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Article

## AI-Based Detection of Jamming Attacks In 6G Drone Networks

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Abstract: A single paragraph of about 200 words maximum. For research articles, abstracts should give a pertinent overview of the work. We strongly encourage authors to use the following style of structured abstracts, but without headings: (1) Background: place the question addressed in a broad context and highlight the purpose of the study; (2) Methods: describe briefly the main methods or treatments applied; (3) Results: summarize the article's main findings; (4) Conclusions: indicate the main conclusions or interpretations. The abstract should be an objective representation of the article, it must not contain results which are not presented and substantiated in the main text and should not exaggerate the main conclusions.

**Keywords:** keyword 1; keyword 2; keyword 3 (List three to ten pertinent keywords specific to the article; yet reasonably common within the subject discipline.)

1. Introduction

The shift from 4G to 5G has been a generational leap has revolutionized connectivity around the world. Despite 5G being still in its early adoption rate at the time of writing[1], the research community is already working on the next generation of wireless communication technologies, 6G. 6G technology is expected to enable a wide variety of new use cases, thanks to the increases in both data rates and latency but this in turn will also bring forth new security challenges, specific to those applications.

One of the main differences between 5G and 6G technology will be the focus of the 6G standard in regards to AI integration. While Software Defined Networks (SDN) have played a key role in improving the efficiency and security of 5G networks, 6G is expected to take this a step further, by integrating artificial intelligence and machine learning directly into the network. This is what the authors of [2] define as the shift from *Softwarization* to *Intelligentization*.

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Interventionary studies involving animals or humans, and other studies require ethical approval must list the authority that provided approval and the corresponding ethical approval code.

This is an example of a quote.

3. Results

This section may be divided by subheadings. It should provide a concise and precise description of the experimental results, their interpretation as well as the experimental conclusions that can be drawn.

3.1. Subsection

3.1.1. Subsubsection

Bulleted lists look like this:

- First bullet:
- Second bullet;
- Third bullet.

Numbered lists can be added as follows:

- 1. First item;
- 2. Second item;
- 3. Third item.

The text continues here.

## 3.2. Figures, Tables and Schemes

All figures and tables should be cited in the main text as Figure 1, Table 1, etc.



**Figure 1.** This is a figure. Schemes follow the same formatting. If there are multiple panels, they should be listed as: (a) Description of what is contained in the first panel. (b) Description of what is contained in the second panel. Figures should be placed in the main text near to the first time they are cited. A caption on a single line should be centered.

**Table 1.** This is a table caption. Tables should be placed in the main text near to the first time they are cited.

Title 1	Title 2	Title 3
Entry 1	Data	Data
Entry 2	Data	Data <sup>1</sup>

<sup>&</sup>lt;sup>1</sup> Tables may have a footer.

The text continues here (Figure 2 and Table 2).



**Figure 2.** This is a wide figure.

**Table 2.** This is a wide table.

Title 1	Title 2	Title 3	Title 4
Entry 1 *	Data	Data	Data
	Data	Data	Data
	Data	Data	Data
Entry 2	Data	Data	Data
	Data	Data	Data
	Data	Data	Data
Entry 3	Data	Data	Data
	Data	Data	Data
	Data	Data	Data
Entry 4	Data	Data	Data
	Data	Data	Data
	Data	Data	Data

<sup>\*</sup> Tables may have a footer.

Text.
Text.

3.3. Formatting of Mathematical Components

This is the example 1 of equation:

$$a=1, (1)$$

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the text following an equation need not be a new paragraph. Please punctuate equations as regular text.

This is the example 2 of equation:

$$a = b + c + d + e + f + g + h + i + j + k + l + m + n + o + p + q + r + s + t + u + v + w + x + y + z$$
 (2)

Please punctuate equations as regular text. Theorem-type environments (including propositions, lemmas, corollaries etc.) can be formatted as follows:

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**Theorem 1.** *Example text of a theorem.* 

The text continues here. Proofs must be formatted as follows:

**Proof of Theorem 1.** Text of the proof. Note that the phrase "of Theorem 1" is optional if it is clear which theorem is being referred to.  $\Box$ 

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4. Discussion

Authors should discuss the results and how they can be interpreted from the perspective of previous studies and of the working hypotheses. The findings and their implications should be discussed in the broadest context possible. Future research directions may also be highlighted.

5. Conclusions

This section is not mandatory, but can be added to the manuscript if the discussion is unusually long or complex.

6. Patents

This section is not mandatory, but may be added if there are patents resulting from the work reported in this manuscript.

**Author Contributions:** For research articles with several authors, a short paragraph specifying their individual contributions must be provided. The following statements should be used "Conceptualization, X.X. and Y.Y.; methodology, X.X.; software, X.X.; validation, X.X., Y.Y. and Z.Z.; formal analysis, X.X.; investigation, X.X.; resources, X.X.; data curation, X.X.; writing—original draft preparation, X.X.; writing—review and editing, X.X.; visualization, X.X.; supervision, X.X.; project administration, X.X.; funding acquisition, Y.Y. All authors have read and agreed to the published version of the manuscript.", please turn to the CRediT taxonomy for the term explanation. Authorship must be limited to those who have contributed substantially to the work reported.

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Written informed consent for publication must be obtained from participating patients who can be identified (including by the patients themselves). Please state "Written informed consent has been obtained from the patient(s) to publish this paper" if applicable.

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reported results can be found, including links to publicly archived datasets analyzed or generated during the study. Where no new data were created, or where data is unavailable due to privacy or ethical restrictions, a statement is still required. Suggested Data Availability Statements are available in section "MDPI Research Data Policies" at <a href="https://www.mdpi.com/ethics">https://www.mdpi.com/ethics</a>.

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Abbreviations

The following abbreviations are used in this manuscript:

MDPI Multidisciplinary Digital Publishing Institute

DOAJ Directory of open access journals

TLA Three letter acronym LD Linear dichroism

Appendix A

Appendix A.1

The appendix is an optional section that can contain details and data supplemental to the main text—for example, explanations of experimental details that would disrupt the flow of the main text but nonetheless remain crucial to understanding and reproducing the research shown; figures of replicates for experiments of which representative data are shown in the main text can be added here if brief, or as Supplementary Data. Mathematical proofs of results not central to the paper can be added as an appendix.

**Table A1.** This is a table caption.

Title 1	Title 2	Title 3
Entry 1	Data	Data
Entry 2	Data	Data

Appendix B

All appendix sections must be cited in the main text. In the appendices, Figures, Tables, etc. should be labeled, starting with "A"—e.g., Figure A1, Figure A2, etc.

## References

- 1. 5G statistics & facts. Available online: https://www.statista.com/topics/3447/5g/#topicOverview (accessed on 13 September 2024).
- 2. Letaief, K.B.; Chen, W.; Shi, Y.; Zhang, J.; AI, B. The Roadmap to 6G: AI Empowered Wireless Networks. *IEEE Communications Magazine* **2019**, 57, 84–90. https://doi.org/10.1109/MCOM.2019.1900271.
- 3. Author 1, T. The title of the cited article. *Journal Abbreviation* **2008**, *10*, 142–149.
- 4. Author 2, L. The title of the cited contribution. In *The Book Title*; Editor 1, F., Editor 2, A., Eds.; Publishing House: City, Country, 2007; pp. 32–58.
- 5. Author 1, A.; Author 2, B. Book Title, 3rd ed.; Publisher: Publisher Location, Country, 2008; pp. 154–196.
- 6. Author 1, A.B.; Author 2, C. Title of Unpublished Work. *Abbreviated Journal Name* year, phrase indicating stage of publication (submitted; accepted; in press).
- 7. Author 1, A.B. (University, City, State, Country); Author 2, C. (Institute, City, State, Country). Personal communication, 2012.

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- 8. Author 1, A.B.; Author 2, C.D.; Author 3, E.F. Title of presentation. In Proceedings of the Name of the Conference, Location of Conference, Country, Date of Conference (Day Month Year); Abstract Number (optional), Pagination (optional).
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