Oct. 11, 2020

Tao WEN

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EDUCATIONAL BACKGROUND

Singapore University of Technology and Design **Singapore**
MEng. (Research) in Science, Mathematics & Technology 09/2020-Expect 07/2021
Advisor: Professor Kang Hao Cheong

Northwestern Polytechnical University **Xi'an, China**
B. Eng. in Detection, Guidance and Control Technology (System Engineering) GPA: 3.84/4.0 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]

* 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*. 2002324. DOI: 10.1002/advs.202002324 [PDF]
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, no. 6, 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. **T. Wen**, K. H. Cheong*, Eugene V. Koonin. "-----," *Nature*. Prepare to submit.
2. **T. Wen**, K. H. Cheong*. "Gravity-based Community Vulnerability Evaluation Model in Social Networks: GBCVE," *IEEE Transactions on Cybernetics*. Second Revision.
3. Z. Liu†, **T. Wen**†, Y. Deng*, H. Fujita. "Cooperation-guided Experts Importance Identification Model with Fuzzy Framework: A Network Design," *IEEE Transactions on Cybernetics*. Under Review.
4. **T. Wen**, K. H. Cheong*. "The Fractal Dimension of Complex Networks: A Review," *Nonlinear Dynamics*. Prepare to submit (Invited review paper).
5. Y. Dai, G. Zhan, Y. Ye, W. Bao, **T. Wen**, K. H. Cheong*, N. Xie*. "Game dynamics of emotion evolution based on the Moran process," *Chaos: An Interdisciplinary Journal of Nonlinear Science*. Under Review.
6. **T. Wen**, Y. Deng*. "The Information Volume of Uncertain Information: (3) Information Fractal Dimension," Prepare to submit.
7. **T. Wen**, Y. Deng*. "The Information Volume of Uncertain Information: (6) Information Multifractal Dimension," Prepare to submit.

SOFTWARE COPYRIGHT

1. **T. Wen**, S. Duan, W. Jiang. User Similarity Detecting in Social Network Software based on MATLAB V1.0, 2019SR0858917.
2. **T. Wen**, S. Duan, W. Jiang. Critical Node Identifying in Information Network Software based on MATLAB V1.0, 2019SR0858914.
3. **T. Wen**, S. Liang, W. Jiang. Evaluating Topological Vulnerability Software based on MATLAB V1.0, 2018SR202109.
4. **T. Wen**, S. Liang, W. Jiang. Measuring Network Complexity Software based on MATLAB V1.0, 2018SR221765.
5. S. Duan, **T. Wen**, X. Deng, W. Jiang. Calculating Network Fractal Dimension Software based on Rényi Entropy V1.0, 2019SR0456722.
6. S. Duan, **T. Wen**, X. Liu, X. Deng, W. Jiang. Importance Node Identifying in Network based on Tsallis Entropy V1.0, 2019SR0858911.

RESEARCH EXPERIENCE

Analyzing the Parrondo's paradox phenomenon in complex networks Jan. 2020 – Now

Singapore University of Technology and Design

Graduate Research Assistant Advisor: Professor Kang Hao Cheong

- Explored the economic and health cost caused by different strategies (open community & lockdown) under the epidemic of COVID, and Parrondo's paradox phenomenon appeared when taking alternating strategies based on time-based and result-based switching scheme.
- Proposed the gravity-based model to describe the large-scale interaction relationship between communities, and quantified the vulnerability of communities in the social network when considering information in different scales.
- Explored the lysis-lysogeny decision of bacteriophage by game theory, and found the reason for the existence of such a slow-growing phase (lysogenic phase) as a competitive evolutionary strategy for bacteriophages.

Finding Important Properties of Nodes and Communities in Complex Networks June 2019 – Sep. 2019

University of Electronic Science and Technology of China

Undergraduate Research Assistant Advisor: Professor Yong Deng

- Unified the local dimension and local information dimension to analyze the fractal property around the central node, and proposed the multi-local dimension with the weighting coefficient q to consider the information in different scales which can degenerate to the other dimensions with a special value of q.
- 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

Undergraduate Research Assistant 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)

- Collected a great deal of data about the American airline networks from Bureau of Transportation Statistics, and processed the network data to make it a connected graph.
- Proposed a novel method to evaluate the topological vulnerability of complex networks based on the fuzzy theory, fractal dimension, and average edge betweenness, and analyzed the vulnerability change of the American airline networks from 2005 to 2013.

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)

- Used Pixhawk as the flight control platform, and processed the images from pan-tilt-zoom camera through airborne computer card.
- Proposed a novel method based on Support Vector Machine to identify the landing sign and estimate the cargo drone's pose to guide its autonomous landing.

Exploring the Composition and Future Scalability of Smart House Jan. 2019 – Feb. 2019

Australian National University

Summer Session Course Project

- Explored the composition of subsystems in a smart house based on the Canberra situation, and sought the relationship between different subsystems.
- Designed the detailed model of each subsystem, and obtained a smart house model based on the trade-off between different components.

HONORS AND AWARDS

[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

- Independent reviewer for *IEEE Transactions on Signal and Information Processing over Networks*.
- Assisted professors to review *IEEE Transactions on Industrial Informatics*, *IEEE Transactions on Systems, Man and Cybernetics: Systems*, *IEEE Transactions on Big Data*, *Information Fusion*, *Scientific Reports*, *International Journal of Intelligent Systems*, *Fractals*, *BioEssays*, etc.

EXTRACURRICULAR ACTIVITIES

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

SKILLS

Technical: MATLAB, Python, C language, LaTex, Gephi, Origin, Visio.

Languages: Mandarin, English (TOEFL 98).

REFERENCES

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