Personalized fashion recommendation system using machine learning
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Introduction

Customer engagement in retail business is an important aspect. To be able to retain those customers for a long time, it becomes important to develop a recommendation system that can generate and deliver personalized suggestions about fashion items to each of its users using a greater level of intelligence. By doing this, not only does the customer engagement get enhanced, but also the overall sales of the e-commerce shall boost. This is because people who click on those generated recommendations shall tend to visit more similar pages and might even put a higher number of products into the cart. Hence such customers who rely on recommendations that the website is generating will buy more and come back for another purchase.

The project provides an approach to capture the clothing preference of a user based on the image uploaded on the portal. The image is further provided to the already trained deep learning model for providing the most accurate recommendations. The application mainly segments the user uploaded image and identifies the different range of colors. Based on the identified clothing type and color combinations the model provides the recommendations. As an additional feature we further generate recommendations based on the current fashion trends extracted from famous celebrities. Moreover, application also recommends considering the style index that depicts the level of trendiness the user is more inclined to, hence displaying the most accurate and diverse fashion options.

Methodology

Project Architecture:
The project architecture comprises of a frontend web application, backend database and a deep learning module. The web application provides user with an ability to login and upload their photos. Features are extracted from the image using the trained deep learning module and will be used to provide most accurate recommendations.
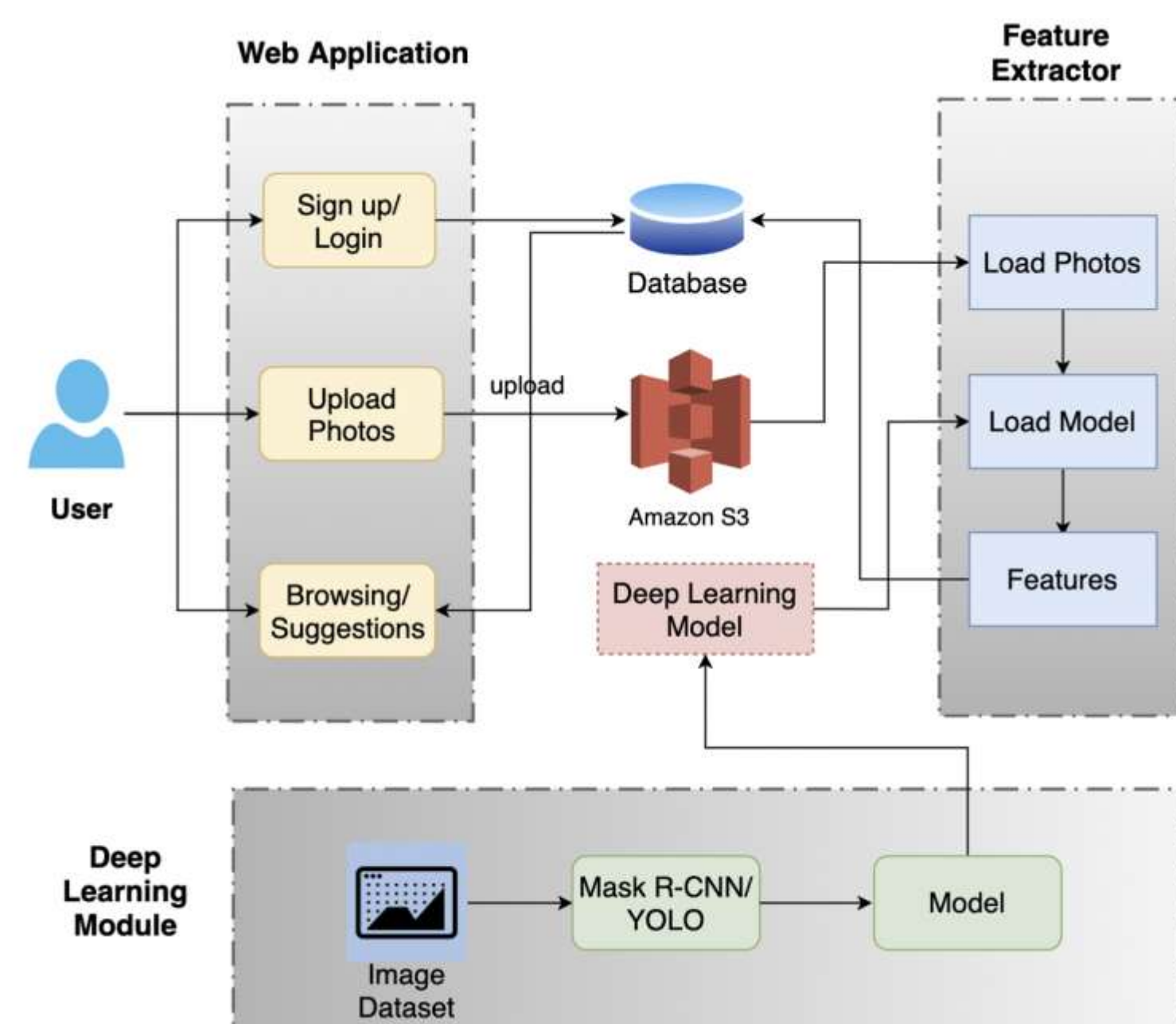
Methodology

- **Instance Segmentation**: Using Mask RCNN algorithm, we detected each distinct object from an input image. We got the annotations and bounding boxes from an image that were further used to train the Mask RCNN model. We converted the dataset in a format compatible to the model and used it for the training.

- **Image Segmentation and Color detection**: We used OpenCV to segment the images and detect colors based on the clothing type. Using K-means clustering we were able to cluster different colors in any given image. Using a library called "web colors" we are converting the RGB hex value to get the exact color of the value. For detecting colors, we used HSL value that is hue saturation and light. We converted RGB to HSL that allowed us to get the broader results within defined thresholds.


- **Designing the database:** We used ElasticSearch to store the meta-data and image URL from images. Actual images are stored in Amazon S3 bucket.

- **Prediction:** We recommend the users different outfits that are based on the confidence scores of the clothing type, color combinations and style indexes that our model is trained on.

- **Recommendation:** Our application finally outputs clothing styles based on the input image, styles that are trending

on instagram that align with user's preferences and also based on style index. This Style index contains three categories: Casual, Moderate and party. Based on their preference, user can choose from a variety of options.

Analysis and Results

Data Insights using Kibana: Data visualization showing the composition of various garment types existing in the data base as well as the breakdown of all types of colors with their percentages
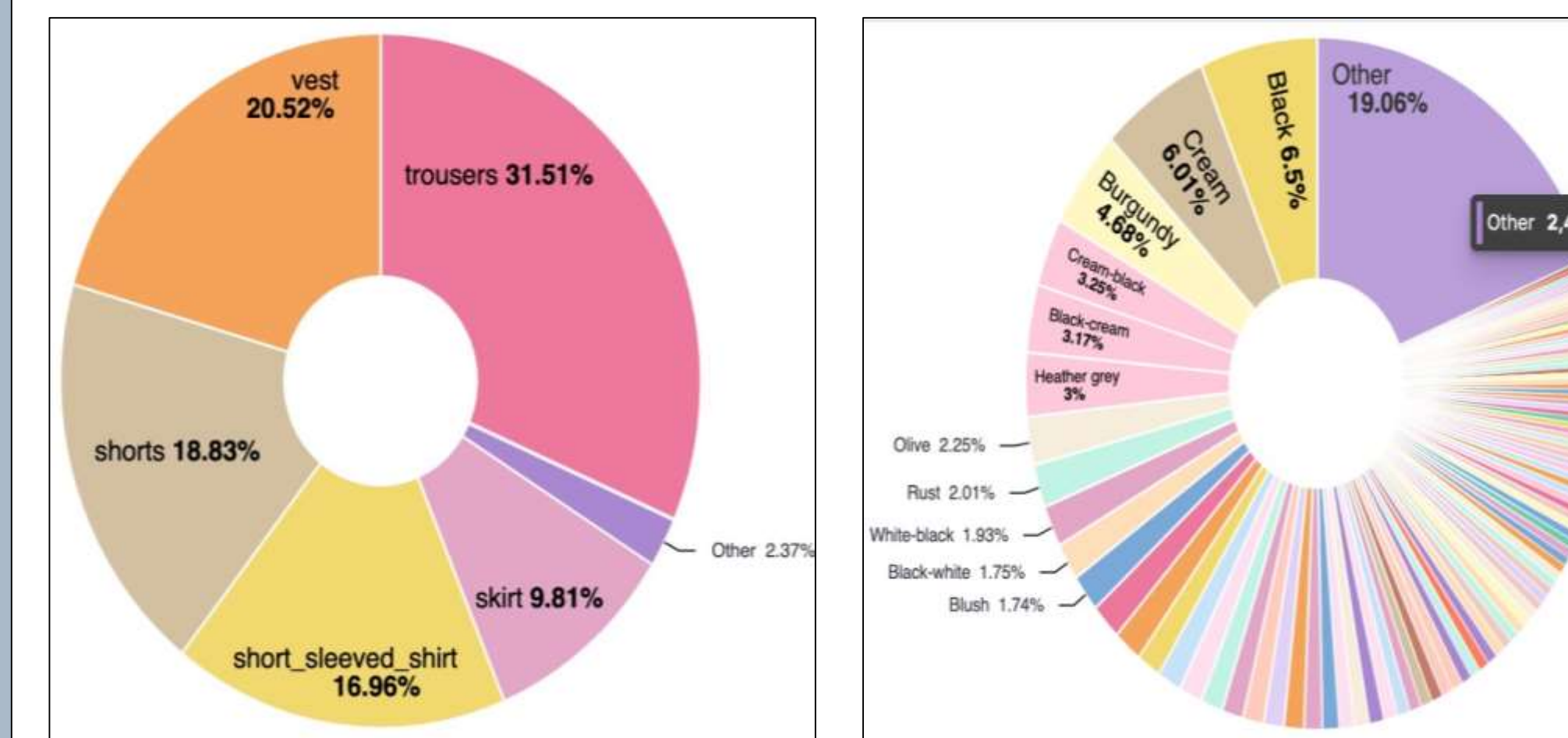
Recommendations from the application: After the user submits an image, there will be generic recommendations which will be generated from our pre-trained model.

Images for recommendation

Succeeding to them, there will be recommendations based on **trending styles existing on instagram**:

Instagram Trending Image

Finally, there is **Style index** that contains casual, moderate and party Categories.

Casual Recommendation

Moderate Recommendation

Party Recommendation

Summary/Conclusions

In this project, we were successfully able to provide wide range of accurate recommendations based on the uploaded images by the user. The model was able to recommend more precisely than other conventional recommendation systems available in market.
The project made a way into setting up a recommendation system as a whole. It could be further enhanced to incorporate various benefits with more advanced features if a wide range of dataset is available.

Key References

[1] The Long Tail Scenario explained in recommendation systems
https://www.researchgate.net/publication/221140982_The_long_tail_of_recommender_systems_and_how_to_leverage_it

[2] The Long Tail of Recommender Systems and How to Leverage It by Yoon-Joo Park
http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.421.1833&rep=rep1&type=pdf

[3] Recommendation Systems by Charu Aggarwal
https://www.springer.com/in/book/9783319296579

[4] That way why and How of Recommendation systems and its implementation
https:medium.com/org/retargetly/the-what-why-and-how-0f-recommendation-systems-810d98789f83/

Acknowledgements