THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON, DC

# IDENTIFYING TYPES OF INTRACRANIAL HERMORRHAGE

## Machine Learning 2 – Deep Learning


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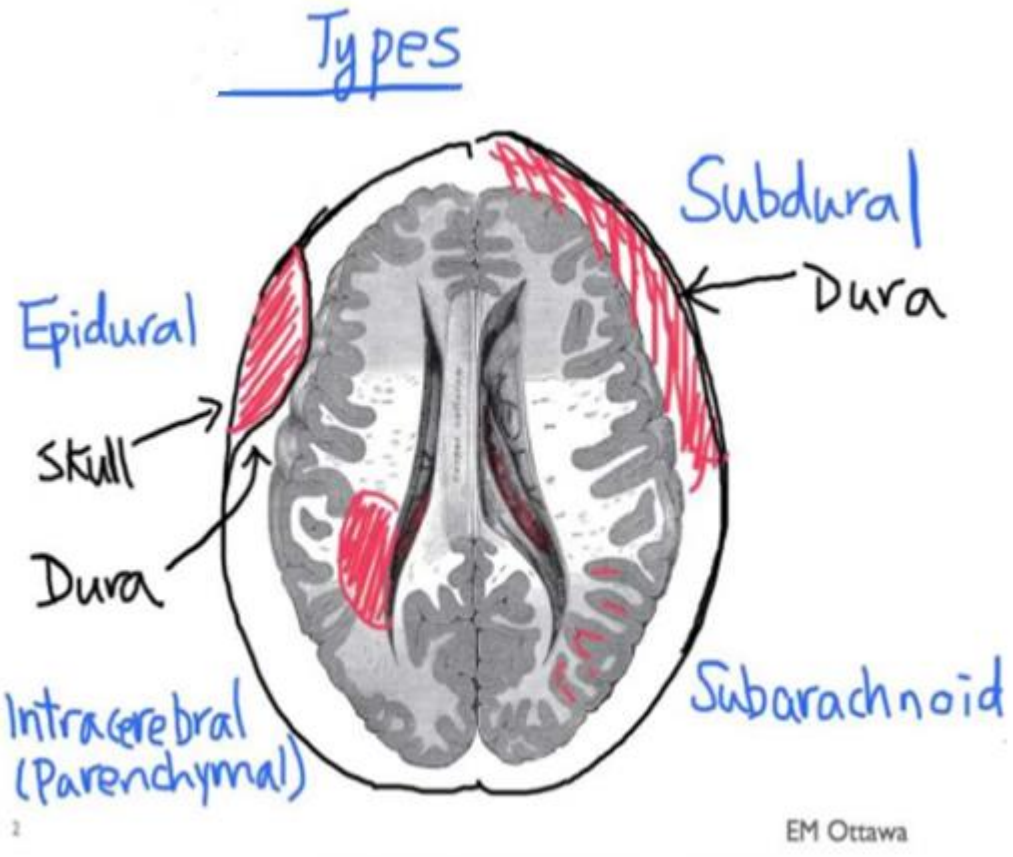
# Topics to cover

1. Introduction
2. Summary of Data
3. Data Preprocessing
4. Models
5. Results
6. Conclusion

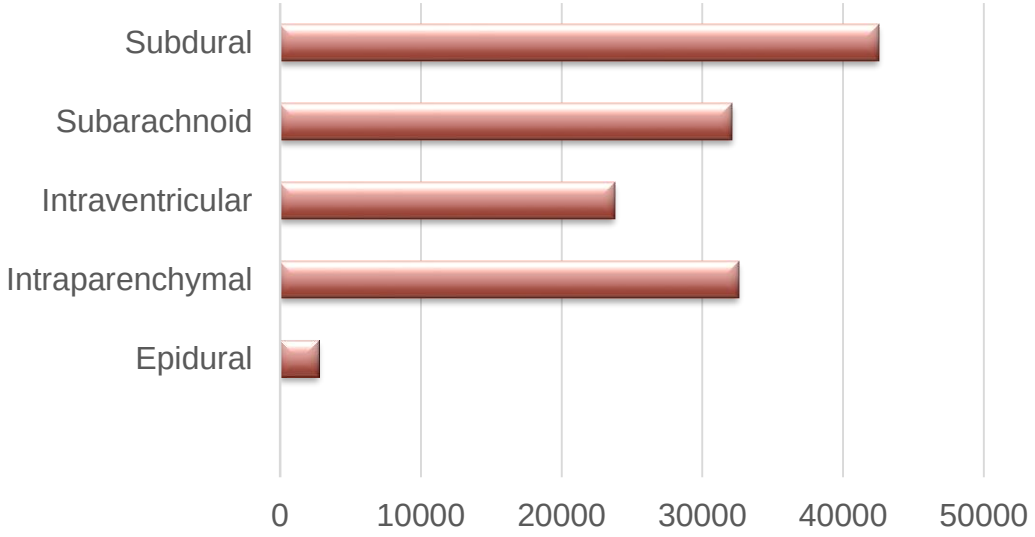
# Introduction

- Intracranial hemorrhage is a condition where some type of bleeding occurs inside of the skeletal structure of the head.
- This bleeding is caused by a rupture of a vessel in the brain which can interrupt the flow of oxygen and cause brain damage.
- Types: intraparenchymal, intraventricular, subarachnoid, subdural and epidural.

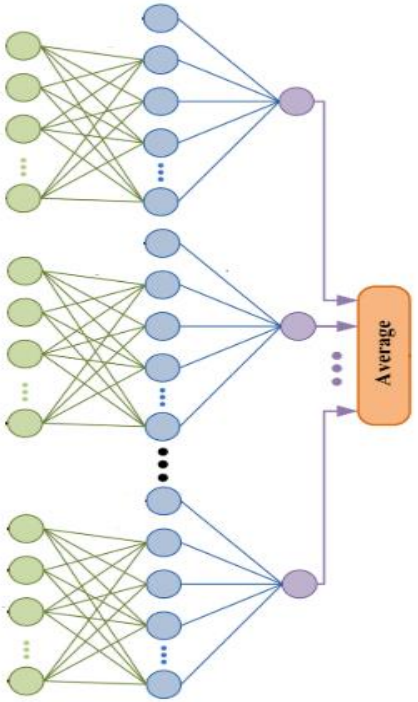


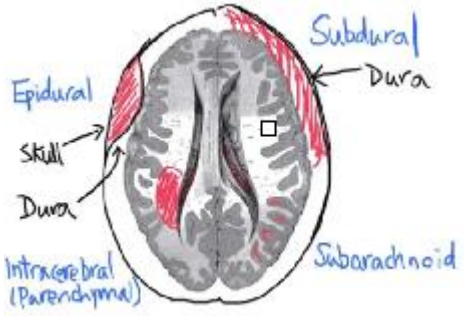
# Summary of Data

- Information was retrieved from Kaggle
- About 600,000 computed tomographies of the brain
- Image format DICOM
- 5 types of intracranial hemorrhage
- Imbalanced labels




# Our Approach

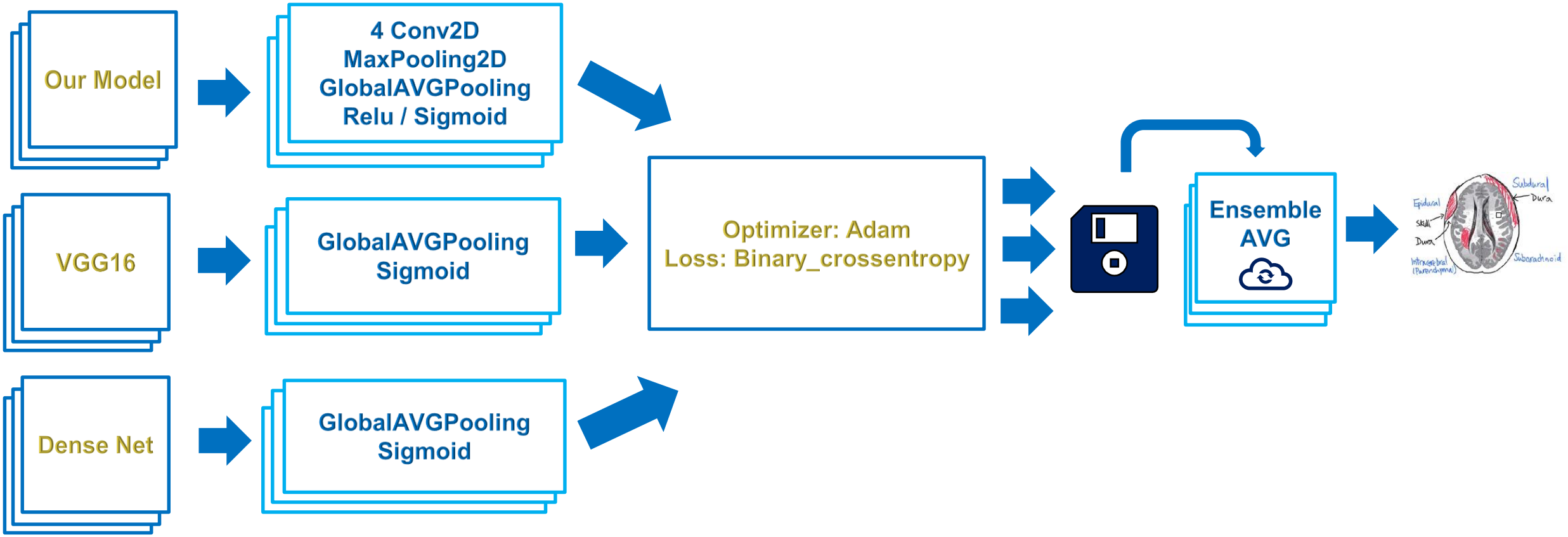

- Get data from Kaggle
- DCM images
- Windowing
- Transform images and resize

- Image data generator

- Model from Scratch
- Transfer Learning (VGG16/Dense net)
- Ensemble Model

- Predict

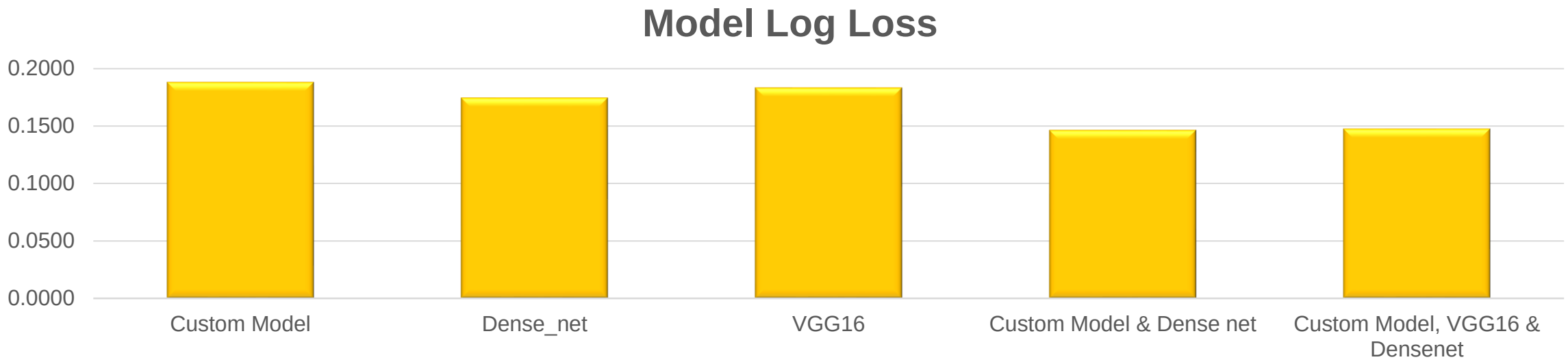
# Our Models


Our Model
4 Conv2D
MaxPooling2D
GlobalAVGPooling
Relu / Sigmoid
VGG16
GlobalAVGPooling
Sigmoid
Dense Net
GlobalAVGPooling
Sigmoid
Optimizer: Adam
Loss: Binary_crossentropy
Ensemble
AVG
Epidural
Subdural
Skull
Dura
Dura
Intracerebral
(Parenchyma)
Subarachnoid

# Results

- Ensemble Model with two models and  five epochs:

| Name | Submitted | Wait time | Execution time | Score |
|---|---|---|---|---|
| submission.csv | just now | 0 seconds | 6 seconds | 0.59109 |



# Conclusions

- Although the model does not look terrible, it will not be able to predict this type of illness accurately. Therefore, the model needs to be improved.
  - ❑ Change the loss function to custom loss
  - ❑ Instead of using pretrained models in ImageNet, we use Nifty Net which is specialized in medical images
  - ❑ Try other ensemble models such as voting or stacking
  - ❑ Try combination of architectures like MLP and LSTM or others

# NO QUESTIONS