**Response letter**

Dear Editor and Reviewers,

We are grateful for the comments and suggestions from the editors and the reviewers, which are crucial for improving our work. We have revised the manuscript to address the reviewers’ comments fully. Our point-by-point reply to the review comments is summarized below. In this document, the original reviewers’ comments are in **black**; our responses are in **blue**; the quotations in the revised manuscript are in **red**.

Reviewers' comments:

EiC: While you are revising your paper, here is a list of points worth checking, which we find author's overlook. I will check that these are adhered to before your paper is approved for publication, assuming the revision satisfies the Associate Editor and Reviewers.

Reply: Thanks. We have double-checked and revised the manuscript according to the list below from the editor-in-chief.

a) Make sure your title is succinct and grammatical. It should ideally not exceed 10-15 words.

Reply: Thanks for your suggestion; our current title, ‘AGMN: Association Graph-based Graph Matching Network for Coronary Artery Semantic Labeling on Invasive Coronary Angiograms,’ has 15 words and precisely conveys the scope of our work.

b) Make sure your conclusions reflect on the strengths and weaknesses of your work, how others in the field can benefit from it and thoroughly discus future work. The conclusions should be different in content from the abstract and be rather longer too.

Reply: Thanks for the suggestion. Our current form of the conclusions follows the suggestions of the editor-in-chief. Specifically, we included a summary of our findings, discussed limitations, and outlined future work.

c) Take a careful look at your bibliography and how you cite papers listed in it. Make sure it is current and cites recent work. Please cite a variety of different sources of literature. Please do not make excessive citation to arXiv papers, or papers from a single conference series. Do not cite large groups of papers without individually commenting on them. So we discourage " In prior work [1,2,3,4,5,6] …". Your bibliography should only exceptionally exceed about 40 items.

Reply: Thanks for the suggestions. We have checked the reference section to meet the publication requirements. Besides, we have added several references accordingly and corrected the format of the citations. Currently we have cited 40 papers.

d) You may have originally written your paper with a different audience in mind. Please make sure the revised version is relevant to the readership of Pattern Recognition. To this end, please make sure you cite RECENT work from the field of pattern recognition that will be relevant to our readership.

Reply: Thanks for the suggestion. Our study is related to deep learning on the graph and medical image processing for coronary arteries semantic labeling using invasive coronary angiograms, aiming at the potential readers in pattern recognition, especially for the special issue of ‘Graph Machine Learning.’

e) Do not exceed the page limits or violate the format, i.e. double spaced SINGLE column with a maximum of 35 pages for a regular paper and 40 pages for a review.

Reply: Our paper has a total number of 27 pages which meets the publication requirements.

GE: One reviewer still has ONE concern on the manuscript which should be addressed before recommend for publication. Based on the review reports, my recommendation is Minor Revisions.

Reply: We would like to extend my appreciation to the editorial team for their support throughout the review process. The commitment to maintaining the quality and rigor of the journal is commendable. And thank you for recognizing the significance of my research. The response to this question is shown below.

**Reviewer #1**: The authors solved my questino thoroughly.

Thanks for your previous constructive comments and valuable suggestions, which have immensely contributed to improving the quality of my research. We are thankful for your time and effort in carefully reviewing our manuscript and providing such thoughtful recommendations.

**Reviewer #2:** Notes to the Reviewer : This field is mandatory. Please put here your comments explaining your ratings of the paper and suggesting improvements

**Reviewer #5**: The authors addressed well the issues presented by the previous reviewers, however, the authors should think more how this work contribute the community of GML for complex graphs such as those presented in some related works such as: Heterogeneous Graph Neural Network via Attribute Completion, AS-GCN: Adaptive Semantic Architecture of Graph Convolutional Networks for Text-Rich Networks, and A Survey of Community Detection Approaches: From Statistical Modeling to Deep Learning.

A: Thank you for your valuable contribution in providing the interesting papers related to graph machine learning. We have thoroughly reviewed each of these papers and found them to be truly insightful and impactful in the field. They have provided us with new perspectives and valuable insights that align well with our ongoing research. Your thoughtful recommendation has greatly enriched our understanding and enhanced the depth of our work. We sincerely appreciate your effort in sharing these papers with us and acknowledge the positive impact they have had on our research endeavors.

1. Heterogeneous Graph Neural Network via Attribute Completion. This paper presents a deep learning based methods for node feature completion using graph neural network and attention mechanism. We evaluated the the robustness of the designed model by randomly removing parts of arterial segments from the ICAs in the test set and performing the graph matching using the corrupted datasets. Though the proposed AGMN was robust, the performance would be further improved if we can complete node features using heterogenouse graph neural network. This paper has provided us with valuable insights into the field of graph-based node feature completion, and we appreciate the authors' effort in advancing this area of research. Their work has inspired us to explore novel techniques and methodologies to enhance the performance of similar models in our own research endeavors.

2. AS-GCN: Adaptive Semantic Architecture of Graph Convolutional Networks for Text-Rich Networks. This paper presents an adaptive semantic graph neural network for node classification. Using the semantic-aware propagation of information on the graph, both of the topology features and node features are considered in graph feature embedding and node classification. Their work has sparked our interest in exploring the effectiveness of adaptive semantic GCN for coronary artery semantic labeling in our own future research endeavors.

3. A Survey of Community Detection Approaches: From Statistical Modeling to Deep Learning. This paper summarized the current state-of-the-art works for community detection using probabilistic models and deep learning models. GCN and undirected graphical models are complementary and they can be integrated to further improve the performance of graph matching.

Thank you for your positive feedback and appreciation. The suggested papers related to graph machine learning are valuable for our research and they shed lights on our future research. Once again, we appreciate your diligence in introducing these important papers, and we are confident that their incorporation will significantly contribute to the overall value and impact of our futhre research. We include these papers in section 5 and section 5 now reads:

We use hand-crafted features as the pixel-level features to reduce the training time and model complexity. However, the feature representation capability is limited compared to CNN-extracted features. In the future, a lightweight deep learning-based method is recommended to automatically extract the pixel features for each segment rather than the hand-crafted radiomics features. Furthermore, in order to address the issue of missing arteries in the arterial individual graph, it is essential to explore attribute completion techniques using heterogeneous graph neural networks [38]. This approach can help fill in the gaps and ensure a more comprehensive representation of the arterial tree. Moreover, investigating adaptive edge feature aggregation in graph convolution is crucial as it allows for the consideration of the unequal contributions of different arteries during graph matching [39,40], leading to more accurate and reliable graph matching results.

**Reference**

[38] D. Jin, C. Huo, C. Liang, L. Yang, Heterogeneous Graph Neural Network via Attribute Completion, in: Proc. Web Conf. 2021, ACM, Ljubljana Slovenia, 2021: pp. 391–400. https://doi.org/10.1145/3442381.3449914.

[39] Z. Yu, D. Jin, Z. Liu, D. He, X. Wang, H. Tong, J. Han, AS-GCN: Adaptive Semantic Architecture of Graph Convolutional Networks for Text-Rich Networks, in: 2021 IEEE Int. Conf. Data Min. ICDM, 2021: pp. 837–846. https://doi.org/10.1109/ICDM51629.2021.00095.

[40] D. Jin, Z. Yu, P. Jiao, S. Pan, D. He, J. Wu, P.S. Yu, W. Zhang, A Survey of Community Detection Approaches: From Statistical Modeling to Deep Learning, IEEE Trans. Knowl. Data Eng. 35 (2023) 1149–1170. https://doi.org/10.1109/TKDE.2021.3104155.