

# Shijun ZHANG

Research Fellow

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## Work Experience

**Research Fellow**, National University of Singapore, Singapore

Jan 2021 ~ Present

Mentor: [Zuowei Shen](#)

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## Education

**Ph.D. in Mathematics**, National University of Singapore, Singapore

Aug 2016 ~ Jan 2021

Thesis: *Deep neural network approximation via function compositions*

Supervisor: [Zuowei Shen](#) and [Haizhao Yang](#)

**B.S. in Mathematics**, Wuhan University, China

Sep 2012 ~ Jul 2016

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## Honors and Awards

The EASIAM (East Asia section of SIAM) Student Paper Prize, 2020 ~ 2021, first prize, [URL](#).

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## Publications

### PhD Thesis

Shijun Zhang. *Deep neural network approximation via function compositions*. PhD Thesis, National University of Singapore. [ [URL](#) ]

### Preprints

- [8] Zuowei Shen, Haizhao Yang, Shijun Zhang. *ReLU network approximation in terms of intrinsic parameters*. Preprint, available on request.
- [7] Zuowei Shen, Haizhao Yang, Shijun Zhang. *Deep network approximation: achieving arbitrary accuracy with fixed number of neurons*. Submitted. [ [arXiv](#) ]

## Published (Accepted)

- [6] Zuowei Shen, Haizhao Yang, Shijun Zhang. *Optimal approximation rate of ReLU networks in terms of width and depth*. Accepted by *Journal de Mathématiques Pures et Appliquées*. [ [arXiv](#), [URL](#) ]
- [5] Jianfeng Lu, Zuowei Shen, Haizhao Yang, Shijun Zhang. *Deep network approximation for smooth functions*. *SIAM Journal on Mathematical Analysis*, Volume 53, Issue 5, September 2021, Pages 5465–5506. [ [arXiv](#), [URL](#) ]
- [4] Zuowei Shen, Haizhao Yang, Shijun Zhang. *Neural network approximation: Three hidden layers are enough*. *Neural Networks*, Volume 141, September 2021, Pages 160-173. [ [arXiv](#), [URL](#) ]
- [3] Zuowei Shen, Haizhao Yang, Shijun Zhang. *Deep network with approximation error being reciprocal of width to power of square root of depth*. *Neural Computation*, Volume 33, Issue 4, April 2021, Pages 1005-1036. [ [arXiv](#), [URL](#) ]
- [2] Zuowei Shen, Haizhao Yang, Shijun Zhang. *Deep network approximation characterized by number of neurons*. *Communications in Computational Physics*, Volume 28, Issue 5, November 2020, Pages 1768-1811. [ [arXiv](#), [URL](#) ]
- [1] Zuowei Shen, Haizhao Yang, Shijun Zhang. *Nonlinear approximation via compositions*. *Neural Networks*, Volume 119, November 2019, Pages 74-84. [ [arXiv](#), [URL](#) ]