

UNIVERSITÀ DEGLI STUDI DI  
MILANO-BICOCCA

ADVANCED MACHINE LEARNING  
FINAL PROJECT

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# Flowers recognition

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## Abstract

The ABSTRACT is not a part of the body of the report itself. Rather, the abstract is a brief summary of the report contents that is often separately circulated so potential readers can decide whether to read the report. The abstract should very concisely summarize the whole report: why it was written, what was discovered or developed, and what is claimed to be the significance of the effort. The abstract does not include figures or tables, and only the most significant numerical values or results should be given.

## 1 Introduction

The introduction should provide a clear statement of the problem posed by the project, and why the problem is of interest. It should reflect the scenario, if available. If needed, the introduction also needs to present background information so that the reader can understand the significance of the problem. A brief summary of the hypotheses and the approach your group used to solve the problem should be given, possibly also including a concise introduction to theory or concepts used later to analyze and to discuss the results.

## 2 Datasets

The dataset used is the *102 Category Flower Dataset* [1] created by the researchers of the *Visual Geometry Group of Oxford*. The dataset is composed of 8189 RGB images of variable size, each image contains one or more flowers on a neutral background and is labeled with a single category extracted from a set of 102 possible categories. The original dataset also contains the flowers segmented from the background (Figure 1); these images can be used for example as further input for the neural network. In this work they were not used in order to force the model to be more elastic with respect to the background of the images.

The subdivision of the dataset defined in the original publication has been maintained, in particular there are:

- 1020 images in the training set
- 1020 images in the validation set

- 6 149 images in the test set



Figure 1: Training images and their segmentation

Each category is represented by 10 images in the training set and validation set, while the proportion of images for each category varies in the test set. The difficulty of operating on a dataset of this type is evident: the number of images is limited while the test set is large.

### 3 The Methodological Approach

This is the central and most important section of the report. Its objective must be to show, with linearity and clarity, the steps that have led to the definition of a decision model. The description of the working hypotheses, confirmed or denied, can be found in this section together with the description of the subsequent refining processes of the models. Comparisons between different models (e.g. heuristics vs. optimal models) in terms of quality of solutions, their explainability and execution times are welcome.

Do not attempt to describe all the code in the system, and do not include large pieces of code in this section, use pseudo-code where necessary. Complete source code should be provided separately (in Appendixes, as separated material or as a link to an on-line repo). Instead pick out and describe just the pieces of code which, for example:

- are especially critical to the operation of the system;
- you feel might be of particular interest to the reader for some reason;
- illustrate a non-standard or innovative way of implementing an algorithm, data structure, etc..

You should also mention any unforeseen problems you encountered when implementing the system and how and to what extent you overcame them. Common problems are: difficulties involving existing software.

## 4 Results and Evaluation

The Results section is dedicated to presenting the actual results (i.e. measured and calculated quantities), not to discussing their meaning or interpretation. The results should be summarized using appropriate Tables and Figures (graphs or schematics). Every Figure and Table should have a legend that describes concisely what is contained or shown. Figure legends go below the figure, table legends above the table. Throughout the report, but especially in this section, pay attention to reporting numbers with an appropriate number of significant figures.

## 5 Discussion

The discussion section aims at interpreting the results in light of the project's objectives. The most important goal of this section is to interpret the results so that the reader is informed of the insight or answers that the results provide. This section should also present an evaluation of the particular approach taken by the group. For example: Based on the results, how could the experimental procedure be improved? What additional, future work may be warranted? What recommendations can be drawn?

## 6 Conclusions

Conclusions should summarize the central points made in the Discussion section, reinforcing for the reader the value and implications of the work. If the results were not definitive, specific future work that may be needed can be (briefly) described. The conclusions should never contain "surprises". Therefore, any conclusions should be based on observations and data already discussed. It is considered extremely bad form to introduce new data in the conclusions.

## References

- [1] M.-E. Nilsback and A. Zisserman, "Automated flower classification over a large number of classes," in *Indian Conference on Computer Vision, Graphics and Image Processing*, Dec 2008.