

Projet 6

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

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Ingénieur Machine Learning

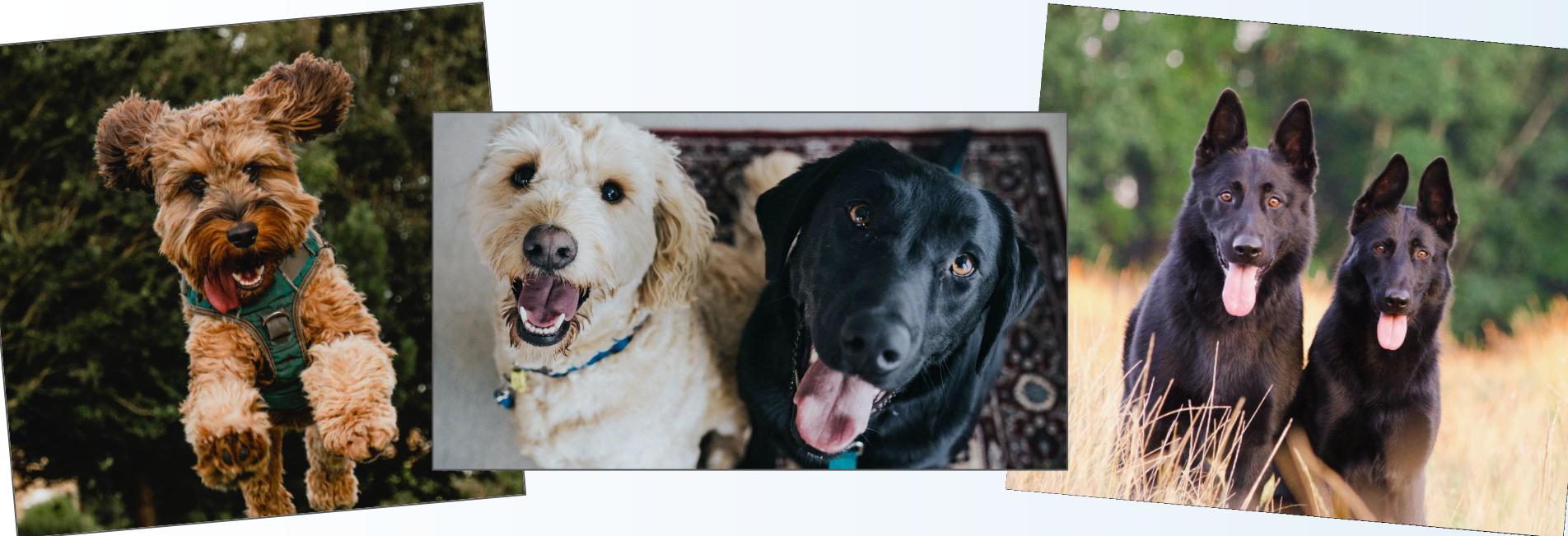
OPENCLASSROOMS



CentraleSupélec



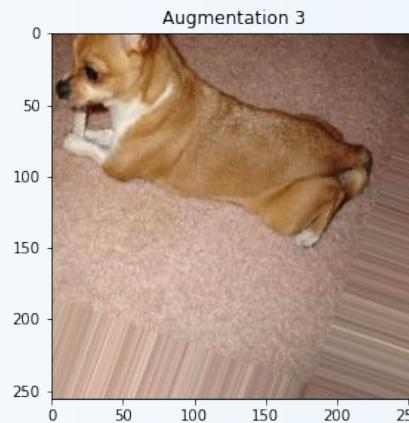
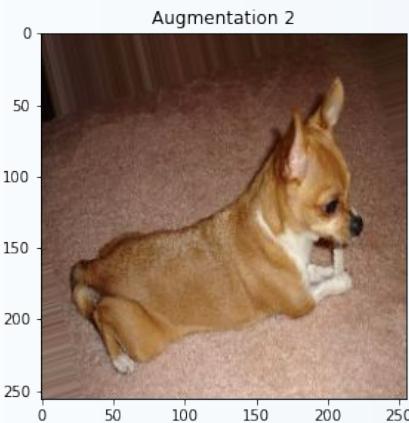
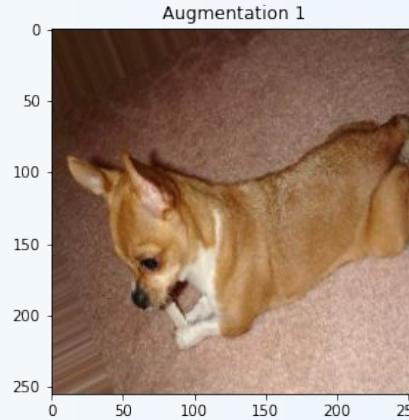
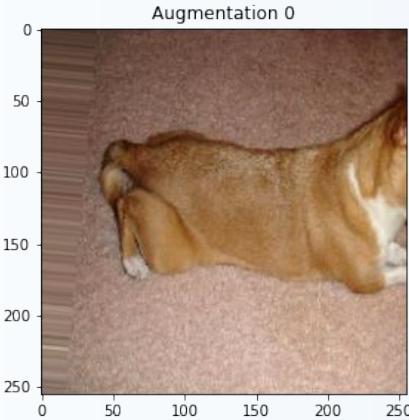
Problématique



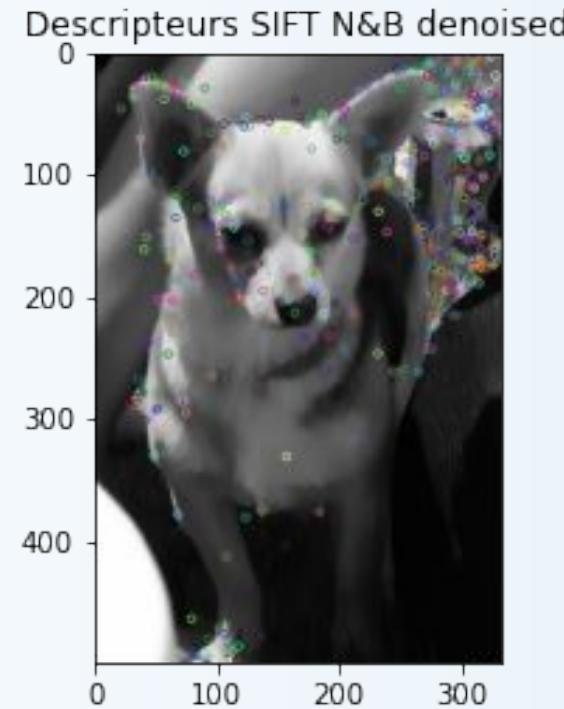
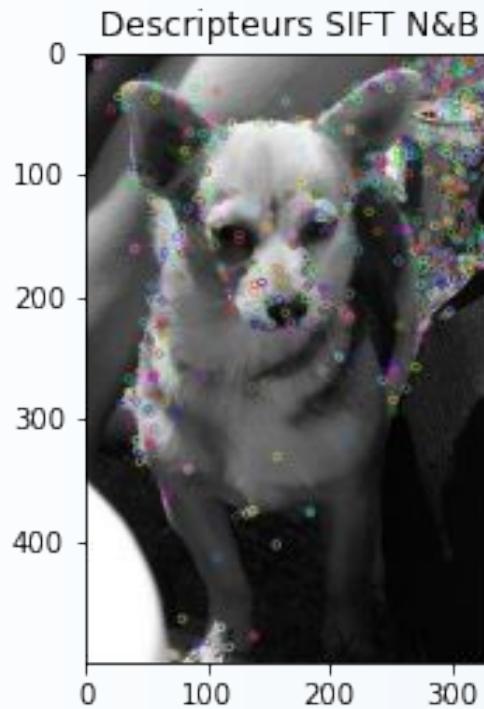
Transformation d'image - Traitements généraux



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

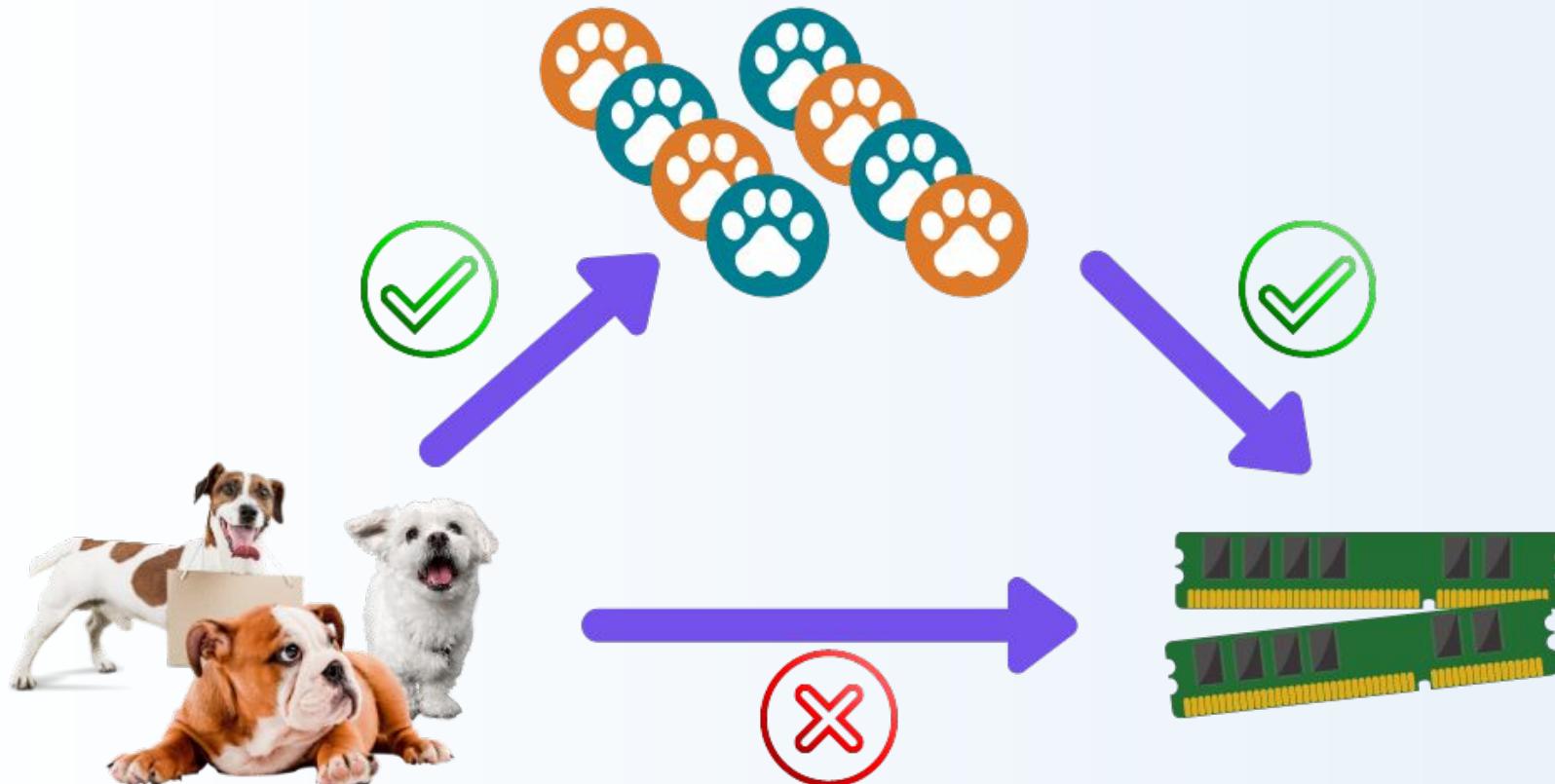


Réseaux convolutionnels - Méthodologie

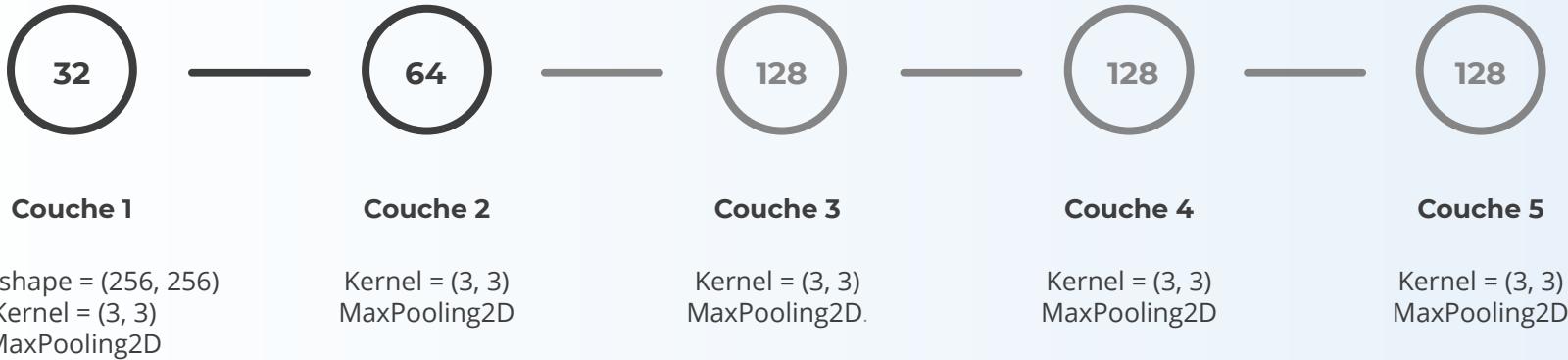
CNN from scratch	Transfer learning
<ul style="list-style-type: none">➤ Convolution :<ul style="list-style-type: none">○ Formation d'une base de convolution○ Mesure des fonctions d'activations➤ Classification :<ul style="list-style-type: none">○ Mesure des optimiseurs○ Mesure d'une couche de Flatten en 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

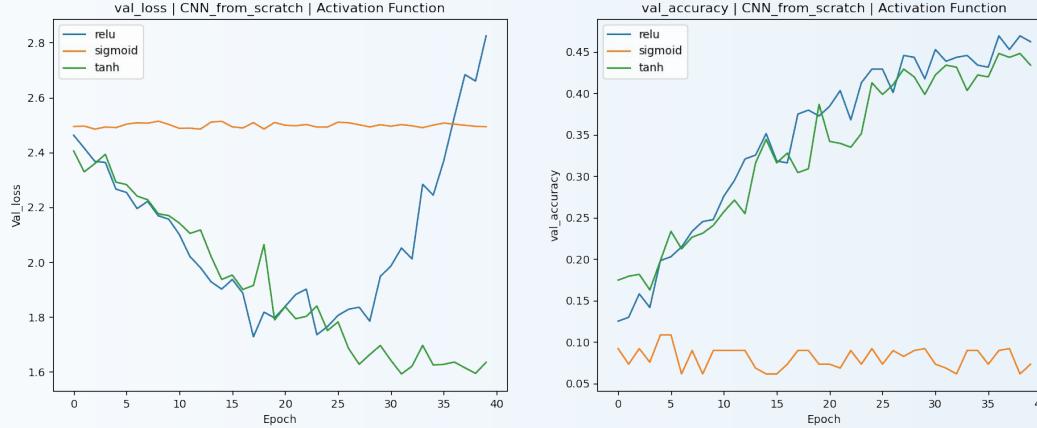


Format en sortie des couches des convolutions : (6, 6)

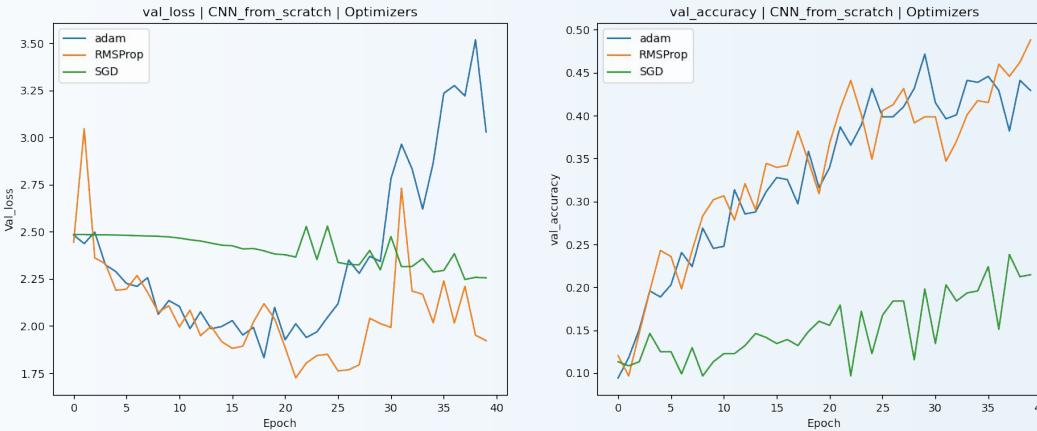


CNN from scratch - Fonctions d'activations | Optimiseurs

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

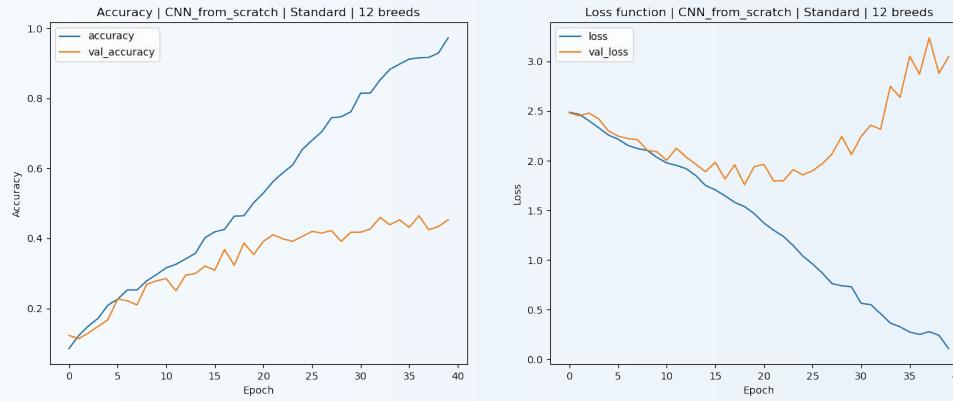


Evaluation des optimiseurs réalisé avec la **fonction d'activation relu**

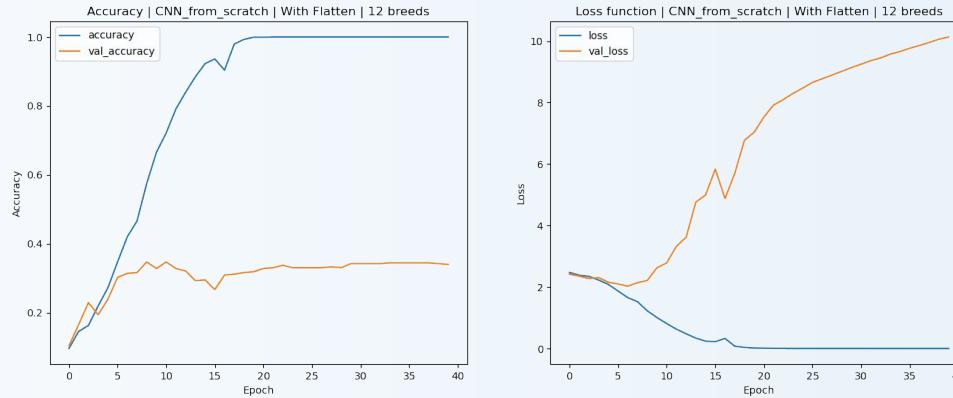


CNN from scratch - Flatten VS GlobalAveragePooling2D

Modèle standard avec
GlobalAveragePooling2D()

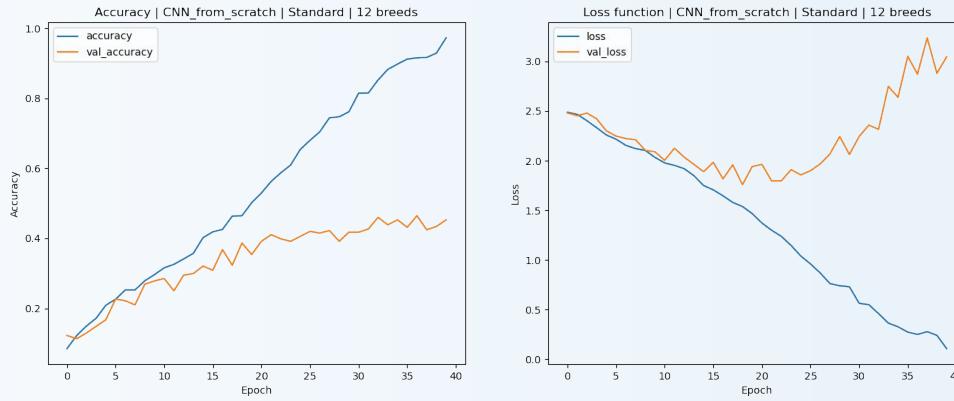


Modèle modifié avec **Flatten()**

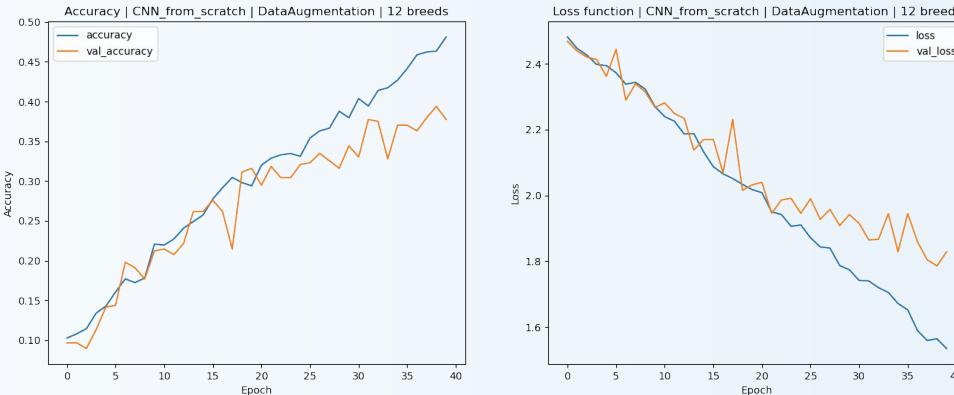


CNN from scratch - Effet de la data augmentation

Entraînement du modèle standard **sans data augmentation**



Entraînement du modèle standard **avec data augmentation**

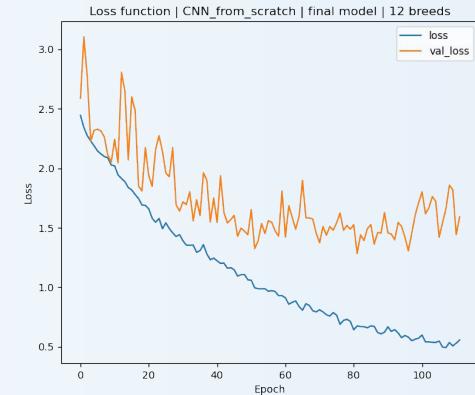
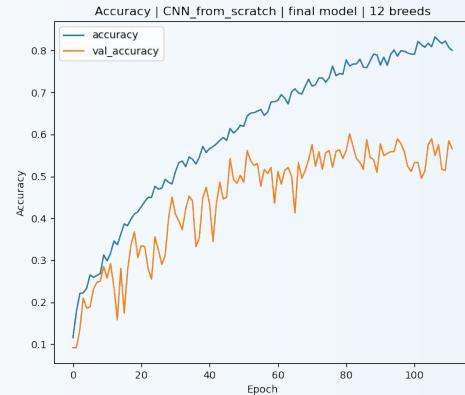


CNN from scratch - Modèle final

Fonction d'activation : **relu**

Optimiseur : **adam**

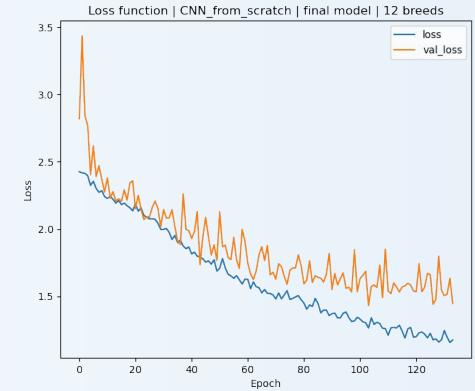
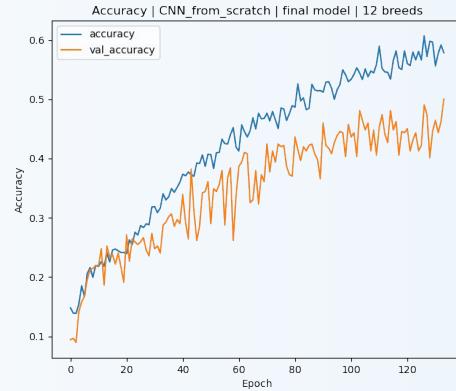
index	test
Standard	0.44
With Flatten	0.32
Dense supp	0.5
batch_normalization_effect	0.52
drop_out_effect_0.2	0.44
drop_out_effect_0.5	0.44
DataAugmentation	0.4



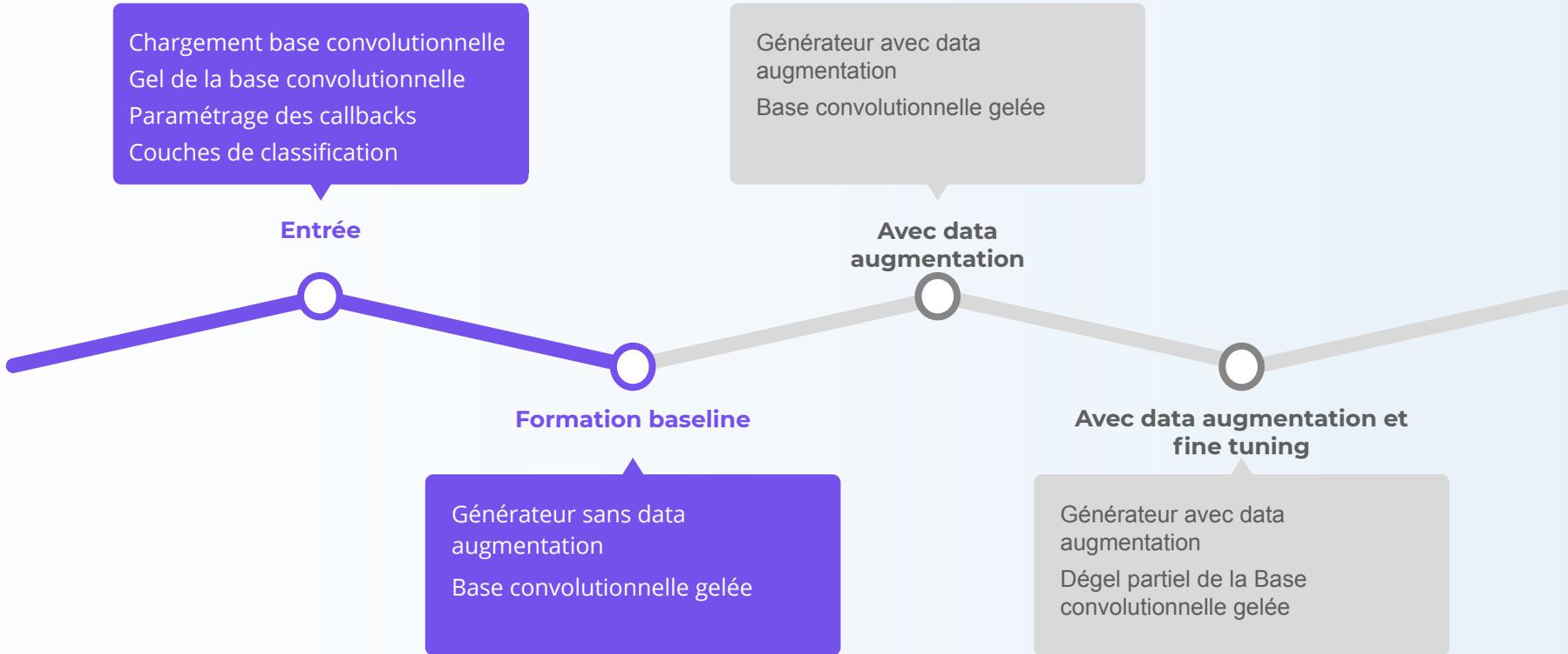
Fonction d'activation : **tanh**

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

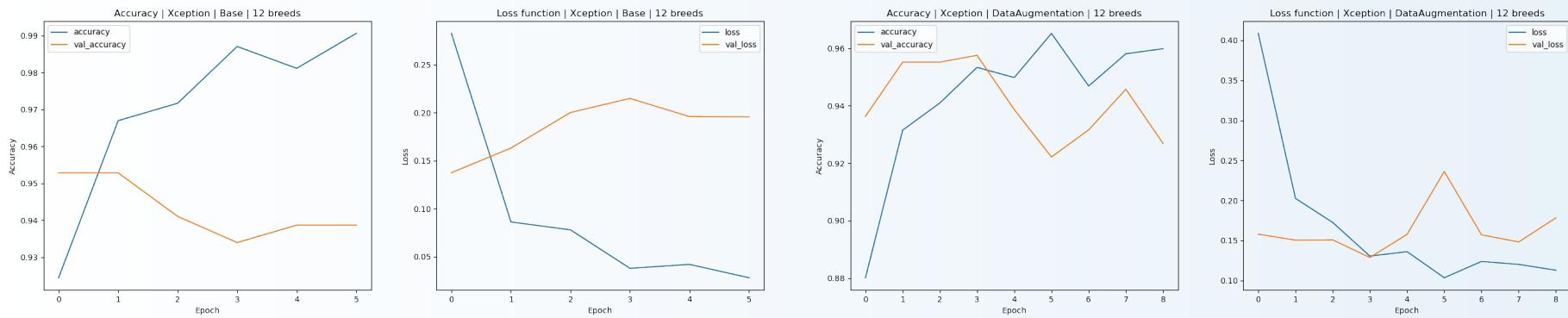


CNN Transfer learning - Processus d'expérimentation



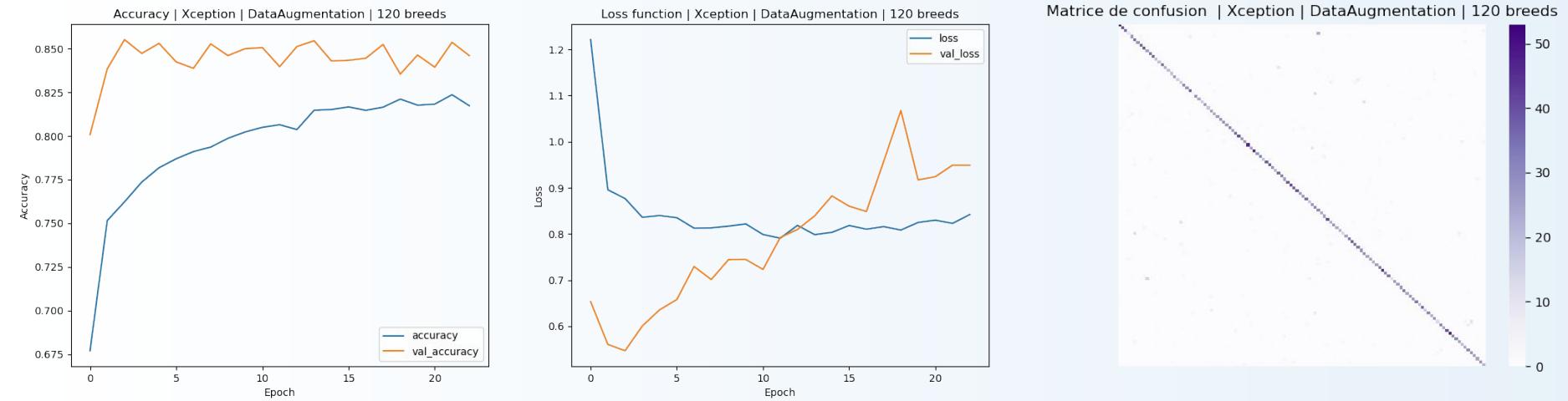
CNN Transfer learning - Expérimentation 12 races

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

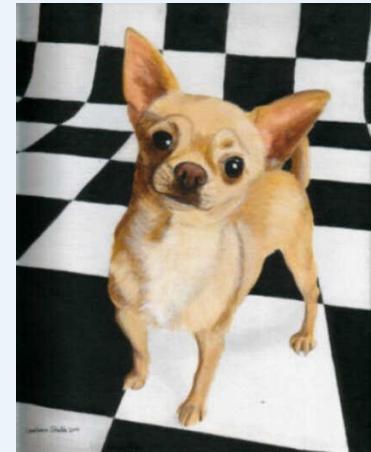
Photo recadrée

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

