

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
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Наведені тези пленарних та секційних доповідей за теоретичними та практичними результатами наукових досліджень і розробок. Представлені результати теоретичних та практичних досліджень стосовно галузі комп'ютерних наук, інженерії програмного забезпечення, кібербезпеки, а також систем та технологій інтелектуальної обробки даних.

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SHALLOW NEURAL NETWORKS FOR CLASSIFYING UKRAINIAN AI-GENERATED CONTENT

Artificial Intelligence (AI) and Generative AI (GenAI) tools are fundamentally transforming education by providing new opportunities for both students and teachers. These technologies facilitate personalized learning through chatbots, automate routine tasks, generate tests and assignments (including grading), and customize course content, among other advantages.

A major risk to academic integrity arises from the use of AI-generated content as a substitute for expected human work. Conversely, current AI content detectors are unreliable, potentially leading to false accusations of academic misconduct. Although the use of such detectors is generally discouraged, they remain in practice. Instead of relying on AI detectors, it is recommended to improve teaching methods and educate all interested parties on the responsible use of AI tools.

The goal of this research [1] is to develop an AI tool for detecting AI-generated content in Ukrainian within the narrow domain of IT documents and coursework. Based on the considerations outlined above, this tool could be used only as an assistant (not a judge), requiring human validation and making no automated decisions. The tool is designed to utilize custom data, employ shallow artificial neural network (ANN) models that can be trained on a standard laptop, and provide transparent quality evaluation.

To address this task, a custom dataset was created, comprising 2533 human-written text chunks and 2634 AI-generated (GPT-4o-mini) pieces. All fragments underwent manual inspection and cleaning, resulting in a challenging dataset that is difficult for humans to classify accurately.

This dataset was partially evaluated using several commercial detectors, yielding the following results:

- GPTZero provided many "uncertain" decisions; for five human-written samples, only one was correctly identified;

- ZeroGPT misclassified 9 out of 10 human-written pieces as AI-generated;

- Copyleaks & Originality.ai, while showing high confidence, still produced notable false positives and false negatives on the Ukrainian data;

- Isgen.ai correctly classified all human-written test chunks but missed 40% of AI-generated pieces.

A traditional natural language processing (NLP) pipeline was employed to construct shallow ANN models, consisting of an embedding layer, a single dense layer, and a single sigmoid output neuron. The optimal number of neurons was determined through a grid search procedure. Five specific architectures,

designated M1–M5, were selected, achieving test accuracy rates of 87–88%.

The developed AI tool processes PDF documents using two primary approaches.

1. **Chunk Report.** The PDF document is divided into non-overlapping text chunks of approximately 1000 symbols each, with each chunk processed by the five models M1–M5. The results are averaged per chunk, and statistics are compiled to indicate the overall probability that a random text chunk from the document is AI-generated. A histogram summarizes the classification results for all chunks (Fig. 1).

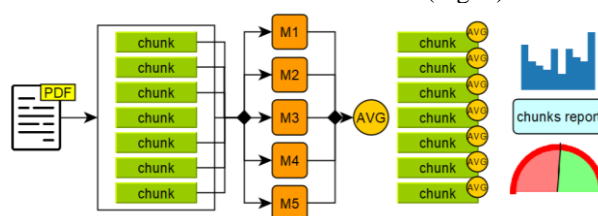


Figure 1. The processing pipeline to create a chunks report.

2. **Sentence Report.** To analyze individual sentences, the text is divided into overlapping chunks, with the step length corresponding to the sentence length. The first 1000 symbols form the initial chunk; subsequent chunks are created by shifting the window to exclude the first sentence, then the second, and so forth. Each sentence appears in multiple chunks, allowing the accumulation of prediction results for each sentence as represented across these chunks. Each prediction is already averaged across all models M1–M5, and these values can be further averaged or visualized without aggregation for more detailed analysis, resulting in a single output value per sentence.

The findings confirm that AI-content classification remains a complex and evolving challenge. Although the shallow models provide a solid foundation with approximately 88% accuracy, substantial opportunities for improvement exist, including evaluating more advanced models and enhancing ANN explainability, as the current models function as black boxes and cannot justify their decisions.

References

1. Peredrii O. "Shallow ANN models to classify Ukrainian AI-generated text," *Control, Navigation and Communication Systems*, No. 4(82), 2025, pp. 108–113. doi:10.26906/SUNZ.2025.4.108-113. URL: <https://journals.nupp.edu.ua/sunz/uk/article/view/4113/3443>

ТЕЗИ ДОПОВІДЕЙ

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