Peer Review File

Article information: https://dx.doi.org/10.21037/mhealth-21-15

****Reviewer A****

****General Comment****

The paper has a very bad organization right now and cannot be published in this form.
It appears as a concatenation of topics related to Information Fusion and Decision Fusion, without a basic differentiation between the two topics, just to start.
Reply: Thank you for your feedback. Our goal through this paper is to provide an overview of the use of this technique within healthcare. We intend to present an extensive reference list that can become a resource for researchers, practitioners and clinicians for future work in DF.

****Specific Comments****

The structure of the paper should be thoroughly revised following a few basic directions such as
Comment 1a: define Information fusion vs Decision Fusion (decisions are the result of information)
Reply 1a: Thank you for your feedback. The two terms 'decision fusion' and 'information fusion' are often used synonymously (Castanedo, F., 2013). The Decision fusion technique encompasses the combination of data, information and decisions.
We therefore include 'information fusion' as one of our keywords for relevant literature search.

Reference: Castanedo, F. (2013). A review of data fusion techniques. *The Scientific World Journal*, 2013(704504), 1-19. doi.org/10.1155/2013/704504

We include the following sentences in the Introduction section for better clarity (See page 4 lines 112-117):
"The terms decision fusion, data fusion, information fusion and sensor fusion are often used synonymously in the literature (151). However, in certain instances the term data fusion is used for raw data and decision fusion/information fusion is used to identify already processed data (151). Information fusion and decision fusion is related to a combination of decisions from various entities and is known as a higher semantic level fusion task than data fusion techniques (18,151)."

Comment 2a: re-structure the paper in its sections (emphasis on technology, methodology, applications with impacts on biology, clinics etc.)
Reply 2a: Thank you for your feedback. The structure of the article is currently organized in the form of defining DF technique, applications, benefits, methods and classifications of applications specifically in the field of health. We classify the applications based on the levels of healthcare delivery, i.e., prevention, diagnosis, treatment and rehabilitation and

administrative. We further classify the applications of these techniques within each of these levels, which is graphically represented in Figure 2. Based on your feedback we have moved the description of the DF technique to introduction for better clarity (See page 4, lines 111-117) and added details to the Methods section for better clarity (See page 6 lines 209-215).

Comment 3a: focus on small vs big data paradigms
Reply 3a: Thank you for the feedback. We have added sentences to the Introduction section that discuss small vs. big data paradigms (See page 4 lines 91-97).

Comment 4a: use of graphics and summary tables is suggested, considering the quality of such representations
Reply 4a: We present graphical representation of the types of methods used in DF technique (Figure 1) and applications of DF technique according to the levels of healthcare delivery (Figure 2) under the Narrative Review section (See pages 8 and 9). We are happy to include graphs/tables outside of what we present here if there are specific topics that reviewers would like to see.

****Reviewer B****

****General Comment****

The authors tried to demonstrate the utility of decision fusion techniques in healthcare big data analytics. This topic is interesting as decision fusion is indeed widely used in recent studies, due to the complexity of medical informatics. Moreover, abundant practical examples of decision fusion methods in healthcare and medicine are narratively listed throughout the manuscript. The reviewer has several suggestions and questions regarding the structure of this review article:
Reply: Thank you for acknowledging the importance of the topic of the paper. We acknowledge that there is scope for improvement, and we have considered yours and other reviewers' feedback to revise the paper.

****Specific Comments****

Comment 1b: As we know, decision fusion is characterized by the combination of classifiers to achieve better classification accuracy. However, this fundamental concept of decision fusion techniques and rationales of using decision fusion were entirely missing in the introduction section.
Reply 1b: Thank you for your feedback. We have added further discussion on the decision fusion technique in the Introduction section (See pages 4-5 lines 111-144).

Comment 2b: The section "1. Decision Fusion Technique" was written in a way that described mostly general machine learning techniques instead of decision fusion-specific contents. I would suggest the authors to provide more technical details on decision fusion, such as image fusion (e.g., pixel-level fusion, image-level fusion, and decision-level fusion) and classifier

fusion, or even just basic concepts such as competitive, complementary, and cooperative fusion.
Reply 2b: Thank you for your feedback. Our goal through this paper is to provide an overview of the use of this technique within healthcare. We intend to present an extensive reference list that can become a resource for researchers, practitioners and clinicians for future work in DF.

Based on your feedback we have added the following sentence under Introduction section for better clarity (See Page 5 lines 135-137)
"The decision fusion technique uses basic machine learning methods. In addition, it uses voting, weighting, competitive approaches and other approaches to determine the value of decisions to combine 22)."

In addition, we have modified the section under Narrative Review- Data fusion technique to include the requested information (See pages 7-8 lines 222-249).

Comment 3b: Figure 2 did not provide specific knowledge on the utility of decision fusion techniques in healthcare databases but general datasets in health informatics. I would recommend the authors to provide more specific information on the nature of the datasets, as well as common classifiers used to analyze these datasets; then finally, provide knowledge on how the classifiers for these datasets are being fused with decision fusion techniques. As such, this could be either a table or a figure.
Reply 3b: The general classification of types of methods was based on the article by Zein-Sabatto et al. (2012) and the classification of categories for applications in the healthcare field was based on the high frequency of use in various studies. For all articles included in the narrative review, we report the methods used and the different approaches used to combine, such as voting and weighting.

Reference: Zein-Sabatto S, Mikhail M, Bodruzzaman M, DeSimio M, Derriso M, Behbahani A. Analysis of decision fusion algorithms in handling uncertainties for integrated health monitoring systems. Multisensor, Multisource Information Fusion: Architectures, Algorithms, and Applications 2012, May 10 (Vol. 8407, p. 84070A). International Society for Optics and Photonics. Doi:10.1117/12.919731.

Comment 4b: The citation form in the introduction section was not kept the same way as that in the rest passages. The authors who respectively wrote the passages should keep them in the same format.
Reply 4b: Thank you for pointing that out. We have made the necessary changes to the manuscript.

****Reviewer C****

****Guideline for Authors****
According to the "Guidelines for Authors" for Narrative Review, a statement "We present the following article in accordance with the narrative review reporting checklist should be included at the end of the "Introduction". The manuscript should also include a Reporting Checklist

statement in the footnote (see the “Footnote” section).
Reply: Thank you for pointing that out. These items were added (See page 5 line 145 and page 22 line 708).

****General comment****
It is not clear what the "Decision Fusion" technique is, or how you define the technique. In all 149 references are shown, but many of them do not mention the term “Decision Fusion” explicitly. For the manuscript to be informative for the readers, the authors are advised to describe what technique you are going to address.
Reply: Thank you for your feedback. The term decision fusion has many synonyms including information fusion, data fusion and sensor fusion (Castanedo, F., 2013). We have clarified this under the Introduction section (See page 4 line 112). Therefore, all synonyms were considered in reviewing the articles. We have revised the Methods section for better clarity (See page 4 line 149).

Reference: Castanedo, F. (2013). A review of data fusion techniques. *The Scientific World Journal*, 2013(704504), 1-19. doi.org/10.1155/2013/704504.

****Specific comments****

Introduction

Comment 1c L56-: The focus of the manuscript seems to be "big data" at the beginning, but as a whole it is not about big data. It is certainly possible to cover "big data" partly, but it is not clear how the magnitude of data relates to the methods described here. Descriptions should be constructed logically.
Reply 1c: Thank you for your feedback. We have included a detailed description of the decision fusion technique under the Introduction section (See pages 4-5 lines 111-144).

Comment 2c L67: For the statement "the Decision Fusion (DF) technique was introduced in 1960" to be meaningful, literature should be cited since this is closely related to the fundamental question posed. See the comment (2).
Reply 2c: Thank you for your feedback. We have added appropriate citation (See page 4 line 112 and page 31-line 1105).
We have modified the sentence as below for better clarity:
“A promising approach to overcome these challenges is through the use of Decision Fusion technique that was first introduced in the literature in 1960s, as mathematical models for data manipulation (150).”

Methods
Comment 3c: The methods should be clear even though the manuscript is under the category Narrative Review.
Reply 3c: Thank you for the feedback. We have added additional details to the methods section as requested (See pages 5-6 lines 204-215).

Comment 4c L80: How the keywords indicated were used, that is, how the keywords were combined for the literature search?
Reply 4c: Keywords such as *Decision Fusion, information fusion, symbolic fusion, distributed decisions, expert fusion,* and *sensor fusion* were used in conjunction with *med-** and *healthcare*. We have added this under methods for better clarity (See page 5 line 149).

Comment 5c L83-84: The criterion "(ii) implemented at least one DF technique" may define the scope of this review. How the authors differentiated the literature that meets the criterion and that does not?
Reply 5c: Thank you for your question. Upon review of the methodology employed by the included study, we determined whether decision fusion technique was used as one of the study approaches to be included in our study, which was true for those studies that used several techniques for big data analysis.

Narrative Review

Comment 6c L94: No description of the DF itself is given. The authors only state "DF is related to a combination of decisions…"
Reply 6c: We have modified the section under Narrative Review- Data fusion technique to include the requested information (See pages 7-8 lines 222-249).

Comment 7c L178: Figure 1. The authors should describe how this schematic representation of the types of methods used in DF was developed. This is also related to some comments given so far.
Reply 7c: The general classification of types of methods was based on the article by Zein-Sabatto et al. (2012).
Reference: Zein-Sabatto S, Mikhail M, Bodruzzaman M, DeSimio M, Derriso M, Behbahani A. Analysis of decision fusion algorithms in handling uncertainties for integrated health monitoring systems. Multisensor, Multisource Information Fusion: Architectures, Algorithms, and Applications 2012, May 10 (Vol. 8407, p. 84070A). International Society for Optics and Photonics. Doi:10.1117/12.919731.

Comment 8c L211: It is stated that "Figure 2 provides a schematic representation of applications of DF in the healthcare field." But it is not clear what does Figure 2 represent.
Reply 8c: Figure 2 classifies and displays the applications of the decision fusion technique in the field of health care based on the four different levels of delivery of service in healthcare. The figure aims at summarizing the applications of DF techniques and the assignment of categories discussed in this narrative review.