

# A smartphone-enabled progressive web application that supports machine learning education

Short Talk@COBLET2022

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# NEW CS PHDS (% of TOTAL) in the UNITED STATES by SPECIALITY, 2020

Source: CRA Taulbee Survey, 2021 | Chart: 2022 AI Index Report

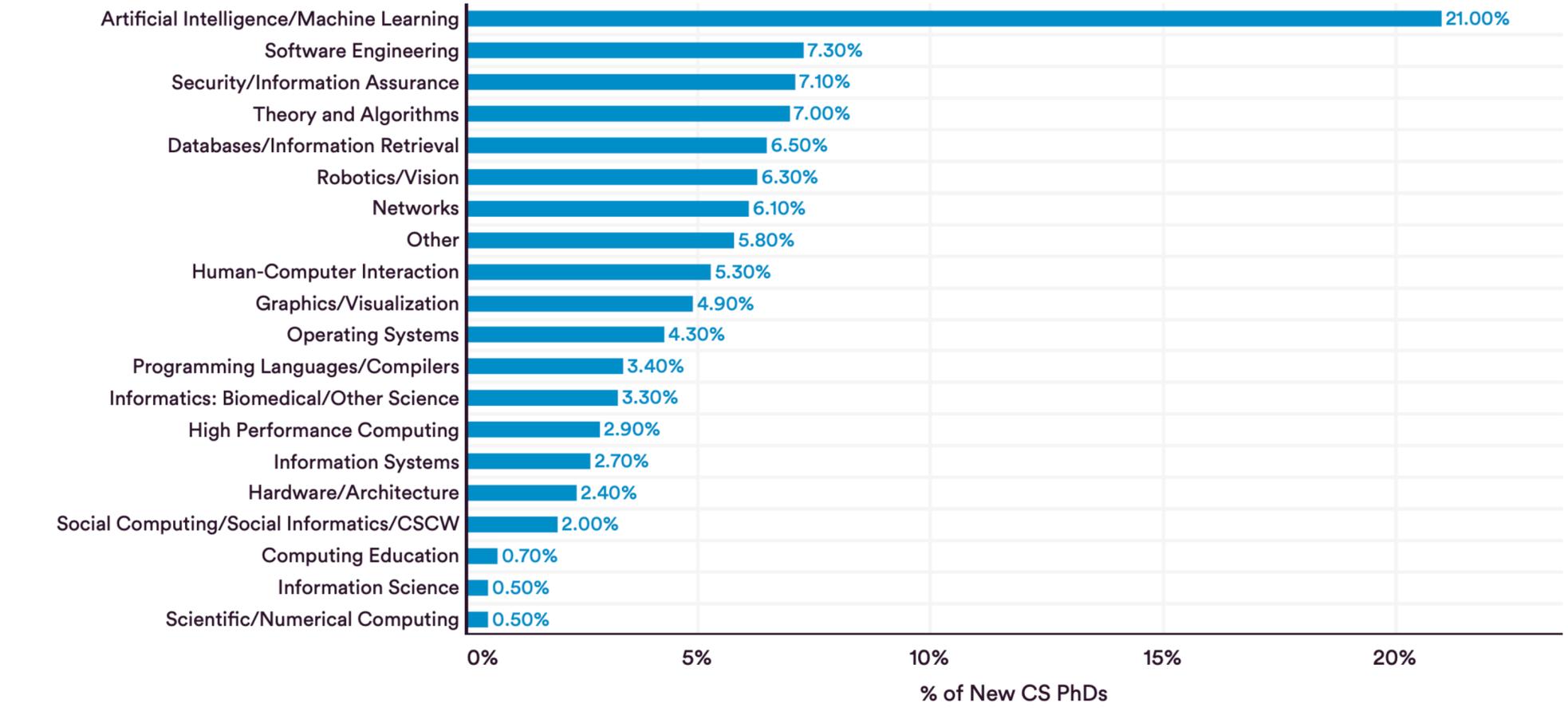


Figure 4.4.2

Source: AI Index Report 2022, Chapter 4: The Economy and Education.

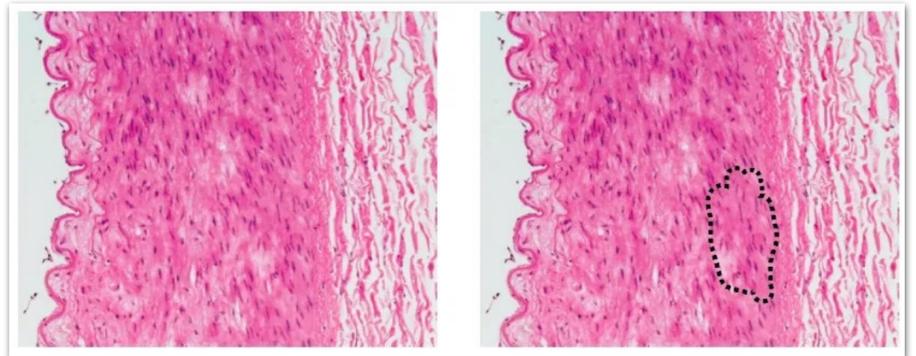
B

# AI x Finance



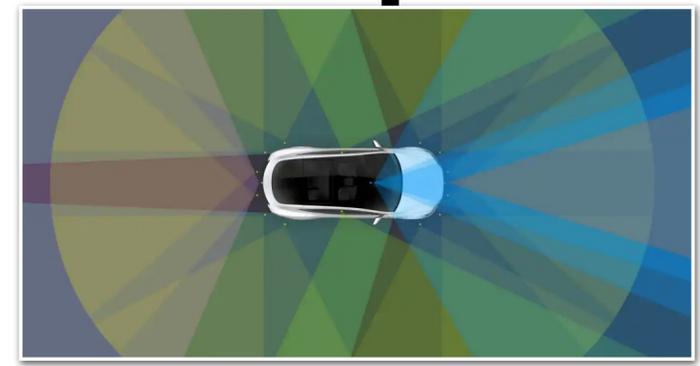
Source: <https://www.fintechweek.hk>

# AI x Medicine



Source: <https://sitn.hms.harvard.edu/flash/2019/artificial-intelligence-in-medicine-applications-implications-and-limitations/>

# AI x Transportation



Source: <https://www.tesla.com/autopilot>

**Ho Lab**  
>Bioinformatics and Digital Health

A

C



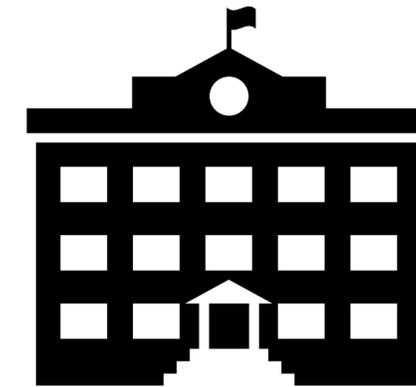
# The High Cost of Delivery

Challenge of applying AI education in k-12/interdisciplinary settings



**Prior experience in coding**

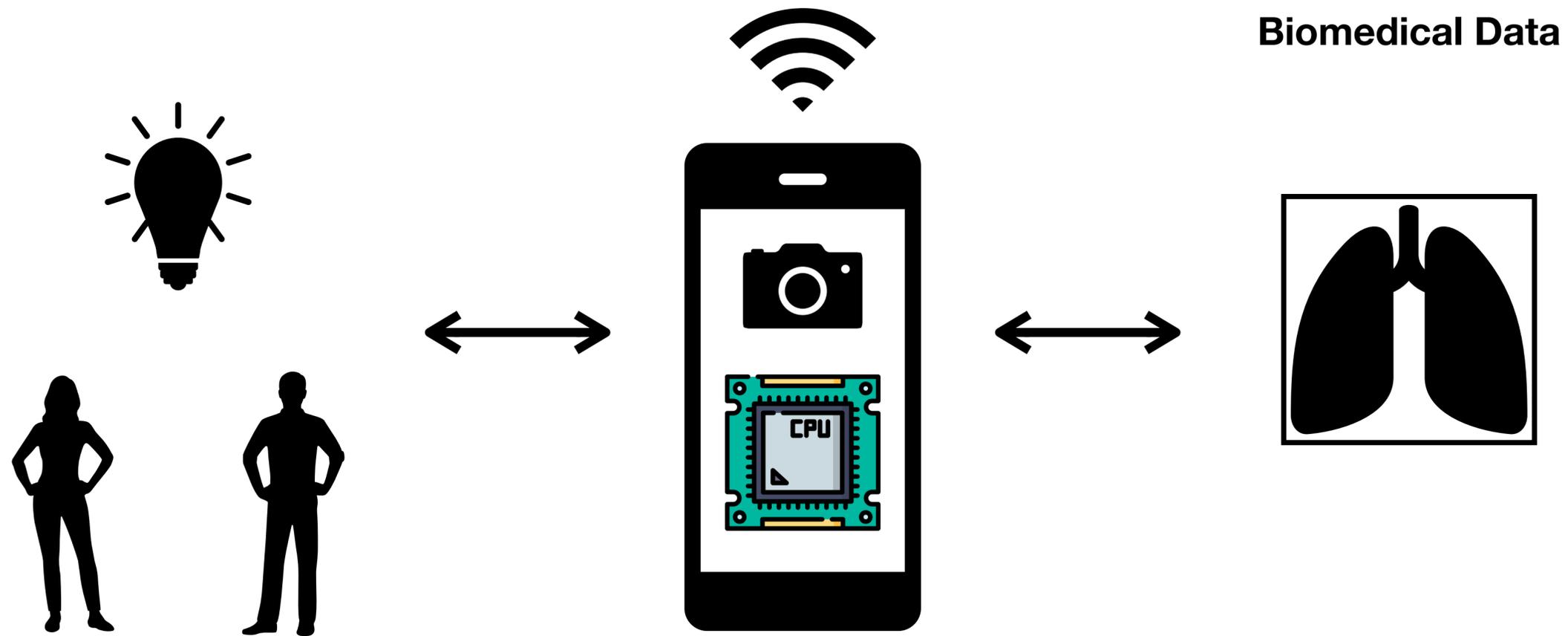
**Often find the concept of AI quite mysterious<sup>1</sup>**



**Expensive equipments**

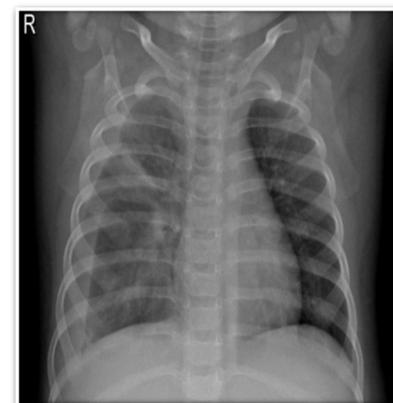
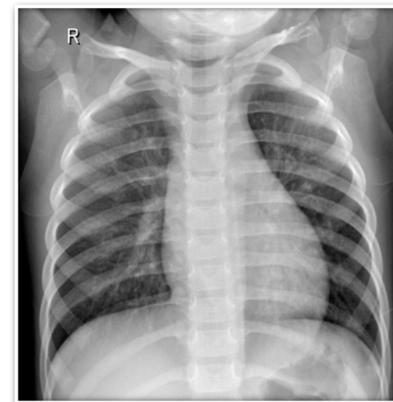
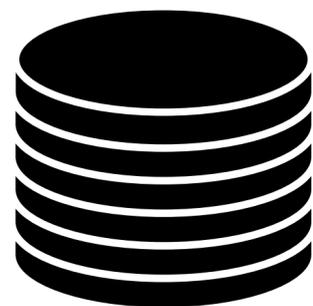
**Often not well equipped to thoroughly explain key concepts of AI<sup>1</sup>**

1.Ho JWK, Scadding M. Classroom Activities for Teaching Artificial Intelligence to Primary School Students.



**Feature I: Activities can be arranged with limited resource**  
**Feature II: Code-free machine learning introductory education**

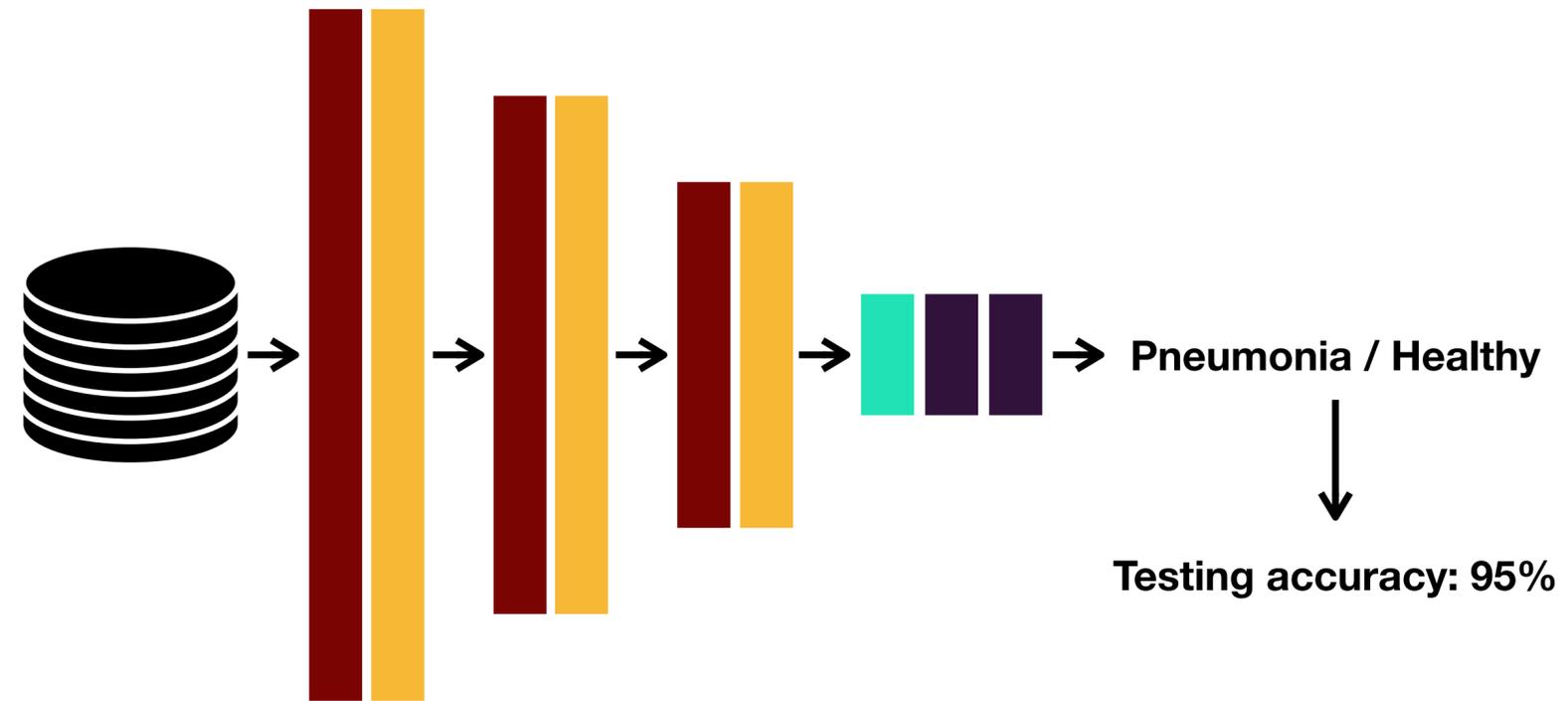
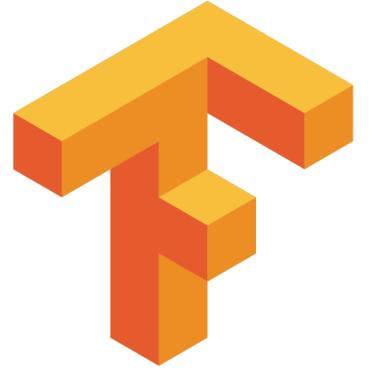
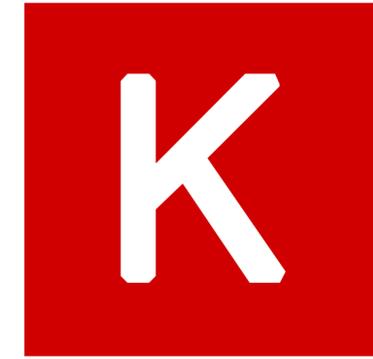
# kaggle™



Source: <https://www.kaggle.com/datasets/paultimothymooney/chest-xray-pneumonia>

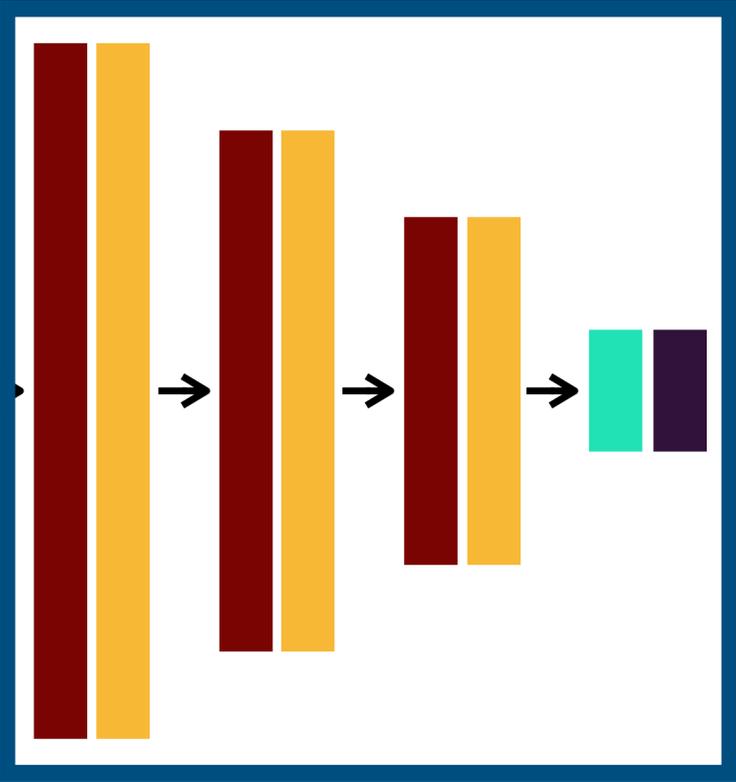
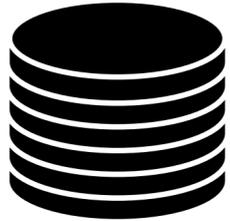
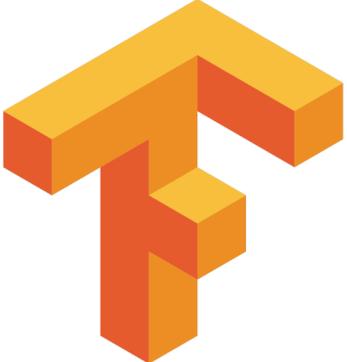
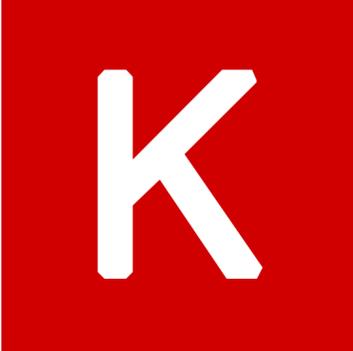
Kermayn DS, Goldbaum M, Cai W, Valentim CCS, Liang H, Baxter SL, et al. Identifying Medical Diagnoses and Treatable Diseases by Image-Based Deep Learning. Cell. 2018 Feb;172(5):1122-1131.e9.

Python environment



Conv2D MaxPooling2D Flatten Dense

Python environment



Make the testing accuracy ~ 50%

Freeze parameters in other layers

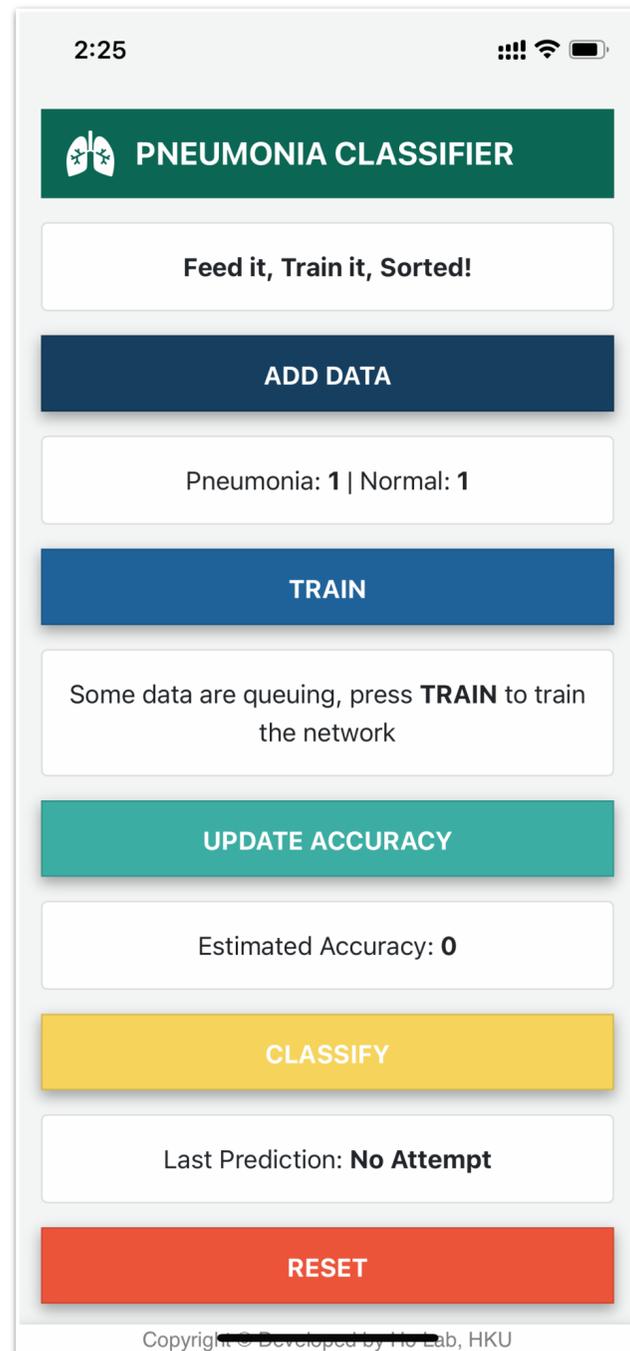


Randomise the parameters in the last layer



## Browser environment

Access the app via browser by scanning a QR code



Students input data (and labels) by taking photos



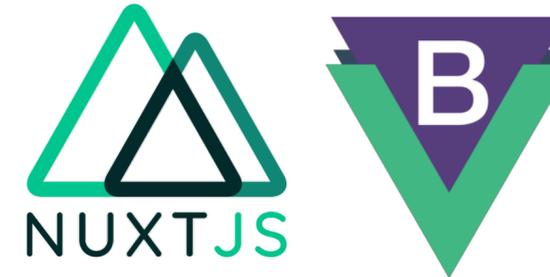
~10 new samples will be enough to retrain the model



Get an accuracy on build-in withheld testing set

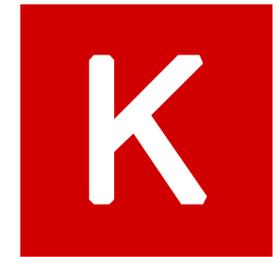


Play with students' neural network trained by themselves

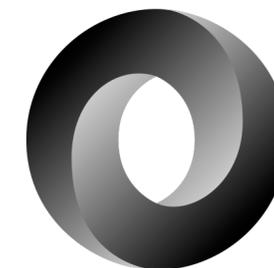


Construct the PWA through open source framework Nuxt and front-end library BootstrapVue

Pre-trained Keras model (Also partially randomised)

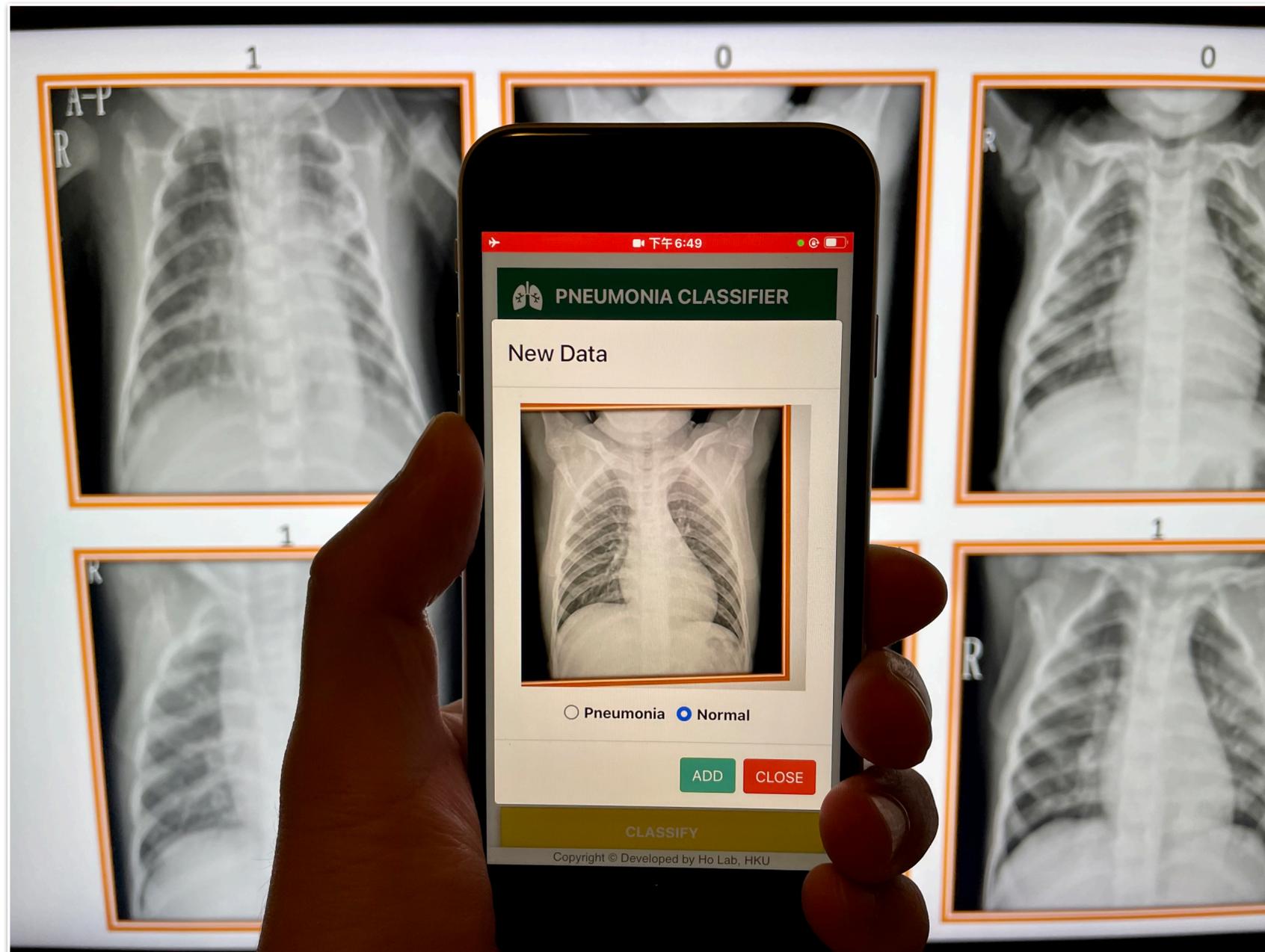


TensorFlow.js Converter



.json file and binary weight files





## Inspire students to think ...

- The role of data and labels (Supervised machine learning)
- The performance of the model VS
  - The amount of data
  - The quality of data
  - The quality of labels
- Overfitting?
- .....

Multiple workshops for medical and k-12 students were held

# Acknowledgement & Contact

Shichao Ma<sup>1,2</sup>, Weizhong Zheng<sup>1,2</sup>, Emily Nicola Stables<sup>1</sup>, Victoria Anna Yeo<sup>1</sup>,  
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**Q&A**