Summer 2024

AUA-ST

Deadline 23:59, July 5, 2024

- Share all the attachments via an email to abutavyan@aua.am and hmadoyan@aua.am
- Complete the Google Form by entering the primary results according to the specified requirements. The submissions which don't have Google Form response will not be considered.

Task 1 Logical Reasoning

Alex has 6 red pens (denoted by A) and 6 green pens (denoted by B), arranged in a row in some arbitrary initial order. A group is any subsequence of consecutive pens of the same color. Given a fixed positive integer $k \leq 12$, Alex repeatedly performs the following operation: he identifies the longest group containing the k^{th} pens from the left, and moves all pens in that group to the right end of the row.

For example, if there are 8 pens (4 of type A, 4 of type B) and $k = 4$, the process starting from the ordering AABBBABA would be

$$\text{AABBBABA} \to \text{AAABABBB} \to \text{AAAABBBB} \to \text{BBBBAAAA} \to \ldots$$

Find all k with $1 \leq k \leq 12$ such that for every initial ordering, at some moment during the process, the leftmost 6 pens will all be of the same color.

Deliverable: You need to attach **single** pdf document for this task. It can be in a handwritten form scanned.

Important: Submission can contain partial or full solution to the problem containing mathematical proofs, reasoning or both.

Task 2 Modeling

You are going to work with DIALOGSUM dataset DialogSum is a large-scale dialogue summarization dataset, consisting of 13,460 dialogues with corresponding manually labeled summaries and topics. You can check more details about the data here.

Data Splits

train: 12460

validation: 500

test: 500

The aim is to construct a model which will predict topics (clustered) based on dialogue or summary or both. The task reduces to multiclass classification problem with target that has 20 classes. The model should make predictions on a test set (500 observations) that are included in the data. The topics are clustered into 20 clusters, you can find them in **dialogsum_clustered.csv**.

Note: For each observation in test set, there are three summaries. You should use only first ones, e.g. test_0_1, test_1_1, etc.

Deliverable: You need to attach one pdf document for this task where you have short description of your approach and script(s) in ipynb/py format which will run smoothly for a given data and will display accuracy (**Weighted Average F1 score**) for the test set.

Important: You are not allowed to use any paid API for the modeling and prediction. We will run the codes offline using RTX3090 or in Google Colab (free version), please make sure that it is something which is executable in reasonable amount of time.

Task 3 Literature Review

Summary of one fundamental academic paper you've checked during the work or a core paper of the final model you applied (no more than 300 words).

Make sure you have a full name of the paper in the title and the link that directs to the paper in a journal, arXiv, etc.

Deliverable: You need to attach one pdf document for this task.

Important: The shortlisted applicants are expected to discuss the paper in the interview with technical details.