KisanSevak: Data-Driven Agriculture for Optimal Yields and Product Procurement

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***Abstract*—In the current digital era, despite advancements in technology, traditional farming methods persist among farmers.This paper introduces an innovative application of machine learning, reshaping pivotal aspects of farming practices.It shows a comprehensive exploration of the convoluted aspects of predictive modeling within the realm of appropriate crop production according to soil and environmental conditions. employing Support Vector Machines (SVM) for precise regression, Random Forest for fine-tuned crop classification, and Long Short-Term Memory (LSTM) networks for nuanced price prediction, our research contributes to sustainable agricultural intensification.The model centers around different information and procedures utilized, like nitrogen, phosphorus, and sulfate values, to know the soil's health and anticipate future harvests, along with reasonable information calculations using the historical data of the particular location.In essence, the primary focus of this paper is on the digitization of the farming industry.Through the amalgamation of machine learning models and data-driven approaches, this research strives to bring about a fundamental shift in the traditional practices of agriculture,and thus will pave the way for the adoption of these prediction models all over India.**

***Index Terms*—component, formatting, style, styling, insert**

I. Introduction

Being the second largest country worldwide for farm outputs,As per the Indian economic survey 2020 -21, agriculture employed more than 50% of the Indian workforce and contributed 20.2% to the country's GDP.[2] Still Indian farmers have always been the most suffering whether in terms of economic or the social growth. A substantial part of our country's economic development depends on proper agricultural planning. Food demand is expected to rise anywhere between 59% to 98% by 2050, according to a Harvard review.Currently, crop yields are rising too slowly to meet the anticipated food demand. Thus, it is important : • To make farmers aware of the tentative amount of production he will obtain from his field. • To comprehend the impact of climatic changes on their land. This shall help them in monitoring the growth of healthy crops.[5] Also Working via local traders however reduces the proit margins for farmers, and also makes it hard for them to negotiate better prices since the traders tend to operate as local monopolies and are often also lenders of credit to the farmers, thus able to maintain signiicant power over them [7]. To overcome all these problems We are trying to make a model for covering the state Maharashtra that can reliably predict the crop yield and crop prices efficiently using diverse machine learning techniques. It takes in account the current weather condition as well as other influencing parameters like soil health which includes the nitrogen, phosphorus and sulphate values. The proposed method helps to improve the prediction of net yield of crops in the state(Maharashtra)and enhance the farming techniques to mitigate crop loss. We have extensively used ML tools to address such problems. In crop production, ML tools have been applied predominantly for yield prediction[6]. The ML techniques can be used for crop yield prediction at diferent scales such as local, regional and country levels [6]. By analyzing historical data on soil compo-

sition, weather patterns, and crop performance, models can be made to suggest the most suitable crop for a particular farm. This not only optimizes agricultural yields but also contributes to sustainable farming practices. Comparison is done between various linear and nonlinear regressor models. Random forest regressor gave better results, followed by K Nearest Neighbor regression[5].Complex relationships between variables such as weather conditions and soil health can be analyzed in order to predict the yield of a particular crop in a given field. Moreover time-series analysis and forecast helps to suggest,to select crops to sow based on expected price realizations predicted using machine learning [7]. By compiling data on market trends and factors affecting the prices, a simple neural network can provide valuable insights. Our key contributer are threefold:A localized, indigenous solution that applies machine learning in a lucid manner can be formulated for the farmers of Maharashtra(India) by building a farmer-friendly system with an easy to navigate interface, accurate predictions, as well as personalized, secure data analysis, and a feedback loop in order to keep the models accurate. An indigenous solution would also involve integrating data from local markets, understanding supply chain dynamics, and factoring in cultural practices that influence pricing. This localized approach ensures that the predictions are more accurate and relevant to the community. For wider adoption, the user interface should be designed with consideration for local languages and literacy levels.

II. Literature Survey

The paper investigates the use of algorithms to predict maize yields under conservation agriculture in Eastern and Southern Africa (ESA). Various ML algorithms are evaluated based on metrics like accuracy and precision, highlighting the performance of linear algorithms, particularly Linear Discriminant Analysis (LDA), compared to nonlinear models. The study emphasizes the importance of a validation set for reliable model assessment. Results reveal that LDA performs exceptionally well, while Support Vector Machine (SVM) shows lower accuracy. The findings contribute insights into the applicability of ML for crop yield prediction in ESA, with implications for agricultural decision-making and planning.[6]

The paper highlights the gap in the traditional method of decision making process for crop selection. The aim is to deploy a modern machine learning system replacing traditional farming methods to get better yield from the farmers field. The model makes use of advanced algorithm tools such as Support Vector Machine and ensemble methods for prediction. The paper was able to achieve a notable increase in accuracy compared to the conventional methods and achieving the potential to leverage farmer's decision making process.[8]

III. Prepare Your Paper Before Styling

Before you begin to format your paper, first write and save the content as a separate text file. Complete all content and organizational editing before formatting. Please note sections III-A–III-E below for more information on proofreading, spelling and grammar.

Keep your text and graphic files separate until after the text has been formatted and styled. Do not number text heads—LaTeX will do that for you.

A. Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, ac, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

B. Units

- Use either SI (MKS) or CGS as primary units. (SI units are encouraged.) English units may be used as secondary units (in parentheses). An exception would be the use of English units as identifiers in trade, such as "3.5-inch disk drive".
- Avoid combining SI and CGS units, such as current in amperes and magnetic field in oersteds. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity that you use in an equation.
- Do not mix complete spellings and abbreviations of units: "Wb/m^2" or "webers per square meter", not "webers/m^2". Spell out units when they appear in text: ". . . a few henries", not ". . . a few H".
- Use a zero before decimal points: "0.25", not ".25". Use "cm^3", not "cc".)

C. Equations

Number equations consecutively. To make your equations more compact, you may use the solidus (/), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in:

$$a + b = \gamma \tag{1}$$

Be sure that the symbols in your equation have been defined before or immediately following the equation. Use "(1)", not "Eq. (1)" or "equation (1)", except at the beginning of a sentence: "Equation (1) is . . ."

D. LaTeX-Specific Advice

Please use "soft" (e.g., `\eqref{Eq}`) cross references instead of "hard" references (e.g., `(1)`). That will make it possible to combine sections, add equations, or change the order of figures or citations without having to go through the file line by line.

Please don't use the `{eqnarray}` equation environment. Use `{align}` or `{IEEEeqnarray}` instead. The `{eqnarray}` environment leaves unsightly spaces around relation symbols.

Please note that the `{subequations}` environment in LaTeX will increment the main equation counter even when there are no equation numbers displayed. If you forget that,

you might write an article in which the equation numbers skip from (17) to (20), causing the copy editors to wonder if you've discovered a new method of counting.

BIBTEX does not work by magic. It doesn't get the bibliographic data from thin air but from .bib files. If you use BIBTEX to produce a bibliography you must send the .bib files.

LATEX can't read your mind. If you assign the same label to a subsubsection and a table, you might find that Table I has been cross referenced as Table IV-B3.

LATEX does not have precognitive abilities. If you put a `\label` command before the command that updates the counter it's supposed to be using, the label will pick up the last counter to be cross referenced instead. In particular, a `\label` command should not go before the caption of a figure or a table.

Do not use `\nonumber` inside the `{array}` environment. It will not stop equation numbers inside `{array}` (there won't be any anyway) and it might stop a wanted equation number in the surrounding equation.

E. Some Common Mistakes

- The word "data" is plural, not singular.
- The subscript for the permeability of vacuum μ_0, and other common scientific constants, is zero with subscript formatting, not a lowercase letter "o".
- In American English, commas, semicolons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
- A graph within a graph is an "inset", not an "insert". The word alternatively is preferred to the word "alternately" (unless you really mean something that alternates).
- Do not use the word "essentially" to mean "approximately" or "effectively".
- In your paper title, if the words "that uses" can accurately replace the word "using", capitalize the "u"; if not, keep using lower-cased.
- Be aware of the different meanings of the homophones "affect" and "effect", "complement" and "compliment", "discreet" and "discrete", "principal" and "principle".
- Do not confuse "imply" and "infer".
- The prefix "non" is not a word; it should be joined to the word it modifies, usually without a hyphen.
- There is no period after the "et" in the Latin abbreviation "et al.".
- The abbreviation "i.e." means "that is", and the abbreviation "e.g." means "for example".

An excellent style manual for science writers is [7].

F. Authors and Affiliations

The class file is designed for, but not limited to, six authors. A minimum of one author is required for all conference articles. Author names should be listed starting from left to right and then moving down to the next line. This is the author sequence that will be used in future citations and by indexing services. Names should not be listed in columns nor group by affiliation. Please keep your affiliations as succinct as possible (for example, do not differentiate among departments of the same organization).

G. Identify the Headings

Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

Component heads identify the different components of your paper and are not topically subordinate to each other. Examples include Acknowledgments and References and, for these, the correct style to use is "Heading 5". Use "figure caption" for your Figure captions, and "table head" for your table title. Run-in heads, such as "Abstract", will require you to apply a style (in this case, italic) in addition to the style provided by the drop down menu to differentiate the head from the text.

Text heads organize the topics on a relational, hierarchical basis. For example, the paper title is the primary text head because all subsequent material relates and elaborates on this one topic. If there are two or more sub-topics, the next level head (uppercase Roman numerals) should be used and, conversely, if there are not at least two sub-topics, then no subheads should be introduced.

H. Figures and Tables

a) Positioning Figures and Tables: Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation "Fig. 1", even at the beginning of a sentence.

TABLE I
TABLE TYPE STYLES

Table Head	**Table Column Head**		
	Table column subhead	***Subhead***	***Subhead***
copy	More table copy[a]		

[a]Sample of a Table footnote.

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity "Magnetization", or "Magnetization, M", not just "M". If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write "Magnetization (A/m)" or "Magnetization {A[m(1)]}", not just "A/m". Do not label axes with a ratio of

Fig. 1. Example of a figure caption.

quantities and units. For example, write “Temperature (K)”, not “Temperature/K”.

ACKNOWLEDGMENT

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression “one of us (R. B. G.) thanks . . .”. Instead, try “R. B. G. thanks. . .”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

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