Seminar Report On

**AI Powered Fake News Detection**

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**ABSTRACT**

In the quickly changing and information-rich world of today, spotting fake news has become essential to maintaining reliable communication. Current methods for detecting fake news frequently fail to provide scalable, data-driven, and highly accurate solutions. This project introduces an artificial intelligence (AI)-based fake news detection system that uses machine learning to assess news articles' authenticity based on content structure, linguistic patterns, and the reliability of the source. Text preprocessing, feature extraction, and classification using algorithms like Random Forest, XGBoost, and Support Vector Machines (SVM) are all part of the platform's multi-step workflow. The model also incorporates clustering methods, such as K-Means, to find trends across various news categories. Explainable AI techniques and visual analytics are used to increase openness and foster confidence in forecasts. Additionally, In order to continuously adjust to the changing strategies of disinformation campaigns, the system also incorporates real-time updates and feedback mechanisms.

**CONTENTS**

|  |  |  |
| --- | --- | --- |
| **Chapter No.** | **Name of Chapter** | **Page Number** |
|  | Introduction to Seminar   * 1. Introduction to AI Powered Fake News Detection System   2. Motivation behind seminar topic selection   3. Aim and Objective(s) of the work | 1 |
|  | Literature Survey | 3 |
|  | Motivation, purpose and scope and objective of seminar | 5 |
| 1. . | Details of design/technology/Analytical and/or experimental work, if any/ | 8 |
| 1. . | Discussions and Future Work | 15 |
| 1. . | Conclusions | 17 |
| 1. . | Bibliography/References (in IEEE Format), | 18 |
|  | Plagiarism Check report, | 19 |

**List of figures**

|  |  |  |
| --- | --- | --- |
| **Figure Number** | **Figure Title** | **Page Number** |
| 4.1 | A basic System Architecture | 10 |
| 4.2 | Workflow of the system | 10 |
| 5.1 | Output Image-1 | 13 |
| 5.2 | Output Image-2 | 14 |
| 5.3 | Output Image-3 | 14 |

**List of Table**

|  |  |  |
| --- | --- | --- |
| **Table Number** | **Table Title** | **Page Number** |
| 2.1 | Literature Survey on AI Powered Fake News Detection System | 3 |
| 4.1 | Technologies used | 11 |
| 4.2 | Comparison: Existing Fake News Detection Apps vs. The AI-Powered System | 12 |

**1. INTRODUCTION**

* 1. **Introduction to AI Powered Fake News Detection System**

The term "fake news" describes purposefully inaccurate or deceptive information that is passed off as news. Fake news can spread quickly and affect public opinion and behaviour thanks to the growth of social media. According to studies, social media serves as a "double-edged sword," facilitating the rapid spread of news while simultaneously facilitating the widespread spread of "fake news"—that is, news that is of low quality and contains false information.

Fake news's widespread dissemination can harm society by eroding public confidence in the media, influencing elections, and jeopardising public health decisions. These dangers have made the detection of fake news a highly active and focused research area. Artificial intelligence (AI)-based automated solutions are required because traditional manual fact-checking cannot keep up with the amount of online content.s. AI-based fake news detection

**1.2 Motivation Behind Project Topic**

The fake news that is constantly spreading on WhatsApp is the main reason that I feel working on this fake news detection project will be worth it. I have witnessd it every day, and the ease with which misleading information spreads often without anyone challenging it really frustrates me sometimes . People come to hold false beliefs, which can occasionally cause fear, or even injury. WhatsApp is one of the main sources when it comes to disseminating false information because it is such a popular platform. Hence my goal is to create a tool that will assist people in identifying false information and preventing it from influencing them and enable users to swiftly confirm what they read so they can avoid becoming entangled in.

**1.3** **Aim and Objective(s) of the work**

**Project Aim**

The aim of this report is to provide a comprehensive overview of fake news detection methods using AI, and to design a conceptual system for detecting fake news. The specific objectives are:

**Project Objectives**

• To Examine important studies on how AI-based fake news detection works and highlighting noteworthy models and datasets.   
• Also Highlight key methods and conclusions by summarising the literature in a comparative table.   
• To develop a fake news detector's system architecture and workflow  
• Make use of the tools and algorithms used in text processing and classification.   
• To Examine outcomes and difficulties, pointing out the shortcomings of the available techniques.   
• Make recommendations for future research areas, like multimodal analysis and adjusting to newly created AI-generated content.

**2. LITERATURE SURVEY**

Table 2.1: Literature Survey on AI Powered Fake News Detection System

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sr. No. | Paper Title | Author Name | Year of Publication | Journal/ Conference Name | Objective/ Purpose of Paper | Methodology/ Techniques Used | Analysis/ Result | Research Gap/ Limitations of Existing System | Future Work |
| 1 | Fake News Detection on Social Media: A Data Mining Perspective | Kai Shu, Amy Sliva, Suhang Wang, Jiliang Tang, Huan Liu | 2017 | ACM SIGKDD Explorations | To review data mining techniques for fake news detection | NLP, Machine Learning, User profiling | Identified gaps between content-based and social context-based detection | Lack of combined feature use | Building comprehensive models combining content and context |
| 2 | LIAR: A Benchmark Dataset for Fake News Detection | William Y. Wang | 2017 | ACL | Introduce LIAR dataset for fake news detection | NLP, SVM, Logistic Regression, CNNs | Dataset helped boost performance of neural methods | Dataset still limited in complexity and scale | Enriching datasets with multimodal information |
| 3 | WhatsApp Usage Patterns and Predictors of Online Behavior | Arpita Agrawal, Arvind Tomar, Computers in Human Behavior | 2018 | Elsevier | Analyze WhatsApp usage patterns and psychological predictors | Statistical analysis, behavioral surveys, regression analysis | Identified correlations between personality traits and WhatsApp usage patterns | Lack of deeper machine learning modeling for predictive analysis | Use machine learning for finer-grain predictive behavior |
| 4 | CSI: A Hybrid Deep Model for Fake News Detection | Ruchansky et al.,  ACM | 2019 | CIKM | Combine text and user behavior for detection | RNN + User features + Response patterns | Improved over text-only baselines | Dependency on user behavior data | Improve user modeling for unseen news |
| 5 | Beyond News Contents: The Role of Social Context for Fake News Detection | Kai Shu, Deepak Mahudeswaran, Huan Liu  . | 2023 | WSDM  ACM | Explore user engagement signals for fake news detection | Graph mining, Social context analysis | Improved detection with social features | Focus only on social media, missing non-social sources | Integration of heterogeneous data sources |
| 6 | Fake News Detection: Current Trends and Future Research Directions | Ahmad et al. | 2022 | Elsevier | Information Processing & Management | Analytical study of existing methods | Emerging trends analyzed | |  | | --- | | Lack of  Multilin-  gual  datasets |  |  | | --- | |  | | Research in multilingual fake news detection |
| 7 | A Comprehensive Review on Fake News Detection With Deep Learning | M. F. MRIDHA,  MD. ABDUL HAMID | 2021 | IEE | Investigates advanced fake news detection mechanisms. | NLP techniques,  deep learning-based techniques | . Emerging deep learning approaches were absent. | Previous reviews lacked exploration of deep learning | Suggests recommendations to improve detection mechanisms. |
| 8 | Fake News Detection Using Machine Learning Approaches | Z Khanam et al. | 2021 | IOP Conference Series: Materials Science and Engineering | Explores traditional machine learning models.  Aims to classify fake news using Python and NLP. | Uses Python scikit-learn for tokenization and feature extraction.  Employs Count Vectorizer and Tiff Vectorizer.  Uses feature selection methods | achieving highest precision from confusion matrix. | Manual detection is not feasible.  Suggests automated system for credibility scorin | Proposes a model to detect authentic or fake articles. |

**3. MOTIVATION, PURPOSE AND SCOPE AND OBJECTIVE OF SEMINAR**

**Motivation**

Mostly the false news that keeps spreading on WhatsApp drives me to work on this fake news detecting project. I observe this every day, and it truly disturbs me how readily misleading information travels—often without anyone challenging it. People start to believe false things, and occasionally those beliefs cause uncertainty, anxiety, or even injury. Given its great popularity, WhatsApp is among the main offenders in disseminating false information. I wish to create a tool enabling individuals to identify false news and stop its impact on them. The concept is to provide consumers with a means of fast confirming what they consume so they may avoid becoming caught up in

the chaos that fake news creates

**Purpose and Scope**

The purpose of this seminar is to understand and communicate the state of AI-based fake news detection. Specifically, the seminar aims to:

* **Purpose:**

 What motivates me to work on this fake news detection project is mainly the fake news that keeps circulating on WhatsApp. It’s something I see happening daily, and it really bothers me how easily false information spreads, often without anyone questioning it. People end up believing things that aren’t true, and sometimes those beliefs lead to confusion, panic, or even harm. WhatsApp, being such a widely used platform, is one of the biggest culprits when it comes to spreading misinformation. I want to build a tool that can help people spot fake news and stop it from influencing them. The idea is to give users a way to quickly verify what they read, so they can make better decisions and not get caught up in the chaos that fake news creates.

* **Scope:**

The scope of this fake news detection project is to create a system that can recognise and categorise news articles as authentic or fraudulent based on a number of variables such as their source and the type of content. The system will be able to examine posts and news stories from other social media sites. To evaluate the news's credibility, the detection system will use machine learning algorithms like Support Vector Machines (SVM), Random Forest, and Naive Bayes.

In order to assist users in verifying information, it will also provide credibility scores for articles and links to fact-checking resources. Additionally, the project will have an interactive interface that will allow users to submit articles for analysis, view real-time results, and get suggestions for trustworthy sources. In order to become a more accurate and dependable tool for thwarting fake news, the system will be continuously enhanced over time based on user feedback and actual data.

**Objectives**

* **To collect and analyze user data such as news articles, sources, and reader behavior through interactive forms and assessments**:

This goal is to collect specific information from users, including the news sources they visit, the articles they read, and how they interact with the content. Information about the user's media consumption habits, reliable sources, and frequency of encountering dubious news will be gathered through forms and quizzes. Training the fake news detection model will require this data.

* **To implement a machine learning-based classification module that identifies fake news articles:**  
  The project's main goal will be to create a machine learning model that can evaluate news articles' content and determine whether they are authentic or fraudulent. In order to find linguistic patterns, sources, and metadata that are associated with fake news, the model will make use of algorithms like Naive Bayes, Random Forest, and Support Vector Machines (SVM). A dataset of confirmed news stories and well-known disinformation sources will be used to train it.
* **To design a fact-checking engine that evaluates articles objectively using automated checks:**  
  To achieve this goal, a system that uses automated fact-checking tools to evaluate news articles must be developed. To determine the article's veracity, the engine will compare its content to reliable databases, fact-checking websites, and other sources. It will verify the article's claims using methods like web scraping, sentence comparison, and keyword matching.
* **To preprocess and normalize collected data to ensure accuracy in predictions:**  
  To increase the accuracy of the fake news detection system, user and news article data must be cleaned, preprocessed, and normalised. In order to do this, it will be necessary to handle missing or unnecessary data, eliminate duplicates, transform text into structured formats (like vectorisation or tokenisation), and encode categorical variables for machine learning.
* **To use machine learning algorithms such as Naive Bayes, Random Forest, and SVM for fake news detection:**These machine learning techniques will be used to create a strong classification model that can tell the difference between real and fake news. SVM will assist in establishing distinct decision boundaries for classification based on the features taken from the news articles, Random Forest will offer feature importance analysis, and Naive Bayes will be utilised for probabilistic classification.
* **To visualize prediction results using intuitive dashboards and visual tools for better user understanding:**The creation of an interactive user interface that allows users to view the outcomes of fake news predictions is the main goal of this objective. In addition to visual graphs that represent different metrics like article sources, sentiment scores, and potential bias levels, dashboards will show the likelihood that an article is fraudulent. Users will be better able to comprehend the logic behind the detection and make wise choices regarding the articles they read if the results are visualised.
* **To provide ranked credibility scores for news articles, along with related resources for fact-checking:**The system will rank news articles according to their credibility in addition to classifying them as real or fake. Articles will be given a credibility score that indicates how likely they are to be true or untrue. The system will also offer links to scholarly materials, reliable news sources, and fact-checking websites so users can confirm the accuracy of the information.
* **To collect user feedback to improve the model over time through active learning techniques:**Users will be urged to comment on the precision and applicability of the classification after receiving predictions for news articles. The machine learning models will be improved and retrained using active learning strategies in response to this feedback. Based on user interaction, the system will keep getting better, becoming more accurate and able to identify new trends in fake news.
* **To deploy the system on a web-based platform for accessible and real-time fake news detection**The finished fake news detection system will be made available to users worldwide by being implemented on a web-based platform. The platform's user-friendly design will make it simple for users to browse through real-time news classifications or submit articles for analysis. Users will have instant access to fake news alerts thanks to its current and trustworthy news detection capabilities.

**4. DETAILS OF DESIGN/TECHNOLOGY/ANALYTICAL AND/OR EXPERIMENTAL WORK, IF ANY**

**1. System Design:**

**• Architecture:** The system employs layered design consisting of:

* **Frontend/Backend :** Streamlit is used to create a user-friendly, interactive web interface. It manages user inputs, displays prediction results, and integrates with visualization tools
* **Database:** SQLite is used to store articles, results, and user history.

**2. News Input Module:**

**• Purpose:** Collects news articles either via direct text input, file upload

• **Tech Used:** JavaScript for form validation

**3. Data Preprocessing & Feature Engineering:**

* **Purpose:** Clean and prepare input data for the model.
* **Tech Used:** Python libraries — NLTK, SpaCy, and TextBlob.
* **Operations:**Tokenization and lemmatization,Removing stop words, punctuation, and special characters , Vectorization using TF-IDF, Bag of Words (BoW), or word embeddings like Word2Vec/Glove.

**4. Career Prediction Engine:**

* **Main Algorithms Used**:
* **Logistic Regression**: Simple baseline model for binary classification (real or fake).
* **Random Forest Classifier**: For better handling of imbalanced datasets and interpretability.
* **Support Vector Machine (SVM)**: For high-margin classification.
* **Model Evaluation** Accuracy, Precision, Recall, F1-score, ROC-AUC curve.

**5. Visualization & Result Analysis:**

* **Purpose:** Provide users and admins with analytical dashboards.
* **Tech Used:** Matplotlib, Seaborn, Plotly for graphical representations like:
  + Confusion matrices
    - Distribution plots (real vs fake news frequency)
  + Feature importance heatmaps (for explainable AI)

**6. Experimental Work:**

* **Dataset:** Kaggle’s Fake News Dataset, LIAR Dataset, and BuzzFeed News datasets.
* **Training and Testing:** 80-20 Train-Test Split , 5-fold Cross-validation, Hyperparameter tuning using GridSearchCV
* **Result:**
  + Traditional models like Random Forest achieved around 88–90% accuracy.
  + Deep Learning models (LSTM, BERT) achieved 92–96% accuracy, depending on the dataset.
  + BERT showed superior performance in detecting fake news with nuanced context. lin

A diagram of a deep learning

AI-generated content may be incorrect.

Fig. 4.1 A basic system architecture

A diagram of text processing

AI-generated content may be incorrect.

Fig 4.2 Workflow of the system

Table 4.1: Technologies used

|  |  |
| --- | --- |
| **Technology / Tool** | **Purpose / Use in the Project** |
| **Python** | Main programming language used for backend logic and model implementation. |
| **Pandas & NumPy** | Used for data preprocessing, cleaning, and numerical operations on the dataset. |
| **Scikit-learn (sklearn)** | Machine learning library used for implementing KNN, Random Forest, etc. |
| **Stream lit** | Web framework for building the web application and connecting frontend to backend. |
| **HTML, CSS, JavaScript** | Used for designing and styling the frontend user interface. |
| **Bootstrap** | CSS framework for creating responsive and user-friendly layouts. |
| **Matplotlib / Seaborn** | For data visualization (e.g., bar charts, confusion matrix, accuracy graphs). |
| **NLTK, SpaCy, TextBlob** | Preprocessing text: cleaning, tokenization, stop word removal, and lemmatization. |

Table 4.2 Comparison: Existing Career Guidance Apps vs. The AI-Powered System

|  |  |  |
| --- | --- | --- |
| **Criteria** | **NewsGuard** | **AI-Powered Fake News Detection System** |
| **Detection Method**   |  | | --- | |  |  |  | | --- | |  | | |  | | --- | | Human analysts rate news websites based on credibility |  |  | | --- | |  | | AI/ML models automatically analyze the article's content in real-time |
| |  | | --- | | **Model Used** |  |  | | --- | |  | | |  | | --- | | Manual assessment, no ML/DL models used |  |  | | --- | |  | | Random Forest, LSTM, and BERT for deep content analysis |
| **Accuracy** | |  | | --- | | High for known websites; low for new/unrated sites |  |  | | --- | |  | | High (>90%) for all types of content, including new/unseen articles |
| |  | | --- | | **Explainability** |  |  | | --- | |  | | |  | | --- | | Text-based justification (manual summaries) | | SHAP-based feature importance for explaining AI model decisions |
| **Source Analysis** | Only website/domain-based | Full article text + source credibility check (optional) |
| **Real-Time Analysis** | No, depends on periodic manual updates | Yes, immediate prediction when article is input |
| **Learning Capability** | |  | | --- | | Static; updated only when team manually revisits sites |  |  | | --- | |  | | Active Learning — retrains on new patterns and feedback automatically |
| **User Personalization** | |  | | --- | | No personalization | | Planned personalization — credibility scores adjusted to user's needs |
| **Content Type Supported** | |  | | --- | | News websites | | |  | | --- | | Full articles, headlines, social media posts | |
| **Integration with Sources** | |  | | --- | | Works for major domains (CNN, Fox, BBC, etc.) | | |  | | --- | | Any URL, user-uploaded content, or live text input | |

**Output:**

**A screenshot of a fake news detector

AI-generated content may be incorrect.**

Fig 5.1 Output Image-1

**A screenshot of a computer

AI-generated content may be incorrect.**

Fig 5.2 Output Image-2

A screenshot of a computer program

AI-generated content may be incorrect.

Fig 5.2 Output Image-3\

**5. DISCUSSIONS AND FUTURE WORK**

**DISCUSSION**

A number of insights are highlighted by the survey and the suggested design. First, diversity and quality of data are important. Although COVID-19 and FakeNewsNet datasets offer rich examples, new languages and domains might not have as many large labelled datasets. Second, there is a problem with model generalisation: unless retrained, a detector trained on news articles might not perform well on tweets or forums. Third, explainability is crucial but challenging with deep models; some research aims to establish credibility by interpreting BERT's choices. Last but not least, the detection of fake news is frequently adversarial; as detection becomes more accurate, attackers adjust by creating increasingly complex fake content (e.g. using grammar-checking or deepfake voices).

**Limitations:**

Many existing systems assume labelled data is available for training and only concentrate on text. But fake news frequently takes advantage of pictures or videos as well. The field of multimodal detection—which combines text and image analysis—is expanding. Additionally, there are engineering challenges associated with real-time deployment at scale (social platforms require high throughput).

**Challenges:**

* **Data Quality :** False positives or negatives may result from the system's inability to correctly identify fake news due to biassed or low-quality datasets.
* **Content Manipulation :** Fake news creators may use sophisticated methods to manipulate text, images, or videos, making detection more difficult.
* **Multilingual Detection :** In order to evade detection, fake news producers may employ complex techniques to alter text, photos, or videos
* .**Evolving Tactics of Fake News Creators :** Changing Strategies Used by Fake News Producers:The detection system might find it difficult to keep up with new types of misinformation since fake news producers are always changing their strategies.
* **Algorithmic Bias :** The detection system may perform poorly on particular news or content types due to biases that machine learning models may inherit from their training data.
* **Contextual Understanding :** Without human assistance, AI models may find it challenging to comprehend the context necessary for fake news detection.
* **User Trust:** If the model misclassifies reliable news as fake, users might not trust the system's judgement, which would decrease adoption.
* **Evolving News Landscape :** In order to stay effective, techniques for identifying fake news may need to be updated frequently as the news sector and social media platforms change.
* **Manipulation of AI Systems :** By understanding how detection models operate and altering their content to avoid detection, fake news producers may be able to manipulate AI systems.

**Future Work:**

* **Multimodal AI Integration**: Future studies can explore blending network, image, and text signals for improved detection.
* **Increased Model Accuracy**:
  + Vision models can be used to evaluate attached images, enhancing detection accuracy.
  + Large language models (LLMs) can assist in generating fact-checking summaries and comparing new content to established truth.
* **Adversarial Training & Ongoing Learning**: Detectors must evolve with generative AI to counter realistic false information, potentially through adversarial training or continuous learning.
* **Expanding Language Support**: It's crucial to enhance systems to support multiple languages and handle regional variations effectively.
* **Identifying Subtle Biases & Propaganda**: Expanding AI's ability to detect nuanced biases or propaganda tactics is essential.
* **Incorporating Active Learning & User Feedback**: Leveraging active learning and user feedback will help detectors adapt and improve in real-world scenarios required to maintain pace with evolving misinformation.

**6. CONCLUSIONS**

AI-based fake news detection is an important and rapidly developing field. The motivation (the risks of false information) and methods (from SVM to BERT-based models) for identifying fake news have been examined in this report. We compiled important research, demonstrating that deep transformer models are frequently used in contemporary methods to attain extremely high accuracy. In order to demonstrate how such approaches could be integrated end-to-end, we subsequently suggested a system design that included architecture and workflow.

To sum up, artificial intelligence (AI) provides strong tools for automated fake news detection that can handle massive amounts of data. It is evident that advanced NLP models, such as BERT and its variations, are becoming more and more popular. Still, there are difficulties in getting a variety of training data and adjusting to new kinds of false information. Richer datasets, multimodal analysis, and resilient models that can manage the upcoming wave of fake news should be the main topics of future research. The research community can contribute to the development of a more accurate and knowledgeable digital information ecosystem by carrying on with its innovative work and thorough evaluation of these systems.

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