Review Form2

Book Name:	Scientific Research, New Technologies and Applications
Manuscript Number:	**Ms_BPR_2680**
Title of the Manuscript:	**Towards Explainable Augmented Intelligence (AI) for Crack Characterization**
Type of the Article	**Book chapter**

PART 1: Review Comments

Compulsory REVISION 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. Why do you like (or dislike) this manuscript? A minimumof 3-4 sentences may be required for this part.	The study focuses on enhancing crack characterization in steel components using Non-destructive Testing and Evaluation (NDT&E) methods, specifically through the use of ultrasonic phased arrays. The authors propose an approach to automate and improve the interpretation of ultrasonic phased array data by developing an explainable AI system called AutoNDE (consists of three main modules: Signal-Processing Module,Image-Processing Module, and Explainable AI Module). The system has been trained on 16 datasets of steel specimens images with large, smooth planar notches (both embedded and surface-breaking) and tested on two additional similar datasets. The results highlights the system's ability to address the primary source of error in ultrasonic data—surface undulations of the specimens.	
Is the title of the article suitable? **(If not please suggest an alternative title)**	Yes	
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.	It is suggested that authors revise the abstract to the formal tone suitable for academic presentations. For example, Crack charcterisation is not the central tasks in NDT, rather it is the critical aspects.. In addition, instead of using "these days…" you can use "currently…". Moreover, it is mentioned "this paper offers…." Scientific researchers do not use this tone in the academic. It can be revised to "This study focuses on ….". Additionally, studies do not 'meet' the challenges, rather they 'address' it. Here is my suggestion for the first paragraph, Authors are recommended to revise it accordingly to emphasize the study's objectives and methodology, providing a clear and concise overview while maintaining a formal tone.: Crack characterization is a critical aspect of Non-destructive Testing and Evaluation (NDT&E) of industrial components and structures. Currently, data for this task are frequently gathered using ultrasonic phased arrays, but while these inspections are often automated, the interpretation of the resulting data typically remains manual. This study focuses on developing an explainable AI (Augmented Intelligence) approach to address this challenge. It introduces a software tool called AutoNDE, which includes a signal-processing module utilizing a modified total focusing method to generate sequences of two-dimensional images of the evaluated specimens.	
Are subsections and structure of the manuscript appropriate?	Yes – Authors are recommended to add some more details in their studies. Please check the general comments section.	
Please write a few sentences regarding the scientific correctness of this manuscript. Why do you think that this manuscript is scientifically robust and technically sound? A minimumof 3-4 sentences may be required for this part.	The study meticulously integrates signal processing, image enhancement, and decision tree algorithms in the AutoNDE code, providing a well-rounded and technically sophisticated solution for identifying and interpreting cracks. The thorough validation of the model using 16 training datasets and testing on additional datasets underscores its reliability and reproducibility. Furthermore, the detailed examination of surface undulations as a primary source of error, along with the systematic approach to addressing	

	these challenges, highlights the depth of the research and its potential impact in the field of NDT&E.	
Are the references sufficient and recent? If you have suggestions of additional references, please mention them in the review form. -	The references in the study span from 2009 to 2021, which are relatively recent works. While this range provides a historical perspective, it is crucial for the study to include the latest advancements in the field to ensure it reflects the current state of research, especially given the rapid developments in AI, signal processing, and NDT&E technologies. To ensure the references are sufficiently recent, I suggest the authors include more citations from recent years, particularly in the areas of explainable AI in NDT&E and recent advancements in ultrasonic phased array techniques. Key areas to explore for recent references could include the latest methods in AI-driven NDT data interpretation, advancements in signal and image processing algorithms for ultrasonic testing, and recent studies on the challenges of surface undulations in ultrasonic inspections. Incorporating these could strengthen the manuscript's literature review and contextualize the study within the most current scientific landscape.I would recommend looking into journals like *NDT & E International*, *Ultrasonics*, and recent conference proceedings on AI in NDT, which frequently publish cutting-edge research in these areas.	

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Minor REVISION comments **Is the language/English quality of the article suitable for scholarly communications?**	No – it is recommended authors check the entire paper and modify it where it is necessary. For example, in page 2, “we demonstrate the efficacy….” It can be revised to: The efficacy of the proposed approach is demonstrated using laboratory data. Test blocks with predefined flaws were manufactured, and the NDT procedure under investigation was applied to determine its capability in accurately estimating the characteristics of these flaws. The key aspect is not who collected the data, but rather the methodology and rationale behind the data collection process. Make the sentences sound and academic.	
Optional/Generalcomments	I suggest authors to add “highlights” section in their study. It can be placed after abstract. It is essential that the highlights clearly reflect the unique and significant results that set this research apart from existing literature. This will ensure that readers quickly grasp the importance and impact of the work. Page 2: “”In order to carry out crack characterization NDT inspectors rely **mostly** on TOFD (Time of Flight Diffraction) configurations””. How do you know that? There are plenty NDT methodologies in crack recognitions and charcterizations. Avoid generalizations; instead, provide a detailed explanation of the existing methods and their limitations, supported by recent studies. This approach will offer a clearer understanding of the context and highlight the specific areas where improvements or innovations are needed. In contrast, what are the advantages and current practices of Ultrasonic Phased Array Inspections? Can you give us an overview of AI methods used in similar contexts? While the study is well-explained and provides comprehensive verbal descriptions of the methodology and findings, I noticed that there are relatively few visual aids, such as figures, diagrams, or images, to support the text. Including more visual representations of key concepts, experimental setups, data analysis, or results would greatly enhance the clarity and accessibility of the study. Visuals can also help to better illustrate complex ideas and make the content more engaging for the readers. I recommend incorporating additional images, charts, or diagrams where possible to complement the detailed verbal explanations provided. For example, section 3.1 part 2: Meshing of the specimen is performed by specifying a regular grid of evenly spaced rows and columns…. How does it look like? How did you generate it? Section 3.2, part 2: You should add extra information about Blob recognition process and classifications. You can draw a diagram that shows the process. From input image, to running code, blob detections, feature extractions and tracker etc. each section should have output to illustrate better understanding of its complexity to readers. It is also suggested to add the blob detection algorithm. A similar approach should be applied to other sections, specifically section 3.4, parts 2 and 4. It is important to ensure consistency in the level of detail and focus on the methodological rigor and rationale across all sections to maintain the overall coherence and scientific integrity of the study. Please enlarge Figures 6 to 17 to improve their clarity and readability. Larger figures will help in better visualizing the data and details, making it easier for readers to understand the presented results and analyses. Ensure that the figures maintain high resolution and that any accompanying text or labels are legible at the increased size.	

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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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