Project Assignment 2

**Classifying Cell Images Using Deep Learning Models**

**Purpose:**

This project is to exercise how to use deep CNN models to classify cell images. Efficient Human Epithelial-2 (HEp-2) cell image classification can facilitate the diagnosis of many autoimmune diseases.

**Data:**

The HEp-2 cell images are from the international competition on cell image classification hosted by International Conference on Pattern Recognition in 2014. The images have been pre-partitioned into training set (8701 images), validation set (2175 images), and test set (2720 images). In addition, a .csv file is enclosed. It contains the category of each image. This file consists of two columns: the first column is the image IDs of all the 13,596 images, and the IDs are consistent with the names of the images in the three sets; and the second column is the category of the cell image.

**Tasks:**

Please finetune the pretrained AlexNet model for your cell image classification task. Specifically, you need to: (1) use the architecture of AlexNet to construct your cell image classification model; (2) use the weights in the pretrained AlexNet to initialize the weights of your model; (3) change the number of neurons in the output layer (i.e., number of classes) in your model from 1000 (used by imageNet) to 6 classes (used in your task); (4) Train your model for a few epochs; (5) Use the finetuned model to classify the test cell images.

Hint: -Use the validation set to select the hyperparameters, e.g., the number of epochs in the training stage.

-Use data augmentation can help improve the classification performance. You can follow the data augmentation in the attached cell image classification paper.

**Submission:**

Please submit (1) a complete report (more instructions could be as follows), and

(2) the code used in your experiment

As for the report, please submit individual reports and clearly indicate the contribution of each team member at the beginning of the report. It is suggested that the report is organized in the following ways.

Section 1: Aims and Background

Section 2: Contributions of Team Members

Section 3: Methodology

Section 4: Results

Section 5: Discussion and Conclusion

**Submission Deadline:**

This project is due on: 11:59pm, Nov 3, 2023 (Week 13 Friday)

This project occupies 20% of the total marks.

**Evaluation Criteria:**

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| Criteria | Ratings | | | |
| Introduction: Aims  (5%) | 5.0 pts  **Exceptional**  Defines and elucidates the problem.  Develops compelling rationale for the lab.  Persuasively explains the multifactorial contribution of learning gained from the lab. | 3.0 pts  **Good**  Defines problem with some depth. States rationale for the lab. Provides explanation beyond basic contribution. | 2.0 pts  **Average**  Defines problem. States only obvious rationale for the lab.  Explains the basic contribution of the activities to the understanding  of the lab. | 1.0 pts  **Poor**  Shows fundamental lack of understanding.  Does not state rationale for the activity.  Does not explain the contribution of the activities to the understanding of the lab. |
| Background and Methods:  Knowledge of the area and use of sources  (25%) | 25.0 pts  **Exceptional**  Demonstrates exceptional depth of knowledge of the field. Comprehensive use of most recent and seminal sources. Clearly discriminates among seminal sources. | 20.0 pts  **Good**  Demonstrates proficient knowledge of the field.  Thorough selection of sources pertinent to project.  Shows some discrimination among seminal sources. | 15.0 pts  **Average**  Demonstrates a basic knowledge of the field.  Selected sources relevant to project.  Limited discrimination among seminal sources. | 7.0 pts  **Poor**  Lacks a basic knowledge of the field.  Selected sources irrelevant to project.  Does not discriminate among seminal sources.  Misinterprets sources. |
| Results  (50%) | 50.0 pts  **Exceptional**  Results organised into sections and subsections in a logical order. | 45.0 pts  **Good**  Results are well organised in a logical order. | 35.0 pts  **Average**  Results organised into sections and subsections. | 10.0 pts  **Poor**  Results are poorly organised. |
| Discussion  and Conclusion  (20%) | 20.0 pts  **Exceptional**  Outstanding and innovative synthesis between results and sources. | 15.0 pts  **Good**  Demonstrates synthesis between results and sources. | 10.0 pts  **Average**  Relevant information about the results is discussed under each heading.  Demonstrates information synthesis to a limited extent. | 5.0 pts  **Poor**  Information on the results are repeatedly reported without any synthesis from sources. |
| Total Points: 100.0 | | | | |