

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

Description

Your team was assigned by the city of Calgary to develop a garbage classification system that given a cellphone picture of an object you want to throw away, the system tells you whether to throw it in the “green”, “blue” or “black” trash bin. You can see more information about the city of Calgary garbage collection system here: <https://www.calgary.ca/uep/wrs/garbage-collection-information/>.

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 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?
 - Object should be centralized in the photo?
 - Homogeneous background?
 - One object per photo?
 - ...
- What experimental design you will use? Which metrics will you compute?
- Determine what kind of data pre-processing you will employ?
- What problems do you expect to face?
 - Cell-phone photos have different quality depending on the device used to take the picture?
 - Images with different resolutions?
 - Model generalization to photos taken using different cellphones will be hard?
 - Too much variability within classes?

Teams can include up to two figures and/or tables and their corresponding captions limited to a maximum of 150 words per caption. The references and figures and/or tables do not count towards the two-page limit. The team should also include a one-page description of what each team member did in the assignment. On that page, the team should also include a consensus score to each team member. This score ranges between 0 and 3 and it will be used to adjust the final grade of each student. Students developing the assignment individually do not need this description and score.

Part 02 of the assignment: Dataset Creation

After designing your garbage classification system, your team will create a small dataset composed of 30 photos of garbage you want to throw out times the number of team members. The photos requirements are:

- There should be only one object in the photo and this object should be an item that we regularly throw out in the trash bin;
- The object should be centered in the photo;
- The team should aim at having a balanced number of photos across classes ("green", "blue" or "black" trash bins)
- The photos' file names should follow this convention:
 - o team_<team number from D2L>_<photo_number>_<class name>.<photo extension>
 - example 01: team_01_01_green.jpg
 - example 02: team_40_01_black.jpg
 - example 03: team_20_03_blue.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. Both files need to be submitted to the corresponding group D2L dropbox by 13 February 2021, 11:59 pm.

The datasets submitted by all groups will be composed into a single larger dataset and it will be used for Assignment 05, where we will actually implement a deep learning model for performing garbage classification from images.

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

Based on the team score, the final grade of each team member is adjusted according to the table below.

Score	Meaning	Grade Adjustment
0	No contribution to the assignment	Automatic 0
1	Little contribution to the assignment	20% reduction to the final grade
2	Moderate contribution to the assignment	10% reduction to the final grade
3	Significant contribution to the assignment	No grade reduction

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 35 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* Introduction (Literature review) 20 points	- Literature selected is appropriate for the topic (e.g., primarily peer reviewed, relevant studies; grey literature included if appropriate). - Reviews and cites at least 5 relevant references	-Literature chosen is mostly appropriate for the topic. - Reviews and cites at least 3 relevant references	- Some of the literature chosen is appropriate for the topic. - Reviews and cites at least 1 relevant reference	- No literature is reviewed, or the reviewed literature is inappropriate

Content Dataset created 15 points	<ul style="list-style-type: none"> - The team delivered the dataset following the requirements - The dataset delivered had at least 30 times the number of team members photos 	<ul style="list-style-type: none"> - The team delivered the dataset following the requirements - The dataset delivered had at least 25 times the number of team members photos 	<ul style="list-style-type: none"> - The team delivered the dataset following most of the requirements - The dataset delivered had at least 15 times the number of team members photos 	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - The report makes use of tables and/or figures to clearly transmit ideas, concepts and results - The figures have outstanding quality 	<ul style="list-style-type: none"> - The report makes use of tables and/or figures to transmit ideas, concepts and results - The figures have good quality 	<ul style="list-style-type: none"> - 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 	<ul style="list-style-type: none"> - The report does not make use of tables and/or figures

*For the categories marked with a *, groups with three people or less will be bumped to “exceeds expectations” if they fall under the “meets expectations” category.*