# COMPUTER VISION COURSEWORK

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## ABSTRACT

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***Index Terms—*** One, two, three, four, five

## 1. INTRODUCTION

This paper focuses on the aspect of two attempts to segment flowers in a small dataset called Oxford Flower Dataset [1]. The specific dataset is of around 750 flowers, with various species, where the images themselves each contain one flower. The difficulty, then, is to create a consistent solution to segmenting these flowers with the background. These flowers have varying viewpoints, colours, lighting, posing, shape, etc, and so the act of 'knowing' what a flower is with so much variance is very difficult.

## 2. LITERATURE REVIEW

This specific dataset has seen classical attempts at segmenting the flowers. The method uses an approximate segmentation with learned distributions for the background and foreground, and then it iterates on improving the foreground segmentation through using a geometric model of what a flower should look like, until it can converge onto some flower segmentation [2]. This specific method achieved its performance through a rudimentary learning method, which is by using a set of sample images to create a 'learned' distributions.

The method is affine invariant, but is still susceptible to colour/lighting variations. To circumvent this, a deep learning approach can be used to expand on the early uses of learning from data, specifically a U-net [3]. This expands on the principle by iteratively learning a set of filters that extract progressively more abstract features as you go down the first half of the network with lowering spatial information. The idea then is that these features would only encode the flower and background, or something useful to then be upscaled with another set of filters into an output segmentation, specifically up-convolutions.

This method removes the need for any assumptions on how a flower is structured, as the entire 'structure' and the concept of a 'flower' is learnt in the fast half. The only downside with this method is its dependence on data, where the quality and quantity of this data affects the performance to a great extent.

Another method, SegNet [4], exists, with the main differentiator being that it doesn't use convolutions to upscale directly, and uses pooling indexes to help with the upsampling. This isn't as popular as U-Net because it isn't as direct in learning the upscaling sequence with convolutions.

All of these methods requires data, and the learning of the first section, the downsampling that lowers the spatial resolution progressively, is the same as any classification CNN, like AlexNet or ResNet [5], [6]. Training these networks often uses methods like Batch Normalisation, which prevents neuron outputs from spiralling into massive values [7], and Dropout, which make the network more robust and lessen overfitting by disabling parts of the network during training [8].

Smaller dataset training in particular has popular configurations for maximizing training efficiency. Along with what has been spoken of, Data Augmentation is another method to expand the dataset by applying affine transformations, along with possible colour variations. This has been shown to reduce overfitting [9] by increasing the model's generalization (through a larger dataset).

These methods can be used together in specific ways to maximize the usefulness in small dataset applications, where the additional concept of injecting this data augmentation technique in the middle of training can maximize its effectiveness [10].

It is also possible to transfer learn, or fine tune pre-trained models to use their more general convolutions as a boost in training, where a pre-trained set of weights for the down-convolution can help it lock into a useful area of search on the onset. It has been shown that pre-training helps with generalizing performance by finding a better 'minima' in loss [11].

## 3. METHODOLOGY

The paper title (on the first page) should begin 1.38 inches (35 mm) from the top edge of the page, centred, completely capitalized, and in Times 14-point, boldface type. The au-

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Since there are many ways, often incompatible, of including images (e.g., with experimental results) in a LaTeX document, below is an example of how to do this **Lamp86**.

## 9. FOOTNOTES

Use footnotes sparingly (or not at all!) and place them at the bottom of the column on the page on which they are referenced. Use Times 9-point type, single-spaced. To help your readers, avoid using footnotes altogether and include necessary peripheral observations in the text (within parentheses, if you prefer, as in this sentence).



**Fig. 1**. Example of placing a figure with experimental results.

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List and number all bibliographical references at the end of the paper. The references can be numbered in alphabetic order or in order of appearance in the document. When referring to them in the text, type the corresponding reference number in square brackets as shown at the end of this sentence **C2**. An additional final page (the fifth page, in most cases) is allowed, but must contain only references to the prior literature.

[1] M.-E. Nilsback and A. Zisserman, "A Visual Vocabulary for Flower Classification," presented at the Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, vol. 2, Feb. 1, 2006, pp. 1447–1454, ISBN: 978-0-7695-2597-6. DOI: 10.1109/CVPR.2006.42.

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