

# Machine Learning Project - Hand-To-Age ( $H_2A$ )

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MSc Health Data Analytics & Machine Learning

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## Project description

**Data source:** Radiology Society of North America(RSNA) and Radiology Informatics Committee (RIC). Available in Kaggle. Images gathered by several

**Dataset:** 12,621 images of individuals aged between 1 month and 19 years (228 months) old. Gender and age available for all fo them.

**Context:** Images gathered for the Pediatric Bone Age ML Challenge.

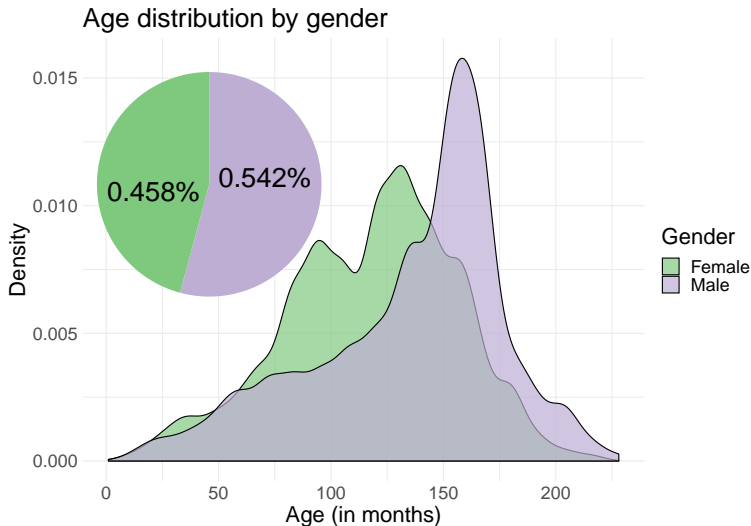
# Aim(s) of my study

***Supervised question #1:*** How close can we estimate age from images only?

***Supervised question #2:*** Can gender be derived from the image?

***Unsupervised question:*** Can clustering algorithm accurately group together individuals by gender

# Population statistics



# The images

X-ray images of each individuals' hand (one or two - information not available)

- ▶ Difficulties:
  - ▶ Varying resolution (plot)
  - ▶ Varying contrast
  - ▶ Some scanned and some digital images
- ▶ Advantages:
  - ▶ Standardised medical images

Let's have a look at some pictures!

# Raw Images

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Methods: Deep  
Learning for  
Computer Vision

Slide with R  
Output

# Methods: Deep Learning for Computer Vision



# Data processing

## Data split

10,000 Images for training, 2611 for testing/validation, no cross-validation because of computational cost and large amount of training data. Overfitting dealt with by regularisation

## Image processing

- ▶ Rescaled and Center Cropped Images:
- ▶ Centering and scaling features (pixel values)
- ▶ Contrast adjustment

# Network of choice: ResNet

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# Further hyperparameters

- ▶ Learning rate  $\alpha$
- ▶ Optimizer: SGD, Adam
- ▶ Learning rate scheduler: StepLR, Exponential LR, ReduceONPlateauLR, CyclicLR
- ▶ Image normalisation: batch vs instance
- ▶ Networks' depth (# of layers)
- ▶ Regularisation #

## Slide with R Output

# POTATO

```
summary(cars)
```

##	speed	dist
##	Min. : 4.0	Min. : 2.00
##	1st Qu.:12.0	1st Qu.: 26.00
##	Median :15.0	Median : 36.00
##	Mean :15.4	Mean : 42.98
##	3rd Qu.:19.0	3rd Qu.: 56.00
##	Max. :25.0	Max. :120.00

# Slide with Plot

