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| Book Name: | [Engineering Research: Perspectives on Recent Advances](https://www.bookpi.org/bookstore/product/engineering-research-perspectives-on-recent-advances-vol-1/) |
| Manuscript Number: | **Ms\_BPR\_4142** |
| Title of the Manuscript:  | **A long short-term memory based prediction model for transformer fault diagnosis using dissolved gas analysis with digital twin technology** |
| Type of the Article | **Book chapter** |

**General guidelines for the Peer Review process:**

This Book’s peer review policy states that **NO** manuscript should be rejected only on the basis of ‘**lack of Novelty’**, provided the manuscript is scientifically robust and technically sound.

To know the complete guidelines for the Peer Review process, reviewers are requested to visit this link:

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**Special note:**

**A research paper already published in a journal can be published as a Book Chapter in an expanded form with proper copyright approval.**

**Source Article:**

**This chapter is an extended version of the article published by the same author(s) in the following journal.**

**International Journal of Power Electronics and Drive Systems (IJPEDS), Vol. 13, No. 2, June 2022, pp. 1266~1276**

**DOI: 10.11591/ijpeds.v13.i2.pp1266-1276**

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| PART 1: Comments |
|  | Reviewer’s comment | Author’s Feedback *(Please correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)* |
| **Please write a few sentences regarding the importance of this manuscript for the scientific community. A minimum of 3-4 sentences may be required for this part.** |  |  |
| **Is the title of the article suitable?****(If not please suggest an alternative title)** | **The title is appropriate as it reflects the core content of the study, including the methodology (LSTM), the application area (transformer fault diagnosis), and the integration of digital twin technology. It is specific, informative, and aligned with the objectives of the paper.****Alternative Title Suggestion:****If needed, a more concise title could be:****"Digital Twin-Assisted LSTM Model for Fault Diagnosis in Transformers Using Dissolved Gas Analysis."** |  |
| Is the abstract of the article comprehensive? Do you suggest the addition (or deletion) of some points in this section? Please write your suggestions here. | **The abstract is fairly comprehensive, covering the problem statement, methodology, results, and significance. However, it can be improved by:****Emphasizing the approach (e.g., unique pre-processing techniques or the application of digital twin technology).****Adding details about the dataset, such as the years of data collection and its volume.****Removing repetitive phrases and focusing on the practical implications of achieving 99.83% accuracy.** |  |
| **Is the manuscript scientifically, correct? Please write here.**  |  **The manuscript appears to be scientifically sound. The methodologies are well-explained, and the results are supported by sufficient data and analysis. However:****Some steps, such as the scaling and windowing processes, need more detailed explanations to clarify how they enhance model performance.****A discussion on the model's potential limitations or failure scenarios (e.g., insufficient data or rare fault types) would strengthen the manuscript.** |  |
| **Are the references sufficient and recent? If you have suggestions of additional references, please mention them in the review form.****-** | **The references are mostly sufficient and include recent studies from 2018–2021. However:****Additional references focusing on digital twin technology in predictive maintenance or LSTM applications in power systems could enhance the manuscript.****Suggested References:****Papers on the latest advancements in digital twin-driven fault diagnostics.****More recent IEEE articles on dissolved gas analysis or transformer maintenance.** |  |
| Is the language/English quality of the article suitable for scholarly communications? | The language is suitable overall but requires minor improvements:Some sentences in the introduction and methodology sections are overly complex and should be simplified.Grammar and consistency in technical terms (e.g., "fault-free data" vs. "non-faulty data") need attention.Proofreading for minor grammatical issues (e.g., "a time series data" should be "time-series data") would enhance readability. |  |
| Optional/General comments | **Comments on "A long short-term memory based prediction model for transformer fault diagnosis using dissolved gas analysis with digital twin technology"****General Observations:**1. **Clarity and Language:** The paper is written in clear technical language, suitable for its target audience. However, there are occasional grammatical errors and redundant phrases that can be streamlined for better readability.
2. **Structure:** The structure is well-organized, with clear sections for Abstract, Introduction, Methodology, Results, and Conclusion. This is appropriate for a technical research paper.
3. **Content Depth:** The paper provides a detailed explanation of the methodology and achieves a balance between theory and application. However, some areas, such as the introduction and conclusion, could benefit from deeper discussion and analysis.

**Section-Specific Comments:**1. **Abstract:**
	* The abstract is concise and provides a good overview of the research. However, consider briefly mentioning the specific contribution of the digital twin in the context of transformer fault diagnosis.
	* Sentence: "It can be validated that the LSTM model for fault identification and analysis using dissolved gas in the transformer has a lot of research potential." — This can be rephrased for precision, e.g., "The results validate that the proposed LSTM model holds significant research potential for fault identification and analysis using dissolved gas analysis."
2. **Introduction:**
	* The introduction effectively highlights the importance of transformer maintenance and the role of dissolved gas analysis (DGA). However, it would benefit from more specific examples or data illustrating the critical need for predictive maintenance in transformers.
	* Consider providing a brief comparison of traditional DGA methods and the advantages of deep learning approaches like LSTM early in the section.
	* The phrase "Data driven methodologies are superior to model based predictive maintenance elucidations as they attempt to learn predictive models from the data automatically that makes them suitable for a wide range of such problems" can be simplified for clarity.
3. **LSTM Network:**
	* This section provides a solid theoretical background on LSTM. Including a brief comparison between LSTM and other deep learning methods for time-series prediction would add value.
	* While the formulas are helpful, ensure all variables are clearly defined immediately after they are introduced (e.g., clarify “σ” as the sigmoid activation function).
4. **Methodology:**
	* The methodology is well-documented, with clear subsections explaining each step. However, some details, such as the rationale behind choosing specific preprocessing techniques (e.g., high-pass filter, scaling, and windowing), could be expanded.
	* In "Data preprocessing," the exclusion of fault numbers (3, 9, and 15) is mentioned. Provide justification for why these faults are considered unrecognizable and how this impacts the results.
	* The description of "Scaling" and "Windowing" could benefit from additional visual aids or examples to clarify the transformations applied.
5. **Results and Discussion:**
	* The results are presented systematically, with validation metrics and graphical representations. However, the discussion could delve deeper into the implications of achieving a 99.83% validation accuracy.
	* Include a comparison table summarizing the performance of the LSTM model against other models (e.g., CNN, SVM). This will enhance the clarity of the results and emphasize the model's superiority.
	* The discussion lacks mention of the potential limitations of the proposed approach. For example, discuss the impact of limited data diversity or the challenges of applying this model in real-world scenarios.
6. **Conclusion:**
	* The conclusion summarizes the findings but could be expanded to include specific future directions. For instance, how can the digital twin framework be further developed or applied to other domains?
	* Avoid vague statements such as "We can investigate its application in transformer online monitoring using a mobile device." Instead, specify how this could be implemented or tested in future work.

**Technical Suggestions:**1. **Figures and Tables:**
	* Ensure all figures and tables are referenced in the text and accompanied by descriptive captions. For example, the "500 kVA transformer" figure should include details about its relevance to the methodology.
	* Figure 9, comparing validation accuracy across models, is useful but could include additional models (if applicable) to broaden the comparison.
2. **Mathematical Notations:**
	* Clearly define all symbols and terms used in equations. For instance, when introducing “C̃” and “σ” in equations (4) and (5), briefly explain their significance in the context of LSTM.
3. **References:**
	* Ensure that all citations are consistent in format (e.g., IEEE style) and verify the correctness of DOIs.
	* Some references are dated (e.g., 1978). Consider adding more recent citations to support claims, particularly regarding advancements in digital twin technology.

**Additional Suggestions:**1. **Technical Challenges:** Briefly address any challenges faced during the implementation of the LSTM model or digital twin framework.
2. **Broader Impact:** Discuss how this research contributes to the broader field of predictive maintenance and its potential scalability to other industries.
3. **Language:** Consider professional proofreading to eliminate minor grammatical errors and improve overall readability.

**Summary of Key Recommendations:*** Expand the introduction and conclusion for a deeper discussion of the problem and future work.
* Provide clearer justifications and examples for preprocessing techniques in the methodology.
* Include a comprehensive comparison of the proposed model with existing methods.
* Discuss potential limitations and areas for improvement.
* Ensure consistency in mathematical notation, figures, and references.

These revisions will strengthen the overall impact and clarity of the paper, making it more accessible and impactful to its audience. |  |

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| **PART 2:**  |
|  | **Reviewer’s comment** | **Author’s comment *(if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)*** |
| **Are there ethical issues in this manuscript?**  | ***(If yes, Kindly please write down the ethical issues here in details)*** |  |

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| **Reviewer Details:** |
| **Name:** | **Anonymous reviewer (Only for this stage as per Review policy)** |
| **Department, University & Country** |  |