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AN EVENT-CONTRASTIVE CONNECTOME NETWORK FOR AUTOMATIC ASSESSMENT OF INDIVIDUAL FACE PROCESSING AND MEMORY ABILITY

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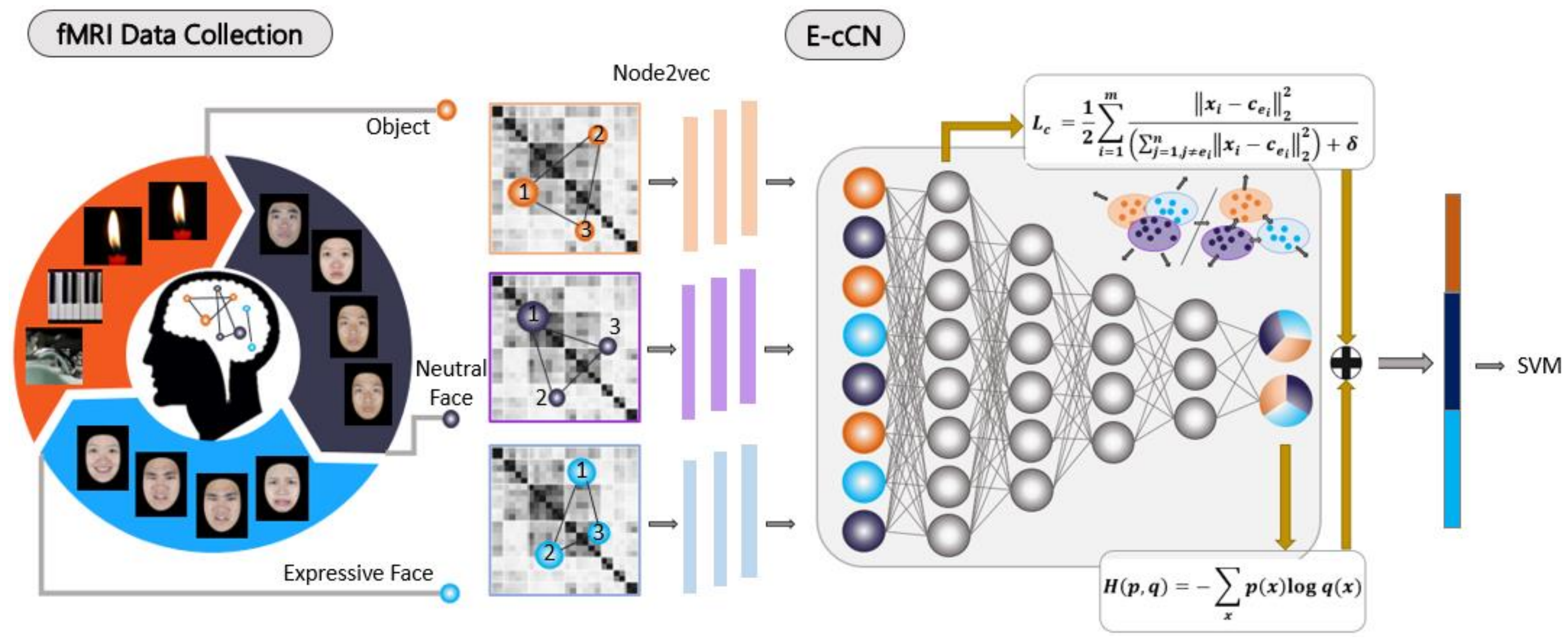
Introduction

- The ability to recognize face identity is a key social component and is highly related to brain functional connectivity.
- Face perception including low level visual retrieval to high level emotion recognition worth further discussion in different brain pattern under distinct stage.
- Our framework is learned based on Node2Vec and additionally optimized with contrastive loss to enhance clustering between representation under same stages.

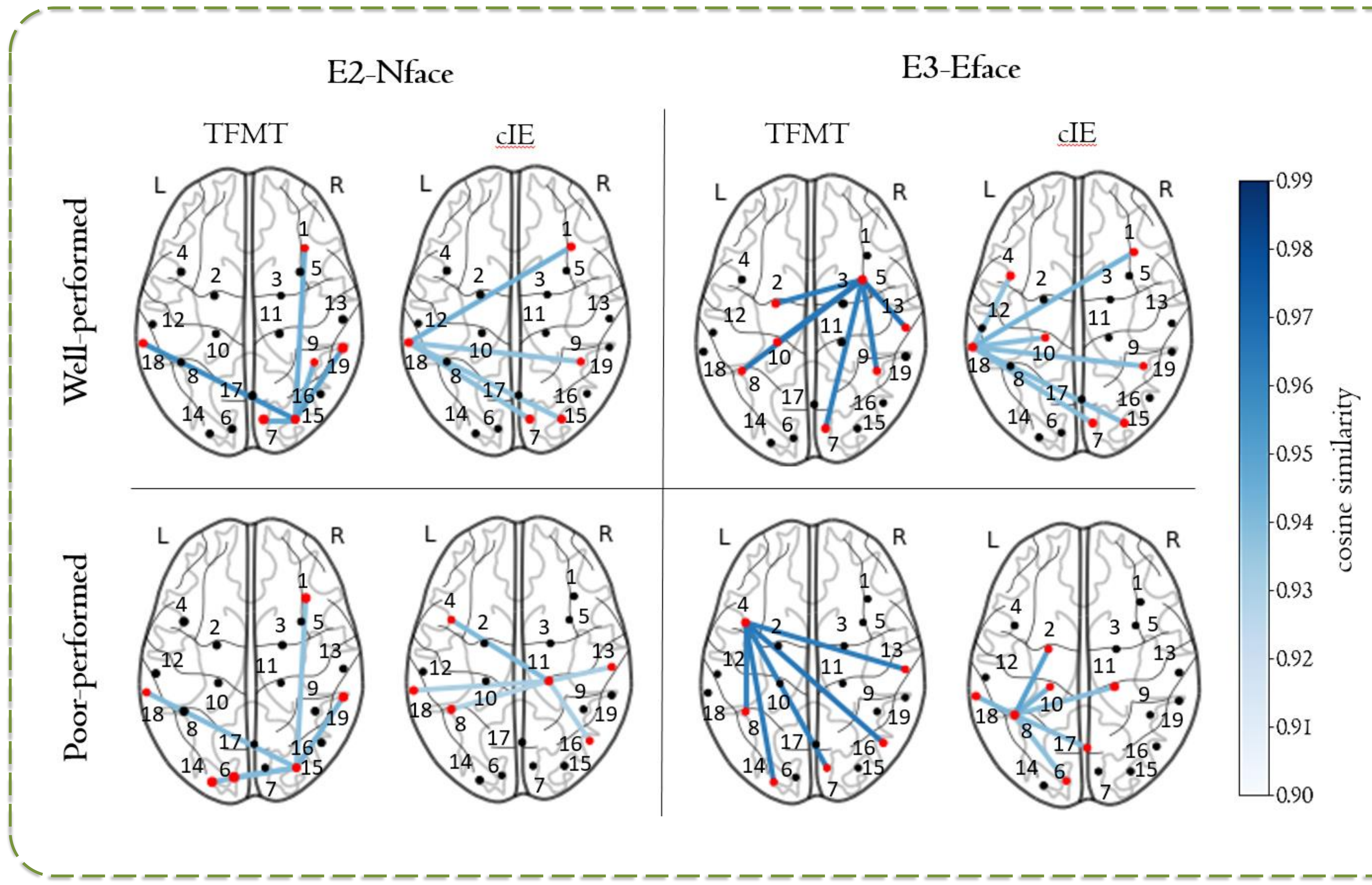
Research Methodology

- **Participants**: We recruited 44 subjects to conduct one-back working memory test with three kinds of event setting, i.e., object, neutral face and expressive face images.
- **fMRI Experiment**: Block design with 18 image blocks and 17 fixation blocks in between (each lasts for 12s)
- **Face Recognition Ability Labels**:
  a. Taiwanese Face Memory Test
     30 trials of novel-image stage and 24 trials of novel-image with varying degrees of noise.
  b. Component Test:
     Inverse efficiency score was used to quantity speed-accuracy tradeoffs.

Experimental setup and results



	TFMT				cIE			
	E1-Object	E2-Nface	E3-Eface	Fusion	E1-Object	E2-Nface	E3-Eface	Fusion
ICA	55.79	55.68	60.95	62.32	60.47	65.38	59.40	61.32
PCA	64.32	60.32	62.32	64.95	49.16	58.55	54.91	59.40
Graph-SVM	64.32	64.32	64.32	67.57	61.32	61.32	62.39	65.17
DeepWalk	53.05	51.58	63.47	62.95	61.32	70.73	68.80	68.80
LINE	55.78	45.16	51.79	59.07	58.33	53.21	64.74	64.32
Node2Vec	58.55	72.65	69.02	73.72	63.68	78.42	63.68	80.34
E-cCN	74.95	71.58	62.95	**80.20**	79.27	76.71	79.49	**82.05**



1. IFGOR (R) 2. Amygdala (L)
3. Amygdala (R) 4. ATL (L)
5. ATL (R) 6. Calcarine (L)
7. Calcarine (R) 8. FFA (L)
9. FFA (R) 10.Hippocampus (L)
11. Hippocampus (R)
12. mSTS (L) 13. mSTS (R)
14. OFA (L) 15. OFA (R)
16. OP Junction (R)
17. Precuneus (R)
18. pSTS (L)
19. pSTS (R)

Conclusions

- Contrastive-based joint learning indeed help uncover the discriminative information.
- E-cCN slightly negatively impacts the results of face condition, but improves the overall prediction results after fusion.
- We found rOFA and rFFA show up together in neutral face condition in high-performance group while low-performance group either misses rFFA or involves with high-level ROI such as lATL and hippocampus.

Future work

- Incorporating event-conditioned constraint in learning Node2Vec, such that the complete model could be trained end-to-end.
- We would like to apply our method in other brain-related disease such as autism and dementia, which will hopefully bring further insights in understanding the brain network differences between healthy control and patients.

References

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