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# Dog Breed Identification

—— CSYE 7200 Final Project Team 10 ——  
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# Goals

- This app aims at helping users to identify dog's breed based on their uploaded image;
- System would list the top three most possible breeds for that dog, according to dog's face inside image;
- System could also detect human faces within the images and mark them out;
- This system would be useful for classifying photos into categories based on different breeds of dog.

# Use Case

## General users:

By uploading image to app, they can

- **Identify Dog's Breed:** app will help identify image with dog and give Top 3 guesses of dog's breed along with probability.
- **Recognize Human Face:** app can also mark all human faces inside the image.

## Business users:

By sending large amount of photos, they can

- **Classify Images:** app can differentiate images with dog from those without and classify the images into categories according to dog's breed.

# Methodology

- **Data Preprocessing:** OpenCV -- Mat, Grey Scale, Equalize Histogram
- **Facial Detection:** Facial Keypoint Localization
- **Re-Training:** CNN (Convolutional Neural Network) based on Tensorflow
- **Visualization:** Zeppelin

# Data Source

- Mainly from Kaggle's competition -- "Dog Breed Identification"; including training dataset (1,000+ images)  
<https://www.kaggle.com/c/dog-breed-identification/data>
- Additional data sources would come from several pets websites.  
eg: <http://www.akc.org/dog-breeds/>



# Criteria

- The Possibility of getting correct breed of dog within 3 guess  $\geq 60\%$   
Actual: 100%
- The Precision of human face recognition  $\geq 90\%$   
Actual: 90.48%
- and the Recall of human face recognition  $\geq 85\%$   
Actual: 86.36%

# Output-Example



Label1

(golden retriever,0.948752)

Label2

(labrador retriever,0.021431418)

Label3

(cocker spaniel,0.010588616)

# Output

breed	pic name	human	breed test result	detect true	detect false
border_terrier	article-2185170-145E37CF000005DC-709_306x423.jpg	2	border_terrier	2	0
border_terrier	f3cf6886f044dea85a7eafd1928fcb97.jpg	1	border_terrier	1	0
boxer	cardiomyopathy-boxer-dogs.jpg	0	boxer	0	0
boxer	woman-with-a-boxer-dog-j91882.jpg	1	boxer	1	0
chihuahua	Chihuahua-1.jpg	0	chihuahua	0	0
chihuahua	chi-preston.jpg	1	chihuahua	1	0
chihuahua	img-thing.jpeg	1	chihuahua	1	0
cocker_spaniel	2871486.main_image.jpg	1	cocker_spaniel	1	0
cocker_spaniel	f7c6e538d3c882a4c71b9f4a6d9038fb--princess-kate-princess-charlotte.jpg	3	cocker_spaniel	2	1
english_springer	English-Springer-Spaniel.jpg	0	english_springer	0	0
german_shepherd	girl-with-german-shepherd.jpg	1	german_shepherd	1	0
german_shepherd	f079f183d0b03e9d1554015128b0d0ad--superman-batman.jpg	1	golden_retriever	1	0
golden_retriever	Golden-Retriever-with-family.jpg	3	golden_retriever	2	0
cocker_spaniel	d2d719822ac7bc59cd27fc0be7a72fb2.jpg	1	cocker_spaniel	1	0
german_shepherd	90648f3694f61ba423b5c7454a32e5ef.jpg	1	german_shepherd	1	0
english_springer	EnglishSpringerSpanielPureBredDogBechamGroomed10MonthsOld1.jpg	3	english_springer	2	0
labrador_retriever	labrador-retriever-253.jpg	0	labrador_retriever	0	0
west_highland_white_terrier	255cab74828dc3a6113915c635a1c240--west-highland-white-terrier-the-order.jpg	0	west_highland_white_terrier	0	0
golden_retriever	mav_family.jpeg	2	golden_retriever	2	0
west_highland_white_terrier	west-highland-white-terrier.jpg	0	west_highland_white_terrier	0	1
		22		19	2
		Precision	0.904761905	Recall	0.8636364



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# Program

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# Repository

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- **Programming in Scala:**
  - Data ingestion and preprocessing;
  - Facial detection;
  - Data visualization.
- [https://github.com/cicioutofspace/CSYE7200\\_FinalProject](https://github.com/cicioutofspace/CSYE7200_FinalProject)

# Unit Test

ScalaTests in 'csye\_7200'

Test Results	8s 20ms
InceptionV3Spec	327ms
getBytes	302ms
getLabelOf	25ms
ImportFolderSpec	1s 692ms
readFromFolder	1s 692ms
ImageFaceDetectorSpec	2s 580ms
readImg	491ms
greyscale	17ms
equalHis	11ms
markFace	2s 61ms
ImageConversionSpec	14ms
toFrame	7ms
toMat	7ms
TensorLabelSpec	3s 407ms
jpgToBytes	84ms
detectBreed	3s 323ms

