# Project 1 - Cat & Dog Classification

Henrik Daniel Christensen[*hench13@student.sdu.dk*]
Frode Engtoft Johansen[*fjoha21@student.sdu.dk*]

Deep Learning
University of Southern Denmark, SDU
*Department of Mathematics and Computer Science*

## 1 Introduction

The objective of this project is to develop a deep learning model capable of distinguishing between images of cats and dogs. The task involves training a neural network using a dataset containing 2,600 images, equally divided between the two categories.

The report is structured as follows: Section 2 explores the dataset and the possible features that can be extracted from it. Section 3 describes which data augmentation techniques were used for the model training. Section 4 presents the architecture of the neural network. Section 5 describes the training process used to optimize the model. Section 6 presents the results obtained by the model. Section 7 presents the results of using a pre-trained model. Section 8 discusses the results and the limitations of the model. Finally, Section 9 concludes the report. In the Appendix, the code and a notebook with the results and visualizations are provided.

## 2 Explorative Analysis

**(a)** Cats **(b)** Dogs

**Fig. 1.** Illustration of the effect of adaptive grids.

Dataset contains many diverse images and differ in terms of color, size, and orientation. The images are of varying quality, with some being clear and well-lit, while others are blurry or poorly framed. The dataset contains a mix of close-up shots and full-body shots of both cats and dogs. The dataset contains a mix of different breeds of cats and dogs, with varying fur lengths, colors, and patterns.

Cats vs. Dogs features - Face: - Cats generally have shorter, more rounded faces, often with triangular ears and pointed noses. - Dogs generally have longer snouts and a greater diversity in ear shapes. - Ears: - Cats ears are typically upright and pointed. - Dogs ears vary widely in shape and position, from erect to floppy, and they often have a different positioning on the head compared to cats. - Eyes: - Cats have generally more sharper-shaped eyes. - Dogs have rounder eyes. - Tail: - Cats have long, flexible tails, often held upright or curled. - Dogs' tails vary greatly in length and shape, often held in different positions. - Body Structure: - Cats are generally lean, with flexible, agile bodies. - Dogs come in a range of body types, from muscular to slender. - Fur and Markings: - Cats fur are often softer, finer, and smoother. - Dogs often are coarser.

## 3 Data Augmentation

We chose to augment the data in a few different ways since we want to generalize the data so the important features remain. Augmented data means that the model can rely less on coincidences and has to rely more on actual features, which means that it will get better results when faced with new images. In other words, it reduces overfitting.

The images are of varying quality and taken in different lighting, and this is also what we can expect from the validation data. For this reason we change the brightness, saturation, contrast, and hue. This should make it easier

for the model to find common features between different images, and make it better at recognising dogs and cats in pictures of varying quality.

The pictures are taken from different angles so we rotate the pictures slightly and flip them horizontally. We don't want to rotate the pictures too much as it is unlikely for a picture to have a cat or dog at an angle of more than 45 degrees. Since the animals in most of the pictures are not entirely vertical we deemed 10 degrees to be good enough.

The pictures are also cropped differently, some are of the face, and some of the full body, so we crop the pictures a bit to make the model better at recognising cats and dogs at different croppings.

Even though some of the pictures are more blurry than others, we chose to not use blurring as data augmentation, as it effectively just reduces the data of the image without reducing input to the model.

Since the training dataset is quite small, we wanted to create more data by reusing the same images but with random augmentations, but in the end we found out that our results did not improve from this.

## 4 Model

hej

## 5 Training and Tuning

## 6 Results

hej

## 7 Pretrained model

## 8 Discussion

## 9 Conclusion

### 9.1 Individual Contributions

## A Code

hej

## B Notebook

hej