

# Gu, Shi (顾实)

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## EDUCATION:

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University of Pennsylvania (UPenn), School of Arts and Science Advisors: Dr. Danielle S. Bassett Ph.D. in Applied Mathematics and Computational Science Dissertation: Control Theory Analysis on Brain Networks	Philadelphia, PA, USA Fall 2011 – Spring 2016
Tsinghua University - Academic Talent Program B.S. in Mathematics and Physics	Beijing, China Fall 2007 – Spring 2011

## EXPERIENCE:

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Professor in Computer Science and Engineering of UESTC. Director of Brain and Intelligence Laboratory	Chengdu, China June 2017–
Postdoc in Psychiatric and Developmental Imaging Laboratory.	Philadelphia, PA May 2016 – May 2017

## HONORS:

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NeurIPS 2021 Outstanding Reviewer Award	Oct 2021
Forbes China 30 under 30 for 2017	July 2017
China's 1000 Young Talent Program	May 2017
Benjamin Franklin Fellowship, University of Pennsylvania,	June 2011
Union Gold Medal winner (ranked 1 <sup>st</sup> ) of S-T Yau College Students Mathematics Contest	Oct 2010

## PUBLICATIONS:

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### Leading and corresponding author papers:

1. **Shi Gu**, Fabio Pasqualetti, Matthew Cieslak, Scott T. Grafton, Danielle S. Bassett. Controllability of Structural Brain Networks. Nature Communications. Nat Commun. 2015, 6:8414.

2. **Shi Gu**, Theodore Satterthwaite, John Medaglia, Muzhi Yang, Raquel Gur, Ruben Gur, Danielle S. Bassett. Emergence of System Roles in Normative Neurodevelopment. *PNAS*. 112(44): 13681-13686
3. **Shi Gu**, Richard F. Betzel, Matthew Cieslak, Scott T. Grafton, Fabio Pasqualetti, Danielle Bassett. Optimal Trajectories of Brain State Transitions. *NeuroImage* (2017).
4. **Shi Gu**, Muzhi Yang, John D. Medaglia, Ruben C. Gur, Raquel E. Gur, Theodore D. Satterthwaite, and Danielle S. Bassett. "Functional hypergraph uncovers novel covariant structures over neurodevelopment." *Human brain mapping* 38, no. 8 (2017): 3823-3835.
5. **Shi, Gu**, Matthew Cieslak, Benjamin Baird, Sarah F. Muldoon, Scott T. Grafton, Fabio Pasqualetti, and Danielle S. Bassett. "The energy landscape of neurophysiological activity implicit in brain network structure." *Scientific reports* 8, no. 1 (2018): 1-15.
6. **Shi, Gu**, Cedric Huchuan Xia, Rastko Ciric, Tyler M. Moore, Ruben C. Gur, Raquel E. Gur, Theodore D. Satterthwaite, and Danielle S. Bassett. "Unifying the Notions of Modularity and Core-Periphery Structure in Functional Brain Networks during Youth." *Cerebral Cortex* 30, no. 3 (2020): 1087-1102.
7. Yang, Huzheng, Xiaoxiao Li, Yifan Wu, Siyi Li, Su Lu, James S. Duncan, James C. Gee, and **Shi Gu\***. "Interpretable Multimodality Embedding of Cerebral Cortex Using Attention Graph Network for Identifying Bipolar Disorder." In *International Conference on Medical Image Computing and Computer-Assisted Intervention*, pp. 799-807. Springer, Cham, 2019.
8. Zhang, Tianwei, Lequan Yu, Na Hu, Su Lv, and **Shi Gu\***. "Robust Medical Image Segmentation from Non-expert Annotations with Tri-network." In *International Conference on Medical Image Computing and Computer-Assisted Intervention*, pp. 249-258. Springer, Cham, 2020.
9. Cui, Hengji, Dong Wei, Kai Ma, **Shi Gu\***, and Yefeng Zheng. "A Unified Framework for Generalized Low-Shot Medical Image Segmentation with Scarce Data." *IEEE Transactions on Medical Imaging* (2020).
10. Deng, Shikuang and **Shi Gu\***. "Optimal Conversion of Conventional Artificial Neural Networks to Spiking Neural Networks." *International Conference on Learning Representations* (2021).
11. Yuhang Li, Ruihao Gong, Xu Tan, Yang Yang, Peng Hu, Qi Zhang, Fengwei Yu, Wei Wang, **Shi Gu\***. "BRECQ: Pushing the Limit of Post-Training Quantization by Block Reconstruction." *International Conference on Learning Representations* (2021).
12. Yuhang Li, Shikuang Deng, Ruihao Gong, Xin Dong, **Shi Gu\***. "Towards Accurate Spiking Neural Networks Conversion by Adaptive Threshold and Layer-wise Calibration." *International Conference on Machine Learning* (2021).
13. Yuhang Li, Feng Zhu, Ruihao Gong, Mingzhu Shen, Xin Dong, Fengwei Yu, Shaoqing Lu, **Shi Gu\***. "MixMix: All You Need for Data-Free Compression Are Feature and Data Mixing." *International Conference on Computer Vision* (2021).
14. Yuhang Li, Yufei Guo, Shanghang Zhang, Shikuang Deng, Yongqing Hai, **Shi Gu\***. "Differentiable Spike: Rethinking Gradient-Descent for Training Spiking Neural Networks." *Neural Information Processing Systems* (2021).

#### **Collaborative papers:**

1. Richard F Betzel, **Shi Gu**, John D Medaglia, Fabio Pasqualetti, Danielle S. Basset. Optimally controlling the human connectome: the role of network topology. *Scientific Reports* 6 (2016).

2. Sarah Feldt Muldoon, Fabio Pasqualetti, **Shi Gu**, Matthew Cieslak, Scott T. Grafton, Jean M. Vettel, Danielle S. Bassett. Stimulation-based control of dynamic brain networks. *PLoS Comput Biol*, 12(9), p.e 1005076.
3. Wiles, Laura, **Shi Gu**, Fabio Pasqualetti, Brandon Parvesse, David Gabrieli, Danielle S. Bassett, and David F. Meaney. "Autaptic connections shift network excitability and bursting." *Scientific Reports* 7 (2017).
4. Ashourvan, Arian, **Shi Gu**, Marcelo G. Mattar, Jean M. Vettel, and Danielle S. Bassett. "The Energy Landscape Underpinning Module Dynamics in the Human Brain Connectome." *NeuroImage* (2017)..
5. Medaglia, John D., Shi Gu, Fabio Pasqualetti, Rebecca L. Ashare, Caryn Lerman, Joseph Kable, and Danielle S. Bassett. "Cognitive control in the controllable connectome." *arXiv preprint arXiv:1606.09185* (2016).
6. Murphy, Andrew C., Shi Gu, Ankit N. Khambhati, Nicholas F. Wymbs, Scott T. Grafton, Theodore D. Satterthwaite, and Danielle S. Bassett. "Explicitly linking regional activation and function connectivity: community structure of weighted networks with continuous annotation." *arXiv preprint arXiv:1611.07962* (2016).
7. Heidi K Norton, Harvey Huang, Daniel J Emerson, Jesi Kim, **Shi Gu**, Danielle S Bassett, Jennifer E Phillips-Cremins. Detecting hierarchical 3-D genome domain reconfiguration with network modularity. *Nature methods*, 15(2), p.119
8. Tang, Evelyn, Chad Giusti, Graham L. Baum, **Shi Gu**, Eli Pollock, Ari E. Kahn, David R. Roalf et al. "Developmental increases in white matter network controllability support a growing diversity of brain dynamics." *Nature Communications* 8, no. 1 (2017): 1252.
9. Cedric Huchuan Xia, Zongming Ma, Rastko Ciric, **Shi Gu**, Richard F Betzel, Antonia N Kaczkurkin, Monica E Calkins, Philip A Cook, Angel Garcia de la Garza, Simon N Vandekar, Zaixu Cui, Tyler M Moore, David R Roalf, Kosha Ruparel, Daniel H Wolf, Christos Davatzikos, Ruben C Gur, Raquel E Gur, Russell T Shinohara, Danielle S Bassett, Theodore D Satterthwaite., 2018. Linked dimensions of psychopathology and connectivity in functional brain networks. *Nature communications*, 9(1), p.3003.
10. Zhen Yang, **Shi Gu**, Nicolas Honnorat, Kristin A Linn, Russell T Shinohara, Irem Aselcioglu, Steven Bruce, Desmond J Oathes, Christos Davatzikos, Theodore D Satterthwaite, Danielle S Bassett, Yvette I Sheline. *Molecular psychiatry*, p.1.
11. Bernhardt, Boris C., Fatemeh Fadaie, Min Liu, Benoit Caldaïrou, **Shi Gu**, Elizabeth Jefferies, Jonathan Smallwood, Danielle S. Bassett, Andrea Bernasconi, and Neda Bernasconi. "Temporal lobe epilepsy: Hippocampal pathology modulates connectome topology and controllability." *Neurology* 92, no. 19 (2019): e2209-e2220.
12. Yang, Zhen, Qawi K. Telesford, Alexandre R. Franco, Ryan Lim, **Shi Gu**, Ting Xu, Lei Ai et al. "Measurement Reliability for Individual Differences in Multilayer Network Dynamics: Cautions and Considerations." *NeuroImage* (2020): 117489.
13. Cui, Zaixu, Jennifer Stiso, Graham L. Baum, Jason Z. Kim, David R. Roalf, Richard F. Betzel, **Shi Gu** et al. "Optimization of energy state transition trajectory supports the development of executive function during youth." *Elife* 9 (2020): e53060.
14. Ashourvan, Arian, Preya Shah, Adam Pines, **Shi Gu**, Christopher W. Lynn, Danielle S. Bassett, Kathryn A. Davis, and Brian Litt. "Pairwise maximum entropy model explains the role of white matter structure in shaping emergent co-activation states." *Communications Biology* 4, no. 1 (2021): 1-15.

15. Zhang, Longfei, Ke Li, and **Shi Gu**. "Empirical study of correlations in the fitness landscapes of combinatorial optimization problems." *Proceedings of the Genetic and Evolutionary Computation Conference Companion*. 2021.

## FUNDINGS:

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1. NSFC General program 61876032: controllability modeling and analysis on functional brain networks. Amount: RMB 620K
2. Young Talent Program package: RMB 3 million
3. School startup package: RMB 3 million
4. General program (Shenzhen): Brain-inspired Training Methods of Spiking Neural Network

## ACTIVITIES:

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1. IPMI 2019 International Summer School, May 2019, Chengdu, Co-organizer.
2. SfN Global Event: AI meets Neuroscience, Jan 2021, Online, Co-chair.
3. Board Member: Recruitment of Tenure-track Assistant Professor in Computer Science, UESTC, 2020
4. Frontiers in Neuroimaging, Associate Editor

## INVITED TALKS:

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1. TEDxChengdu 2017: Understand our brain, Chengdu, Nov, 2017
2. NetSci 2018 Satellite Symposium: Controlling complex networks, Paris, June 11, 2018
3. OHBM 2018 Symposium: A spotlight on network hub, Singapore, June 11, 2018
4. SfN 2018 Minisymposium: Controllability Analysis on Functional Brain Networks, Nov 6, 2018
5. SfN 2019 Minisymposium: Cross-modality optimization of Brain's Modular Structure, Oct 22, 2019
6. Invited Talk in Fudan University: Neurodevelopment from the network perspective, May 2020
6. Invited Talk in Tsinghua University: Control Theoretic Analysis on Brain Networks, May 2021
7. Invited Talk in Peking University: Conversion Theory for Spiking Neural Networks, May 2021
8. Invited Lecture in Peking University: Introduction to Network Neuroscience, May 2021

## REFERENCES:

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1. **Danielle S. Bassett**, [dsb@seas.upenn.edu](mailto:dsb@seas.upenn.edu)  
J. Peter Skirvanich Professor, University of Pennsylvania & Santa Fe Institute
  2. **Theodore D. Satterthwaite**, [sattertt@pennmedicine.upenn.edu](mailto:sattertt@pennmedicine.upenn.edu)  
Associate Professor & Director of PennLINC, University of Pennsylvania
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Associate Professor of Radiologic Science in Radiology, University of Pennsylvania
  4. **Charles L. Epstein**, [cle@math.upenn.edu](mailto:cle@math.upenn.edu)  
Thomas A. Scott Professor of Mathematics, Founding AMCS Chair, University of Pennsylvania
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