



Projet 6

CLASSEZ DES IMAGES À L'AIDE D'ALGORITHMES DE DEEP LEARNING

Alexandre Monod

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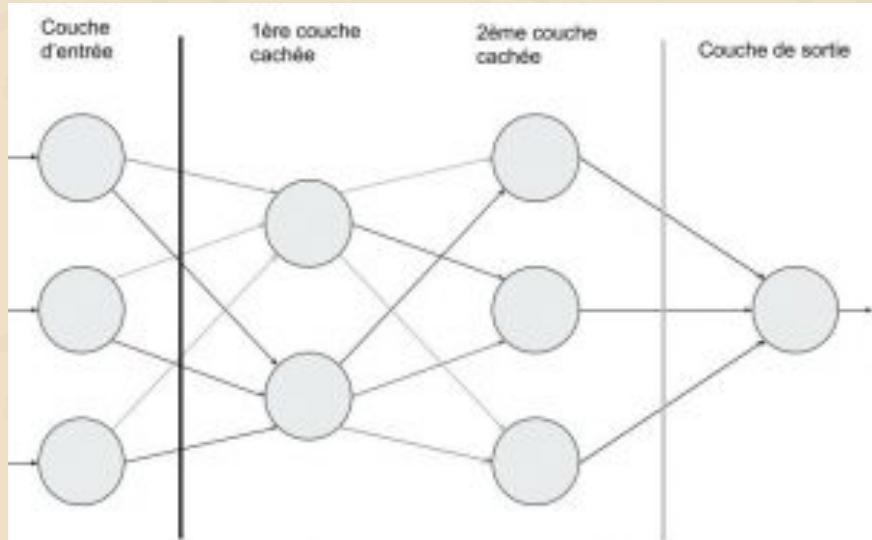
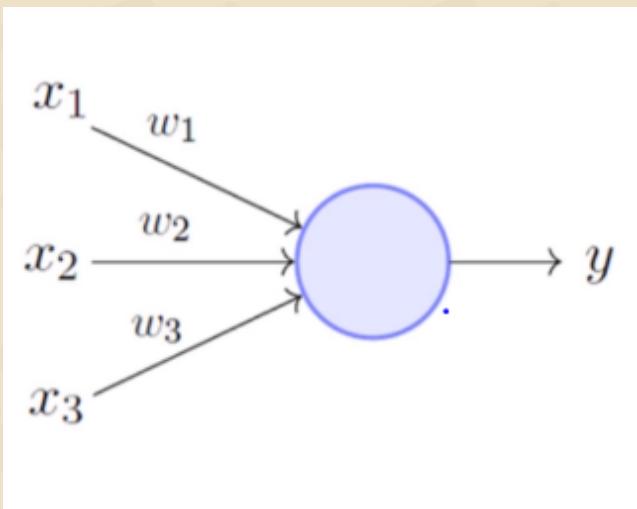
Transfer
Learning





Introduction

Deep Learning et RNN



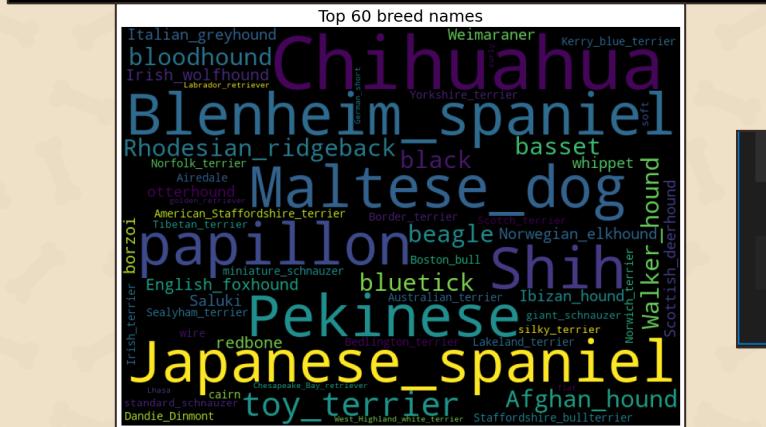
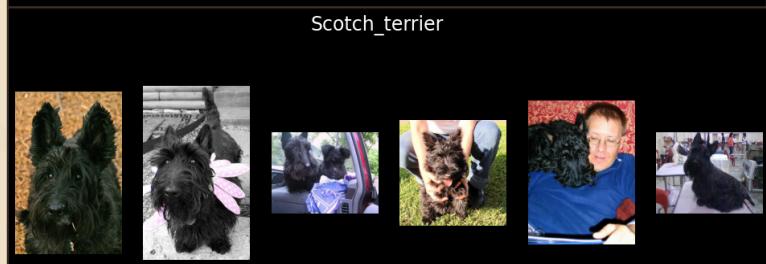
Contexte et problématique



- Association de protection des animaux veut réaliser une indexation suivant les races des chiens
- Classification des images suivant la race des chiens afin d'accélérer le processus d'indexation
- Données: Stanford Dogs Dataset



Partie 1 - EDA



- 20580 images
- 120 races
- 150 à 250 images par race

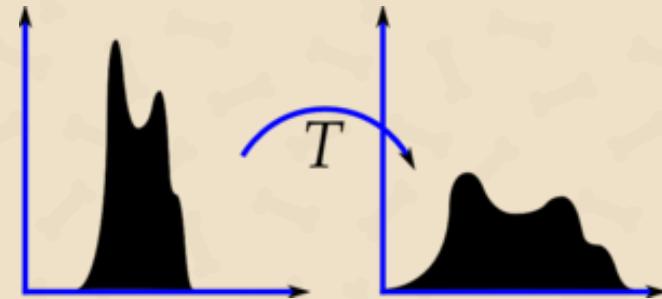
	Id_name_breed	breed_name	Id	nb_pic
0	n02085620-Chihuahua	Chihuahua	n02085620	152
1	n02085782-Japanese_spaniel	Japanese_spaniel	n02085782	185
2	n02085936-Maltese_dog	Maltese_dog	n02085936	252



Partie 2 - Preprocessing

1/4 Egalisation d'histogramme

- Mieux répartir l'intensité lumineuse dans l'ensemble de l'image : éclairer les images ternes, assombrir les images claires. Cela revient à égaliser un histogramme.
- Pour des images couleur, il faut procéder couleur par couleur : red, green, puis blue.



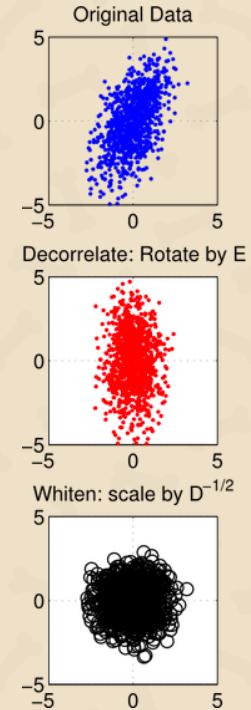
2/4 Débruitage

- Une image peut être "bruitée", c-à-d avoir des pixels indésirables, du grain, en raison de la mauvaise qualité de l'appareil ou de conditions climatiques défavorables.
- Filtre non linéaire : moyenne des blocs de pixels similaires



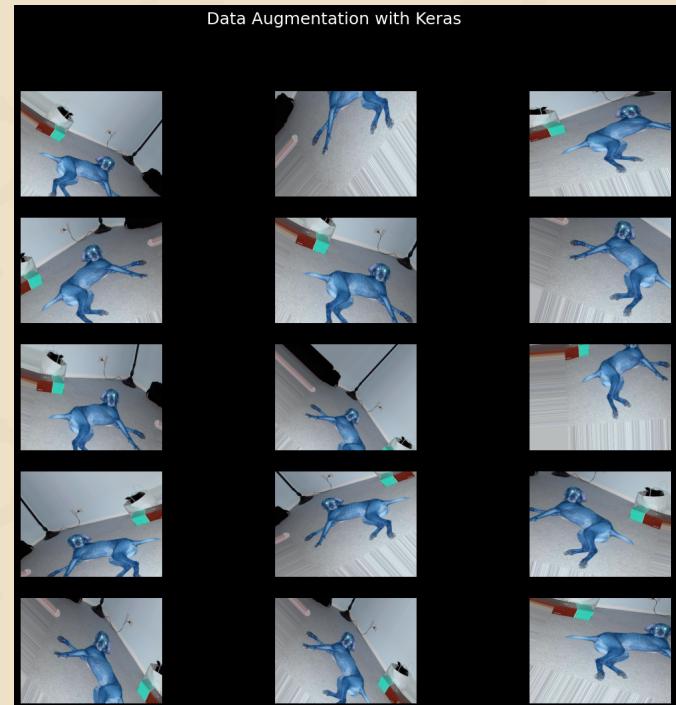
¾ Whitening

- Le but du whitening est de supprimer la corrélation entre les pixels.
- Le whitening, contrairement à ce que son nom indique, n'aboutit pas forcément à une image en noir et blanc.



4/4 Data Augmentation

- L'objectif est de produire de nouvelles images depuis des images existantes afin d'augmenter la base de données.
- Il s'agit d'appliquer des transformations géométriques aléatoires : translations, rotations, mirroring, ...



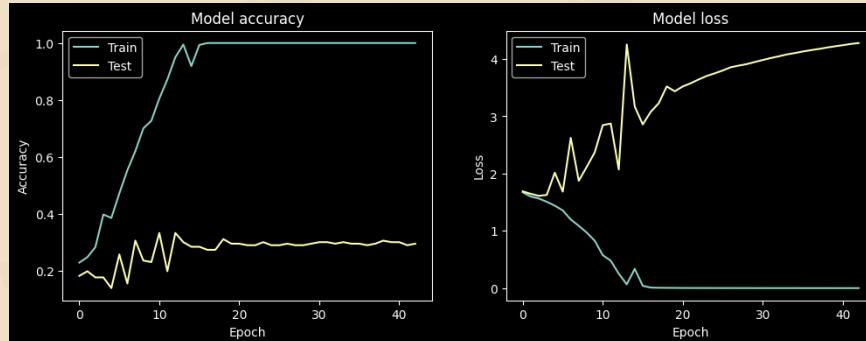


Partie 3 – CNN from Scratch

1/3 Baseline

- Train/Test sur 5 races
- Couches de Convolution, MaxPooling, Flatten et Dense
- Fonction d'activation Softmax
- 10 couches environ

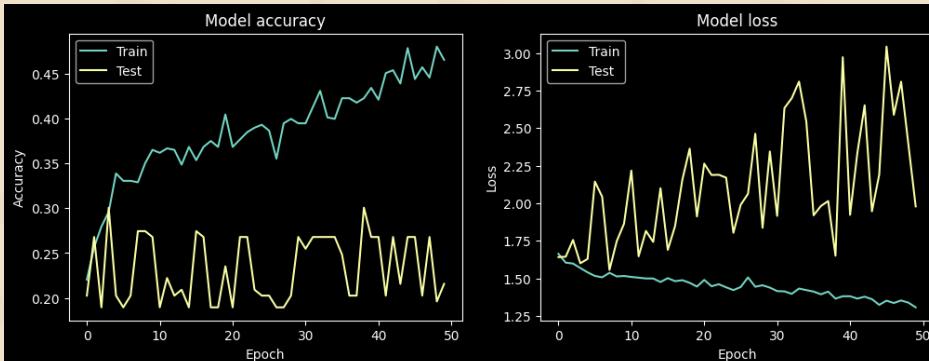
```
def create_model(NB_BREEDS):  
    model = Sequential()  
    model.add(Conv2D(32, (3, 3), activation='relu', input_shape=(224, 224, 3)))  
    model.add(Conv2D(32, (3, 3), activation='relu', input_shape=(224, 224, 3)))  
    model.add(MaxPooling2D((2, 2)))  
    model.add(Conv2D(64, (3, 3), activation='relu', input_shape=(224, 224, 3)))  
    model.add(Conv2D(64, (3, 3), activation='relu', input_shape=(224, 224, 3)))  
    model.add(MaxPooling2D((2, 2)))  
    model.add(Flatten())  
    model.add(Dense(300, activation='relu'))  
    model.add(Dense(100, activation='relu'))  
    model.add(Dense(NB_BREEDS, activation='softmax')) # For multi-class classification  
    # Couche Dropout : permet de prévenir le surapprentissage  
  
    model.compile(optimizer='sgd',  
                  loss='categorical_crossentropy',  
                  metrics=['accuracy'])  
  
    return model
```



2/3 Second modèle

- Architecture proche de VGG16
- 4 couches de convolution
- Optimisation avec kt.Hyperband

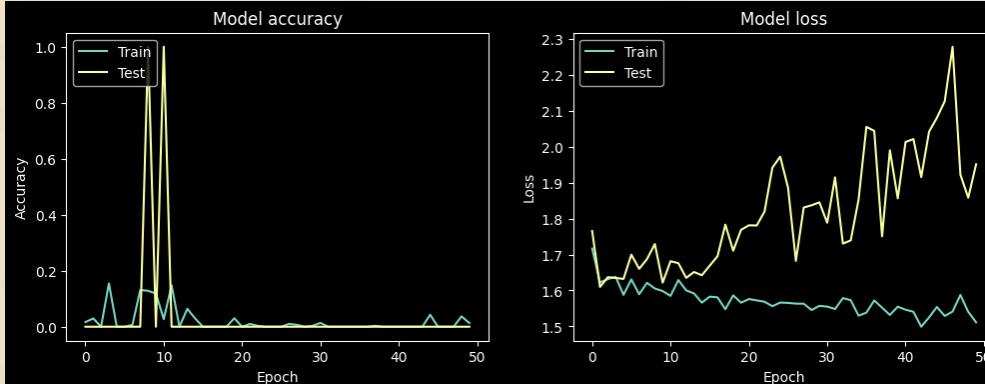
```
# 1.Convolution layer
model.add(Conv2D(filters=hp_filters, kernel_size=hp_kernel, input_shape=(224, 224, 3), padding='same'))
model.add(BatchNormalization())
model.add(Activation(hp_activation))
# Pooling layer
model.add(MaxPooling2D(pool_size= hp_wind, strides=(strd,strd), padding='same'))
# 2.Second convolution layer
model.add(Conv2D(filters=2*hp_filters, kernel_size=hp_kernel, padding='same'))
model.add(BatchNormalization())
model.add(Activation(hp_activation))
# Pooling layer
model.add(MaxPooling2D(pool_size=hp_wind, strides=(strd,strd), padding='same'))
# 3.Third convolution layer
model.add(Conv2D(filters=4*hp_filters , kernel_size=hp_kernel, padding='same'))
model.add(BatchNormalization())
model.add(Activation(hp_activation))
# Pooling layer
model.add(MaxPooling2D(pool_size=hp_wind, strides=(strd,strd), padding='same'))
# 4.Fourth convolution layer
model.add(Conv2D(filters=8*hp_filters , kernel_size=hp_kernel, padding='same'))
model.add(BatchNormalization())
model.add(Activation(hp_activation))
model.add(GlobalAveragePooling2D())
model.add(Dropout(0.4))
model.add(Flatten())
# Fully connected layers
model.add(Dense(16*hp_filters, activation=hp_activation))
model.add(Dense(nb_breed, activation='softmax'))
```



3/3 Data Augmentation

- Performances restent faibles

```
1 train_gen2 = datagen.flow(X_train, y_train, batch_size=16)
```



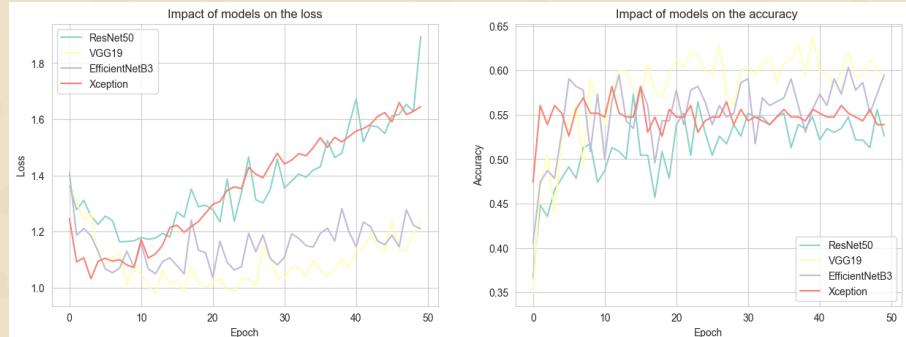


Partie 4 – Transfer Learning

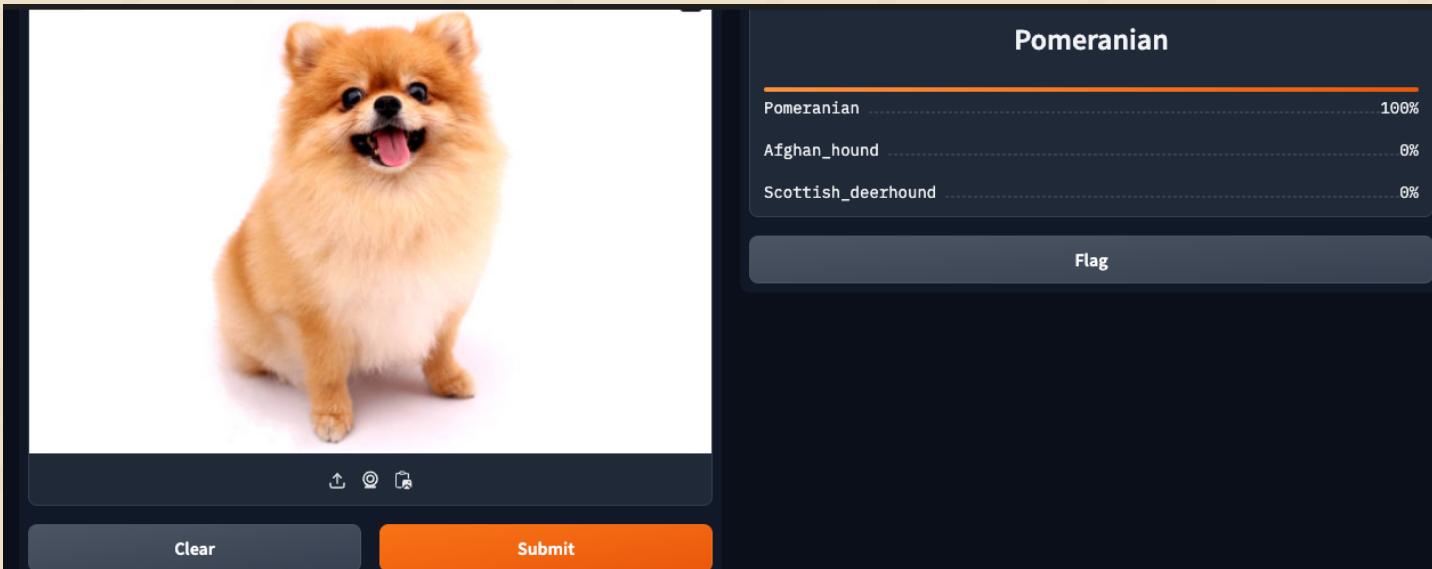
½ Mise en place

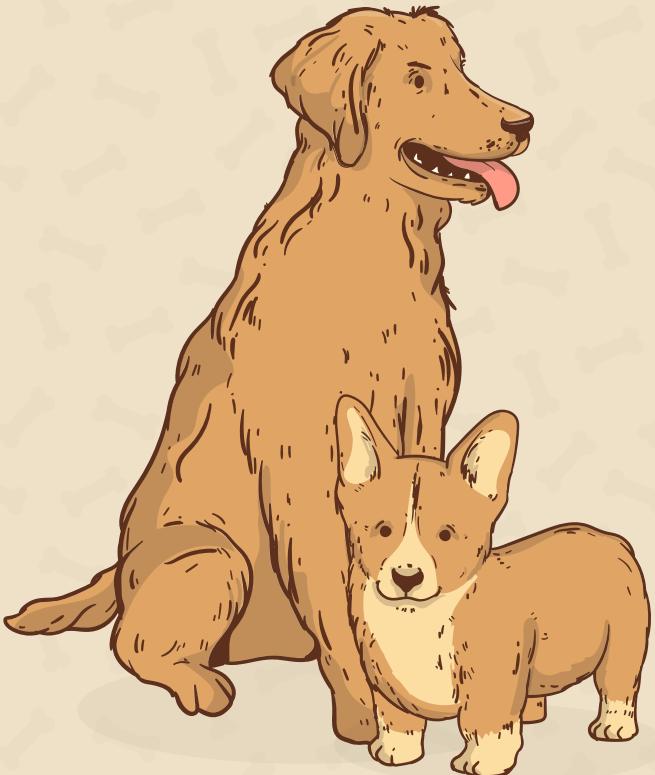
- Utilisation d'un modèle pré-entraîné
- Ajout de 4 couches pour l'adapter au cas
- Resnet, VGG19, EfficientNet, Xception
- Définition de callbacks : ModelCheckpoint et EarlyStopping

```
#Define tf model with a new fully-connected layers
tf_model = Sequential()
tf_model.add(model)
tf_model.add(GlobalAveragePooling2D())
tf_model.add(Dense(512, activation='relu'))
tf_model.add(Dropout(0.2))
tf_model.add(Dense(nb_classes, activation='softmax'))
```



2/2 Déploiement sur Gradio





Conclusion

Compétences acquises

- Traitement d'images
- RNN
- Transfert Learning

Pistes d'amélioration

- Fine-tuning
- Data Augmentation





Contents of this *template*

- This template contains an assortment of complementary infographic resources for the **Dog Breeds and Their Personalities** presentation
- These infographics are adapted to the style of the aforementioned presentation, so you can insert them easily and have them completely integrated at once. You just need to do the following:
 - Select the element that you want to copy
 - Right-click and choose “Copy”
 - Go to the slide where you want the element to appear
 - Right-click and choose “Paste”



Dog breeds infographics



Mars

Despite being red, Mars is actually a cold planet. It's full of iron oxide dust

Aggression  **4/5**

Activity  **5/5**

Trainability  **3/5**

Friendliness  **3/5**

Country	USA
Height	
Weight	
Life span	
Colors	

Dog breeds infographics



French bulldog

15,421,000

Total searches



Cane corso

14,021,000

Total searches



**Golden
retriever**

12,965,000

Total searches



Dog breeds infographics

Popularity

Venus has a beautiful name, but it's terribly hot



1	French bulldog	15,000,000
2	Cane corso	14,000,000
3	Golden retriever	11,590,000
4	German shepherd	11,134,000



Dog breeds infographics

40%



Mercury

Mercury is the closest planet to the Sun

70%



Saturn

Saturn is a gas giant and has several rings

50%



Venus

Venus is the second planet from the Sun



Dog breeds infographics



Solar System

Mercury

Mercury is the closest planet to the Sun

Saturn

Saturn is a gas giant and has several rings

Venus

Venus is the second planet from the Sun

Dog breeds infographics

A

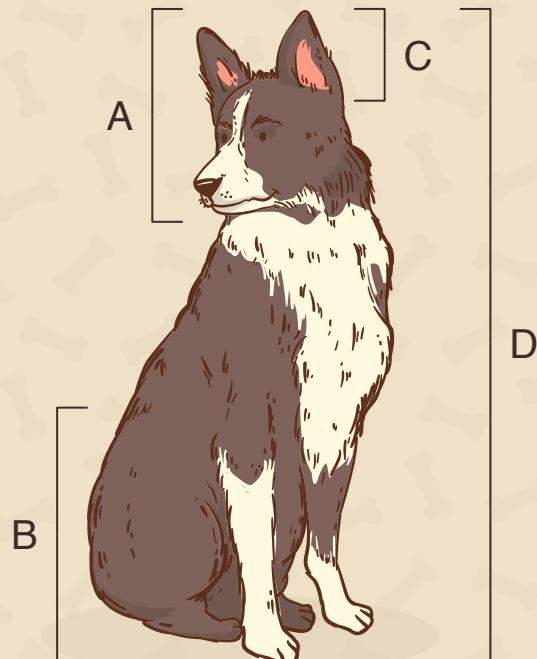
16-20 cm

Neptune is the farthest planet from the Sun

B

20-24 cm

Venus is terribly hot, even hotter than Mercury



C

8-10 cm

Mercury is the closest planet to the Sun

D

45-50 cm

Despite being red, Mars is a cold place,

Dog breeds infographics

2XX

X

2XX

X

2XX

X

2XX

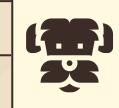
X



Mars



Saturn



Neptune



Mercury

Despite being red, Mars is a cold place.
It's full of iron oxide dust

Saturn is a gas giant. It's composed
mostly of hydrogen and helium

Wind speeds on Neptune are among the
fastest recorded in the Solar System

Mercury is the closest planet to the Sun
and the smallest of them all

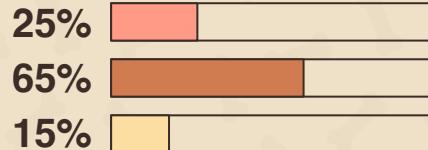


Dog breeds infographics



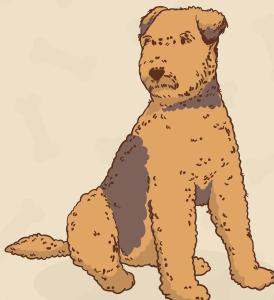
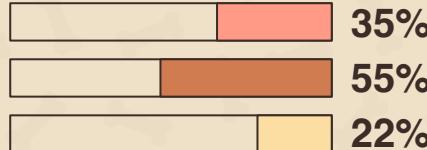
Saturn

Saturn has several rings



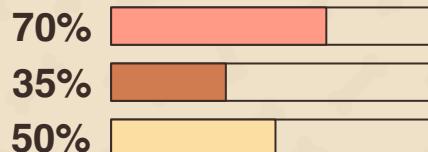
Mars

Mars is a cold planet



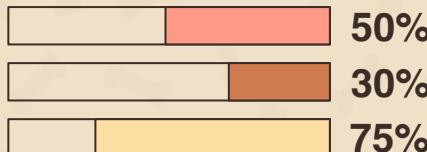
Moon

The Moon is a satellite



Jupiter

Jupiter is a gas giant



Other

Dog breeds infographics



10-12 kg

Mercury

First dog	Good
Trainability	Regular
Noise	High
Kids	Good



8-10 kg

Saturn

First dog	Very good
Trainability	Good
Noise	Medium
Kids	Very good



12-14 kg

Jupiter

First dog	Very good
Trainability	Very good
Noise	Low
Kids	Very good

Dog breeds infographics



Earth 15% 

Earth is the only planet with life



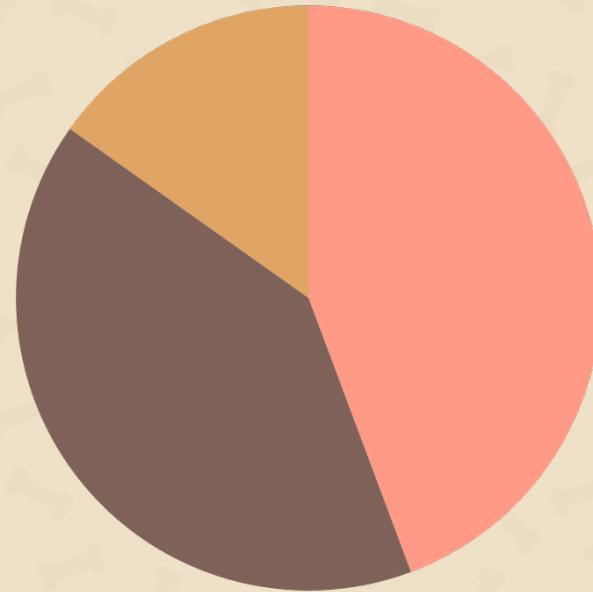
The Sun 45% 

The Sun is a bright star



Mercury 40% 

Mercury is quite a small planet



Follow the link in the graph to modify its data and then paste the new one here. [For more info, click here](#)



Dog breeds infographics

Favorite items

Mercury

Mercury is the closest planet from the Sun



Neptune

Neptune is the farthest planet from the Sun



Mars

Despite being red, Mars is a cold place



Venus

It's terribly hot, even hotter than Mercury



Dog breeds infographics



15
%

Saturn

Saturn has several rings



35
%

Mercury

It's quite a small planet



55
%

Jupiter

Jupiter is a gas giant



40
%

Venus

It has high temperatures

Moon

The Moon is a satellite



80
%

Mars

Mars is a cold planet



55
%

Earth

Earth is full of life



75
%

Neptune

It's far from the Sun



25
%

Dog breeds infographics



Neptune

Neptune is the farthest planet in the Solar System and the fourth-largest by diameter

Propensity to training	■ ■ ■ ■ ■	5/5
Caring for hair	■ ■ ■ □ □	3/5
Security quality	■ ■ ■ ■ □	4/5
Agility	■ ■ ■ ■ ■	5/5
Children's rating	■ ■ ■ □ □	3/5

Dog breeds infographics

■ Vaccinations

Saturn has several rings

■ Feeding

Earth is full of life

■ Care

Jupiter is a gas giant

■ Health

The Moon is a satellite



Follow the link in the graph to modify its data and then paste the new one here. [For more info, click here](#)



Dog breeds infographics

Breed 1

Neptune

Neptune is the farthest planet from the Sun

Mars

Despite being red, Mars is a cold place

Mercury

Mercury is the closest planet to the Sun

Breed 2

Moon

It's an astronomical body orbiting Earth

Saturn

Saturn is a gas giant and has several rings

Sirius

Sirius is the brightest star in the night sky



Dog breeds infographics



Breed 1

Venus has a beautiful name, but it's terribly hot

Care

Neptune is the farthest planet from the Sun



Breed 2

Jupiter is the biggest planet in the Solar System

Care

Despite being red, Mars is actually a very cold place



Breed 3

The Moon is an astronomical body orbiting Earth

Care

Saturn is not solid like Earth, but is a gas giant



Breed 4

Ceres was the first asteroid to be discovered

Care

Sirius is the brightest star in the night sky

Dog breeds infographics

Feeding

- Venus has a beautiful name, but it's terribly hot
- Earth is the third planet from the Sun
- Mercury is the closest planet to the Sun



Dog breed care

Activity

- Jupiter is the biggest planet of them all
- Mercury is the smallest planet of them all
- Despite being red, Mars is a cold place

Vaccination

- The Moon is Earth's natural satellite
- Saturn is a gas giant and has several rings
- Sirius is the brightest star in the night sky

Dog breeds infographics

30%

Neptune

Neptune is the farthest planet from the Sun



20%

Venus

It's terribly hot, even hotter than Mercury



40%

Mercury

Mercury is the closest planet to the Sun



10%

Jupiter

It's the biggest planet in the Solar System



Dog breeds infographics

Saturn

Saturn has several rings



Mars

Mars is a cold planet



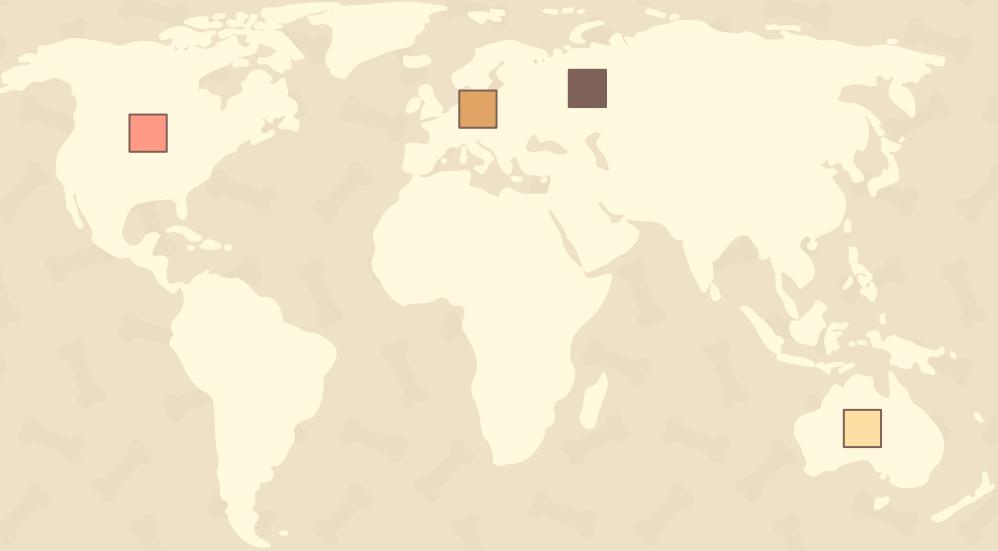
Jupiter

Jupiter is a gas giant



Moon

The Moon is a satellite



Dog breeds infographics

About

Jupiter is the biggest planet in the Solar System



Ears

Saturn has several rings

Head

The Moon is a satellite

Body

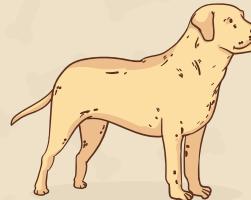
Venus has a beautiful name

Paws

Mars is a cold place

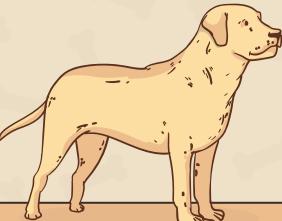


Dog breeds infographics



Dog breed	Mercury	Saturn	Jupiter	Neptune	Mars
Life span	8-10 years	9-11 years	10-12 years	12-14 years	14-16 years
Popularity	7/10	6/10	7/10	9/10	5/10
Weight	8-10 kg	10-12 kg	16-18 kg	18-20 kg	22-26 kg

Dog breeds infographics



2

Size	Medium
Group	Herding
Origin	England



1

Size	Big
Group	Herding
Origin	Germany



3

Size	Big
Group	Sporting
Origin	Scotland

Dog breeds infographics

Dog breed
1



- Neptune is the farthest planet from the Sun
- Mercury is the closest planet to the Sun
- Despite being red, Mars is a cold place

Dog breed
2



- Saturn is not solid like Earth, but is a gas giant
- Ceres was the first asteroid to be discovered
- Sirius is the brightest star in the night sky

Dog breed
3



- Earth is the third planet from the Sun
- Venus has a beautiful name, but it's terribly hot
- Jupiter is the biggest planet in the Solar System

Dog breeds infographics

Neptune

Neptune is the farthest planet from the Sun



1

Mars

Despite being red, Mars is a cold place



2

Saturn

Saturn is not solid like Earth, but is a gas giant



3

Sirius

Sirius is the brightest star in the night sky



4

Dog breeds infographics

Earth

Earth is the third planet from the Sun

1

Venus

- Mercury is very small
- Venus is a hot planet
- We all live on Earth

2

Neptune

- Earth has human life
- The Moon is a satellite
- Saturn has several rings

3

Saturn

- Neptune is an ice giant
- Mars is made of basalt
- Jupiter is a gas giant

Dog breeds infographics



Breed 1

Neptune is the farthest planet from the Sun

Breed 2

Jupiter is the biggest planet in the Solar System

Breed 3

The Moon is an astronomical body orbiting Earth

Breed 4

Ceres was the first asteroid to be discovered

Follow the link in the graph to modify its data and then paste the new one here. [For more info, click here](#)

Solar System

Venus has a beautiful name and is the second planet from the Sun. Venus is the second-brightest natural object in the night sky after the Moon

Dog breeds infographics



70% Jupiter

Jupiter is a gas giant
and the biggest planet
in the Solar System



55% Venus

Venus has a beautiful
name and is the
second planet from
the Sun



Dog breeds infographics



50%

Mars

Despite being red,
Mars is actually a cold
place



30%
Mercury

Mercury is the closest
planet to the Sun



20%
Venus

Venus is the second
planet from the Sun

Dog breeds infographics



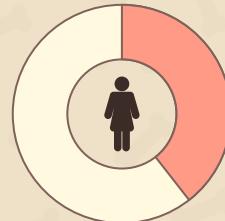
Most popular breeds in USA

1	Mixed	4	German shepherd
2	Labrador retriever	5	Goldendoodle
3	Golden retriever	6	Siberian husky



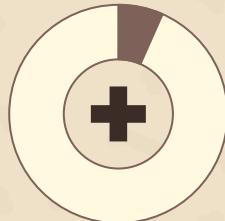
45%
Men

Saturn has several rings



40%
Women

Mars is a very cold place



5%
Other

Neptune is far from the Sun

Dog breeds infographics

1

Jupiter is a gas giant and the biggest planet in the Solar System

2

The reason why Neptune is blue is due to the presence of methane

3

Venus has a beautiful name and is the second planet from the Sun

4

Mercury is the closest planet to the Sun and the smallest one

5

Mars is a dusty, cold, desert world with a very thin atmosphere

6

Pluto is now classified as a dwarf planet, so it's no longer a planet

7

Saturn is composed mostly of hydrogen and helium

8

Earth is also the only planet in the Solar System with liquid water



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- Choose your favourite infographic and insert it in your presentation using Ctrl C + Ctrl V or Cmd C + Cmd V in Mac.
- Select one of the parts and **ungroup** it by right-clicking and choosing “Ungroup”.
- **Change the color** by clicking on the paint bucket.
- Then **resize** the element by clicking and dragging one of the square-shaped points of its bounding box (the cursor should look like a double-headed arrow). Remember to hold Shift while dragging to keep the proportions.
- **Group** the elements again by selecting them, right-clicking and choosing “Group”.
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