View Reviews

Paper ID
1296

Paper Title
Disease Knowledge Transfer across Neurodegenerative Diseases

Reviewer #1

Questions

1. Please confirm that you have read and understood the MICCAI 2019 Reviewers' Guide https://www.miccai2019.org/information/information-cmt_rev/information-reviewers/
Agreement accepted

2. As reviewer conflicts have been taken into consideration for the paper allocation process, there are no allowable changes of co-authorship during the paper review process and after paper acceptance. Only in exceptional circumstances, requests for late authorship changes may be made in writing to the Program Chairs, but under no circumstances may they compromise the review process conflict checking and will be denied in such cases. Please acknowledge that you have read and understood this notice.
Agreement accepted

3. Please provide a summary of the paper (a few lines)
The authors of this paper propose a new framework to transfer biomarker information from neurodegenerative disease to another related one by inferring multimodal biomarker trajectories. The method is evaluate within a synthetic dataset and two different datasets involving AD and PCA patients. Moreover, the method shows for the first time a multimodal signature derived for PCA.

4. Please list the major strengths of the paper (bulleted list)
1. The paper is well structured.
2. The proposed method to infer the trajectory of multimodal biomarkers within longitudinal studies is novel and promising.
3. The evaluations are pertinent and the proposed technique — that is compared with state-of-the-art methods — shows promising results.
4. The strength and limitations of the method are well discussed.

5. Please list the major weaknesses of the paper (bulleted list).
1. The description of demography of the subjects involved in the validation datasets is missing.
2. Since the proposed technique is designed for longitudinal studies, it would be interested to see the impact of the number of visits and the time of follow up.

6. Please provide detailed and constructive comments for the authors. Please also refer to our Reviewer's guide on what makes a good review: http://www.miccai2019.org/information/information-reviewers/
1. A better description of the generation of synthetic dataset would help to appreciate the validation.
2. How many time visits and how long the follow up of each subjects is provided (is it homogeneous?)

7. Please rate the clarity and organisation of this paper
Very Good

8. Please rate whether the paper introduces significant scientific innovation.
Moderately likely

10. Please rate whether this work is likely to make a significant impact (clinical, scientific, algorithmic, biomedical, mathematical, etc.).

Moderately likely

Reviewer #4

Questions

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Agreement accepted

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Agreement accepted

3. Please provide a summary of the paper (a few lines)
Authors introduced Disease Knowledge transfer (DKT) for transferring biomarker information between related neurodegenerative diseases.

4. Please list the major strengths of the paper (bulleted list)
• DKT infers robust multimodal biomarker trajectories in rare neurodegenerative disease
• DKT is a joint-disease generative model of biomarker progression, which allows understanding underlying disease mechanisms and also predicting the future evolution of subjects at risk of disease.

5. Please list the major weaknesses of the paper (bulleted list).
• It is not generally convincing to use sigmoid function to model two functions
• Some errors
• Lack of the detailed interpretation for the results

6. Please provide detailed and constructive comments for the authors. Please also refer to our Reviewer's guide on what makes a good review: http://www.miccai2019.org/information/information-reviewers/
In Method section, authors model both two functions using sigmoid function. It might be reasonable for the disease stage to a dysfunction score with the assumption that the function is a smooth monotonic. However, the trajectory of biomarker within agnostic unit is a function of mapping dysfunctionality score to biomarker value.
It might not always be monotonically increasing.

This also relates to the motivation of better interpretation than existing transfer learning methods. Unfortunately, authors did not show the detailed interpretation of the obtained results, but eave it as the future work. Hence, the motivation of the good interpretation of this method is not verified by the experiments.

In equation (1) and (2), the subscript j for the jth visit is missing. This confuses the understanding of this model on how it works. From the model, the model parameter beta and lambda should be related to each subject, so how is the model possible for the prediction of unseen data?

7. Please rate the clarity and organisation of this paper
Satisfactory

8. Please rate whether the paper introduces significant scientific innovation.
Neutral

10. Please rate whether this work is likely to make a significant impact (clinical, scientific, algorithmic, biomedical, mathematical, etc.).
Neutral

Reviewer #5

Questions

1. Please confirm that you have read and understood the MICCAI 2019 Reviewers' Guide https://www.miccai2019.org/information/information-cmt_rev/information-reviewers/
Agreement accepted

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Agreement accepted

3. Please provide a summary of the paper (a few lines)
1. This paper introduces Disease Knowledge Transfer (DKT) to transfer biomarker information between related neurodegenerative diseases. It is a joint-disease generative model of biomarker regressions.
2. The proposed method is claimed to be the first work to estimate plausible multimodal biomarker trajectories in Posterior Cortical Artophy (PCA).
3. Experiments have validated on synthetic data and two patients datasets.

4. Please list the major strengths of the paper (bulleted list)
1. The proposed DKT is interpretable and can also predict the future evolution of subjects at risk of diseases.
2. DKT can model the dynamics of some biomarkers disease-agnostic.

5. Please list the major weaknesses of the paper (bulleted list).
1. Missing details in method section which will make readers difficult to follow and re-implement.
2. It seems the authors didn't compare with state-of-the-art methods.

6. Please provide detailed and constructive comments for the authors. Please also refer to our Reviewer's guide on what makes a good review: http://www.miccai2019.org/information/information-reviewers/
1. Solving the full model likelihood (3) is also very important for readers. However, not much details are given which will not help readers understand how model parameters are estimated. It is recommended to include a detailed algorithm here.
2. It is important to compare with other state-of-the-art models as authors claimed the contribution of the proposed DKT. Discussions with other transfer learning methods [4, 5] can be included in experiments to better see their limitations.

7. Please rate the clarity and organisation of this paper
Very Good

8. Please rate whether the paper introduces significant scientific innovation.
Moderately likely

10. Please rate whether this work is likely to make a significant impact (clinical, scientific, algorithmic, biomedical, mathematical, etc.).
Moderately likely