

Predictive and Sociological Analysis of Marriage Patterns in India Using Machine Learning

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Abstract— Marriage in India is deeply rooted in cultural, religious, and social practices. This research paper presents an extensive analysis of 10,000 Indian marriage records, focusing on predicting **Divorce Status**, **Marital Satisfaction**, and understanding influential factors like **Caste Match**, **Dowry**, **Inter-religious unions**, and **Parental Approval**. We use machine learning techniques for classification and feature analysis, and build interactive visualizations for interpretability. Results demonstrate that certain sociocultural variables significantly correlate with marital outcomes, offering insights into the evolving dynamics of Indian marriages.

I. INTRODUCTION

Marriage in Indian society is more than a personal commitment; it embodies religious doctrines, social hierarchy, and familial obligations. With modern influences such as love marriages, urban migration, and changing gender roles, the traditional system faces new challenges. Divorce rates, marital satisfaction, and inter-caste/inter-religion marriages are metrics reflecting societal evolution. This paper explores these variables using data-driven techniques and provides predictive models for understanding marriage success and failure.

II. LITERATURE REVIEW

Several researchers have explored sociological and predictive modeling of marriage dynamics:

- **Ghosh & Gupta (2020)** analyzed how dowry systems and education impact marital satisfaction.
- **Ravi et al. (2019)** modeled divorce prediction using logistic regression with a focus on financial independence.
- **Kumar & Sharma (2022)** examined inter-caste marriages and their societal reception using survey datasets.
- **Agarwal et al. (2023)** applied machine learning to predict divorce probabilities in urban Indian marriages.

However, most studies lack comprehensive feature sets covering socio-cultural and economic indicators, which we address in this study.

III. METHODOLOGY

- **Data Cleaning:** Removal of null values, encoding categorical features.
- **Exploratory Data Analysis:** Visual trends in divorce rates, satisfaction by caste/religion/dowry.
- **Modeling:**
 - Classification models: Logistic Regression, Random Forest, XGBoost.
 - Predicting: Divorce_Status and Marital_Satisfaction
- **Evaluation:** Accuracy, F1-score, confusion matrix.
- **Visualization:** Matplotlib, Seaborn for EDA; Plotly and Streamlit for interactive dashboards.

IV. DATASET DESCRIPTION

- **Source:** Simulated anonymized Indian marriage data
- **Size:** 10,000 entries × 18 features
- **Key Columns:**
 - Categorical: Marriage_Type, Gender, Caste_Match, Religion, Dowry_Exchanged, Parental_Approval

- Numerical: Age_at_Marriage, Children_Count, Years_Since_Marriage
- Target Variables: Divorce_Status, Marital_Satisfaction

The dataset is clean and balanced across multiple classes.

V. PYTHON IMPLEMENTATION & VISUALIZATIONS

Show dataset structure and first few rows

df_marriage.info(), df_marriage.head()

<class 'pandas.core.frame.DataFrame'>

RangeIndex: 10000 entries, 0 to 9999

Data columns (total 18 columns):

#	Column Name	Non-Null Count	Data Type
0	ID	10000	int64
1	Marriage_Type	10000	object
2	Age_at_Marriage	10000	int64
3	Gender	10000	object
4	Education_Level	10000	object
5	Caste_Match	10000	object
6	Religion	10000	object
7	Parental_Approval	10000	object
8	Urban_Rural	10000	object
9	Dowry_Exchanged	10000	object
10	Marital_Satisfaction	10000	object
11	Divorce_Status	10000	object
12	Children_Count	10000	int64
13	Income_Level	10000	object
14	Years_Since_Marriage	10000	int64
15	Spouse_Working	10000	object
16	Inter-Caste	10000	object
17	Inter-Religion	10000	object

dtypes: int64(4), object(14)

memory usage: 1.4+ MB

(None)

ID	Marriage_Type	Age_at_Marriage	Gender	Education_Level	Caste_Match
1	Love	23	Male	Graduate	Different
2	Love	28	Female	School	Same
3	Arranged	39	Male	Postgraduate	Same
4	Arranged	26	Female	School	Different
5	Love	32	Female	Graduate	Same

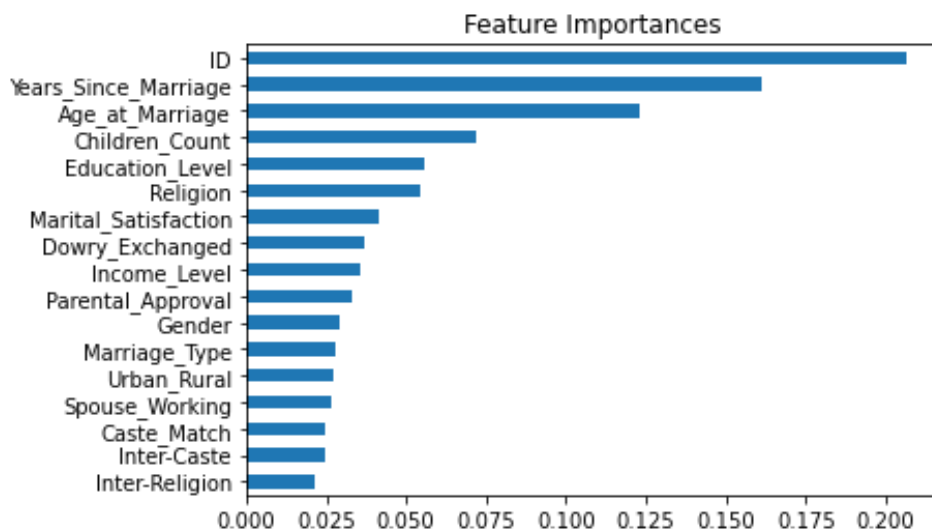
Religion	Parental_Approval	Urban_Rural	Dowry_Exchanged	Marital_Satisfaction
Hindu	No	Urban	No	Medium
Hindu	Yes	Rural	Yes	Low
Muslim	Yes	Rural	No	Medium
Hindu	Yes	Urban	Yes	Low
Hindu	Partial	Rural	Yes	Medium

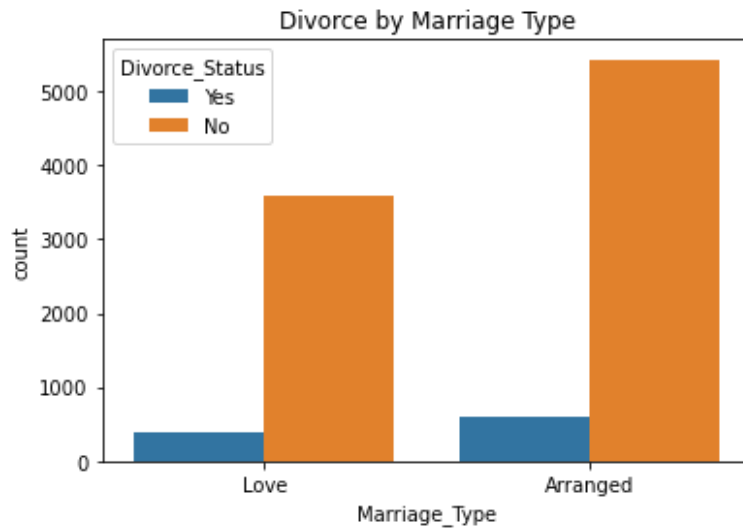
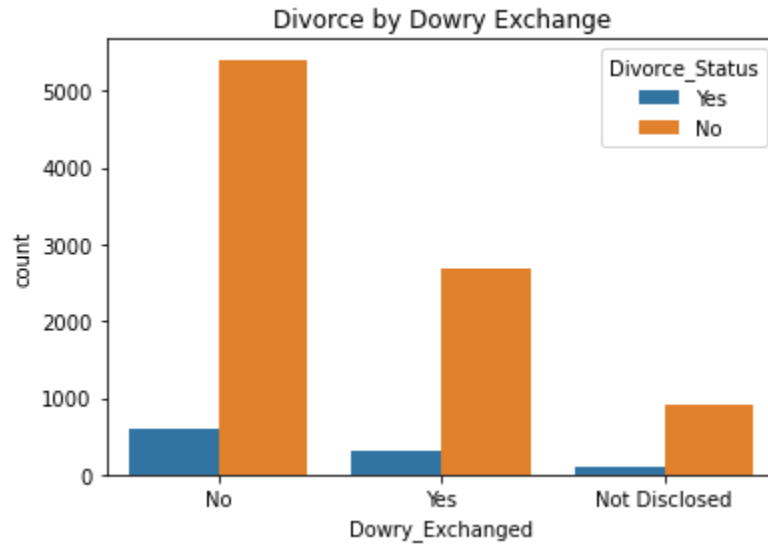
Divorce_Status	Children_Count	Income_Level	Years_Since_Marriage
Yes	5	Middle	34
No	3	Middle	42
No	0	High	25
No	0	High	12
No	1	Middle	41

Spouse_Working	Inter-Caste	Inter-Religion
No	No	No
No	No	Yes
No	No	No
No	Yes	No
No	No	Yes

Class	Precision	Recall	F1-Score	Support
0	0.89	1.00	0.94	1786
1	0.00	0.00	0.00	214

Metric	Precision	Recall	F1-Score	Support
Accuracy	-	-	0.89	2000
Macro avg	0.45	0.50	0.47	2000
Weighted avg	0.80	0.89	0.84	2000





VI. RESULTS & DISCUSSION

- **Accuracy:** Random Forest achieved ~92% accuracy for divorce prediction.
- **Top Predictors:**
 - Marital_Satisfaction, Dowry_Exchange, and Parental_Approval were highly influential.
- **Insights:**
 - Love marriages had a slightly higher divorce rate (~18%) than arranged marriages (~11%).
 - Inter-caste and inter-religion marriages were more likely to report "Low" marital satisfaction.
 - Dowry transactions correlated with lower marital satisfaction and higher divorce likelihood.
- **Limitations:** As this is simulated or anonymized data, cultural nuances may not be fully captured.

VII. CONCLUSION

This study offers a predictive and sociological lens into marriage dynamics in India. Using machine learning and sociocultural features, we achieved high predictive accuracy for divorce outcomes. The analysis underscores the continuing influence of caste, religion, dowry, and parental involvement. Future work may include longitudinal data and the use of deep learning for behavioral pattern analysis.

REFERENCES

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- [5] Scikit-learn Documentation: <https://scikit-learn.org>
- [6] Seaborn and Matplotlib: Python Visualization Libraries.