UNIVERSITY OF CALGARY

Assignment 01: Design a Garbage Classification System based on Cellphone Photos and Natural Language

Description

The city of Calgary assigned your team to develop a garbage classification system that, given a cellphone picture of an object you want to throw away and a short sentence describing the object, the system tells you whether to throw it in the “green”, “blue”, “black” trash bin or somewhere else. You can see more information about the city of Calgary's garbage collection system here: https://www.calgary.ca/uep/wrs/what-goes-where/default.html.

Part 01 of the assignment: Design Proposal for the Garbage Classification System

For part 01 of the assignment, your team should prepare a two-page maximum document describing how you would design such a system. Focus on the system specifications and the dataset creation part of the problem. A non-exhaustive list of things to consider in your proposal:

- What kind of data you will use to solve the problem? How the data should be collected?
    - Should the object be centralized in the photo?
    - Homogeneous background?
    - One object per photo?
    - How long should the natural language sentence be?
- What experimental design will you use? Which metrics will you compute?
- Determine what kind of data pre-processing you will employ.
- What problems do you expect to face?
    - Cellphone photos have different qualities depending on the device used to take the picture.
    - Images with different resolutions?
    - Will model generalization to photos taken using different cellphones be hard?
    - Too much variability within classes?

Teams should include references and up to two figures and/or tables, and their corresponding captions should be limited to 150 words per caption. The references and figures and/or tables do not count toward the two-page limit.

Part 02 of the assignment: Dataset Creation

After designing your garbage classification system, your team will create a small dataset composed of 32 photos, times the number of team members and a short sentence describing each photo. The photo and sentence requirements are:

- There should be only one object in the photo, an item we regularly throw in the trash bin.
- The object should be centred in the photo.
- The team should have a balanced number of photos across classes (“green”, “blue”, “black” trash bins or “other”)
- The team should strive for diversity within the images and sentences generated for each class (i.e., take photos of different objects)
- The photos’ file names should follow this convention:
    - <sentence_describing_image>.<photo extension>
        - example 01: greasy_pizza_box.jpg
        - example 02: dirty_toothbrush.jpg
        - example 03: empty_water_bottle.png
        - example 04: old_shirt.png

The assignment design proposal needs to be in pdf format and the dataset of images needs to be saved as a single ZIP file. Inside the ZIP file, create four folders, “Blue,” “Green,” “Black,” and “Other,” to store the images of each class. Both files need to be submitted to the corresponding group D2L dropbox by the assignment deadline. Please submit the Zip file with the photos and the PDF description as two separate files.

The datasets submitted by all groups will be combined into a larger dataset and used to implement a deep learning model for performing garbage classification from images and natural text in assignment #02.

Document Formatting Rules

Prepare your attachments in any word processing program (Microsoft Word, LatTex, Overleaf), following the requirements below:

A) Explain any acronyms and abbreviations fully.

B) Pages must be 8 ½" x 11" (216mm x 279mm);

C) Pages must be single-spaced, with no more than six lines of type per inch;

D) All text must be in 12 pt Times New Roman font;

E) Condensed fonts will not be accepted;

F) Margins must be set at a minimum of ¾" (1.87 cm);

G) The first page should contain the names of the team members;

H) The pages should be numbered.

Rubric

The total grade of the written component is assessed based on the table below and the grade is assigned to the team.

	Exceeds Expectations (85-100)	**Meets Expectations (75-84)**	**Needs Improvement (65-74)**	**Below Expectations (0-64)**
Content Formatting Rules 15 points	- The written document fully adheres to the formatting rules.	- The written document adheres to most of the formatting rules	- The written document adheres to some of the formatting rules	- The written document does not follow any of the formatting rules
Content Writing quality 40 points	- Extensive details and relevant examples. - All information was accurate and delivered effectively. - Terminology made the ideas in the assignment clear.	- Subject knowledge was evident. - Included details and examples to answer the essential question. - Used proper terminology and vocabulary.	- Information related to the topic, but assignment needed more details and examples to fully support ideas. - Work showed little student interpretation. - Used the wrong terminology to describe the topic.	- Information did not include details or examples from reliable sources. - Information was not sufficient to make successful argument. –Used inappropriate terminology or vocabulary.
Content Dataset created 30 points	- The team delivered the dataset following the requirements - The dataset delivered had at least 32 times the number of team members' photos	- The team delivered the dataset following the requirements - The dataset delivered had at least 25 times the number of team members' photos	- The team delivered the dataset following most of the requirements - The dataset delivered had at least 15 times the number of team members' photos	- The team did not deliver the dataset or the delivered dataset did not follow the requirements
Content Quality of Tables and/or Figures+ 15 points	- The report makes use of tables and/or figures to transmit ideas, concepts and results clearly - The figures have outstanding quality	- The report makes use of tables and/or figures to transmit ideas, concepts and results - The figures have good quality	- The report makes use of tables and/or figures to transmit ideas, concepts and results, but these tables and/or figures can confuse the reader - The figures have low quality	- The report does not make use of tables and/or figures