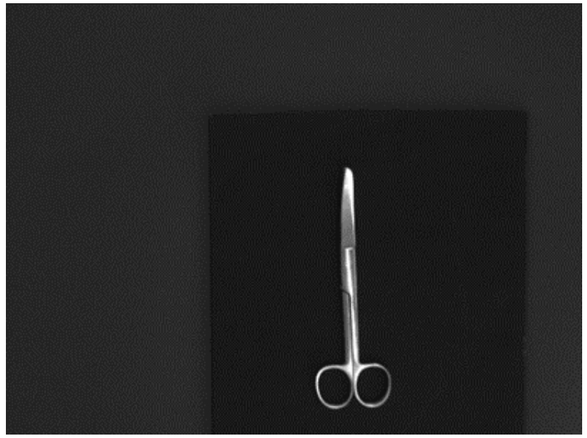
SYSTEM OVERVIEW



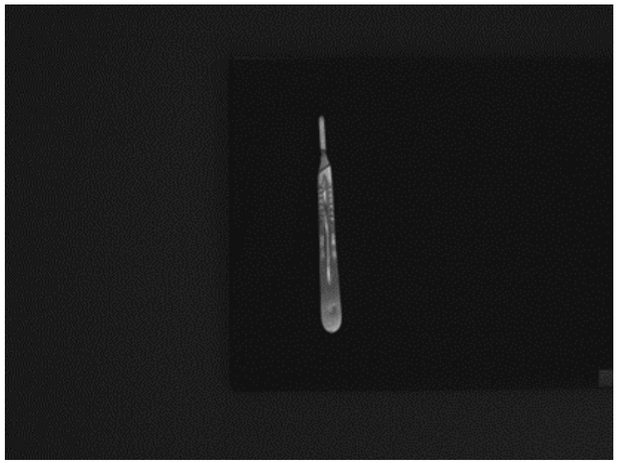
- **Detection model** croping image of object for reduce background and see more detail
- **Classification model** classify class of object

DATASET contain 2010 images from **kaggle** for classification

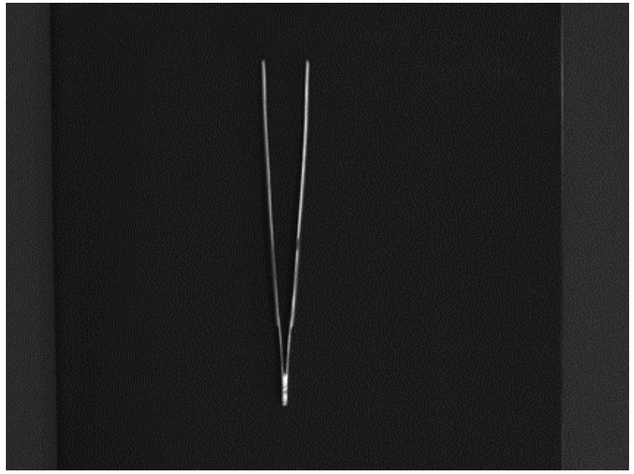
1. Curved Mayo Scissor



2. Scalpel



3. Straight Dissection Clamp



4. Straight Mayo Scissor

MODEL

State of the art model

using Transfer Learning from ImageNet

- ResNet-50
- VGG-16

DATA AUGMENTATION

- Resize to (224,224)
- Horizontal flip for train

EVALUATION

Accuracy : describes how the model performs across all classes.

accuracy = (True Positive + (True Negative) / N

F1 - score: measure of how well a model can detect positive instances.

F1 score= True Positive/(True Positive+1/2(False Positive+False Negative))

RESULT

Accuracy

Model	Accuracy
ResNet50	0.930
VGG16	0.960

F1-score

Model \ Classes	Curved Mayo Scissor	Scalpel	Straight Dissection Clamp	Straight Mayo Scissor
ResNet50	0.88	0.99	0.99	0.88
VGG16	0.92	0.98	0.98	0.92

RESULT

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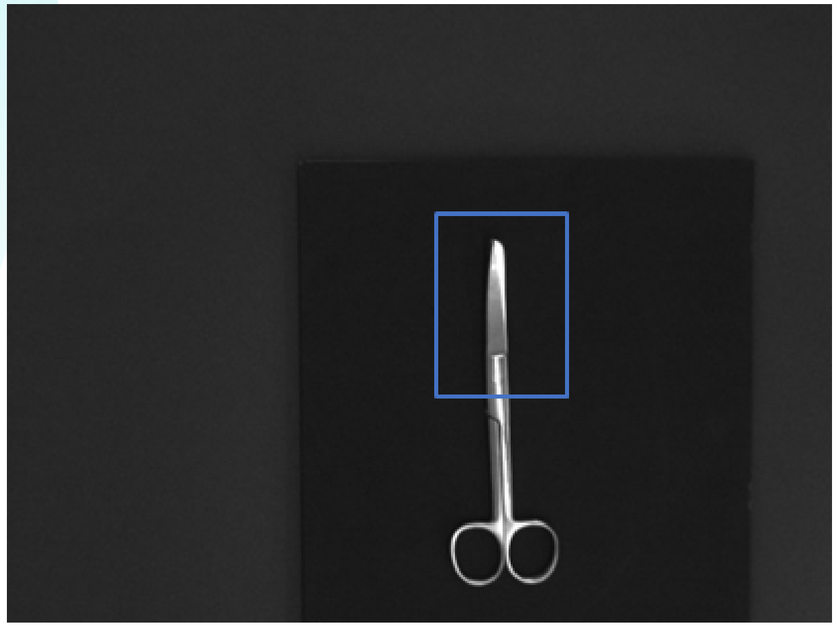
F1-score

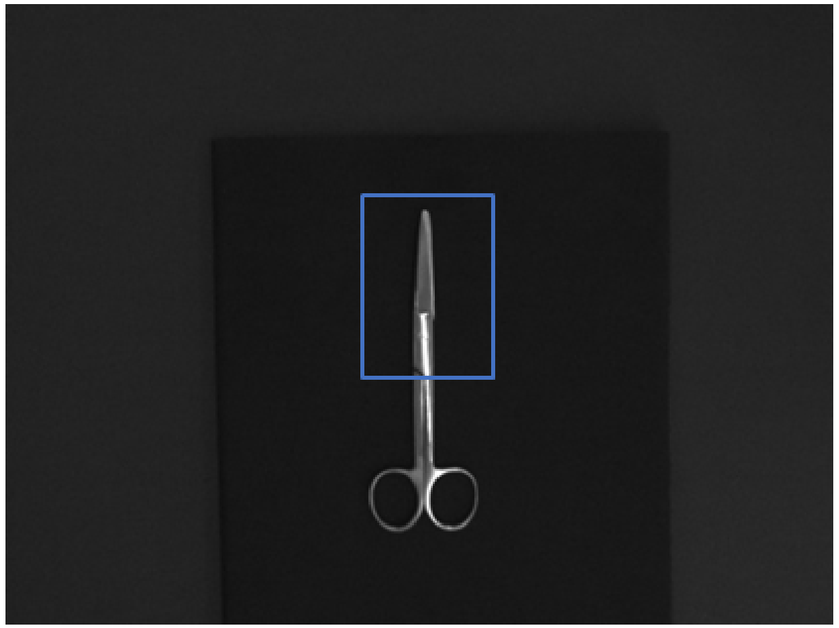
Model \ Classes	Curved Mayo Scissor	Scalpel	Straight Dissection Clamp	Straight Mayo Scissor
ResNet50	0.88	0.99	0.99	0.88
VGG16	0.92	0.98	0.98	0.92

The difference of class Curved mayo scissor and Straight Mayo Scissor

Curved Mayo Scissor



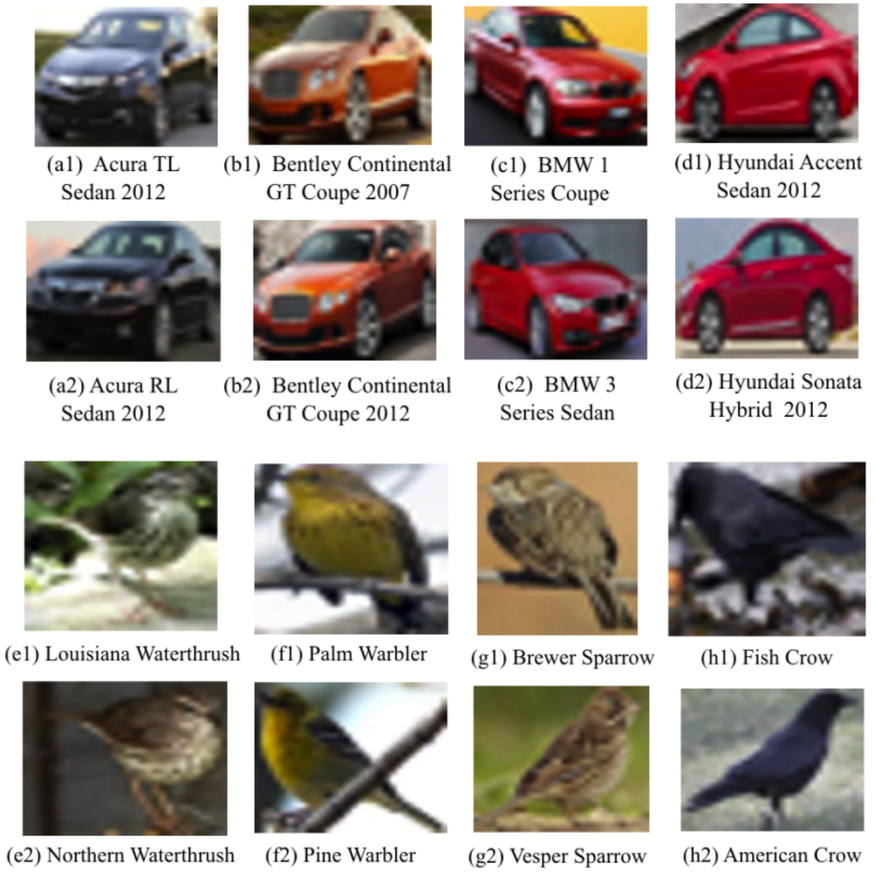
Straight Mayo Scissor



only difference being the end of the scissor.
The Curved Mayo Scissor has a curved end while the Straight Mayo Scissor has a straight end.

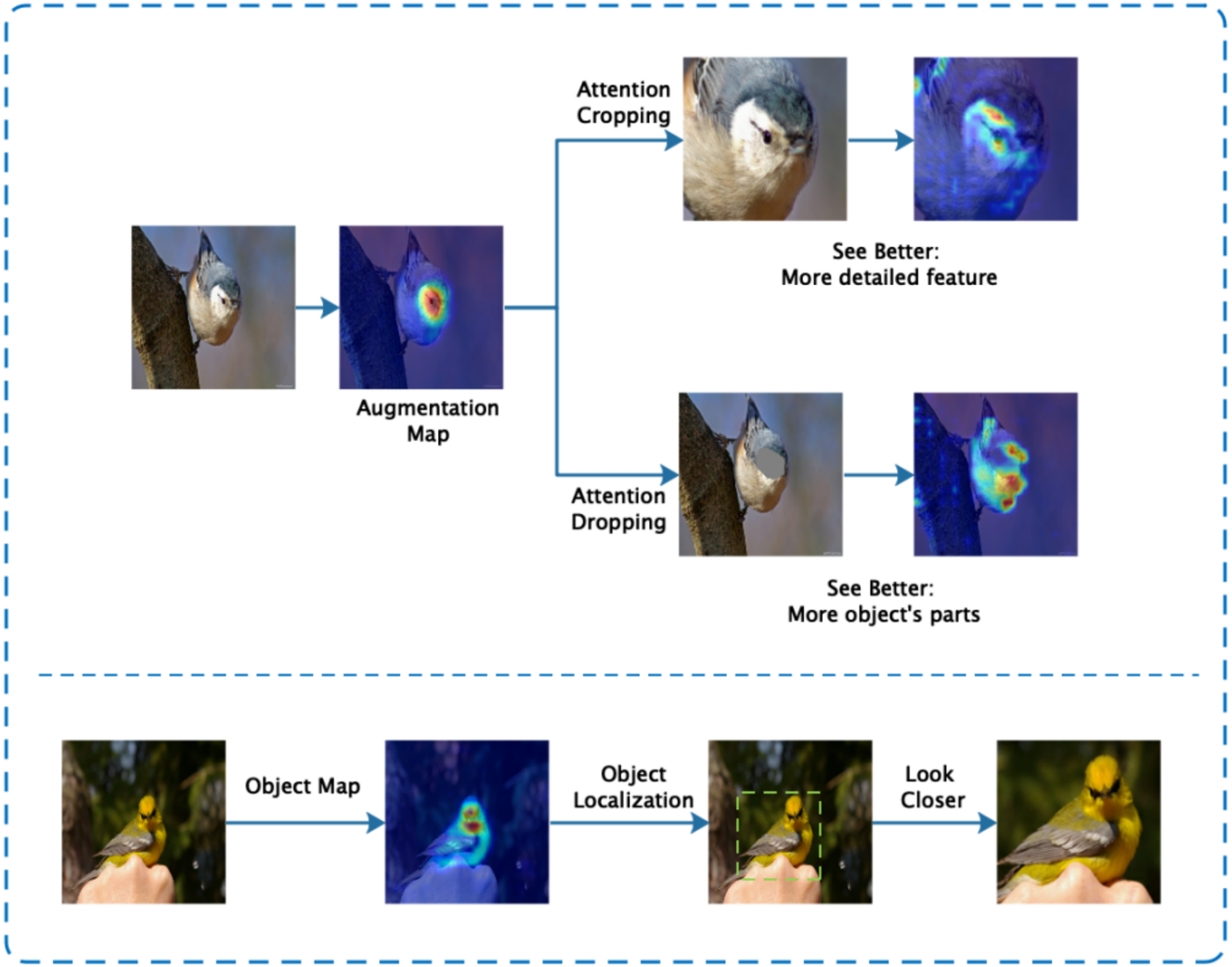
FINE GRAIN CLASSIFICATION

is an area of expertise in image recognition where we get to differentiate minor categories such as dog breeds, bird species, airplanes, etc



WSDAN

Weakly Supervised Data Augmentation Network for Fine-Grained Visual Classification



RESULT

Accuracy

Model	Accuracy
ResNet50	0.930
VGG16	0.960
SEResNet50	0.950
Bilinear ResNet50	0.955
WSDAN	**0.985**

F1 score

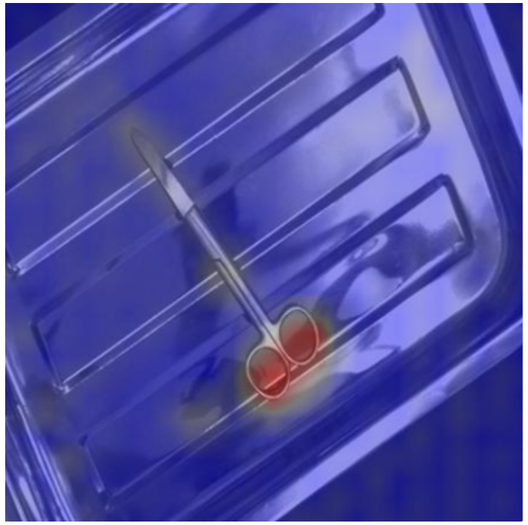
Model \ Classes	Curved Mayo Scissor	Scalpel	Straight Dissection Clamp	Straight Mayo Scissor
ResNet50	0.88	0.99	0.99	0.88
VGG16	0.92	0.98	0.98	0.92
SEResNet50	0.91	1.00	1.00	0.90
Bilinear ResNet50	0.93	1.00	0.98	0.92
WSDAN	**0.96**	**1.00**	**1.00**	**0.96**

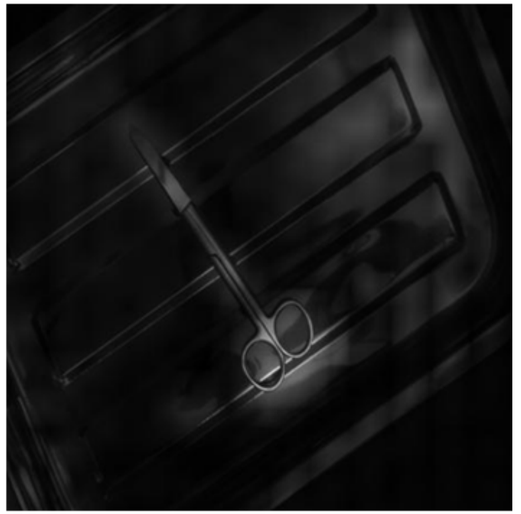
ATTENTION MAPS VISUALIZATION WSDAN

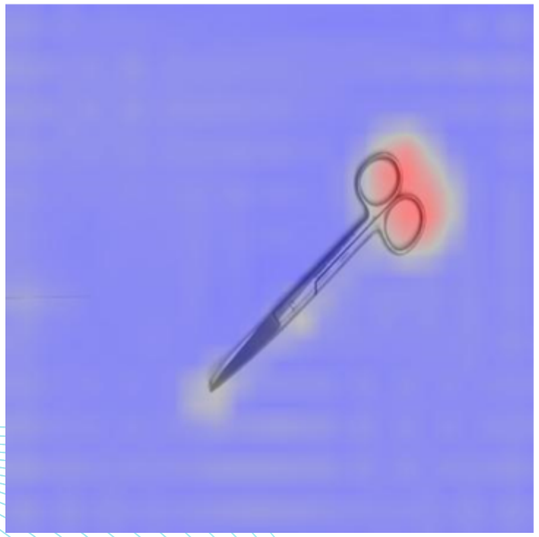
Heat Attention Map

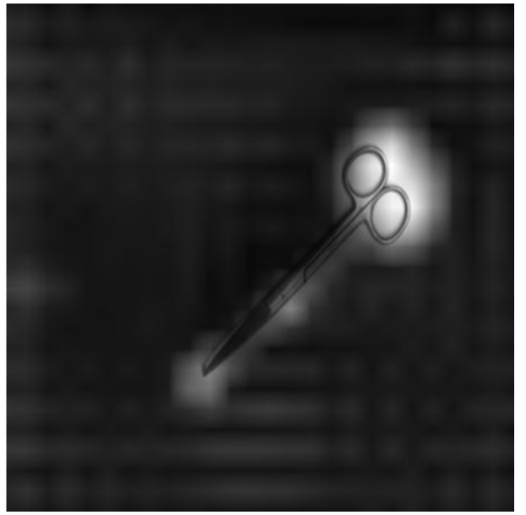
Raw Image

Image x Attention Map









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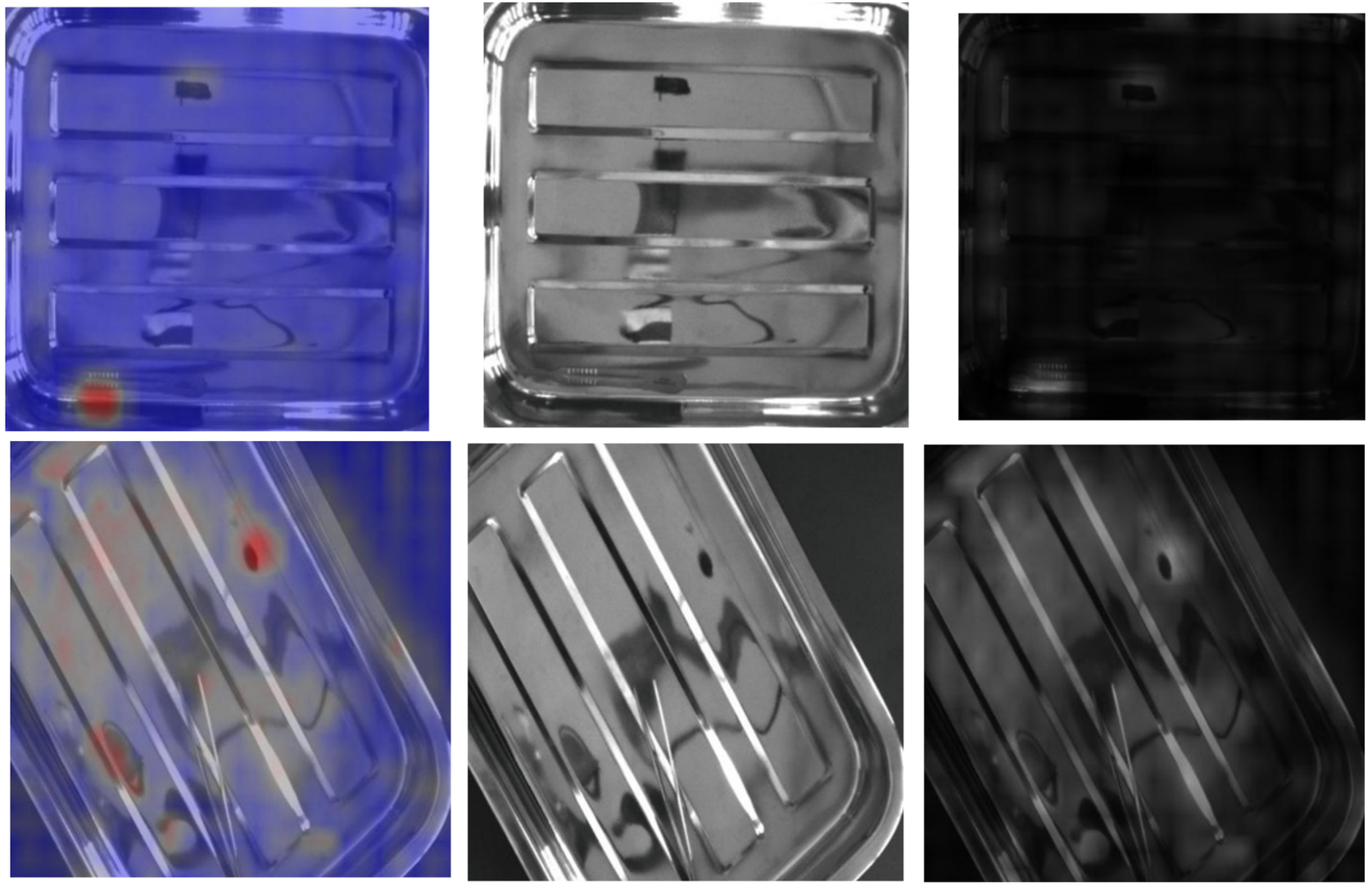

LESSONS LEARNED

1. learn about Image classification
2. learn about Fine grain image classification
3. learn how to survey related research
4. literature review

WHAT I WANT TO LEARN MORE

1. Hyper parameter tuning
2. Other Method to classification or detection

THANK YOU