Learning System for Kids

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Abstract*: The COVID-19 pandemic has affected academic systems worldwide, resulting in the near-total closures of faculties, universities and faculties. An honest education may be a foundation for a higher future. Because it plays a crucial role in each single person's life, in response to high school closures, UNESCO suggested the utilization of distance learning programs and open academic applications and platforms that faculties and lecturers will use to achieve learners remotely and limit the disruption of education. Early childhood may be a crucial period of time for the event of the mental functions of youngsters. Today youngsters are unit exposed to world with engineering. However, folks or guardians cannot expect them to use the normal ways as the way previous generation accustomed to learn. Considering these circumstances, we have a tendency to come up with plan of children learning application which is able to educate them whereas taking part in, and wholesome their childhood. During this application we've created use of deep learning and tongue process techniques, to supply interactive options, whereas eliminating the requirement for direction.

***Keywords*: Deep Learning, Natural Language Processing**

1. Introduction

Efforts to slow the unfold of COVID-19 through non-pharmaceutical interventions and preventive measures like social-distancing and self-isolation have prompted the widespread closure of primary, secondary, and tertiary schooling in over a hundred countries. By the tip of March 2020, UNESCO computed that over 89% of the world's student population was out of college or university thanks to closures aimed toward mitigating the unfold of COV ID-19.[1] This raised serious considerations concerning the social, economic, and academic impacts of long faculty closures on students [2][3][4][5]. Additionally, faculty closures disproportionately have an effect on kids from low-income or minority families, kids with disabilities, and young girls, thanks to disparities in access to distance education, unequal distribution of exaggerated child-care and domestic responsibilities, and also the proven fact that faculty sponsored meal programs and vaccinations are cornerstones of kid health care for several families. The National Academies of Sciences, Engineering, and medicine states that in-person instruction for grades K-5 and students with special desires ought to be prioritized to stop kids from falling behind.[6] Younger kids are at higher risk of stricken by long tutorial consequences and organic process

deficits while not in-person learning.[6][7] The impact on tutorial integrity has been discovered round the world [8]. An increase in contract cheating and tutorial file-sharing, and examination cheating were known as notably problematic. Because of the very fact that learning is usually remote since the beginning of COVID-19 in March, cheating has become way easier for college kids. There's no sorrow from students since attitudes have shifted aloof from prioritizing education over alternative things. From the purpose of read of teachers' rights, on-line education has exposed numerous thus far unresolved legal problems, particularly in terms of copyright and the way to touch upon unapproved misuse of lectures. Many institutions turned to industrial services to require over examination proctoring, however presently considerations were raised regarding student privacy, surveillance, and also the impact on student mental state.
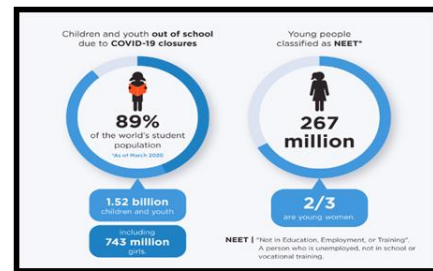

Fig. 1. Children and youth out of school due to COVID-19 closures and Young people classified as NEET

The lack of student to teacher interaction has additionally led students to feel less enthusiastic about the integrity of their work. This leaves students to show in half-completed assignments, get the answers from their friends at school, or flip in nothing in the slightest degree just because education has lessened its importance thanks to COVID-19. Primary or teaching usually consists of the primary four to seven years of formal education. Preschool is where, the first-time kids participate in formal education. Supported a comparison of longitudinal literacy knowledge in kindergarten-aged students throughout a spring semester of schooling versus throughout summer vacation, one study foreseen that COVID-19 college closures would slow the speed of attainment ability gain by 66 in preschool kids within the absence of mitigating various instructional ways.[6] The study estimates that over an 8-month

amount from 1 January to 1 September 2020, assuming college closures from 16 March to 1 September 2020 (and taking into consideration the summer vacation that will have still usually taken place throughout that time), that these preschool kids would have gained 31 less literacy ability on the average than if college closures had not occurred [9]. There is no denying that kids like to use instructional apps. They're stimulating and fun. Whereas lecturers could have issue obtaining kids to concentrate to a room lesson, they rarely have issue motivating a student to use a laptop. Whereas students aren't forever fascinated by a lecture, they will notice they're interested in a specific subject because of an app. Using education apps may be an alternative to promote interest in topics that students would possibly otherwise disregard. In nearly any profession, you're about to ought to use computers. Using education apps prepares kids to use technology. Several of the abilities} necessary to use apps are constant abilities they're going to ought to perform everyday tasks and bound job functions. Moreover, kids who don't have computers at home have the possibility to develop their technology skills at college.

It is no secret that kids learn other ways that. Some are additional visual learners, whereas different could have confidence exteroception cues or other senses. Associate app will attractiveness to several differing kinds of scholars. In addition, kids will go at their own pace instead of got to follow the teacher's rate of instruction. Having the chance to learn without a teacher's direct influence encourages students to price freelance study. Technology might provide kids with disabilities the simplest way to learn that they can't receive in a very traditional classroom setting. As an example, there are apps that specialize in serving to dyslexic kids to read and unfit kids to develop social skills. Making progress separately, without public scrutiny, is very important for college students who are used to being judged. With future exploration and development, education technology will improve on current areas of concern. Specifically, apps could also be employed in the simplest way to push social interaction instead of diminish it. Moreover, education policy will facilitate level the taking part in field instead of continue the inequality between the haves and have-nots. If used responsibly, education apps will be a strong tool.

2. Literature Survey

Effective teaching is extremely important because teaching relies on helping kids progress from one level of learning to another in a more sociable interactive environment and to get the approach right to induce students to be independent learning. Bracken and Nagle (2007) said that Studies hold contrary grounds from the studies at school, researchers have clearly proved the importance of play in various aspects of child development using web-based system. In terms of the cognitive aspect of it, kids play has been known to enhance skills like problem solving, critical thinking, spoken and written language organizing, and planning. [10] - In this paper they explained how web-based computer system or the use of technology is additionally be used to spice up the traditional way of learning. [11] - During this paper, they proposed a color sensing AR-

Based interactive learning system for small children which helps them to scan and explore the shades and learn their corresponding words in other language. "Intelligent e-Learning Systems" [12] - This paper focuses on the various discipline of intelligent e-learning such as personalized based e-learning, confidence e-learning, intelligent tutoring system, etc. to enlighten the tutorial paradigm shift in intelligent e-learning system. Its AI based learning. [13] - during this paper, the research investigates the path to support self-learning of modern-day preschoolers. It relies on a robust theoretical foundation [14]. This research work proposed a comprehensive framework which could be ready to provide support to the personalization and also helps in adaptation of e-learning courses. Its disadvantage is that, within the universe it's unable to supply real time framework for every individual's educational activity.

3. Proposed System

The given proposed system is divided in two parts.
i.   Front End
ii.   Back End
In this proposed system we have used HTML, CSS and Bootstrap. The Hyper Text Markup Language, or HTML is the standard markup language for documents designed to be displayed in a web browser. It can be assisted by technologies such as Cascading Style Sheets (CSS) and scripting languages such as JavaScript. HTML describes the structure of a web page semantically and originally included cues for the appearance of the document. CSS is used to improve content accessibility, provide more flexibility and control in the specification of presentation characteristics, enable multiple web pages to share formatting by specifying the relevant CSS in a separate .css file which reduces complexity and repetition in the structural content as well as enabling the .css file to be cached to improve the page load speed between the pages that share the file and its formatting. Bootstrap is a potent front-end framework used to create modern websites and web apps. It's open-source and free to use, yet features numerous HTML and CSS templates for UI interface elements such as buttons and forms.

In Back End we have used Deep Learning algorithms for prediction purpose. The first advantage of deep learning over machine learning is the needlessness of the so-called feature extraction. Feature Extraction is usually quite complex and requires detailed knowledge of the problem domain. This pre-processing layer must be adapted, tested and refined over several iterations for optimal results.
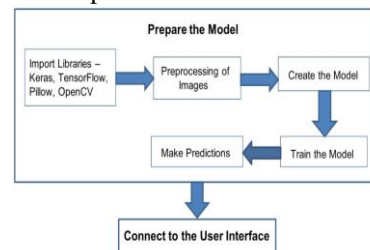

Fig. 2. Proposed Diagram for Learning System

Image captioning is the process of generating textual

description of an image. It uses both natural language processing and computer vision to generate the captions. The dataset will be in the form [image-captions] the dataset consists of input images and their corresponding output captions. The Front end and Back end are connected using Flask which a micro web framework is written in Python

4. Algorithm

The Deep Learning algorithms used in this system are Convolutional Neural Network (CNN) and Long-Short Term Memory (LSTM). Convolutional Neural Network (CNN) is suitable for spatial data such as images. This network takes fixed size inputs and generates fixed size outputs. CNN is a type of feed-forward artificial neural network with variations of multilayer perceptron designed to use minimal amounts of pre-processing. CNNs are ideal for images and video processing. Long-Short Term Memory (LSTM) networks are a type of recurrent neural network capable of learning order dependence in sequence prediction problems. This is a behavior required in complex problem domains like machine translation, speech recognition, and more. LSTM is well-suited to classify, process and predict time series given time lags of unknown duration.

The following steps describes the algorithm of the System:

Step 1: Select any one option from the menu - image cards/image captioning/verbal question answering /spotting the difference, etc.

Step 2: If selected menu is image card:
- Select any one from fruit or vegetable.
- Gives hover effect to the image, flips the card and the ajax calls flask for backend interpretation.
- In backend, the CNN model makes prediction.
- Return predicted value to html page.

If selected menu is image captioning:
- Gives hover effect to the image, flips the card and the ajax calls flask for backend interpretation.
- Display predicted value from LSTM model

If selected menu is verbal question answering:
- Make predictions using CNN model
- Gives hover effect to the image, flips the card and ajax calls flask for backend interpretation.
- Return required predicted answer value to html page

If selected menu is spotting difference:
- On click of select answer button invoke the backend function
- Function creates popup window of two images with contours around difference.
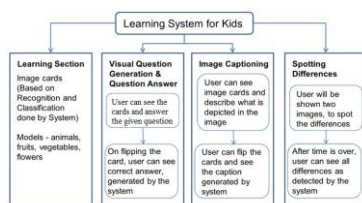
5. System Flow Diagram

Fig. 3. System flow diagram for learning system

6. Working and Implementation

The first module of the system is the learning section, which contains image cards for fruits and vegetables shown in Figure 4. The images cards can be flipped to reveal the corresponding fruit or vegetable name shown in Fig. 4. And Fig. 5. A convolutional neural network (CNN) based model is developed, to recognize fruits and vegetables from an image. The dataset consists of a total of 36 categories of fruits and vegetables and is separated into training and testing images. The initial steps are directed towards the pre-processing of the images, which involves resizing the images and converting them into arrays. Then a numerical category is assigned corresponding to each of the training labels. A sequential model is constructed with multiple layers and various steps are responsible for convolution, max pooling and flattening. The output layer has 36 neurons, each denoting a particular label. The Soft max activation function results in corresponding probabilities for each category and the category with the highest probability is the name of the fruit or vegetable shown in the image. The model is trained up to 35 epochs and a 96% training accuracy was obtained.
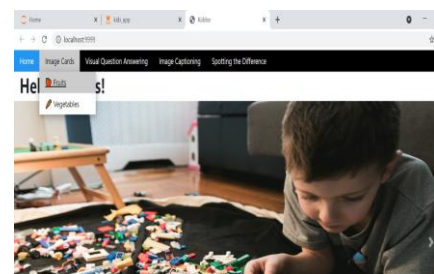

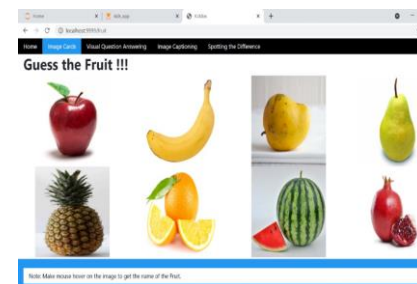Fig. 4. Fruits and vegetables image cards
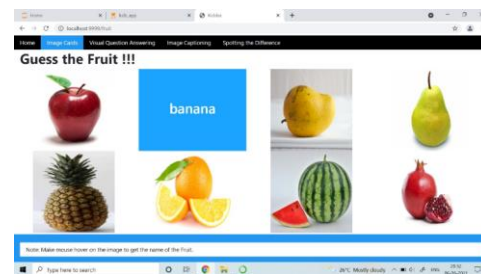

Fig. 5. Fruits image cards

Fig. 6. Image card flipped to reveal name of fruit

The next section is the question answering section, which contains images along with some simple questions related to the shape, colour etc. of the objects shown in the images Figure 7. Similar to the learning section, flipping the images displays the

system generated answer to these questions shown in Figure 8. The easy_vqa dataset is used and a CNN model is developed to answer the questions. The images and questions in this dataset are such that there are one-word answers to the questions. Each of the possible answers, such as triangle, circle for the shape, yellow, green for the colour or simply 'yes' or 'no' is assigned a particular numerical category. The numerical predictions are then mapped to the corresponding label. An accuracy of 78% was obtained for this model.
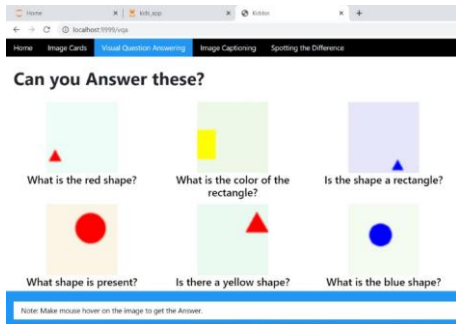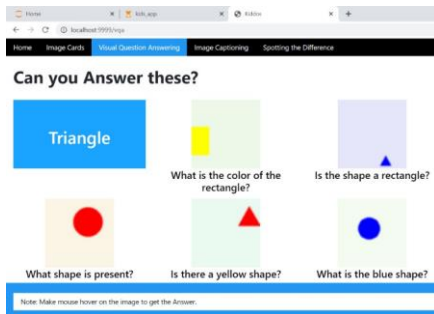

Fig. 7. Image with question

Fig. 8. Image with answer

The next module is an image captioning section where various images are displayed and the users are asked to caption what the image depicts shown in Figure 9. A model using the Flickr8k dataset is developed to train the system to generate the captions. The dataset consists of five captions corresponding to each image in the training folder of the dataset. The model is a combination of an image model and a language model, and makes use of ResNet and LSTM. The image model is used to extract features from the images, which are then mapped to appropriate keywords using the language model. The final model is trained and an accuracy of 70% is obtained.

Fig. 9. Image Captioning

Spotting the differences section of the system provides a small game for the users to spot the differences in 2 images before the timer runs out shown in Figure 10. The scikit-image library is used for this model. The main development constraint is that the 2 images need to be of the same dimensions. Initially certain operations are performed on the images, such as, converting to grayscale, resizing and computing the transpose. After this the similarity score of the images is computed. The threshold is selected to be 255 and using imutils library contours are obtained around the portions of the images which are different. When the user clicks on the button to check the answer, windows are popped up with the images along with the generated contours to show the differences.
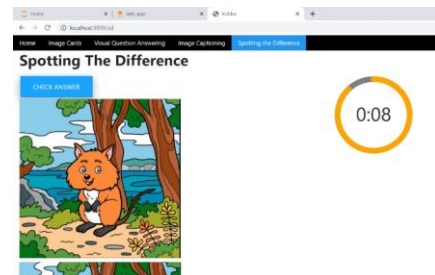

Fig. 10. Spotting differences within the time period

The values predicted by the models are sent to the html frontend pages with the use of Flask. Ajax calls with the necessary data parameter are made from the html templates and in response, the corresponding model is invoked and the predicted data is sent back to the html page. This data is then displayed in the desired form when the user flips an image card.

7. Conclusion and Future Scope

For kids to learn online, different features such as image captioning, visual question generation and question answering, learning section and spotting differences in images are carried out. Our proposed system is practical and useful in improving kid's knowledge in a self-instructional and interactive manner. It focuses on providing an appropriate solution to the learning difficulties at pre-school level and using a content web-based e-learning solution to address the gap in the kids learning system. It also presents a practical solution to the parents to support the learning needs of their pre-school kids in an effective way. Using a web-based e-learning solution to address the gap in the pre-school learning system, it is important to study further on how to improve the system with regards to the future technologies and innovations.

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