E-SAN THAILAND CODING & AI ACADEMY

โครงการวิจัยโมเดลระบบนิเวศการเรียนรู้ที่บูรณาการ 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**

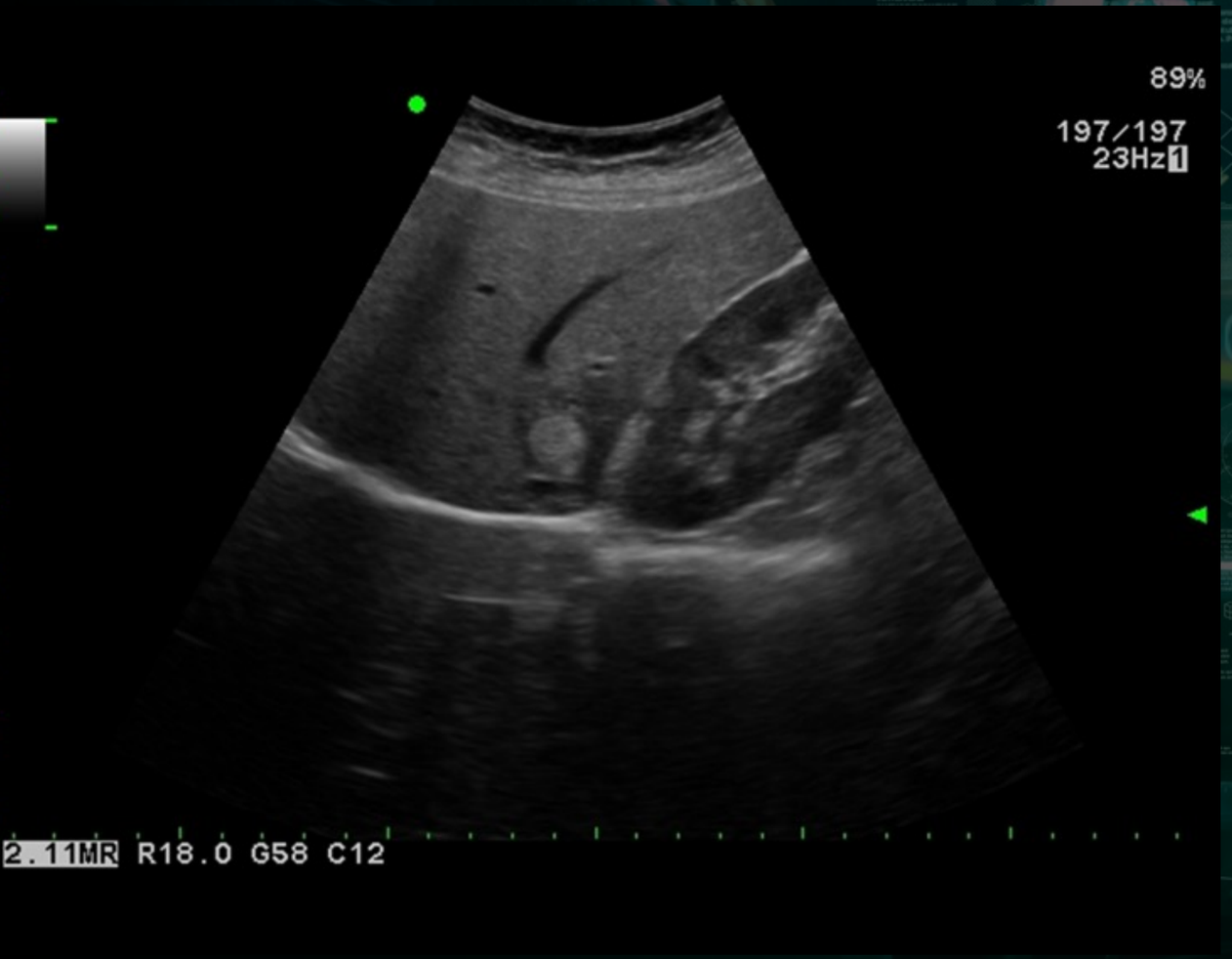
BiTNet: AI for Ultrasound Image Classification

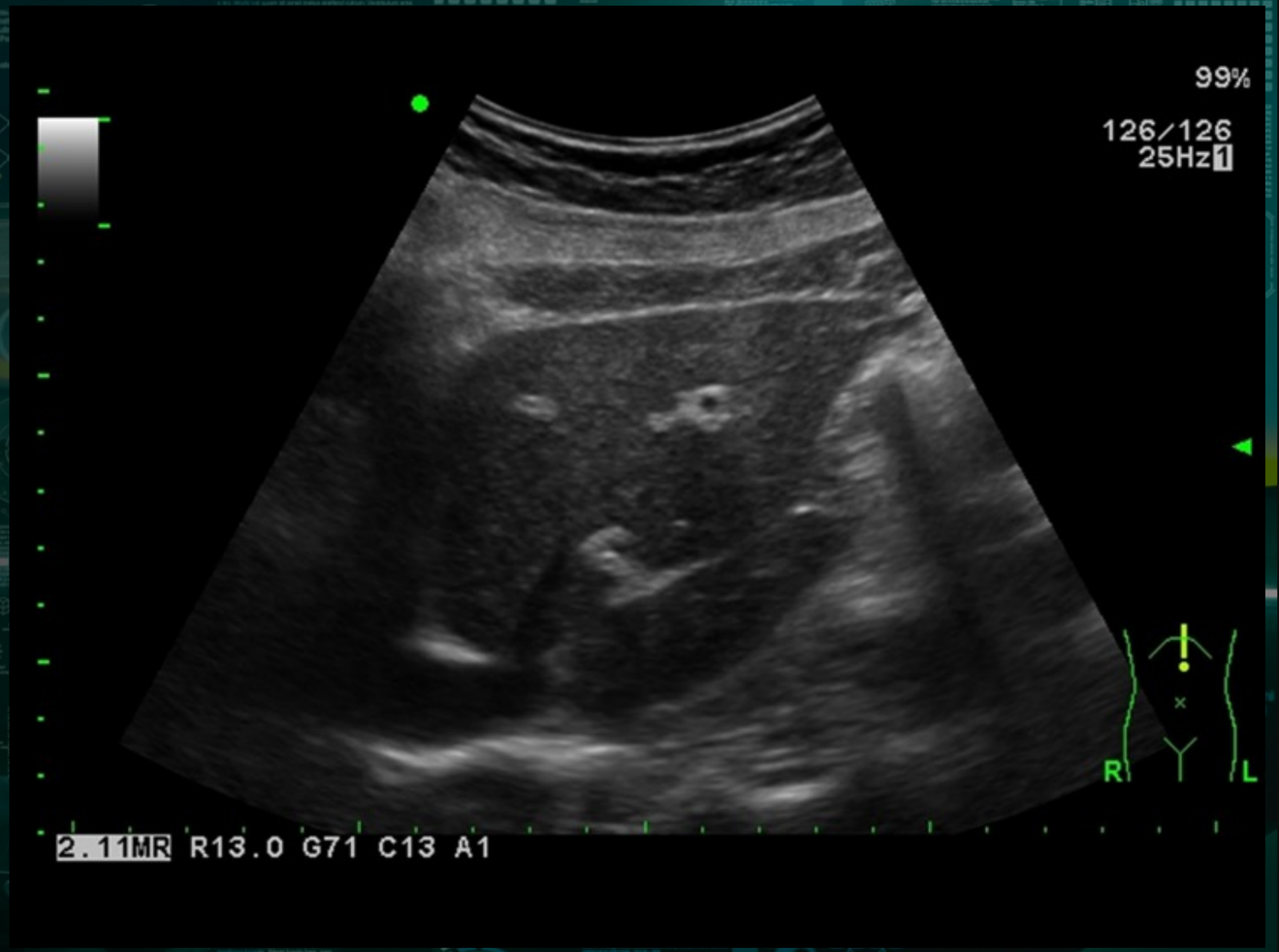
ผศ.ดร.ธนพงศ์ อินทระ

ผู้เชี่ยวชาญด้าน Computer Vision

Add a little bit of body text

Dataset


89%
197/197
23Hz1
2.11MR R18.0 G58 C12


99%
126/126
25Hz1
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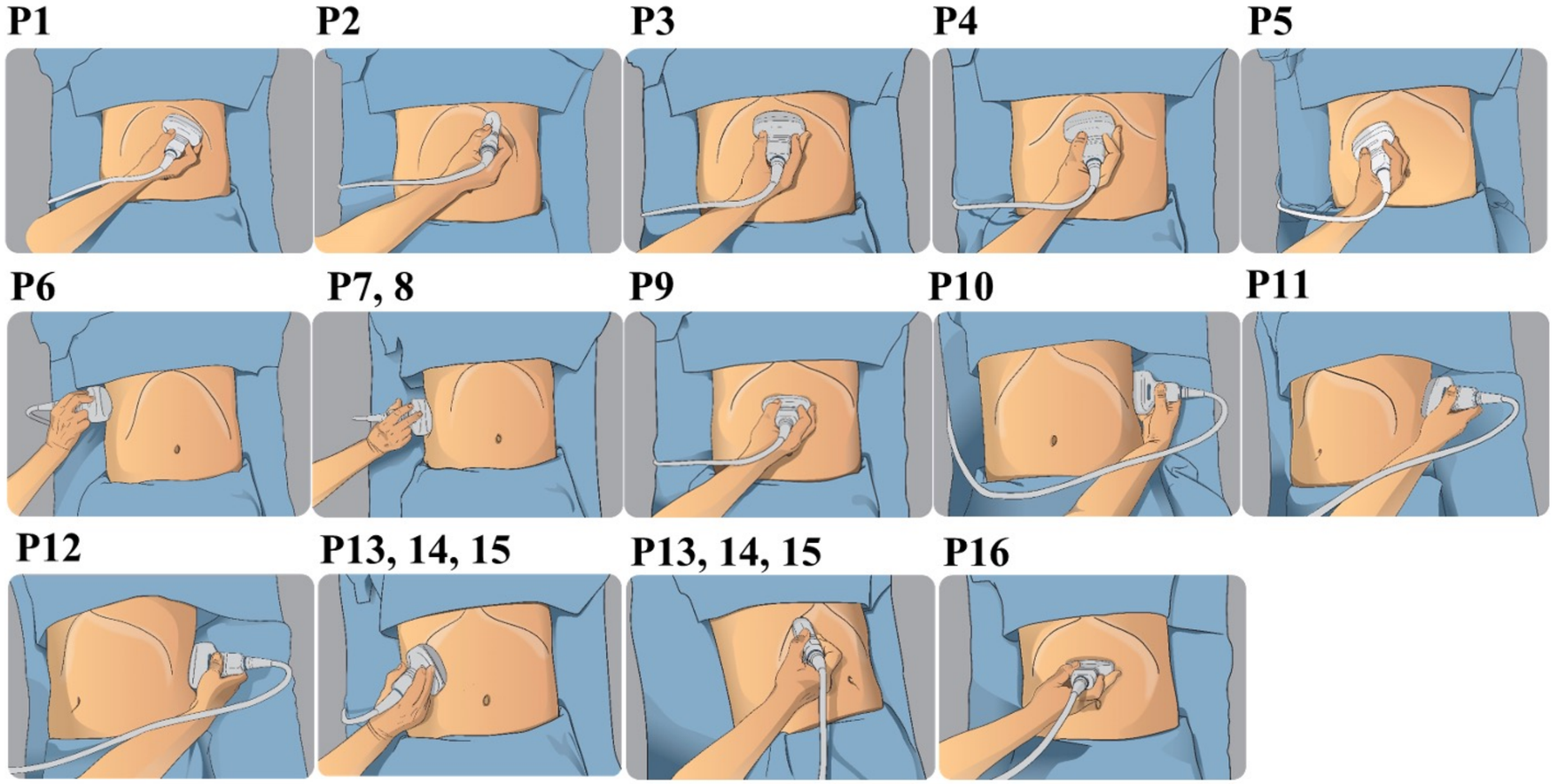
L
2.11MR R13.0 G71 C13 A1

Hand positions of 16 scanning positions



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

Ultrasound Screening

Identifying Risk Group
Isan cohort

Need ultrasound
every six months

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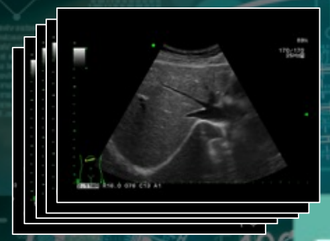


produced 11-15
images per patient

Tele-radio consultation

Tele-radio consultation

ask for advice

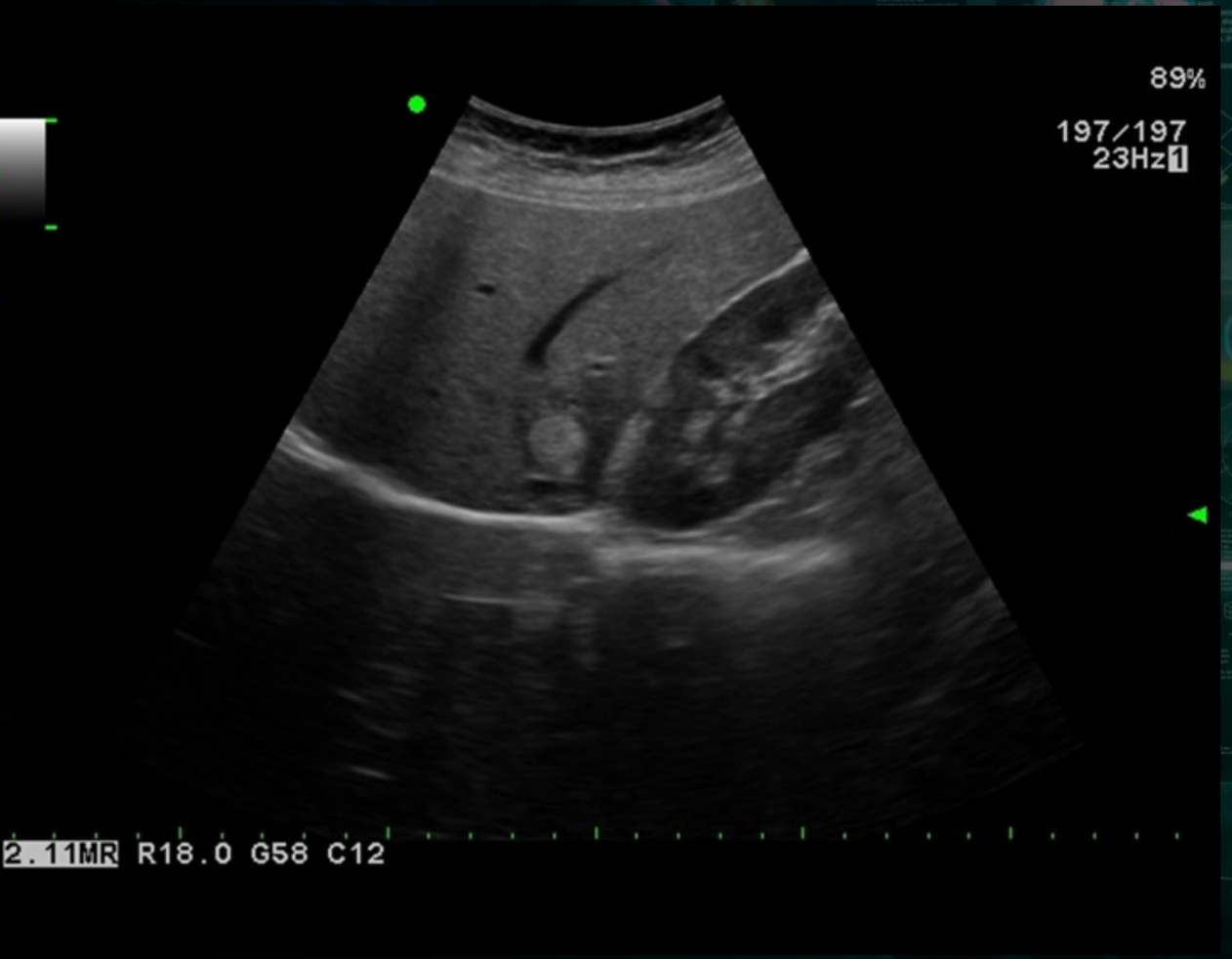
Expert radiologist

Diagnosis Advice

Class number	Label	Abnormality	#Images	Total
1	AB01	Mild Fatty Liver	369	369
2	AB02	Moderate Fatty Liver	328	328
3	AB03	Severe Fatty Liver	108	108
4	AB04	Cirrhosis	200	200
5	AB05	PDF1	127	127
6	AB06	PDF2	85	85
7	AB07	PDF3	95	95
8	AB081	Livermass	156	156
9	AB082	BDD (Bile Duct Dilatation)	136	137
		IHDStone	1	
10	AB083	Liver Mass & BDD	54	54
11	AB09	Gallbladder Stone	124	124
12	AB10	Gallbladder Mass	7	53
		Gallbladder Polyp	45	
		Gallbladder Sludg	1	
13	AB11	Hydronephrosis	79	276
		Renal Cyst	27	
		Renal Cyst & Stone	3	
		Renal Mass	2	
		Renal Parenchymal Change	7	
		Renal Stone	91	
		Renal Stone & Parenchymal Change	9	
		Renal Stones & Hydronephrosis	58	
14	AB12	Splenic Cyst	1	166
		Splenomegaly	165	
15		Normal	4291	4291
Total				**6569**

Add a little bit of body text

Data preparation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197/197
23Hz1
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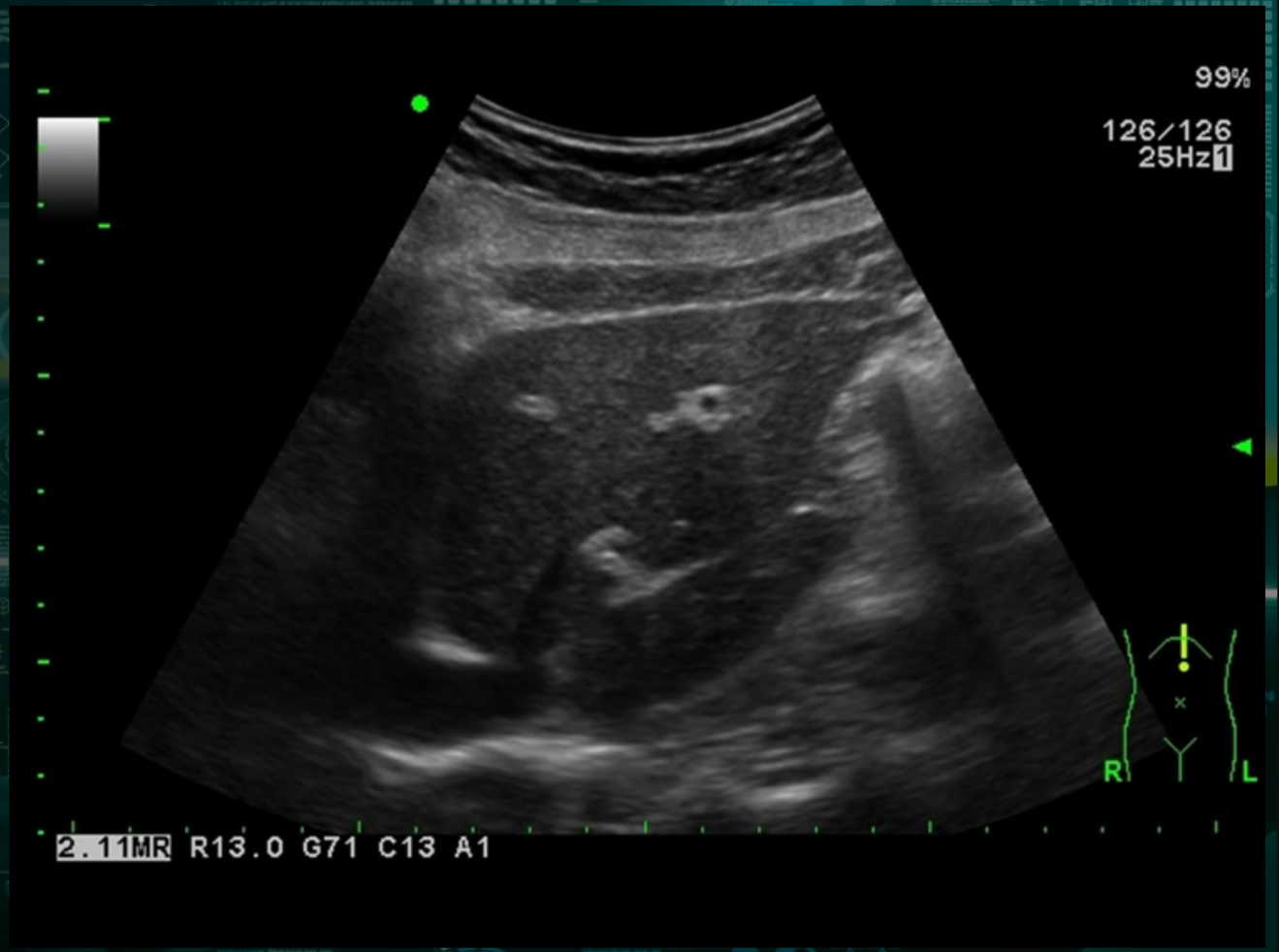
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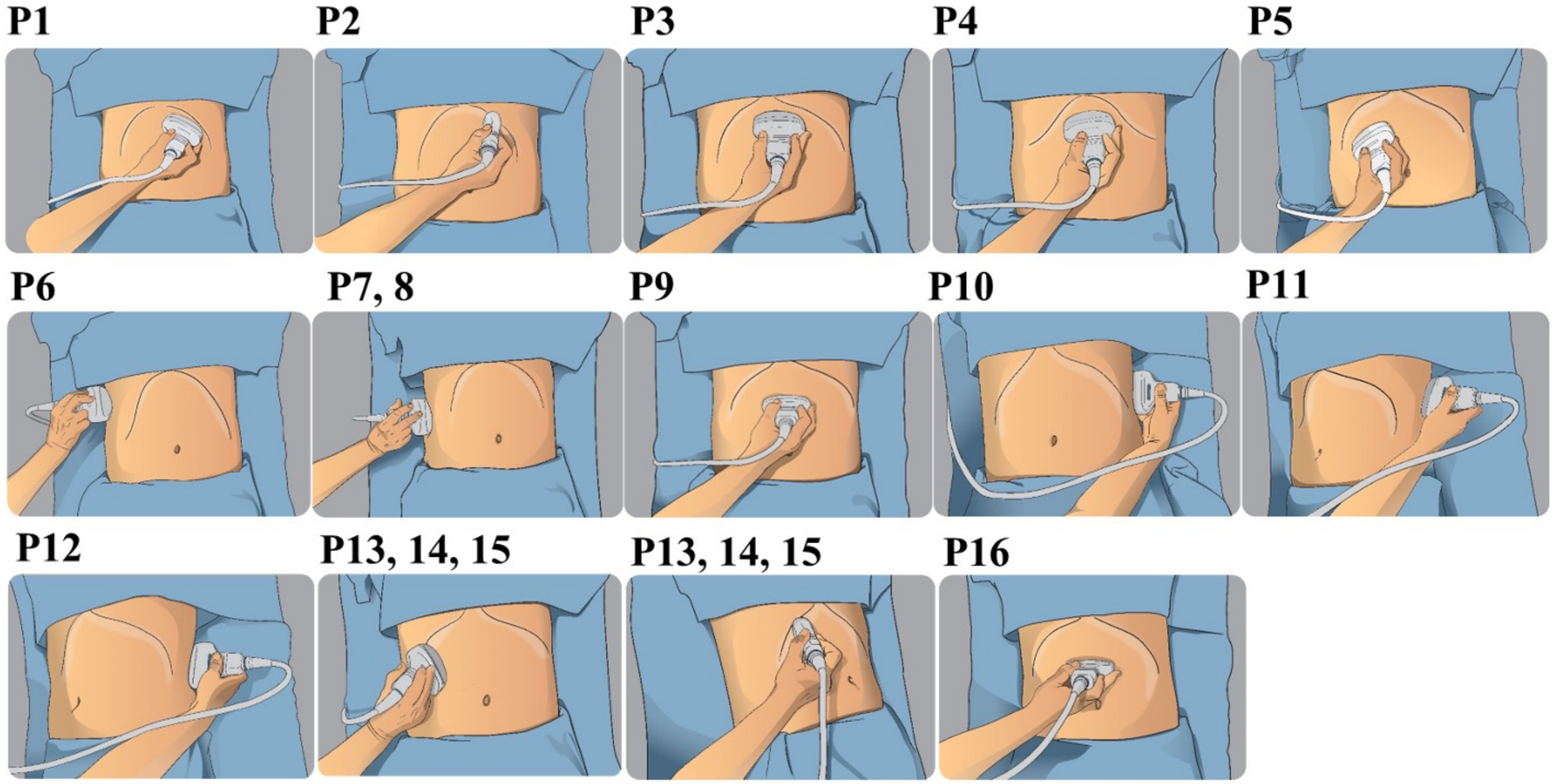
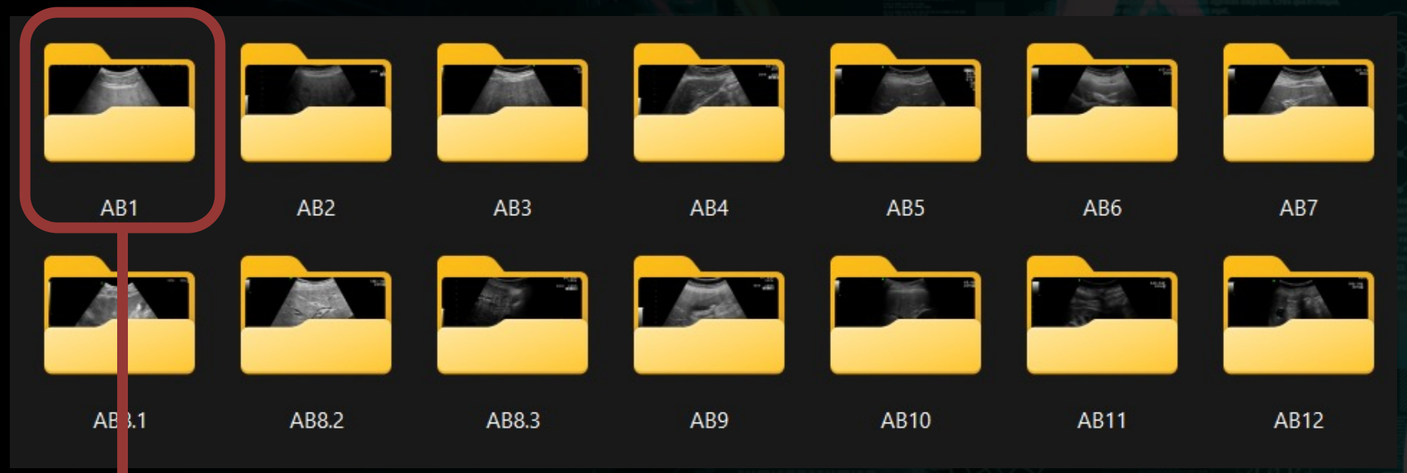
126/126
25Hz1
R
L
2.11MR R13.0 G71 C13 A1

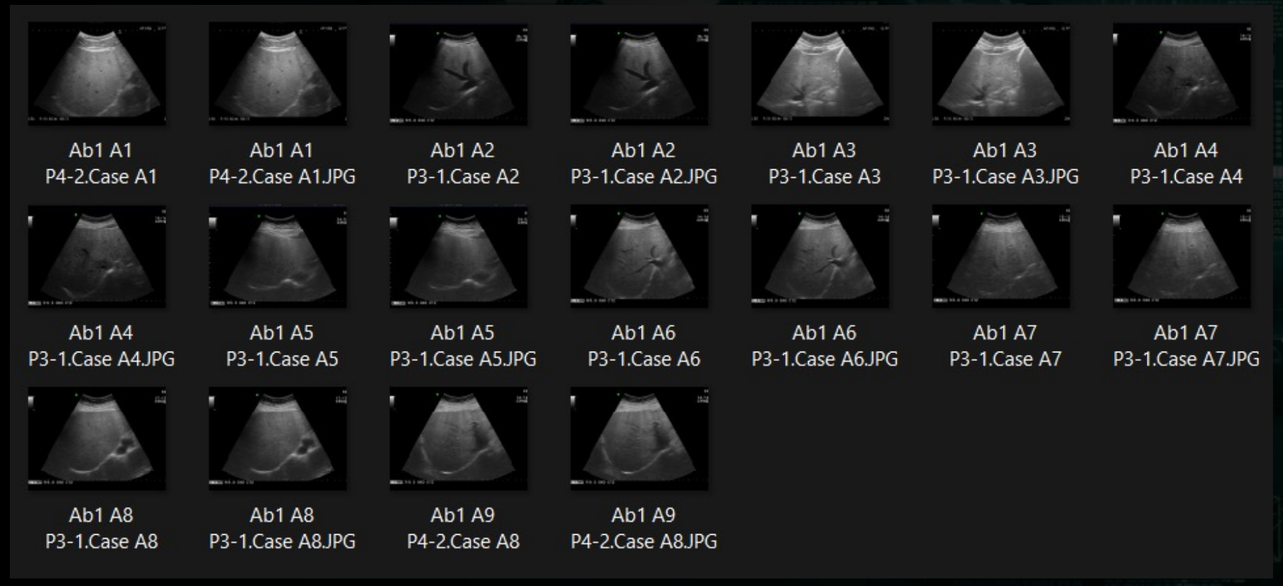
Hand positions of 16 scanning positions



Naming - Metadata



14AB+Normal Classes



US Images name

Viewing angle

Classes

Patient case

Ab1 A1 P4-2.Case A1.jpg
Ab1 A6 P3-1.Case A6.jpg
Ab1 A2 P3-1.Case A2.jpg
:
:
Ab1 A9 P4-2.Case A8.jpg

	Path Full	Sub Position	Sub_class	Case
	/media/tohn/HDD/VISION_dataset/USAI/ABnormal01...	P1	AB01	40
	/media/tohn/HDD/VISION_dataset/USAI/ABnormal01...	P2	AB01	40
	/media/tohn/HDD/VISION_dataset/USAI/ABnormal01...	P41	AB01	40
	/media/tohn/HDD/VISION_dataset/USAI/ABnormal01...	P51	AB01	40
	/media/tohn/HDD/VISION_dataset/USAI/ABnormal01...	P31	AB01	40
	...	...	...	...
	/media/tohn/HDD/VISION_dataset/USAI/US images ...	P32	Normal	350
	/media/tohn/HDD/VISION_dataset/USAI/US images ...	P42	Normal	350
	/media/tohn/HDD/VISION_dataset/USAI/US images ...	P52	Normal	350
	/media/tohn/HDD/VISION_dataset/USAI/US images ...	P61	Normal	350
	/media/tohn/HDD/VISION_dataset/USAI/US images ...	P8	Normal	350

	Path Full	Sub Position	Sub_class	Case
	/media/tohn/HDD/VISION_dataset/USAI/ABnormal01...	P1	AB01	40
	/media/tohn/HDD/VISION_dataset/USAI/ABnormal01...	P2	AB01	40
	/media/tohn/HDD/VISION_dataset/USAI/ABnormal01...	P41	AB01	40
	/media/tohn/HDD/VISION_dataset/USAI/ABnormal01...	P51	AB01	40
	/media/tohn/HDD/VISION_dataset/USAI/ABnormal01...	P31	AB01	40
	...	...	...	...
	/media/tohn/HDD/VISION_dataset/USAI/US images ...	P32	Normal	350
	/media/tohn/HDD/VISION_dataset/USAI/US images ...	P42	Normal	350
	/media/tohn/HDD/VISION_dataset/USAI/US images ...	P52	Normal	350
	/media/tohn/HDD/VISION_dataset/USAI/US images ...	P61	Normal	350
	/media/tohn/HDD/VISION_dataset/USAI/US images ...	P8	Normal	350

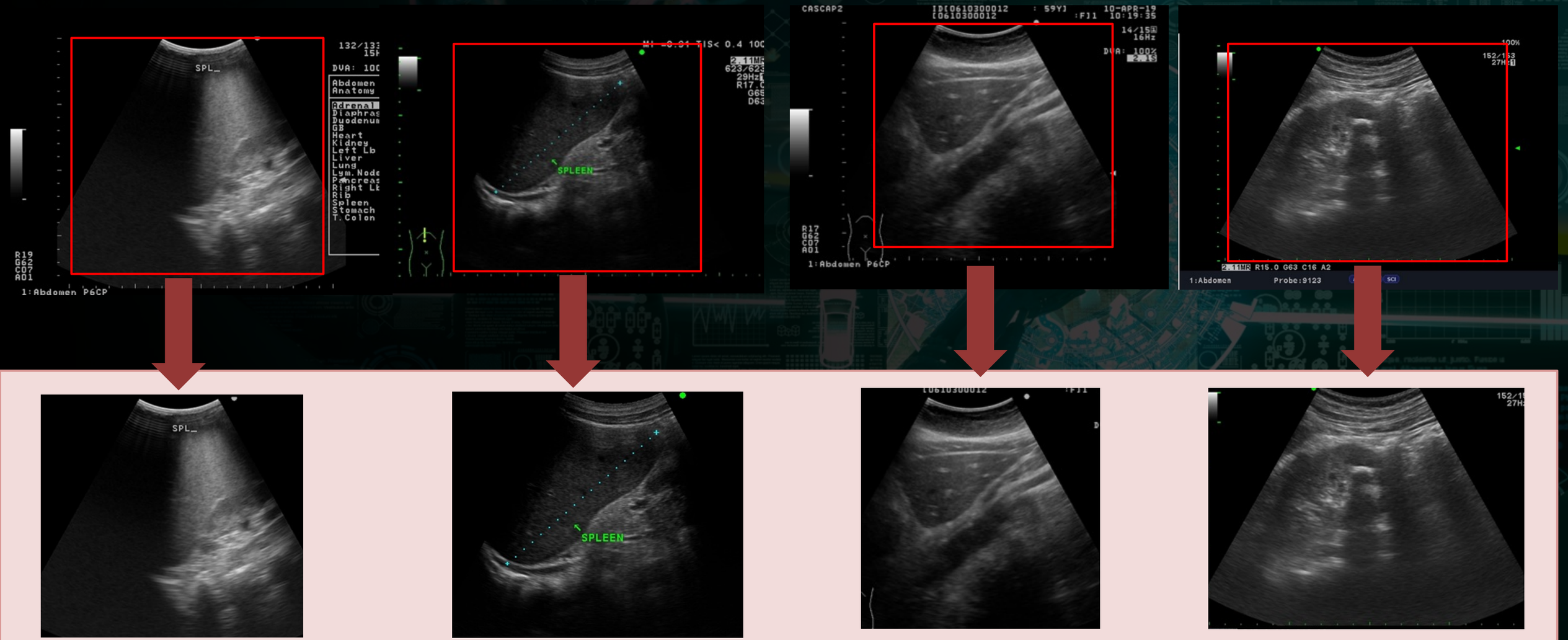
Fold

Train / Test

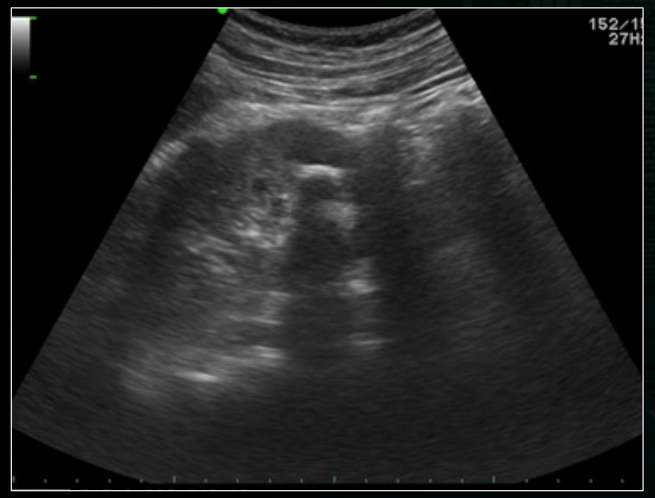
	Class	Case	US images count	
Train	Abnormal	366	1,823	5,257
	Normal	289	3,434	
Test	Abnormal	91	455	1,312
	Normal	71	857	
Total		817	6,569	

Class number	Label	FP-A	FP-B	FP-C	FP-D	FP-E	Total
1	AB01	105	164	100			369
2	AB02	128	123	77			328
3	AB03	53	31	24			108
4	AB04	105	46	46	3		200
5	AB05	44	78	5			127
6	AB06	76	9				85
7	AB07	3	67	25			95
8	AB081	27	72	57			156
9	AB082	32	56	49			137
10	AB083	11	27	16			54
11	AB09		2	122			124
12	AB10			53			53
13	AB11			73	203		276
14	AB12			1	165		166
Abnormal (Class number 1-14)		584	675	648	371	0	2,278
Normal (Class number 1-14)		748	1,329	1,261	605	348	4,291
Total		1,332	2,004	1,909	976	348	6,569

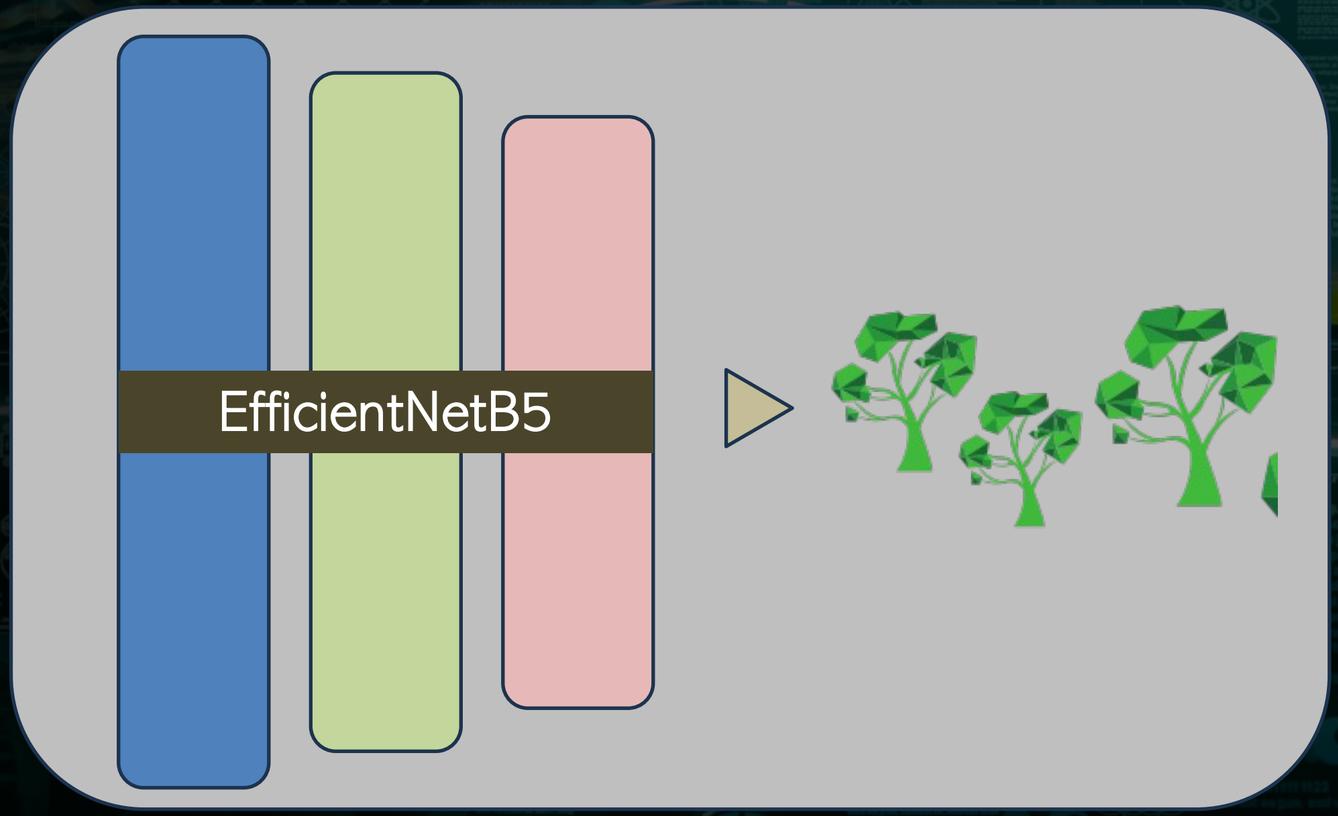
Remove BG Information



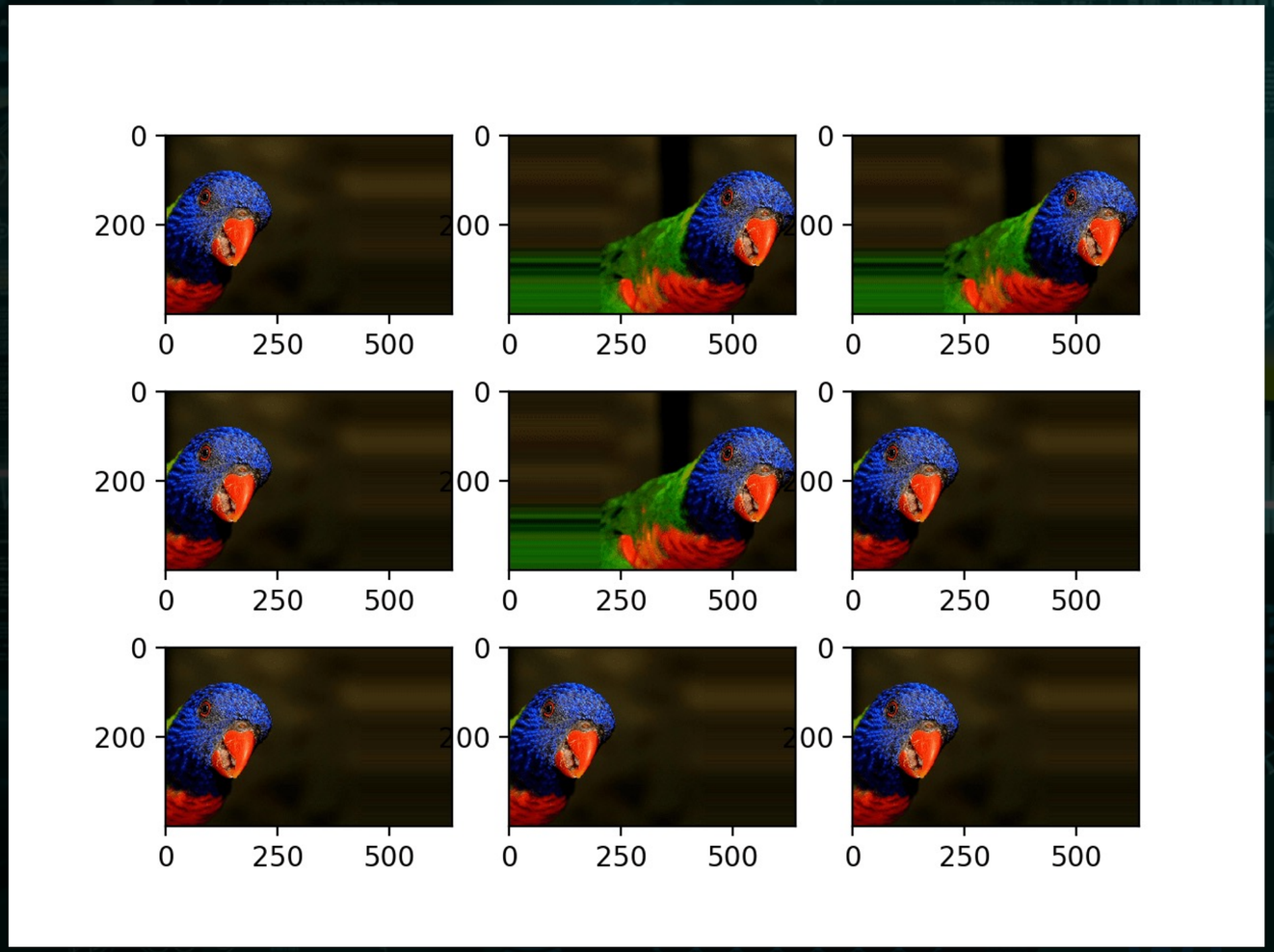
Input Size



456x456x3

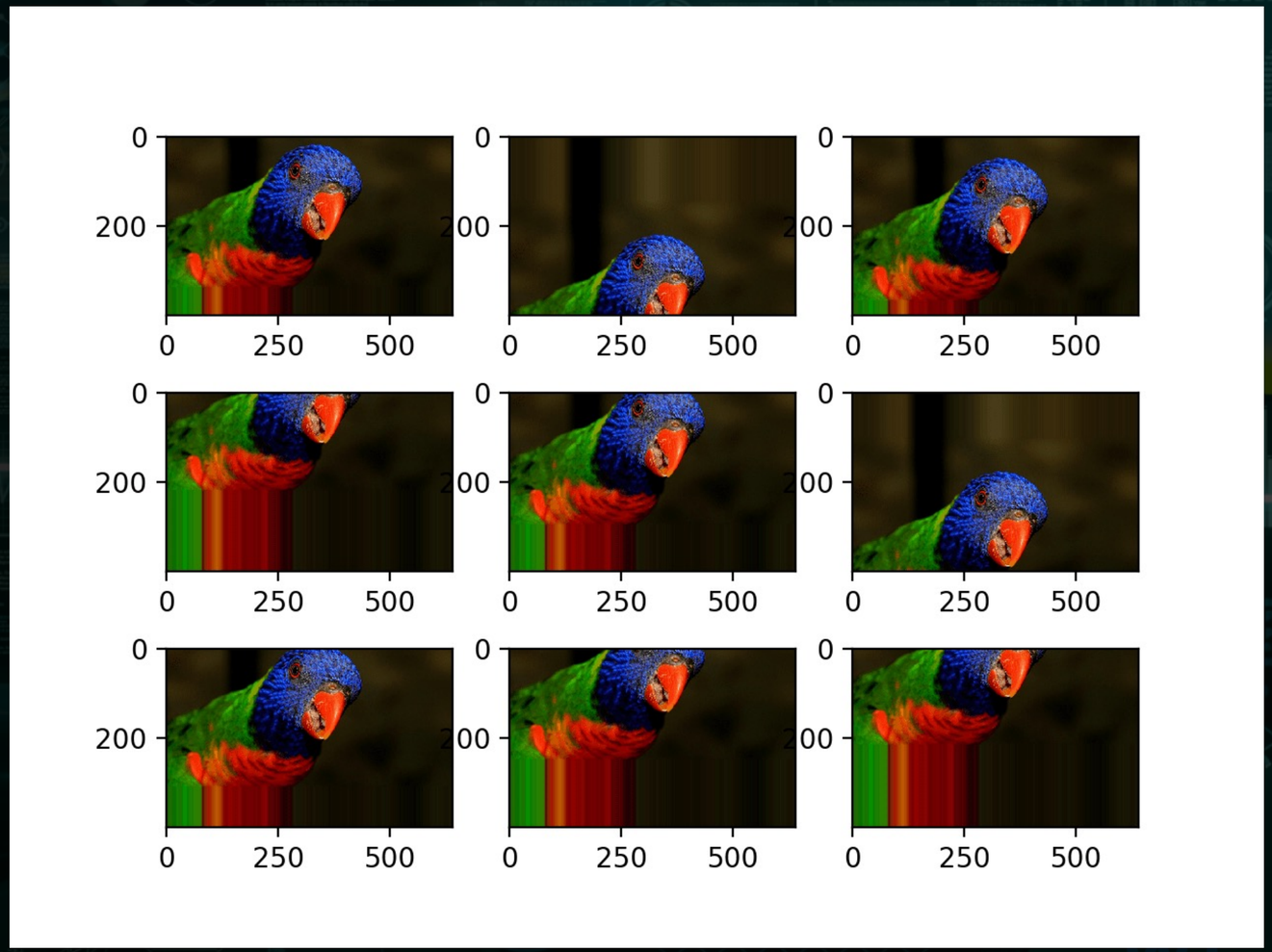


Data Augmentation



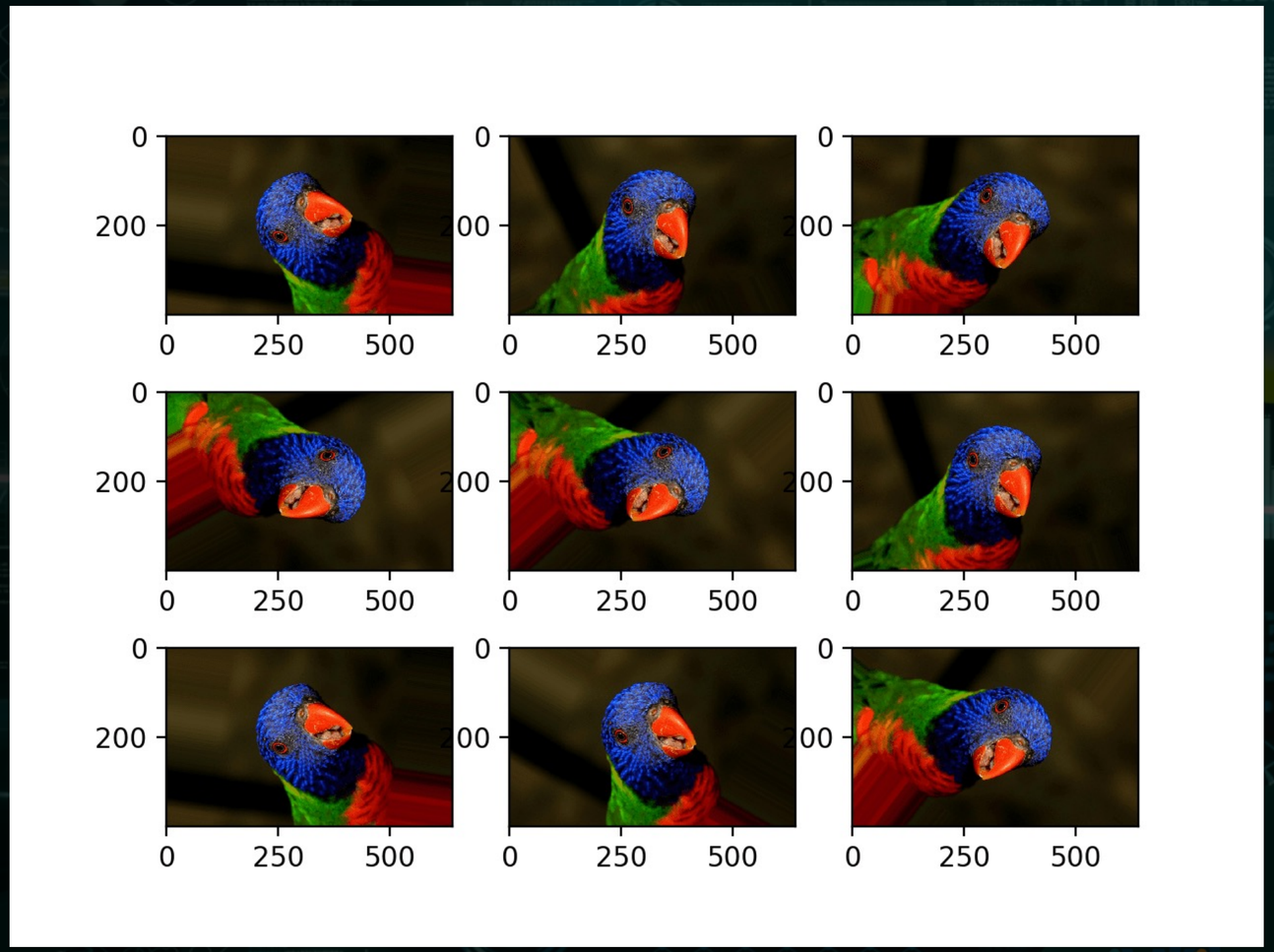
Horizontal Shift

Data Augmentation



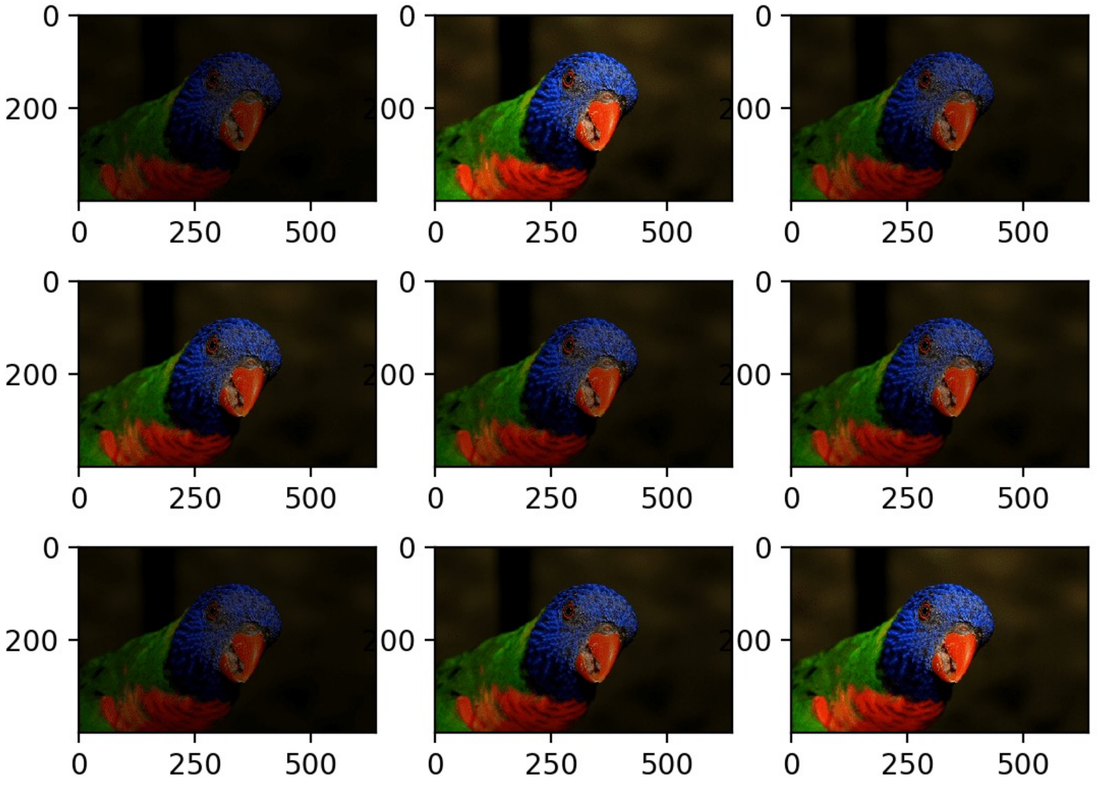
Vertical Shift

Data Augmentation



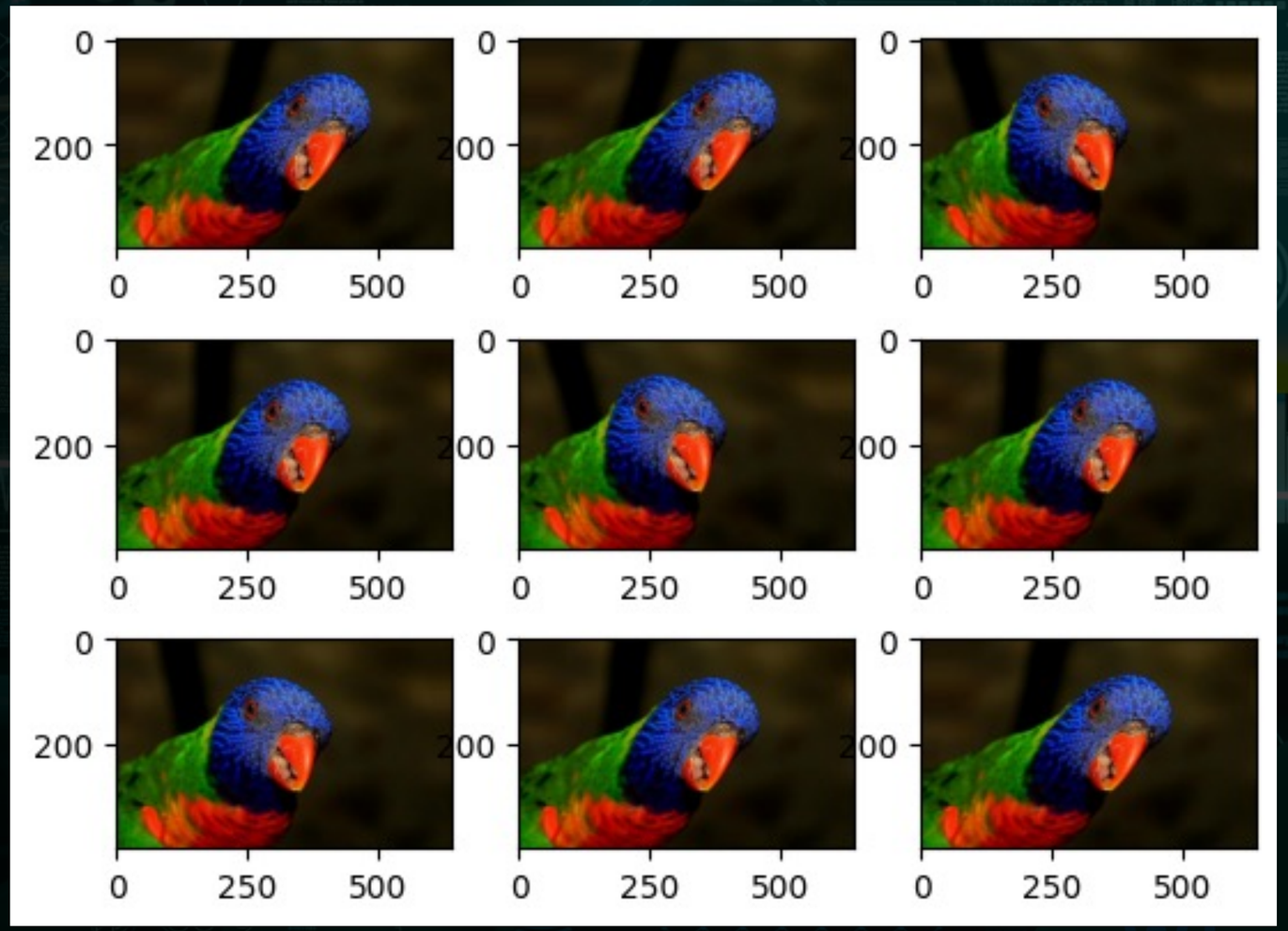
Rotation 30°

Data Augmentation



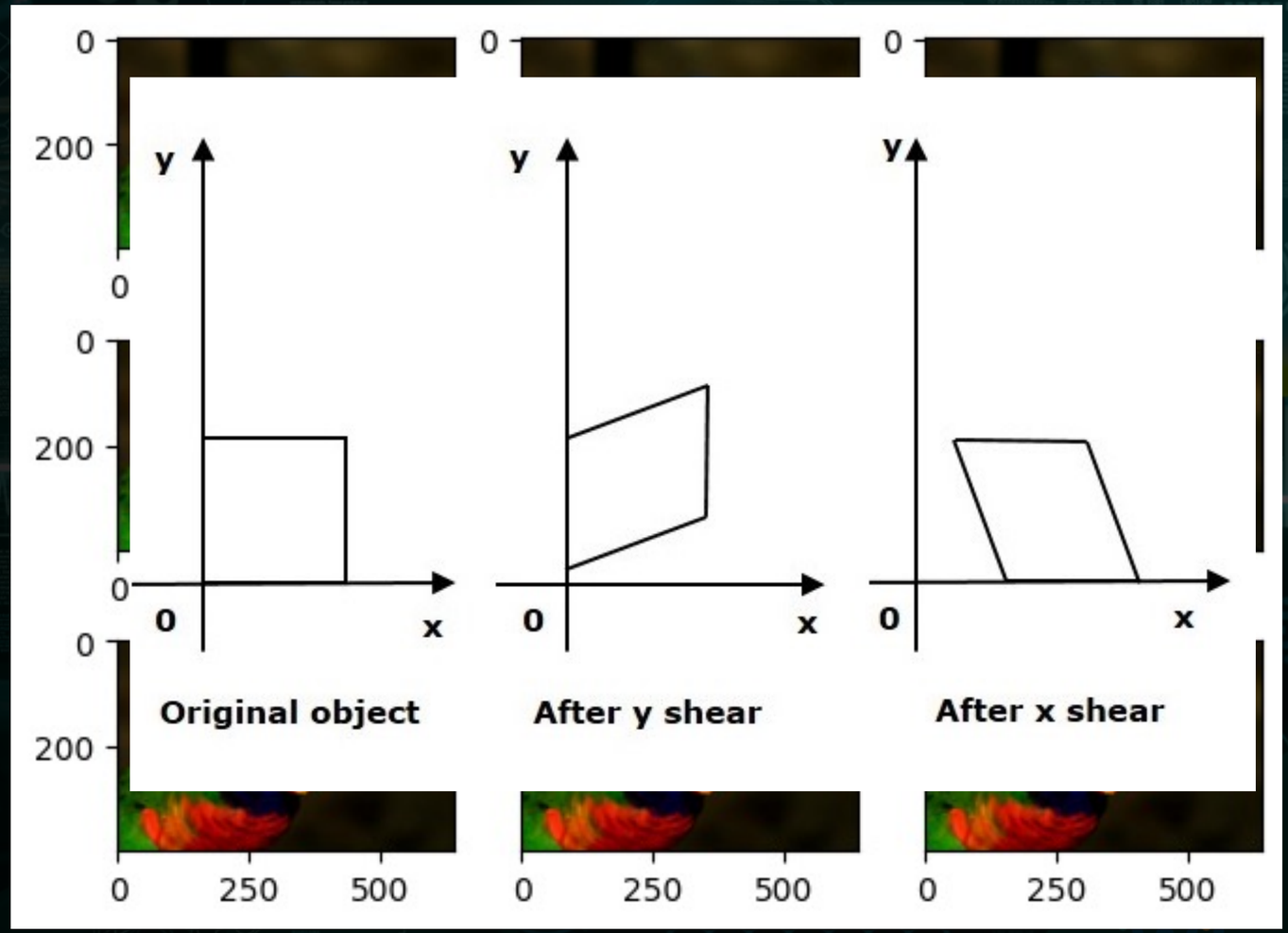
Bright

Data Augmentation



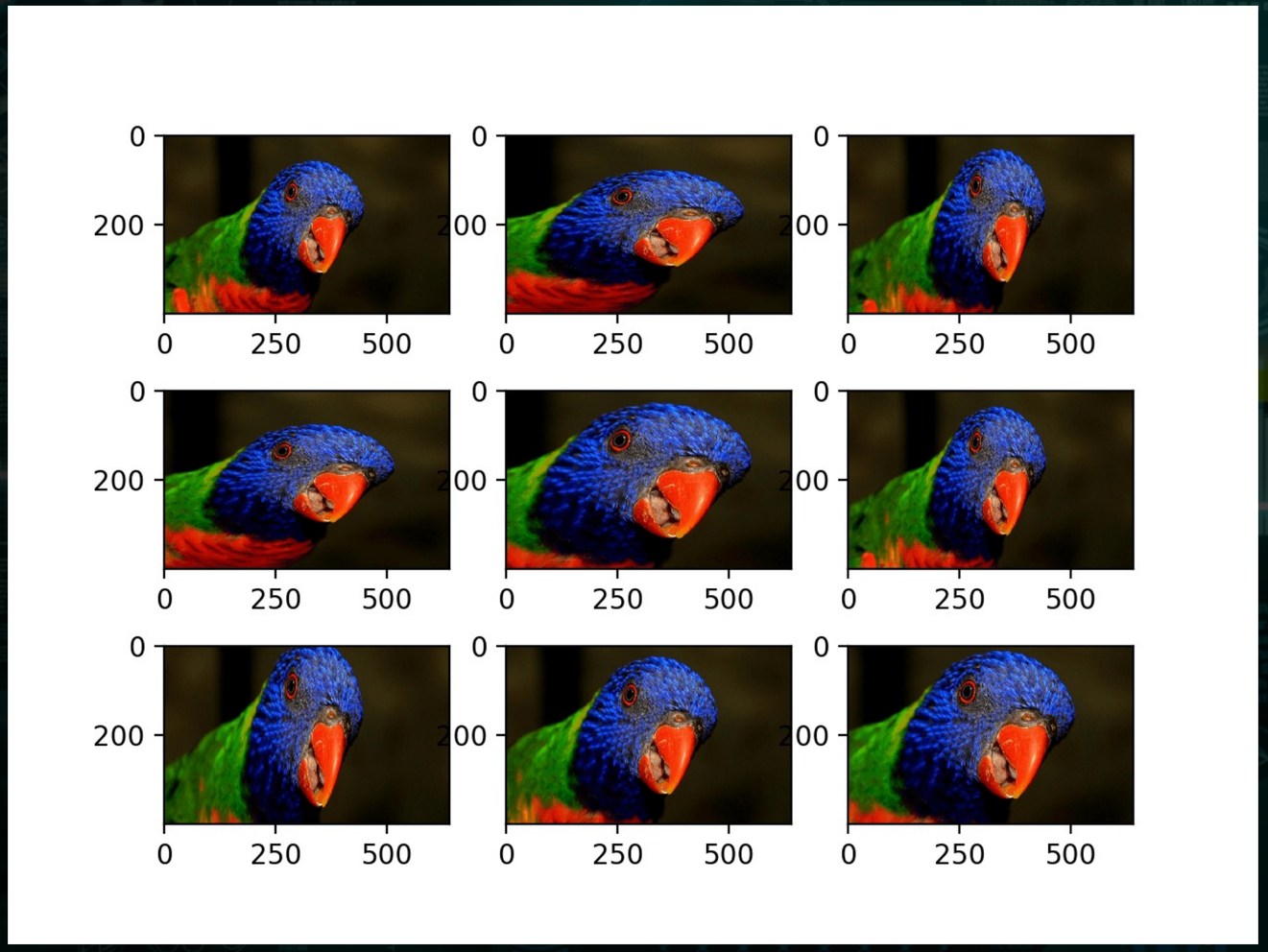
Shear

Data Augmentation



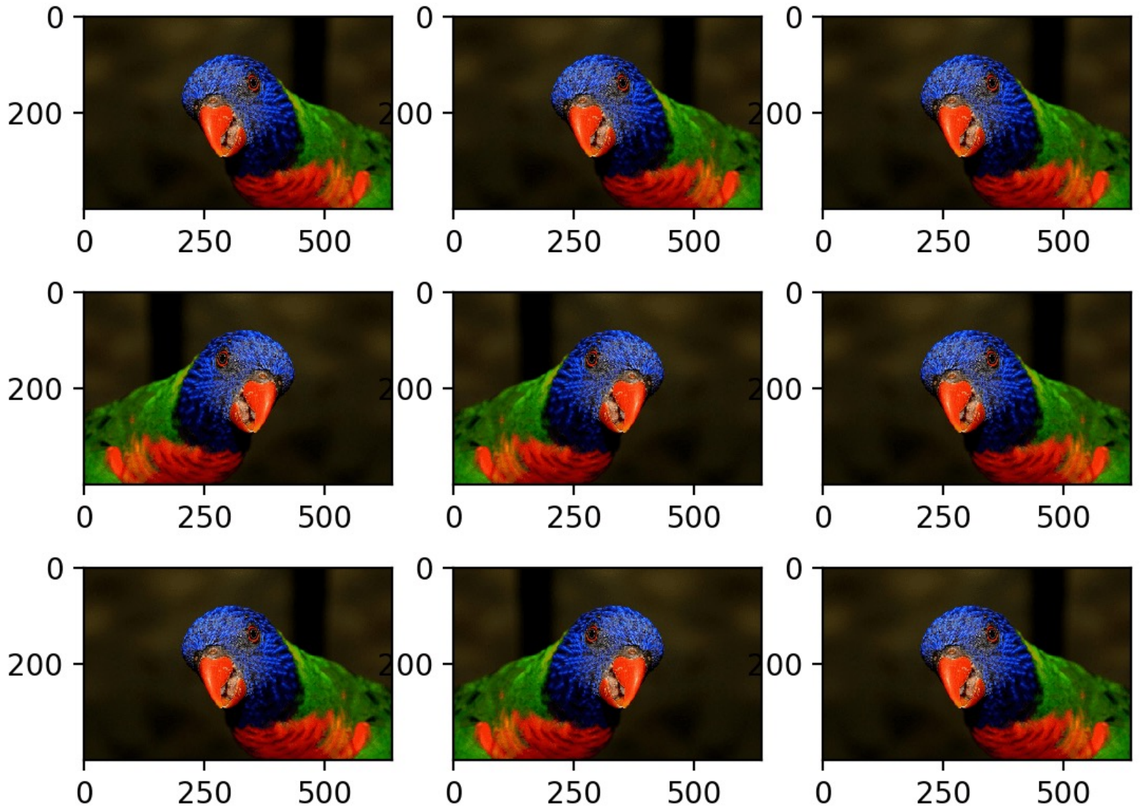
Shear

Data Augmentation



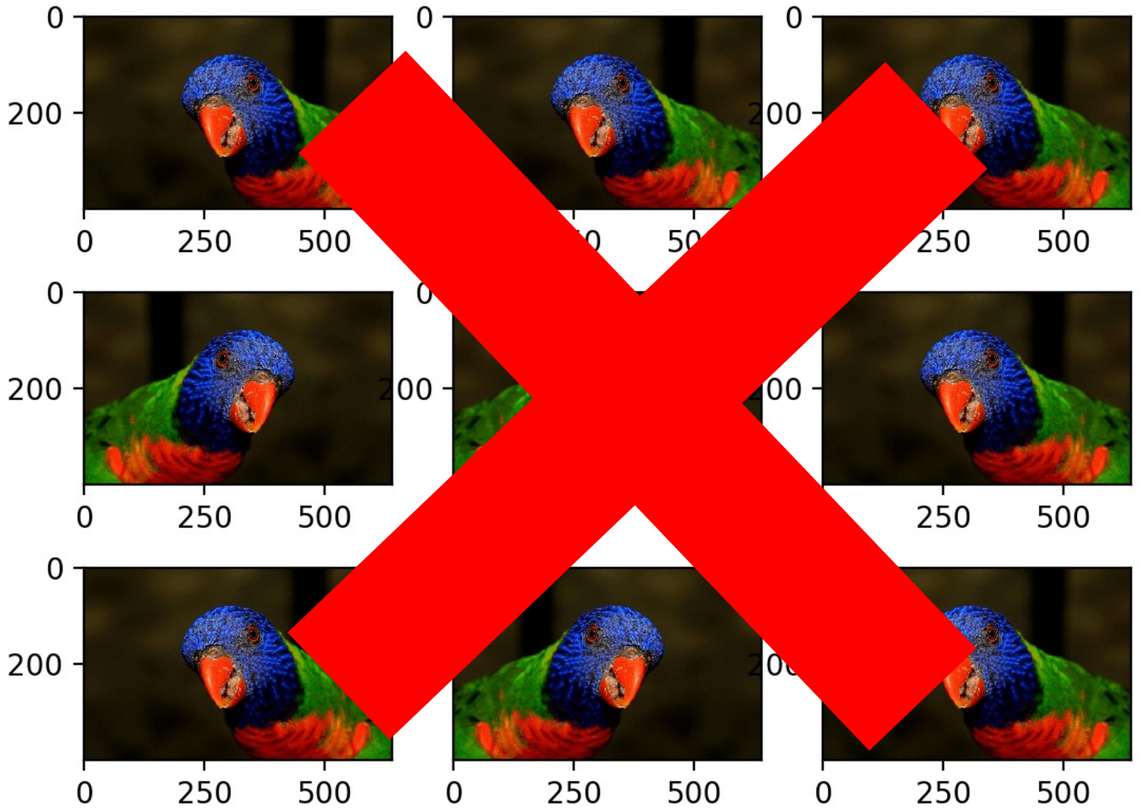
Zoom

Data Augmentation



No Flip

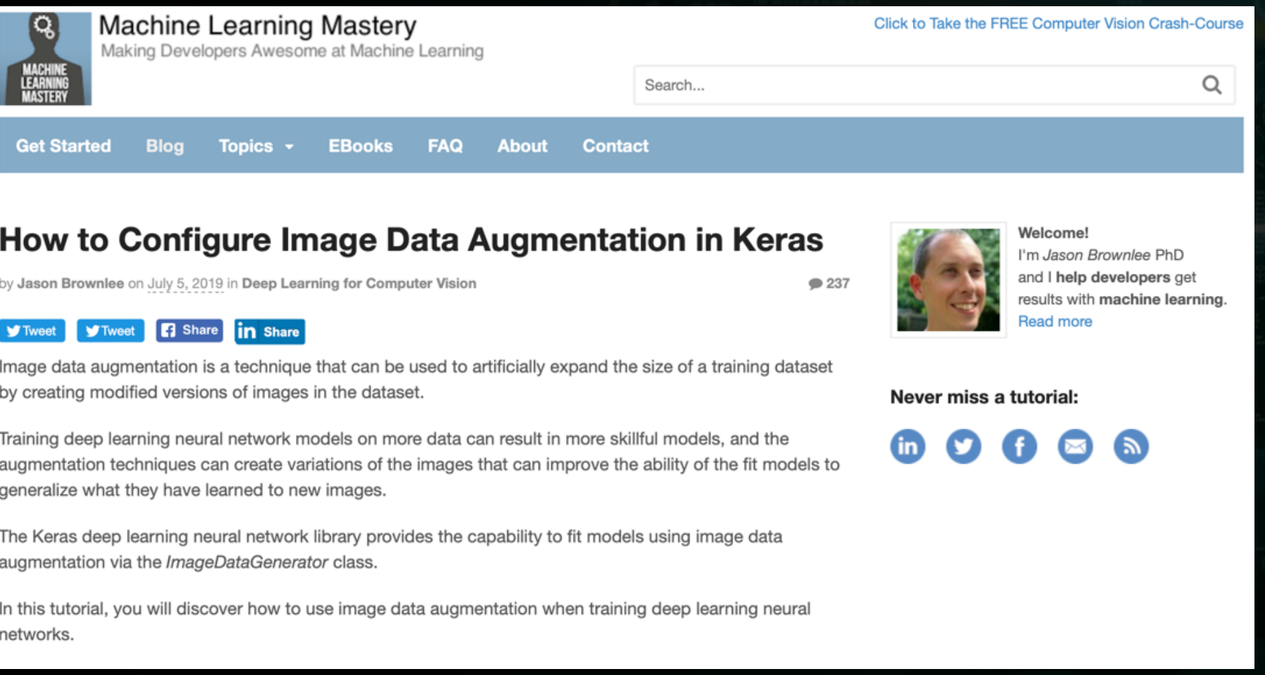
Data Augmentation



No Flip

Data Augmentation

https://machinelearningmastery.com/how-to-configure-image-data-augmentation-when-training-deep-learning-neural-networks/



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How to Configure Image Data Augmentation in Keras

by **Jason Brownlee** on July 5, 2019 in **Deep Learning for Computer Vision** 237

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Image data augmentation is a technique that can be used to artificially expand the size of a training dataset by creating modified versions of images in the dataset.

Training deep learning neural network models on more data can result in more skillful models, and the augmentation techniques can create variations of the images that can improve the ability of the fit models to generalize what they have learned to new images.

The Keras deep learning neural network library provides the capability to fit models using image data augmentation via the *ImageDataGenerator* class.

In this tutorial, you will discover how to use image data augmentation when training deep learning neural networks.

Welcome!
I'm *Jason Brownlee* PhD and I **help developers** get results with **machine learning**.
Read more

Never miss a tutorial:

```python
# example of horizontal shift image augmentation
from numpy import expand_dims
from keras.preprocessing.image import load_img
from keras.preprocessing.image import img_to_array
from keras.preprocessing.image import ImageDataGenerator
from matplotlib import pyplot
# load the image
img = load_img('bird.jpg')
# convert to numpy array
data = img_to_array(img)
# expand dimension to one sample
samples = expand_dims(data, 0)
# create image data augmentation generator
datagen = ImageDataGenerator(width_shift_range=[-200,200])
# prepare iterator
it = datagen.flow(samples, batch_size=1)
# generate samples and plot
for i in range(9):
 # define subplot
 pyplot.subplot(330 + 1 + i)
 # generate batch of images
 batch = it.next()
 # convert to unsigned integers for viewing
 image = batch[0].astype('uint8')
 # plot raw pixel data
 pyplot.imshow(image)
# show the figure
pyplot.show()
```

Coding Reference

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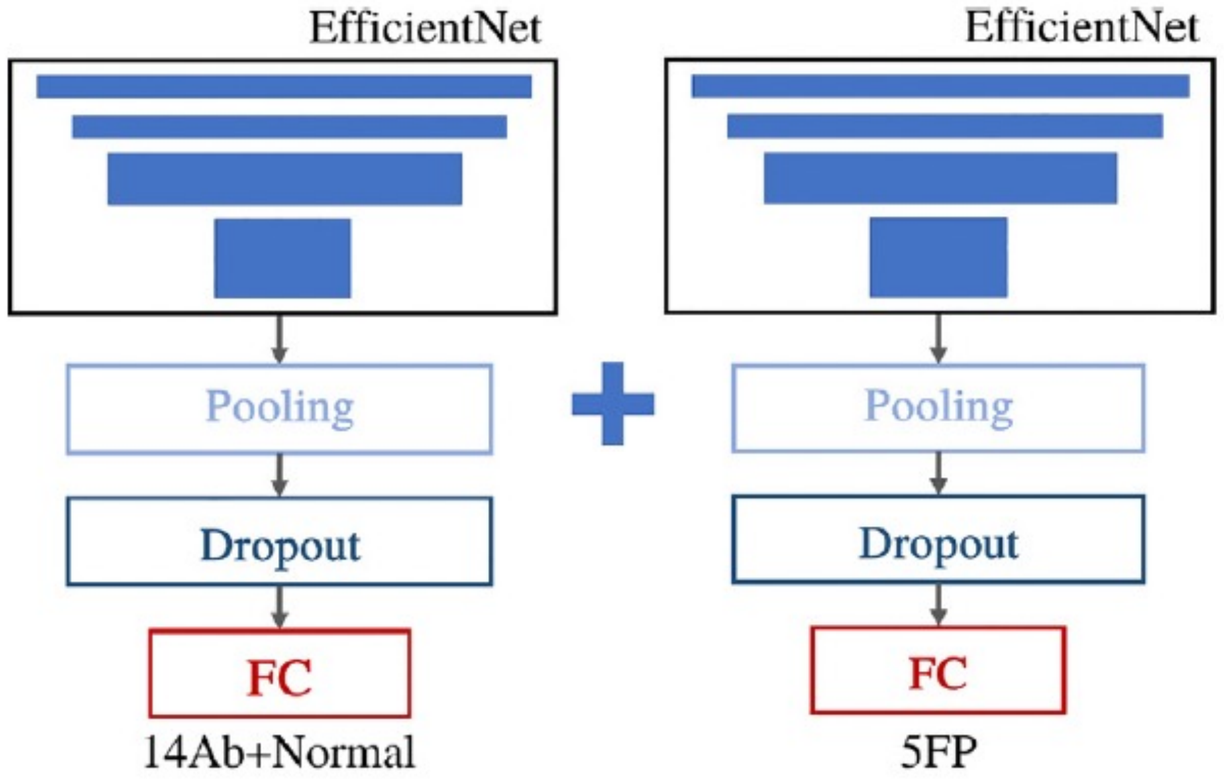
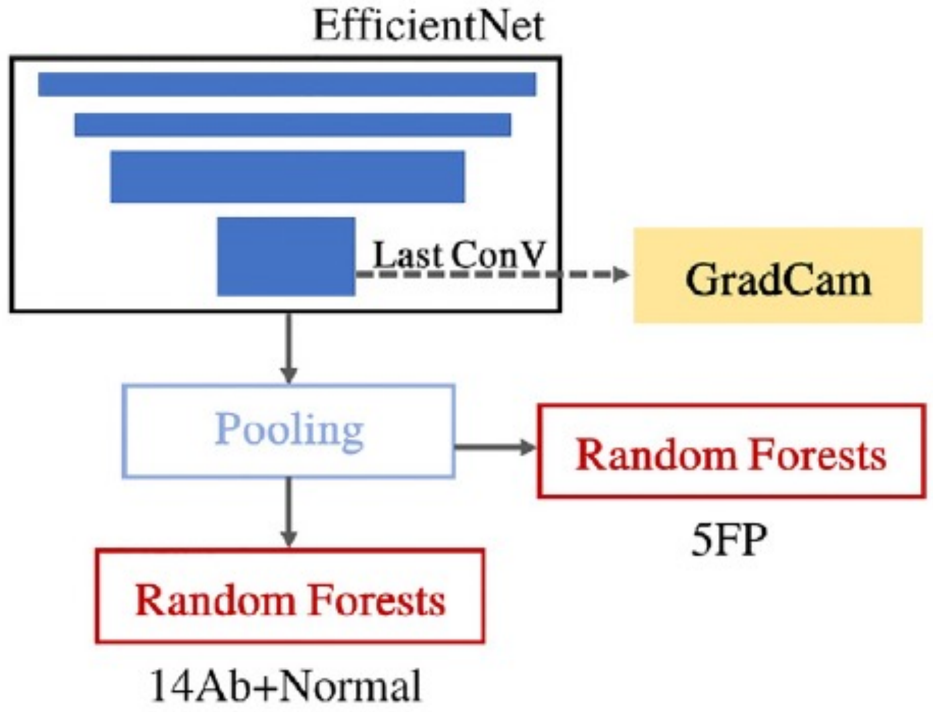
Model of Learning Ecosystem Platform integrate with Coding & AI for Youth

Add a little bit of body text

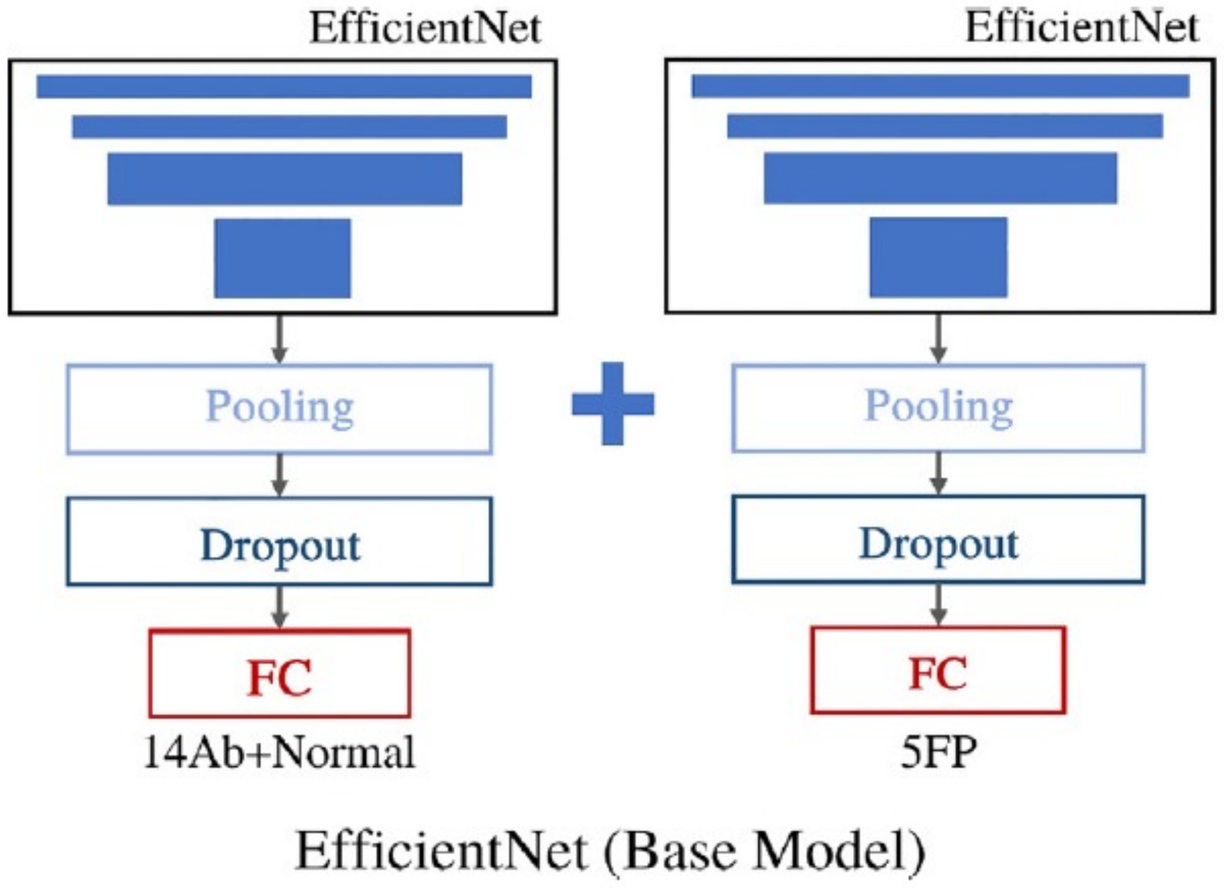
Model Development



EfficientNet (Base Model)



BiTNet



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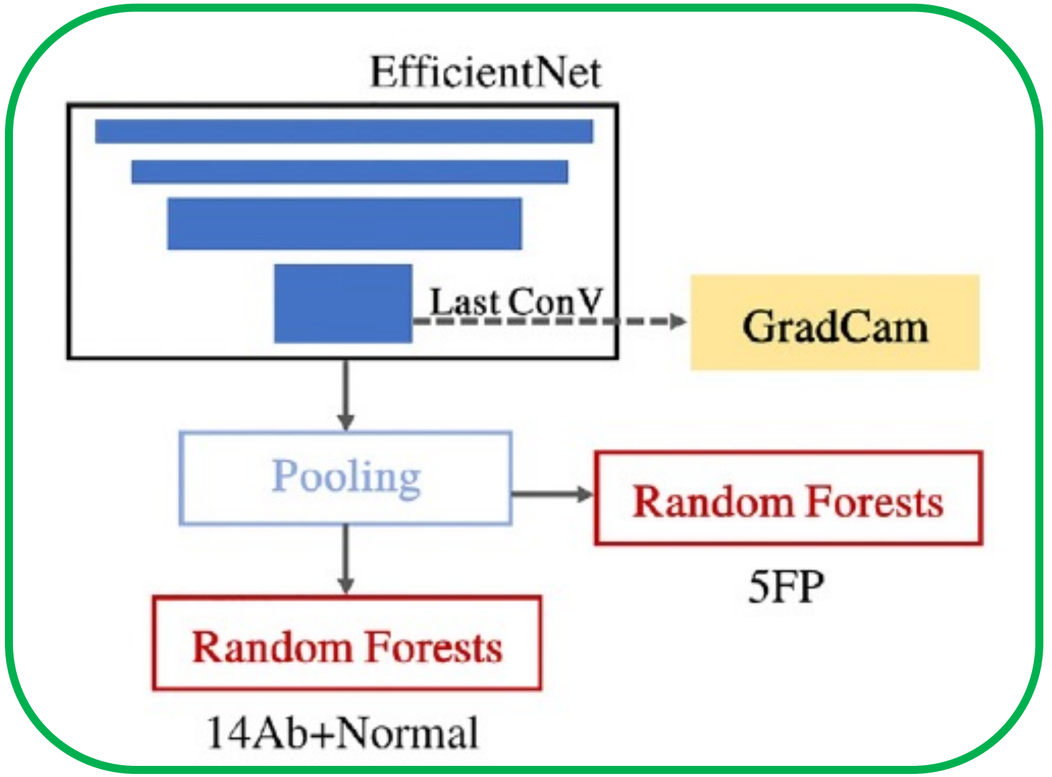


BiTNet

Biliary Tract Network

EfficientNet

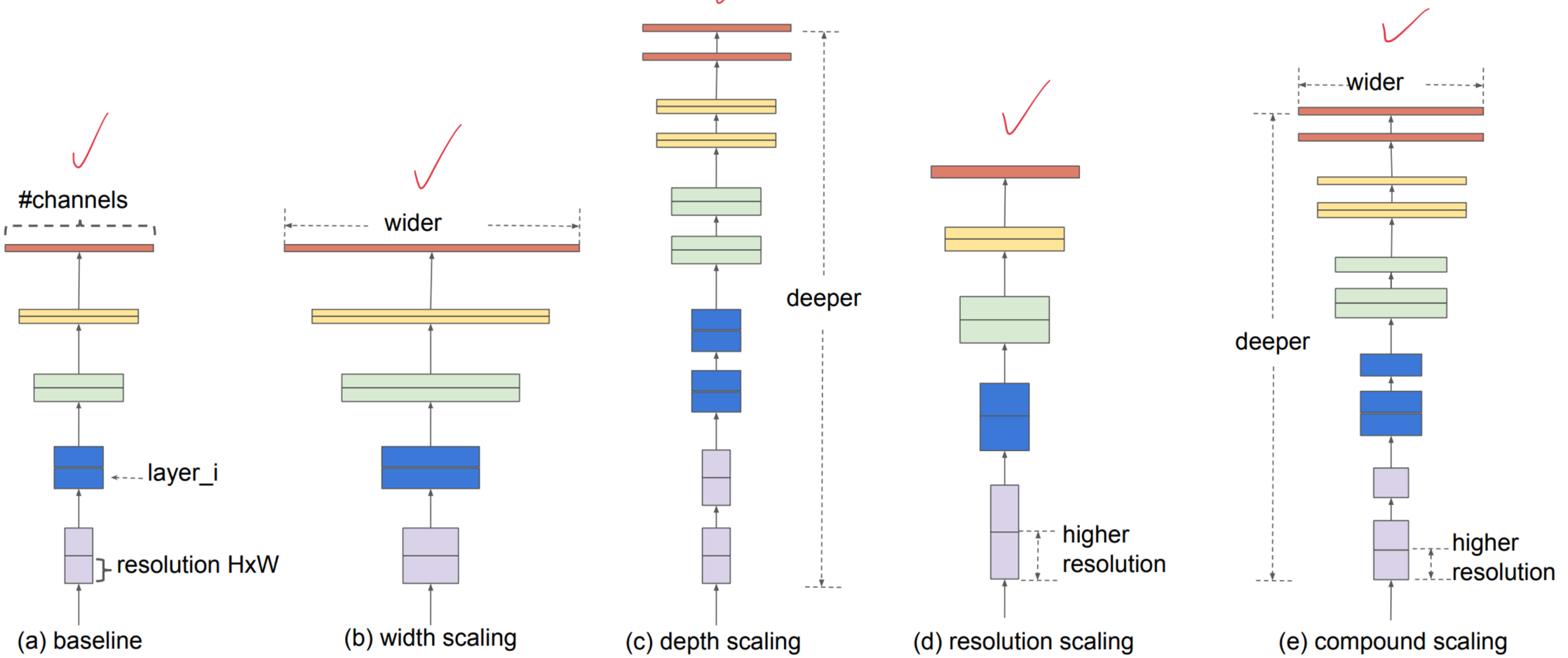
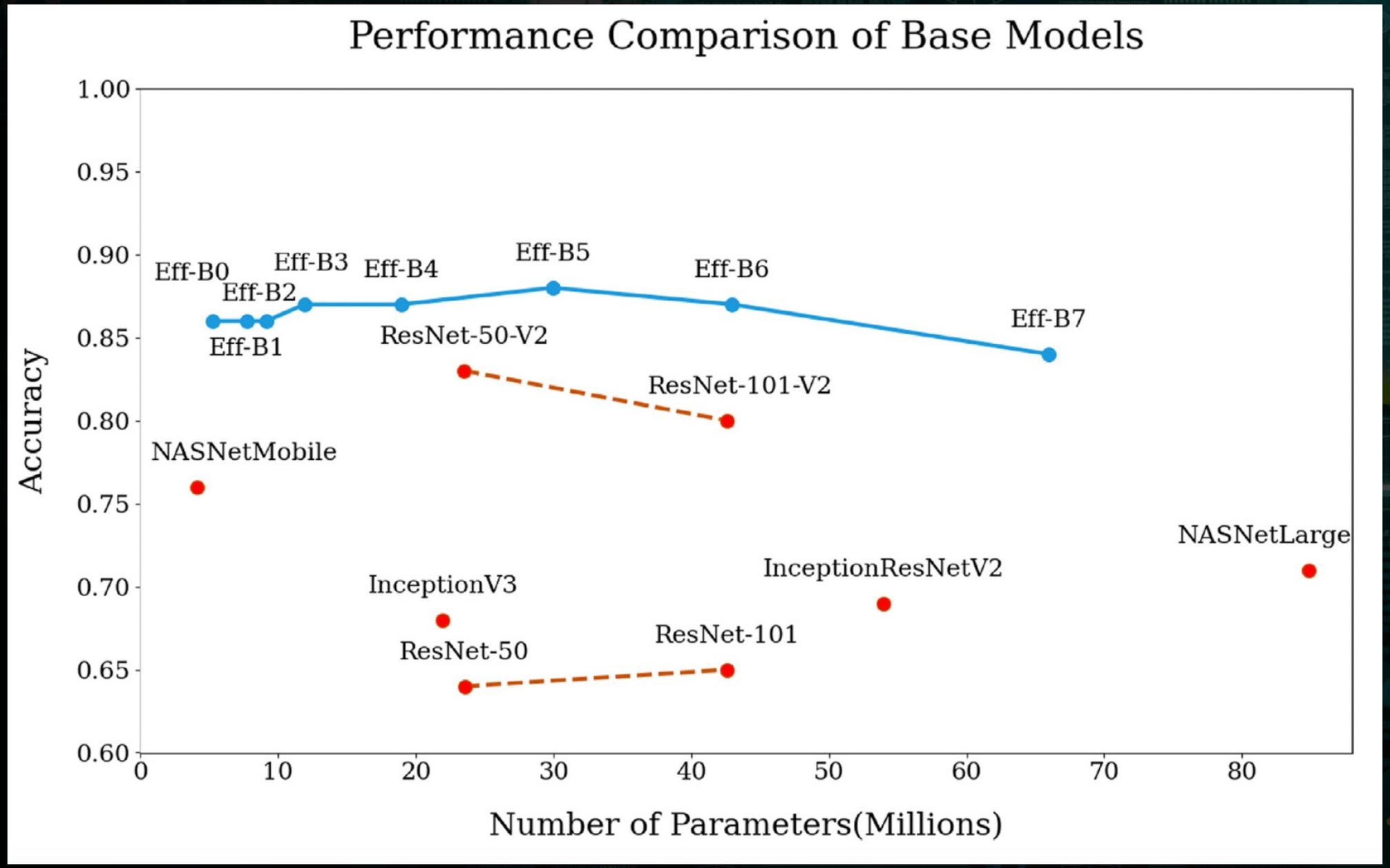
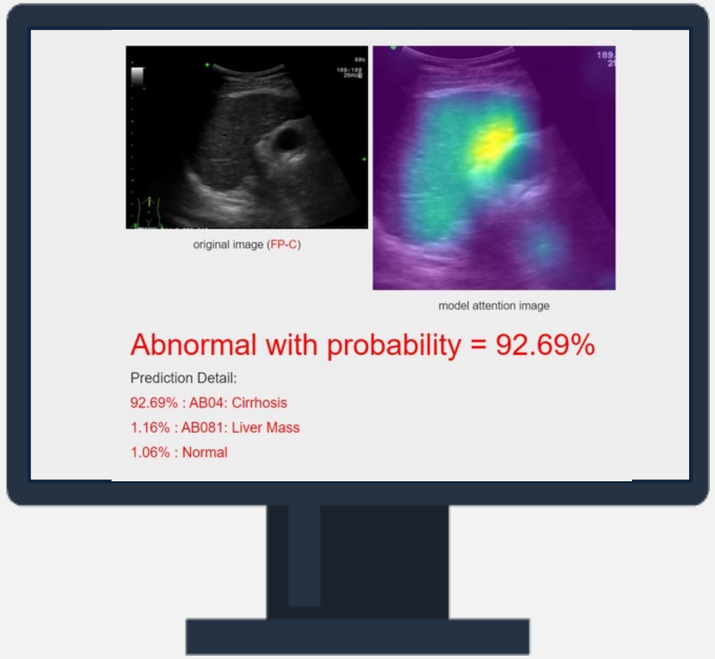


Figure 2. **Model Scaling.** (a) is a baseline network example; (b)-(d) are conventional scaling that only increases one dimension of network width, depth, or resolution. (e) is our proposed compound scaling method that uniformly scales all three dimensions with a fixed ratio.


Performance Comparison of Base Models
Accuracy
Number of Parameters(Millions)
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0
10
20
30
40
50
60
70
80
Eff-B0
Eff-B1
Eff-B2
Eff-B3
Eff-B4
Eff-B5
Eff-B6
Eff-B7
ResNet-50-V2
ResNet-101-V2
NASNetMobile
NASNetLarge
InceptionV3
InceptionResNetV2
ResNet-50
ResNet-101

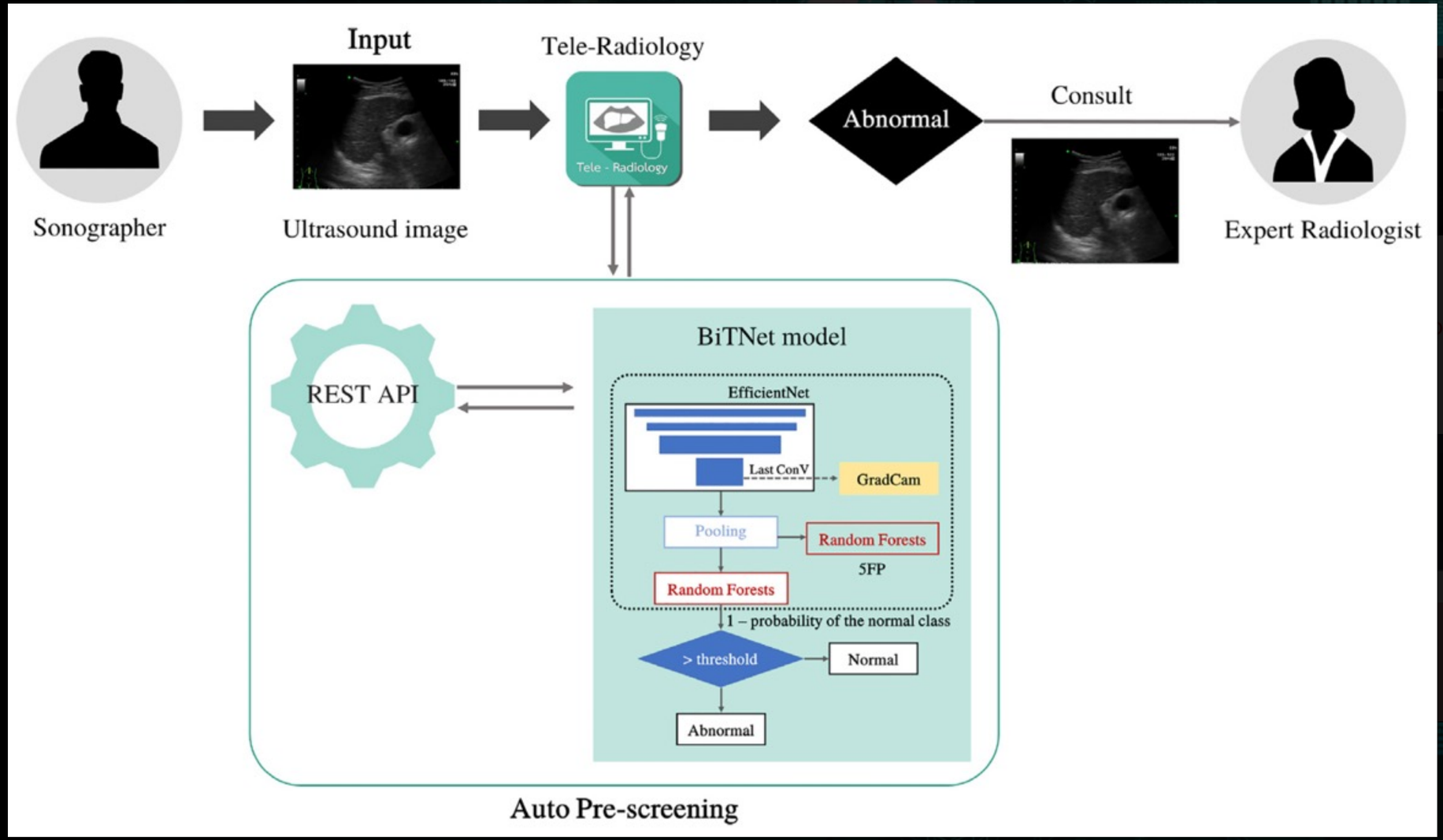
2 Applications

Auto Pre-screening

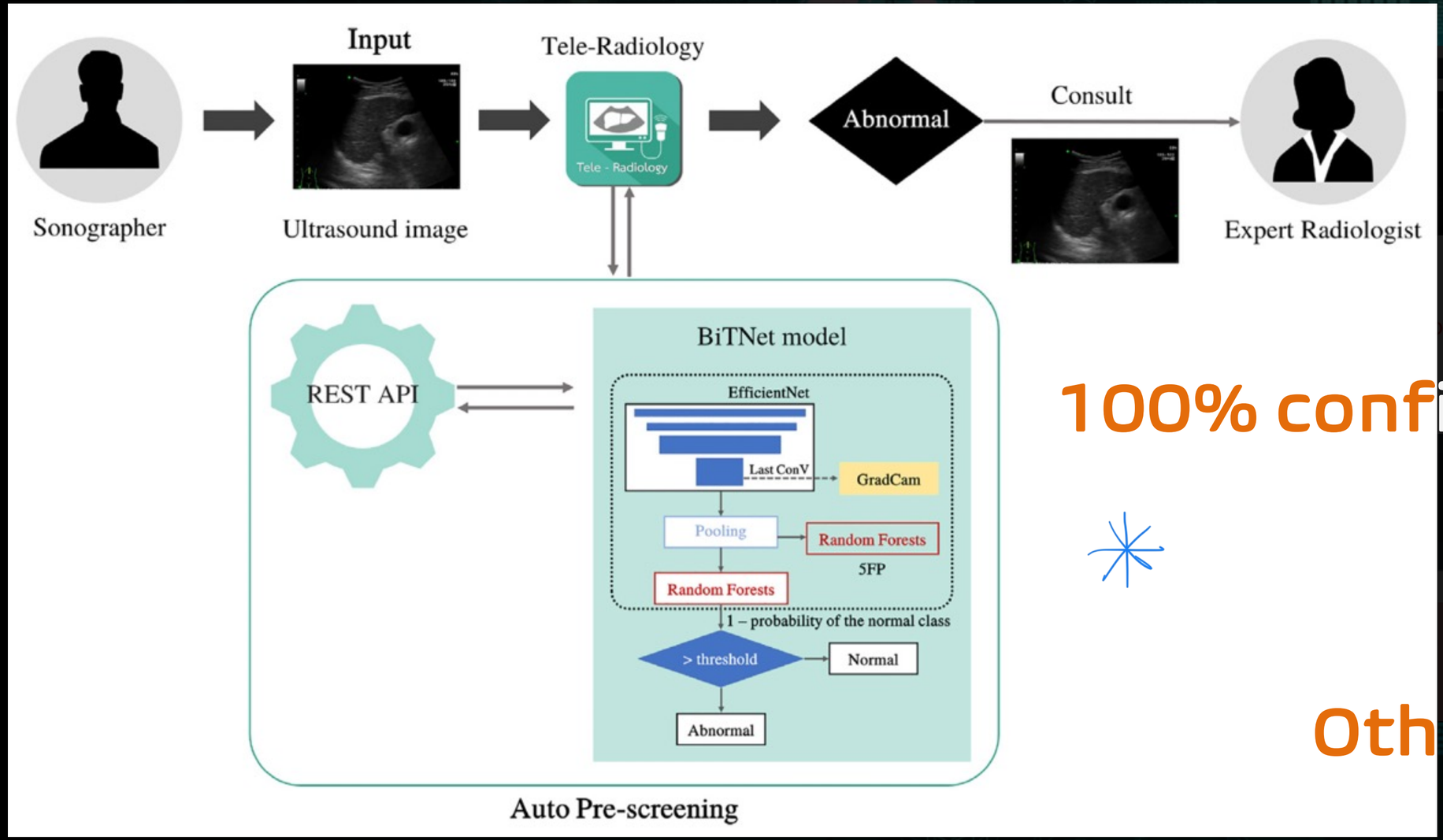


Assisting tool

1st Application



1st Application



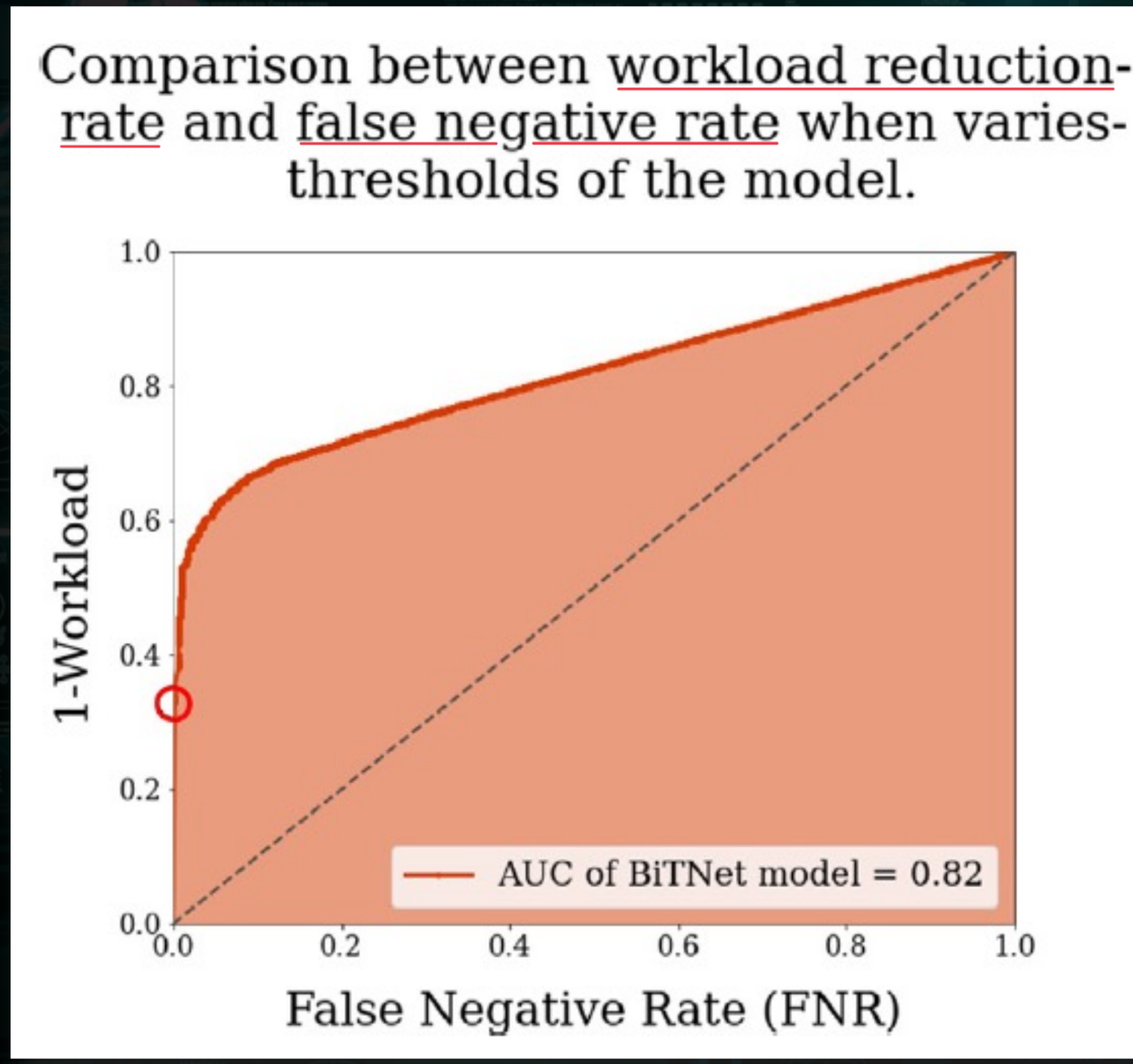
100% confidence normal

or

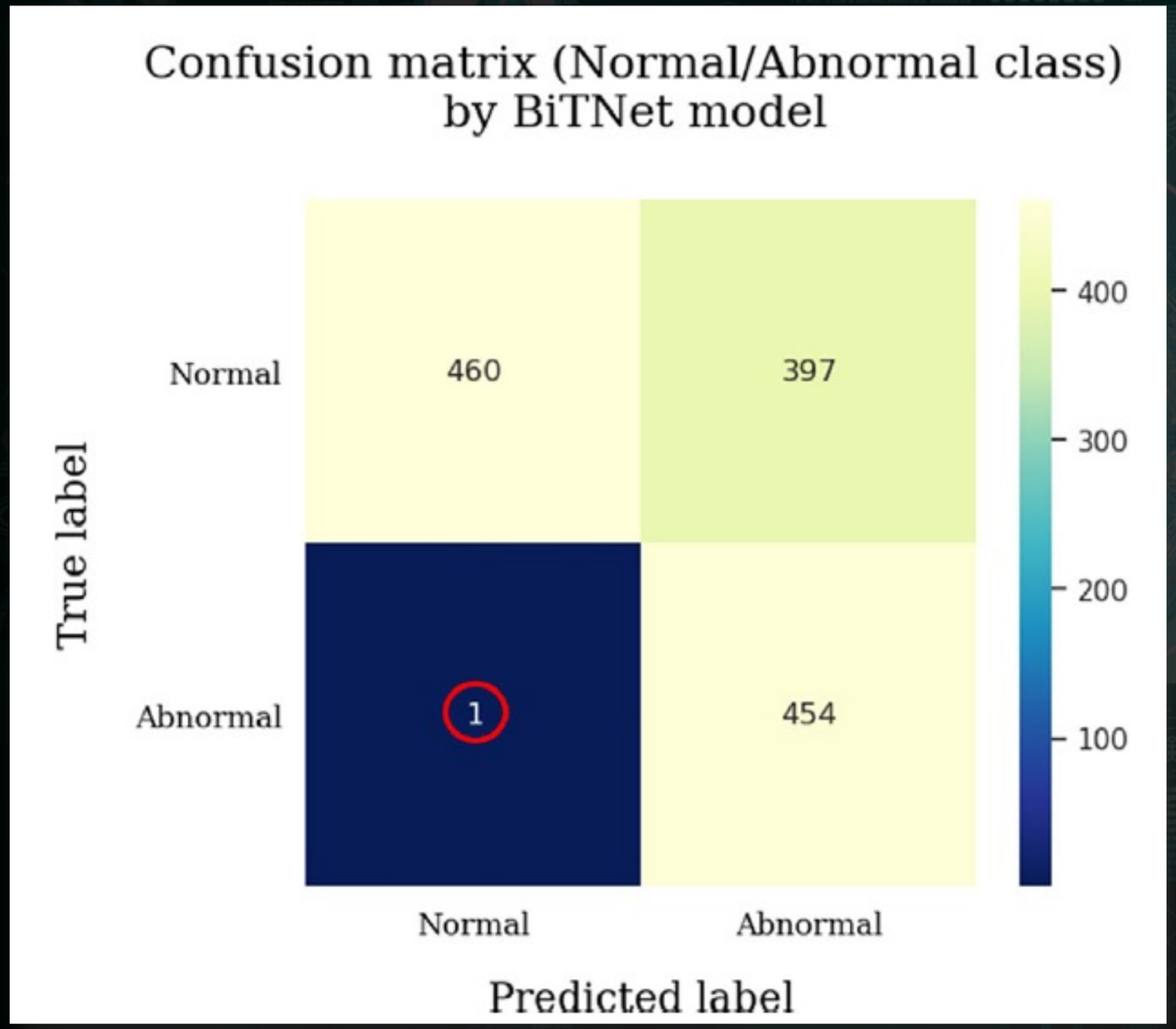
Otherwise

Auto Pre-screening

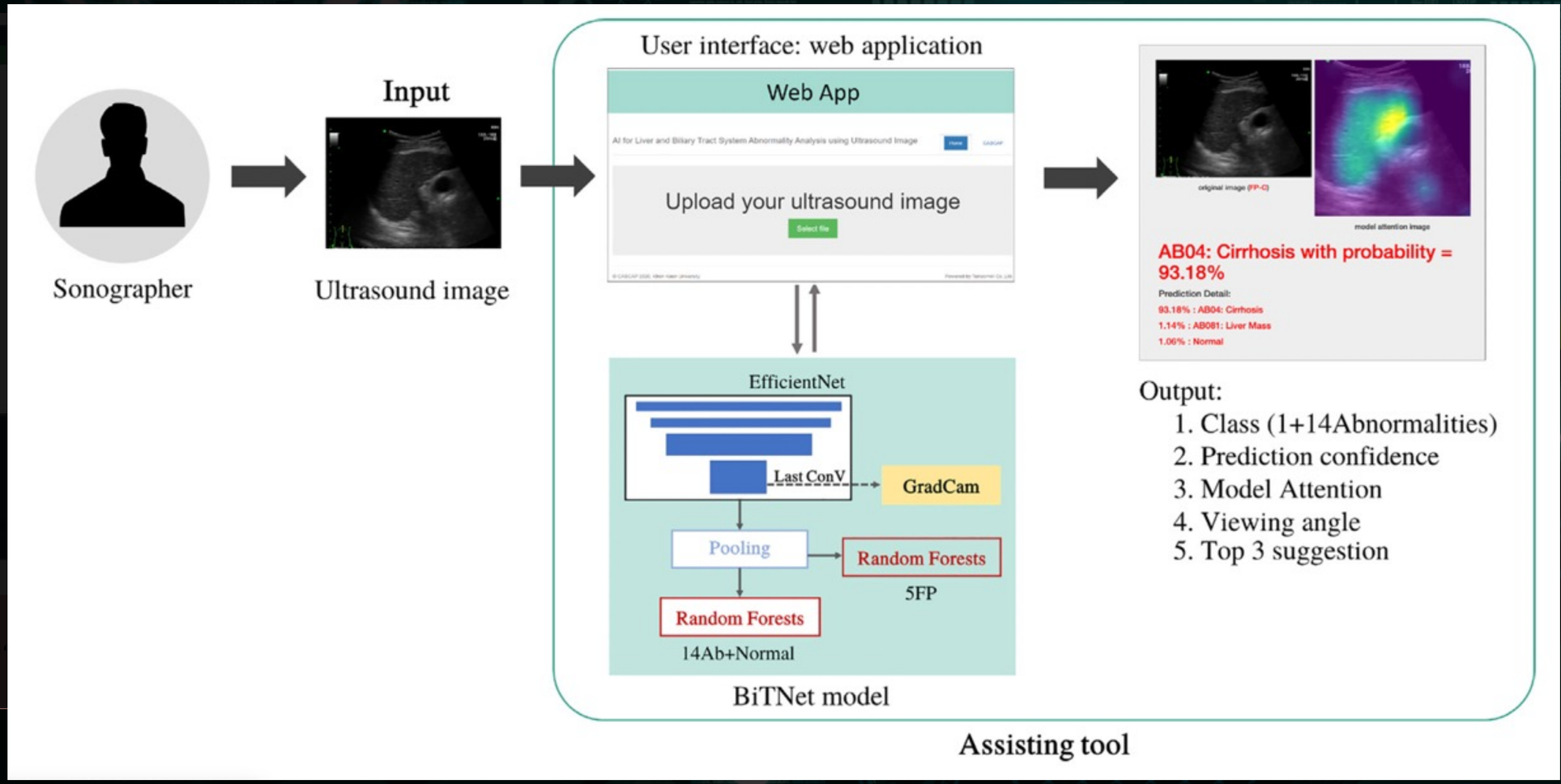
#images identified as abnormal
#submitted images



Auto Pre-screening



2nd Application

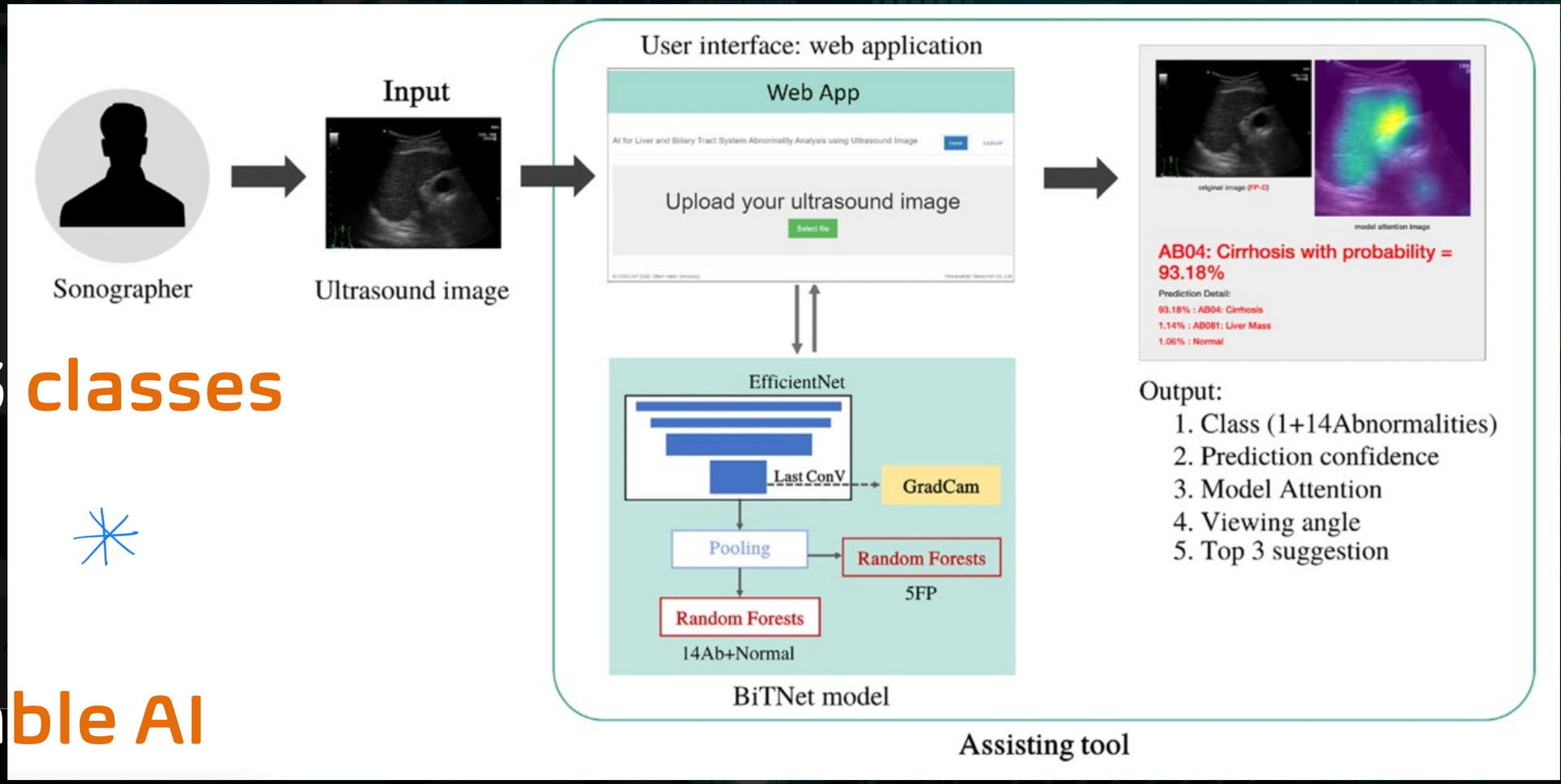


2nd Application

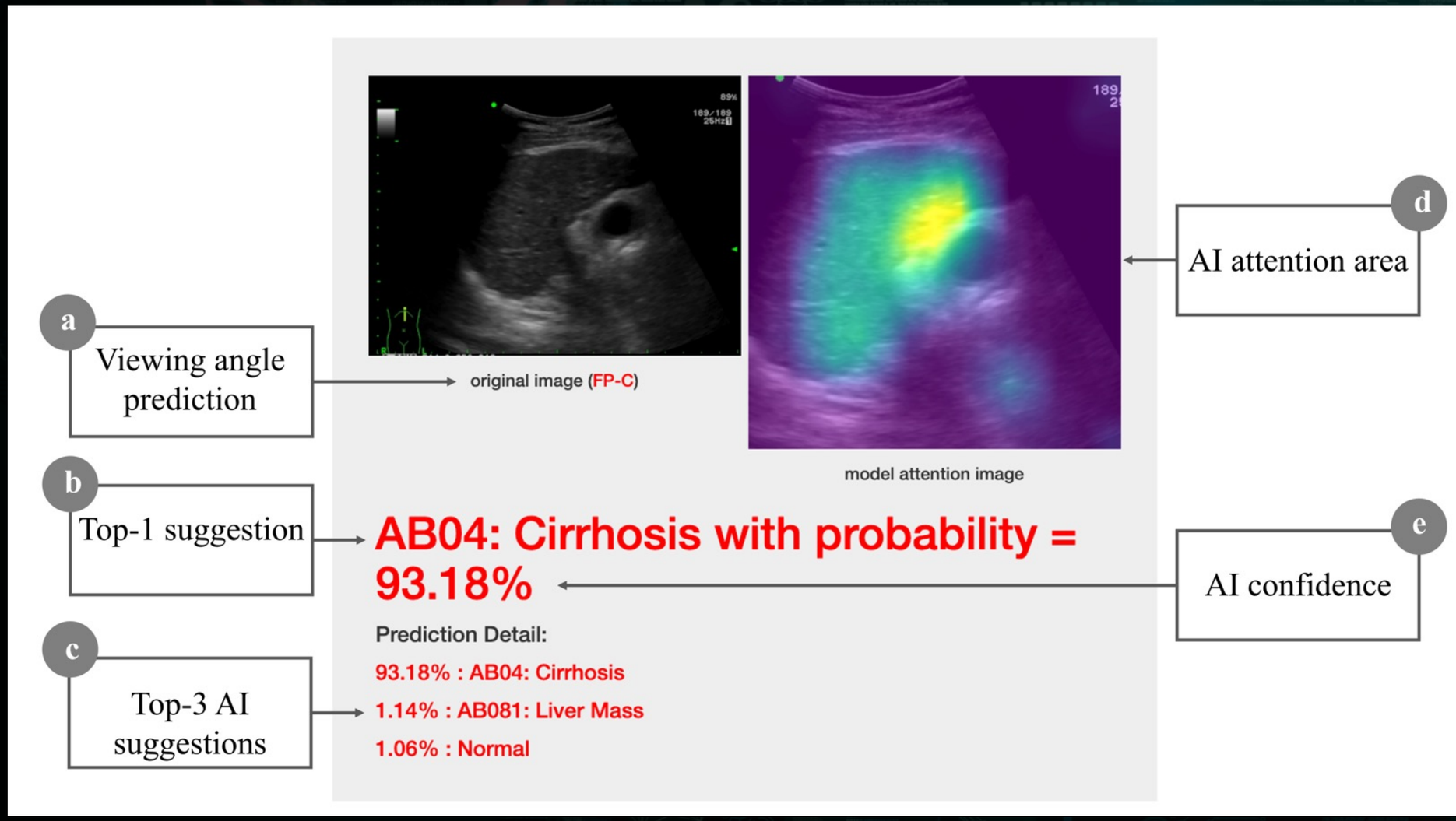
Predict 15 classes

+

eXplanable AI



Assisting tool

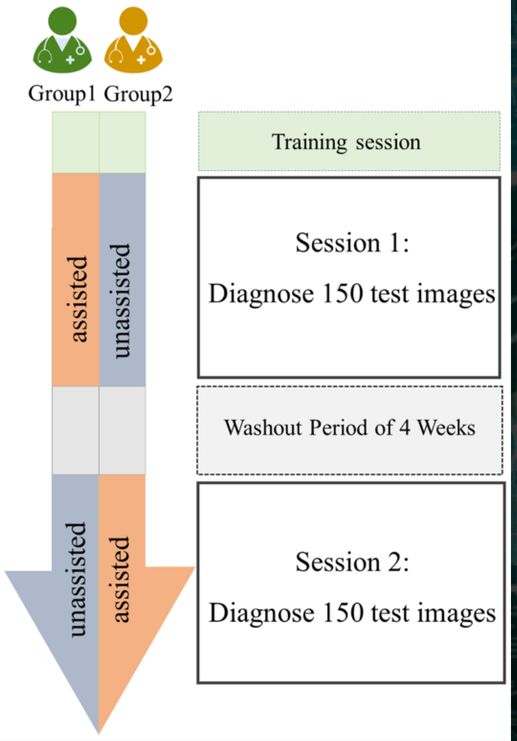


Assisting tool

Data distribution (150 test images)

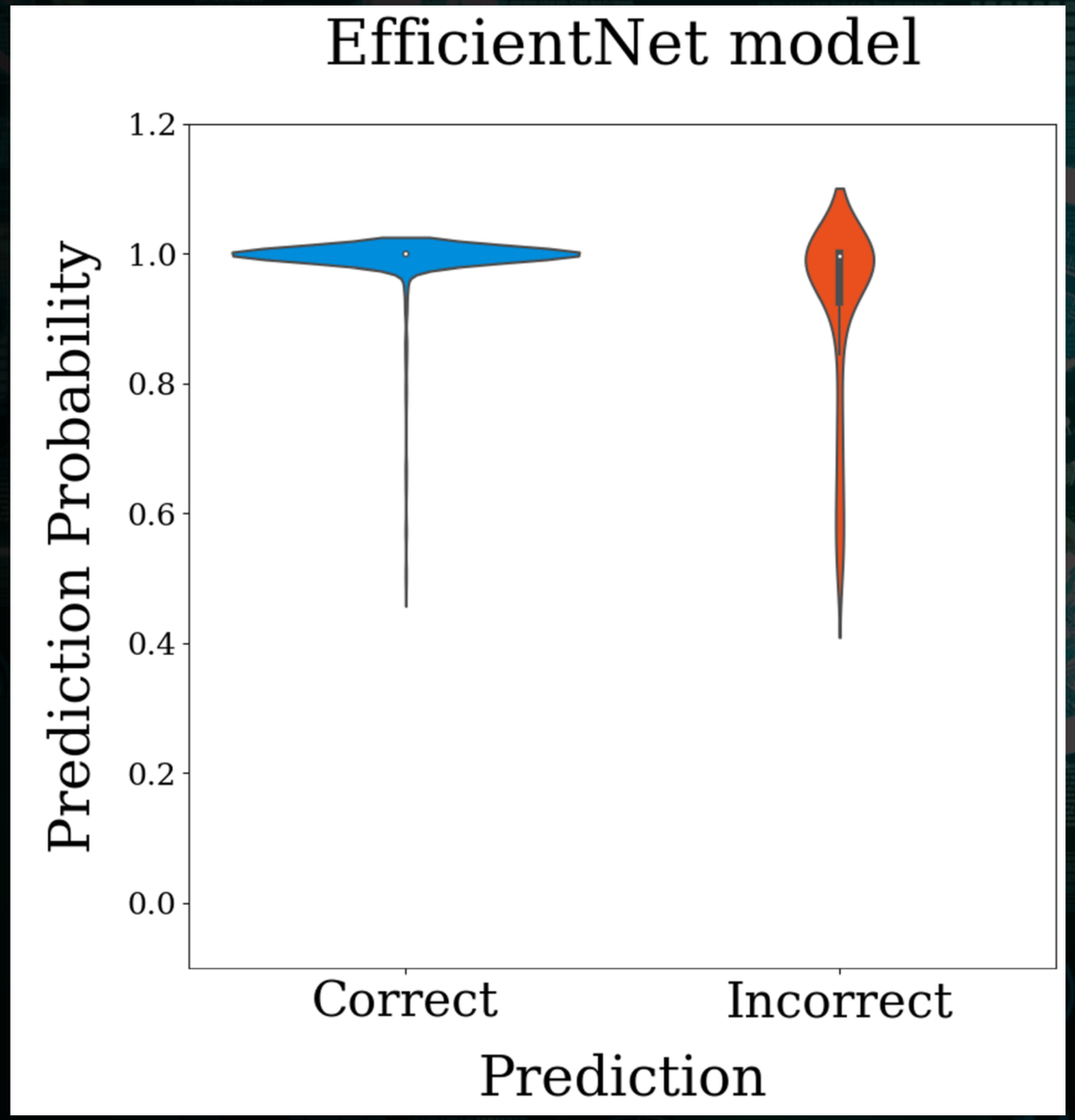
	FP-A	FP-B	FP-C	FP-D	FP-E
AB01	1	1	1		
AB02	1	1	1		
AB03	1	1	1		
AB04	1	1	1	1	
AB05	1	1	1		
AB06	1	1	1		
AB07	1	1	1		
AB081	1	1	1		
AB082	1	1	1		
AB083	1	1	1		
AB09		2	1		
AB10			3		
AB11			1	2	
AB12				3	
Abnormal	**11**	**12**	**14**	**6**	**0**
Normal	**22**	**24**	**28**	**12**	**21**

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

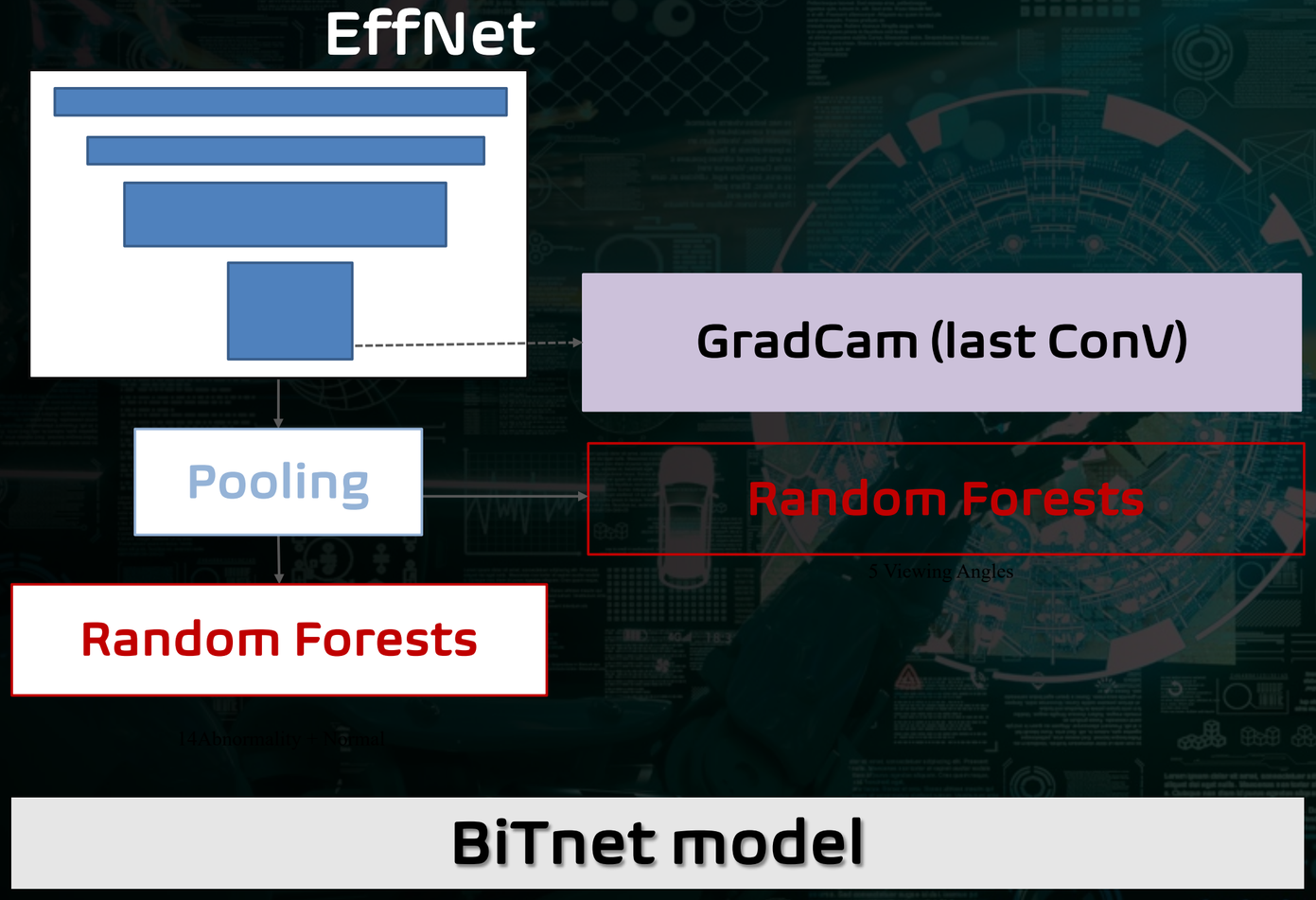


5 general practitioners (GP's), 2 residence radiologists, 2 non-hepatobiliary radiologists and 2 hepatobiliary radiologists.

Assisting tool

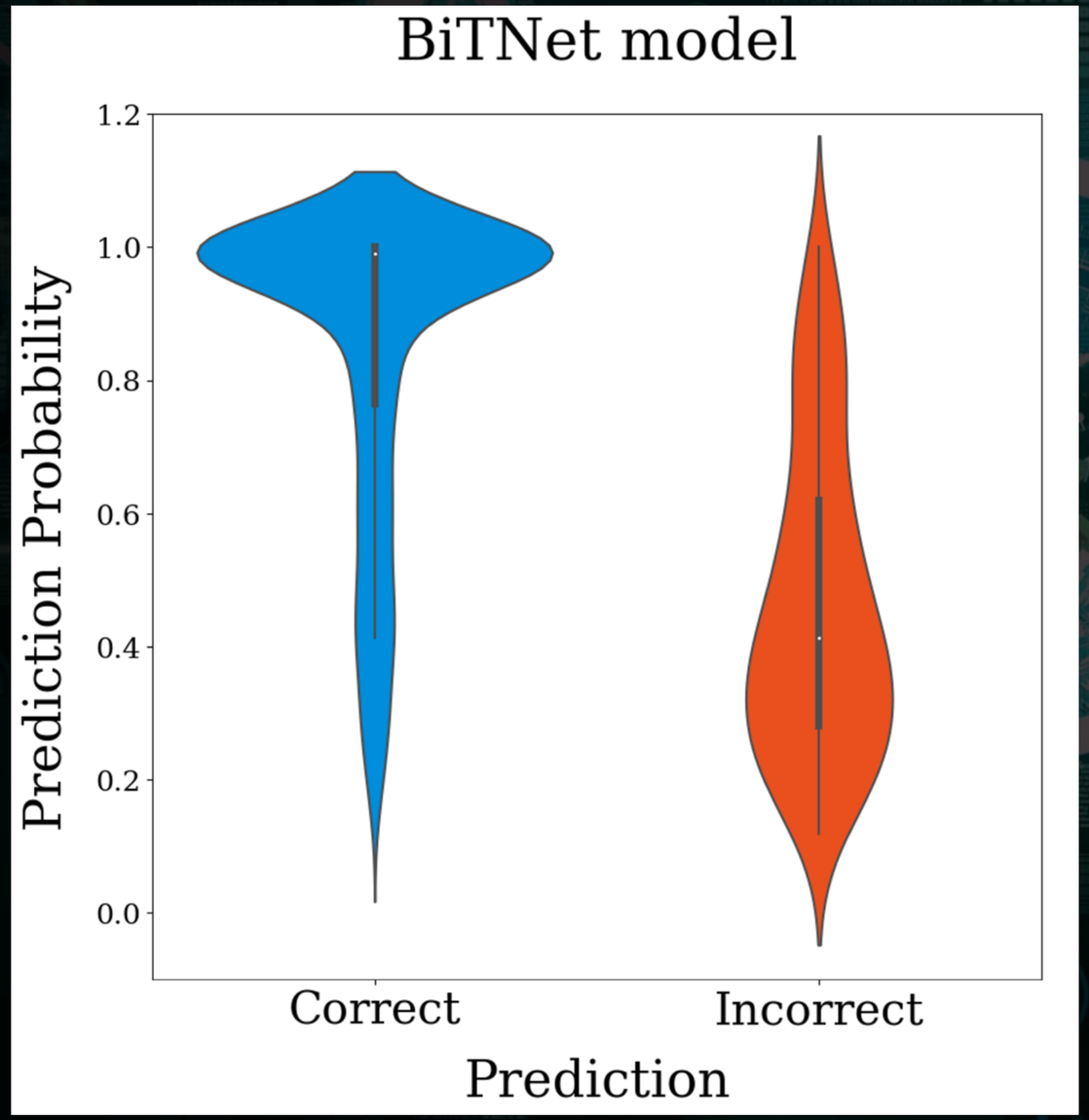


Assisting tool

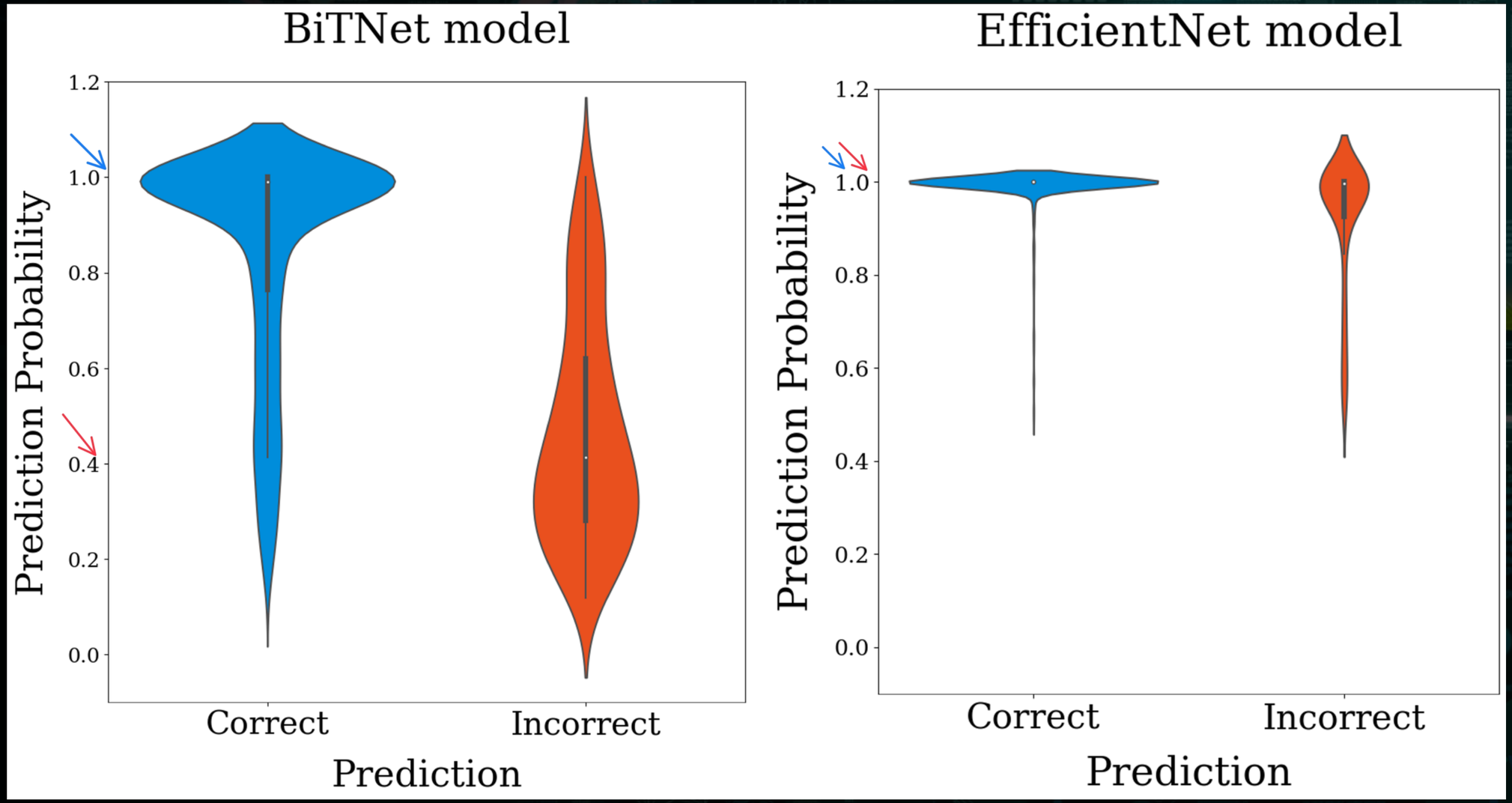


BiTnet model

Assisting tool



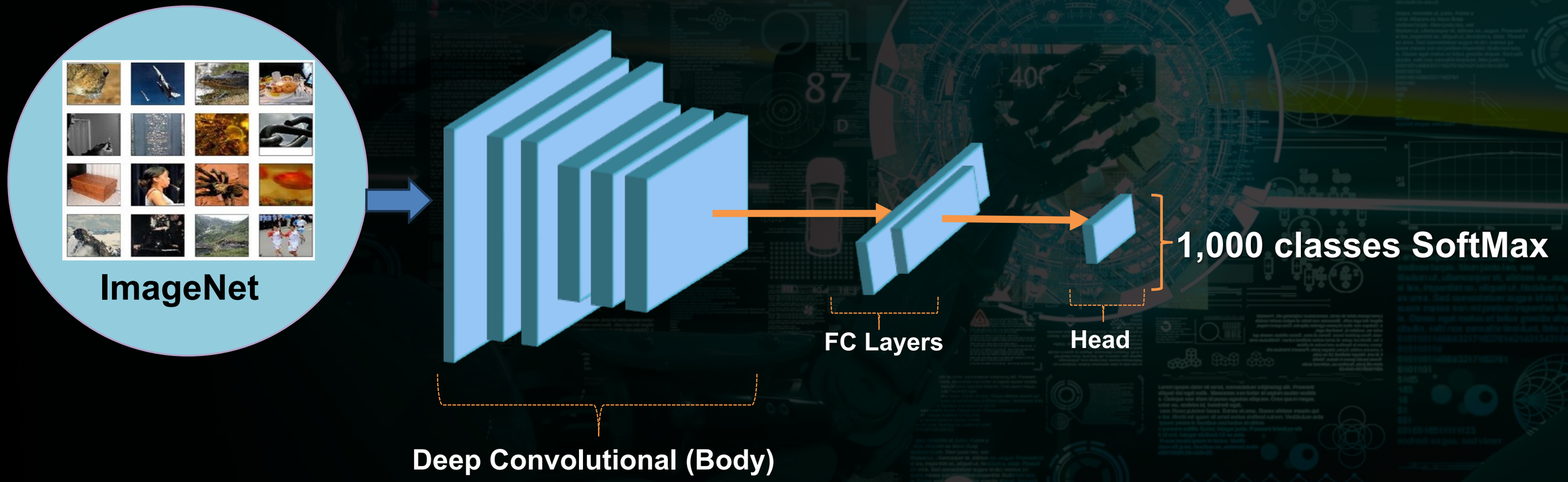
Assisting tool



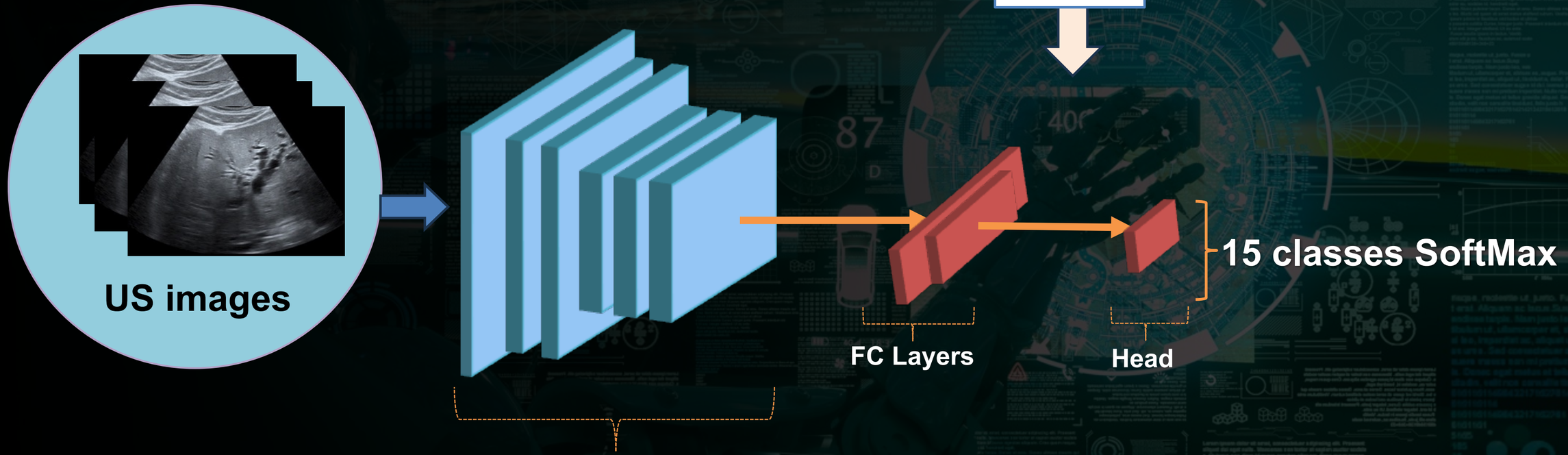
More on training

Pre-trained

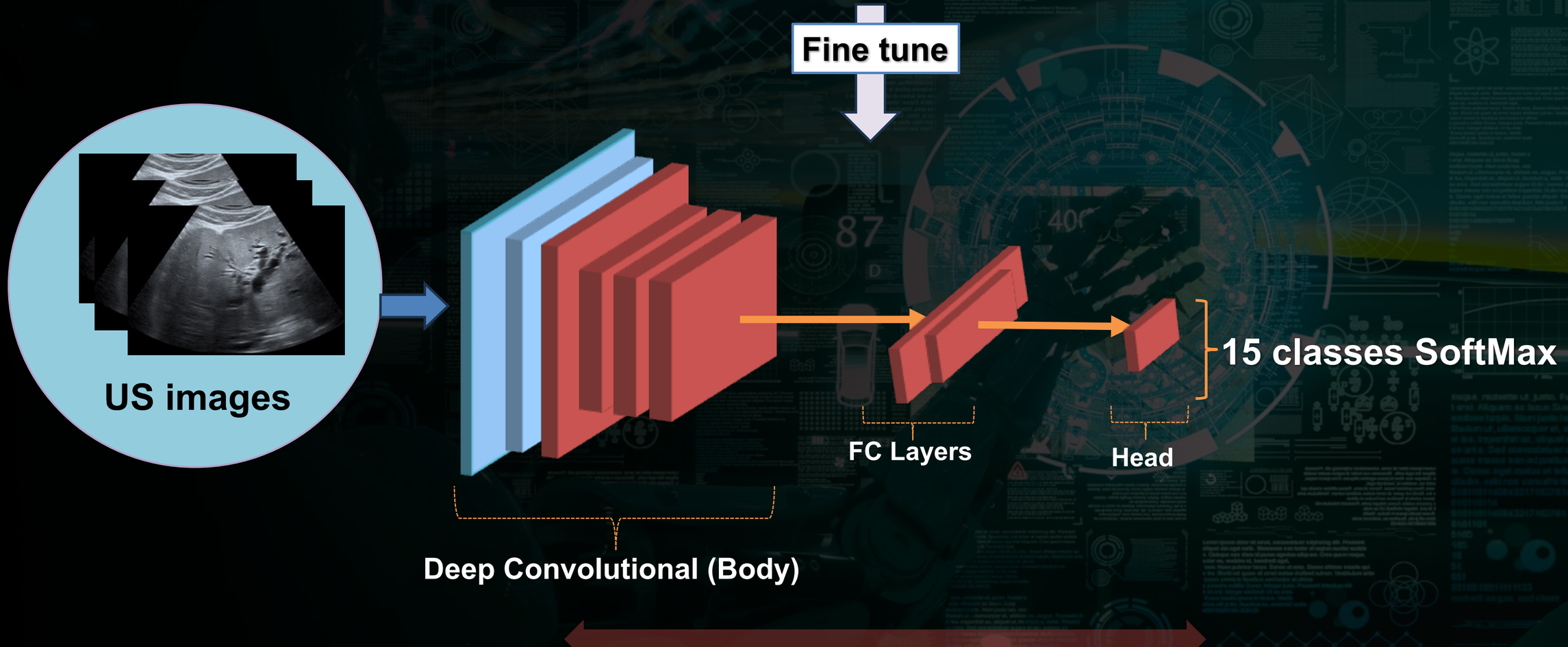
Load pre-trained EfficienNetB5 model



Freezed


Transfer
US images
15 classes SoftMax
FC Layers
Head
Deep Convolutional (Body)
Freeze Early Layers in Network
Customize and Train FC Layers

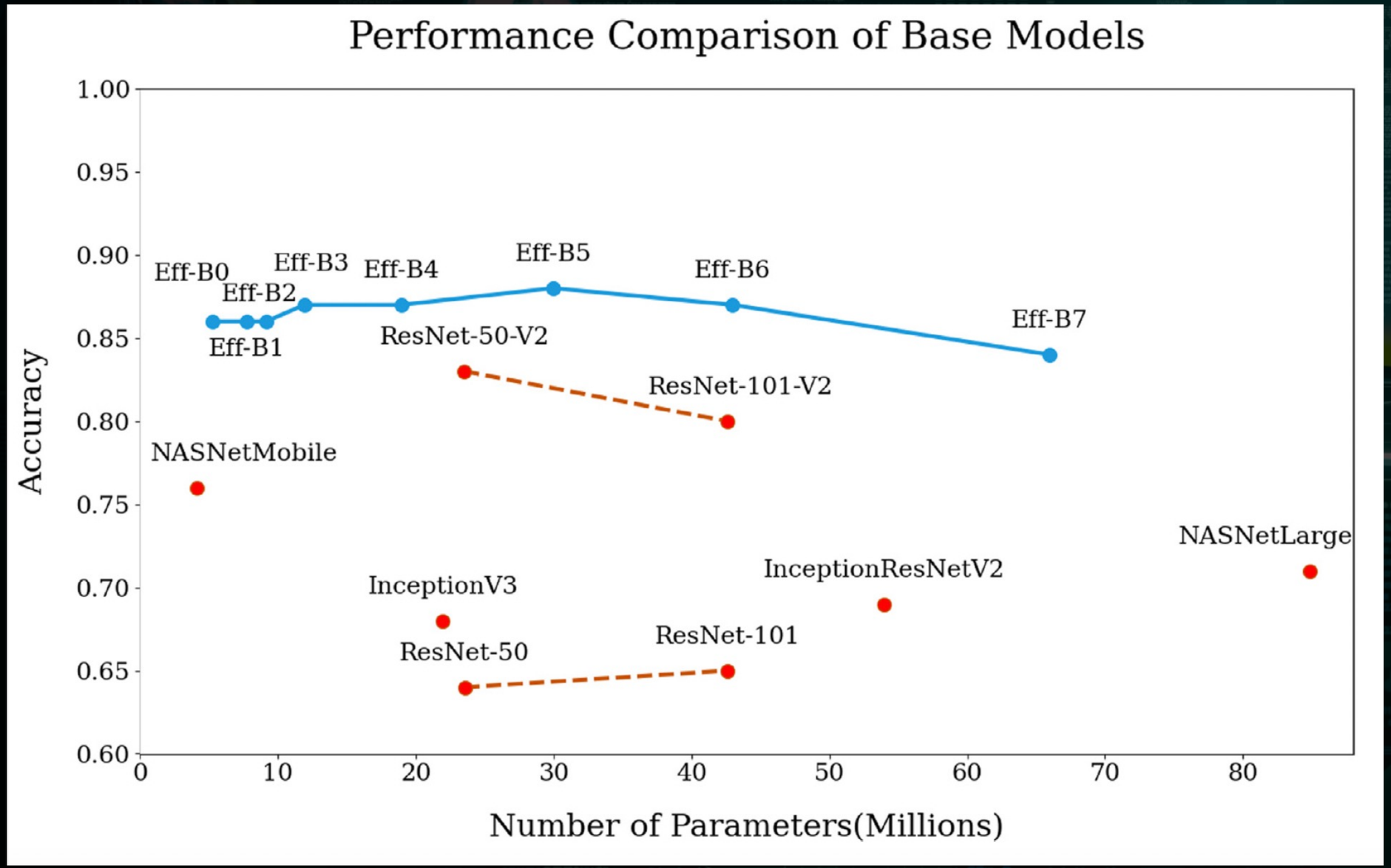
Unfreezed


Fine tune
US images
15 classes SoftMax
FC Layers
Head
Deep Convolutional (Body)
Unfreeze from block5a_se_excite
Layers & Train

Add a little bit of body text

Evaluation

Models


Performance Comparison of Base Models
Accuracy
Number of Parameters(Millions)
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0
10
20
30
40
50
60
70
80
Eff-B0
Eff-B1
Eff-B2
Eff-B3
Eff-B4
Eff-B5
Eff-B6
Eff-B7
ResNet-50-V2
ResNet-101-V2
NASNetMobile
NASNetLarge
InceptionV3
InceptionResNetV2
ResNet-50
ResNet-101

Models

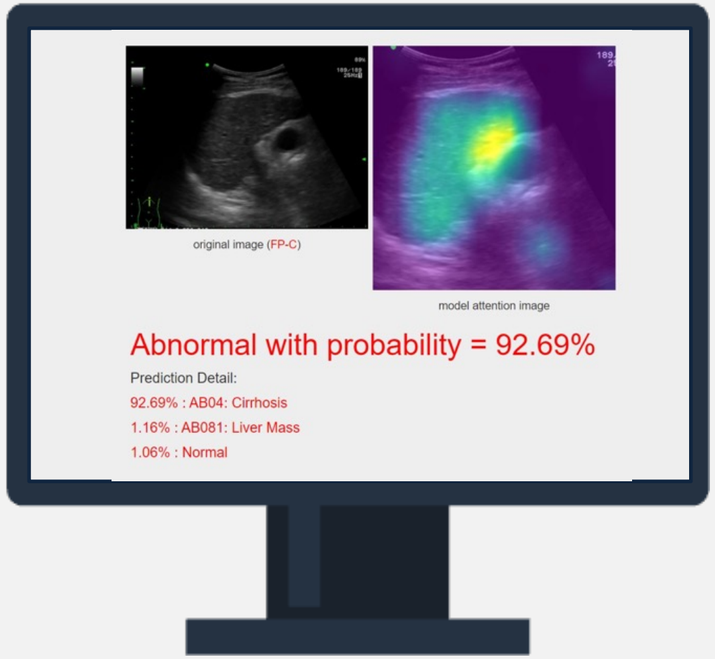
Table 2

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

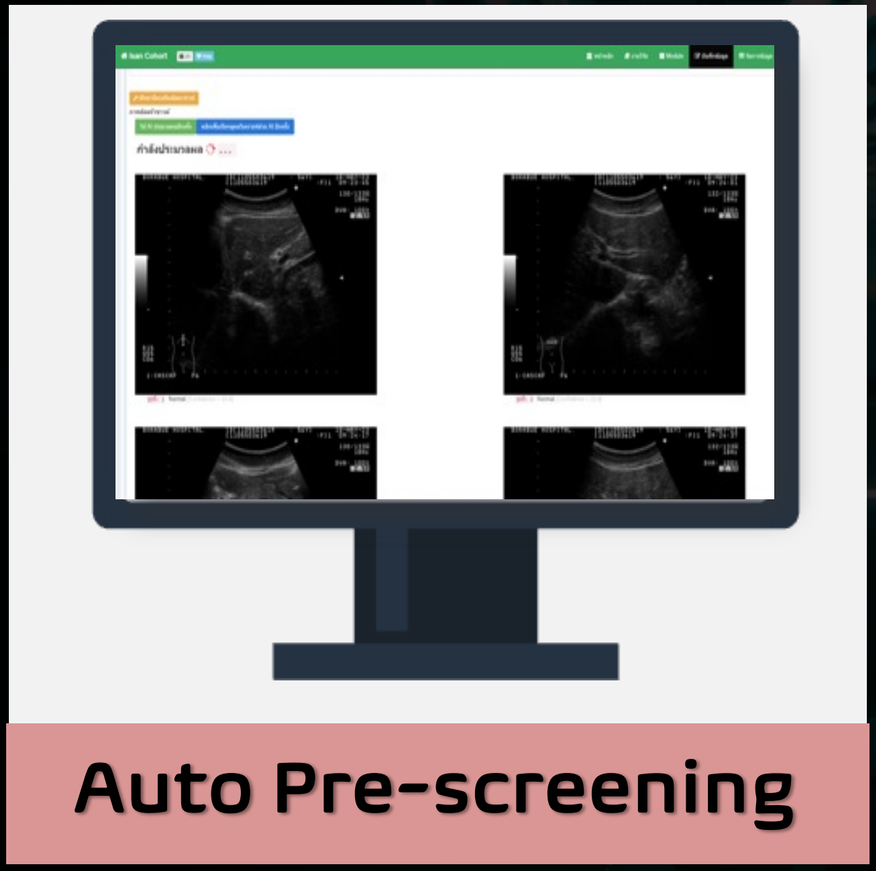
2 Applications

Auto Pre-screening

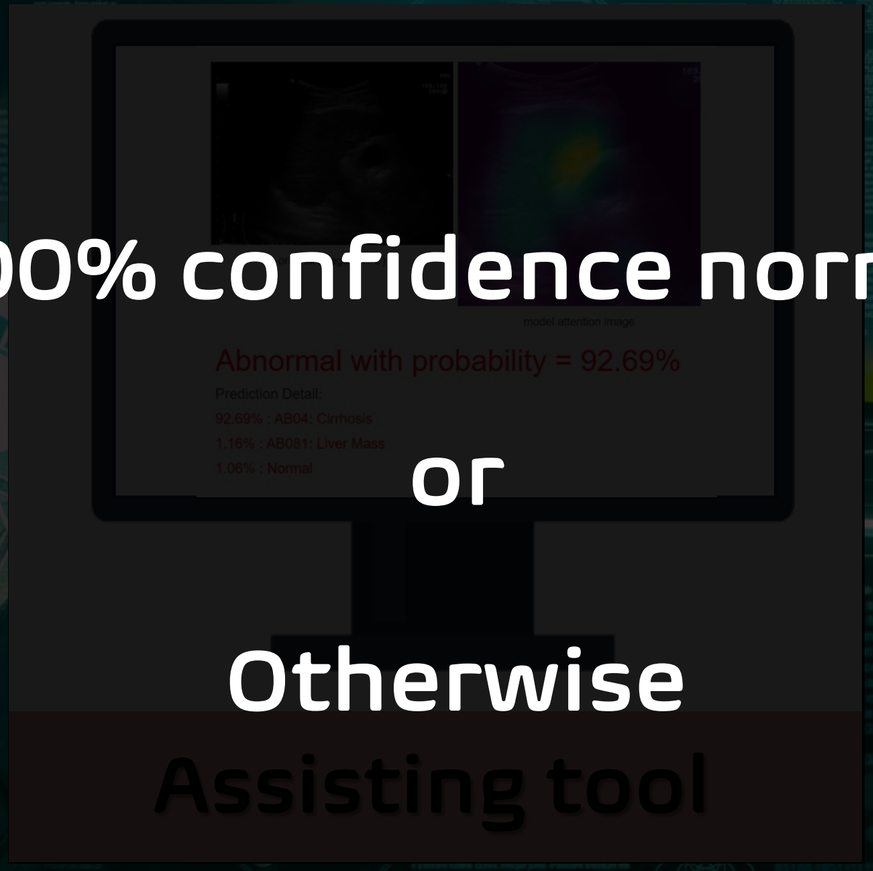


Assisting tool

1st Application



Auto Pre-screening



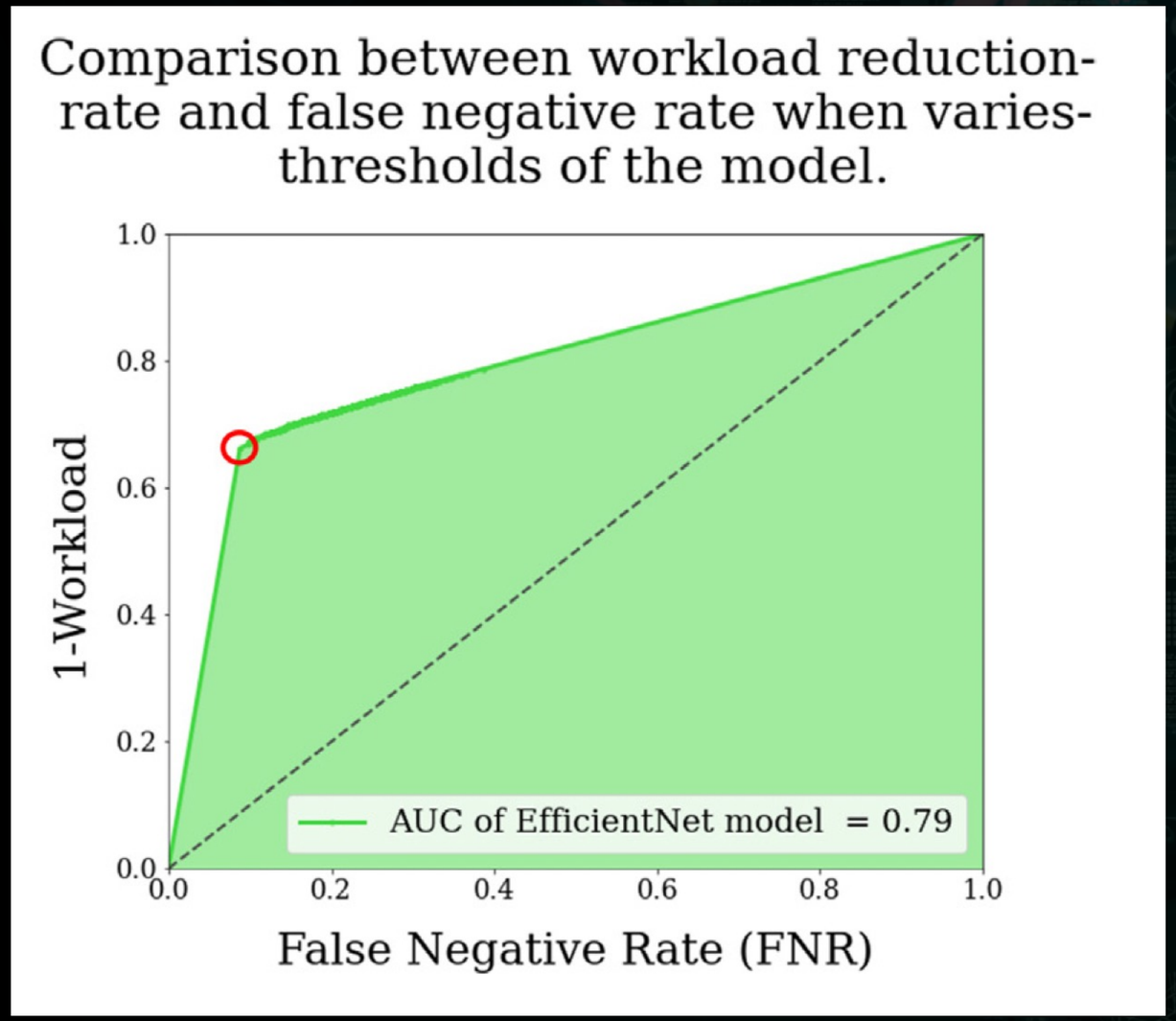
100% confidence normal

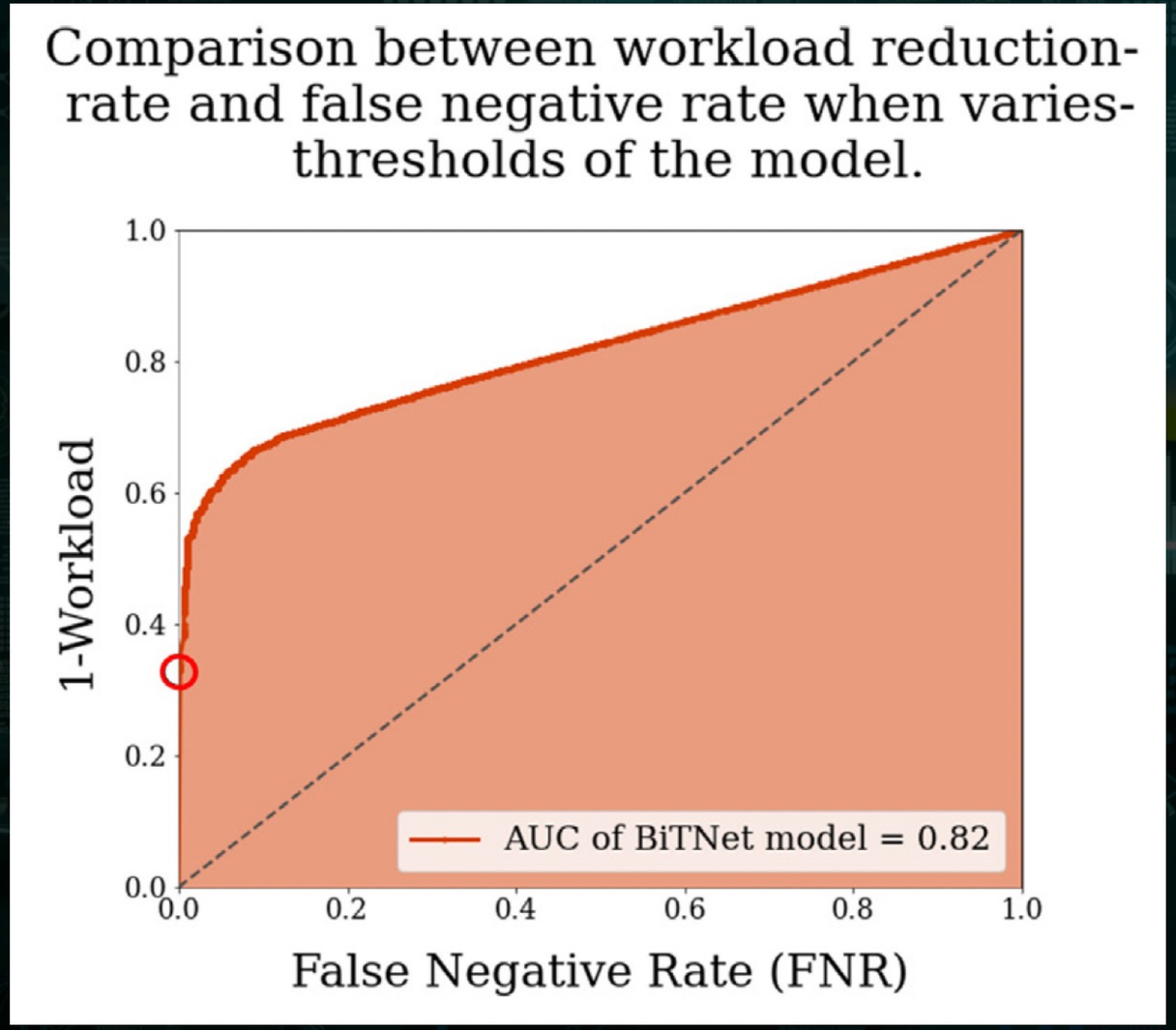
or

Otherwise

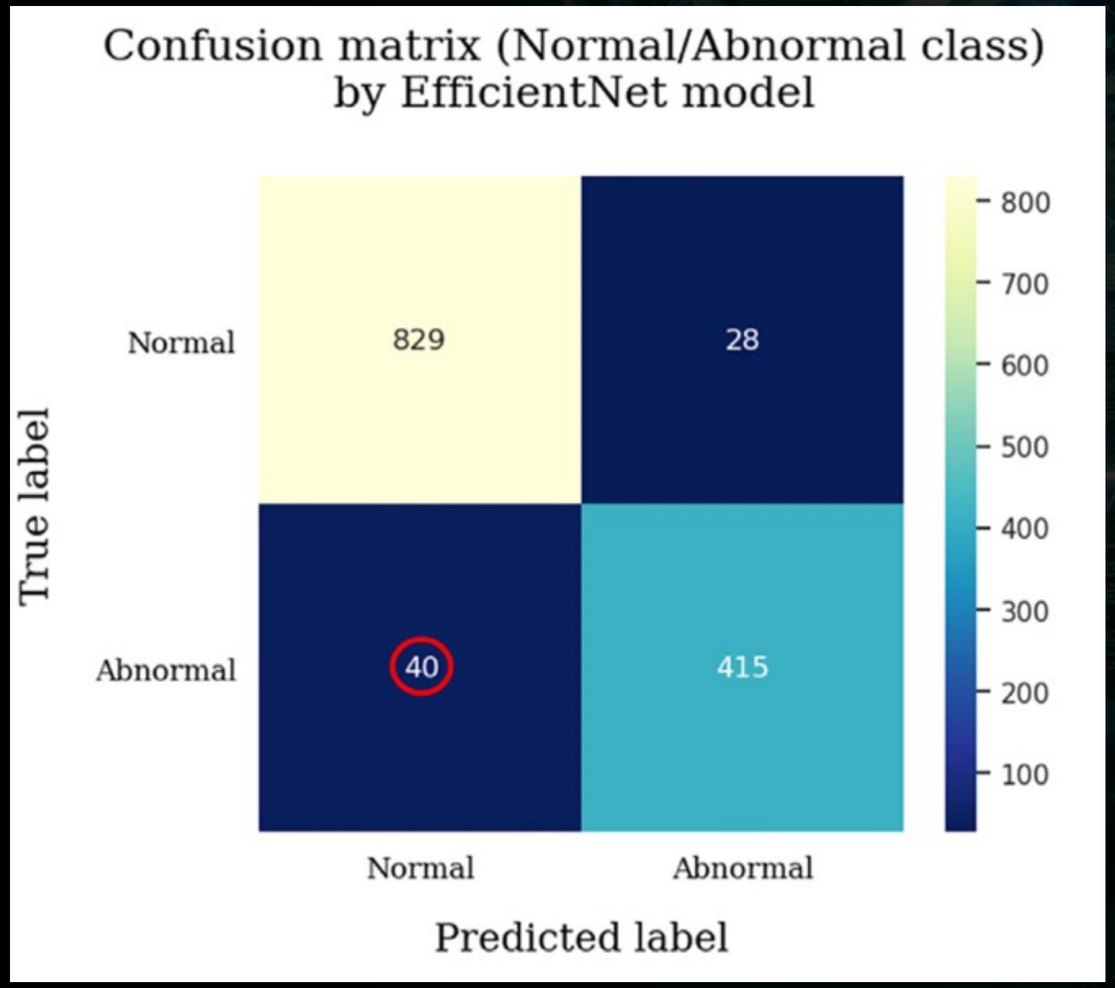
Assisting tool

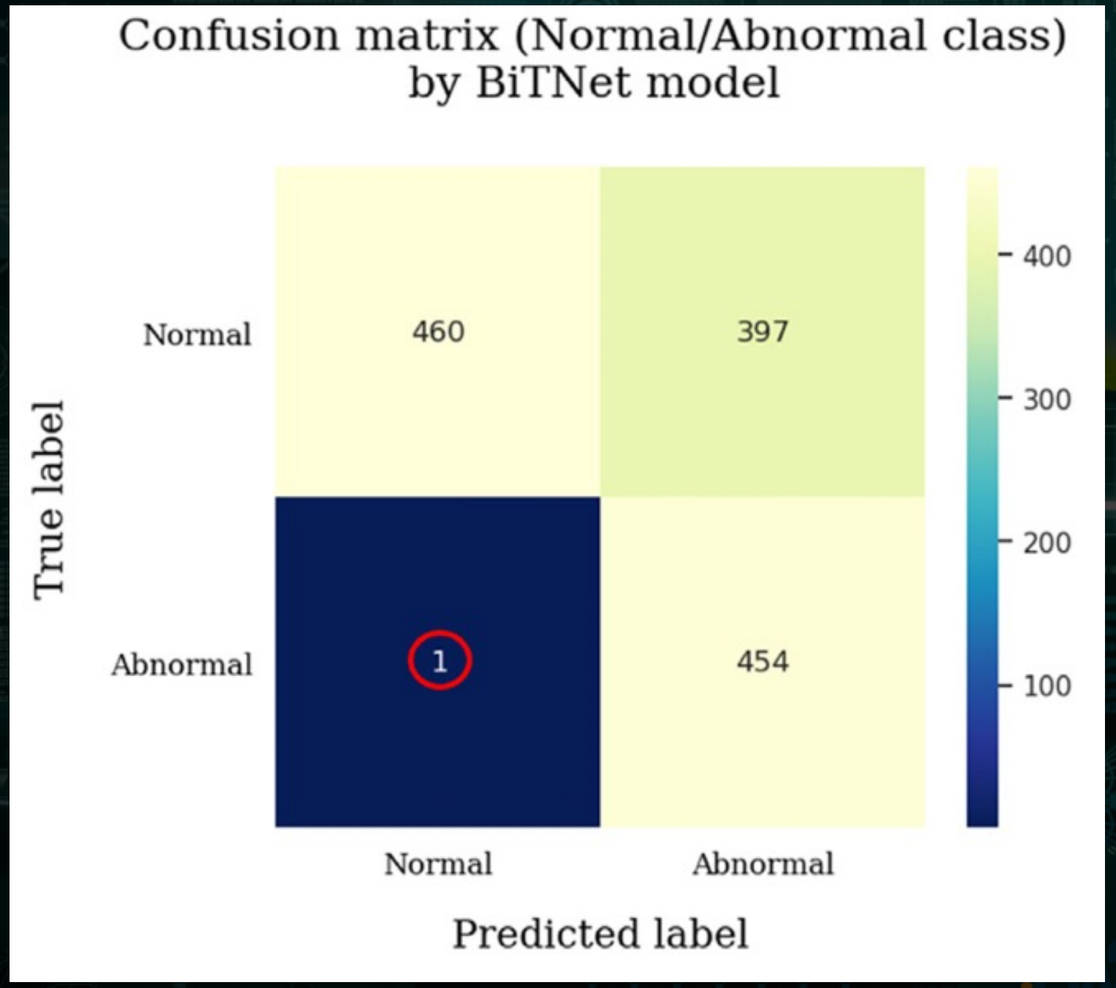
Auto Pre-screening





Auto Pre-screening





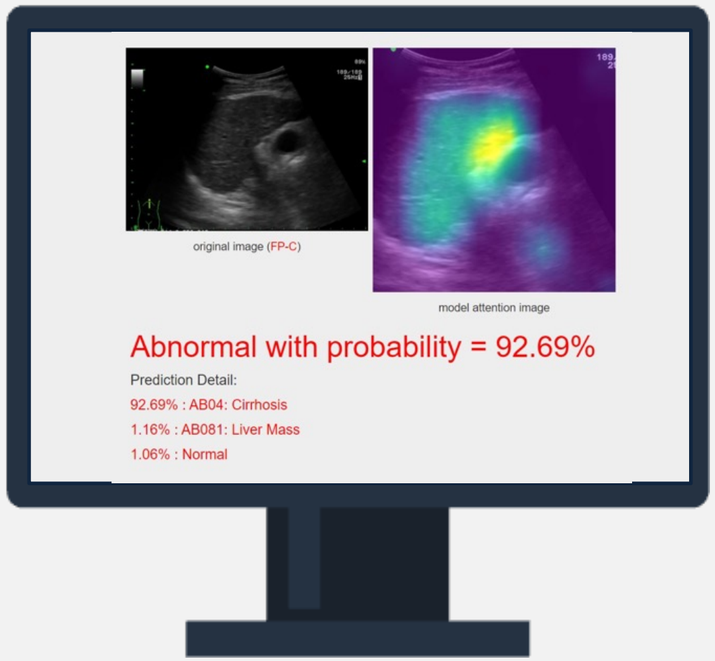
2nd Application

Predict 15 classes

+

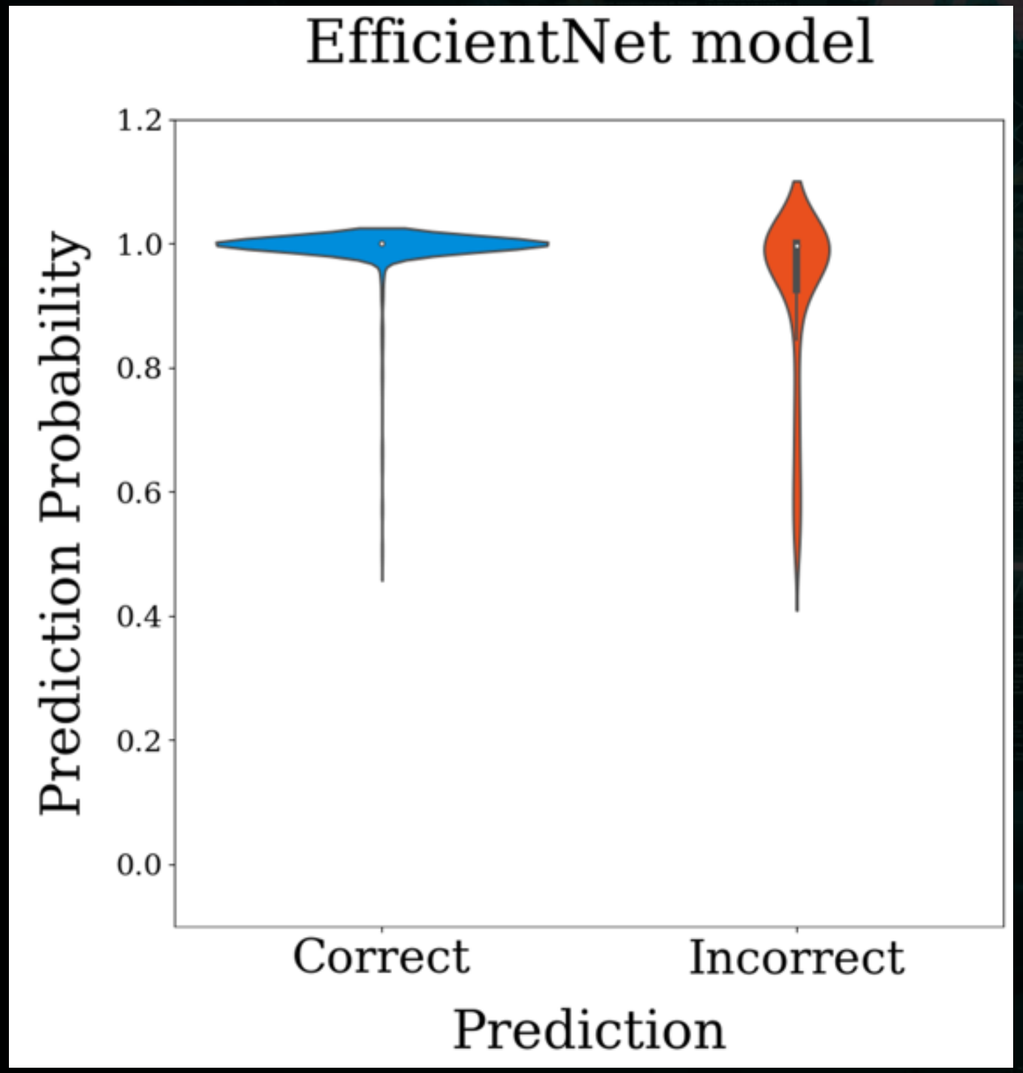
eXplanable AI

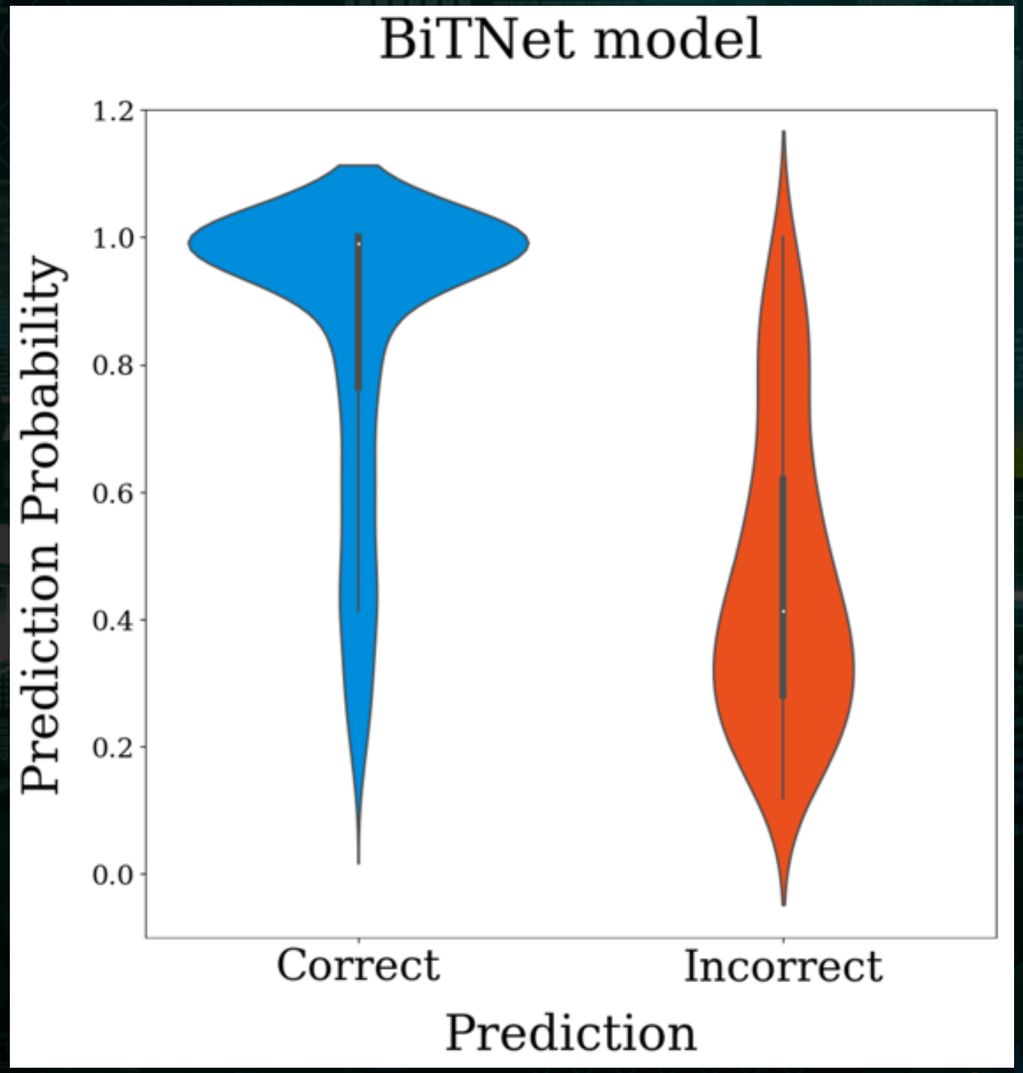
Auto Pre-screening



Assisting tool

Assisting tool





Assisting tool

Data distribution (150 test images)

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Total : 150 images
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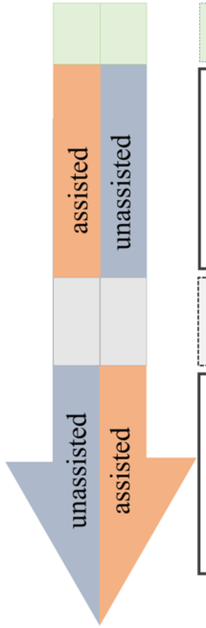

Training session

Session 1:
Diagnose 150 test images

Washout Period of 4 Weeks

Session 2:
Diagnose 150 test 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.
   - Compare of mean accuracy between the first round of the experiment and the second round of the experiment with the participants.
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   - Compare of mean similarity scores between AI suggestion (prediction) and the final decision of the participants when assisted/unassisted.
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Assisting tool

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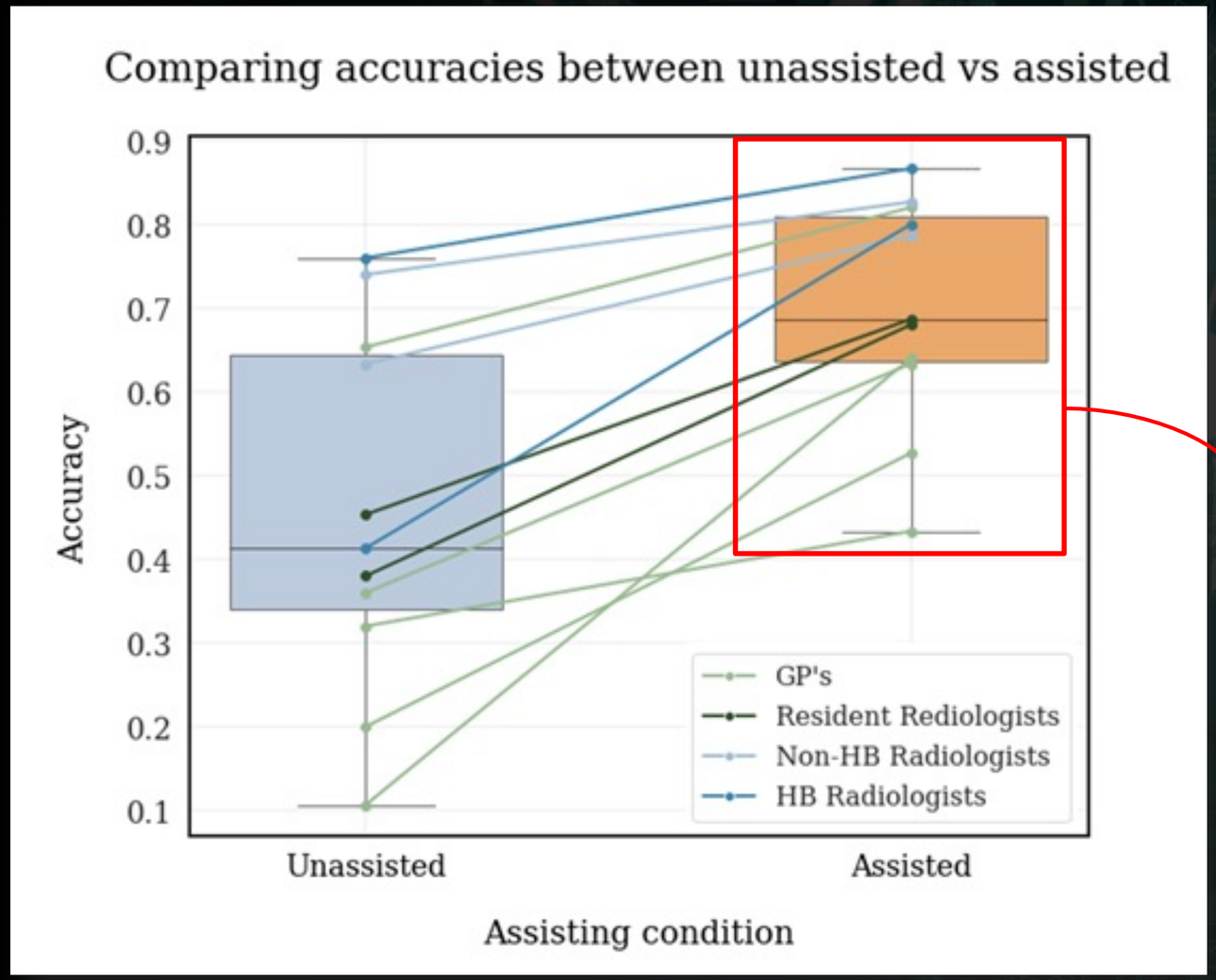
Assisting tool

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 ± 0.13	0.50 ± 0.23	3.44×10^{-4} [a]
Precision	0.62 ± 0.15	0.46 ± 0.16	1.58×10^{-4} [a]
Recall	0.94 ± 0.07	0.85 ± 0.06	0.05

[a] indicates p-value < 0.05.

Assisting tool



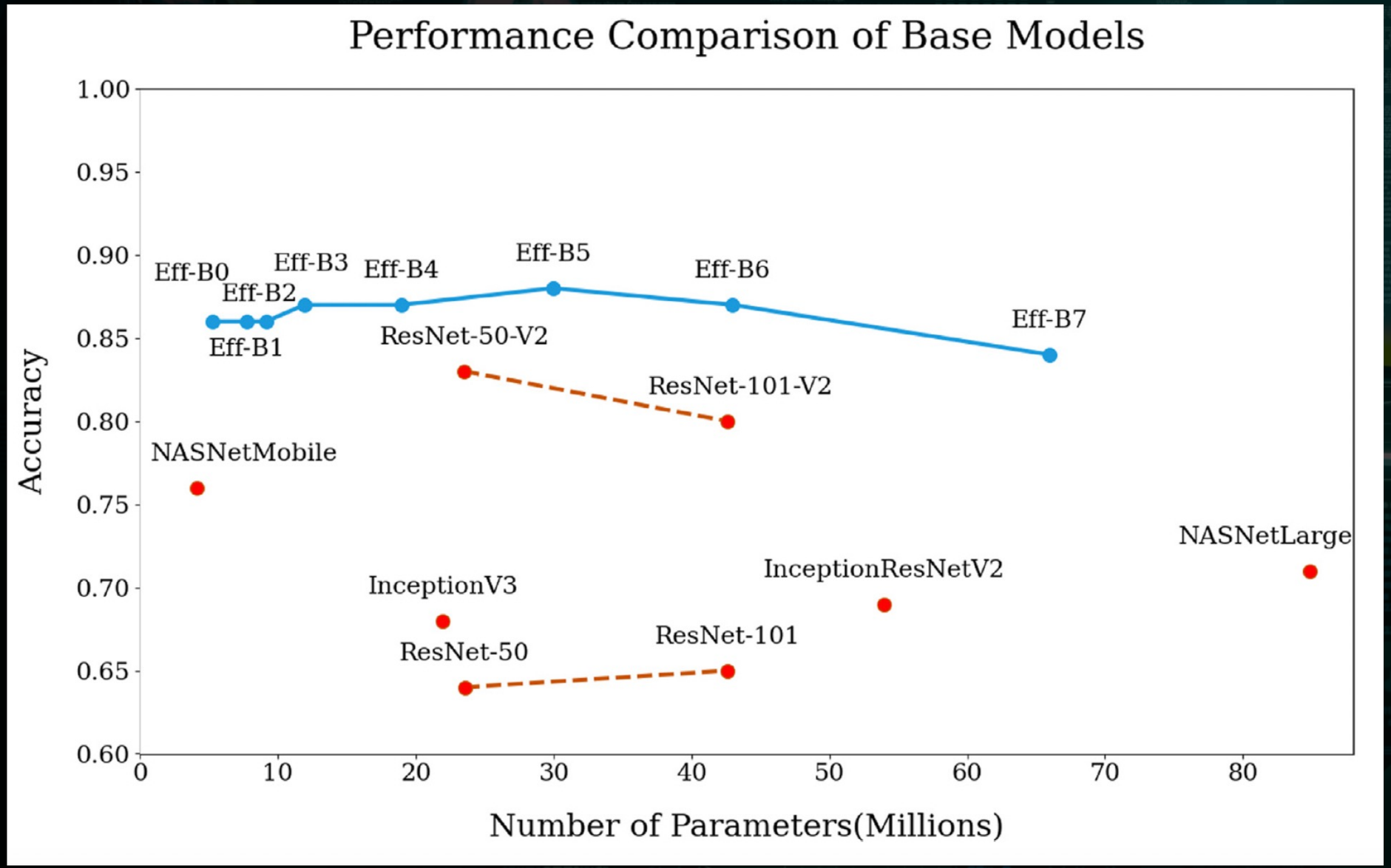
increase overall's accuracy by 18%

increase GP's accuracy by 26%

Add a little bit of body text

Visualization

Models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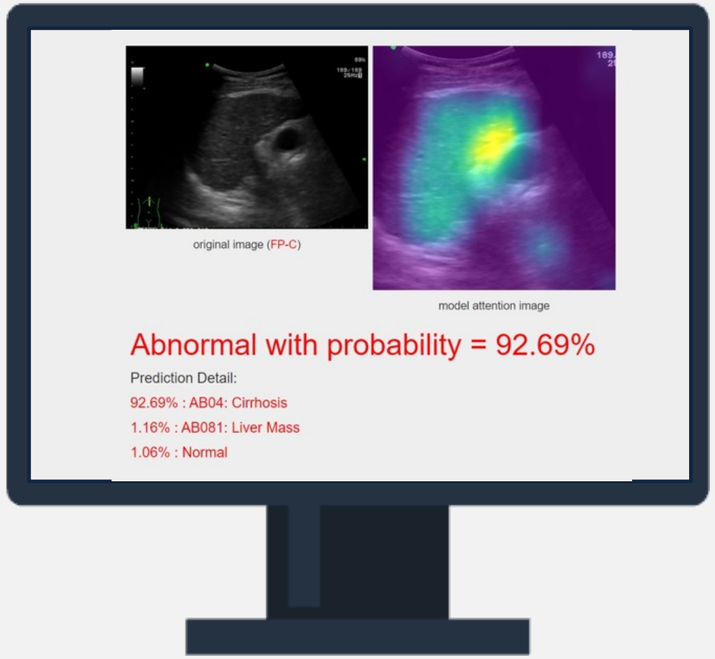
0.70
0.65
0.60
0
10
20
30
40
50
60
70
80
Eff-B0
Eff-B1
Eff-B2
Eff-B3
Eff-B4
Eff-B5
Eff-B6
Eff-B7
ResNet-50-V2
ResNet-101-V2
NASNetMobile
NASNetLarge
InceptionV3
InceptionResNetV2
ResNet-50
ResNet-101

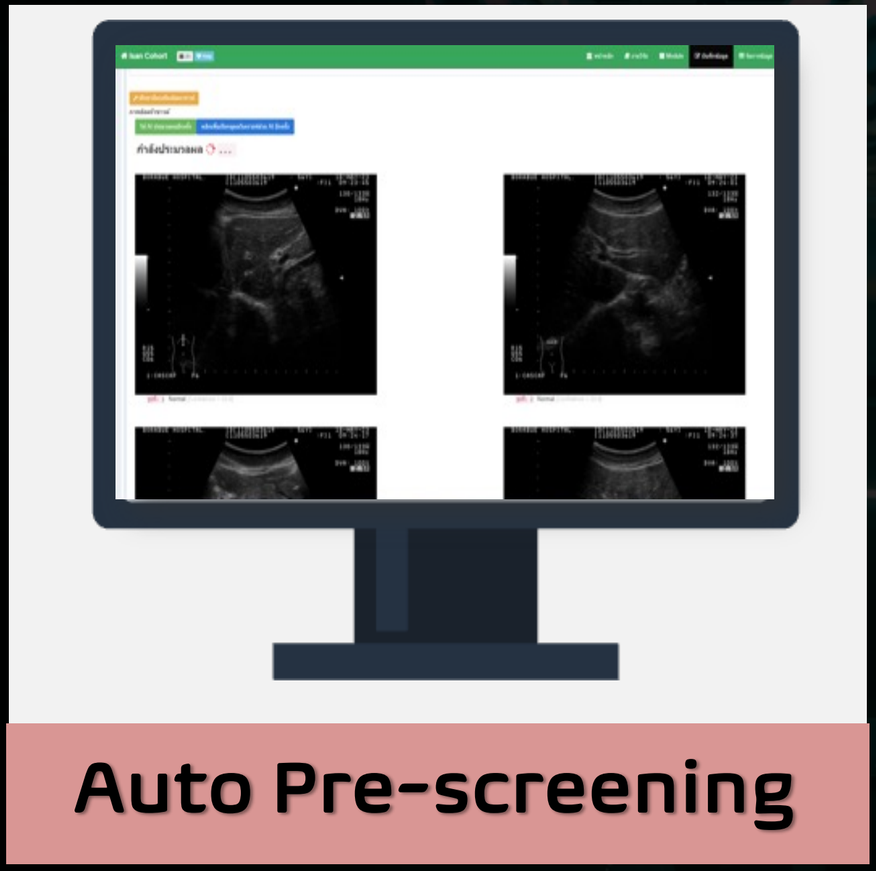
2 Applications

Auto Pre-screening

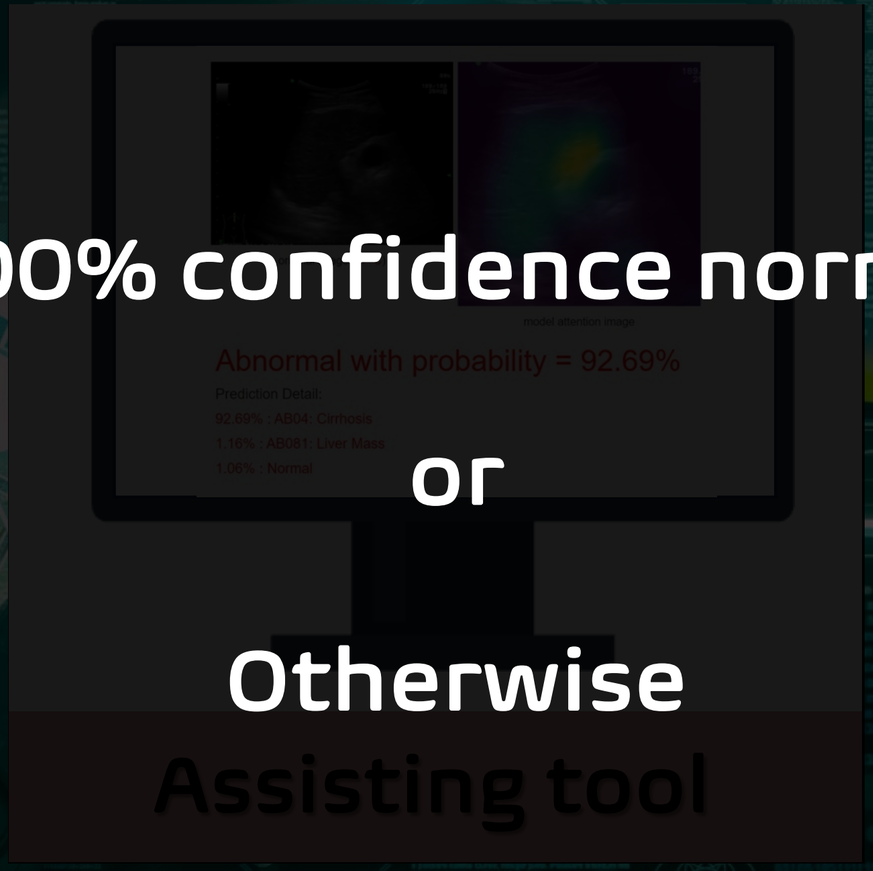


Assisting tool

1st Application



Auto Pre-screening



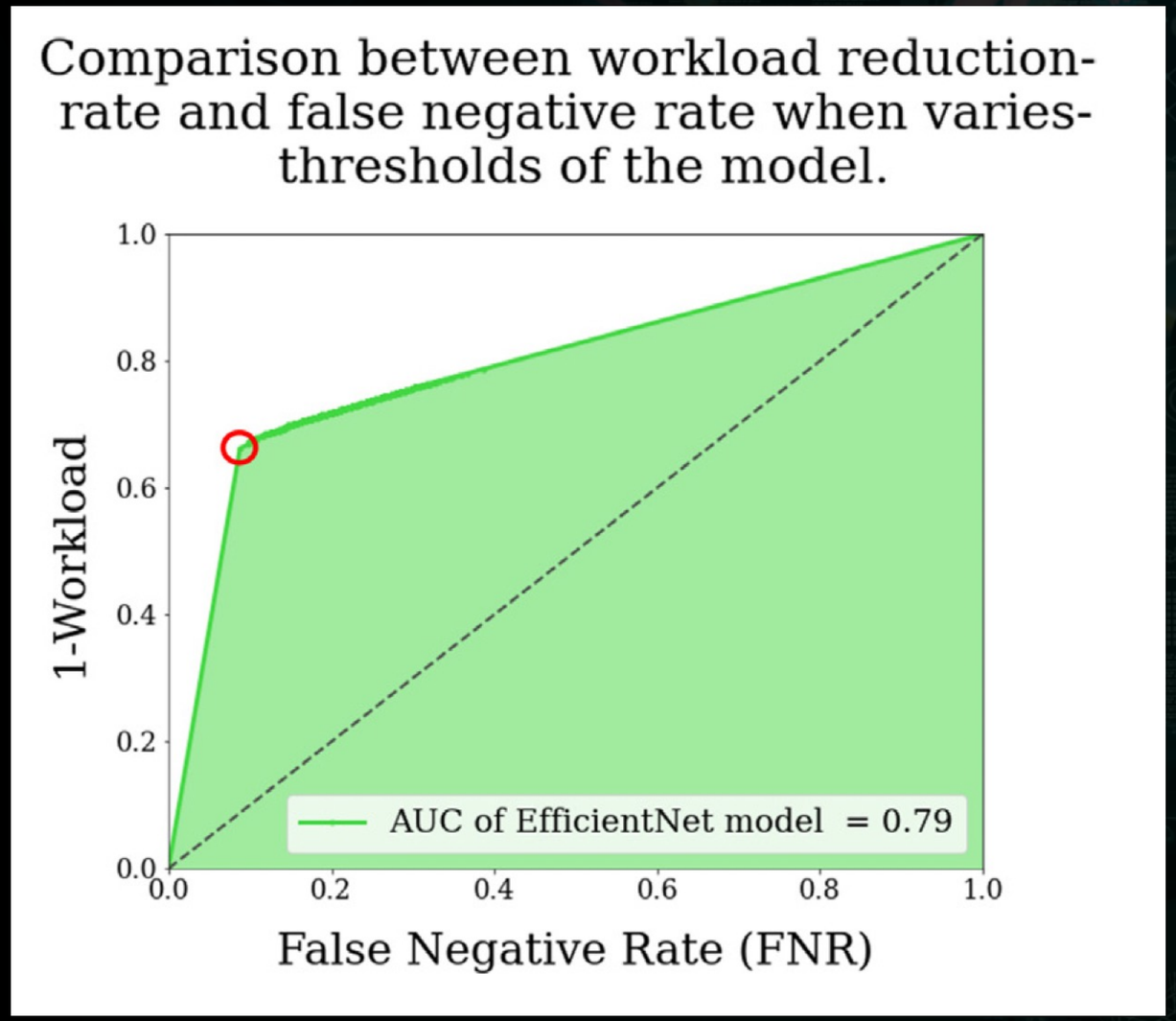
100% confidence normal

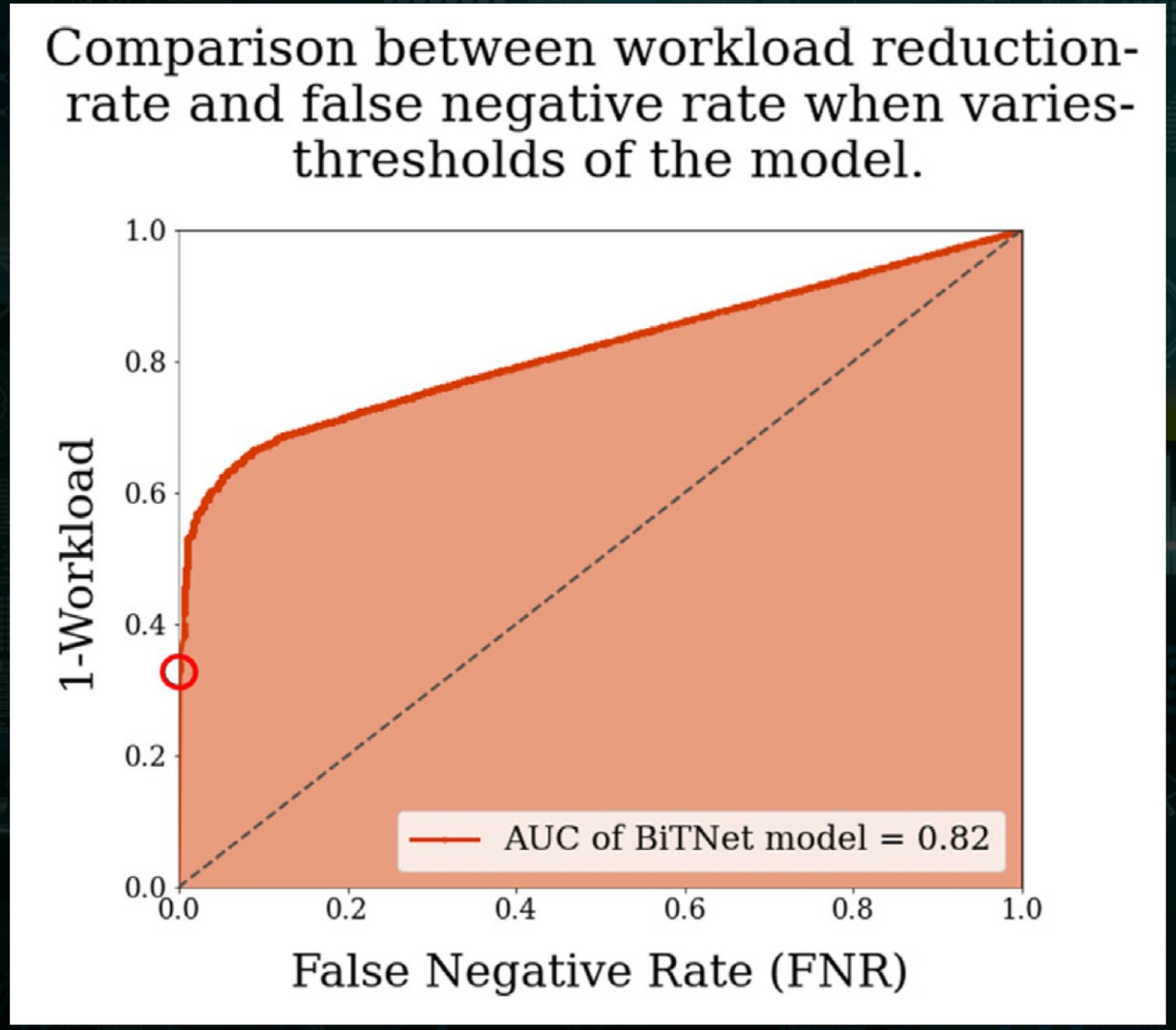
or

Otherwise

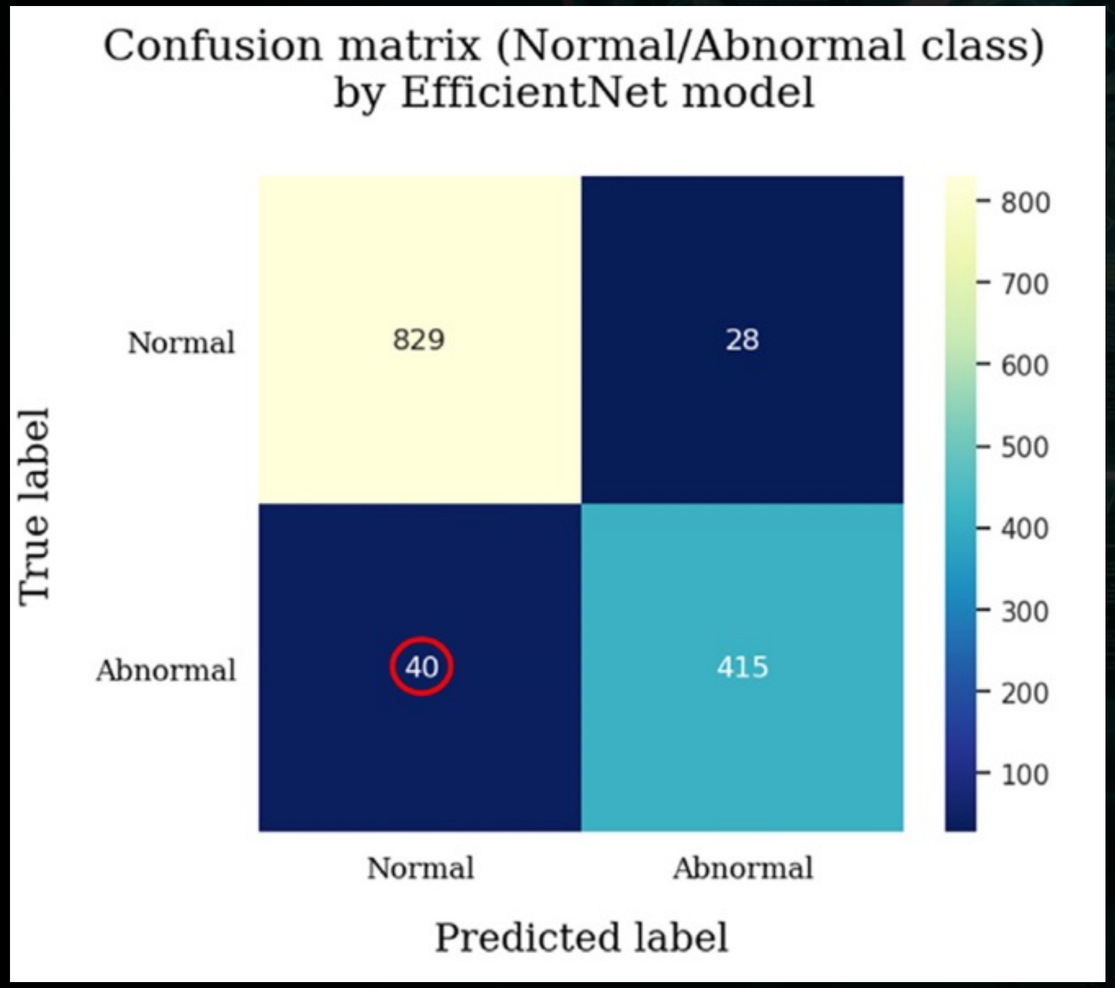
Assisting tool

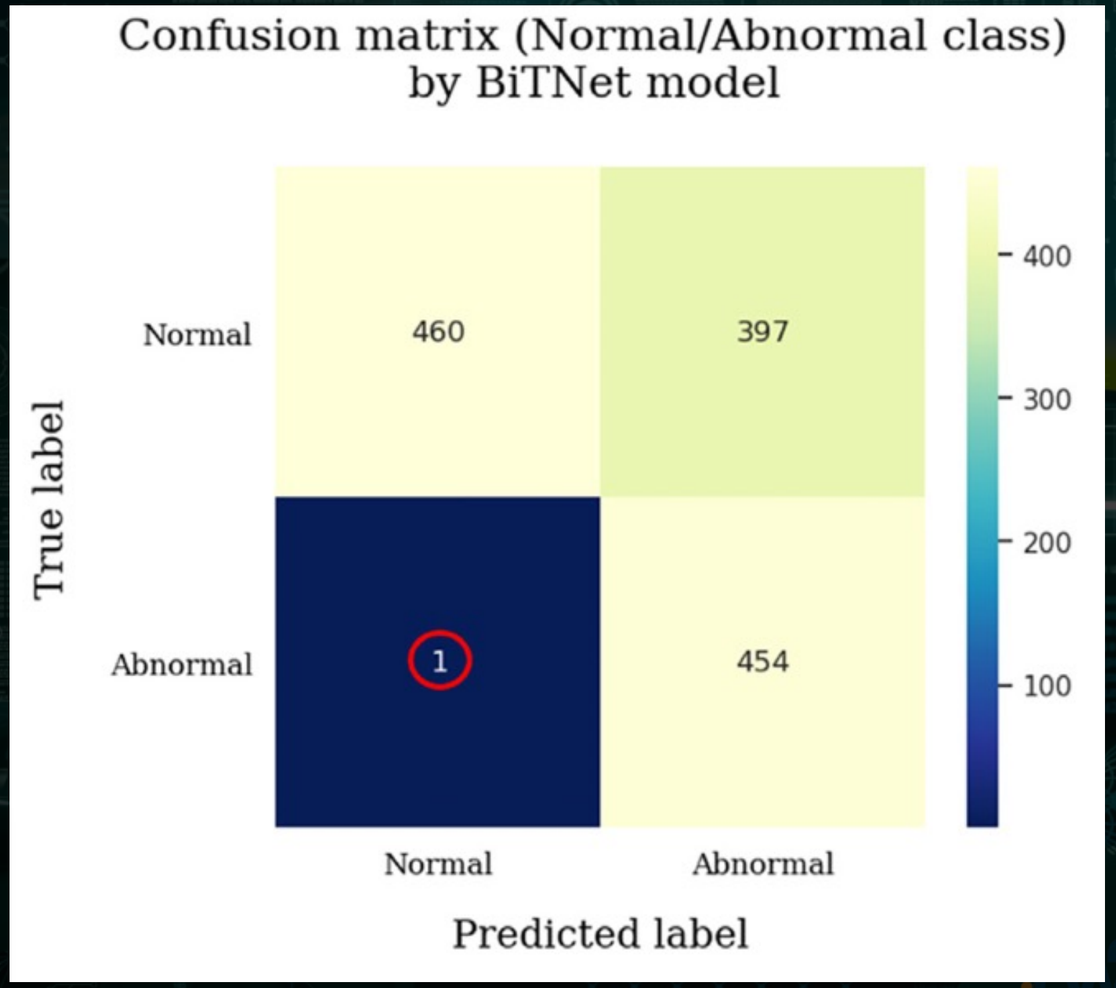
Auto Pre-screening





Auto Pre-screening





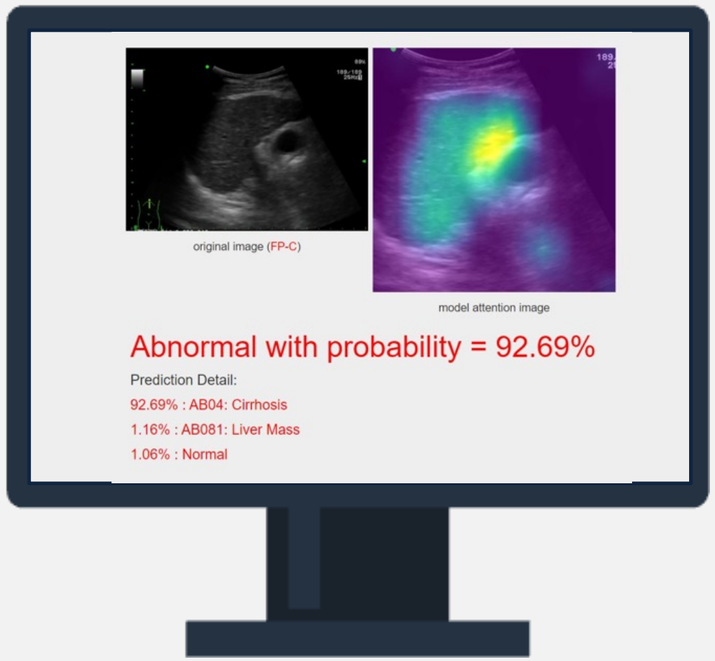
2nd Application

Predict 15 classes

+

eXplanable AI

Auto Pre-screening



Assisting tool

Assisting tool

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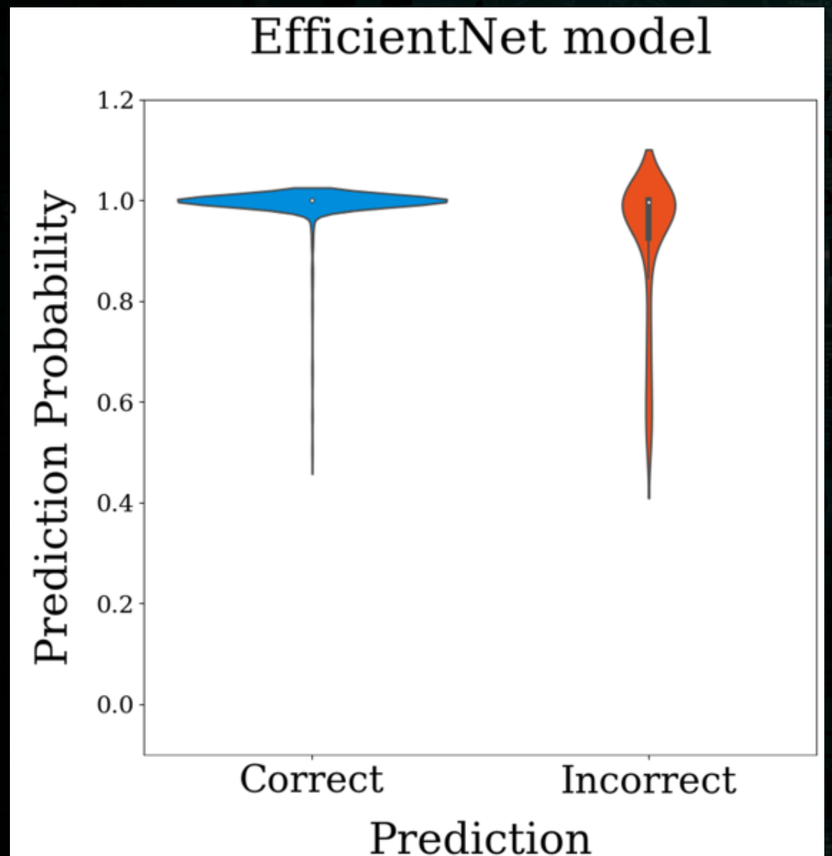

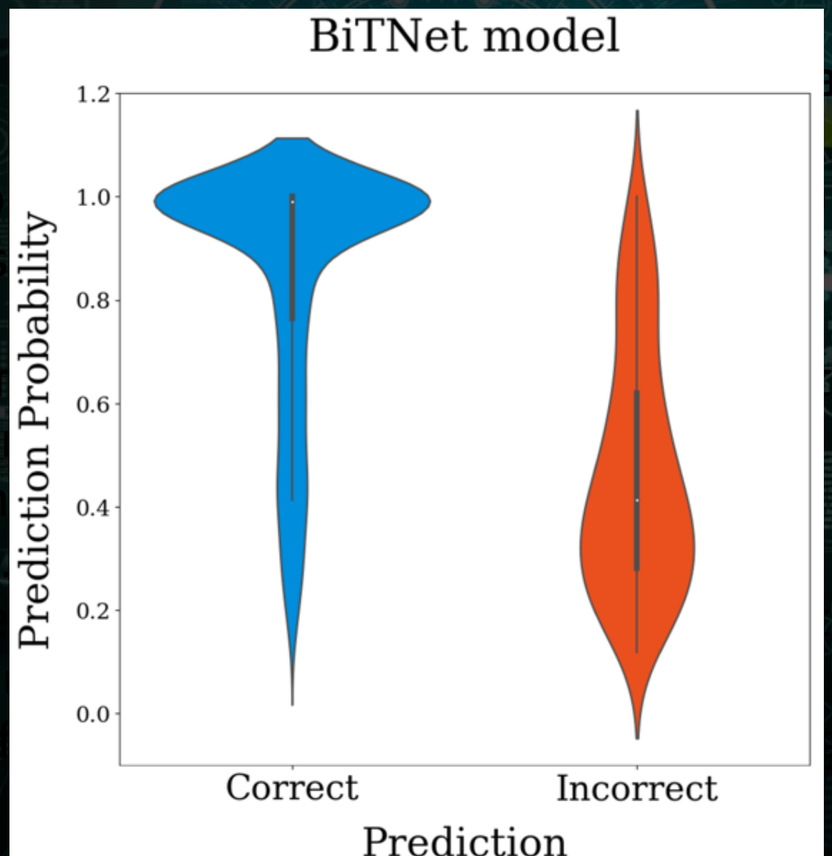

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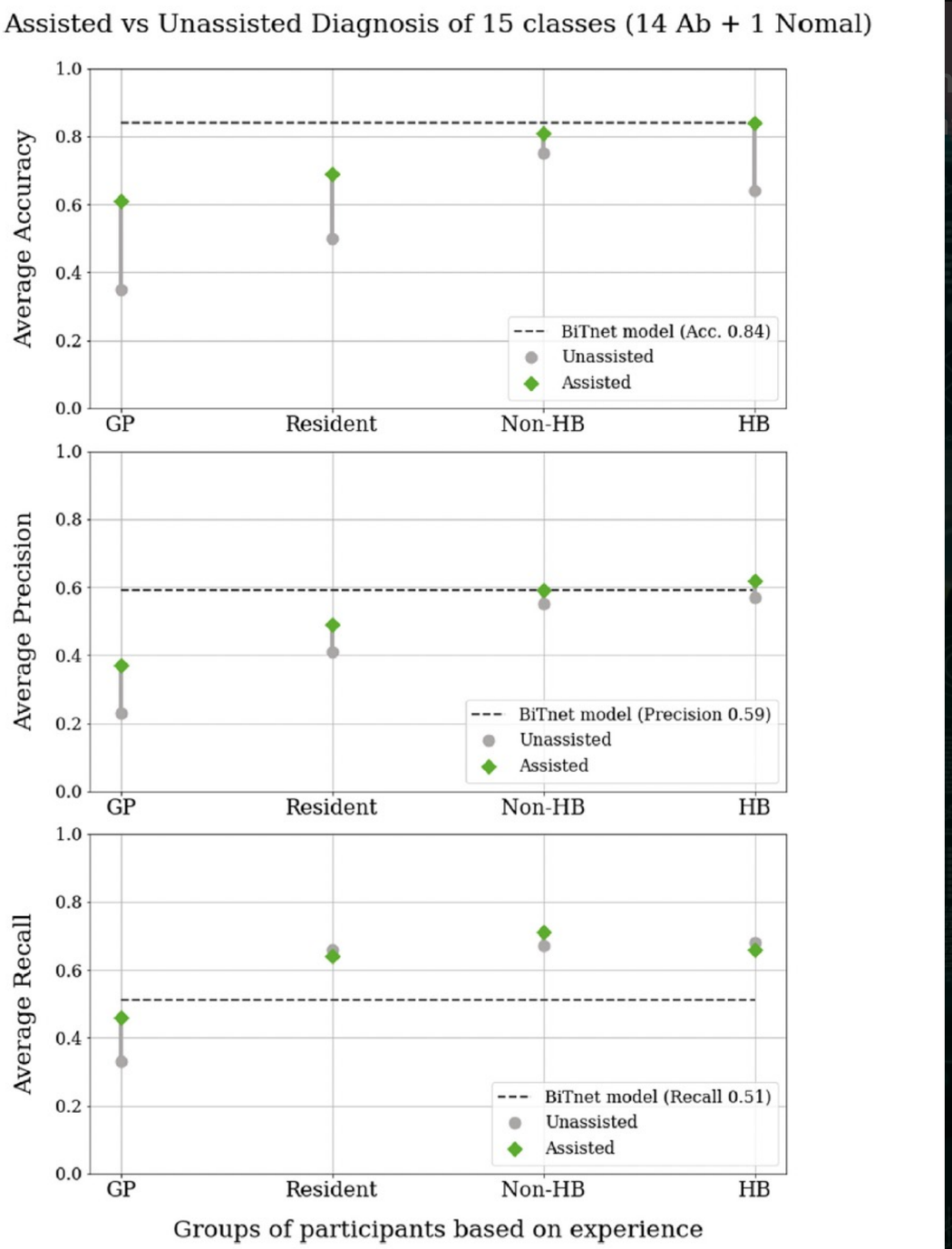
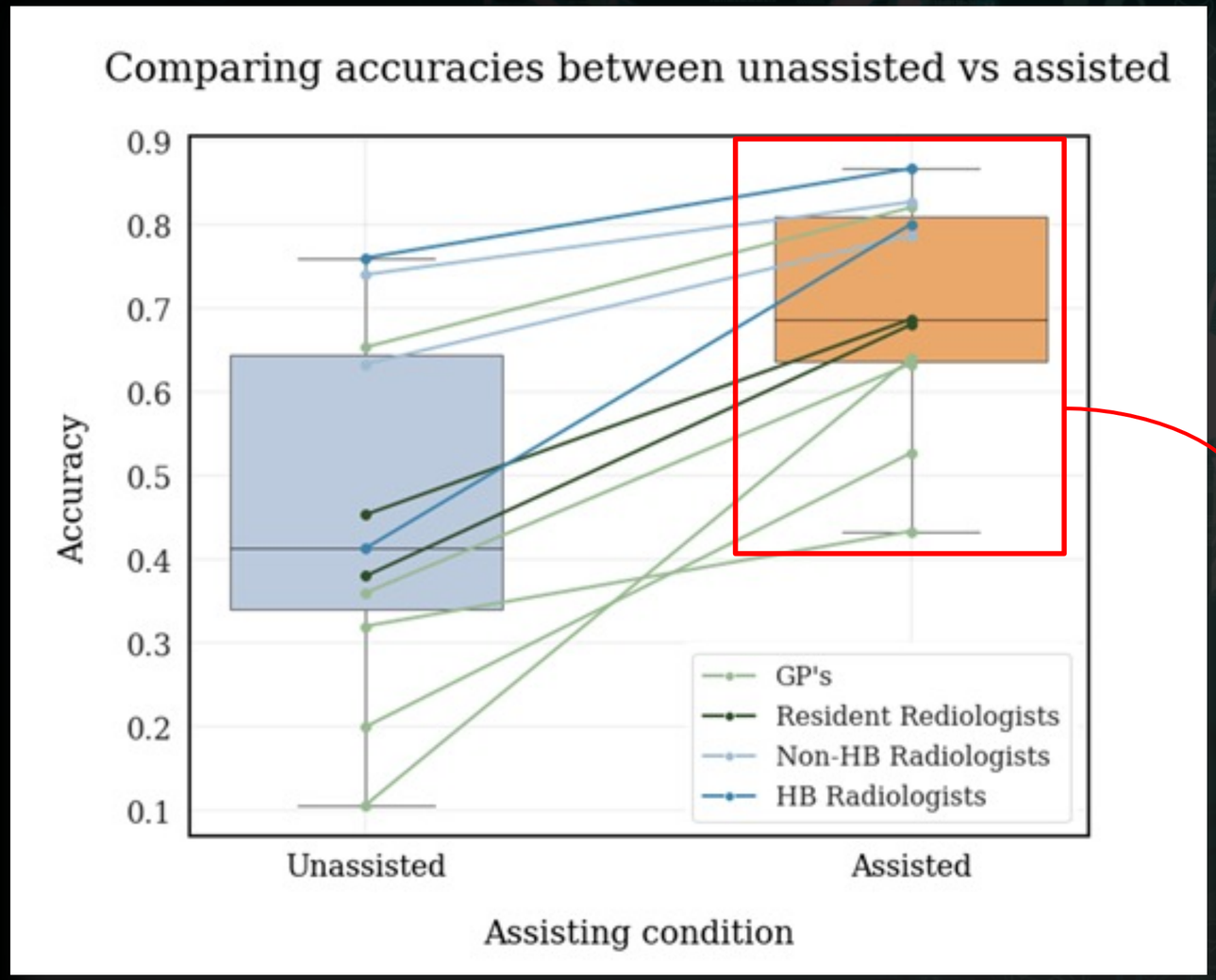


Fig. 10. Comparing assisted versus unassisted diagnosis among four different groups of participants on accuracy, precision, and recall.

Assisted

Assisting tool



increase overall's accuracy by 18%

increase GP's accuracy by 26%

Assisting tool

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Assisting tool

2. The **Paired Samples T-Test**

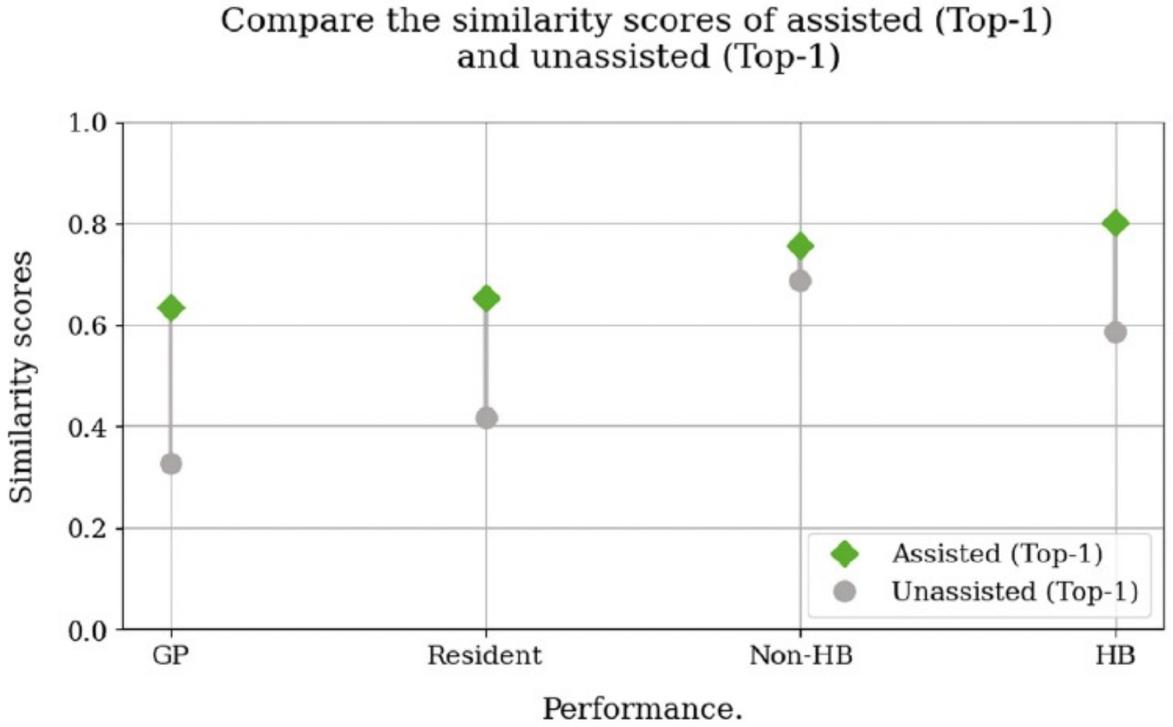

Fig. 11. Similarity score between the answer suggested by the assisting tool and the participant's final decisions, assisted vs. unassisted.

- 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.

Add a little bit of body text

Summary & Future

✓The first AI system in the world that screens CCA via ultrasound image

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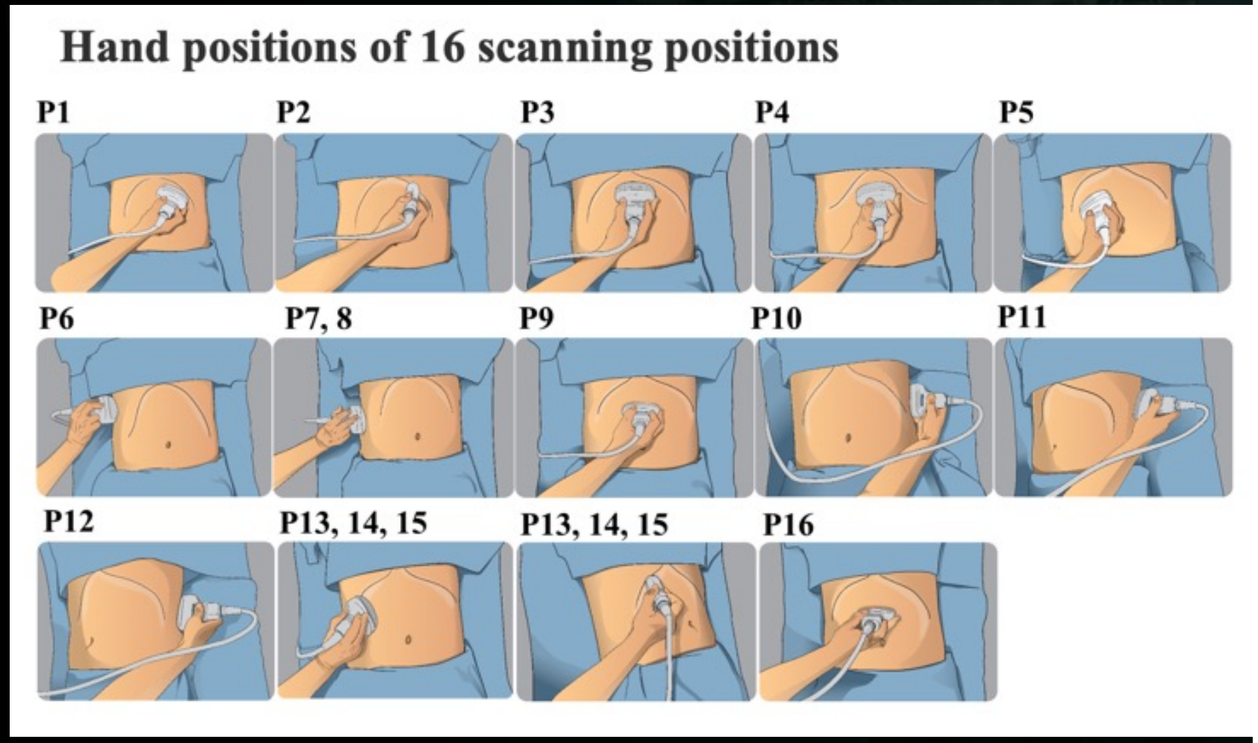
✓Diagnose 25 abnormalities in the human upper abdominal

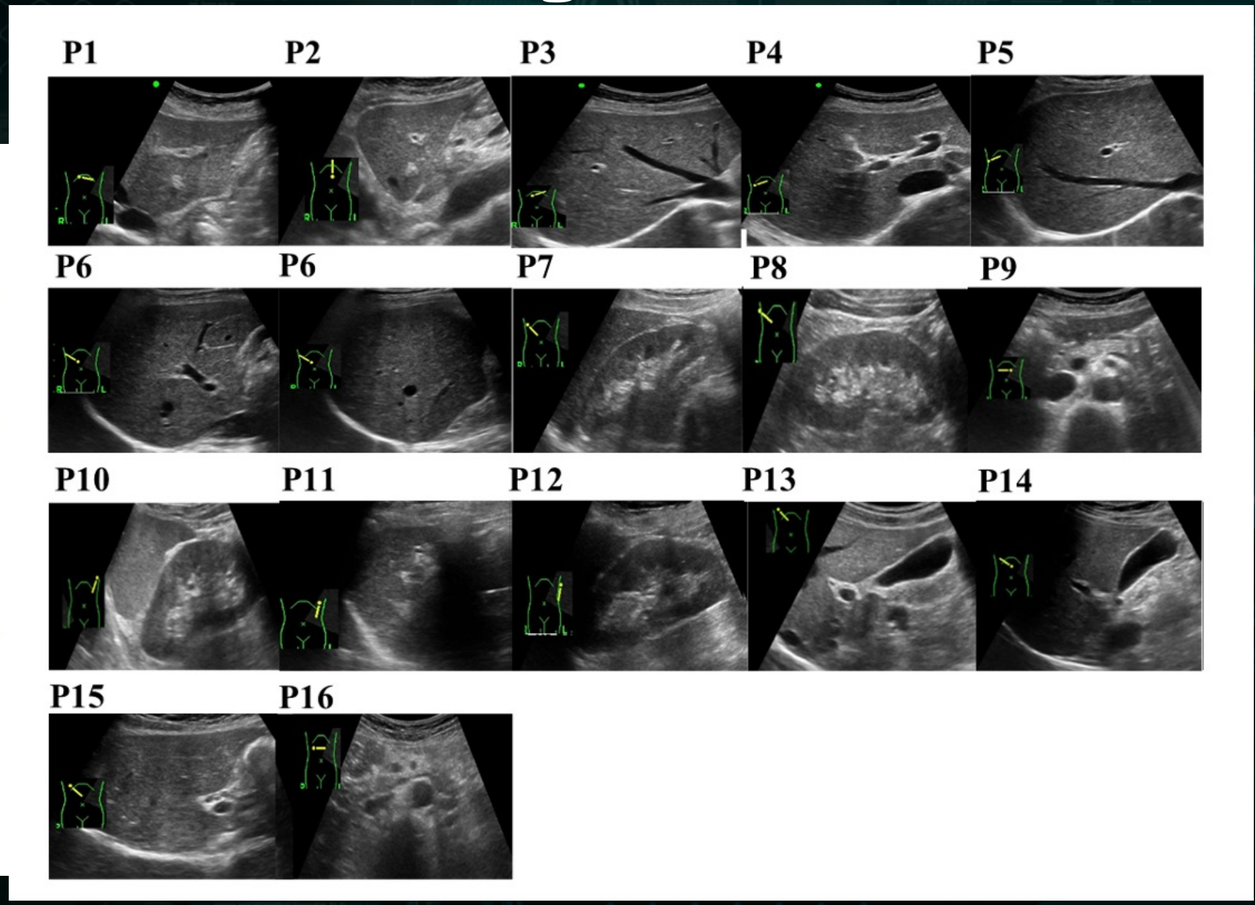
✓The first AI system in the world that screens CCA via ultrasound image

✓Diagnose 25 abnormalities in the human upper abdominal

✓Currently used in Srinagarind Hospital and 205 Affiliated hospitals

Scanning manual and training for the human upper abdominal ultrasound scanning **150 GP's** per year



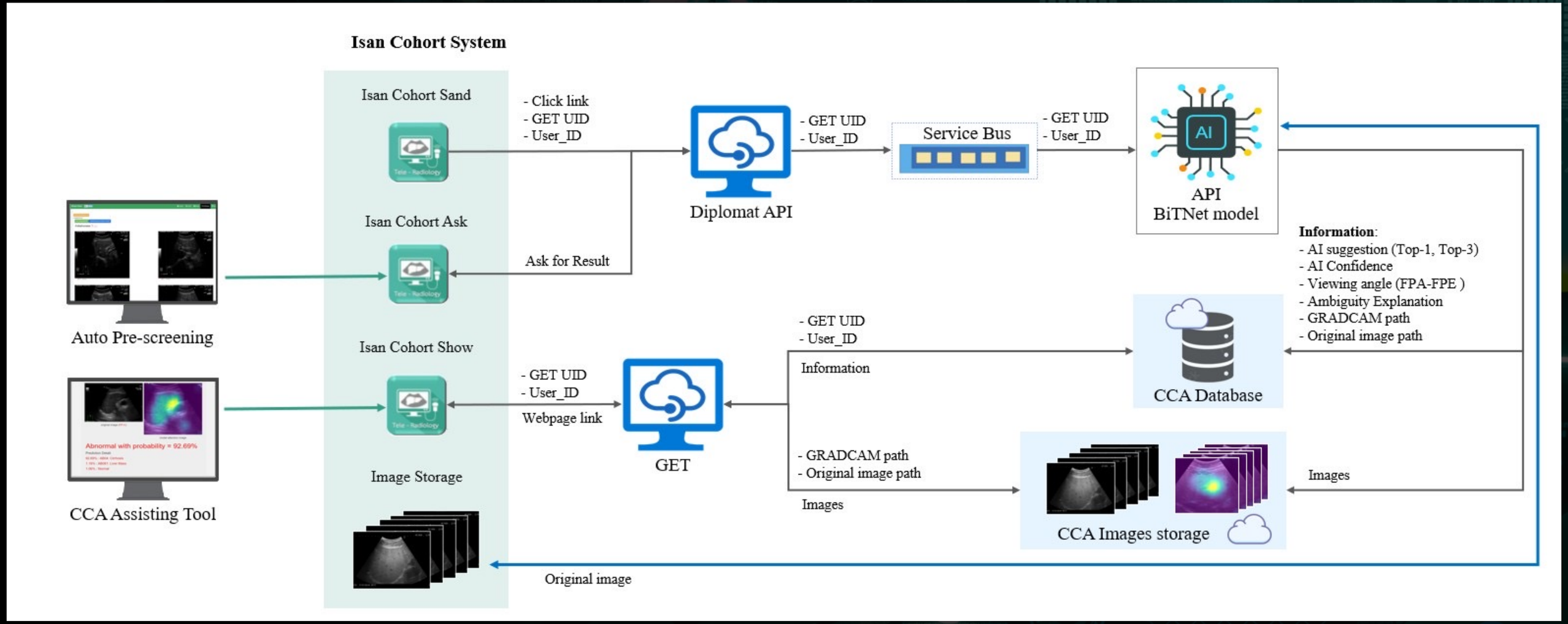


✓The first AI system in the world that screens CCA via ultrasound image

✓Diagnose 25 abnormalities in the human upper abdominal

✓Currently used in Srinagarind Hospital and 205 Affiliated hospitals

✓Cloud-based AI Services


Isan Cohort System
Isan Cohort Sand
Isan Cohort Ask
Isan Cohort Show
Image Storage
- Click link
- GET UID
- User_ID
Ask for Result
Diplomat API
- GET UID
- User_ID
Service Bus
- GET UID
- User_ID
AI
API
BiTNet model
Information:
- AI suggestion (Top-1, Top-3)
- AI Confidence
- Viewing angle (FPA-FPE)
- Ambiguity Explanation
- GRADCAM path
- Original image path
Auto Pre-screening
CCA Assisting Tool
Abnormal with probability = 92.69%
- GET UID
- User_ID
Webpage link
GET
- GET UID
- User_ID
Information
CCA Database
- GRADCAM path
- Original image path
Images
CCA Images storage
Images
Original image

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

First Runner-up Award (2021)
Service Design Category
from National Innovation Agency (Thailand)

Merit Award (2023)
Inclusion and Community Service Category
from Association of Thailand ICT Industry (Thailand)

Merit Award (2024)
ICT Category
from National Research Council Thailand

กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัยและนวัตกรรม
Ministry of Higher Education, Science, Research and Innovation

สำนักงานการวิจัยแห่งชาติ
NATIONAL RESEARCH COUNCIL OF THAILAND
วช.
NRCT

ASEAN DIGITAL AWARDS

30 Jan - 1 Feb 2024
Singapore

Team

Prof. Dr. Narong Khuntikeo

Prof. Dr. Nittaya Chamadol

Prof. Dr. Vallop Laopaiboon

Asst. Prof. Dr. Attapol Titapun

Asst. Prof. Dr. Arunnit Boonrod

Supranee Worapon

Asst. Prof. Dr. Thanapong Intharah

Dr. Prem Junsawang

Asst. Prof. Dr. Anchalee Techasen

Yupaporn Wanna

Kannika Wiratchawa

นโยบาย กระทรวงสาธารณสุข พ.ศ. 2567

ยกระดับ 30 บาท พลัส เพิ่มคุณภาพชีวิตประชาชน

1 โครงการพระราชดำริฯ/ เฉลิมพระเกียรติ/ ที่เกี่ยวเนื่องกับพระบรมวงศานุวงศ์

- โครงการเฉลิมพระเกียรติฯ 72 พรรษา
- โครงการราชกัณฑ์เป็นสุข
- โรงพยาบาลอัจฉริยะต้นแบบ (รพร./รพก.)
- สุขศาลาพระราชทาน

แก้ปัญหา

2 รพ.กทม. 50 เขต 50 รพ. และปริมณฑล

- เพิ่มการเข้าถึงบริการเขตเมือง
- รพ.ประชาชน, รพ.รัฐในกำกับ

3 สุขภาพจิต/ ยาเสพติด

- รพ.ใกล้บ้าน มีแผนกจิตเวชที่เข้าถึงได้
- ปรึกษาจิตแพทย์/ นักจิตวิทยา ผ่าน Telemedicine
- ดูแล บำบัด รักษา ยาเสพติดครบวงจร

4 มะเร็งครบวงจร

- ป้องกัน คัดกรอง รักษา ดูแล
- วัคซีนมะเร็งปากมดลูก
- มะเร็งท่อน้ำดี
- จัดตั้งทีม Cancer Warrior

5 สร้างขวัญและกำลังใจบุคลากร

- สื่อสาร สร้างความสัมพันธ์ บุคลากร ผู้ป่วย ญาติ
- สร้างขวัญกำลังใจ
- ก.สธ. ออกจาก กพ.

วางรากฐาน

6 การแพทย์ปฐมภูมิ

- นัดหมาย พบหมอ ตรวจเลือด รับยา หน่วยบริการใกล้บ้าน
- อนามัยโรงเรียน (ครู หมอ พ่อแม่)
- Smart อสม.
- การแพทย์ทางไกล เทคโนโลยีทุกที่ทุกเวลา

7 สาธารณสุขชายแดนและพื้นที่เฉพาะ

- สามจังหวัดชายแดนภาคใต้
- พื้นที่ชายแดน
- กลุ่มประชากรเฉพาะ

8 สถานชีวาภิบาล

- ดูแลผู้ป่วยติดเตียงและผู้ป่วยระยะสุดท้าย
- ดูแลผู้ป่วยที่บ้าน (Home Ward/ Hospital at Home)

9 พัฒนา รพช. แม่ข่าย

- พัฒนาศักยภาพ การตรวจวินิจฉัย และรักษา CT MRI
- ลดแออัด ลดรอคอย
- ระบบส่งต่อแบบไร้รอยต่อ
- Mobile Stroke Unit

สร้างเศรษฐกิจ

10 ดิจิทัลสุขภาพ

- บัตรประชาชนใบเดียว รักษาได้ทุกที่
- ประวัติสุขภาพอิเล็กทรอนิกส์
- รพ.อัจฉริยะ
- Virtual Hospital
- e-Service

11 ส่งเสริมการมีบุตร

- วาระแห่งชาติ "เพิ่มอัตราการเกิดของเด็กคุณภาพ"
- คัดกรองโรคหายากในทารกแรกเกิด

12 เศรษฐกิจสุขภาพ

- Blue Zone สร้างต้นแบบพื้นที่อายุยืน
- ศูนย์กลางการแพทย์มูลค่าสูง
- นวัตกรรมบริการและผลิตภัณฑ์สุขภาพ
- สร้างงาน สร้างอาชีพ

13 นักท่องเที่ยวปลอดภัย

- ยกระดับความปลอดภัย ด้านอาหาร สถานที่ ผู้ให้บริการ
- ยกระดับระบบเฝ้าระวังโรค และควบคุมโรคให้ทันสมัย ทันเวลา
- เพิ่มบริการการแพทย์ฉุกเฉิน สำหรับผู้ป่วยวิกฤต อย่างครอบคลุม

V.9 20/09/2566

นโยบาย
กระทรวงสาธารณสุข พ.ศ. 2567

ยกระดับ 30 บาท พลัส
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1 โครงการพระราชดำริฯ/ เฉลิมพระเกียรติ/ ที่เกี่ยวเนื่องกับพระบรมวงศานุวงศ์

- โครงการเฉลิมพระเกียรติฯ 72 พรรษา
- โครงการราชทัณฑ์ปันสุข
- โรงพยาบาลอัจฉริยะต้นแบบ (รพร./รพก.)
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2 เขต 50 รพ.

- รพ.ใกล้บ้าน มีแผนกจิตเวชที่เข้าถึงได้
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3 ยาเสพติด

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- วัคซีนมะเร็งปากมดลูก
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- สร้างขวัญกำลังใจ
- ก.สธ. ออกจาก กพ.

แก้ปัญหา

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- Smart อสม.
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สาธารณสุขชายแดนและพื้นที่เฉพาะ 7

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- ระบบส่งต่อแบบไร้รอยต่อ
- Mobile Stroke Unit

วางรากฐาน

ดิจิทัลสุขภาพ 10

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- คัดกรองโรคหายากในทารกแรกเกิด

เศรษฐกิจสุขภาพ 12

- Blue Zone สร้างต้นแบบพื้นที่อายุยืน
- ศูนย์กลางการแพทย์มูลค่าสูง
- นวัตกรรมบริการและผลิตภัณฑ์สุขภาพ
- สร้างงาน สร้างอาชีพ

นักท่องเที่ยวปลอดภัย 13

- ยกระดับความปลอดภัย ด้านอาหาร สถานที่ ผู้ให้บริการ
- ยกระดับระบบเฝ้าระวังโรค และควบคุมโรคให้ทันสมัย ทันเวลา
- เพิ่มบริการการแพทย์ฉุกเฉิน สำหรับผู้ป่วยวิกฤต อย่างครอบคลุม

สร้างเศรษฐกิจ

V.9 20/09/2566

Future

Model	Testset	Performance (15AB)			
		Acc.	Prec.	Recall	F1-scores
BiTNet	Lab Test (1312)	0.87	0.82	0.61	0.82
	Field Test (807)	0.66	0.91	0.66	0.76
BiTNet + Prior knowledge	Lab Test (1312)	0.87	0.87	0.87	0.86
	Field Test (807)	0.84	0.89	0.84	0.86

Future

Even **Bigger** Biliary Tract Ultrasound Dataset (V2)

- 25,676 cases
- 228,177 images
- 10 years of data

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

Add a little bit of body text

Workshop

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https://kku.world/pmubbitnet

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ข้ามพรมแดน








สร้างคน
ข้ามพรมแดน

E-SAN Thailand Coding & AI Academy
ESAN
Thailand Coding & AI
Academy

คณะศึกษาศาสตร์ มหาวิทยาลัยขอนแก่น
FACULTY OF EDUCATION KHON KAEN UNIVERSITY
1968

มหาวิทยาลัยขอนแก่น

สอวช
สำนักงานสภานโยบายการอุดมศึกษา
วิทยาศาสตร์ วิจัย
และนวัตกรรมแห่งชาติ

INET


THAI
PROGRAMMER

SST
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The Asia Foundation

EVER

BOTNOI
GROUP

CODE COMBAT

ClusterKit

DOMECLOUD

Let's Code
Thailand

DMAP
DIGITAL MAKERS
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