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# Predictive Analysis for Identifying the Relationship between Forest Cover and Tiger Population

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***Abstract - This paper analyzes the forest cover in India as a whole and also in terms of states. The species growth with respect to the forest cover and the survival of species based on their Kingdoms of Classification is studied. The dependencies between the forest covers of India with the flora of India is studied. With respect to fauna, this paper discusses the state population of India's national animal, Tiger and its relationship to the degree of deforestation over years. This also studies the wasteland cover and the areas of improvement for the betterment of Indian flora and vegetation. This also checks for relationships, dependencies and variations between flora and fauna to obtain patterns for improving the Indian Ecosystem.***

***Keywords: Environment, Prediction Analysis, Forest Cover, Deforestation, Tiger Population***

## I. INTRODUCTION

India is one of the mega biodiversity nations with several plant species consisting of 17000 species of flowering plants and 5400 endemic species. The vegetation is wealthy due to variety of climatic conditions and altitude variations. The country also has varied ecological habitats. But there are change in forest cover in different parts of the country. The main reasons are encroachments for agriculture, mining, quarrying, construction of dams, expansion of cities and illegal logging. The range of man-made destructions is the major concern now, as deforestation is becoming a serious global environmental problem. Deforestation affects the habitat, fragmentations and creates edge effects in the forest boundary. This study is an attempt to relate the forest cover changes to the population of living species and to improve the ecosystem balance of Indian environment. This paper is majorly concerned about data analysis and predictions. The data estimates of forest covers and tiger estimates are studied and visualized to predict the changes in depletion from year to year. We targeted over the years 2016, 2018 and 2020 and the data estimates of the year 2009, 2011 and 2013 were used.

## II. LITERATURE SURVEY

C. Sudhakar Reddy [9] describes the importance of forests like economic heritage, economic wealth and wildlife heritage. The studies conducted in various regions are clear and also predictive. The forest degradation data can be either visible or visible. They are combined with field observations to know the conservation strategies. A clear representation on the gross deforestation is provided in the review. The prime reasons for deforestation are also illustrated. Apart from those stated already, forest fire and over-grazing are also included. The satellite images are considered for identifying the forest covers. The varying resolutions can also give different results at different scales in an automated classification system.

The final results indicated that about 20% of forest patch labels were improved. The rate of change in forest cover loss in Southeast Asia was 0.9% from 1990 to 2000. With visual control, it was assessed as 1.6%. The above case illustrates that very high spatial resolution and scales are to be used to assess the forest cover change. New methodologies and techniques for forest cover quantification is a challenging task. Action plans are to be strongly recommended in the areas like North East India, some parts of Eastern Ghats and islands.

Sreenivasan Narayanan [6] discusses about the population of tigers in India in the recent decades. The Tiger Task Force appointed in 2005 by Government of India, stressed on the importance of adopting the procedures in the tiger reserves. It also regularized the need for a streamlined management with the establishment of National Tiger Authority. It suggested on the participation of local communities to protect the tigers. In 2006, amendment was made in Wildlife Protection Act, 1972 and the National Tiger Conservation Authority (NTCA). A number of measures to increase the area of tiger reserves was taken. This included relocation of villages, regularizing funds for conservation, streamlined procedures, reduction of man-animal conflicts. These measures resulted in sustaining the tiger population during the year 2010.

The study reveals that the local communities involved in the process plays a major role. They can be benefitted by tourism and sharing the conservation efforts. The policy needs to have a solid framework to involve local community, to ensure their livelihood and development. This can then become a real participation and ends up in avoiding the extinction stage of tigers.

Simon Levinb [7] studies the effective conservation planning of globally endangered tigers (Panthera tigris). An agent-based model of tiger population with territorial behaviors of male and female tigers was developed. The demographic rates are merged with territory dynamics for deducting the population. Nepal's Chitwan National Park model was applied. The park houses a large population of tigers and serves as a biodiversity hotspot. The model has closest match with the park's tiger population. The patterns were observed in terms of reproduction, dispersal, mortality, male and female land tenure, resource selection,

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territory size and spatial distribution with tiger population size and age. This model aims to explore human-tiger interactions.

It also assess threats to tiger populations across various contexts and scales. The models informs decision makers on various ways to conserve tigers, though the conditions are uncertain.

Bibek Yumnan[10] recommends for global support for Panthera tigris conservation. They are threatened by poaching, habitat loss and isolation which makes them hard to survive. At present, there are about 3000 tigers available in fragmented population within 7% of their range. The conservation strategy to identity and secure habitat linkages by connecting with the source populations is an important aspect. The landscape-level gene flow should also be maintained. The genetic analysis combined with landscape permeability is used to model in this case. The model identifies and prioritizes the movement corridors across 7 tiger populations. The Central Indian Landscape territory is used for analysis. The habitat linkages are modeled for tiger occupancy probability with habitat permeability as parameters. The least-cost and circuit theory pathway analysis is done to explain pairwise genetic differences between populations. The results highlight the functionality of many corridors in migration.

Aditya Joshi [8] discusses about the future and conservation of tigers. Tiger survival is dependent on local population size and connectivity between populations. Few initiatives on landscape-level connectivity need to be taken, as the landscape elements are important in maintaining connectivity. The individual-based genetic approach can be combined with landscape ecology. This significantly improves the conservation effect in increasing tiger population size. Six protected areas with varying tiger densities and separation are considered in the Central Indian tiger landscape. This describes the importance of habitat viability between protected areas. This illustrates a quantitative approach to test functionality of tiger corridors.

N. Rajathi [5] discusses the ensemble model for prediction and forecasting. The paper discusses about the combination of multiple models which can improve the performance of the system. This proposes a model with neural network, perceptron and SVM to analyse and predict on the natural data like soil moisture.

K.R. Baskaran [12] discusses the SVM based approach for web caching systems. This approach seems to be better compared with a few other techniques. The SVM algorithm combined with LRU is performing efficiently.

## III. EXISTING SYSTEM

The existing system helps to analyse the problems of forest cover changes. It also predicts the patterns of forest cover changes and the reasons of changes. It also recommends strong ideas to restrict deforestation that has been happening over decades by making regional analysis of forest cover change data. It implements new techniques to analyse forest cover changes and their complications thus giving out an elaborate detail on forest cover changes. But the system fails to obtain patterns by predictive analysis. The accuracy of the findings seem to be low as no formal algorithms are used to analyse historic environment data. The system also fails in establishing relationships by comparing with the fauna changes in the regions to improve the whole ecological system of vegetation.

## IV. PROPOSED SYSTEM

The proposed work provides an opportunity for accuracy of findings by implementing data exploration and analysis algorithms. The approach is predictive and prescriptive to elaborately deal with the data over decades of time and to obtain patterns of changes where improvement has to be done. This also compares the forest cover cycle with the living organisms and the population of fauna in regions.

### A. Dataset Extraction

Initially we started our research with n number of datasets, which were concerned about the two parameters called forest covers and tiger reserves. The data sets were published by the Government of India in the Statistical Year Book and the available data was there for the years 2009, 2011 and 2013. The Environment and Forest Year Book 2016 was used for the state wise forest cover and tiger estimates. The second step about the process was that, every data set was categorized and cleaned. It was then broken down in to various small entities and units. The 29 states were categorized in the basis of year and area.

### B. Segregation and cleaning

The entire data is split into entities that categorizes different states for different types of forest covers. The redundant data is eliminated and the regional references are standardized with unambiguous terms. The cleansed data is evaluated for its correctness with the selected algorithm and tool.

### C. Application of Algorithm

The cleansed data set is imported as an object. Linear Regression model is used to represent linear relationship between the two variables. Other methodologies like Logistic Regression, Polynomial Regression, Stepwise Regression, and Multiple Regression will not suit Bi-variate analysis. Various other growing technologies like, Random forests, neural networks do not suit it as it requires more data to train the algorithm. It would be heavily affected by outliers if less number of training data is used. Linear Regression is the best fit for small number of data, with only two parameters to consider. With the two parameters say year and area, we can only access it using linear regression. We then proceeded with R tool.

The R tool helped us to proceed with the predictions. Based on the predictions we were able to derive and predict the future estimates of the two factors – forest covers and tiger estimates. We plotted our predictions in Indian map, so as to find the regions which have to be concentrated to balance our eco system.



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## V. RESULTS AND DISCUSSION


**Figure 1. Protected data set**


**Figure 2. Reserved data set**


**Figure 3 – Tiger estimates data set**

The data sets resulted in a map depicting the density of forest cover and tiger estimates. The figures 1, 2 and 3 illustrates various facts about forest cover and tiger estimates.

Karnataka, Uttarkhand, Madhya Pradesh and Tamil Nadu are the major places where tiger numbers are high. These areas need not be concentrated. Instead proper balance of ecosystem of these areas are enough. These states make efficient use of their own reserved forest areas to initiate sanctuaries and maintain a developing phase of tiger population.

Maharashtra, Punjab, Haryana, Kashmir and Orissa are the areas which has to be concentrated for the tiger reserves. In these areas both the reserved and protected forests have to be concentrated.

Andhra Pradesh, Telangana, Rajasthan are the places where the tiger populations should be increased. Once we focus on the reserved and protected forests in these areas, the tigers in those regions will be increased.

## VI. CONCLUSION

Proper maintenance of reserved forests in each state alone with tiger species is enough to increase the population of tiger. States which do not have reserved forests have a plenty of resources like protected forests, can make divisions of protected into reserved and accommodate tigers. This paper uses linear regression model to depict the relation between the forest areas and tigers to balance the ecosystem. The system can be improved further with multivariate data and decision models.

## REFERENCES

1. C. Sudhakar Reddy, Kalloli Dutta and C. S. Jha, "Analyzing the gross and net deforestation rates in India", *Forestry and Ecology Group*, 2011.
2. Kaushik Das, Abhijit Guha Roy, "Landscaping of Random Forests through controlled deforestation", *Second National Conference on Communication (NCC)*, 2016.
3. Jean Francois Mas, Gabriela Cuevas, "Local Deforestation patterns in Mexico – An approach using geographically weighted regression", *1st International Conference on Geographical Information Systems Theory, Applications and Management (GISTAM)*, 2015.
4. E. Menaka; S. Suresh Kumar; M.Bharathi, "Change detection in deforestation using high resolution satellite image with Haar Wavelet Transforms", *International Conference on Green High Performance Computing (ICGHPC)*, 2013.
5. N. Rajathi, L.S. Jayashree, "Soil Moisture Forecasting Using Ensembles of Classifiers", *Springer*, 2016.
6. Sreenivasan Narayanan, "Saving the Indian Tiger - A study on the effects of Wildlife (Protection) Amendment Act 2006 and National Tiger Conservation Authority", 2014.
7. Neil Carter, Simon Levinb, Adam Barlowc, Volker Grimmd, "Modeling tiger population and territory dynamics using an agent-based approach", *Ecological Modelling*, 2015.
8. Aditya Joshi, Srinivas Vaidyanathan, Samrat Mondol, Advait Edgaonkar, Uma Ramakrishnan, "Connectivity of Tiger (Panthera tigris) Populations in the Human-Influenced Forest Mosaic of Central India", *PLOS Genetics*, 2013.
9. C. Sudhakar Reddy Et al., "Quantification and Monitoring of Deforestation in India over Eight Decades", *Biodiversity and Conservation*, 2015.
10. Bibek Yumnam, Yadvendradev V. Jhala, Qamar Qureshi, Jesus E. Maldonado, Rajesh Gopal, Swati Saini, Y. Srinivas, Robert C. Fleischer, "Prioritizing Tiger Conservation through Landscape Genetics and Habitat Linkages", *PLOS Genetics*, 2014.
11. R. Anuradha, N. Rajkumar, "A Novel Approach in Mining Specialized Coherent Rules in a Level-Crossing Hierarchy", International Journal of Fuzzy Systems, 2017.
12. K.R. Baskaran, C. Kalaiarasan, "Improved Performance by Combining Web Pre-Fetching Using Clustering with Web Caching Based on SVM Learning Method", *International Journal of Computers Communications & Contro*l, ISSN 1841-9836, 11(2):167-178, April 2016.



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