A Deep Learning-based Stock Footage Platform for the Caribbean Content

Koffka Khan
Department of Computing and Information Technology
The University of the West Indies,
Trinidad and Tobago, W.I

Chanelle Mondesir
Department of Computing and Information Technology
The University of the West Indies,
Trinidad and Tobago, W.I

Kadesha Ambris
Department of Computing and Information Technology
The University of the West Indies,
Trinidad and Tobago, W.I

Joshua Stapleton
Department of Computing and Information Technology
The University of the West Indies,
Trinidad and Tobago, W.I

Abstract— **Stock media are an essential component to the marketing and advertising, for promotional work, for personal or commercial creative projects, for publishing, for websites and blogs and provides a representation of the world that is cheap and easily available. The lack of a stock media platform that provides Caribbean based content limits accurate regional representation and marketing capabilities. We present a platform for hosting Caribbean focused stock media that provides photographers and videographers with a space for housing their portfolios and users with a website for browsing and downloading content. We implemented a machine learning algorithm based on deep learning to automate the tagging process for media uploaded to the site and object and scene recognition of Caribbean elements. We measured the performance of our deep learning stock footage platform (DSFP).**

Keywords— Stock, images, media, machine, learning, deep, caribbean, tagging.

I. INTRODUCTION

Stock media are professional photographs and videos of common places, landmarks, nature, events, or people that are bought and sold on a royalty-free basis and can be used and reused for commercial design purposes. Stock media is a great way to add depth and richness, and a professional, refined edge, to projects [11]. They let you use content that would be difficult, if not impossible, to have in your work otherwise and helps to boost your project's appeal to your target customers. Stock imagery sites, though essential to marketing, have little to no presence in the Caribbean space. Therefore, there is a lack of authentic and novel media representing the Caribbean image and identity as well as a platform that can host and promote such content. We designed a website that provides an online space for photographers to upload their Caribbean themed media and for general users to easily discover and access these media.

In 2019 Uncommon Caribbean, a travel website focused on the Caribbean, launched an extended service of its site called Uncommon Caribbean Images [1]. The site acts as a stock image library of photos taken in the Caribbean and offered to subscribers for varying prices. The site boasts a substantial collection of photographs showcasing various locations and regions within the Caribbean. The main means of navigation or discovery of images within their library is through a search bar. The site however lacks any categorical means of navigation outside of keyword matches made through the search bar. The site also lacks means of free browsing without using an entered search and its media is currently only restricted to photographs.

Caribbean View was created to target mainly Caribbean photographers and videographers, where they can access a platform to provide their services to a wider audience. Other content makers are open to share on the platform whether it be Caribbean based or not. The stock image industry will benefit from having a website that can provide content that is rarely available and thus bringing exposure to the livelihood of Caribbean countries. This platform provides quality Caribbean based content to users for their benefit in terms of marketing use as well as personal use. It also allows the widespread recognition of the Caribbean and its imagery by increasing availability through a public platform. Advantages include:

- Automatic tagging [4] is performed on uploaded content that is relevant. This eliminates the mandatory tagging process for producers on what they upload.

- Photographers and videographers can showcase their portfolio of appropriate content that portrays the Caribbean.

- A wide variety of selected scenery and scarce images of the Caribbean are made available to the public to access for free without having to subscribe or create an account.

The Caribbean View was created to be like many stock image websites to create a sense of familiarity for users who are used to retrieving their content from these websites. Consumers can not only download common photos and videos, but also have access to quality media that is not readily available related to Caribbean views. Established stock imagery websites such as Shutterstock and Pexels [12] with extensive photo libraries also provide access to Caribbean focused media. However, their selections lack any many more informal Caribbean themes such as certain foods, town locations and events.

We now give a description of technology used to develop DSFP. Hardware devices, software products, programming languages that were used during development. Firstly, Meteor [20] is an open source platform for web, mobile, and desktop used by over half a million developers around the globe to

make shipping JavaScript applications [6] simple, efficient, and scalable. Secondly, React [23] is a declarative, efficient, and flexible JavaScript library for building user interfaces. It lets you compose complex UIs from small and isolated pieces of code called "components". Thirdly, Amazon Simple Storage Service (Amazon S3) [24] is an object storage service that offers industry-leading scalability, data availability, security, and performance. Fourthly, Amazon CloudFront [25] is a web service that speeds up distribution of your static and dynamic web content, such as .html, .CSS, .js and image files, to your users. CloudFront delivers your content through a worldwide network of data centers called edge locations. When a user requests content that you're serving with CloudFront, the user is routed to the edge location that provides the lowest latency (time delay), so that content is delivered with the best possible performance. Fifthly, Amazon Rekognition [18] makes it easy to add image and video analysis to your applications using proven, highly scalable, deep learning technology. With Amazon Rekognition, you can identify objects, people, text, scenes, and activities in images and videos, as well as detect any inappropriate content. Amazon Rekognition also provides highly accurate facial analysis and facial search capabilities that you can use to detect, analyze, and compare faces for a wide variety of user verification, people counting, and public safety use cases. Sixthly, Material-UI [3] is an open-source project that features React components that implement Google's Material Design. Finally, MongoDB is a document database with the scalability and flexibility that you want with the querying and indexing that you need.

The outline of this paper is as follows: Section II describes and discusses literature related to stock content and its relevance to the stakeholders along with requirements analysis, design and specifications of the system. Section III discusses the Amazon Rekognition deep learning framework utilized by DSFP. In Section IV we describe the methodology of the system that was built and how each component of the system interacts with each other. Section V lays out the experiments used to evaluate the working prototype. Section VI outlines the results of the experiments. Section VII is a discussion on the results produced and Section VIII gives the conclusion.

II. REQUIREMENTS ANALYSIS AND DESIGN

A. DSFP Requirements

The website should allow users to upload, browse, download, and search for media. It consists of two main modules. One is the admin side responsible for the approval, rejection or deletion of images uploaded to the site. The second is the user side capable of uploading and downloading content to and from the site. The user needs and features are shown on Table 1.

TABLE 1: TABLE SHOWING NEEDS AND FEATURES

NEED	FEATURE
User can login, edit and view profile.	User Profile
A registered user can upload any number of content within its constraints.	Upload content
User can download any free content available with or without a user account.	Download content
User can view content available.	Browse

User can search for content by using relevant tags.	Search content
Administrator user can approve content uploaded.	Admin: Approve content
Administrator user can remove content from live website.	Admin: Remove content
Administrator user can remove users.	Admin: Remove user
System should allocate relevant tags uploaded content automatically.	Automatic tagging

A functional requirement [10] is a definition of behavior between inputs and outputs that is used in software engineering and systems engineering to specify a function of a system or its component. Table 2 shows the system functional requirements of DSFP.

TABLE 2: TABLE SHOWING THE FUNCTIONAL REQUIREMENTS

Identifier	Requirement
REQ-1	The system shall allow users to upload images, music, and videos.
REQ-2	The system shall allow users to download images, music, or videos.
REQ-3	The system shall allow users to browse easily.
REQ-4	The system shall display all verified content to users that have a personal account.
REQ-5	The system shall allow users to monetize selected content.
REQ-6	The system shall allow users to create an account.
REQ-7	The system shall allow users to edit their profile at any time.
REQ-8	The system shall allow only users with authorization access to verify images, videos, or music.
REQ-9	The system shall allow users to search for an image or video.

A non-functional requirement [13] is a requirement in systems engineering and requirements engineering that defines criteria that may be used to assess the performance of a system rather than particular behaviors. Table 3 shows the system non-functional requirements of DSFP.

TABLE 3: TABLE SHOWING THE NON-FUNCTIONAL REQUIREMENTS

Identifier	Requirement
REQ-10	The system should complete uploads to the cloud in approximately 3-5 seconds.
REQ-11	The system should take approximately 5 seconds to download content retrieved from the database.
REQ-12	The system should display content to users instantly upon visiting the website.
REQ-13	The system should notify users when their content is being used in email.
REQ-14	The system should have a throughput rate of approximately 3-5 seconds.
REQ-15	The system should store content links to database and upload images or videos to the cloud.
REQ-16	The system should have data integrity.
REQ-17	The system should be able to categorize all verified content appropriately and timely.
REQ-18	The system should be able to scale up without any delay.
REQ-19	The system should retrieve all related content to a user's search request in 3-5 seconds.

B. DSFP User Stories

The user narrative focuses on the experience – what the user wants to be able to accomplish with the product [5]. A typical requirement focuses on the product's functionality, or what it should be able to perform. The remaining distinctions consist of a small but significant list of "how," "who," and "when." DSFP user stories are illustrated in Table 4.

TABLE 4: User stories for the DSFP system.

USER STORY NO.	AS A...	I WANT TO...	SO THAT...
1	User	Create an account	I can personalize content to meet my needs
2	User	Login	I can access my account
3	Producer	Upload content to personal page on website	Other users can download them
4	Producer	Manage my photos	My page best represents that content I wish to promote.
5	Producer	Tag my photos	They can be found based on relevant categories
6	Producer	Track statistics on my images	I can know how much activity my photos get
7	Consumer	Browse and download content from the website	I can use the necessary content for personal gain
8	Consumer	Search for content	I can find content that is relevant to me easily.
9	Consumer	Save images	I can easily find them later.
10	Content manager	Manage and verify uploaded content	Content will be classified correctly and appropriate for users

C. DSFP User Cases

A use case [22] is a system analysis approach for identifying, clarifying, and organizing system needs. A use case is a collection of conceivable sequences of interactions between systems and users in a certain environment, all of which are tied to a specific purpose. Objects and actions for the DSFP system include with Figure 1 and Figure 2 showing two use case diagrams:
• User: a person who can browse, create an account, edit, and view profile.
• Producer: a user who uploads content to the live website.
• Consumer: a user who downloads content from the live website.
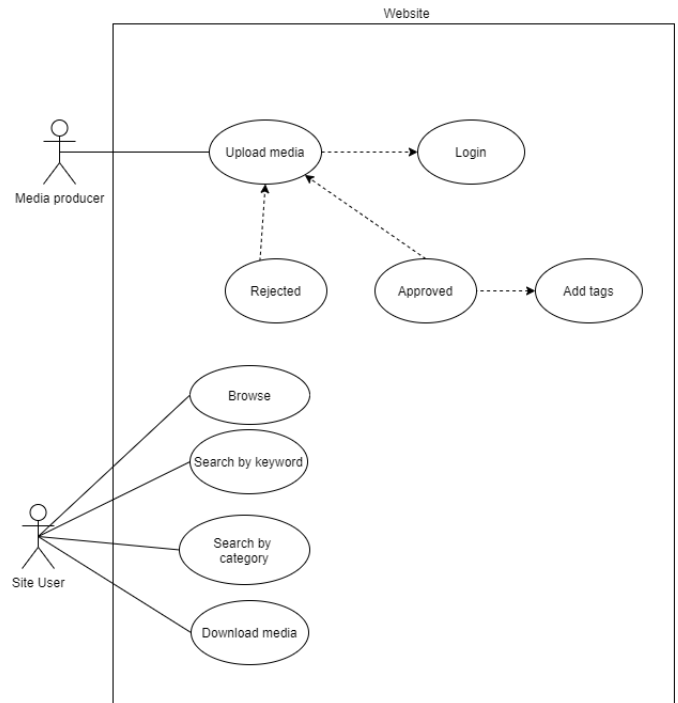• Administrator: approves content, removes content and users.
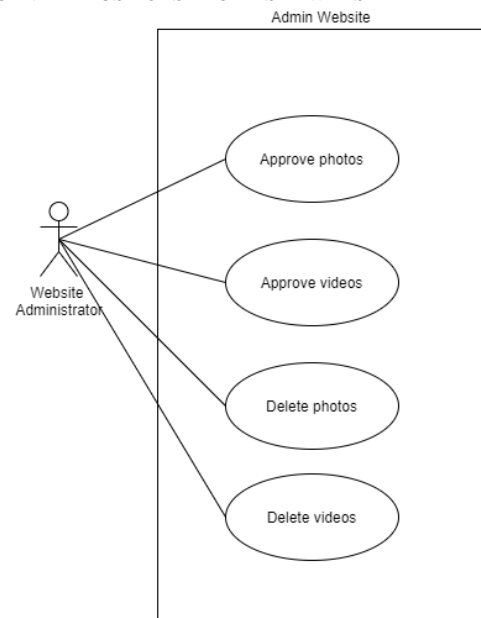

FIG. 1. GENERAL USE CASE FOR DSFP WEBSITE

FIG. 2. ADMIN USE CASE FOR DSFP WEBSITE

D. DSFP Entity Relationship Diagram

An Entity Relationship (ER) Diagram [7] is a sort of flowchart that shows how "entities" in a system, such as people, things, or concepts, interact with one another. Figure 3 shows an ERD for the DSFP system.
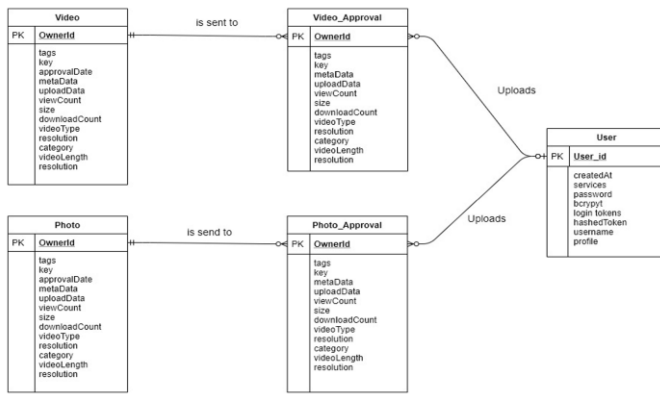
FIG. 3. ENTITY RELATIONSHIP DIAGRAM OF THE DSFP WEBSITE

E. DSFP Technical Constraints

o   Photos: Maximum size of 15MB, resolution should be at least 3000x3000 pixels.

o   Videos: Maximum size of 300MB, resolution should be at least 1920x800 pixels, less than or up to 60 seconds long.

F. DSFP Sequence Diagrams

In the world of software engineering, a sequence diagram or system sequence diagram [2] depicts object interactions in temporal order. It represents the scenario's objects as well as the sequence of messages exchanged between them in order to carry out the scenario's functionality, see Figures 4, 5 and 6.
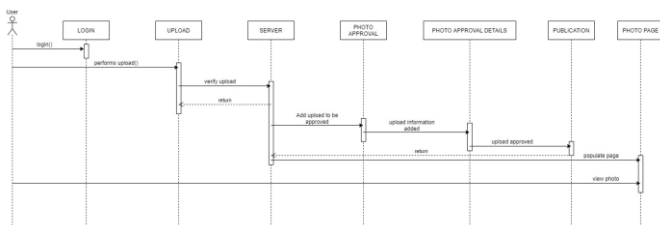

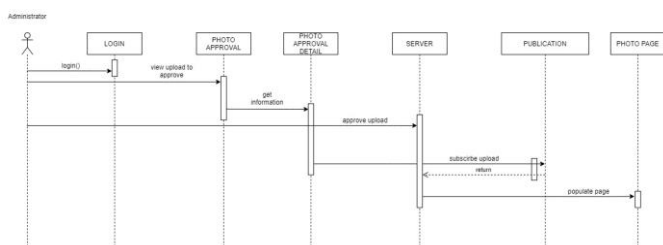FIG. 4. SEQUENCE DIAGRAM OF USER UPLOADING A PHOTO

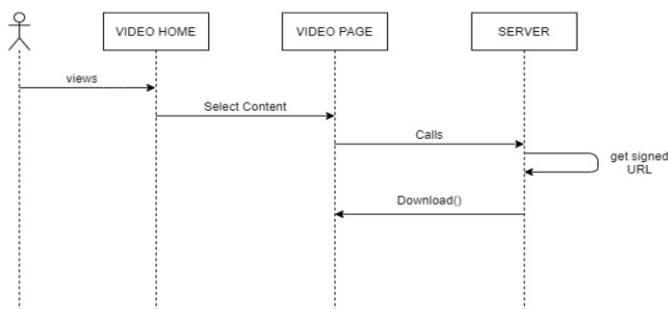FIG. 5. SEQUENCE DIAGRAM OF ADMINISTRATION APPROVING A PHOTO

FIG. 6. SEQUENCE DIAGRAM OF USER DOWNLOADING A VIDEO

III.   AMAZON REKOGNITION

Deep learning [17] is a discipline of Artificial Intelligence and a subfield of Machine Learning [19]. It uses a deep network with several processing layers made of various linear and non-linear transformations to infer high-level abstractions from raw input. Deep learning is based on models of the brain's information processing and communication. Deep learning uses enormous volumes of annotated data to replace handmade features with ones learnt from big amounts of data. Iteratively estimating hundreds of thousands of parameters in the deep graph using efficient algorithms is how learning takes place.

Several deep learning designs, such as convolutional deep neural networks (CNNs) [15] and recurrent neural networks [21], have been used to deliver state-of-the-art results on numerous tasks in computer vision, speech recognition, natural language processing, and audio recognition.

Rekognition Image [14] is an image recognition service that recognises objects, sceneries, and faces in pictures, extracts text, recognizes celebrities, and flags photos with questionable material. You may also use it to search for and compare faces. Rekognition Image is built on the same highly scalable, proven deep learning technology that Amazon's computer vision scientists use to analyze billions of photographs every day for Prime Photos. Rekognition Image detects and labels millions of objects and situations in your photographs using deep neural network models, and we're constantly adding additional labels and facial recognition features to the service.

Users may import a database of photos with pre-labeled faces, train a machine learning model on it, then publish the model as a cloud service with an API using the SearchFaces algorithm [16]. The user may then use the API to upload fresh photographs and retrieve information about the faces in the image. The API may be used to expose a variety of features, such as recognizing known people's faces, comparing faces, and searching for similar faces in a database.

IV.   METHODOLOGY

The project will be implemented using several different pieces of software. The backend framework used to build and implement the code will be Meteor. The React library will be used to structure and display the UI components of the website. Users must first register to the site through the Meteor authentication functionality or log on through Google and Facebook via the assisted API offered by Meteor. Media uploaded to the site will be handled by Meteor methods that generate an image ID and stores the image information to MongoDB while the actual image is sent and stored in an unapproved bucket within S3. Images that have successfully been uploaded will await approval by an administrator and once approved will be moved to an approved bucket. On the server-side calls will be continuously made to the collections for any updated information added to the database collection and any new approved images added will be posted to the site. The tagging of uploaded images is automated through Amazon Rekognition. On the client-side photo grid, a react component interprets the image information then renders it, displaying all approved images to the site. Downloading images is handled

by Amazon CloudFront which acts as a middleman between the client and S3 to cache images and make them available for download with improved performance. Search functionality is implemented through a Meteor method that queries the database based on the result of a search. A system diagram for DSFP is shown on Figure 7.
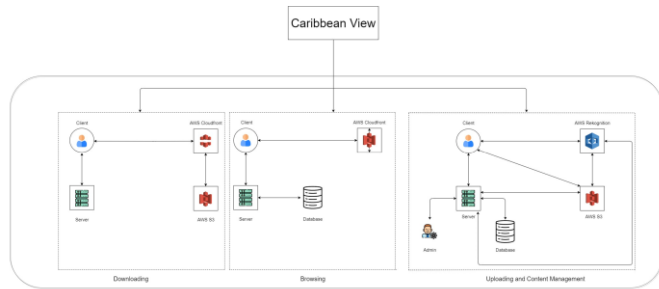

FIG. 7. SYSTEM DIAGRAM FOR CARIBBEAN DSFP WEBSITE

Programming was done in JavaScript with the following Browser Minimum Requirements: Android stock browser (Webkit based), Chrome, Firefox 7+, iOS browser, IE8+, Safari 4+, Desktop Opera and Mobile Opera. The site is designed with a client-server architecture. This architecture consists of two parties: a server and multiple clients, see Figure 8. The server component will provide services to multiple client components. Clients request services from the server and the server provides relevant services to those clients. Furthermore, the server continues to listen to client requests. Caribbean View's sever is powered by our Meteor back-end which provides the main functionality of the system.
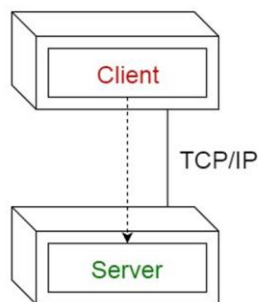

FIG. 8. A DIAGRAM SHOWING DSFP CLIENT SERVER ARCHITECTURE

We now provide a detailed description of DSFP Components/Subsystems. The system consists of the following components:

- Administration: This component is where an administrator can access functionality such as the management and media and users on the system.

- EditProfilePage: This component allows for users to edit/manager their account information

- ProfilePage: This is where persons utilizing CaribbeanView can view the profile of users on the system, where they can see all the published work of the user to the system and other details such as social media account info, website and contact information.

- Login: This component is solely responsible for allowing a user to log into the system.

- Log out: This component is solely responsible for allowing a user to log out of the system

- PhotoApprovalDetails: This component enables the administrator to see details of the photo to be approved.

- PhotoApprovals: This component provides an administrator of a dashboard of all the photos that are pending to be approved on the system

- PhotoPage: This component allows a user to click on an image during browsing and get further information on it such as the user that uploaded it and allows them to download the photo for use.

- PhotoSearchResult: This component is responsible for processing and rendering the photos that meet the search requirement of the user.

- PhotosHome: This component is responsible for rendering all the photos on the system to the client for browsing.

- RemoveApproved: This component allows an administrator to remove already approved content from the system when necessary.

- Upload: This component is responsible for allowing a user who desires to publish media to CaribbeanView to do so.

- VideoApprovalDetails: This component enables the administrator to see details of a video to be approved.

- VideoApprovals: This component provides an administrator of a dashboard of all the videos that are pending to be approved on the system

- VideoSearchResult: This component is responsible for processing and rendering the videos that meet the search requirement of the user.

- VideoPage: This component allows a user to click on a video during browsing and get further information on it such as the user that uploaded it and allows them to download the video for use.

- VideosHome: This component is responsible for rendering all the videos on the system to the client for browsing.

- Database: This component is responsible for storing data of media and users of the system.

- Server: It exposes an API for the various functionalities in the system and communicates with the database. The server is also a middleman between the client and the database, where it ensures that users are authorized to access and modify different levels of information and privileges.

We now give a description of the User Interface. It should be:

□ Clear - clarity is the most important element of a user interface design. Caribbean View is designed with the intention of being intuitive, and easy to navigate without getting confused or frustrated.

□ Responsive - the interface should work fast, whereby waiting for things to load and using stuttering and slow interfaces can be frustrating. So, the system was designed to provide feedback as efficiently as possible

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to the client using the various technologies incorporated into Caribbean View.

☐ Consistent - consistent interfaces allow users to develop usage patterns, which in turn allows them to learn how+ work and will be able to work out how to operate new features quicker.

☐ Efficient - The interface is designed with the intention to be efficient by allowing users to figure out exactly what they want to do without any fuss. This was done by identifying how the application should work, what functions does it need to have and what goes does it need to achieve. So therefore, users can easily accomplish what they want.

☐ Simplicity -The user interface was designed not to be made up of unnecessary elements or features. It is logical and concise. Steps were taken to ensure simplicity by asking questions such as "Does the users really need this to complete their task?". So, the interface was limited to the items that are essential to the user.

The following are screen shots of the DSFP system, see Figures 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 and 19:
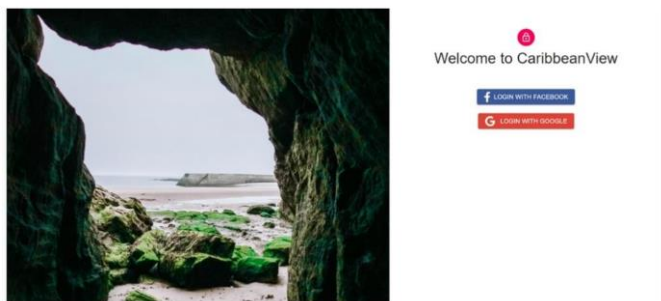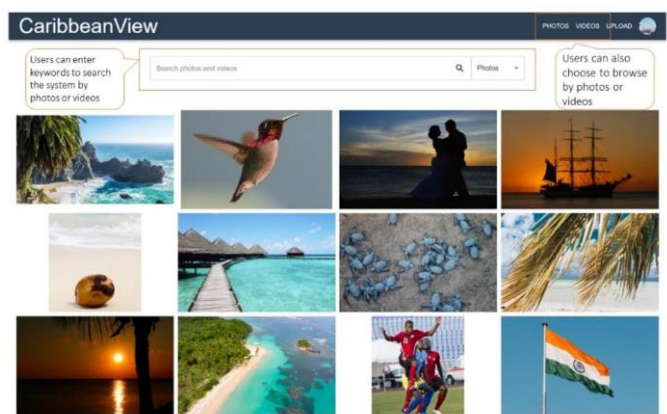

Fig. 9. User Sign In
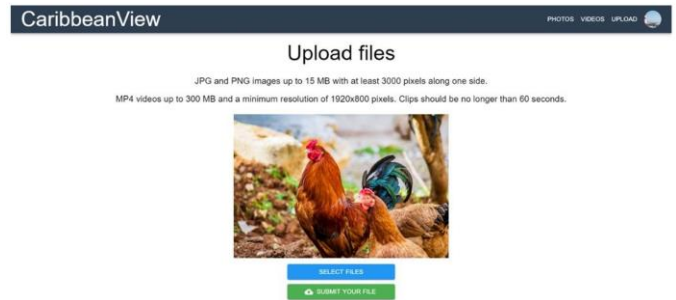

Fig. 10. Homepage

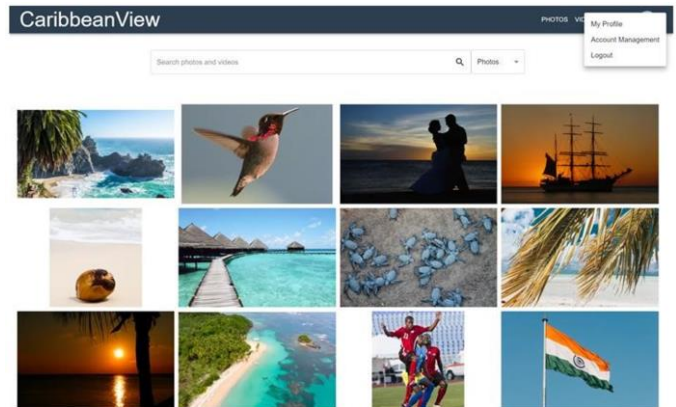Fig. 11. Search for Hummingbird

Fig. 12. Uploading an image file

Fig. 13. Access User Profile

Fig. 14. View Profile Information
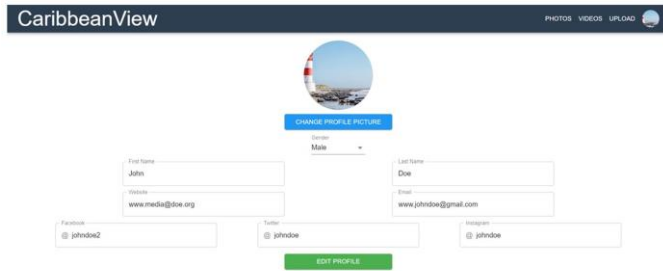
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Fig. 15. Account Management
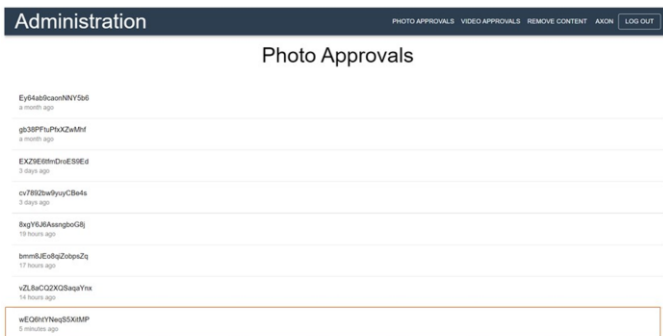

Fig. 16. Administration Login

Fig. 17. Administration approving videos

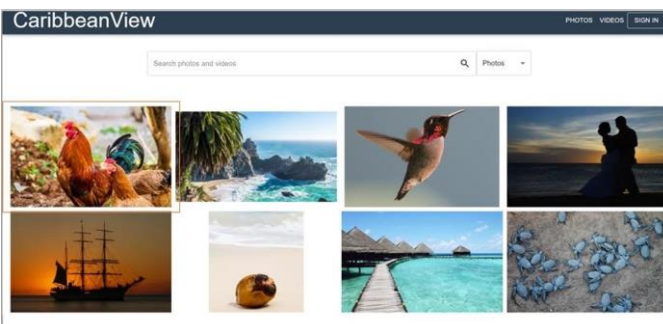Fig. 18. Administration approving video

Fig. I9. Administration approved video made available to everyone.

V. EXPERIMENTS

The component of the system that is up for testing is the ability to analyze and tag media through deep learning. The component recognizes images by using machine language which in turn tags the content accordingly.

Media (photos and videos) will be uploaded to the system and the output tags given by the deep learning algorithm will be noted and determined if that analysis was appropriate or accurate.

The features tested were the deep learning algorithm's accuracy to correctly detect object, scene and facial features relevant to the uploaded media. The features not tested were design and layout.

Success were given by the completion of the following, see Table 5:

□ Allows user to upload and download content.

□ After content is uploaded, the system should identify, analyze and appropriately allocate tags to content so that manual tagging would not be needed.

□ At least 50% of tags allocated to content should be relevant to the specified subject.

TABLE 5: TABLE SHOWING TEST CASES

TEST CASE ID	TEST SCENARIO	TEST STEPS	TEST DATA	EXPECTED RESULTS
T1	Check accuracy of automatic tagging	1. Login 2. Select upload button 3. Upload desired media 4. Document given tags	**5 Images of:** o Sports (cricket, football, swimming) o Carnival o Flags **1 Video of:** o Sports (cricket, football, swimming) o Carnival o Flags	**Success case:** At least 50% of tags allocated to content are relevant to the subject. **Failed case:** Less than 50% of tags are not relevant to the content.
T2	Check upload option with valid data	1. Login 2. Select upload button 3. Upload desired	**Photos:** Size of 2.93MB, resolution of 5184 x 3456 pixels **Videos:** Size of 7.74 MB, resolution of 1920 x 1080 pixels, 16 seconds long	**Success case:** Media is uploaded and an success notification is shown
T3	Check upload option with invalid data	1. Login 2. Select upload button 3. Upload desired	**Photos:** Size of 16 MB, resolution of 1920 x 1056 **Videos:** Size of 400 mb, 300 seconds long	Media not uploaded and a failed message showed
T4	Check search option with valid tags	1. Enter tag in search bar 2. Validate given content	**3 keywords are searched:** 1. Beaches 2. Birds 3. Costume	**Success case:** 75% of images are relevant to the keywords entered
T5	Check search option with invalid tags	1. Enter tag in search bar 2. Validate given content	**3 keywords are searched:** 1. Beachez 2. Bireds 3. Costoom	**Success case:** No images are relevant to keywords entered
T6	Check removal of content	1. Admin login 2. Enter photo ID 3. Select remove button 4. Check live website	**Photo ID:** PXxaovJMLup8DMTbz	**Success case:** photo is not visible on live website **Failure case:** photo is still visible on live website

VI. RESULTS

A graphical representation of the data can be found on Figures 20, 21, 22 and 23.
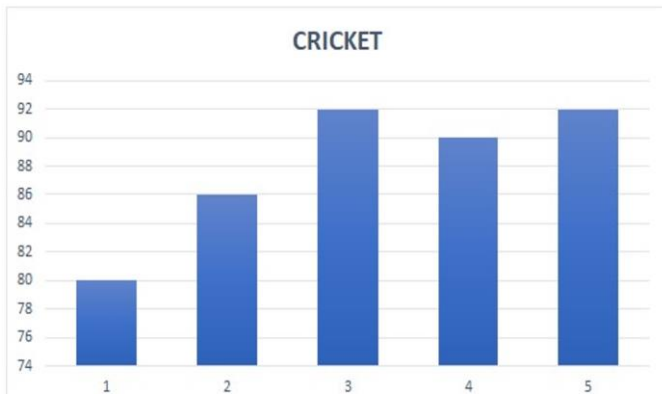
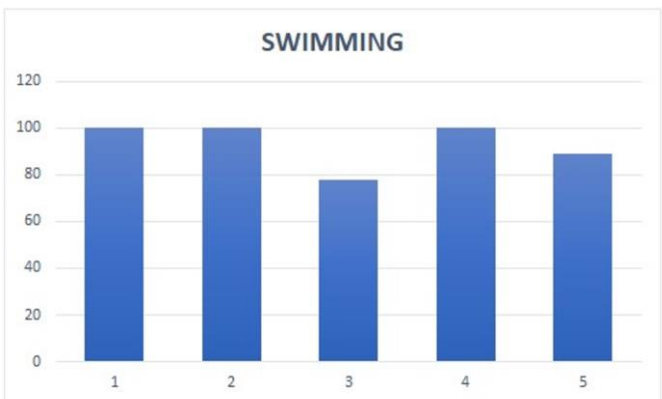Fig. 20. RESULT PERCENTAGES FOR IMAGES FOR CRICKET

Fig. 21. RESULT PERCENTAGES FOR IMAGES FOR SWIMMING
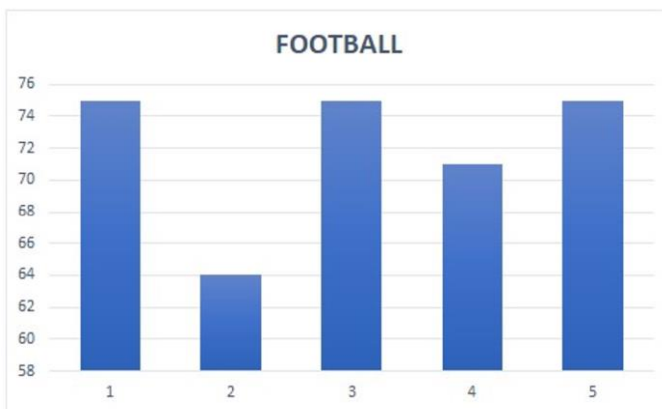
Fig. 22. RESULT PERCENTAGES FOR IMAGES FOR FOOTBALL
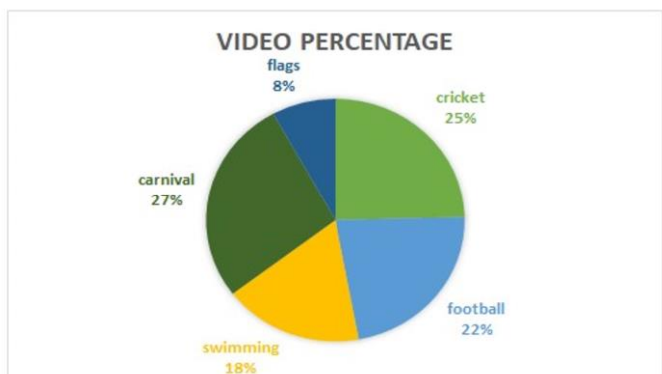
Fig. 23. RESULT PERCENTAGES FOR TAGGING VIDEOS

We now show some images and resulting tags on Figures 24, 25, 26, 27 and 28.

Fig. 24. SAMPLE 1: Cricket_1

Image description: Front view. A man holding a cricket bat and reading a swing. A ball heading towards the man. A man in the background hunched over and readying to catch.

Fig. 25. SAMPLE 2: Cricket_2

Image description: Front view. Cricketer throwing a ball towards the camera. Two persons standing in the foreground.

Fig. 26. SAMPLE 3: Cricket_3

Image description: Side view. Woman cricketer holding a cricket bat. Three men in the background.

Person Human Cricket Sport Sports Apparel Helmet Clothing Male

SAD

Fig. 27. SAMPLE 4: Cricket_4

Image description: Top front view. A man holding a cricket bat reading a swing. A man in the background hunched over.

Human Person Sport Sports Cricket Grass Plant Clothing Helmet

Apparel Field Female CONFUSED

Fig. 28. SAMPLE 5: Cricket_5

Image description: Front view. Woman holding a bat running. A woman running at the side. A woman in the background running to the right.

For the specific case the following Tables (see Tables 6, 7, 8 and 9) give the percentage of tags that accurately represent the subject. For instance, Table 6 is for Test Case ID: T1, Category: Sports and Subject: Cricket.

TABLE 6: TABLE SHOWING THE PERCENTAGE OF TAGS THAT ACCURATELY REPRESENT CRICKET

T1.1.1					
Content No.	Number of tags returned	Number of relevant tags	Number of non-relevant tags	Percentage of tags that accurately represent the subject	PASS/FAIL
1	15	12	3	80	PASS
2	7	6	1	86	PASS
3	13	12	1	92	PASS
4	10	9	1	90	PASS
5	13	12	1	92	PASS
Videos					
1	15	12	3	80	PASS

TABLE 7: TABLE SHOWING THE PERCENTAGE OF TAGS THAT ACCURATELY REPRESENT FOOTBALL

T1.1.2					
Content No.	Number of tags returned	Number of relevant tags	Number of nonrelevant tags	Percentage of tags that accurately represent the subject	PASS/FAIL
1	12	9	3	75	PASS
2	11	7	3	64	PASS
3	12	9	3	75	PASS
4	17	12	5	71	PASS
5	20	15	5	75	PASS
Videos					
1	11	8	3	73	PASS

TABLE 8: TABLE SHOWING THE PERCENTAGE OF TAGS THAT ACCURATELY REPRESENT SWIMMING

T1.1.3					
Content No.	Number of tags returned	Number of relevant tags	Number of nonrelevant tags	Percentage of tags that accurately represent the subject	PASS/FAIL
1	6	6	0	100	PASS
2	6	6	0	100	PASS
3	9	7	2	78	PASS
4	6	6	0	100	PASS
5	9	8	1	89	PASS
Videos					
1	30	17	13	57	PASS

TABLE 9: TABLE SHOWING THE PERCENTAGE OF TAGS THAT ACCURATELY REPRESENT FLAGS

T1.3					
Content No.	Number of tags returned	Number of relevant tags	Number of nonrelevant tags	Percentage of tags that accurately represent the subject	PASS/FAIL
1	3	1	2	33	FAIL
2	3	2	1	67	PASS
3	8	5	3	63	PASS
4	3	1	2	33	FAIL
5	3	1	2	33	FAIL
Videos					
1	7	2	5	26	FAIL

For brevity Table 10 shows the result of remaining test cases T2 to T6.

TABLE 10: TABLE SHOWING THE RESULTS OF TEST CASES T2 - T6

TEST CASE ID	ACTUAL RESULTS	PASS/FAIL
T2	Content was successfully uploaded. A success message was shown	PASS
T3	Content was not uploaded. Failure message was shown	PASS
T4	All content given was relevant to keywords used	PASS
T5	No content was given that were relevant to the keywords used	PASS
T6	Content was not seen on live website	PASS

VII. DISCUSSION

A. T1: Check Accuracy of Tagging

According to the graph 1.1,1.2 and 1.3, the results obtained showed that all the test cases passed and tagged test data showing sport activities with more than 50% relevant tags. Graph 1.4 showed that the system tagged images of Carnival in the Caribbean with more than 50% relevant tags. The system only identified nonCaribbean Flags such as the American Flag as seen in graph 1.5 and table T3.1. The tags allocated to flags of

Caribbean did not state the country that each flag identified but instead recognized objects around the flag. Graph 1.6 showed how the system automatically tagged videos. Videos of sports and carnival were relevantly tagged, however the video that contained flags was only allocated tags of 25% relevance.

This test case confirmed that the system was not trained sufficiently with a variation of flags, however it successfully identified that it was a flag. Introducing more Flags and custom tags to the system can therefore improve automation and accuracy of tagging Caribbean Flags.

B. T2: Check Upload with Valid data

This test case was passed when a user tried to upload an image and video that met the requirements. A success message was given.

C. T3: Check Upload with Invalid data

This test case was passed when a user tried to upload an image and video that did not meet the requirements. An error message was given.

D. T4: Check Search with Valid tags

This test case passed when a user searched for content with valid and correctly spelled tags in the search bar. The content provided was related to the given tags.

E. T5: Check Search with Invalid tags

This test case passed when a user searched for content with invalid and incorrectly spelled tags in the search bar. No content was provided related to the given tags.

F. T6: Check removal of content

This test case passed when an administrator user removed an image from the live website. The image was no longer visible for other users to access but it was still present in the cloud storage in the approval folder.

VIII. CONCLUSION

The final project solution is proven to be significant and beneficial to the marketing field as well as to photographers and videographers who capture scenes of the Caribbean. Advertisers and those who use stock content can now have access to photos and videos that portray Caribbean countries. This provides a deeper understanding and exposure to those who are unaware.

The intended core functionality of the system was completed, whereby users can easily upload media and it will automatically be categorized on the system. Users can search and download for content freely. The system is optimized for performance and stability by the indexing of the database and the use of technologies to deliver data to users at low latency and high transfer speeds.

Caribbean View was designed with responsive, clear, simple, efficient, and consistent design principles with the intention to enable the best possible user experience. The design of the code and components were done keeping in mind extensibility and reusability. This enables us to perform quick debugging and analysis of the system. This results in the culmination of a feasible software product that will aid in users wanting to use the platform and taking it to another level

Future work can include:

o View all content producers in system by different filters such as most views, likes, downloads, etc.

o Improved User Management System where users can have more control of their profile via editing and administrators can have a better overview of the system's users through metrics, graphs, and other forms of management.

o Improved user interface design.

o Incentives such as monetary rewards based on certain goals and events a user can participate.

o Improved analysis and search of media of the Caribbean.

DSFP may be extended in the following ways:

❖ Stock Music

❖ Licenses and Agreements

❖ Dynamic System, where based on certain current events the system can populate the homepage with relevant media.

❖ Professional AdSense, where ads will be displayed on different aspects of the website to generate revenue.

❖ Monetization System, for content producers to earn income, the system can also generate revenue by accepting a percentage of each transaction.

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