

Automated Caption Generator

AI Model Development

Time: 60 mins

Introduction

In this class, the student/s will learn to train a model to generate captions for a video..

New Commands Introduced

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|--------------------------------|--|
| • <code>pickle.load()</code> | To retrieve data. The primary argument of pickle load function is the file object that you get by opening the file in read-binary mode. |
| • <code>f.read()</code> | Read the contents of a file. |
| • <code>split()</code> | Splits a string into a list. You can specify the separator, default separator is any whitespace. |
| • Mapping / <code>map()</code> | It is a built-in function that allows you to process and transform all the items in an iterable without using an explicit for loop |
| • <code>replace()</code> | Replaces a specified phrase with another phrase |
| • <code>Tokenizer()</code> | Tokenization is used in natural language processing to split paragraphs and sentences into smaller units that can be more easily assigned meaning. |

Vocabulary

- **Pickle** is a python tool that allows you to save your ML models, to minimize lengthy re-training and allow you to share, commit, and reload pretrained machine learning models.
- **Tokenization** is used in natural language processing to split paragraphs and sentences into smaller units that can be more easily assigned meaning.
- **Captions** are a text version of the speech and non-speech audio information needed to understand the content.

Learning Objectives

Student/s should be able to:

- **Recall** how to process the video to predict the age of the person.
- **Demonstrate** how to display the captions for a video.
- **Explain** the steps required to generate captions for a video.

Activities

1. Class Narrative: (2 mins)

- Brief the student/s that you can create model to generate the caption for a video.

2. Concept Introduction Activity: (5 mins)

- Let the student/s play the explore-activity to see how the caption generator works.
- Using the slides, explain that the student/s will learn:
 - to prepare caption dataset.
 - to clean the caption dataset
 - to tokenize and generate captions

3. Activity 1: Prepare Caption Dataset (14 mins)

Teacher Activity: (7 mins)

- Ask the student/s to recall how they fed the images to train a model, extract features and classify images.
- Explain how to collect the set of images.
- Explain how to set a corresponding caption for each image.
- Explain how to train the model.

Student Activity: (7 mins)

- Guide the student/s to feed the sample images and corresponding captions to a model to train the model.

4. Activity 2: Clean the Caption Dataset (12 mins)

- Guide the student/s to convert the text to lower case and replace special characters with whitespaces.
- Guide the student/s to replace multiple whitespaces with one and add the words start sequence and end sequence
- Explain that these steps need to be followed for all the images.

5. Activity 3: Tokenize and Generate Captions (12 mins)

Teacher Activity: (6 mins)

- Explain about the tokenizer class which is used to create tokens from sentences.
- Explain how to create a list from all the caption text.
- Demonstrate how to declare a tokenizer object, create a vocabulary index based on word frequency.

Student Activity: (6 mins)

- Guide the student/s to tokenize the caption dataset.

6. Introduce the Post class project: (2 min)

- Use the concepts learned in the class to predict caption for the image given.

7. Test and Summarize the class learnings: (5 mins)

- Check for understanding through quizzes and summarize learning after respective missions.
- Summarize the overall class learning towards the end of the class.

8. Additional activities:

- Encourage the student/s to debug and remove the error while running the code
- Encourage the student/s to predict captions till the end of the video file.

9. State the Next Class Objective: (1 min)

- In the next class, student/s will learn to create an AI car that moves on a track.

U.S. Standards:

CSTA: 2-AP-11, 2-AP-12, 2-AP-13, 2-AP-14, 2-AP-19

Links Table		
Activity	Activity Name	Link
Class Presentation	Automated Caption Generator	https://s3-whjr-curriculum-uploads.whjr.online/11242cd2-c63a-47e0-9604-ca104a6ccc9f.html
Explore Activity	Automated Caption Generator	https://github.com/Tynker-Computer-Vision/TNK-M10-PRO-C77-SAS-BP
Teacher Activity 1	Prepare the caption dataset	https://github.com/Tynker-Computer-Vision/TNK-M10-PRO-C77-TAS-BP

Teacher Reference: Teacher Activity 1 Solution	Prepare the caption dataset: Solution	https://github.com/Tynker-Computer-Vision/TNK-M10-PRO-C77-TAS
Student Activity 1	Prepare the caption dataset	https://github.com/Tynker-Computer-Vision/TNK-M10-PRO-C77-SAS-BP
Teacher Reference: Student Activity 1 Solution	Prepare the caption dataset: Solution	https://github.com/Tynker-Computer-Vision/TNK-M10-PRO-C77-SAS
Student Activity 2	Clean the caption dataset	https://github.com/Tynker-Computer-Vision/TNK-M10-PRO-C77-SAS-BP
Teacher Reference: Student Activity 2 Solution	Clean the caption dataset: Solution	https://github.com/Tynker-Computer-Vision/TNK-M10-PRO-C77-SAS
Teacher Activity 3	Tokenize and generate captions	https://github.com/Tynker-Computer-Vision/TNK-M10-PRO-C77-TAS-BP
Teacher Reference: Teacher Activity 3 Solution	Tokenize and generate captions: Solution	https://github.com/Tynker-Computer-Vision/TNK-M10-PRO-C77-TAS
Student Activity 3	Tokenize and generate captions	https://github.com/Tynker-Computer-Vision/TNK-M10-PRO-C77-SAS-BP
Teacher Reference: Student Activity 3 Solution	Tokenize and generate captions: Solution	https://github.com/Tynker-Computer-Vision/TNK-M10-PRO-C77-SAS
Student's Additional Activity 1	Remove the Error	https://github.com/Tynker-Computer-Vision/TNK-M10-PRO-C77-SAS-BP
Teacher Reference: Student's Additional Activity 1 Solution	Remove the Error: Solution	https://github.com/Tynker-Computer-Vision/TNK-M10-PRO-C77-SAS
Student's Additional Activity 2	Generate Captions for the Complete File	https://github.com/Tynker-Computer-Vision/TNK-M10-PRO-C77-SAS-BP
Teacher Reference: Student's Additional Activity 2 Solution	Generate Captions for the Complete File: Solution	https://github.com/Tynker-Computer-Vision/TNK-M10-PRO-C77-SAS
Post Class Project	Caption for ImageCaption for Image	https://github.com/Tynker-Computer-Vision/TNK-M10-PRO-C77-PCP-BP
Teacher Reference: Post Class Project Solution	Caption for ImageCaption for Image: Solution	https://github.com/Tynker-Computer-Vision/TNK-M10-PRO-C77-PCP