

# Tao WEN

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## EDUCATIONAL BACKGROUND

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### Singapore University of Technology and Design

Singapore

MEng. (Research) in Science, Mathematics & Technology

09/2020-Expect 09/2021

Advisor: Professor Kang Hao Cheong

### Northwestern Polytechnical University

Xi'an, China

B. Eng. in Detection, Guidance and Control Technology (System Engineering) GPA: 3.8/4.0

09/2015-07/2019

Advisor: Professor Wen Jiang & Yong Deng

### Australian National University

Canberra, Australia

Summer Session

01/2019-02/2019

## RESEARCH PAPERS [[Google Scholar](#)]

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\* Corresponding Author; † Contribute equally.

### 2020

1. K. H. Cheong\*, **T. Wen**, J. W. Lai. "Relieving cost of epidemic by Parrondo's paradox: A COVID-19 case study," *Advanced Science*. vol. 7, p. 2002324, 2020. [[PDF](#)] [[Press](#)]
2. **T. Wen**, D. Pelus, Y. Deng\*. "Vital Spreaders Identification in Complex Networks with Multi-Local Dimension," *Knowledge-Based Systems*. vol. 195, p. 105717, 2020. [[PDF](#)]
3. **T. Wen**, Y. Deng\*. "The vulnerability of community structure in complex networks: An entropy approach," *Reliability Engineering & System Safety*. vol. 196, p. 106782, 2020. [[PDF](#)] (**ESI Highly Cited Paper**)
4. **T. Wen**, Y. Deng\*. "Identification of influencers in complex network by local information dimensionality," *Information Sciences*. vol. 512, pp. 549-562, 2020. [[PDF](#)] (**ESI Highly Cited Paper**)

### 2019

1. **T. Wen**, S. Duan, W. Jiang\*. "Node similarity measuring in complex networks with relative entropy," *Communications in Nonlinear Science and Numerical Simulation*. vol. 78, p. 104867, 2019. [[PDF](#)]
2. **T. Wen**, W. Jiang\*. "Identifying influential nodes based on fuzzy local dimension in complex networks," *Chaos, Solitons & Fractals*, vol. 119, pp. 332-342, 2019. [[PDF](#)]
3. **T. Wen**, W. Jiang\*. "Measuring the complexity of complex network by Tsallis entropy," *Physica A: Statistical Mechanics and Its Applications*. vol. 526, p. 121054, 2019. [[PDF](#)]
4. S. Duan, **T. Wen**, W. Jiang\*. "A new information dimension of complex network based on Rényi entropy," *Physica A: Statistical Mechanics and Its Applications*, vol. 516, pp. 529-542, 2019. [[PDF](#)]
5. **T. Wen**, S. Duan, W. Jiang\*. "Forecasting time series based on visibility graph and relative entropy," *The Ninth Chinese Information Fusion Conference*, Taiyuan, Oct. 2019. (In Chinese)
6. S. Duan, **T. Wen**, X. Deng, W. Jiang\*. "Identifying influential nodes based on Tsallis entropy and information dimension," *The Ninth Chinese Information Fusion Conference*, Taiyuan, Oct. 2019. (In Chinese)

### 2018

1. **T. Wen**, M. Song, W. Jiang\*. "Evaluating topological vulnerability based on fuzzy fractal dimension," *International Journal of Fuzzy Systems*, vol. 20, pp. 1956-1967, 2018. [[PDF](#)]
2. **T. Wen**, W. Jiang\*. "An information dimension of weighted complex networks," *Physica A: Statistical Mechanics and Its Applications*, vol. 501, pp. 388-399, 2018. [[PDF](#)]
3. S. Xu, Z. He, **T. Wen**, W. Jiang\*. "A Physarum-inspired Model for the Path Planning of Uninhabited Combat Air

Vehicle,” *The Eighth Chinese Information Fusion Conference*, Xi’an, July, 2018. (In Chinese)

#### **Paper submitted to Journal**

1. K. H. Cheong<sup>\*†</sup>, T. Wen<sup>†</sup>, S. Benler, E. V. Koonin. “Alternating lysis and lysogeny: a winning strategy in bacteriophages due to Parrondo's Paradox,” *Nature Communications*. Under Review.
2. T. Wen, K. H. Cheong<sup>\*</sup>. “Gravity-based Community Vulnerability Evaluation Model in Social Networks: GBCVE,” *IEEE Transactions on Cybernetics*. Second Revision.
3. T. Wen, K. H. Cheong<sup>\*</sup>. “The Fractal Dimension of Complex Networks: A Review,” *Information Fusion*. Under Review.
4. T. Wen, K. H. Cheong<sup>\*</sup>. “Examining the Parrondo's effect across stock markets,” *Nonlinear Dynamics*. Under Review.
5. Z. Liu<sup>†</sup>, T. Wen<sup>†</sup>, Y. Deng<sup>\*</sup>, H. Fujita. “Cooperation-guided Experts Importance Identification Model with Fuzzy Framework: A Network Design,” *IEEE Transactions on Cybernetics*. Under Review.
6. Y. Dai, G. Zhan, Y. Ye, W. Bao, T. Wen, K. H. Cheong<sup>\*</sup>, N. Xie<sup>\*</sup>. “Game dynamics of emotion evolution based on the Moran process,” *Chaos: An Interdisciplinary Journal of Nonlinear Science*. Under Review.
7. T. Wen, Y. Deng<sup>\*</sup>. “The Information Volume of Uncertain Information: (3) Information Fractal Dimension”. Prepare to submit.
8. T. Wen, Y. Deng<sup>\*</sup>. “The Information Volume of Uncertain Information: (6) Information Multifractal Dimension”. Prepare to submit.

#### **RESEARCH EXPERIENCE**

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##### **Analyzing the Parrondo's paradox phenomenon in complex networks**

Jan. 2020 – Now

**Singapore University of Technology and Design**, Advisor: Professor Kang Hao Cheong

- Explored the increase in economic and health cost caused by different strategies (open community & lockdown) under the epidemic of COVID-19, but the loss can be controlled by taking alternating strategies based on time-based and result-based switching scheme – a phenomenon attributed to Parrondo's paradox.
- Reviewed the development and progress of fractal characteristics in the network systematically, including network covering, various concepts of dimensions, and their real-world applications.

##### **Finding Important Properties of Nodes and Communities in Complex Networks**

June 2019 – Sep. 2019

**University of Electronic Science and Technology of China**, Advisor: Professor Yong Deng

- Combined the internal factors and external factors of community to measure the vulnerability of each community and improved the recognition accuracy in real-world network applications via the entropy-based method.
- Collected the personal opinion of each expert by 2-order additive fuzzy measure and identified the most important expert after constructing the expert network based on their relationships, thereby solving group decision-making problems without sufficient information.

##### **Network mining: Exploring the Properties of Networks by Applying Different Dimension**

May 2016 – June 2019

**Northwestern Polytechnical University**, Advisor: Professor Wen Jiang & Yong Deng

- Promoted information dimension and Rényi dimension into weighted complex networks and explored the fractal and self-similarity properties of complex networks.
- Developed several recognition models based on the dimension of the network to solve practical problems, such as measuring the complexity and vulnerability of airline networks, as well as identifying the similarity and importance of individuals.

##### **Evaluating Topological Vulnerability of Networks Based on Fuzzy Fractal Dimension**

May 2017 – May 2018

**Team Leader**, National Undergraduate Training Programs for Innovation and Entrepreneurship (¥ 20,000)

##### **An Autonomous Landing Scheme for Cargo Drone Based on Computer Vision**

May 2017 – May 2018

**Researcher**, National Undergraduate Training Programs for Innovation and Entrepreneurship (¥ 20,000)

## HONORS AND AWARDS

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[Sep. 2020] Singapore University of Technology and Design MEng (Research) Fellowship (S\$ 1500 / month)

[Nov. 2019] The “Challenge Cup” National Undergraduate Extracurricular Academic Science and Technology Contest:  
**Special First Prize (Top 4%)**

**Highest award** in the field of information science in natural science papers.

The “Challenge Cup” is the **highest academic science and technology competition** in China.

[May 2019] The “Challenge Cup” National Undergraduate Extracurricular Academic Science and Technology Contest in Shaanxi Area: **Outstanding Winner (TOP 5%)**

**Best grade** in the field of natural science papers in Northwestern Polytechnical University **so far**.

[Sep. 2018] **Outstanding Student Pacemaker in Northwestern Polytechnical University (TOP 0.1%)**

Only **10 undergraduates** are awarded among more than 12,000 undergraduates in NWPU in 2018.

[Sep. 2018] **China National Scholarship (Top 1%)**

**Highest honor** for students’ year achievement in the School of Electronics and Information.

[Feb. 2018] Global Mathematical Contest in Modeling: **Meritorious Winner**

[Oct. 2017] Mathematical Contest in Modeling for Chinese Undergraduate Students in Shaanxi Area: **First Prize**

[Sep. 2017] Second Prize scholarship of AVIC Optronics Institute (**TOP 5%**)

[Sep. 2017] First Prize scholarship of Northwestern Polytechnical University (**TOP 10%**)

[Feb. 2017] Global Mathematical Contest in Modeling: **Honorable Mention**

## ACADEMIC SERVICE

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- Independent reviewer for *IEEE Transactions on Signal and Information Processing over Networks*.
- Conference talks at Ninth China Information Fusion Conference, Taiyuan, China.

## EXTRACURRICULAR ACTIVITIES

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- Volunteer of *International Conference on Intelligent Unmanned System* (2018).
- Volunteer of *Northwestern Polytechnical University 80th Anniversary*.

## SKILLS

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**Technical:** MATLAB, Python, C language, LaTeX, Gephi, Origin, Visio.

**Languages:** Mandarin, English (TOEFL 98).