MUVC-AMLCV 45350082122 - Aprendizaxe Automática Avanzada para Visión por Computador - Máster Universitario en Visión por Computador

Final project (25%)

Gender classification and landmark detection in celebrity face images

This project can be done in pairs. The teams must be notified by e-mail to Prof. Joaquim de Moura (joaquim.demoura@udc.es) during the following two weeks (deadline for team notification: May 10th).

In this project we will consider two different analysis tasks over face images, consisting on male/female classification and face landmark localization.

The assignment consists in proposing and implementing deep learning based methods allowing to solve these two tasks following both a single-task and multi-task settings. To that end, it is recommended to follow some basic architecture of choice, and to provide appropriate adjustments so that it is possible to approach each of the tasks, as well as both tasks simultaneously. Then, it is recommended to follow a straightforward training and evaluation, without bells and whistles, to achieve a baseline results.

Once the baseline results are established, the teams may propose one or several improvements over the baseline. These improvements can imply using an alternative or a just a slightly modified approach. These improvements must be appropriately evaluated against the baseline, trying to objectively quantify the effect of each the proposal on the results.

The primary objective of this project is to compare the performance of the methods following the single-task approach with the ones following the multi-task approach. Thus, the baseline approaches, which consist on a base network slightly adapted to approach each task or both tasks simultaneously, methods must be compared.

The secondary objective is to provide improved alternative approaches over the baseline. The proposed modifications can be architectural, to the dataset management (e.g. augmentation), to the overall training strategy (e.g. pre-training), to the minimized objectives (e.g. losses, regularization) or any other that can be identified as a relevant modification with potential to improve the results. The choice of modifications must be appropriately motivated. However, in this case, the experiments comparing the baseline and improved methods can be limited to one of the three settings (single-task gender classification, single-task landmark detection, or the multi-task setting)

Materials and resources

A package with starter material is avaliable for download at the Moodle platform (Project material). This starter kit includes:

- **Dataset**. A dataset containing 500 face images of 500 different celebrities (250 men, and 250 women). Each image is associated with a gender label (0 for women, 1 for men), and a set of 5 landmark (x,y) coordinates corresponding to the two eyes, the nose, and the two sides of the mouth.
- **Custom PyTorch Dataset class**. A Dataset class that manages the loading of the provided dataset, ready to be used for training in PyTorch. **Note that the dataset does not manage training / validation / test splits.** The appropriate splitting of the dataset must be managed as part of the project.
- **Sample code**. An example Colab notebook allowing to load samples from the dataset and performing visualization of the sample images and their labels.

Students are allowed to use any software resource available on the web to complete the assignment, subject to these rules:

- The technical details of the used methods must be correctly understood and discussed.
- The use of pre-trained networks for the same, or similar tasks, using a the CelebA dataset [1], or a similar face dataset is forbidden. The provided dataset of 500 images is the only labeled face images dataset that can take part on the training of any part of the project. Pre-trained models on clearly and undoubtedly different domains can be used without limitation.
- The licenses of the external resources must be strictly followed and respected.
- The sources must be acknowledged and correctly cited. Any piece of code taken from an external source must be accompanied with a comment indicating the source URL, and the external sources the must be correctly cited in the report. This includes following any additional requirements of the license by which this software is released (e.g. attribution, preservation of license notes, citation of specific papers, etc.)
- There must be significant original contributions, i.e., the amount of original contribution will take a relevant part in the assessment and grading of the project.

To clarify, if you find a good external source of software or information that is valuable for your learning experience while developing the project, fostering the application of more advanced methods or ideas, it is perfectly fine that you take advantage of it, as in a real case scenario the appropriate use of these resources is part of the equation. However, this is an academic assignment that aims at evaluating your own skills and understanding of deep learning technology and its application. So there must be a contribution, demonstrating a complete understanding of the details, and providing some original contributions.

Objectives

Using the same basic architecture, and overall approach, with minor modifications adapted to each case:

1. **Single-task 1 - Gender classification**. Train and evaluate a baseline network that, given a face image, predicts the gender of the person.
2. **Single-task 2 - Eyes and nose landmark location**. Train and evaluate a baseline network that, given a face image, predicts the (x,y) coordinates, in the image, of (at least) the left eye, the right eye, and the nose.
3. **Multitask setting**. Train and evaluate a baseline network that, given a face image, predicts both the gender and the eyes and nose location.
4. **Improvements**. Propose and implement, at least, one possible improvement to the baseline model / training setting. Train and evaluate on at least one of the tasks in points 1, 2, or 3.
5. **Experiments**. The experiments must include a comparison of the different training settings (single-task vs multi-task) using the baseline approach. They must also include a study of the influence of each of the proposed improvements with respect to at least one baseline approach. Appropriate evaluation metrics must be chosen for each task. For the gender classification, among with other metrics, the report must include ROC curves.
6. **Report**. Write a brief report, explaining the proposed approach and the motivation behind the used methods, indicating the dataset and training details, presenting the experimental results, and providing a discussion. The report must be handed in in pdf format. It is recommended to use LaTeX to format the document (e.g. using the Overleaf platform).

Hand in and deadline

The source code, the trained models, and the pdf report must be delivered before the **deadline**: June 13th 23:59 (Spain time).

Grading criteria

The amount of original contribution will be taken into account as an overall assessment. Providing a reasonably enough contribution will grant you the highest grade in terms of contribution. The pdf report contents must be 100% original, with the exception of appropriately cited quotations or figures from external sources. Plagiarism is not allowed by any means.

Depending on the coverage of the project, the maximum achievable scores are:

- (max. score = 1.0) Solving one of the two single-task settings
- (max. score = 1.5) Solving the two single-task settings, or the multi-task setting
- (max. score = 2.0) Solving both the two single-tasks and the multi-task settings
- (max. score = 2.5) Solving both + improvements on any.

Note that the primary objective is to compare single-task with multi-task settings. Thus, the improvements will not be taken into account unless this objective is achieved.

The assessment of the assignment will follow these weights (with respect to the max. score):

- (50%) - Includes baseline models for the single task and/or multi-task settings, minimal comparison results, and a reasonable report.
- (25%) - Quality and significance of the proposals
- (25%) - Quality of the evaluation experiments and report.

References

[1] Large-scale CelebFaces Attributes (CelebA) Dataset. http://mmlab.ie.cuhk.edu.hk/projects/CelebA.html

Estado de la entrega

Estado de la entrega	No entregado
Estado de la calificación	Sin calificar
Fecha de entrega	lunes, 13 de junio de 2022, 23:59
Tiempo restante	25 días 6 horas
Última modificación	-
Comentarios de la entrega	▶ Comentarios (0)

Agregar entrega

Todavía no has realizado una entrega.

◄ Project materials

Ir a...

Questions and answers - Final project ►

Usted se ha identificado como Pablo García Fernández (Cerrar sesión)
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Alumnado
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