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Image Captionbot for Assistive Technology

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Abstract— Generating small descriptions from the image is a very difficult task because of the complexity of image features and the vastness of the language contexts. An image may contain a wide variety of information and thus extracting the context of the information contained in the image and generation of the sentence using that context is a very complex task. However, the task can help blind people to understand the surrounding without others assistance. Deep learning techniques have emerged as a new trend in programming and can be utilized to develop this kind of system. In the project, we will be using VGG16, one of the best CNN architectures for image classification and for extracting features from images. An embedding layer and LSTM will be used for text description. And these two networks will be combined to form an image caption generation network. Then we will train the model using data prepared from the flickr8k dataset. The trained model will be used to generate caption from new images and the generated caption will be converted to audio for helping the blind.
Keywords— Deep learning, CNN,LSTM

I. INTRODUCTION

Even in this modern period, the differently abled people remains a vital element of our modern societies, where they struggle to integrate their daily lives with the greater society. As a result, their social advancement is hampered, and their contribution to commercial production is reduced to none. They were not included in crucial aspects of socioeconomic culture. Our aim is to decrease this constantly increasing gap and assist them to contribute more productively to their respective societies. This is achieved with the help of advancing modern technology.

For a normal person it is easy to determine the scene description and its contents when an image is given but the visually impaired or blind do not have this capacity. This system will describe the visual contents in natural language will help the impaired a lot. In this automate the way to take visual contents and will convert to natural language descriptions will empowered the impaired population that why the system will be a socially relevant one.

The capacity to produce natural language content descriptions of photographs is still one of the most difficult challenges for a machine to accomplish. It was made possible by recent breakthroughs in the field of computer vision. Image descriptions are more difficult to create than object identification and classification tasks because they require the descriptions of the

objects as well as the context in which they are located in the visual. The challenge of developing visual descriptions in natural language necessitates a combined knowledge of the language model and the visual model.

II. RELATED WORKS

Producing natural language descriptions of visual components is a difficult issue that has become a popular study topic in recent years. These are the systems in place.

Because of some limitations, they are easily broken and provide there are extremely few features.

Seung-Ho Han and Ho-Jin Choi proposed a novel in [1].

Domain-specific image captioning is a type of picture captioning model.A caption generator that creates a caption for a video,image created with visual and semantic attention (also known as a domain-specific caption)from the overall caption by substituting semantic ontology for the individual phrases in domain-specific terms in the generic caption.

Kurt Shuster, Samuel Humeau, Hexiang Hu, Antoine Bordes, and Jason Weston introduced a model in [2] that can understand image information while also providing feedback, captions that are interesting to read for humans In this case, in particular, achieve a on COCO, a new state-of-the-art in caption generating, and provide a new retrieval architecture, dubbed TransResNet.

N. Komal Kumar, D. Vigneswari, A. Mohan, and K. Mohan published [3], J. Yuvaraj and Laxman proposed a deep learning method for the use of neural networks to generate image captions is new.The proposed method was tested on a Flickr 8k dataset .The deep learning procedure that has been proposed created captions that were more descriptive than the original. Image caption generators that are already in use. It is possible to create a hybrid picture caption generator model for more accurate captions in the future

Feng Chen, Songxian Xie, Xinyi Li, Shasha Li, Jintao Tang, and Ting Wang suggested a method in [4] that brought attribute concept into the CNN-RNN architecture and improved performance while relying heavily on manually picked attributes. The CNN-RNN framework is used to propose a topic-guided neural image captioning model that incorporates a topic model.

Rakshith Shetty, Marcus Rohrbach, Lisa Anne Hendricks, Mario Fritz, and Bernt Schiele introduced an adversarial caption generator model that is deliberately trained to generate a variety of captions for photos in [5.] It's done by training the generator with an adversarial learning framework and a discriminator network designed to enhance diversity.

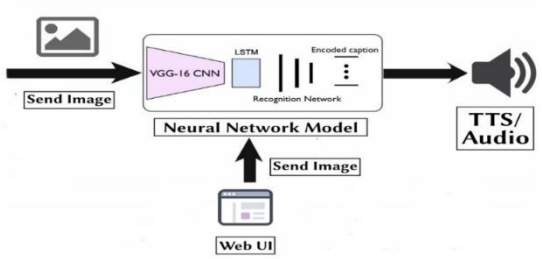
Bo Dai, Sanja Fidler, Raquel Urtasun, and Dahua Lin introduced a new method for generating image descriptions in [6]. In contrast to current methods, which are primarily concerned with matching detailed phrasing, our approach focuses on improving overall quality, which includes semantic relevance, naturalness, and diversity. In comparison to the progressive MLE-based approach, the suggested methodology produced descriptions that were more natural, diversified, and semantically meaningful on MSCOCO and Flickr30k.

Chuang Gan, Zhe Gan, Xiaodong He, Jianfeng Gao, and Li Deng offer StyleNet as a new framework for creating attractive captions for photos and videos of various styles in [7]. On the recently gathered FlickrStyle10K image caption dataset, it reveals that StyleNet

outperforms existing algorithms for creating visual captions with radically diverse styles, as judged by both automatic and human review criteria.

Jiasen Lu, Caiming Xiong, Devi Parikh, and Richard Socher introduce a new adaptive attention encoderdecoder system in [8], which includes a decoder fallback option. Introduce a new LSTM extension that creates an additional'visual sentinel.' In this case, the model achieves state-of-the-art performance on typical picture captioning benchmarks. Many reviews are presented in literature by many researchers with respect to ecommerce applications in different domain [13][14][15]. This analysis will surely enable the researchers with the idea of deep learning technique in different applications [16][17][18][19]. Different issues also discussed in machine learning applications [20][21][22].

III. PROPOSED SYSTEM



A. OVERVIEW

Proposed method will be using VGG16, one of the best CNN architectures for image classification and for extracting features from images. An embedding layer and LSTM will be used for text description. And these two networks will be combined to form an image caption generation network. Then we will train the model using data prepared from the flickr8k dataset. The trained model will be used to generate caption from new images and the generated caption will be converted to audio for helping the blind**.**

3.2 MODULES

The proposed system consists of following main modules:

3.2.1 IMAGE FEATURE EXTRACTION

VGG16 model, one of the best CNN architectures for image classification is used for extracting features of an image. Using this pre-trained model VGG16, we first extract all the features of a particular image. VGG16 returns a vector of features and it is then saved as a file. Then we create a mapping of image id and image features.

3.2.2 TEXT PROCESSING

Initially convert the text into lower case and remove the punctuations, remove the words with numbers. After processing, create a vocabulary of text and save the vocabulary. May one image has more than one description, so a mapping is created between images and descriptions.

3.2.3 TOKENIZATION

In the text, add starting and ending tokens. The next step after adding tokens is to prepare a tokenizer for the text and save the tokenizer. Tokenize the description of the image that is with numbers. Then create image sequence, input sequence, output words for the corresponding image.

3.2.4 ARCHITECTURE CREATION

Two dense layers are used for image features that are for text descriptions. The layers are the embedding layer and the LSTM layer. These two networks will be combined to form an image caption generation network that is by concatenation.

3.2.5 TRAIN THE MODEL

We train the model in google colab and save the trained model.

3.2.6 IMAGE CAPTION GENERATION

The challenge of creating a human-readable written description for a given image is a difficult artificial intelligence problem, and caption creation is no exception. It necessitates expertise in both computer vision and natural language processing. Computer vision knowledge is required for picture recognition, while the natural language processing area is required for language modelling. To do so, load the image and use the pre-trained model VGG16 to extract the feature from it.

After loading the image, load the tokenizer and creae a caption generation function using the saved model and the tokenizer. At last, convert the generated caption to audio.

IV. CONCLUSION

As a result, we offer a system that delivers natural descriptions of provided images to the visually impaired population, allowing them to contribute more constructively to society. We create an encoder-decoder system in which a VGG-16 network is trained first, followed by an LSTM network, to produce a mapping from images to phrases.. The system performance is evaluated and shows a good results. In future we will try to improve accuracy and performance.

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