

Projet 6

**Classez des images à l'aide
d'algorithmes de deep learning**

Adrian Rodriguez

Ingénieur Machine Learning

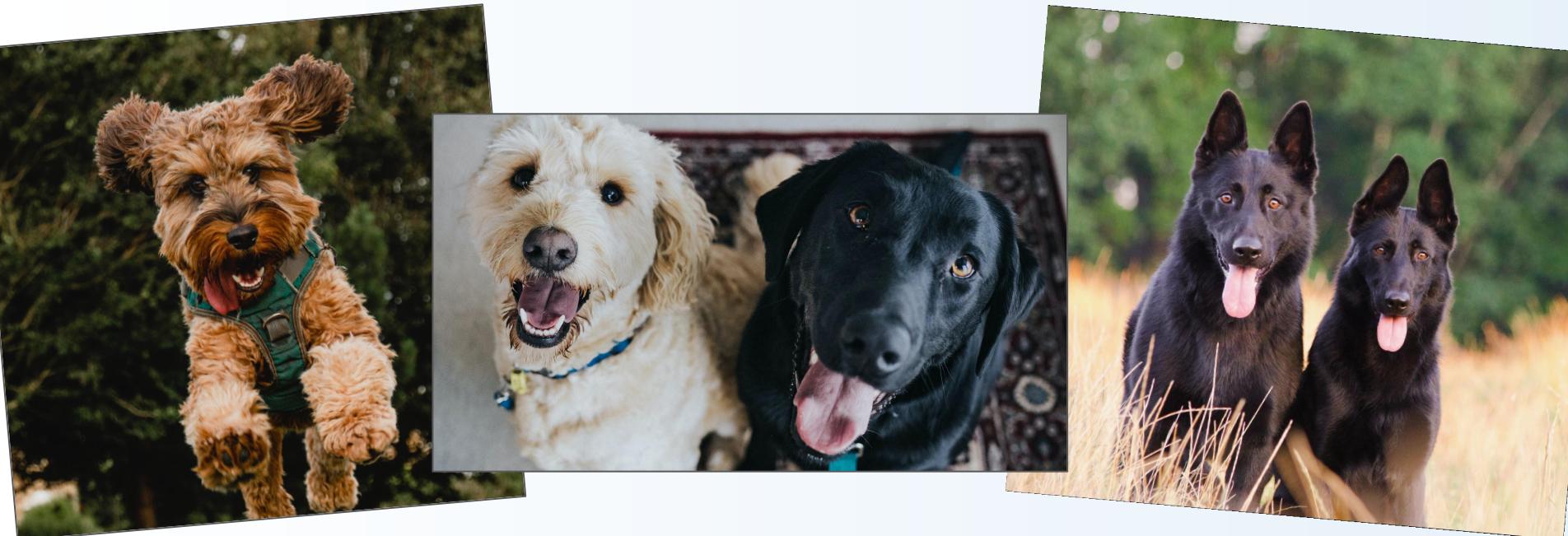
OPENCLASSROOMS



CentraleSupélec



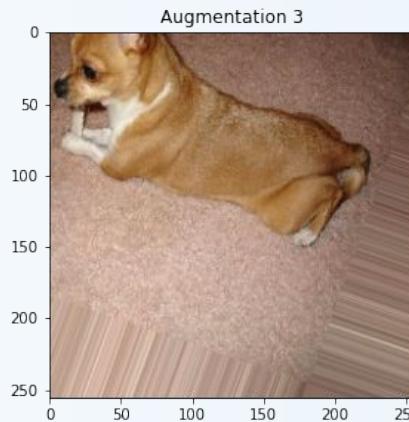
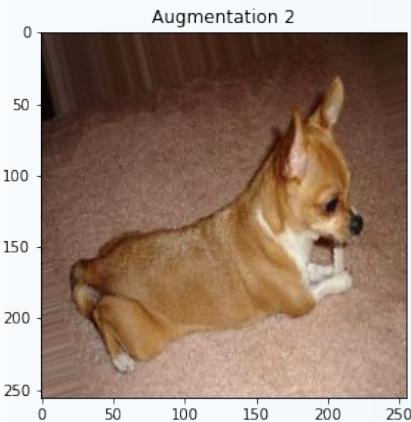
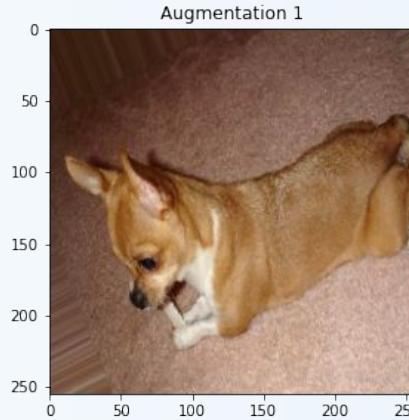
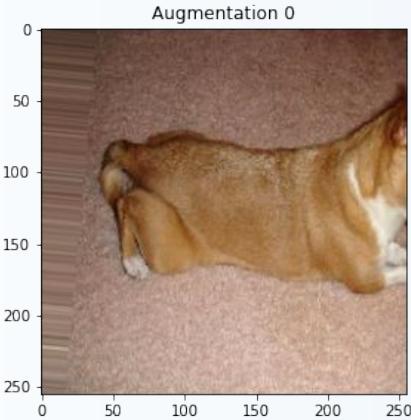
Problématique



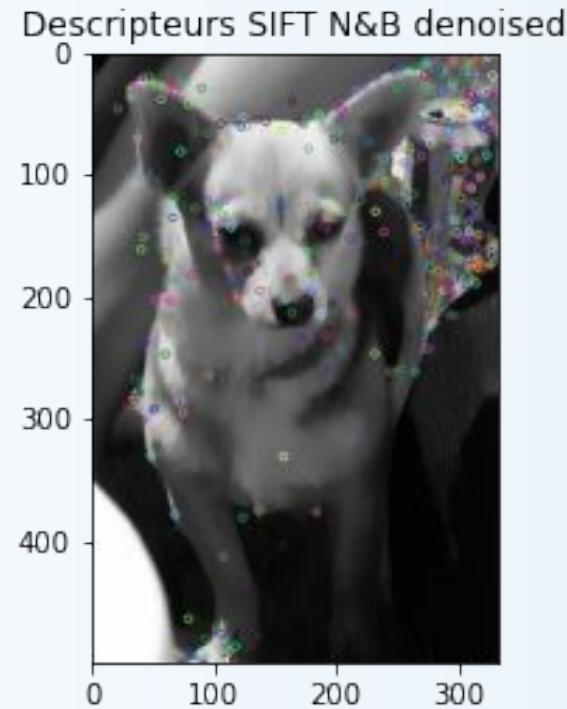
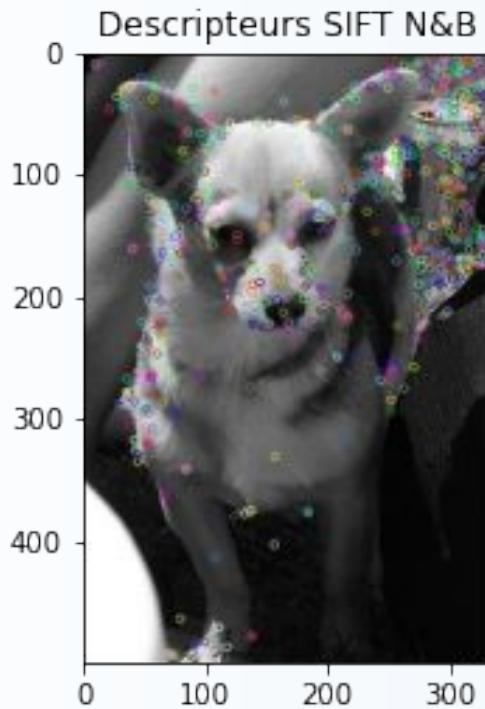
Transformation d'image - Traitements généraux



Transformation d'image - Data Augmentation



Classification SIFT - Descripteurs



Classification SIFT - Résultats

Résultats avec 5 races

| sift_220px_5_breeds | Test : accuracy | mean_test_score | mean_fit_time | C | alpha | n_estimators |
|---------------------|-----------------|-----------------|---------------|-------|-------|--------------|
| LogisticRegression | 0.44 | 0.44 | 0.14 | 0.001 | nan | nan |
| LinearSVC | 0.362 | 0.38 | 0.62 | 0.1 | nan | nan |
| SGD | 0.371 | 0.39 | 0.12 | nan | 1e-05 | nan |
| RandomForest | 0.435 | 0.43 | 3.96 | nan | nan | 1000.0 |
| GradientBoosting | 0.422 | 0.41 | 55.87 | nan | nan | 1000.0 |

Résultats avec 10 races

| sift_220px_10_breeds | Test : accuracy | mean_test_score | mean_fit_time | C | alpha | n_estimators |
|----------------------|-----------------|-----------------|---------------|-------|--------|--------------|
| LogisticRegression | 0.309 | 0.27 | 0.57 | 0.001 | nan | nan |
| LinearSVC | 0.233 | 0.21 | 4.58 | 0.1 | nan | nan |
| SGD | 0.226 | 0.2 | 0.83 | nan | 0.0001 | nan |
| RandomForest | 0.28 | 0.25 | 13.47 | nan | nan | 1000.0 |
| GradientBoosting | 0.291 | 0.24 | 237.22 | nan | nan | 500.0 |

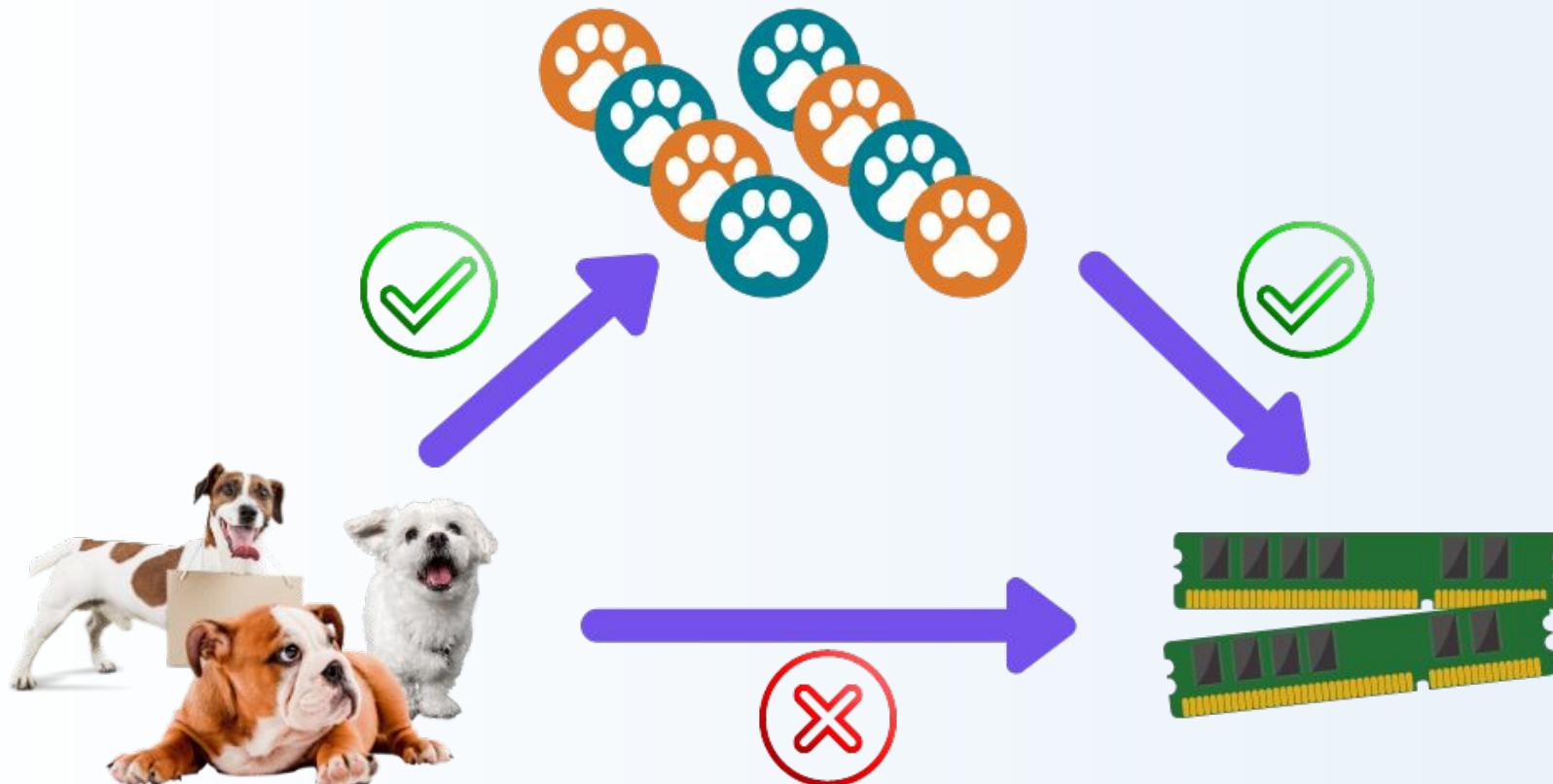


Réseaux convolutionnels - Méthodologie

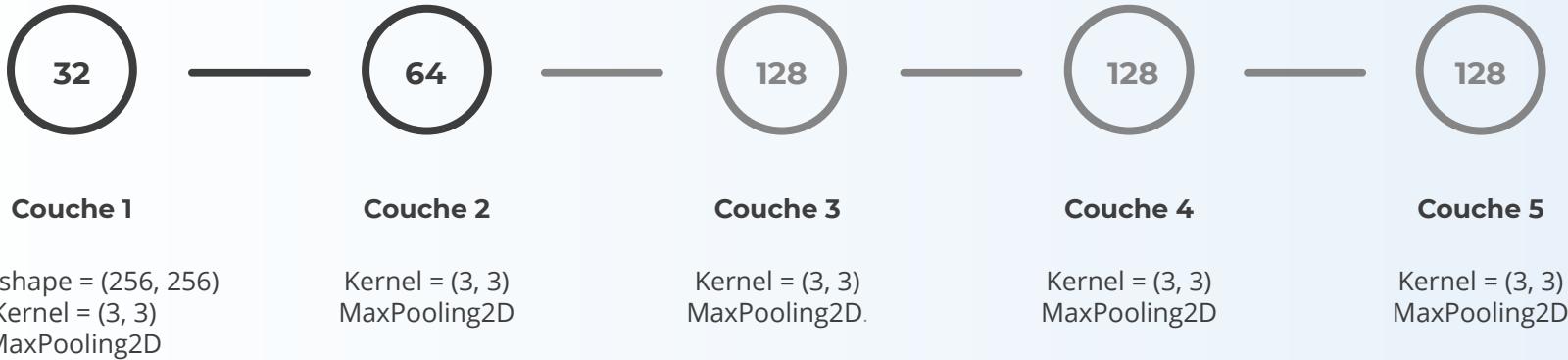
| CNN from scratch | Transfer learning |
|--|--|
| <ul style="list-style-type: none">➤ Convolution :<ul style="list-style-type: none">○ Formation d'une base de convolution○ Mesure des fonctions d'activations➤ Classification :<ul style="list-style-type: none">○ Mesure des optimiseurs○ Mesure d'une couche de Flatten en place d'un GAP○ Mesure d'une couche dense supplémentaire○ Mesure d'une couche de batch normalization○ Mesure d'une couche de dropout➤ Mesure de l'effet de la data augmentation | <ul style="list-style-type: none">➤ Phase d'expérimentation sur 3 modèles et 12 races :<ul style="list-style-type: none">○ Entrainement d'un modèle de base○ Entrainement avec data augmentation○ Entrainement avec data augmentation et fine tuning➤ Mise à l'échelle sur 60 races➤ Mise à l'échelle sur 120 races. |



Générateurs de données



CNN from scratch - Couches de convolutions

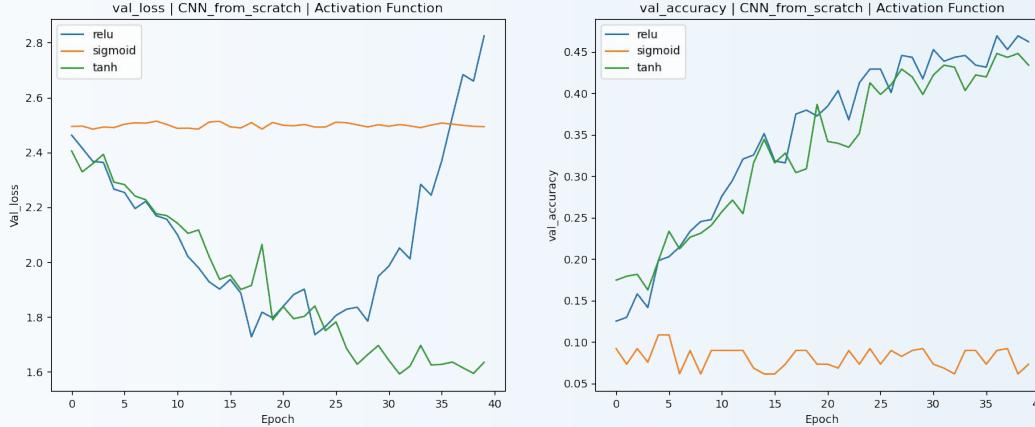


Format en sortie des couches des convolutions : (6, 6)

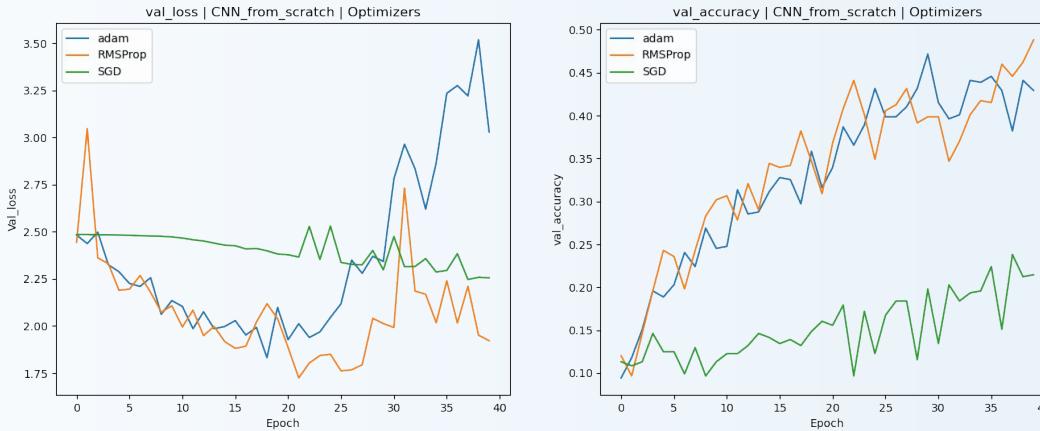


CNN from scratch - Fonctions d'activations | Optimiseurs

Evaluation des fonctions d'activations réalisé avec l'**optimiseur adam**

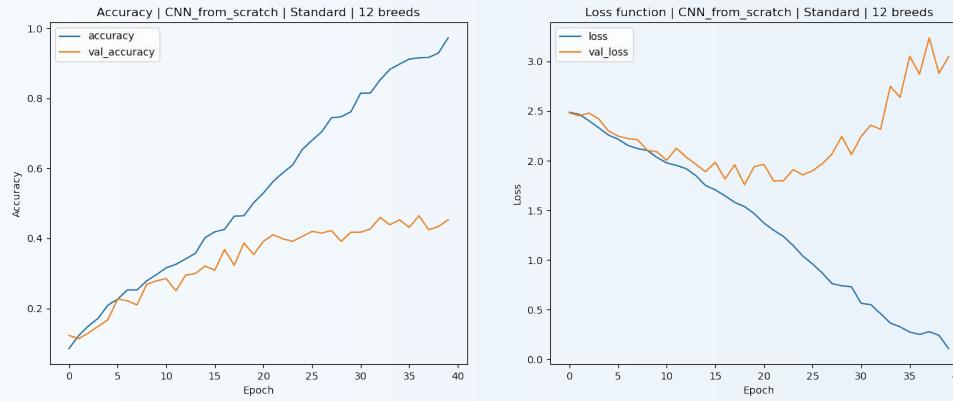


Evaluation des optimiseurs réalisé avec la **fonction d'activation relu**

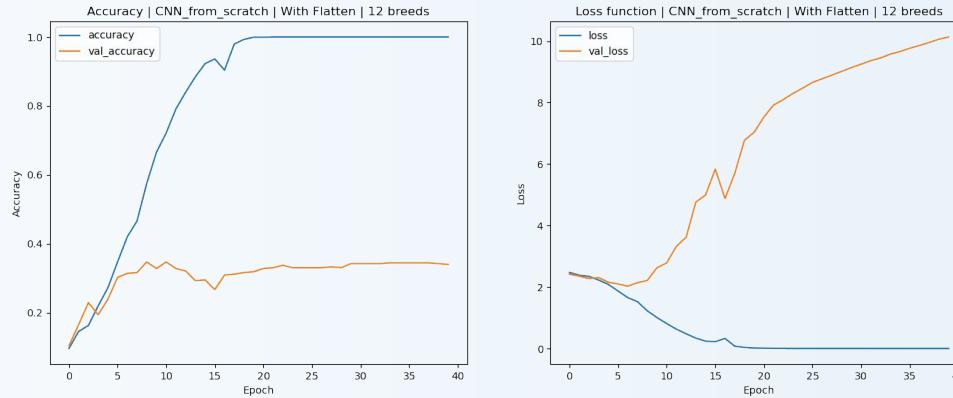


CNN from scratch - Flatten VS GlobalAveragePooling2D

Modèle standard avec
GlobalAveragePooling2D()

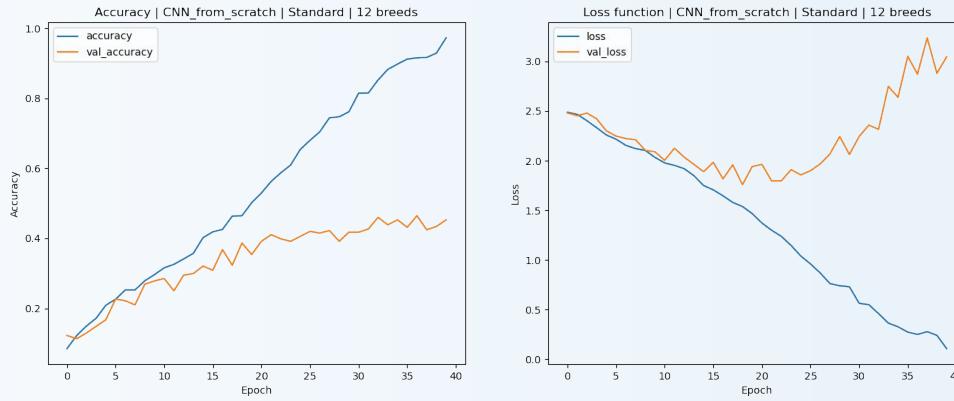


Modèle modifié avec **Flatten()**

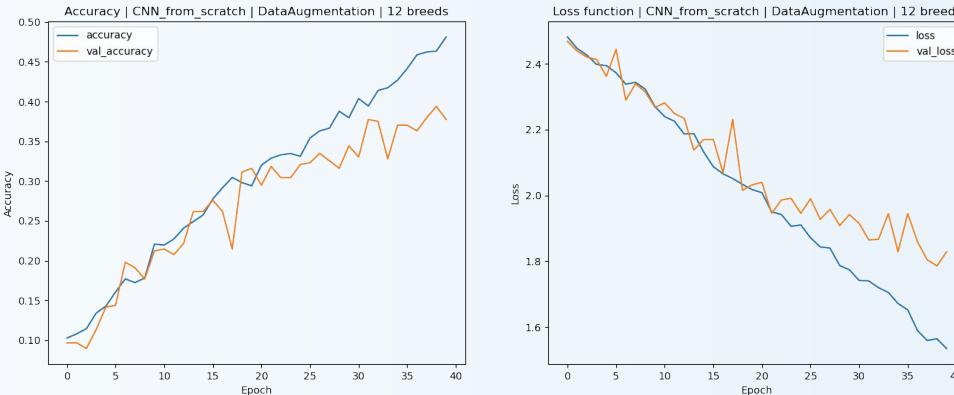


CNN from scratch - Effet de la data augmentation

Entraînement du modèle standard **sans data augmentation**



Entraînement du modèle standard **avec data augmentation**

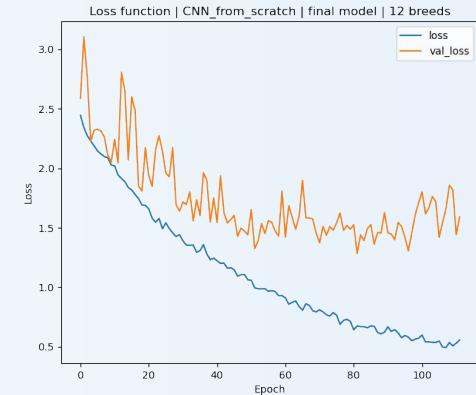
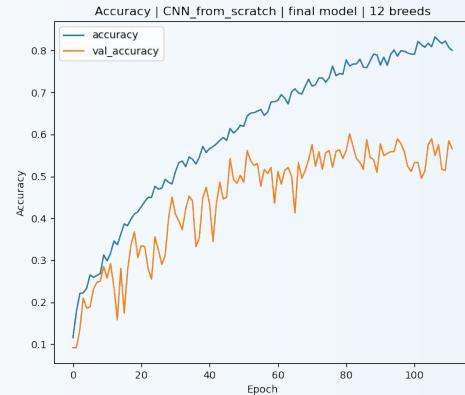


CNN from scratch - Modèle final

Fonction d'activation : **relu**

Optimiseur : **adam**

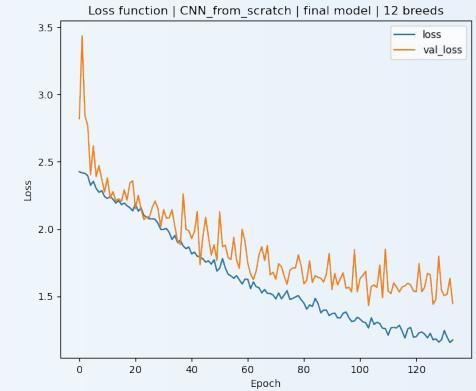
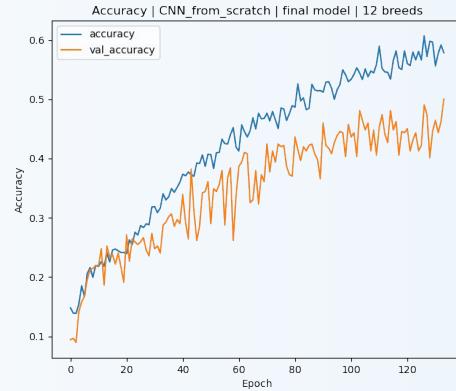
| index | test |
|----------------------------|------|
| Standard | 0.44 |
| With Flatten | 0.32 |
| Dense supp | 0.5 |
| batch_normalization_effect | 0.52 |
| drop_out_effect_0.2 | 0.44 |
| drop_out_effect_0.5 | 0.44 |
| DataAugmentation | 0.4 |



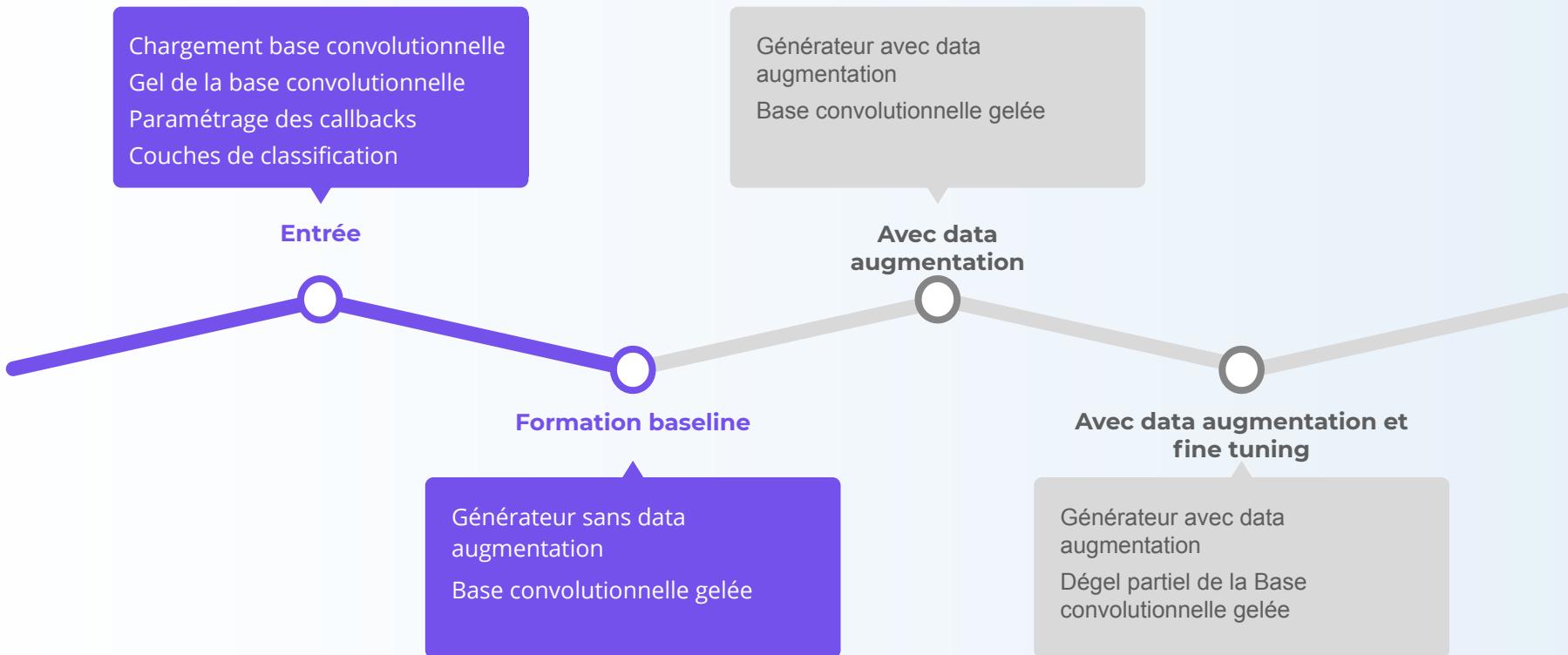
Fonction d'activation : **tanh**

Optimiseur : **adam**

| index | test |
|----------------------------|------|
| Standard | 0.46 |
| With Flatten | 0.34 |
| Dense supp | 0.41 |
| batch_normalization_effect | 0.3 |
| drop_out_effect_0.2 | 0.44 |
| drop_out_effect_0.5 | 0.5 |
| DataAugmentation | 0.45 |

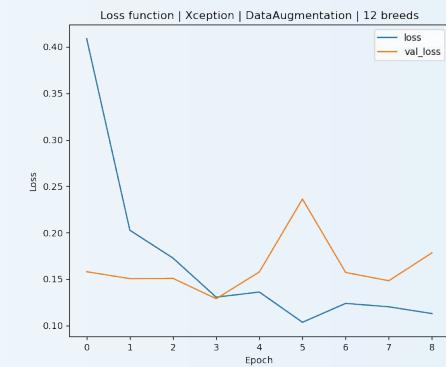
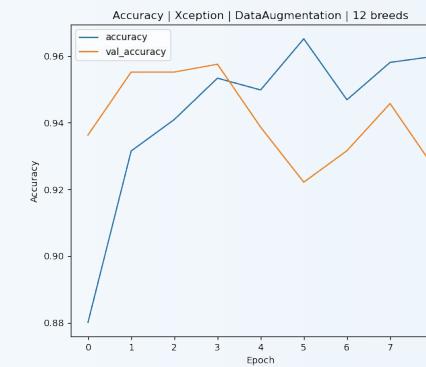
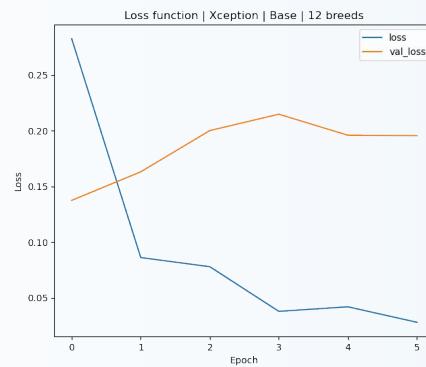
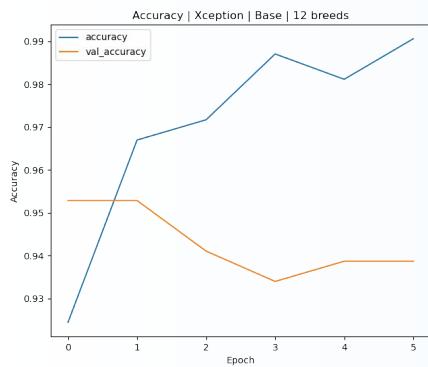


CNN Transfer learning - Processus d'expérimentation



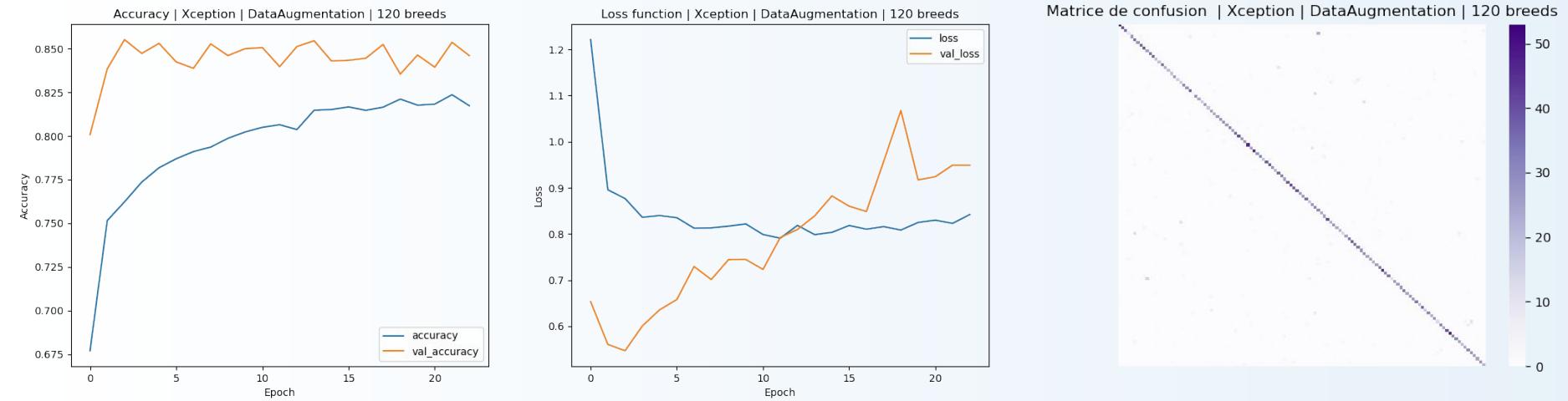
CNN Transfer learning - Expérimentation 12 races

| Models | Base | DataAugmentation | DataAugmentation & FineTuning |
|-------------|------|------------------|-------------------------------|
| VGG16 | 0.57 | 0.62 | 0.09 |
| InceptionV3 | 0.97 | 0.97 | 0.95 |
| Xception | 0.97 | 0.96 | 0.93 |



CNN Transfer learning - Mise à l'échelle 120 races

| Models | DataAugmentation |
|-------------|------------------|
| InceptionV3 | 0.8 |
| Xception | 0.84 |



Rapport de classification - Erreur de type 1



Race
Soft Coated Wheaten
Terrier



Race donnée
Sealyham Terrier



Race prédictive
Soft Coated
Wheaten Terrier

Race
Sealyham Terrier



Race
Soft Coated
Wheaten Terrier



Rapport de classification - Erreur de type 2



Race
French Bulldog

✓ **Race donnée**
French Bulldog

✗ **Race prédictive**
Chihuahua

Photo recadrée

Race donnée
French Bulldog



Race prédictive
French Bulldog



Race
Chihuahua



Rapport de classification - Races les moins performantes



Race
Tibetan Mastiff
51 % de précision



Race
Eskimo dog
54 % de précision



Race
English Foxhound
57 % de précision

