



CONCLUSION

on the scientific novelty, theoretical and practical significance of the dissertation results

by Pan Tiande on the topic:

“Methods and Software Tools for Recognizing Fake or Irrelevant Information in the Content of News-Oriented Social Networks”

submitted for the degree of Doctor of Philosophy in the field of knowledge
12 Information Technology, specialty 121 Software Engineering

Excerpt

from the Minutes of the Meeting of the Specialized Seminar of the Department of
Computer Science dated October 23, 2025, No. 4

Present:

Vice-Rector for Scientific Research, Doctor of Technical Sciences, Professor Dyvak M.P. (Scientific Supervisor), Head of the Department of Computer Sciences, Doctor of Technical Sciences, Professor Pukas A.V. (Chairman of the Meeting), Professor of the Department of Cybersecurity, Doctor of Technical Sciences, Professor Pasichnyk R. M. (Reviewer), Professor of the Department of Computer Sciences, Doctor of Technical Sciences, Professor Melnyk A.M., Professor of the Department of Computer Sciences, Doctor of Technical Sciences, Associate Professor Manzhula V.I., Associate Professor of the Department of Computer Sciences, Candidate of Economic Sciences, Associate Professor Gonchar L.I., Associate Professor of the Department of Computer Sciences, Candidate of Technical Sciences, Associate Professor Spivak I.Ya., Associate Professor of the Department of Computer Sciences, Candidate of Technical Sciences, Associate Professor Porplytsya N.P., Associate Professor of the Department of Computer Sciences, Candidate of Technical Sciences, Associate Professor Krepych S.Ya. (reviewer), Associate Professor of the Department of Computer Sciences, Candidate of Technical Sciences, Associate Professor Shpintal M.Ya., Associate Professor of the Department of Computer Sciences, Candidate of Technical Sciences, Associate Professor Martsenyuk Ye.O., Associate Professor of the Department of Computer Sciences, Candidate of Technical Sciences, Associate Professor Stasiv I.S., Associate Professor of the Department of Computer Sciences, Candidate of Technical Sciences, Associate Professor Voytyuk I.F., Associate Professor of the Department of Computer Sciences, Candidate of Technical Sciences, Associate Professor Shevchuk R.P. (online), Associate Professor of the

Department of Computer Sciences, Doctor of Philosophy Papa O.A., Senior Lecturer of the Department of Computer Sciences, Doctor of Philosophy Tymchyshyn V.S., Lecturer of the Department of Computer Sciences Yushko A.V., Associate Professor of the Department of Computer Sciences, Candidate of Technical Sciences Maslyak Yu.B., Senior Laboratory Assistant of the Department Simak O.G.

Among those present there were 5 Doctors of Technical Sciences and 9 Candidates of of Technical Sciences, 1 Candidate of Economic Sciences, and 2 Doctors of Philosophy - experts in the field of the submitted dissertation.

Agenda:

Discussion of the dissertation research of postgraduate student Pan Tiande on the topic: «Methods and Software Tools for Recognizing Fake or Irrelevant Information in the Content of News-Oriented Social Networks» submitted for the degree of Doctor of Philosophy in the field of knowledge 12 Information Technology, specialty 121 Software Engineering, regarding its recommendation for defence.

Listened about:

Report by the Applicant Pan Tiande on the Results of the Dissertation Research.

Pan Tiande substantiated the relevance of the chosen topic, defined the purpose and objectives, characterized the object and subject of the study, and presented the main scientific statements submitted for defense.

The author examines the general theoretical foundations of the problem of detecting fake information in the content of news-oriented social networks, in particular, the features of information flow formation, the nature of fake messages, the reasons for their dissemination, and their consequences for the user environment. Special attention is given to the factors that complicate the automatic recognition of false content, such as the dynamic nature of updates, contextual variability, multilingualism, and the high emotionality of messages.

An analysis of fake content detection methods is conducted, covering the main approaches used in contemporary research and practical implementations. In particular, groups of methods based on artificial neural networks, source analysis, comparison with a priori verified data, community-based verification, network propagation analysis, and user behavior analysis are identified. The advantages, limitations, and conditions for the effective application of these methods are assessed, allowing the formulation of requirements for the development of improved algorithms for reliability assessment.

An analysis of software services for detecting fake content, such as Google Fact Check Explorer, ClaimBuster, Logically Facts (AI), and Hoaxy, was carried out. The comparative analysis of their functionality, technological principles, and areas of application showed that each of them solves only separate aspects of the problem — from searching for verified facts to visualizing distribution networks. The absence of a comprehensive approach aimed at integrating multifactor analysis and user behavioral models determines the need to create new software solutions.

Based on the conducted theoretical and applied analysis, in the final part of the section, the author formulated the research task, substantiating the need to develop a hybrid method for assessing information credibility based on interval models of user profiles.

The applicant proposed to use a mathematical model for making decisions about the truthfulness of content posted on social networks, based on establishing the relationship between the result on which the decision about the credibility or unreliability of the content is made and the factors that influence it. At the same time, the main quantitative factors are proposed to be the following: the number of posts, shares, or likes made by users within a short time after the appearance of the content; the number of comments or reactions at certain time intervals; the time during which the information spreads through social networks, for example, how many people interact with the content within the first minutes, hours, or days after publication; the coefficient of viral dissemination of content, for example, the number of shares from each user. The resulting indicator of such a model is the degree of credibility of certain content in the range from 0 to 1. It was proposed and substantiated that methods of interval data analysis should be used to represent and analyze this indicator based on expert examination of the content.

The author proposed and substantiated a hybrid method for identifying interval models of user profiles in a social network, which is based on the combination of a metaheuristic algorithm for synthesizing the structure of the model based on the behavioral model of a bee colony and gradient methods for identifying the parameters of candidate models.

The applicant considered the concept, structure, and implementation of software agents that ensure the implementation of the proposed method in the form of a multi-level system. In particular, the credibility assessment method serves as the theoretical basis for building computational modules that form an integral indicator of content credibility. This indicator allows for a quantitative assessment of the plausibility of news messages, taking into account their source, content, network dissemination, and emotional characteristics.

Special attention is paid to the procedure for selecting the threshold value of the integral indicator, which determines the boundary between reliable and doubtful content. This value is justified based on a compromise between the accuracy and completeness of fake message detection, which allows the system to adapt to the specifics of different information domains (breaking news, socio-political messages, analytical materials, etc.).

The author has implemented and described the main conceptual and architectural principles of creating a software environment designed to detect and analyze fake content in news-oriented social networks. Particular attention is paid to the mechanisms of integration with social networks, the structure of the analytical core of the system (the CIEngine module), and the role of the interval approach in improving the accuracy and adaptability of news credibility assessment. The focus is placed on the subsystems of information analysis and

storage, which ensure the functional integrity of the system. The principles of building a database based on MongoDB are described in detail, including the structure of the main collections (posts, user_profiles, facts, config, logs), their purpose, the logic of interaction with analytical and behavioral modules, as well as methods of indexing, sharding, and performance optimization. The implementation of data access classes, mechanisms for integrity control, backup, and reproducibility of results is presented. Special attention is paid to the subsystem of interval user modeling, which provides the accumulation and dynamic updating of behavioral characteristics used to refine the trust indicators (TrustRate) and the comprehensive credibility indicator (CI).

The applicant conducted an evaluation of the effectiveness of the developed software environment based on the integral efficiency indicator (IE), which takes into account the analytical, network, behavioral, and user characteristics of the system. A comparative analysis with well-known tools (Google Fact Check Explorer, ClaimBuster, Logically Facts, Hoaxy) showed that the proposed system achieves the highest level of comprehensiveness, corresponding to the category of “high-efficiency systems.” This confirms that the integration of interval user modeling, the comprehensive credibility indicator CI, automatic data collection from social networks, and modern analytical tools provides a significant advantage of the developed solution over existing analogues.

After the presentation, the following questions were addressed to Pan Tiande by the attendees:

Doctor of Technical Sciences, Prof. Melnyk A.M.: What was the reason for selecting exactly these software tools and services for the comparative analysis, and what criteria were used in their selection?

Answer: The choice of software tools and services for comparative analysis was determined by their representativeness, popularity, and scientific significance in the field of detecting unreliable content. The study included only those solutions that have a high level of practical application, wide recognition among specialists, and reliably reflect the current state of technological development in this domain. The following tools were compared — ClaimBuster, Logically Facts (AI), Google Fact Check Explorer, and Hoaxy.

Doctor of Technical Sciences, Prof. Pasichnyk R.M.: Why was the approach based on the behavior of bee colonies chosen as the basic mechanism for constructing the hybrid identification method, and what theoretical and practical considerations justify its appropriateness compared to alternative evolutionary algorithms?

Answer: The choice of the approach based on Artificial Bee Colony (ABC) behavior for constructing a hybrid identification method is determined by its high efficiency in solving complex nonlinear optimization problems, which are characteristic of the processes of identifying mathematical models and systems. The ABC algorithm belongs to the class of evolutionary computations, specifically to swarm intelligence optimization methods that simulate the collective behavior of

insects, and possesses a number of properties that make it suitable for this type of task.

Doctor of Technical Sciences, Assoc. Prof. Manzhula V.I.: Was a comparison conducted within the framework of the study between the proposed hybrid identification method and other well-known evolutionary algorithms, such as genetic algorithms, differential evolution, ant colony, or particle swarm methods, in order to assess its relative efficiency, accuracy, and convergence speed?

Answer: Within the framework of this study, no comparison was conducted with other evolutionary algorithms, as the main focus was placed on the development and experimental verification of the effectiveness of the hybrid approach based on Artificial Bee Colony (ABC) behavior. Its selection is theoretically justified — previous publications indicate the high performance of the ABC method in solving identification problems of complex nonlinear systems.

Candidate of Technical Sciences, Assoc. Prof. Krepych S. Ya.: Does the proposed model provide the possibility of expanding the set of factors on which it is based, and how would such an extension affect its structure, parameters, and the accuracy of identification results?

Answer: Yes, the model provides the possibility of expanding the set of factors on which it is based. Its structure is designed to ensure flexibility and adaptability to new input parameters without the need for a complete redesign of the algorithm. The addition of new factors is carried out through updating the feature base or parameter sets, allowing the inclusion of additional aspects of the studied process. Such an expansion can improve the accuracy and robustness of the model by more deeply accounting for inter-factor relationships; however, it requires a repeated stage of parameter calibration and identification to avoid excessive correlation or overfitting. Overall, the model maintains its generalization capability, and its architecture supports further evolution as new data and additional relevant indicators become available.

Doctor of Technical Sciences, Prof. Melnyk A.M.: What tools, development environments, and technologies were used for the implementation and deployment of the software environment, and what criteria justified their selection?

Answer: A modern technological stack combining tools for scientific computing, machine learning, and web-oriented integration was used to implement the software environment. The main implementation was carried out in Python, using libraries for analytics, text processing, and data visualization, as well as the Flask framework for building server-side logic. Data storage was handled in a document-oriented MongoDB database, which ensures flexibility and scalability. The software environment was deployed in Docker containers with REST API support, which provided stability, reproducibility of experiments, and the possibility of further system expansion.

Candidate of Technical Sciences, Assoc. Prof. Krepych S. Ya.: Which improvement relates to software agents?

Answer: The improvement of software agents consists in introducing intelligent mechanisms for multi-criteria credibility assessment of content, which, unlike known approaches, integrate both traditional analytical indicators and new characteristics inherent to digital media environments. In particular, the enhanced agents simultaneously consider the criteria of redundancy, contradiction, relevance, reliability, and completeness of information, which allows forming an objective multidimensional credibility assessment of news content.

In addition to these basic indicators, the model integrates new parameters of digital interaction, such as network-based credibility confirmation and emotional coloring of content, reflecting the specifics of information dissemination and perception in social networks.

By combining these criteria, the agents are capable not only of determining the factual accuracy of messages but also of detecting informational anomalies typical of fake or manipulative materials, including source consistency, artificial dissemination patterns, and emotional imbalance in user reactions.

Candidate of Technical Sciences, Assoc. Prof. Voytyuk I.F.: How were the experimental data obtained within the study using the Facebook Graph API, considering that access to this interface is currently restricted or suspended?

Answer: The data were collected during the period when access to the Graph API was valid for our application, in full compliance with policies and based on granted permissions (metadata of public posts/pages: publication time, reactions, comments, shares). Part of the dataset was also formed from archived samples (local dumps exported during the research) — these were used for the experiments that can be reproduced today. For new replications, the MCL/API was applied, following the selection process in accordance with the eligibility conditions of the Researcher Platform. This explains why the experiments in the study are valid: they rely on legally obtained and stored data and on procedures that were in effect at the time of collection, while the methods remain reproducible on the MCL given appropriate access.

After the applicant's responses, the scientific supervisor — Doctor of Technical Sciences, Professor Mykola Dyvak — took the floor to characterize the candidate's scientific maturity and present his conclusion.

Mykola Dyvak confirmed that all of the above constitutes the independent work of the PhD candidate and represents the fundamental elements of the scientific novelty and practical value of the dissertation. In the course of his research, Pan Tiande demonstrated the ability to independently solve complex scientific and technical problems. He possesses a high level of proficiency in the theoretical foundations of systems analysis, machine learning methods, and modern software development technologies, including web technologies, non-relational databases, computational libraries, and tools for integration with large language models. He has sufficient knowledge in the field of software engineering and extensive experience in its practical application. The obtained scientific results have been repeatedly presented and validated at international scientific and technical conferences.

In conclusion, the scientific supervisor stated that Pan Tiande's dissertation is a completed and independent research work and can be recommended for consideration and defense before a specialized academic council for the purpose of awarding him the degree of Doctor of Philosophy.

After that, the floor was given to the reviewers of the dissertation.

Doctor of Technical Sciences, Prof. Pasichnyk R.M.: The dissertation is devoted to the development of mathematical and software tools aimed at increasing the efficiency of detecting and analyzing fake content in news-oriented social networks under conditions of limited data sampling.

The relevance of the dissertation topic is determined by the rapid growth of information volumes in social networks and the widespread dissemination of unreliable or manipulative content, which directly influences the formation of public opinion, political decisions, and the level of information security in society. In the context of modern hybrid information influences, the problem of detecting fake news and unreliable information acquires not only scientific but also strategic importance for states, media institutions, and digital communication platforms.

The scientific novelty of the applicant's research lies in the development of an interval mathematical model that establishes a relationship between the credibility of content in a news-oriented social network and the behavioral portrait of its users. Of particular note is the proposed hybrid method for identifying interval models of user profiles in a social network, which is based on the combination of a metaheuristic algorithm for model structure synthesis inspired by the behavioral model of a bee colony and gradient-based methods for parameter identification of candidate models. Such a hybrid approach overall increases the efficiency of credibility recognition at the early stages of content publication.

The theoretical significance of the obtained results lies in the advancement of the scientific foundations for building intelligent systems for assessing the credibility of information in social networks. The dissertation forms a generalized concept of content credibility evaluation based on the integration of interval modeling, user behavioral characteristics, and semantic analysis of information flows, which expands the understanding of uncertainty formalization in digital communications.

The practical significance lies in the development and testing of software for detecting and analyzing fake content in news-oriented social networks, integrating automated tools for retrieving content from social platforms with modules for its credibility assessment under limited data sampling conditions. The system is also adapted to function as an intelligent assistant for supporting the creation and implementation of news services.

The dissertation of Pan Tiande titled «Methods and Software Tools for Recognizing Fake or Irrelevant Information in the Content of News-Oriented Social Networks» may be recommended for consideration and defense before a one-time specialized academic council for the purpose of obtaining the degree of Doctor of Philosophy in the relevant specialty.

Candidate of Technical Sciences, Assoc. Prof. Krepych S. Ya.: The dissertation entitled «Methods and Software Tools for Recognizing Fake or Irrelevant Information in the Content of News-Oriented Social Networks» represents a comprehensive study aimed at solving an important scientific and technical problem. The author has demonstrated a deep understanding of the issue and proposed well-founded approaches to its resolution.

The scientific novelty of the research results is manifested in the proposed hybrid method for identifying interval models of user profiles in a social network, which is based on the combination of a metaheuristic algorithm for model structure synthesis inspired by the behavioral model of a bee colony and gradient-based methods for identifying the parameters of candidate models. The implementation of this method enabled the construction of an interval mathematical model that establishes the relationship between the credibility of content in a news-oriented social network and the behavioral portrait of users.

In the course of the research, the author developed a multi-agent, service-oriented system architecture that ensures flexibility and scalability. Particularly noteworthy is the successful application of the non-relational MongoDB system, which optimized the complex analysis of interconnections required for determining content credibility.

The theoretical significance of the study lies in the further development of methods for identifying interval mathematical models. The improvement of software agents for content credibility assessment in social network news resources, integrating the criteria of redundancy, contradiction, relevance, reliability, and completeness, as well as new digital media characteristics such as network-based verification and emotional tone, has increased the efficiency of fake content detection.

The practical significance consists in the creation of a ready-to-use software solution for detecting and analyzing fake content in news-oriented social networks. Testing has shown that the proposed system is more effective compared to known fake content detection services, which has been confirmed by corresponding calculations of the integral efficiency indicator.

The dissertation of Pan Tiande titled «Methods and Software Tools for Recognizing Fake or Irrelevant Information in the Content of News-Oriented Social Networks» may be recommended for consideration and defense before a one-time specialized academic council for the purpose of obtaining the degree of Doctor of Philosophy in the relevant specialty.

Based on the results of the discussion, the participants of the meeting Resolved:

To accept the conclusion regarding the dissertation of Pan Tiande titled «Methods and Software Tools for Recognizing Fake or Irrelevant Information in the Content of News-Oriented Social Networks» as meeting the requirements established for a dissertation.

CONCLUSION

on the scientific novelty, theoretical and practical significance of the dissertation results

Justification of the Research Topic. Modern information society is characterized by the rapid development of social networks, which have become one of the main channels for news dissemination, communication, and the formation of public opinion. At the same time, with the expansion of digital communication capabilities, the scale of the problem of spreading false or irrelevant information is also growing, directly affecting information security, political stability, and public trust in the media.

The problem is particularly relevant in the context of news-oriented social networks, where information flows are characterized by high update speed, heterogeneous structure, and a significant share of user-generated content. The absence of centralized control, the dominance of emotionally charged messages, and the presence of coordinated information campaigns create favorable conditions for the emergence and rapid spread of fake news. This poses a threat of manipulating public consciousness, reducing the level of critical thinking, and undermining trust in reliable sources of information.

Existing approaches to content credibility verification are based mainly on manual fact-checking or on the use of separate software services such as Google Fact Check Explorer, ClaimBuster, Logically Facts, and Hoaxy. However, as analysis shows, these systems address only individual subtasks — such as searching for previously verified statements, detecting potentially suspicious phrases, or visualizing information dissemination networks. None of them provides a comprehensive credibility analysis that considers user behavioral characteristics, reaction dynamics, and data uncertainty typical of social networks.

In this regard, there arises a need to develop next-generation methods and software tools capable of automatically analyzing news content streams, integrating information from various sources, assessing the credibility level of messages, and adapting to conditions of limited or incomplete data samples.

The foundation of this approach lies in the integration of natural language processing (NLP), interval modeling, network analysis, and intelligent agent technologies. The use of an interval mathematical model makes it possible to account for uncertainty in user behavior and variations in the parameters of the information environment, ensuring the correctness of credibility assessment even in the presence of incomplete data.

Purpose and Objectives of the Research. The purpose of the research is to increase the efficiency of detecting and analyzing fake content in news-oriented social networks under conditions of limited data sampling.

To achieve this goal, the following objectives were set:

- to analyze existing methods and software tools for recognizing false or irrelevant information in the content of web resources;

- to substantiate and develop a hybrid method for identifying interval models of user profiles in social networks;
- to develop an interval mathematical model that establishes the relationship between the result used for determining the credibility or unreliability of content and the influencing factors;
- to improve software agents for assessing content credibility in news resources of social networks by combining classical credibility evaluation criteria with those characteristic of social media content;
- to develop a software environment for recognizing false or irrelevant information in web content, integrating software agents for retrieving social network content with tools for credibility assessment;
- to conduct experimental testing (validation) of the developed methods and tools.

Object of the research – recognition of false or irrelevant information in the content of news-oriented social networks.

Subject of the research – methods and software tools for recognizing false or irrelevant information in the content of news-oriented social networks.

Research Methods. To solve the problems of detecting unreliable information, the study employed methods of systems analysis, identification theory, mathematical modeling, interval arithmetic, and optimization techniques.

For processing textual information, natural language processing (NLP) methods were applied, including tokenization, lemmatization, part-of-speech analysis, named entity recognition (NER), and semantic matching.

In building the software implementation, object-oriented design methods were used — in particular, UML modeling, along with the principles of modularity and encapsulation. Additionally, an agent-oriented approach was adopted, which made it possible to create intelligent software agents for the automated collection, analysis, and evaluation of content.

Scientific Provisions Personally Developed by the PhD Candidate and Their Novelty. For the first time:

- an interval-based mathematical model was developed for the first time, establishing a relationship between the credibility of content in news-oriented social networks and user behavioural profiles, which, unlike existing models, relies on the analysis of interval data under limited sample conditions and thereby enhances the efficiency of credibility recognition at the early stages of publication.
- hybrid method for identifying interval models of user profiles in social networks was proposed and substantiated, which, unlike existing approaches, combines a metaheuristic algorithm for model structure synthesis based on the behavioural model of a bee colony with gradient methods for identifying the parameters of candidate models, thereby reducing the computational complexity of the identification process and overall improving the efficiency of content credibility recognition at the early stages of its publication.

Further developed:

- software agents for assessing the credibility of content in news-oriented

social network resources have been further developed, which, unlike existing ones, integrate both traditional criteria – redundancy, inconsistency, timeliness, reliability, and completeness – and new characteristics inherent to digital media, such as network confirmation and emotional tone, thereby enhancing the overall effectiveness of fake content detection in news social networks;

- software environments for detecting and analysing fake content in news-oriented social networks have been further developed, which, unlike existing solutions, integrate automated tools for retrieving content from social platforms with modules for assessing its credibility under limited data conditions, and are adapted to function as intelligent assistants supporting the creation and deployment of news services.

Validity and Reliability of the Scientific Provisions, Conclusions, and Recommendations under Defense.

The reliability and validity of the obtained results and the proposed solutions, conclusions, and recommendations are ensured by the correct application of analytical and numerical research methods; the consistency between theoretical and experimental results; the correspondence of conclusions and findings to the physical essence of the studied phenomena; comparison of the proposed solutions with those found in the literature; correlation of the obtained results with data from other authors; and their overall alignment with the set research objectives. The research results are illustrated by tables, graphs, and figures. The decisions adopted in the dissertation are scientifically novel, well-substantiated, and effectively address the research tasks.

The practical significance of the dissertation results lies in the development of a software environment for recognizing false or irrelevant information in the content of news-oriented social networks.

List of Publications on the Dissertation Topic with Indication of the Applicant's Personal Contribution. Based on the results of the dissertation research, eight scientific papers with a total volume of 94 pages have been published, including six articles in peer-reviewed scientific journals and two publications in conference proceedings. According to the SCImago Journal and Country Rank or Journal Citation Reports classification, one article belongs to quartile Q1, one to quartile Q3, and one to quartile Q4. In total, five publications are indexed in the Scopus / Web of Science scientometric databases.

LIST OF PUBLISHED PAPERS BY THE TOPIC OF THESIS

Scientific papers in which the main scientific results of the dissertation were published:

1. Dyvak M., Yushko A., Melnyk A., Pan T. An Intelligent Information System for Generating a Scientist's Scientometrics Using Content Analysis Methods. CEUR-WS. 2024. Vol. 3942, p. 66-82. (0.8 author's sheets / 0.2 author's

sheets; personal contribution: the applicant proposed an approach to selecting indicators that form the community profile in a specialized environment.)

https://ceur-ws.org/Vol-3942/S_06_Dyvak.pdf

2. Dyvak M., Pan T., and Kindzerskyi O. 2025. Mathematical Model of a Social Network User Profile Based on Interval Data Analysis. *International Journal of Computing* Vol. 24 (3): p. 452-459. (0.9 author's sheets / 0.6 author's sheets; personal contribution: the applicant proposed and substantiated a hybrid method for identifying interval models of social network user profiles, as well as an interval-based mathematical model that establishes the relationship between the credibility of news content in social networks and user behavioral profiles.)

<https://www.computingonline.net/computing/article/view/4182>.

3. Dyvak M., Manzhula V., Melnyk A., Petryshyn N., Pan T., Banasik A., Pikiewicz P., and Wojciech M. Kempa. 2025. Modeling the Electricity Generation Processes of a Combined Solar and Small Hydropower Plant. *Energies* Vol. 18, no. 9: 2351. (1.1 author's sheets / 0.2 author's sheets; personal contribution: the applicant substantiated the use of hybrid methods for identifying interval models.)

<https://doi.org/10.3390/en18092351>

4. Melnyk, A., Tymchyshyn, V., Pukas, A., Matiichuk, L., Shcherbiak, I., Yurchyshyn, T., Pan, T. Automatic Generation of Test Tasks Using ChatGPT API. *CEUR-WS*. 2025. Vol. 3974. P. 263-271. (0.9 author's sheets / 0.5 author's sheets; personal contribution: the applicant substantiated the use of intelligent approaches for information retrieval via API.)

<https://ceur-ws.org/Vol-3974/short09.pdf>

5. Mistriakov V. and Pan T. 2024. Processing Content Query Requests for CSAF Documents Using a GraphQL-BASED API. *Optoelectronic Information-Power Technologies*. Vol. 48 (2): p. 152-161. (0.8 author's sheets / 0.6 author's sheets; personal contribution: the applicant proposed a multi-agent architecture for processing weakly structured content.)

<https://doi.org/10.31649/1681-7893-2024-48-2-152-161>.

6. Pan T. 2025. Research on Identification Methods for False or Unrelated Information in Network Resource Content. *International Journal of High Speed Electronics and Systems*. Vol. 34, No. 04, 2540203.

<https://doi.org/10.1142/S0129156425402037>

Scientific works certifying the approval of the dissertation materials:

7. Pan T., Dudnyk Yu., Hordiiuk V., Dankiv A., Kolodii A. A Method of Multimodal Profiling of Social Network Users' Personalities. *Computer Information Technologies: Proceedings of the School-Seminar for Young Scientists and Students CIT'2024*. Ternopil: WUNU, 2024, pp. 95–96. (0.1 author's sheets / 0.03 author's sheets; personal contribution: the applicant proposed a component-based structure of an intelligent system for profiling social network users.)

https://dspace.wunu.edu.ua/bitstream/316497/52868/1/CIT%272024_Last.pdf

8. Pan Tiande, Zabchuk V.D., Sudeichenko D.V., Byts S.S., Samsonovych V.V. Mathematical and Software Tools for the Analysis and Processing of Large Data Volumes. Computer information technologies: materials of the school-seminar of young scientists and students CIT'2024. Ternopil: WUNU, 2024. P. 97-98. (0.1 author's sheets / 0.03 author's sheets; personal contribution: the applicant proposed an approach to processing and analyzing heterogeneously structured data.)

https://dspace.wunu.edu.ua/bitstream/316497/52868/1/CIT%272024_Last.pdf

Approbation of the Dissertation Materials. The main results of the dissertation research were presented in the proceedings of international conferences, including the Second International Conference of Young Scientists on Artificial Intelligence for Sustainable Development (YAISD 2025) and the 8th International Scientific and Practical Conference "Applied Information Systems and Technologies in the Digital Society" (AISTDS 2024). The research findings were also reported within the framework of the Winter School-Seminar of Young Scientists and Students SIT'2024.

Evaluation of the Language and Style of the Dissertation. The dissertation is written in Ukrainian in a grammatically correct and stylistically coherent manner. The scientific terminology used in the work is generally accepted, and the style of presenting the results of theoretical and practical research, as well as new scientific statements, conclusions, and recommendations, ensures their clarity and accessibility. The content of the dissertation provides a clear understanding of the main propositions, conclusions, and recommendations proposed by the author. The presentation style of the research materials and scientific concepts guarantees their proper perception and comprehension.

Compliance of the Dissertation with the Established Requirements and Eligibility for Defense. Having reviewed Pan Tiande's dissertation research and the scientific publications presenting its main results, as well as taking into account the outcomes of the specialized seminar, we conclude that the dissertation by Pan Tiande, entitled "Methods and Software Tools for Recognizing Fake or Irrelevant Information in the Content of News-Oriented Social Networks" meets the requirements established by the Procedure for Awarding the Degree of Doctor of Philosophy and Revoking the Decision of a One-Time Specialized Academic Council of a Higher Education Institution or Scientific Institution on the Awarding of the Doctor of Philosophy Degree, approved by the Resolution of the Cabinet of Ministers of Ukraine No. 44 of January 12, 2022.

As a result of the review of Pan Tiande's dissertation and the completeness of the publications of the main research results

Resolved:

1. To propose that the Academic Council approve the following composition of the one-time specialized academic council:

Chairperson:

Doctor of Technical Sciences, Professor Anatoliy Sachenko, Professor of the Department of Information and Computing Systems and Control, West Ukrainian National University;

Reviewers:

Doctor of Technical Sciences, Professor Roman Pasichnyk, Professor of the Department of Cybersecurity, West Ukrainian National University;

Candidate of Technical Sciences, Associate Professor Svitlana Krepych, Associate Professor of the Department of Computer Science, West Ukrainian National University;

Opponents:

Doctor of Technical Sciences, Professor Igor Grebennik, Head of the Department of Systems Engineering, Kharkiv National University of Radioelectronics;

Doctor of Technical Sciences, Senior Researcher Dmytro Dosyn, Head of the Department of Information Systems and Networks, Lviv Polytechnic National University.

2. It is recommended that the newly established one-time specialized academic council accept the dissertation of Pan Tiande titled «Methods and Software Tools for Recognizing Fake or Irrelevant Information in the Content of News-Oriented Social Networks» for consideration and defense with the purpose of awarding him the degree of Doctor of Philosophy.

Chairman of the meeting,
Head of the Department of Computer Science,
Doctor of Technical Sciences, Professor



Andriy PUKAS