MSc Computer Science

School of Computing, Engineering and Digital technologies

Research Methods

ICA Element 1: Literature Review/Search

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1. Introduction:

The spread of fake news increased rapidly over the past two decades. One of the main reasons for this ascent of misleading information was social media platforms like Twitter, WhatsApp, Facebook, and other websites. The spread of fake news has a severe impact in the society including all age groups. Some of the consequences are losing faith in media, limitation of speech freedom. There are also some severe consequences that can create a lot of tension and chaos like covid-19 and war news. This needs to be stopped for welfare of our future generations. It is time to act on this issue before it grows worse.

Fake news is purposefully used to fool consumers by manipulating facts and data. Claiming fake news as a real news and there is also a possibility that genuine news can be stated as false news by tampering evidence. This complex problem which is difficult to solve for humans can be dealt with technology. Machine learning and Artificial intelligence helps us solve the problems with high accuracies.

2. Research question:

What machine learning techniques can be used to detect patterns in fake news and devise effective countermeasures?

Key Concepts:

False news detection

Machine learning algorithms

Mitigating Fake news

3. Table of synonyms:

Techniques	Methods	Approaches	Strategies
Detect	Identify	encounter	Notice
Pattern	Arrangement	Design	
Devise	Formulate	Work out	
Effective	Productive	Efficient	Impactful
Countermeasures	Solutions	Defensive measures	
Mitigate	Reduce	Combat	Minimize

4. Database Search:

Three databases are selected for literature search. They are:

1. Discovery
2. IEEE Xplore
3. Science direct

4.1 Discovery Database

Why Discovery Database?

Discovery is an exclusive database that is related to library of Teesside University. This database is very easy to use just like google search engine. The search results include both the library's catalogue and academic databases. The reason to choose this database is because, it is the best option to start the research which includes multiple outcomes such as books, full-text articles, journals, and conference papers. In addition, the database works best for the interdisciplinary topics.

Search:

Question	**Keywords**	**Filters**	**Number of results**	**Notes**
What articles are produced about the false news?	fake news	None	301,916	"Fake news" is a generalized topic. So, the results were very huge in number with combinations of conferences, articles, and journals. In the next search we can be more specific about our keywords
What articles are produced about the false news excluding newspaper articles?	(Fake news detection)	Excluded: Newspaper article	2,067	The newspaper articles are not primary source of information. They are not reliable. Therefore, they are removed, new filters can be added to make our search results more credible.
What articles are produced about the false news detection that are peer reviewed?	(Fake news detection)	Included: Peer Reviewed	832	The number of articles decreased significantly. Peer reviewed articles are more trustworthy. Some other keywords can be added.

What articles are produced about the false news detection or mitigating fake news?	((fake news detection) OR (mitigating fake news))	Included: Peer Reviewed	830	The result count is almost the same. More keywords related to our field can be added.
What articles are produced about the false news or mitigating fake news related to machine learning?	((fake news detection) OR (mitigating fake news)) AND (machine learning)	Included: Peer Reviewed	313	This search gives better results that use machine learning algorithms to predict fake news. Discipline filter can be added.
What articles are produced about the false news detection and Computer Science discipline?	((fake news detection) OR (mitigating fake news)) AND (machine learning)	Included: Peer Reviewed, Computer Science Discipline	203	This filter makes sures that all other domain papers were removed. Publication date filter can be added in the next search.
What articles are produced about the false news detection in last one year?	((fake news detection) OR (mitigating fake news)) AND (machine learning)	Included: Peer Reviewed, Computer Science Discipline, Last one-year publications	55	The latest papers are best because they include previous as well as new algorithms to include. Filter by subject can be added to get the desired number of articles.
What articles are produced about the false news detection subject terms?	((fake news detection) OR (mitigating fake news)) AND (machine learning)	Included: Peer Reviewed, Computer Science Discipline, Last one-year publications, fake news detection subject term	13	Including all the filters and keywords, Articles that are most relevant to our search are displayed.

4.2 IEEE Xplore Database

Why IEEE Xplore Database?

IEEE Xplore is a powerful digital library which is used for accessing and finding the scientific and technical content that is published by Institution of Electrical and Electronics Engineers (IEEE). Many content types such as conferences, books, courses, journals, and magazines are published in electrical and computer fields. IEEE was chosen because of its high-quality content and reliability. It also gives multiple results based on our keywords with advanced search options.

Question	**Keywords**	**Filters**	**Number of results**	**Notes**
What articles are produced about the false news?	Fake news	None	1296	A lot of articles including books, journals, magazines, and conferences. Adding more keywords and filters can reduce the number of results.
What articles are produced about the false news detection?	Fake news detection	None	806	The results are specific to detecting of fake news. Time frame can be specified to reduce the number of results.
What articles are produced about the false news in last 3 years?	Fake news detection	Included: Published from 2020 to present	671	The latest articles and papers are displayed. For the next search, Boolean expressions can be introduced.
What articles are produced about the false news	(Fake news AND (detection OR patterns))	Included: Published from 2020 to present	745	The search results are related to both detection and patterns of fake news. Field

detection and its patterns?				can be added to make the search more specific.
What articles are produced about the false news and patterns using machine learning?	(Fake news AND (detection OR patterns)) AND (machine learning)	Included: Published from 2020 to present	353	As anticipated the search outcomes are reduced with more desired papers. Advanced search can be added.
What articles are produced about the false news and patterns?	(Fake news AND (detection OR patterns)) AND (machine learning) AND (mitigating fake news)	Included: Published from 2020 to present Search within results: Mitigating fake news	9	The number of results is reduced to targeted number and the content is related to our search.

4.3 Science direct Database

Why Science Direct Database?

Science direct is one of the largest databases which gives access to various disciplines. It provides research articles for many subjects such as physical sciences, life sciences and Engineering. One of the main reasons to choose this database is full-text articles and quality publications. It also produces high quality results relevant to the search queries.

Question	Key words	Filters	Number of results	Notes
What articles are produced about the false news?	Fake news	None	9190	There were lot of results for fake news from the year 2000 with many types of articles.
What articles are produced about the false news detection ?	Fake news detection	None	2954	Result number is reduced by adding detection we can add more keywords here.
What articles are produced about the false news and its patterns?	fake news AND (detection OR patterns)	None	2978	The search outcomes are decreased because of adding patterns, more filters can be added to lower it down.
What articles are produced about the false news from 2021 to present?	fake news AND (detection OR patterns)	Included: From 2021-present	1340	Time frame adds more specific results that are more relevant. Filters like types of articles.
What articles are produced about the false news research articles?	fake news AND (detection OR patterns)	Included: From 2021-2023, research articles	986	This search adds more credibility to our results removing less trusted sources like newspapers, encyclopaedias and more.
What articles are produced about the false news Computer Science field?	fake news AND (detection OR patterns)	Included: From 2021-2023, research articles, Computer Science field	554	All the results are from our related field. Now, we can add more keywords.

What articles are produced about the false news and machine learning?	(Fake news AND (detection OR patterns)) AND (machine learning)	Included: From 2021-2023, research articles, Computer Science field	95	The search results are more accurate with the key word of machine learning. Keywords can be added to be more specific.
What articles are produced about the false news and mitigating fake news ?	(Fake news AND (detection OR patterns)) AND (machine learning) AND (mitigating fake news)	Included: From 2021-2023, research articles, Computer Science field, publication titles	8	Including all the filters and keywords, the desired results which are credible and relevant to our topic are found.

5. Inclusion and Exclusion Process:

Research Title	**Included / Excluded**	**Reason**
Deep transfer learning for COVID-19 fake news detection in Persian	Excluded	This article is related to fake news in Persian language which comes under language processing.
Content-Based Fake News Detection with Machine and Deep Learning: A Systematic Review	Excluded	Only review is included, no discussions and research are very less
A Survey on Explainable Fake News Detection	Excluded	The survey is very limited.
Multimodal fake news detection through data augmentation-based contrastive learning	Included	Good use of algorithms and results are satisfactory.
COVID-19 Fake News Detection Using Machine Learning Techniques: A Comparative Study	Included	The topic is relevant, but it mainly focusses on COVID-19
Hierarchical Co-Attention Selection Network for Interpretable Fake News Detection	Included	This focuses on social media. Analysis is good with better results.

A Systematic Literature Review and Meta-Analysis of Studies on Online Fake News Detection	Included	Good literature review with the type of techniques used with frequency.
Classification, detection and sentiment analysis using machine learning over next generation communication platforms	Included	Good analysis of the data, algorithms, with examples.
Comparative analysis of machine learning methods to detect fake news in an Urdu language corpus	Excluded	It comes under natural language processing topic.
Deception detection on social media: A source-based perspective	Included	In depth analysis is done on detecting fake news.
Fusion of Semantic, Visual and Network Information for Detection of Misinformation on social media	Included	Clearly explained on how prediction works in social media news.
Use of Data Augmentation Techniques in Detection of Antisocial Behaviour Using Deep Learning Methods	Excluded	The content is not relevant to our current research question.
SSM: Stylometric and semantic similarity oriented multimodal fake news detection	Excluded	This is a good article, but more relevant articles are found.
Machine Learning Methods to identify Hindi Fake News within social media.	Excluded	It is more about natural language processing.
Bilingual Fake News Detection Algorithm Using Naïve Bayes and Support Vector Machine Models	Excluded	Only methodology is mentioned. No proper research.

A Taxonomy of Fake News Classification Techniques: Survey and Implementation Aspects	Included	The article is very detailed and good analysis is done.
Detection of Fake News related to COVID-19 using Natural Language Processing	Included	The article shows good understanding of the detection with good outcomes.
FN-Net: A Deep Convolutional Neural Network for Fake News Detection	Included	The neural networks are efficiently used.
Fake News Detection with Hybrid CNN-LSTM	Exclude	The research is very limited.
Mitigating Attacks on Fake News Detection Systems using Genetic-Based Adversarial Training	Excluded	Data analysis is not as good as other articles.
An Enhanced Approach for Fake News Detection using Ensemble Techniques	Included	It enhances the prediction rate providing better accuracies
One-class learning for fake news detection through multimodal variational autoencoders.	Excluded	More discussion on encoders than misinformation detection.
Hybrid fake news detection technique with genetic search and deep learning	Included	All requirements are satisfied.
The effects of emotions, individual attitudes towards vaccination, and social endorsements on perceived fake news credibility and sharing motivations	Excluded	Not related to the topic
Dual emotion based fake news detection: A deep attention-weight update approach.	Excluded	The topic is related but other articles are much better.
Dynamic graph neural network for fake news detection	Excluded	The model accuracies and usage is not as good as others.
Multiple features-based approach for automatic fake news detection on social networks using deep learning.	Included	Inclusion of multiple features adds more weightage

Temporally evolving graph neural network for fake news detection	Included	Using of graph network brings more stability producing accurate results.
Knowledge augmented transformer for adversarial multidomain multiclassification multimodal fake news detection	Excluded	It is excluded because of augmented transformer.
BerConvoNet: A deep learning framework for fake news classification	Included	Model is very innovative and also provides better results.

Total articles: 30

Included: 15

Excluded:15

6. Conclusion and Limitations:

The literature survey provides overview of the previous research that is related to the similar topic. Many articles are found which are related to this research topic and question. It also gives the summary and evidence that can contribute to this topic. The literature survey was successful, the results are as expected. Some articles are selected to include because of the relevance of topic.

Three databases are used for literature survey. The search is slightly different in every database. Science direct is comparatively difficult all the databases. The Discovery and IEEE databases are easy to shortlist because of the various filters. On the other hand, Science Direct has lot of articles that are related to computing, the keyword usage and applying a lot of filters is necessary to get the desired number of results. There are some limitations, due to the relevance of results some articles have only less citations that means they are not very popular and used. Some articles are off the topic. Finally, the search results are good providing us with the various articles related to the topic.

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