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FOMO and Online Purchasing Behaviour of Students Using Random Forest

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ABSTRACT :

Fear of Missing Out (FOMO) is a psychological factor that can influence how students respond to trending products, peer purchases, influencer recommendations, discounts, and limited-time offers on social media and e-commerce platforms. This study examines the impact of FOMO on students' online purchasing behaviour and identifies the factors that contribute to FOMO-driven purchasing decisions, including social media usage, peer influence, influencer marketing, product trends, discounts, and limited-time offers. Primary data are to be collected from college students through a structured questionnaire. The responses are cleaned, encoded, and converted into features, and a Random Forest classifier is proposed to classify purchasing behaviour. The model is to be evaluated using accuracy, precision, recall, F1-score, and a confusion matrix, and feature-importance analysis is used to identify the most useful predictors. As the work presents a proposed methodology, no experimental results are reported, and final conclusions must be based on the collected data. The study is intended to improve understanding of FOMO-driven online purchasing among students and to provide a basis for future research on psychological and social influences in e-commerce.

Keywords: FOMO; online purchasing behaviour; impulse buying; Random Forest; social media; college students.

Introduction

The rapid growth of social media and e-commerce platforms has significantly influenced the purchasing behaviour of students. Students are frequently exposed to trending products, friends' purchases, influencer recommendations, flash sales, limited-time offers, and online discounts. Such exposure may create a sense of urgency and encourage students to purchase products even when they are not initially planning to do so.

One psychological factor that may influence these online purchasing decisions is Fear of Missing Out (FOMO). FOMO refers to the feeling of anxiety or concern that others are experiencing something desirable without the individual (Przybylski et al., 2013). The proposed research examines the impact of FOMO on students' online purchasing behaviour and identifies the factors contributing to FOMO-driven purchasing decisions. Random Forest is used as the proposed machine-learning algorithm for classifying purchasing behaviour from questionnaire-based factors.

Literature Review

FOMO has become increasingly relevant in the context of social media and online shopping because users are continuously exposed to information about products, trends, influencers, discounts, and other people's purchases. Przybylski et al. (2013) provided a foundational account of FOMO and its relationship with social-media engagement, and Abel et al. (2016) described the development and assessment of a FOMO scale that is relevant to

questionnaire-based measurement. Good (2021) examined how FOMO appeals affect purchase likelihood, while Dinh and Lee (2022) linked FOMO to buying intention for products endorsed by social-media influencers.

Flecha Ortiz et al. (2024) studied uncontrolled social-media use, FOMO, and consumer purchase intent using a survey of 543 active social-media users, and Kumar and Kumar (2024) examined social-media use, FOMO, impulsive buying, and compulsive buying among young adults in India. The role of limited-time offers has been addressed by Khetarpal and Singh (2024), who studied time-scarcity messages and impulse purchase. The influence of social-media celebrities and influencers on impulse buying has been examined by Zafar et al. (2021), whose study used questionnaire data from 452 respondents, by Shamim and Azam (2024), and in a further study of influencer effects and trust in influencer posts (*How do social media influencers induce the urge to buy impulsively?*, 2024).

Online purchasing behaviour can be studied using questionnaire responses that capture psychological and social influences. Traditional statistical analysis can be used to examine relationships between FOMO and purchasing behaviour, while machine learning can additionally be used to identify predictive patterns. Random Forest is an ensemble learning algorithm that combines multiple decision trees. It is suitable for a questionnaire-based prediction task when several factors jointly influence a categorical outcome, and it can also provide feature-importance information that may help identify which measured factors are most useful for prediction.

The proposed study therefore combines questionnaire-based research with Random Forest classification. Since completed machine-learning results are not yet available, the Random Forest component is presented as a proposed methodology rather than as an already verified finding.

Problem Statement and Objectives

3.1 Problem Statement

Students are increasingly exposed to online trends, social-media content, influencer recommendations, discounts, flash sales, and limited-time offers. These exposures may create FOMO and a sense of urgency, which can influence online purchase intentions and impulse buying behaviour.

The research problem is to examine how FOMO-related factors are associated with students' online purchasing behaviour and to develop a machine-learning model that can classify purchasing behaviour using the collected questionnaire data. A major challenge is that purchasing behaviour is influenced by several factors at the same time. A model such as Random Forest can combine these variables and learn patterns from the collected responses. The final target categories must be defined from the actual questionnaire and research design.

3.2 Objectives

The proposed system collects primary data from college students through a structured questionnaire. The responses are cleaned, encoded, and converted into suitable features. A Random Forest classifier is then trained to predict the selected category of FOMO-driven online purchasing behaviour. The major objectives are:

- To examine the impact of FOMO on students' online purchasing behaviour.
- To identify factors contributing to FOMO-driven purchasing decisions.
- To study social media usage, peer influence, influencer marketing, product trends, discounts, and limited-time offers.
- To collect primary data from college students using a structured questionnaire.
- To preprocess and encode questionnaire responses for machine learning.
- To apply Random Forest for classification of purchasing behaviour.
- To evaluate the model using suitable performance measures.
- To identify the importance of the selected factors in the prediction model.

Proposed Methodology

4.1 System Architecture and Workflow

The proposed pipeline is organized into five stages: data collection, data preprocessing, feature preparation, Random Forest model training, and evaluation (Fig. 1).

Stage 1: Data Collection. Primary data are collected from college students through a structured questionnaire.

Stage 2: Data Preprocessing. Responses are checked for missing or invalid values, and categorical answers are converted into numerical representations where necessary.

Stage 3: Feature Preparation. The main features are social media usage, peer influence, influencer marketing, product trends, discounts, limited-time offers, and relevant FOMO measures.

Stage 4: Random Forest Training. The prepared dataset is divided into training and testing portions. Multiple decision trees are trained using the training data, and their predictions are combined to produce the final classification.

Stage 5: Evaluation. The trained model is evaluated using accuracy, precision, recall, F1-score, and a confusion matrix. Feature importance is also examined to understand which factors contributed most to the model's predictions.

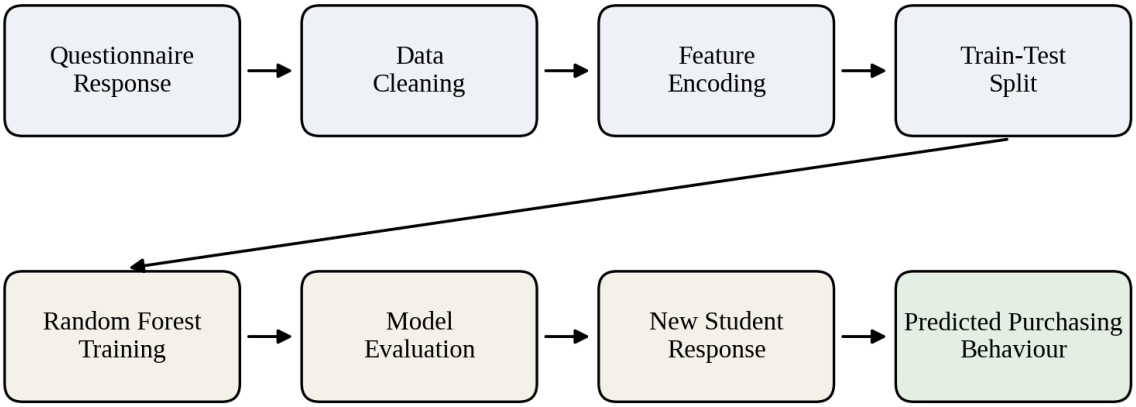


Fig. 1 - Workflow of the proposed Random Forest system for FOMO-driven purchasing behaviour.

4.2 Data Collection

Primary data are collected from college students through a structured questionnaire that covers the factors identified in the study. The possible variables include:

- Social media usage
- Peer influence
- Influencer marketing
- Product trends
- Discounts
- Limited-time offers
- FOMO-related responses
- Online purchase intention
- Impulse buying behaviour

The number of participants, sampling technique, exact questionnaire items, and class distribution will be documented after the actual survey is completed.

4.3 Data Preprocessing

Data preprocessing prepares questionnaire responses for machine learning. The proposed preprocessing steps are:

1. Collect the questionnaire responses.
2. Remove duplicate or unusable records.
3. Check and handle missing values.
4. Convert categorical responses into numerical form where required.
5. Encode rating-scale responses consistently.
6. Separate input features from the target variable.
7. Split the dataset into training and testing sets.
8. Apply the same preprocessing rules to new data before prediction.

Proper preprocessing is important because Random Forest requires structured input features. The exact preprocessing procedure will be documented according to the final questionnaire.

4.4 Feature Selection and Creation

The main features are derived from social media usage, peer influence, influencer marketing, product trends, discounts, and limited-time offers. FOMO-related responses are also included according to the research design. Questionnaire responses may be represented using numerical scores or encoded categories, and these features form the input to the Random Forest classifier.

Random Forest can provide feature-importance measures, which can be used to identify the variables that were most useful to the model for prediction. However, feature importance represents predictive contribution and should not automatically be interpreted as proof of a causal relationship.

4.5 Train-Test Split and Cross-Validation

The dataset is divided into training and testing portions. The training data are used to build the Random Forest model, while the testing data are kept for evaluating performance on unseen responses. Where appropriate, stratified splitting can be used when the target classes have unequal frequencies. Cross-validation can be applied to the training data to assess model stability and support hyperparameter selection. The final test data remain separate until the final evaluation to reduce the risk of an overly optimistic performance estimate.

Random Forest Algorithm

Random Forest is an ensemble machine-learning algorithm that combines the predictions of multiple decision trees. Each tree is trained using a different sample of the training data and considers subsets of features while making decisions. For the proposed FOMO study, a Random Forest classifier is used because the target variable represents categories of online purchasing behaviour, such as different levels or classes defined by the questionnaire.

5.1 Working Process

1. Input the preprocessed questionnaire features.
2. Create multiple decision trees from the training data.
3. Use randomly selected samples and feature subsets while building the trees.
4. Obtain a prediction from each tree.
5. Combine the tree predictions through majority voting.
6. Produce the final predicted purchasing-behaviour class.

5.2 Advantages of Random Forest

- Handles multiple input variables together.
- Can model nonlinear relationships.
- Works well with mixed questionnaire features after suitable encoding.
- Provides feature-importance information.
- Reduces dependence on a single decision tree.

Random Forest is used here as the proposed predictive algorithm. Statistical methods can additionally be used because the research objective also involves examining relationships between FOMO and purchasing behaviour.

5.3 Prediction Process

After training, the Random Forest model can receive a new questionnaire response. The new response is processed using the same encoding and preprocessing procedure used during training, and the processed feature values are supplied to the trained model. Each decision tree generates a prediction, and the forest combines these predictions to produce the final class (Fig. 1). The trained model can also be analysed using feature importance to understand the predictive contribution of the selected factors.

Implementation

6.1 Technologies Used

The proposed technologies for implementation are listed in Table 1.

Table 1 - Proposed technologies for implementation.

Component	Proposed technology
Programming language	Python 3.x
Data handling	Pandas, NumPy
Machine learning	Scikit-learn Random Forest
Data visualization	Matplotlib, Seaborn
Statistical analysis	SciPy / suitable statistical tools
Development environment	Jupyter Notebook or Visual Studio Code

6.2 System Requirements

Hardware requirements:

- Intel Core i5 or equivalent processor and above.
- Minimum 8 GB RAM recommended.
- Sufficient storage for questionnaire data and model files.
- GPU is generally not required for a standard Random Forest model.

Software requirements:

- Windows or Linux operating system.
- Python 3.x.
- Pandas and NumPy.
- Scikit-learn.
- Matplotlib and Seaborn.
- Jupyter Notebook or Visual Studio Code.

6.3 Implementation Modules

Data Handling Module. This module collects and prepares the questionnaire dataset. It performs data cleaning, missing-value handling, encoding, and feature preparation.

Random Forest Module. This module separates the input features and target variable, trains the Random Forest classifier, and generates predictions.

Evaluation Module. This module calculates accuracy, precision, recall, F1-score, and the confusion matrix. It can also generate feature-importance results.

Prediction Module. This module accepts a new student response, applies the same preprocessing steps, and predicts the corresponding purchasing-behaviour category.

Results and Discussion

This paper presents the proposed methodology; experimental results will be reported after the model is implemented on the collected questionnaire data. After implementation, the Random Forest model should be evaluated using suitable metrics. If the target is multiclass, class-wise precision, recall, and F1-score can be reported along with a confusion matrix.

Feature-importance results can provide an additional view of which measured factors were most useful for prediction. The results should be interpreted together with the questionnaire design and statistical analysis rather than treating predictive importance as proof of causation.

Advantages and Applications

8.1 Advantages of the Proposed System

- Combines several FOMO-related factors in a single predictive model.
- Can handle multiple questionnaire variables.
- Can model nonlinear relationships between features and purchasing behaviour.
- Provides feature-importance information.
- Uses a supervised machine-learning approach suitable for labelled questionnaire outcomes.
- Can support analysis of online purchase intention and impulse buying behaviour.
- Can be combined with statistical analysis for a broader research study.

8.2 Applications

- Studying FOMO-driven online purchasing behaviour among college students.
- Identifying patterns associated with impulse buying.
- Analysing the influence of social media on purchase decisions.
- Examining the role of influencer marketing.
- Studying the effect of discounts and limited-time offers.
- Supporting awareness and educational programmes about online purchasing behaviour.
- Providing a basis for future research on psychological and social influences in e-commerce.

Limitations of the Study

The sample size, sampling method, questionnaire scale, and final target-variable categories have not yet been finalised, and these factors may affect the reliability and generalizability of the final model. Questionnaire data may also be affected by self-reporting and response bias, since students may report their behaviour differently from their actual online purchasing behaviour.

Random Forest can identify predictive patterns, but model feature importance does not establish psychological causation. The study should therefore combine machine learning with appropriate statistical analysis. The results may also be limited to the population represented by the collected sample and should not automatically be generalized to all students.

Conclusion and Future Work

This research focuses on the relationship between Fear of Missing Out and students' online purchasing behaviour. Social media usage, peer influence, influencer marketing, product trends, discounts, and limited-time offers are identified as important factors, and primary data are to be collected from college students through a structured questionnaire. Random Forest provides a suitable proposed machine-learning approach for classifying purchasing behaviour from multiple questionnaire features. Its ensemble structure and feature-importance capability can support predictive analysis.

Future work can include collecting a larger and more diverse dataset, comparing Random Forest with other classifiers, applying cross-validation and hyperparameter tuning, examining class imbalance, and combining machine learning with statistical hypothesis testing. Final conclusions should be based on the actual collected data and verified experimental results.

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