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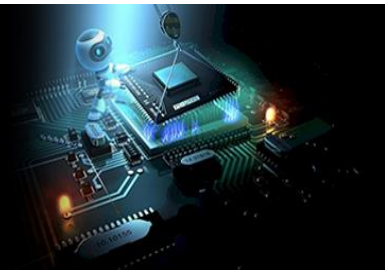

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A deep learning method utilizing Bi-GRU for the determination of novelty seeking in online travel reviews

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Abstract
The comprehension of novelty seeking (NS), an innate personality feature that affects travel motivation and location selection, requires an awareness of the experience related information found in online travel evaluations. Because of their large number and lack of organization, manually classifying these evaluations is difficult. The objective of this research is to address these shortcomings by creating a deep learning model and classification system. Four dimensions—relaxation seeking, experience seeking, arousal seeking, and boredom alleviation—that were combined from earlier research were included in a multi-dimensional categorization framework for the NS personality characteristic. Using 30 000 TripAdvisor reviews as a basis, we suggest a deep learning model that uses the Bidirectional Encoder Representations from Transformers (BERT)-Bidirectional Gated Recurrent Unit (BiGRU) to automatically identify NS in the reviews. The classifier based on the NS and BERT BiGRU multi-dimensional scales demonstrated a reasonably accurate recognition of the NS personality trait, with accuracy and F1 scores of 93.4% and 93.3%, respectively. This research also shows that by applying the deep learning model, the classifier based on multi-dimensional NS scales may provide good results. In comparison to other deep learning models of the same sort, the results also show that the BERT-BiGRU model performs at the highest level. It also demonstrates how personality characteristics may be automatically extracted from trip reviews using computational methods. Practically speaking, this research offers a thorough categorization framework for NS that can be used to recommendation and marketing systems in the travel and tourism sector.

Keywords: Novelty Seeking (NS), online travel reviews, deep learning, Bidirectional Gated Recurrent Unit (Bi-GRU)

Introduction
Crowdsensing, a leading paradigm that takes use of the widespread usage of smartphones and their sophisticated sensors, has grown more popular as a means of efficiently gathering data. An application for crowdsensing typically involves a server posting the necessary sensing data and enlisting a group of smartphone users to gather sensing data. The server collects sensory data from smartphone users and uses it to assess common interest phenomena, such as real-time traffic conditions, environmental pollutant quality, and environmental noise pollution. The superior quality contributions of very experienced users determine how accurate the common interest estimate is. Smartphone users soak up their energy and the resources on their phones—battery, storage, and processing power—while making excellent contributions. Furthermore, as the detected data includes time and location markers, users may be subject to privacy risks. As a result, the donors need to get adequate compensation to make up for any resource use or any privacy breaches. Anyone can tell that a user wants to maximize her profit and would lie or pretend to be someone else in order to get more money. Consequently, it is crucial to create a safe and reliable reward system. Numerous incentive schemes, including monetary and reputation-based systems, have been put forward and put into practice. Reputation systems [1] may be useful in identifying noncompliant users, but they are vulnerable to sybil assaults [2] and whitewash attacks [3] when they disregard a clear specification and analysis of the incentive types. Because of their clear and adaptable incentive structures, monetary techniques [26] may be the most promising. The majority of financial systems provide genuine incentive mechanisms via pricing techniques so that users of smartphones and servers cannot raise their value by

dishonesty or collusion with others. However, other incentive systems that safeguard privacy have been suggested. The internet has steadily become a part of many aspects of our everyday life due to the quick advancement of information technology. Online and offline travel has steadily expanded in the tourist sector. As a result of the growth of online travel communities, a growing number of visitors now research destinations online and read other travelers' reviews on their experiences before deciding where to go [1]. Travelers' perceptions are reflected in the majority of reviews on internet travel platforms. Let's say this data is gathered and examined to graphically represent visitors' opinions—both positive and negative—or their emotional inclinations about the components of tourism services. If so, it will assist travelers in making decisions by assisting them in comprehending the emotional inclinations of those who came before them toward a certain tourism site [2]. Tour guides are able to interpret visitors' views and attitudes toward compliments and criticism in order to highlight their advantages and minimize their disadvantages. In order to get a competitive edge, reviews can assist management in personalizing goods or enhancing initiatives [3]. Individual behavior is triggered by a set of psychological characteristics known as personality traits, which cause people to react uniformly to various stimuli [4]. In the past, personality characteristics have been studied using self-reporting measures, which ask participants to assess their own attributes after experiencing the real scenario [5]. Presently, the majority of personality trait measuring scales are standardized examinations since the scale primarily depends on the subjective emotions and self-statements of the individuals [6]. Survey respondents, on the other hand, tend to express themselves in ways that are more supportive of self-representation and more consistent with societal norms. Put differently, it is possible for individuals to knowingly provide replies that are skewed, so impairing the validity of measurement findings [7]. Personality trait identification based on online activity data is a technique to automatically identify and evaluate personality characteristic types, as opposed to measuring personality traits by psychological examinations [8]. One the one hand, it gets around the fixed and subjective aspects of conventional approaches for measuring personality traits. Conversely, it also circumvents the measuring bias resulting from self-reporting and offers fresh approaches and concepts for acquiring personality characteristics among visitors. Novelty seeking (NS) is a personality characteristic that shows up as a general inclination to seek out complexity, diversity, curiosity, and intense emotions and experiences [9]. It is well known that NS is a major factor in leisure travel and is regarded as an innate characteristic [10], [11]. It has been shown to have a significant influence on travelers' views and to play an important part in the choice of destination [12]. According to earlier studies, NS has an impact on travelers' pleasure [15], loyalty [14], and inclination to return [13]. tourist sector marketing methods heavily rely on the personality attribute known as NS, which is generally acknowledged as an influencer on tourist motivation. Since NS individuals like visiting isolated and foreign locations, new tourism sites might be suggested in the tailored suggestion space based on the NS inclinations of the clientele. Organizations may create more focused marketing efforts by taking into account the demands of their customers in addition to improving recommender systems. It may increase visitor pleasure, cut down on redundant material, and broaden the range of suggestions. Practically speaking, it is possible to precisely identify and pinpoint user groups with NS features by using NS identification in online travel evaluations. But it's challenging to pinpoint travelers' NS traits because of the proliferation of information in travel-related internet evaluations. Finding NS requires a time-consuming and expensive manual analysis of a huge number of web evaluations. This work aims to provide deep learning techniques in order to tackle this problem. Following the creation of a multidimensional NS scale, we use deep learning—referred to as the BERT-BiGRU model—to identify and categorize NS in internet travel evaluations. This research examines pertinent literature, which is covered in the following part. Next, NS recognition using a deep learning model was created and evaluated. Lastly, the model's application is covered. Future research and practice implications are also included in this paper.

Related Work

A Review of Deep Learning Models for IoT Security and Privacy

The Internet of Things (IoT) is a rapidly developing technology that is very helpful for managing smart objects such as smart meters, parking, infrastructure monitoring, healthcare, government, banking, smart homes, smart cars, etc. Every day, this makes our lives simpler. Even though IoT is a centralized device that everyone can access, it still has to protect itself against security flaws like botnets, DDoS/DoS, malicious assaults, and Shinhole attacks. These concerns include the requirement for more energy-efficient devices, the usage of a large number of heterogeneous devices that compromises security and scalability, and the centralized system that is easily accessible by anyone, making it an ideal target for attackers. This study aims to address security and privacy problems in the Internet of Things by offering a thorough description of deep learning methods and standard datasets. Using deep learning to improve IoT security is our main goal. First, we examine deep learning algorithms and classification in the context of IoT security from the perspective of methods and device design. We next look at how suitable IoT systems are from a security standpoint.

The adoption of user-generated content (UGC) and age and gender inequalities in it: integrating credibility theory into the technology acceptance model (TAM)

This research uses structural equation modeling (SEM) to investigate the impacts of perceived utility (PU), perceived ease of use (PEOU), trustworthiness, and competence on use intention toward online reviews and user-generated content (UGC) among male and female younger and older travelers. A sample of 200 UK citizens who had traveled for pleasure at least once in the previous year and had looked up travel-related information in preparation on travel review websites were included in the research to evaluate the model. For men, PU was the most powerful predictor of UGC use, while it was not statistically significant for females. The utilization of PEOU was most strongly correlated with female travelers and older passengers; however, it had no significant effect on male travelers or younger travelers. Experience made a big difference for younger tourists, but not for older ones. The findings provide more insights into how age and gender affect online

travel evaluations, which will benefit theory and practice alike.

Sport Tourism: A Comprehensive Review of Studies

In recent years, there has been a rise in interest in sport-related tourism as a topic for academic research and as a travel commodity. This study reviews and evaluates the state-of-the-art sport tourism literature in 1998 and proposes a research agenda for the future. In addition to discussing differences in definitions, this article highlights some of the challenges academics have had in coming up with a consensus definition of sport tourism. When considering the reasons for the rapid rise in popularity of sport tourism, historical evidence indicates that travel associated to sports has been a part of human activity for generations. That being said, this mode of transportation has been more and more popular within the last 10 years. Several factors are explored, including the growing focus on fitness and health and the growing use of sporting events by cities as a tourist draw. A review and analysis of the literature in the three categories of sport tourism—active sport tourism, which is defined as travel for sports participation; event sport tourism, which is defined as travel to attend sporting events; and nostalgia sport tourism, which includes trips to renowned sports venues, sports museums, and sports-themed cruises—is part of the question of what is known about sport tourism. This review's main finding is that there is a dearth of integration between the area and the domains of policy, research, and education. Better cooperation is required at the policy level between the organizations in charge of tourism and sports. Research-wise, additional interdisciplinary studies are required, especially those that expand on the body of information already known about sport and tourism. Territorial conflicts between departments claiming sport expertise and those claiming tourist expertise in education must be resolved.

The conduct and disposition of tourists

Two scales—one measuring preferred locations and the other measuring desired activities during vacation—were used to operationalize Stanley Plog's idea of psychocentric - allocentric travel preferences. Psychocentric (non-adventurous) females were shown to be more extraverted and less neurotic than allocentric ones.

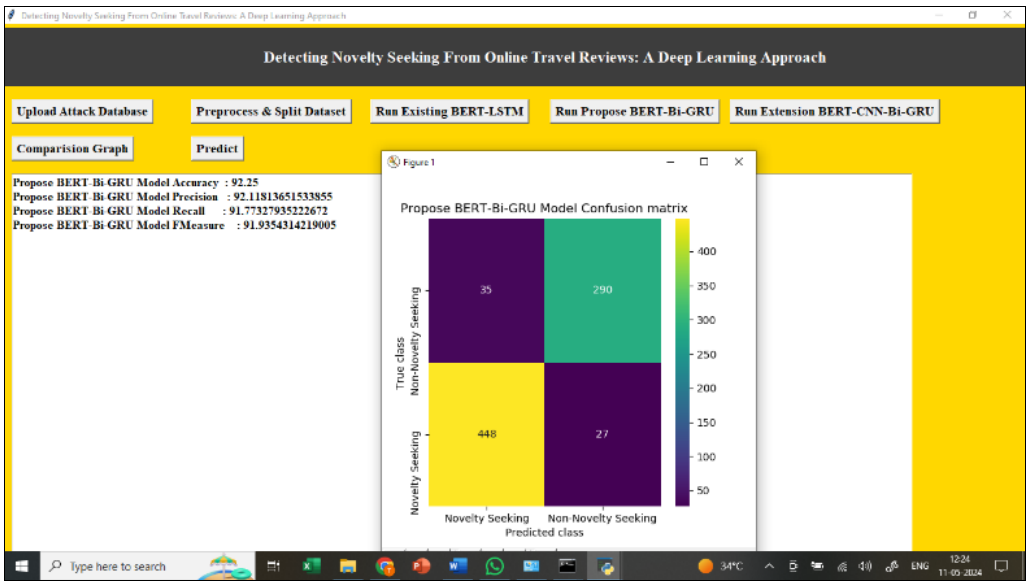
Inconsiderate clients and service delivery: the influence of motivation and disposition

We construct and test an integrative paradigm that explains the relationship between customer incivility and staff service performance, based on the self-determination theory. We discovered that employee core-self evaluations influenced the strength of the mediated relationship between customer incivility and employee service performance (via employee intrinsic motivation). Specifically, employees with higher core-self evaluation scores had a smaller negative indirect effect of customer incivility via intrinsic motivation on service performance than employees with lower core-self scores.

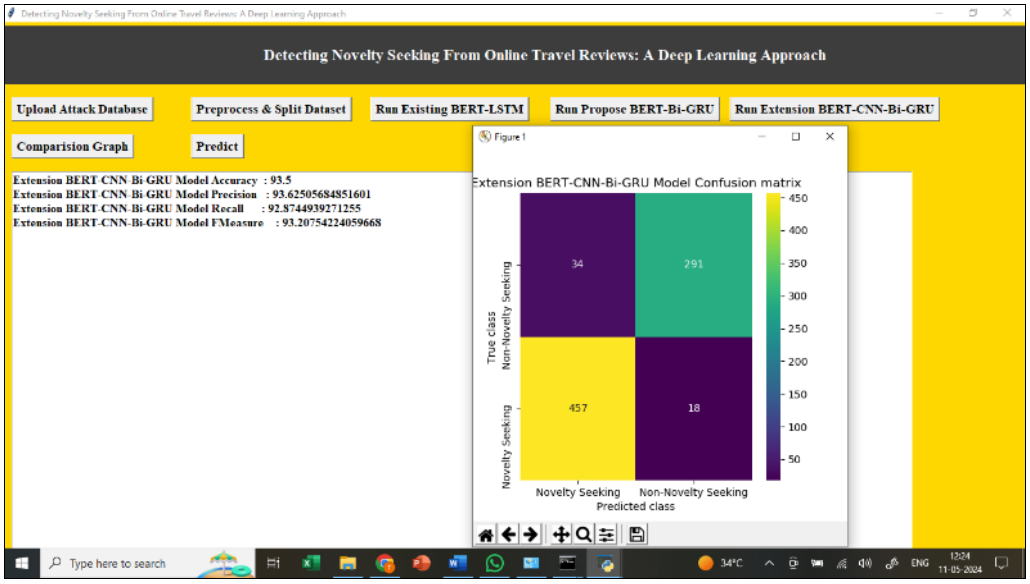
Methodology

1. **Upload Attack Dataset:** We may upload datasets to the program by using this module.
2. **Preprocess And Split Dataset:** Processing datasets using this module, including shuffles and splits into train and test
3. **Run Existing BERT-LSTM:** With this Module, the current BERT-LSTM achieved 79% accuracy and was able to see more metrics in the confusion matrix graph.
4. **Run proposed BERT-BI-GRU:** This module's proposed BERT-BI-GRU achieved 92% accuracy and was able to see additional metrics in the confusion matrix graph.
5. **Run Extension BERT-CNN-BI-GRU:** With the use of this Module extension model, which achieved 95% accuracy, additional metrics could be seen in the confusion matrix graph.
6. **Comparison Graph:** This module allows us to create a network connecting every algorithm.
7. **Predict from Test Data:** This module allows us to upload test data.

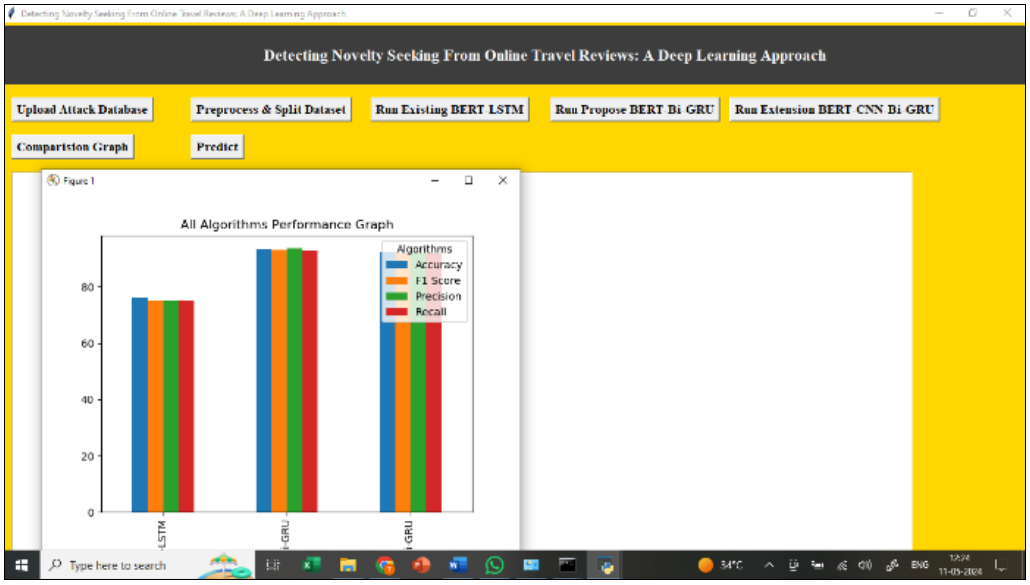
Results and Discussion



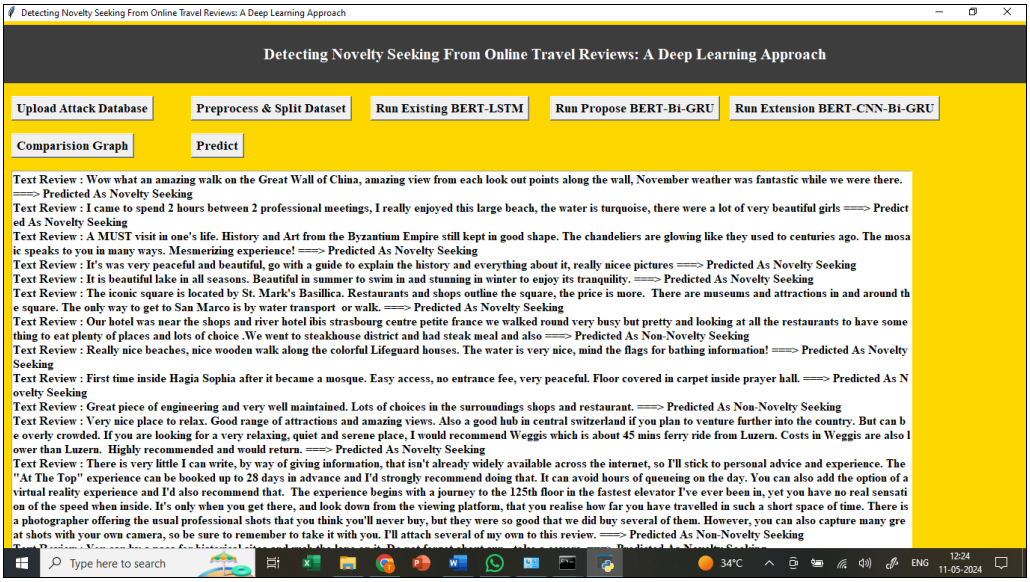
In above results propose BERT-BI-GRU got 92% accuracy



In above results extension model got 95% accuracy



In above graph x-axis represents algorithm names and y-axis represents accuracy and other metrics in different colour bars and in all algorithms extension got high performance



In above results reading TEST reviews and then converting to BERT features and then using extension model predicting Novelty Seeking or not and in output before arrow symbol we can see TEST data and after arrow symbol =➔ we can see predicted output as Novelty Seeking or Non-Novelty seeking.

Conclusion

This study uses a theory-based categorization of NS personality characteristics to show how deep learning may be used to automatically handle large volumes of travel-related web reviews. It demonstrates that using sophisticated computer tools, personality characteristics can be reliably and automatically recognized. This study does, however, have several drawbacks. The notion encompasses several dimensions with a high level of abstraction, and NS dimensions are arbitrary. Multi-category recognition depending on the number of dimensions of the scale is an additional option for novelty recognition, in addition to the straightforward two-category method. Possible future study directions include categorizing users with NS, enhancing user portrait comprehension, and precision marketing, as well as optimizing the tourist destination suggestion system based on NS personality.

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