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Wheat Kernel Prediction (Wheat Classification App)

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Abstract: *Grains are quite possibly the main piece of our diet. There are various sorts of grains like corn, millet, wheat, grain, and so on. We as a whole realize that Wheat is one of the biggest cropped grains in India and it has various different sorts related with it. The wheat type can stretch by taking into consideration various elements like As. Code, length of Kernel, and so on. Various methods related to Machine Learning can be utilized to separate the sorts of Wheat based on its characteristics. So, by utilizing our application the client can have the option to recognize the wheat into various gatherings by entering the respected values in the regarded fields in User Interface (UI).*

Keywords: *Machine Learning, Dataset, Classification, Regression, Wheat Classifier, Identification, Multi-Class classification, Hyper-Parameter Tuning, Support Vector Machine, Rosa, Kama, Canadian, Parameters.*

1. INTRODUCTION

Wheat is one of the most essential parts of the Indian diet. Different categories of wheat are produced in different parts of India. These different wheat types can be further categorized based on different components. Machine Learning is one of the booming fields in IT sector and it can help us to categorize the different types of wheat based on different components like Area of Kernel, Asymmetric Coefficient, Length of Wheat Kernel, etc. The categorizing of wheat into different groups can also further help in the educational and agro-industrial sector and can benefit other sectors as well. There are different Machine Learning Techniques which can help the client to distinguish the wheat into different components based on its characteristics. The client only needs to open the designed application and enter the appropriate values in the specific fields to generate the expected result. The application link is also available online on the internet as the application is deployed in the cloud

environment. The only requirement for the user is to have a stable connection and to enter valid values.

2. MOTIVATION

The primary goal of the task is to observe the wheat types in light of their properties. In the agrarian area, farming produce market advisory groups and corporates that purchase wheat in mass need recognizable proof of the kinds of wheat they purchase. Here wheat type identifier assumes a significant part in distinguishing the kind of wheat. Also, in the field of Agricultural examinations, the application can assist the understudies with recognizing the wheat types from which they can find out about wheat and its sorts.

3. PROBLEM STATEMENT

To build an application that can be used to classify wheat seed types named Canadian, Rosa, and the Kama from each other i.e., [Multi-Class Classification] according to their Kernel features/properties using Support Vector Machine Classifier.

4. PROBLEM DEFINITION

Wheat is quite possibly the main cereal consumed in India. There are a few kinds of wheat. These kinds of wheat can be distinguished in view of their kernel properties; by utilizing machine learning algorithms, we can group the several types of wheat in light of their portion properties like perimeter, area, compactness, and so on. To create an application that can be used to differentiate wheat kernel types namely Canadian, Rosa, and the Kama, from one another, for example [Multi-Class Classification] as indicated by their kernel features/properties utilizing Support Vector Machine Classifier.

5. MODEL/APP BUILDING

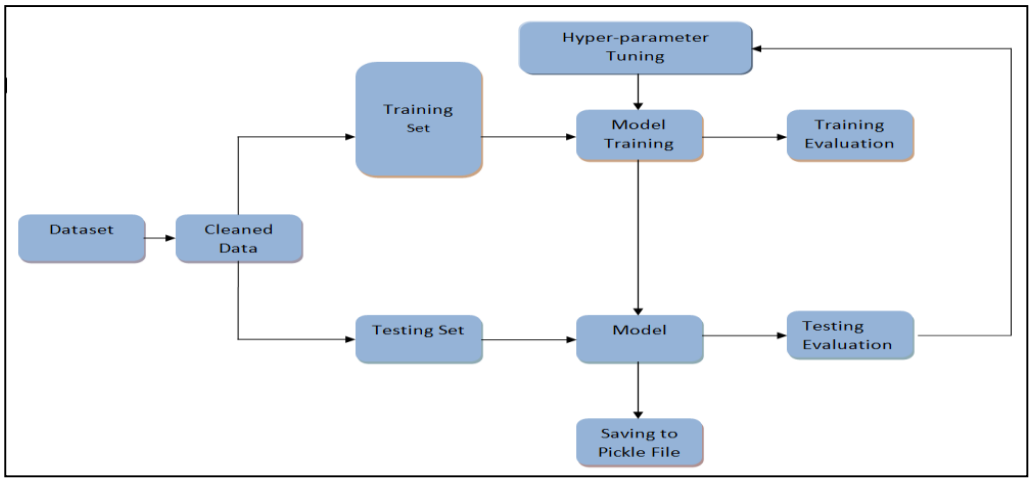


Fig 1: -Model Building

6. APPLICATION FLOW

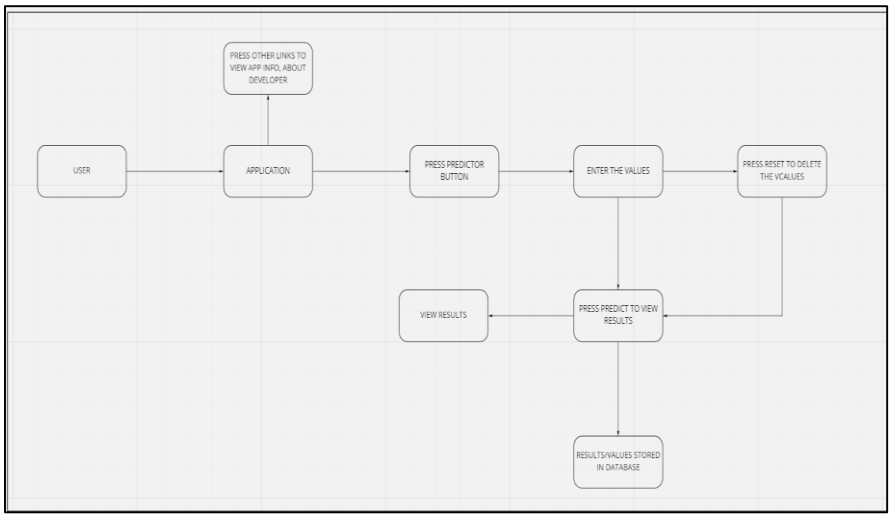


Fig 2: -Flow

7. ARCHITECTURE DIAGRAM

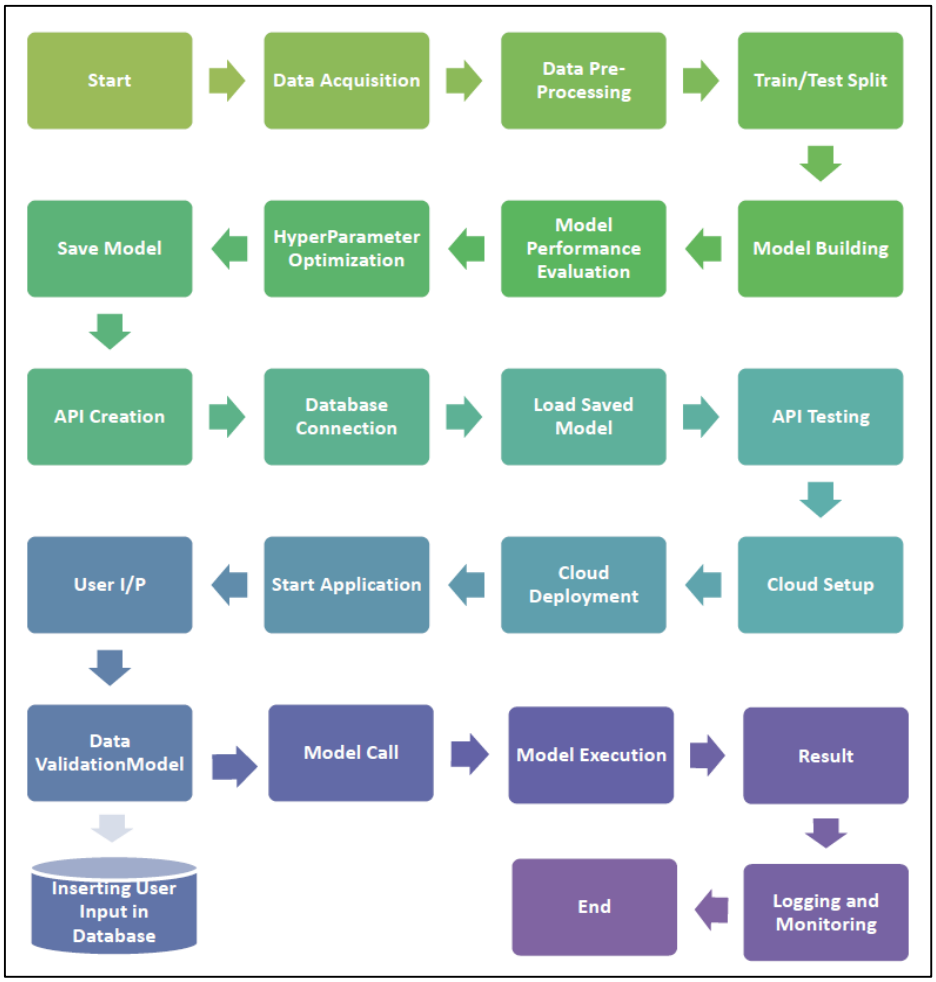


Fig 3: -System Architecture

8. PROPOSED SYSTEM

8.1 METHODOLOGY

Wheat is viewed as one of the most involved grains on the planet and is supposed to be one of the most cropped grains on the planet. Various sorts of Wheat are recognized in different gatherings by taking into account various segments like Asym. Coefficient, Area of the kernel, etc. This application just necessities the client to include suitable figures in the particular field to come by the ideal outcome to sort the wheat into different types.

8.2 ALGORITHM

Step 1: Start (Click and Open the link of the design)
App
Step 2: On the Home Page
IF (To check app info, about developers, etc
Click on the links mentioned in the top left corner.)
New Pages will be opened according to the links
Selected by the user.
Step 3: On the Home Page
IF (To Enter the main application
Press Predictor Button)
The user is navigated to the main page
Of the application.
Step 4: Enter the appropriate Values on the Main Page
(Area, Perimeter, Compactness, etc.)
Step 5: IF (Values are validated)
Press Predict button.
Step 6: IF (To Re-Enter the values)
Press Reset Button
Step 7: ELSE (If values are not validated)
Return to step 4
Step 8: Press Predict button to display the result.
Step 9: IF (To navigate back to the main page press the back button)
Return to step 4
Step10: Stop

9. RESULT

The dataset is gathered from the UCI Machine Learning Repository then the Data is loaded into PyCharm using the Pandas library. To see the properties of data like size, shape, and info, NumPy library from python is used. We found out that the data had abnormalities like outliers, so to counter it Robust Scalar was applied on top of the data. Then, the data is divided into train and testing sets. After splitting the data Machine Learning algorithms like Random Forest, SVM Classifier, Decision Tree are applied. After applying these models and performing Hyper- Parameter tuning, we can see that SVM performs best with this data. Random Forest takes Much time and Decision Tree gives over-fitted model and SVM gives generalized model with good testing and training accuracy. The SVM parameters like kernel, degree, gamma, Decision function helps in getting the optimal model.

SVM Hyper-Parameters	Description
kernel	It describes kernel types like rbf, poly, linear.
degree	It describes the degree for poly kernel Ignored by all other types of kernels.
gamma	It is the Kernel Coefficient.
Decision Function	It has OVO or OVR.

After properly selecting the above-mentioned parameters for SVM Classifier optimized machine learning model can be obtained. We compare the models below: -

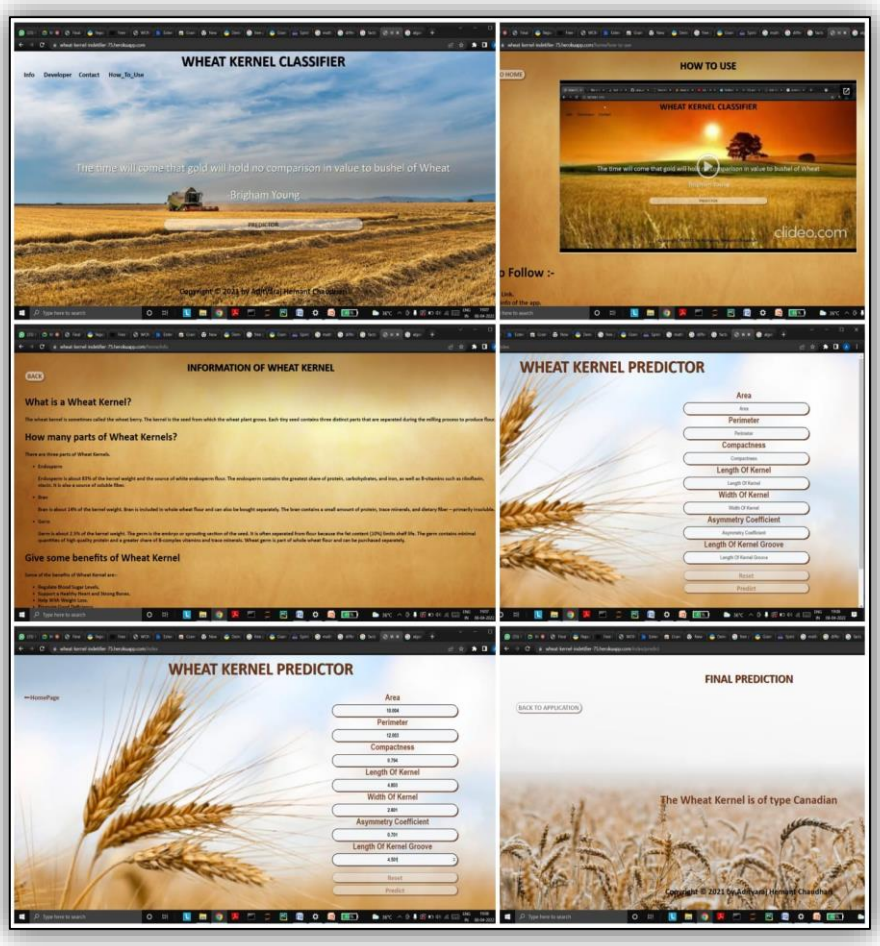
Model	Training Accuracy	Testing Accuracy
Random Forest Classifier	*0.99*	*0.90*
SVM Classifier	*0.90*	*0.91*
Decision Tree Classifier	*1.0*	*0.85*

Here it is clearly seen that SVM Classifier clearly outperforms the other machine learning models like Random Forest and Decision Tree Classifier.

After saving the model, one can then create a frontend using HTML and CSS and create API to establish the relationship between frontend and backend. To collect the data points Databases like the PostgreSQL database can be utilized. The data points we have stored can help us with further analysis.

Area	Perimeter	Compactness	Kernellength	Kernelwidth	Asymmetriccoeff	Kernelcoefflen	Wheattype
11.5	15.6	0.87	5.24	3.32	6.45	5.21	Canadian
11.5	18.65	0.845	5.24	3.21	1.44	5.29	Kama
11	20	0.91	5.9	4	6.39	6.6	Rosa
11.5	14.89	0.798	5.1	2.75	1.56	5.52	Canadian
10.859	21.83	0.845	5.24	3.761	6.99	4.5	Kama
11.85	15.25	0.849	5.894	3.519	2.55	5.75	Canadian
11.8	20.5	0.845	6.62	3.9	4.55	6.52	Rosa

Then, after successfully testing the application on local system further, the application can be deployed on Heroku Cloud Platform where users can experiment with other values. The deployed application will be seen as in the collaged image mentioned below. The user will have the privilege to enter the values and see the results based on the value entered. The final result will be seen as below: -



10. ADVANTAGES, LIMITATIONS &APPLICATION

ADVANTAGES

a. It is both protected and simple to utilize.
b. It tends to be involved by the understudies chasing after schooling in the agro field or for the experts who are working in the Agro-Industry.
c. It is open effectively and is educational.

LIMITATIONS

a. To utilize this application client needs steady and dynamic web availability.
b. The client is supposed to include the appropriate figures to acquire wanted outcome.

APPLICATION

a. When an understudy needs data about wheat and requirements to recognize the wheat into various kinds, he/she can utilize this application.
b. The expert working in the agro-business can likewise utilize this application to classify wheat into different kinds.
c. The businesspeople selling wheat can utilize this application.

11. FUTURE SCOPE

Here we have only considered the dataset that has different types of kinds of wheat. But in reality, there are many bowls of cereal or grains that can be classified so we can add many more options like rice, barley and many more to be classified based on their characteristics. Here we have only used Machine Learning but by adding Computer Vision we can introduce some more advancements in this topic.

12. CONCLUSION

Wheat is quite possibly the most consumed and most huge cereal gather. Of a huge number of assortments known, the most critical are normal wheat (Triticum aestivum), used to make bread; durum wheat (T. durum), utilized in making pasta (nutritious pastes) like spaghetti and macaroni; and club wheat. Thusly, we have used the Support Vector Machine Classifier to deal with the Multi-Class Classification issue. For our circumstance, the Wheat Kernel Identification issue has three classes explicitly Rosa, Kama, and Canadian. By using SVM

and doing suitable Hyper Parameter Tuning we can arrange such wheat (Rosa, Kama, and Canadian) considering its piece properties.

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