



## E-SAN THAILAND CODING & AI ACADEMY

โครงการวิจัยโมเดลระบบนิเวศการเรียนรู้กีบูรณาการ CODING & AI สำหรับเยาวชน  
Model of Learning Ecosystem Platform integrate with Coding & AI for Youth

### โครงการย่อยที่ 6

การพัฒนาเยาวชนเพื่อเข้าสู่วิชาชีพขั้นสูงด้าน Coding & AI  
ร่วมกับ Coding Entrepreneur & Partnership: Personal AI

## BiTNet: AI for Ultrasound Image Classification

ผศ.ดร.วนพงศ์ อิบ,trn  
ผู้เชี่ยวชาญด้าน Computer Vision



อี-เทคโนโลยี  
THAILAND  
CODING & AI ACADEMY

โครงการวิจัยโมเดลระบบบูรณาการ CODING & AI สำหรับเยาวชน  
Model of Learning Ecosystem Platform integrate with Coding & AI for Youth

Add a little bit of body text

# Evaluation

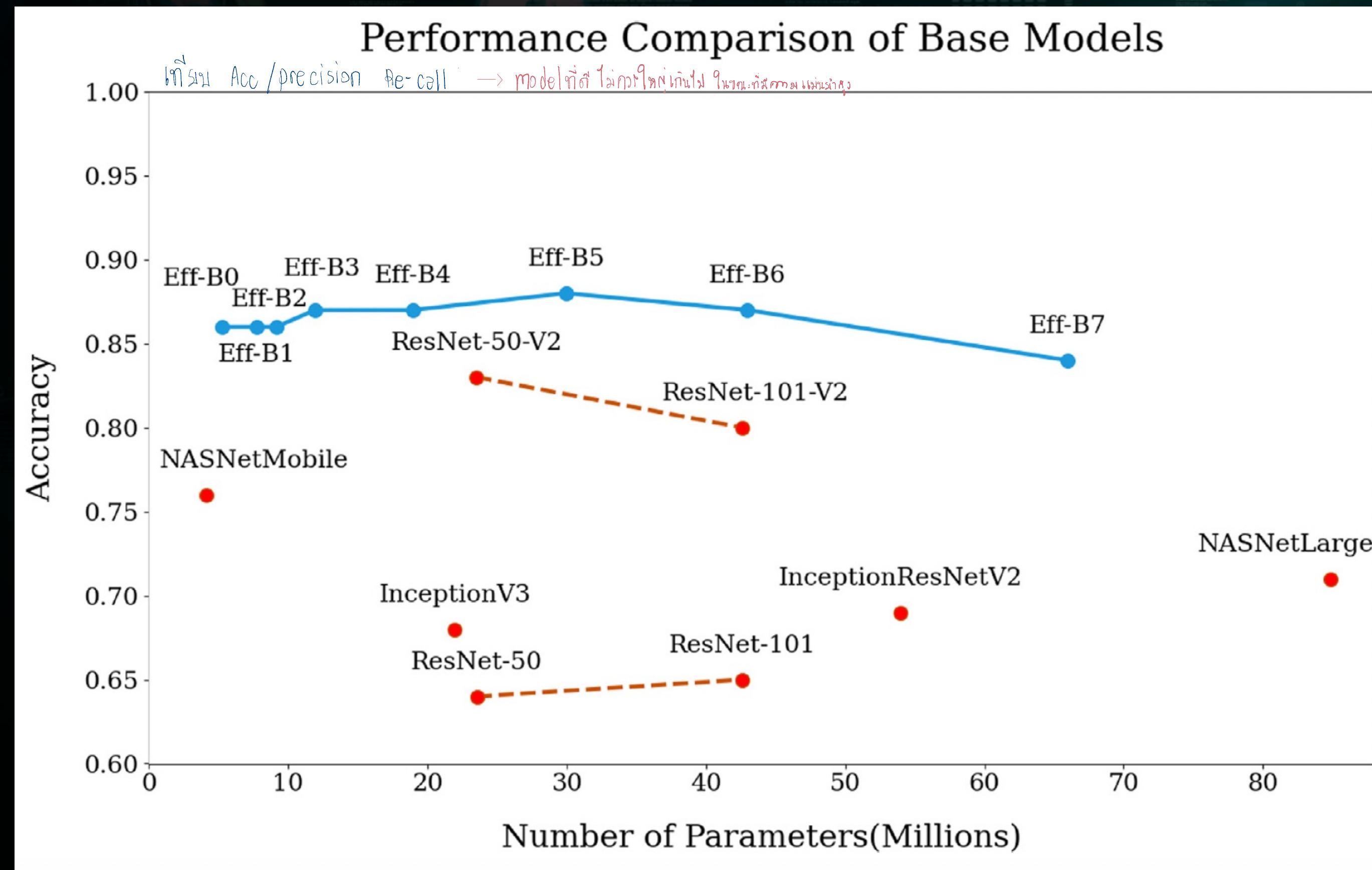
model

ก. วัตถุประสงค์

App



# Models



# Models

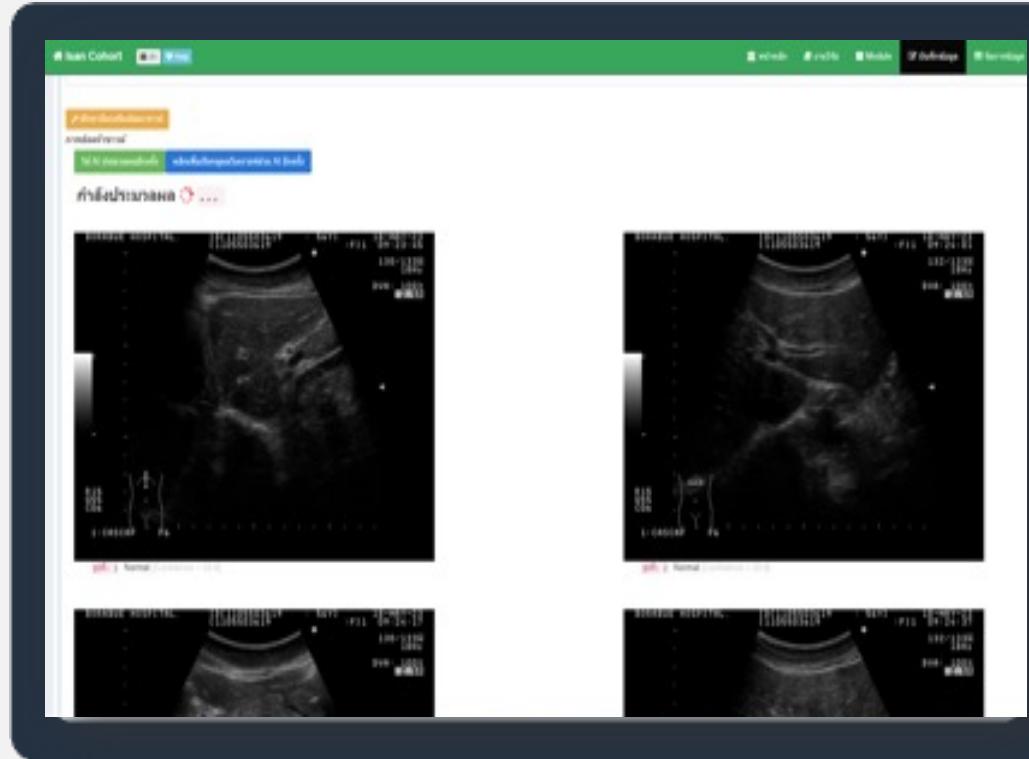
**Table 2**

Comparison between EfficientNet base model and BiTNet model modification on 8-fold cross-validation and the test set. The format of the numbers is *abnormality (viewing angle)*.

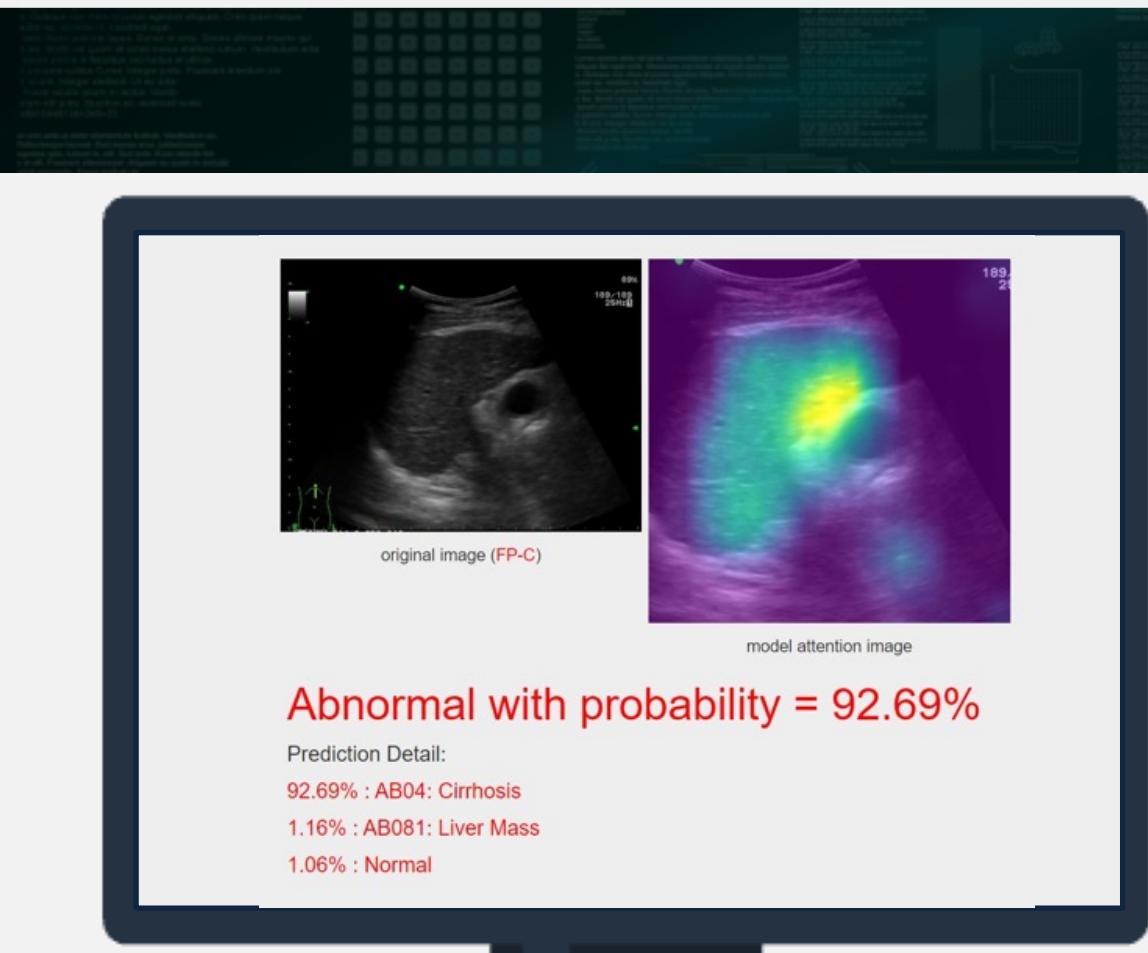
Model	Dataset	Accuracy	Precision	Recall	AUC
EfficientNet	Validation	0.88 (0.92)	0.79 (0.92)	0.64 (0.92)	0.74
BiTNet	Validation	0.87 (0.75)	0.79 (0.79)	0.60 (0.73)	0.82
EfficientNet	Test	0.88 (0.93)	0.82 (0.93)	0.66 (0.93)	0.79
BiTNet	Test	0.87 (0.74)	0.82 (0.80)	0.61 (0.74)	0.82

จดหมายเหตุ

# 2 Applications



Auto Pre-screening



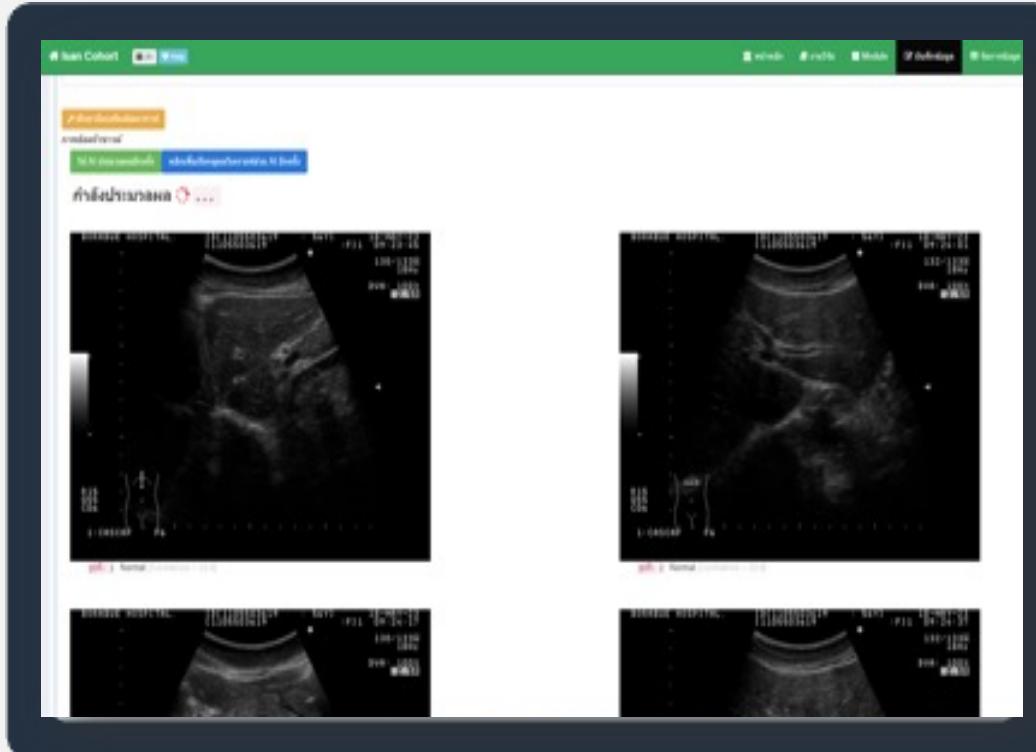
Assisting tool



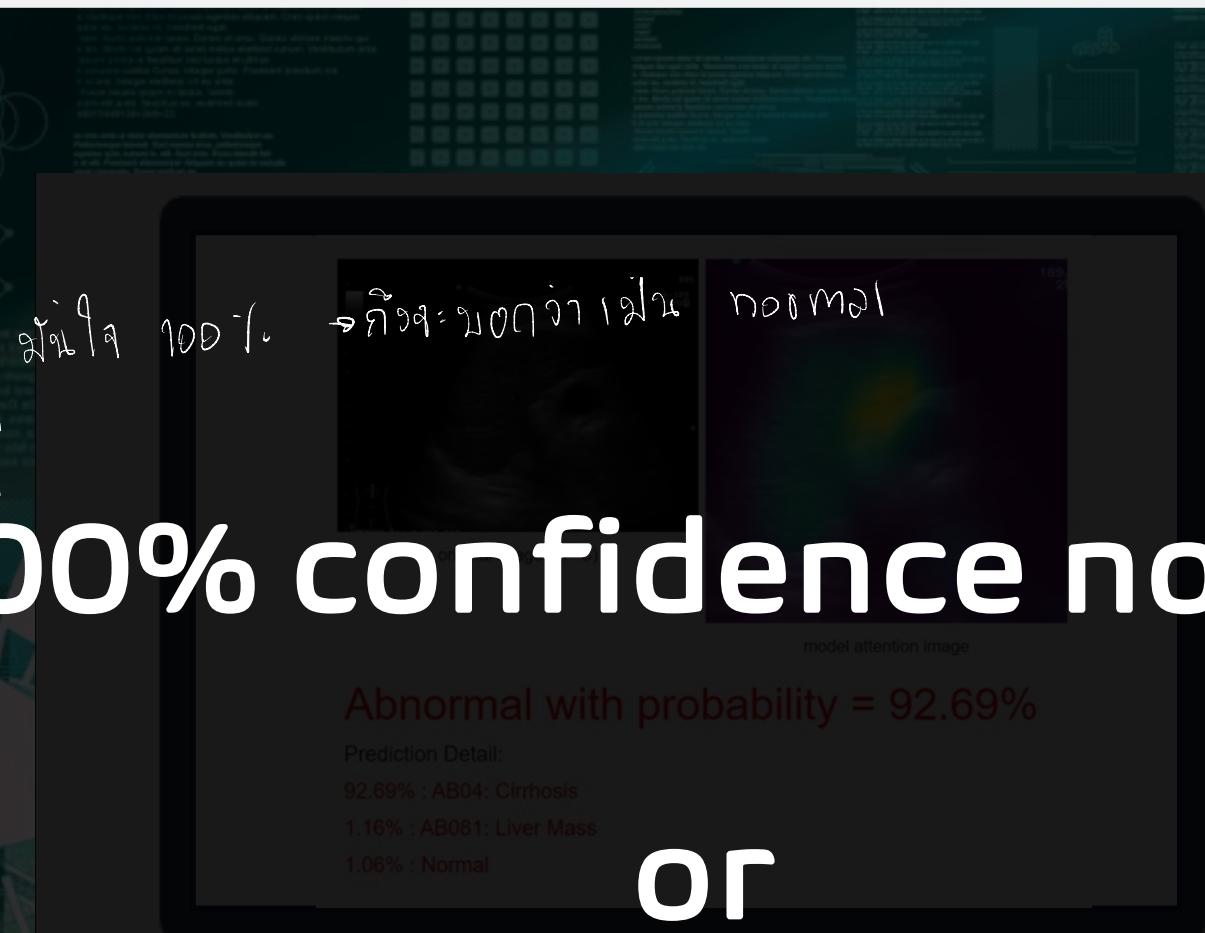
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Model of Learning Ecosystem Platform integrated with Coding

# 1<sup>st</sup> Application



Auto Pre-screening

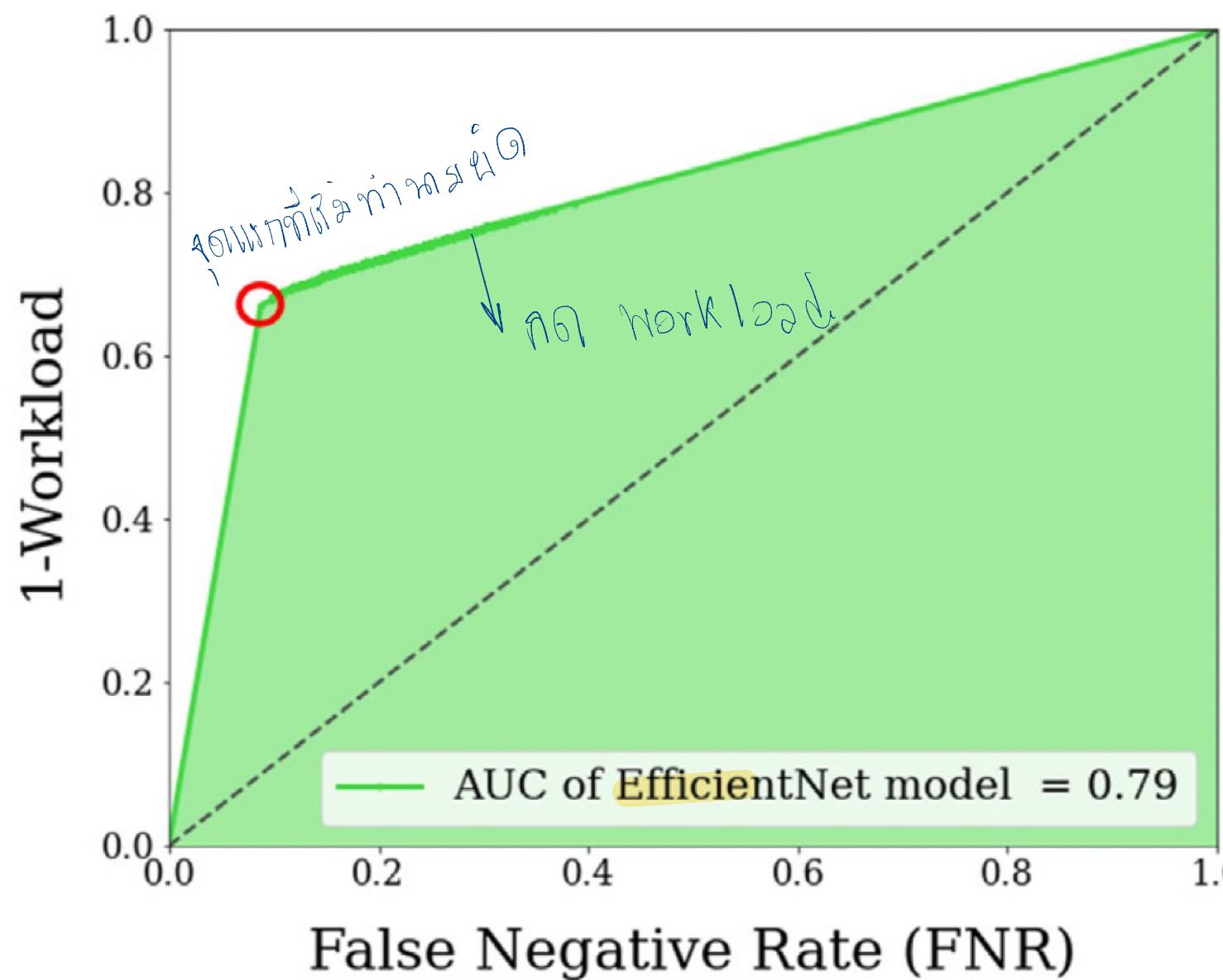


or

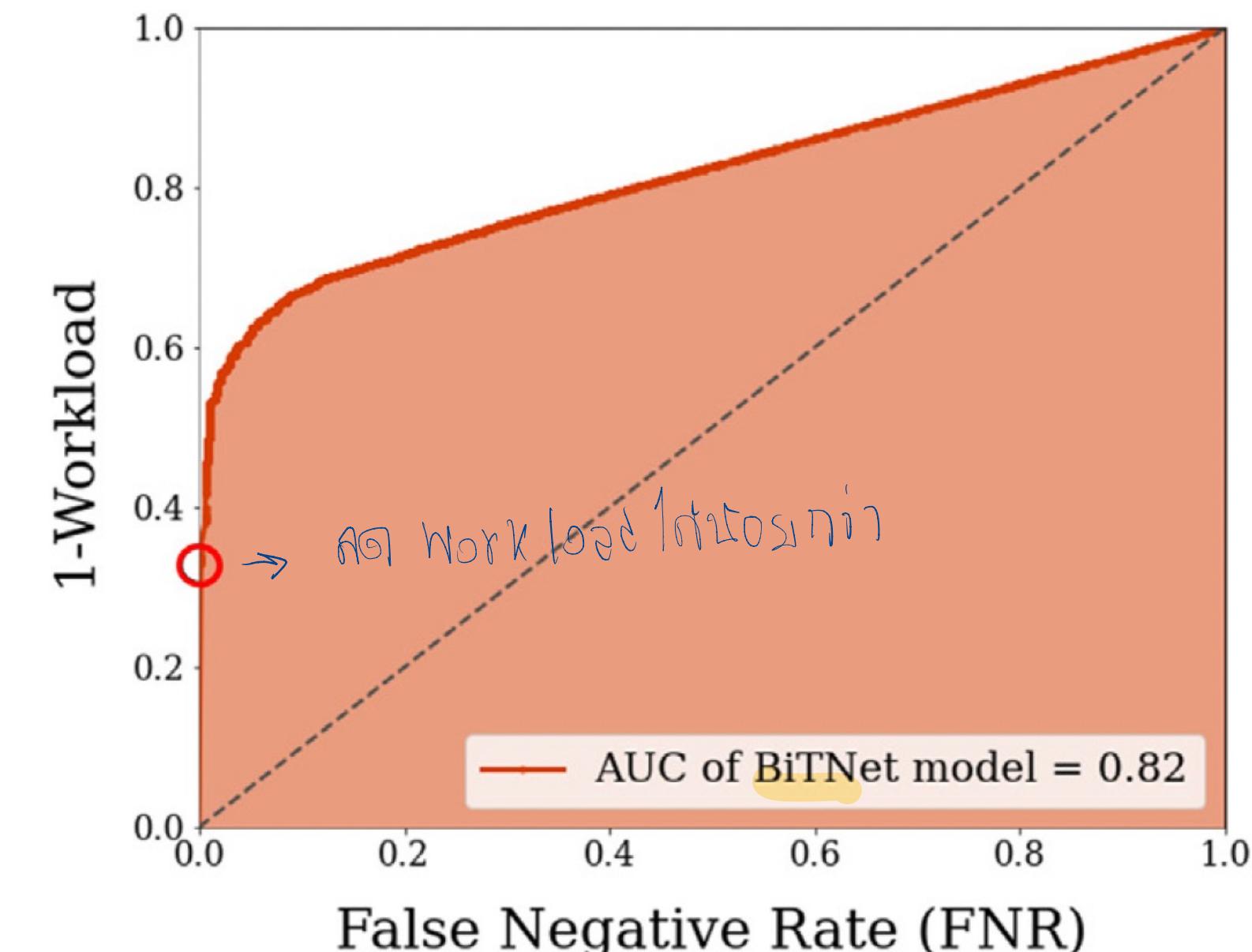
Otherwise  
Assisting tool

กดอินๆ หน่อยค่ะ

Comparison between workload reduction-rate and false negative rate when varies-thresholds of the model.

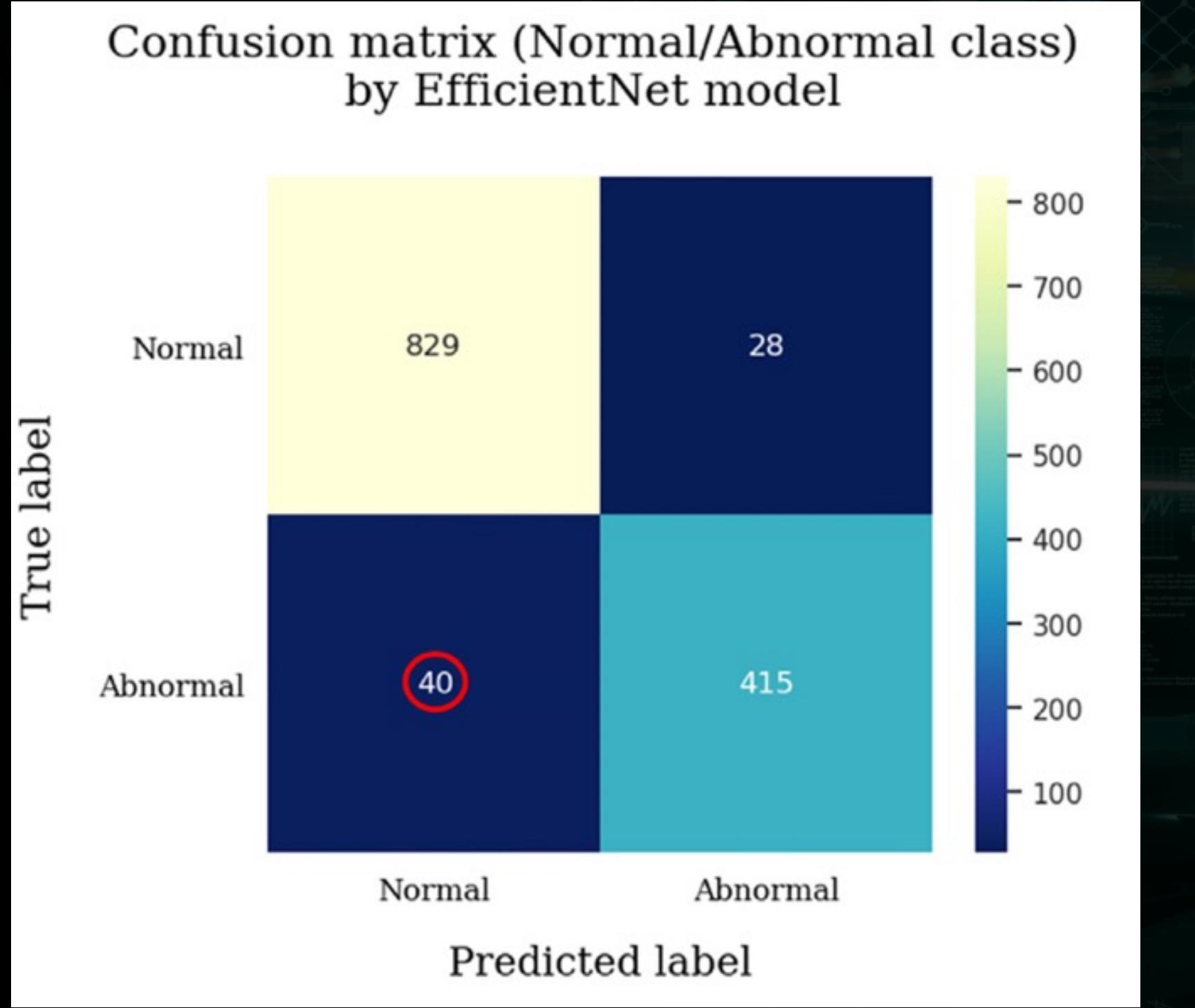


Comparison between workload reduction-rate and false negative rate when varies-thresholds of the model.

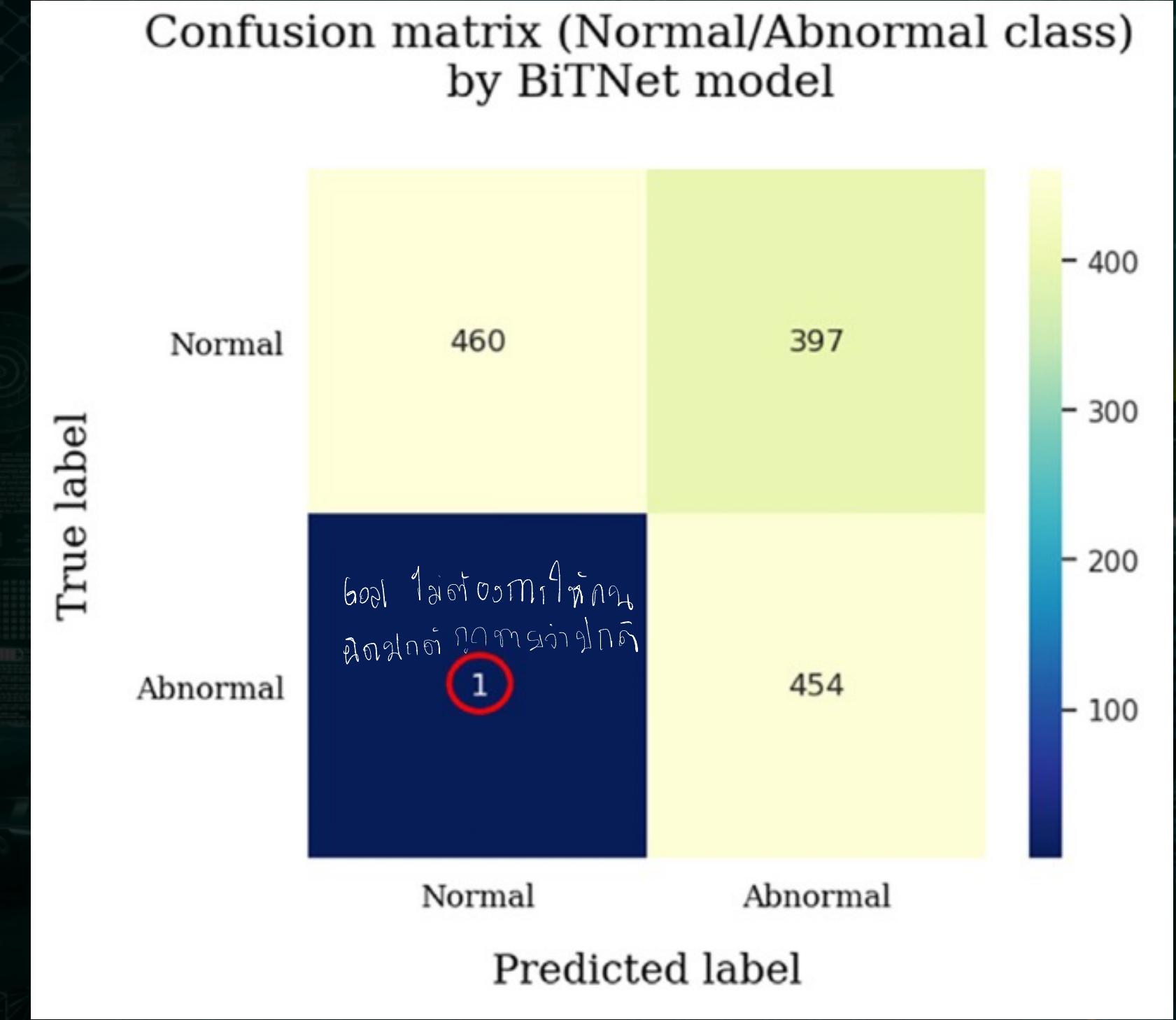


# Auto Pre-screening

Confusion matrix (Normal/Abnormal class)  
by EfficientNet model



Confusion matrix (Normal/Abnormal class)  
by BiTNet model

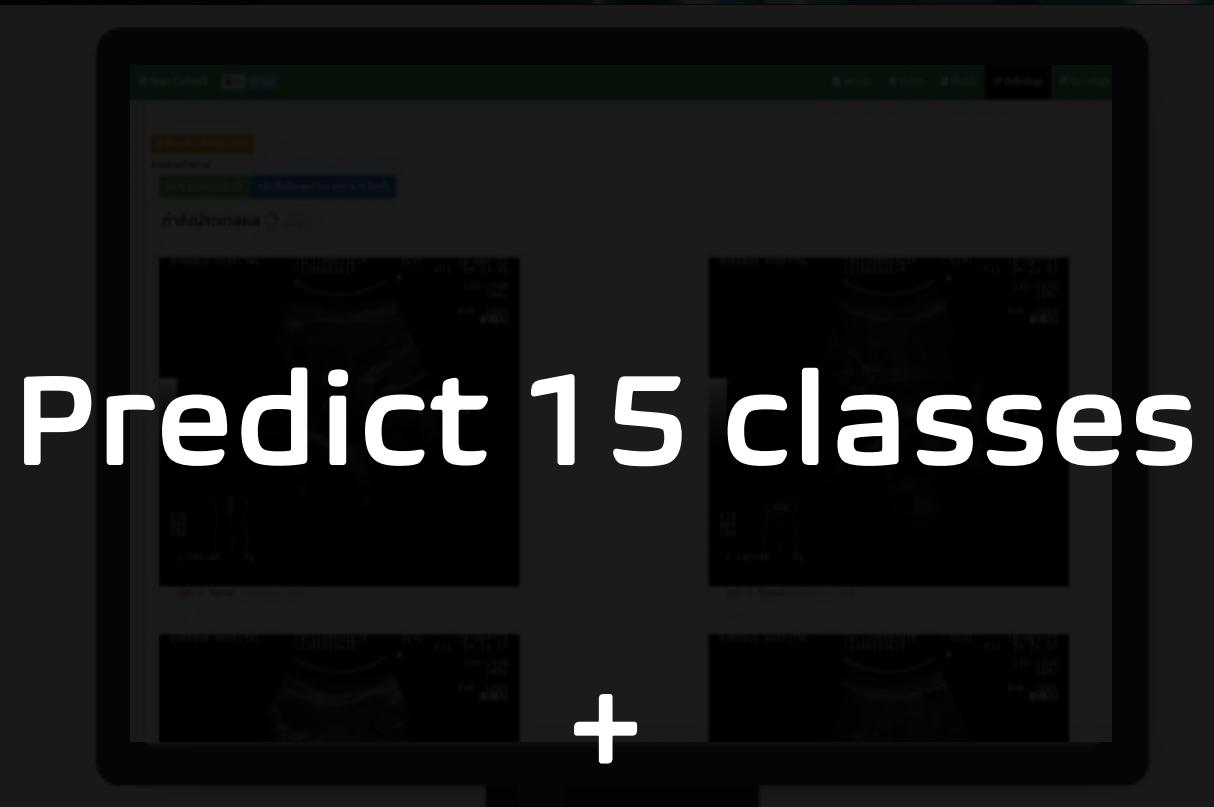




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Model of Learning Ecosystem Platform integration with E&S

# 2<sup>nd</sup> Application



eXplanable AI  
Auto Pre-screening

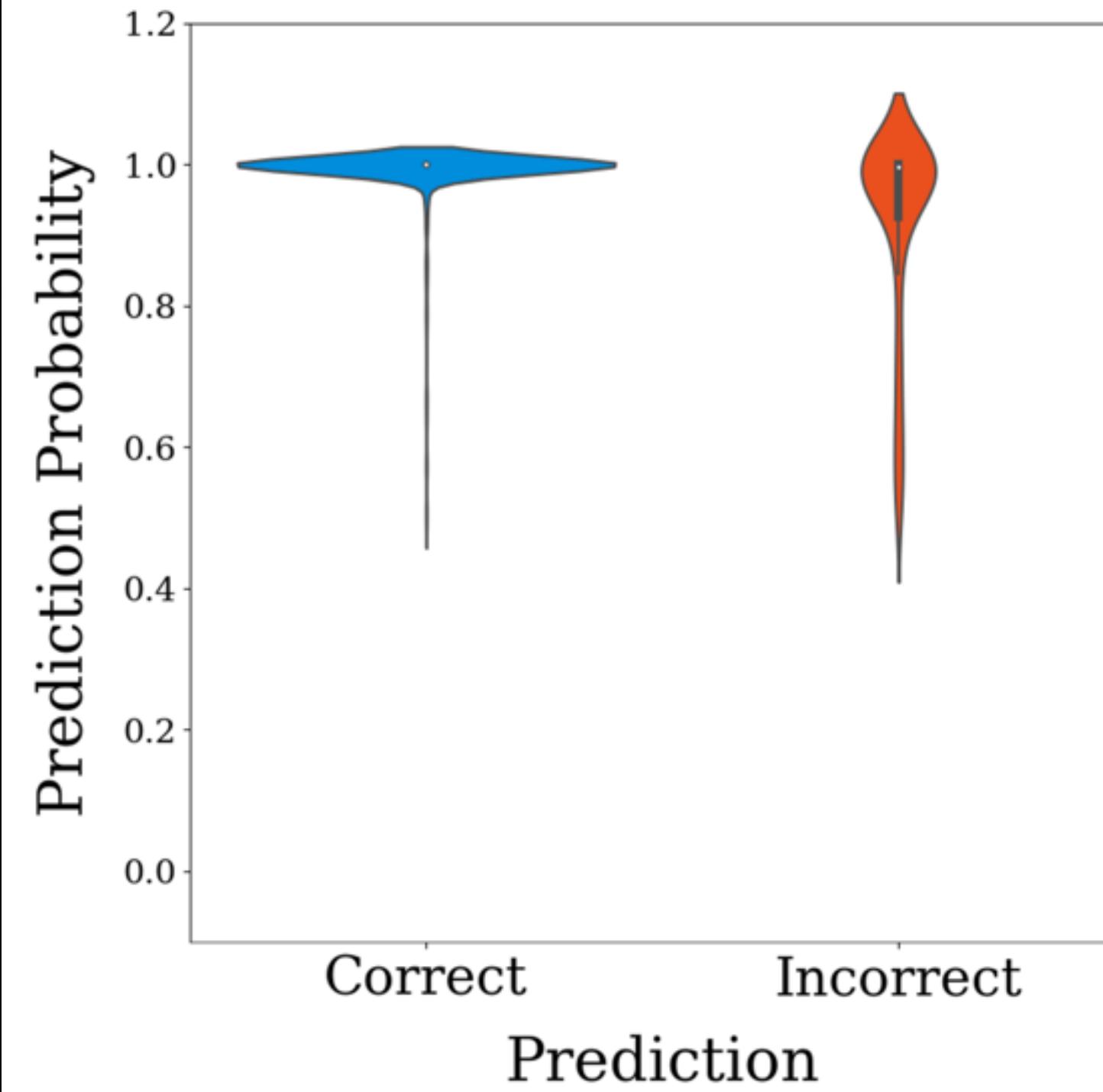


Assisting tool

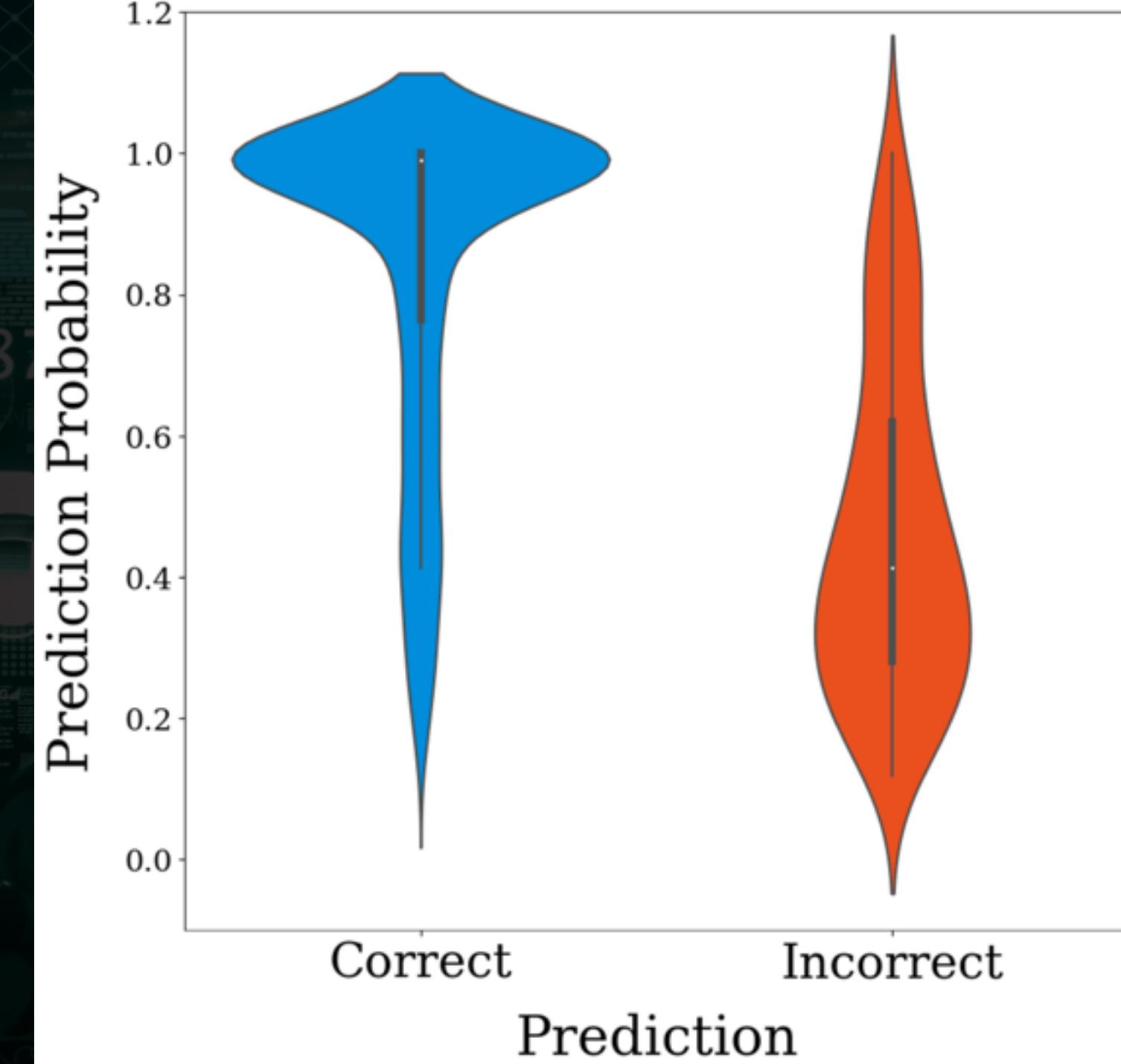
๒๕๖๐ ก้าวต่อไปของนักศึกษา

# Assisting tool

EfficientNet model



BiTNet model



# Assisting tool



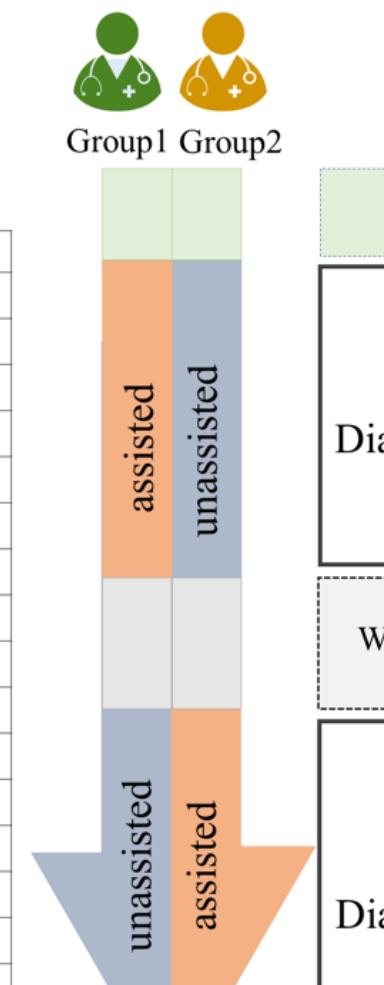
งาน坊 กันหล่อ

1st tool  
2nd tool

Data distribution (150 test images)

	FP-A	FP-B	FP-C	FP-D	FP-E
AB01	1	1	1		
AB02	1	1	1		
AB03	1	1	1		
AB04	1	1	1	1	
AB05	1	1	1		
AB06	1	1	1		
AB07	1	1	1		
AB081	1	1	1		
AB082	1	1	1		
AB083	1	1	1		
AB09		2	1		
AB10			3		
AB11			1	2	
AB12				3	
Abnormal	11	12	14	6	0
Normal	22	24	28	12	21

Total : 150 images  
Abnormal : 43 images  
Normal : 107 images



5 general practitioners (GP's), 2 residence radiologists, 2 non-hepatobiliary radiologists and 2 hepatobiliary radiologists.

# Assisting tool

## 1. The independent samples T-Test

- Compare the means of **mean difference** in prediction confidence of the **correct and incorrect** groups between the BiTNet model and the EfficientNet model.
- **Hypothesis :** The means of mean differences of the BiTNet model were significantly higher than those of EfficientNet.

## 2. Paired Samples T-Test

- Compare of mean accuracy, precision, and recall of the diagnostic performance of the participants with and without assistance.

- **Hypothesis :** The mean accuracy, precision, and recall scores of the diagnostic performance of the participants with assistance were significantly higher than those without assistance.

## 3. Paired Samples T-Test

➤ Compare of mean accuracy scores between the first round of the experiment and the second round of the experiment with the participants.

- **Hypothesis :** The mean accuracy scores no significant difference between the first round and the second round of the experiment.

## 4. Paired Samples T-Test

➤ Compare of mean similarity scores between AI suggestion(prediction) and the final answer of the participants when assisted/unassisted.

- **Hypothesis :** The mean similarity score of the assisted participants was significantly higher than that of the unassisted participants.

# Assisting tool

## 1. The independent samples T-Test

➤ Compare the means of **mean difference** in prediction confidence of the correct and correct groups between the BiTNet model and the EfficientNet model.

○ **Hypothesis :** The means of mean differences of the BiTNet model were significantly higher than those of EfficientNet.

## 2. The Paired Samples T-Test

กทม. / ๑๒๙๕

➤ Compare of mean **accuracy**, **precision**, and **recall** of the diagnostic performance of the participants **with** and **without** assistance.

○ **Hypothesis :** The mean **accuracy**, **precision**, and **recall** scores of the diagnostic performance of the participants with assistance were significantly higher than those without assistance.

➤ Compare of mean **accuracy scores** between the first round of the experiment and the second round of the experiment with the participants.

○ **Hypothesis :** The mean accuracy scores no significant difference between the first round and the second round of the experiment.

➤ Compare of mean **similarity scores** between AI suggestion(prediction) and the final answer of the participants when assisted/unassisted.

○ **Hypothesis :** The mean similarity score of the assisted participants was significantly higher than that of the unassisted participants.

# Assisting tool

## 2. The independent samples T-Test

Compare the means of **mean difference** in prediction confidence of the correct and correct groups between the BiTNet model and the EfficientNet model.

**Hypothesis :** The means of mean differences of the BiTNet model were significantly higher than those of EfficientNet.

## 2. The Paired Samples T-Test ทำก้าวๆ ให้ถึง ฝี Acc ทางการค้า กันจะไหหนะ

Compare of mean **accuracy**, **precision**, and **recall** of the diagnostic performance of the participants with and without assistance.

**Hypothesis :** The mean accuracy, precision, and recall scores of the diagnostic performance of the participants with assistance were significantly higher than those without assistance.

➤ Compare of mean **accuracy** between the **first round** of the experiment and the **second round** of the experiment with the participants.

○ **Hypothesis :** The mean accuracy scores no significant difference between the first round and the second round of the experiment.

➤ mean **similarity scores** between AI suggestion(prediction) and the final answer of the participants when assisted/unassisted.

**Hypothesis :** The mean similarity score of the assisted participants was significantly higher than that of the unassisted participants.

# Assisting tool

## 2. The independent samples T-Test

○ Compare the means of **mean difference** in prediction confidence of the correct and correct groups between the BiTNet model and the EfficientNet model.

○ Hypothesis : The means of mean differences of the BiTNet model were significantly higher than those of EfficientNet.

## 2. The Paired Samples T-Test

○ Compare of mean **accuracy**, **precision**, and **recall** of the diagnostic performance of the participants with and without assistance.

○ Hypothesis : The mean accuracy, precision, and recall scores of the diagnostic performance of the participants with assistance were significantly higher than those without assistance.

○ Compare of mean **accuracy** between the first round of the experiment and the second round of the experiment with the participants.

○ Hypothesis : The mean accuracy scores no significant difference between the first round and the second round of the experiment.

➤ Compare of mean **similarity scores** between **AI suggestion (prediction)** and the final decision of the participants when **assisted/unassisted**.

○ **Hypothesis** : The mean similarity score of the assisted participants was significantly greater than that of the unassisted participants.

# Assisting tool

**Table 3**

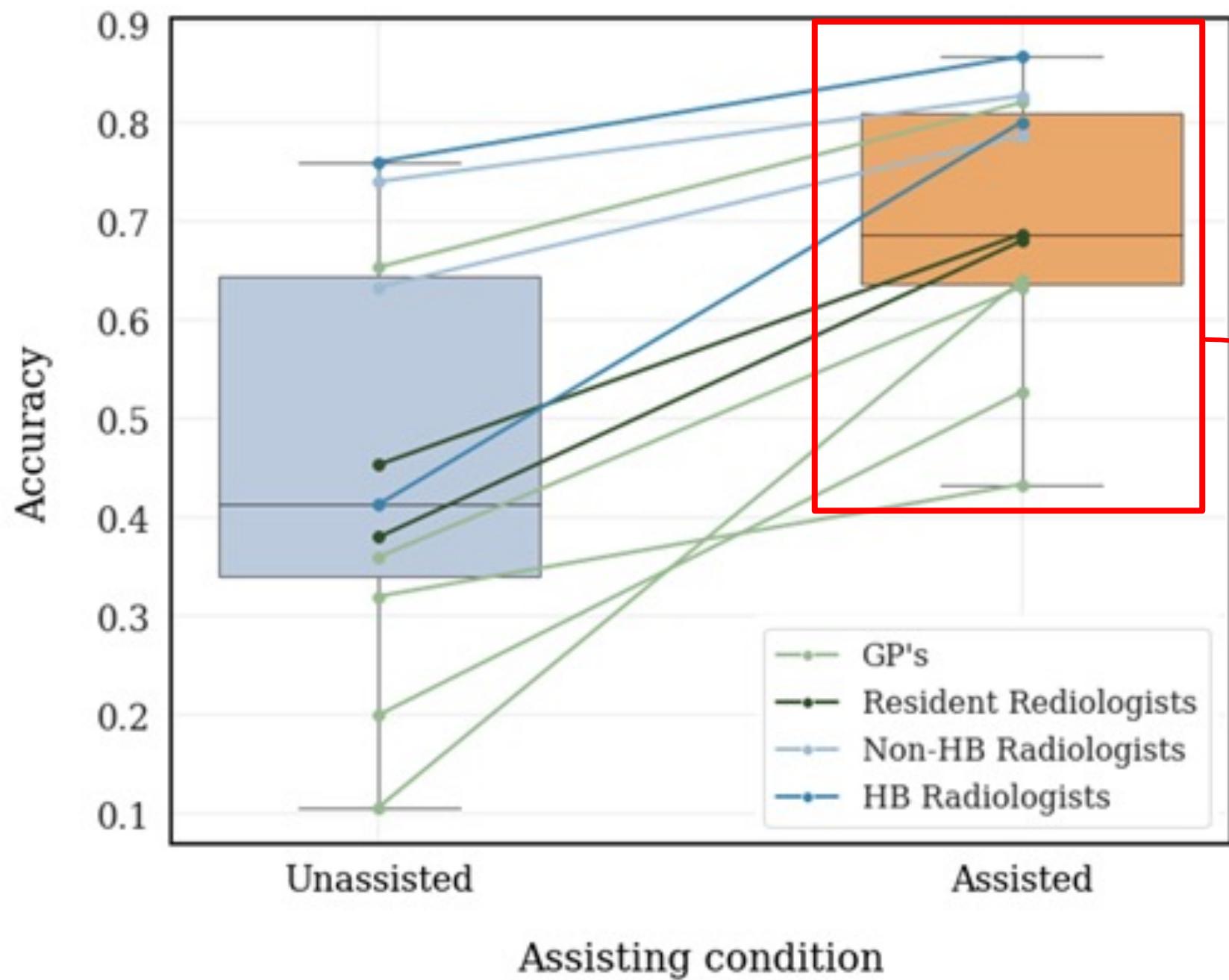
Comparison of mean accuracy, precision, and recall of assisted vs unassisted diagnosis with 99% confidence interval.

Metric	Assisted	Unassisted	p-value
Accuracy	$0.74 \pm 0.13$	$0.50 \pm 0.23$	$3.44 \times 10^{-4}$ <sup>a</sup>
Precision	$0.62 \pm 0.15$	$0.46 \pm 0.16$	$1.58 \times 10^{-4}$ <sup>a</sup>
Recall	$0.94 \pm 0.07$	$0.85 \pm 0.06$	0.05

<sup>a</sup>indicates  $p$ -value  $< 0.05$ .

# Assisting tool

Comparing accuracies between unassisted vs assisted



increase overall's accuracy  
by 18%

increase GP's accuracy  
by 26%

