

Ling-Yun Wu

Curriculum Vitae

Institute of Applied Mathematics
Academy of Mathematics and Systems Science
Chinese Academy of Sciences
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Beijing 100190, China

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PROFILE

Ling-Yun Wu is Professor at the Academy of Mathematics and Systems Science (AMSS), Chinese Academy of Sciences (CAS). He is the director of Bioinformatics Center of AMSS, and the member of Executive Council of Operations Research Society of China. He received his Ph.D. degree in Operations Research and Cybernetics from AMSS of CAS in 2002. He had taken the postdoctoral position at the Hong Kong University of Science and Technology and Weill Medical College of Cornell University. His current interest is in operations research and information science, especially the application of OR in bioinformatics, logistics and financial technology. The main research works include DNA sequencing algorithms, protein structure alignment algorithms, molecular biological networks alignment algorithms, biomarker identification methods, optimal storage and order picking strategy for autonomous unmanned warehouse, high-performance blockchain technology, and so on. In 2014, he got the Youth OR Award from Operations Research Society of China.

PERSONAL DATA

Name: Ling-Yun Wu

Citizenship: People's Republic of China
Birth Date and Place: November 8, 1975, Fujian, China
Gender: Male

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EDUCATION

1997 – 2002 Academy of Mathematics and Systems Science, CAS
Ph.D. Operational Research
Supervisor: Prof. Xiang-Sun Zhang

1993 – 1997 Wuhan University, China
B.S. Applied Mathematics

PRESENT POSITIONS

2015 – present Professor
Academy of Mathematics and Systems Science, CAS

2016 – present Director
Bioinformatics Center, Academy of Mathematics and Systems Science, CAS

2017 – present Assistant Director
Institute of Applied Mathematics, Academy of Mathematics and Systems Science, CAS

EXPERIENCE

- 1997 Software Developer (Part-time)
Wuhan University
Designed and developed a personnel management system for the
Wuhan University Committee of CCP.
- 1997 – 2002 Network System Administrator (Part-time)
Academy of Mathematics and Systems Science, CAS
Designed and built a computer network with more than 400 PC
and more than 30 Unix/Linux servers and super computers. Much
experienced in network administration and maintenance.
- 2002 – 2003 Research Associate (Postdoctoral)
Department of Industrial Engineering & Engineering Management,
Hong Kong University of Science and Technology
- 2003 – 2005 Postdoctoral Fellow
Academy of Mathematics and Systems Science, CAS
- 2005 – 2007 Assistant Professor
Academy of Mathematics and Systems Science, CAS
- 2006 Visiting Scholar
School of Mathematical Sciences, Fudan University
- 2007 Visiting Scholar
Department of Mathematics, Chinese University of Hong Kong
- 2008 – 2009 Postdoctoral Fellow
The Methodist Hospital Research Institute, Weill Medical College
of Cornell University
- 2007 – 2015 Associate Professor
Academy of Mathematics and Systems Science, CAS
- 2007 – 2012 Deputy Director
Department of Operations Research, Institute of Applied Mathe-
matics, Academy of Mathematics and Systems Science, CAS
- 2012 – 2017 Director
Department of Operations Research, Institute of Applied Mathe-
matics, Academy of Mathematics and Systems Science, CAS

QUALIFICATIONS

TOEFL	600 (57 63 60) TWE 4.0 (Oct. 2001)
Software Engineer	Rank Certificate of Computer Software, 1996 Approved and issued by State Council Office of Promotion and Application of Electronics and Information Systems.

SOCIAL ACTIVITIES

2009 – present	China Zhi Gong Party, Member
2014 – 2017	China Zhi Gong Party, CAS Haidian Branch Committee, Member
2017 – present	China Zhi Gong Party, CAS Haidian Branch Committee, Vice Chairman
2017 – present	China Zhi Gong Party, CAS Committee, Member
2017 – present	China Zhi Gong Party, Beijing Committee, Working Committee for Science and Technology, Vice Director

AWARDS

2007	Top 10 Research Advances, AMSS, CAS
2007	Research Award, K. C. Wong Education Foundation
2008	Top 10 Outstanding Scientific Research Achievement, AMSS, CAS
2014	The Youth OR Award, Operations Research Society of China

SOCIETY MEMBERSHIP

2012 – present	Operations Research Society of China (ORSC), Member of Council
2016 – present	Operations Research Society of China (ORSC), Member of Executive Council
2019 – present	China Society for Industrial and Applied Mathematics (CSIAM), Vice Secretary-General
2020 – present	Beijing Operations Research Society, Vice President
2011 – present	Operations Research Society of China, Computational Systems Biology Society, Vice President
2019 – present	China Society for Industrial and Applied Mathematics, Active Group on Blockchain, Executive member
2017 – present	Chinese Society of Biochemistry and Molecular Biology, Systems Biology Division, Member
2018 – present	China Medicinal Biotechnology Association, Society of Gene Technologies, Member
2006 – present	China Simulation Federation, Life System Modeling and Simulation Technical Committee, Member

EDITORIAL BOARD

2010 – present	Operations Research and Management Science
2016 – present	Scientific Reports

JOURNAL REFEREE

- Advances in Bioinformatics
- Annals of Biomedical Engineering
- Applied Mathematical Modelling
- Bioinformatics
- BMC Bioinformatics

- BMC Systems Biology
- Discrete Optimization
- European Journal of Operational Research
- IEEE Transactions on Circuits and Systems I
- IET Systems Biology
- Information Sciences
- Journal of Global Optimization
- Journal of Theoretical Biology
- Neural Processing Letters
- Neurocomputing
- Oncotarget
- Proceedings of the IEEE
- Acta Mathematicae Applicatae Sinica (Chinese Series)
- Journal of Mathematical Research and Exposition (Chinese Series)
- Journal of Systems Science and Mathematical Science (Chinese Series)
- OR Transactions (Chinese Series)
- Progress in Natural Science (Chinese Series)
- Computer Engineering and Applications (Chinese Series)

CONFERENCE SERVICES

- | | |
|------|---|
| 1999 | Service Volunteer
The 15th Conference of International Federation of Operations Research Societies, Beijing, China, August 16–20, 1999. |
| 2002 | Organizing Committee
The 4th International Symposium on Operations Research and Its Applications (ISORA), Three Gorges, Yichang-Chongqing, China, June 1–4, 2002. |
| 2002 | IT Service Manager
The 24th International Congress of Mathematicians (ICM), Beijing, China, August 20–28, 2002. |

- 2004 Organizing Committee
The 7th National Conference of Operations Research Society of China, Qingdao, China, October 16–20, 2004.
- 2005 Organizing Committee
The 5th International Symposium on Operations Research and Its Applications (ISORA), Lhasa-Nyingchi, Tibet, China, August 8–13, 2005.
- 2006 Organizing Committee
The 8th National Conference of Operations Research Society of China, Shenzhen, China, June 29–July 2, 2006.
- 2006 Organizing Committee
The 6th International Symposium on Operations Research and Its Applications (ISORA), Urumqi, Xinjiang, China, August 8–12, 2006.
- 2007 Organizing Committee
The 1st International Symposium on Optimization and Systems Biology (OSB), Beijing, China, August 7–9, 2007.
- 2007 Program Committee
The 2007 International Conference on Intelligent Computing (ICIC), Qingdao, China, August 21–24, 2007.
- 2007 Program Committee
The 2nd International Conference on Life System Modeling and Simulation (LSMS), Shanghai, China, September 14–17, 2007.
- 2008 Program Committee
The 2008 International Conference on Intelligent Computing (ICIC), Shanghai, China, September 15–18, 2008.
- 2008 Organizing Committee
The 2nd International Symposium on Optimization and Systems Biology (OSB), Lijiang, China, October 31–November 3, 2008.
- 2009 Program Committee
The 2009 International Conference on Intelligent Computing (ICIC), Ulsan, Korea, September 16–19, 2009.
- 2009 Organizing Committee
The 3rd International Symposium on Optimization and Systems Biology (OSB), Zhangjiajie, China, September 20–22, 2009.
- 2009 Organizing Committee
The 8th International Symposium on Operations Research and Its Applications (ISORA), Zhangjiajie, China, September 20–22, 2009.

- 2010 Program Committee
The 2010 International Conference on Intelligent Computing (ICIC),
Changsha, China, August 18–21, 2010
- 2010 Organizing Committee
The 9th International Symposium on Operations Research and Its
Applications (ISORA), Jiuzhaigou, China, August 20–24, 2010.
- 2010 Organizing Committee
The 4th International Conference on Computational Systems Biol-
ogy (ISB), Suzhou, China, September 9–11, 2010.
- 2011 Organizing Committee
The 10th International Symposium on Operations Research and Its
Applications (ISORA), Dunhuang, China, August 28–31, 2011.
- 2011 Organizing Committee
The 5th IEEE International Conference on Systems Biology (ISB),
Zhuhai, China, September 2–4, 2011.
- 2012 Organizing Committee
The 6th IEEE International Conference on Systems Biology (ISB),
Xi'an, China, August 18–20, 2012.
- 2012 Organizing Committee
The 9th National Meeting of the Operations Research Society of
China and 2012 Annual Conference, Shenyang, China, October 19–
22, 2012.
- 2013 Organizing Committee
The 11th International Symposium on Operations Research and Its
Applications (ISORA), Huangshan, China, August 23–25, 2013.
- 2013 Organizing Committee
The 7th International Conference on Systems Biology (ISB), Huang-
shan, China, August 23–25, 2013.
- 2014 Organizing Committee
The Operations Research Society of China 2014 Annual Conference,
Xuzhou, China, October 17–20, 2014.
- 2014 Organizing Committee
The 8th International Conference on Systems Biology & 4th Trans-
lational Bioinformatics Conference (ISB/TBC), Qingdao, China,
October 24–27, 2014.
- 2015 Organizing Committee
The 12th International Symposium on Operations Research and Its
Applications (ISORA), Luoyang, China, August 21–24, 2015.

- 2015 **Organizing Committee**
The 9th International Conference on Systems Biology (ISB), Luoyang, China, August 21–24, 2015.
- 2016 **Organizing Committee**
The 10th International Conference on Systems Biology (ISB), Weihai, China, August 19–22, 2016.
- 2016 **Organizing Committee**
The 10th National Meeting of the Operations Research Society of China and 2016 Annual Conference, Kunming, China, October 13–17, 2016.
- 2017 **Organizing Committee**
The 11th International Conference on Computational Systems Biology (ISB), Shenzhen, China, August 18–21, 2017.
- 2018 **Program Committee Chair**
The 12th International Conference on Computational Systems Biology (ISB), Guiyang, China, August 18–21, 2018.

RESEARCH INTERESTS

- Bioinformatics
- Systems Biology
- Combinatorial Optimization
- Artificial Neural Networks
- Application of Operations Research

PROJECTS

- | | |
|-------------|--|
| 1999 – 2002 | Important Mathematical Problems in Bioinformatics
Supported by Academy of Mathematics and Systems Science, CAS. |
| 1999 – 2002 | Applications of Neural Networks in Optimization
Supported by Academy of Mathematics and Systems Science, CAS. |
| 2001 | Evaluation of the Education Level of Middle Schools in Kunming
This work is a graduate student research project supported by CAS. |
| 2002 – 2003 | Decision Support Tools for Intelligent Multi-modal Transportation Logistics Management Systems
This is a research project by Department of Industrial Engineering & Engineering Management, Hong Kong University of Science and Technology, and supported by Hong Kong Innovation Technology Fund. |
| 2004 – 2005 | Strategic Planning of the Electrical Government of China
Sponsored by State Council Informatization Office. |
| 2007 – 2008 | Research on Tax Revenue Prediction Methods
Supported by Department of Planning and Statistics, State Administration of Taxation. |
| 2009 – 2010 | Research on Data Mining and Modeling for Industrial Safety
Supported by Beijing Municipal Institute of Labour Protection. |
| 2009 – 2010 | Research on Multiple Department Coordinated Decision Model for Urban Public Facility Emergency Management
Supported by Beijing Research Center of Urban System Engineering. |
| 2017 – 2019 | Research on High Performance Blockchain Network Technology
Supported by Beijing Tai Cloud Corporation. |

- 2017 – 2018 Optimal slotting and order picking strategy for autonomous unmanned warehouse
Supported by JD.com.
- 2019 – 2020 Research on Safety Accident Chain Analysis Models
Supported by Beijing Municipal Institute of Labour Protection.
- 2019 – 2021 Research on Optimization Modeling and Algorithms for Order Batching Problem in AGV Warehouse System
Supported by Beijing Intelligent Logistics System Collaborative Innovation Center.

GRANTS

- 2004 – 2005 Research on the Algorithm of DNA Sequencing
Principal Investigator, Research Grant, No. 20040350428
National Postdoctoral Foundation of China
- 2004 – 2006 Modeling and Optimization of Supply Chain Design and Management
Joint Investigator, Youth Research Grant, No. 70302003
National Natural Science Foundation of China (NSFC)
- 2005 – 2007 Research on Several Difficult Bioinformatics Problems by Using OR Methodologies
Joint Investigator, Research Grant, No. 10471141
National Natural Science Foundation of China (NSFC)
- 2005 – 2008 Some Important Problem in Bioinformatics
Joint Investigator, Important Direction Research Grant
Chinese Academy of Sciences (CAS)
- 2006 – 2008 Research on Models and Algorithms of Haplotype Inference Problem in Bioinformatics
Principal Investigator, Youth Research Grant, No. 60503004
National Natural Science Foundation of China (NSFC)
- 2007 – 2009 Protein Function Annotation and Prediction Based on Three Dimensional Structural and High Throughput Experimental Data
Joint Investigator, International Cooperation Research Grant, No. 10711140116
National Natural Science Foundation of China (NSFC)
- 2007 – 2010 Bioinformatics and Optimization
Joint Investigator, Key Research Grant, No. 10631070
National Natural Science Foundation of China (NSFC)

- 2007 – 2011 Function of molecular network of type 2 diabetes progression
Joint Investigator, 973 SubProgram, No. 2006CB503910
Mechanism of Type 2 Diabetes Progression
973 Program, No. 2006CB503900
Ministry of Science and Technology of China
- 2008 Single nucleotide polymorphism (SNP) array data analysis method
Principal Investigator, Research Award
K. C. Wong Education Foundation, Hong Kong
- 2009 – 2012 Research on the applications of optimization methods in information
technology
Joint Investigator, Important Direction Research Grant, No. kjcx-
yw-s7
Chinese Academy of Sciences (CAS)
- 2010 – 2012 Bioinformatics methods based on conditional random fields
Principal Investigator, Research Grant, No. 60970091
National Natural Science Foundation of China (NSFC)
- 2012 – 2016 Optimization in Complex Networks and Its Applications in Systems
Biology
Joint Investigator, Key Research Grant, No. 11131009
National Natural Science Foundation of China (NSFC)
- 2014 – 2016 Modeling and Algorithms for Identifying Dynamic Network Biomarkers
Principal Investigator, Research Grant, No. 91330114
National Natural Science Foundation of China (NSFC)
- 2017 – 2021 Research on Graph Theory Model and Algorithm with Their Applica-
tions in Bioinformatics
Joint Investigator, Key Research Grant, No. 11631014
National Natural Science Foundation of China (NSFC)
- 2017 – 2019 Optimization Modeling and Algorithms for Deep Analyses of Cancer
Genomics Data
Joint Investigator, International Cooperation Research Grant, No.
11661141019
National Natural Science Foundation of China (NSFC)
- 2018 – 2019 Computational Modeling for Stem Cell Regeneration with Application
to Cancer Development Dynamics
Joint Investigator, Key Research Grant, No. 91730301
National Natural Science Foundation of China (NSFC)

BOOKS

1. Chinese Version of the 50th Anniversary Issue of *Operations Research*
Edited by Xiang-Sun Zhang, De-Gang Liu, Jing Zhang, Ling-Yun Wu, and Yong Wang. Special Issue of *Operations Research and Management Science*, Vol. 13, 2004. (in Chinese)
2. Credit Portfolio Management (Chinese Edition)
Charles Simithson. Translated by Ji-Hong Zhang, De-Sheng Chen, Ling-Yun Wu, and Liang-Feng Chang. China Remin University Press, Beijing, 2006. (in Chinese)

PROCEEDINGS

3. Operations Research and Its Applications, *Lecture Notes in Operations Research 5*
Edited by Xiang-Sun Zhang, De-Gang Liu, and Ling-Yun Wu. Proceedings of the Fifth International Symposium of Operations Research and Its Applications, Tibet, China, 8–13 August, 2005. World Publishing Corporation, Beijing, 2005. (ISTP: BEI33)
4. Proceedings of the 8th National Conference of Operations Research Society of China
Edited by Ya-Xiang Yuan, Xiao-Dong Hu, De-Gang Liu, and Ling-Yun Wu. Global-Link Publishing Company, Hong Kong, 2006. (in Chinese)
5. Operations Research and Its Applications, *Lecture Notes in Operations Research 6*
Edited by Xiang-Sun Zhang, De-Gang Liu, and Ling-Yun Wu. Proceedings of the Sixth International Symposium of Operations Research and Its Applications, Xinjiang, China, 8–12 August, 2006. World Publishing Corporation, Beijing, 2006. (ISTP: BFB26)
6. Optimization and Systems Biology, *Lecture Notes in Operations Research 7*
Edited by Xiang-Sun Zhang, Luonan Chen, Ling-Yun Wu, and Yong Wang. Proceedings of the First International Symposium of Optimization and Systems Biology, Beijing, China, 8–10 August, 2007. World Publishing Corporation, Beijing, 2007. (ISTP)
7. Optimization and Systems Biology, *Lecture Notes in Operations Research 9*
Edited by Xiang-Sun Zhang, Luonan Chen, Ling-Yun Wu, and Yong Wang. Proceedings of the Second International Symposium of Optimization and Systems Biology, Lijiang, China, 31 October–3 November, 2008. World Publishing Corporation, Beijing, 2008. (ISTP)
8. Optimization and Systems Biology, *Lecture Notes in Operations Research 11*
Edited by Luonan Chen, Xiang-Sun Zhang, Ling-Yun Wu, and Yong Wang. Proceedings of the Third International Symposium of Optimization and Systems Biology, Zhangjiajie, China, 20–22 September, 2009. World Publishing Corporation, Beijing, 2009. (ISTP)
9. Operations Research and Its Applications, *Lecture Notes in Operations Research 12*
Edited by Xiang-Sun Zhang, De-Gang Liu, Ling-Yun Wu, and Yong Wang. Proceedings

- of the Ninth International Symposium of Operations Research and Its Applications, Chengdu-Jiuzhaigou, China, 19–23 August, 2010. World Publishing Corporation, Beijing, 2010. (ISTP)
10. **Optimization and Systems Biology, *Lecture Notes in Operations Research 13***
Edited by Luonan Chen, Xiang-Sun Zhang, Bairong Shen, Ling-Yun Wu, and Yong Wang. Proceedings of the Fourth International Conference on Computational Systems Biology, Suzhou, China, 9–11 September, 2010. World Publishing Corporation, Beijing, 2010. (ISTP)
 11. **Proceedings of the 10th National Conference of Operations Research Society of China**
Edited by Ya-Xiang Yuan, Xiao-Dong Hu, Ling-Yun Wu, and De-Gang Liu. Global-Link Publishing Company, Hong Kong, 2010. (in Chinese)
 12. **Operations Research and Its Applications, *Lecture Notes in Operations Research 14***
Edited by Xiang-Sun Zhang, De-Gang Liu, Ling-Yun Wu, and Yong Wang. Proceedings of the Tenth International Symposium of Operations Research and Its Applications, Dunhuang, China, 28–31 August, 2011. World Publishing Corporation, Beijing, 2011. (ISTP)
 13. **Proceedings of 2011 IEEE International Conference on Systems Biology**
Edited by Luonan Chen, Xiang-Sun Zhang, Ling-Yun Wu, and Yong Wang. Zhuhai, China, 2–4 September, 2011. IEEE, 2011. (EI)
 14. **Proceedings of 2012 IEEE International Conference on Systems Biology**
Edited by Luonan Chen, Xiang-Sun Zhang, Ling-Yun Wu, and Yong Wang. Xi'an, China, 18–20 August, 2012. IEEE, 2012. (EI)
 15. **Proceedings of 2013 International Conference on Systems Biology**
Edited by Luonan Chen, Xiang-Sun Zhang, Ling-Yun Wu, and Yong Wang. Huangshan, China, 23–25 August, 2013. IEEE, 2013. (EI)
 16. **Proceedings of 2013 International Symposium of Operations Research and Its Applications**
Edited by Xiang-Sun Zhang, De-Gang Liu, Ling-Yun Wu, and Yong Wang. Huangshan, China, 23–25 August, 2013. IET, 2013. (EI)
 17. **Proceedings of 2014 International Conference on Systems Biology**
Edited by Luonan Chen, Xiang-Sun Zhang, Ling-Yun Wu, and Yong Wang. Qingdao, China, 24–27 October, 2014. IEEE, 2014. (EI)

CHAPTERS

18. **Computational Imaging and Modeling for System Biology**
Ling-Yun Wu, Xiaobo Zhou, and Stephen T. C. Wong. Chapter 17 in *Elements of Computational Systems Biology*, Huma M. Lodhi and Stephen H. Muggleton (Editors). John Wiley & Sons, March, 2010.

19. Haplotype Inference Models and Algorithms

Ling-Yun Wu. Chapter 36 in *Algorithms in Computational Molecular Biology: Techniques, Approaches and Applications*, Mourad Elloumi and Albert Y. Zomaya (Editors). John Wiley & Sons, February, 2011.

20. Performing Network Alignments with R

Qiang Huang and Ling-Yun Wu. Chapter 7 in *Computational Network Analysis with R: Applications in Biology, Medicine and Chemistry*, Matthias Dehmer, Yongtang Shi, and Frank Emmert-Streib (Editors). John Wiley & Sons, October, 2016.

REFEREED JOURNAL ARTICLES

1. Xiang-Sun Zhang, Ji-Hong Zhang, and Ling-Yun Wu. Combinatorial optimization problems in the positional DNA sequencing by hybridization and its algorithms. *Journal of Systems Science and Mathematical Science*, 22(3):258–269, 2002. (in Chinese)
2. Ji-Hong Zhang, Ling-Yun Wu, and Xiang-Sun Zhang. Reconstruction of DNA sequencing by hybridization. *Bioinformatics*, 19(1):14–21, 2003. (SCI: 636PA, PubMed: 12499288)
3. Rui-Sheng Wang, Ling-Yun Wu, Ji-Hong Zhang, and Xiang-Sun Zhang. Algorithms for the SNP haplotype assembly problem. *Applied Mathematics A Journal of Chinese Universities (Series A)*, 19(S):515–528, 2004.
4. Xiang-Sun Zhang, Yong Wang, Zhong-Wei Zhan, Ling-Yun Wu, and Luonan Chen. Exploring protein’s optimal HP configurations by self-organizing mapping. *Journal of Bioinformatics and Computational Biology*, 3(2):385–400, 2005. (PubMed: 15852511)
5. Rui-Sheng Wang, Ling-Yun Wu, Zhen-Ping Li, and Xiang-Sun Zhang. Haplotype reconstruction from SNP fragments by minimum error correction. *Bioinformatics*, 21(10):2456–2462, 2005. (SCI: 928QA, PubMed: 15731204)
6. Yu-Ying Zhao, Ling-Yun Wu, Ji-Hong Zhang, Rui-Sheng Wang, and Xiang-Sun Zhang. Haplotype assembly from aligned weighted SNP fragments. *Computational Biology and Chemistry*, 29(4):281–287, 2005. (SCI: 956XI, EI, PubMed: 16051522)
7. Ji-Hong Zhang, Ling-Yun Wu, and Xiang-Sun Zhang. A reconstruction algorithm to DNA sequencing by hybridization with target DNA length error. *Acta Mathematicae Applicatae Sinica*, 28(3):385–395, 2005. (in Chinese)
8. Yong Wang, Zhong-Wei Zhan, Ling-Yun Wu, and Xiang-Sun Zhang. An improved self-organizing map algorithm for protein folding and its realization. *Journal of Systems Science and Mathematical Science*, 25(5):562–573, 2005. (in Chinese)
9. Luonan Chen, Ling-Yun Wu, Ruiqi Wang, Yong Wang, Shi-Hua Zhang, and Xiang-Sun Zhang. Comparison of protein structures by multi-objective optimization. *Genome Informatics*, 16(2):114–124, 2005. (PubMed: 16901095)
10. Ling-Yun Wu, Xiang-Sun Zhang and Ju-Liang Zhang. Capacitated facility location problem with general setup cost. *Computers & Operations Research*, 33(5):1226–1241, 2006. (SCI: 986SU, EI)
11. Xiang-Sun Zhang, Rui-Sheng Wang, Ling-Yun Wu and Luonan Chen. Models and algorithms for the haplotyping problem. *Current Bioinformatics*, 1(1):105–114, 2006. (SCI: 138OS)
12. Yong Wang, Ling-Yun Wu, Xiang-Sun Zhang and Luonan Chen. Exploring the classification of protein structures on geometric patterns by neural networks. *International Journal of Computational Intelligence Research*, 2(1):105–109, 2006.

13. Luonan Chen, Ling-Yun Wu, Yong Wang and Xiang-Sun Zhang. Inferring protein interactions from experimental data by association probabilistic method. *Proteins: Structure, Function, and Bioinformatics*, 62:833–837, 2006. (SCI: 019XV, PubMed: 16395667)
14. Luonan Chen, Ling-Yun Wu, Yong Wang, Shi-Hua Zhang and Xiang-Sun Zhang. Revealing divergent evolution, identifying circular permutations and detecting active-sites by protein structure comparison. *BMC Structural Biology*, 6:18, 2006. (SCI: 088LQ, PubMed: 16948858)
15. Zhong-Wei Zhan, Yong Wang, Ling-Yun Wu and Xiang-Sun Zhang. A DEA evaluation model of the official province websites. *Operations Research and Management Science*, 15(4):97–102, 2006. (in Chinese)
16. Xiang-Sun Zhang, Rui-Sheng Wang, Ling-Yun Wu and Wei Zhang. Minimum conflict individual haplotyping from SNP fragments and related genotype. *Evolutionary Bioinformatics Online*, 2:271–280, 2006.
17. Zhen-Ping Li, Ling-Yun Wu, Yu-Ying Zhao and Xiang-Sun Zhang. A dynamic programming algorithm for the k-haplotyping problem. *Acta Mathematicae Applicatae Sinica (English Series)*, 22(3):405–412, 2006.
18. Rui-Sheng Wang, Ling-Yun Wu, Xiang-Sun Zhang and Luonan Chen. A Markov chain model for haplotype assembly from SNP fragments. *Genome Informatics*, 17(2):162–171, 2006. (PubMed: 17503389)
19. Yong Wang, Ling-Yun Wu, Luonan Chen and Xiang-Sun Zhang. Supervised classification of protein structures based on convex hull representation. *International Journal of Bioinformatics Research and Applications*, 3(2):123–144, 2007. (PubMed: 18048184)
20. Ji-Hong Zhang, Ling-Yun Wu, Yu-Ying Zhao and Xiang-Sun Zhang. An optimization approach to the reconstruction of positional DNA sequencing by hybridization with errors. *European Journal of Operational Research*, 182(1):413–427, 2007. (SCI, EI)
21. Rui-Sheng Wang, Yong Wang, Ling-Yun Wu, Xiang-Sun Zhang, and Luonan Chen. Analysis on multi-domain cooperation for predicting protein-protein interactions. *BMC Bioinformatics*, 8:391, 2007. (SCI, PubMed: 17937822)
22. Ju-Liang Zhang, Ling-Yun Wu and Xiang-Sun Zhang. A trust region method for optimization problem with singular solutions. *Applied Mathematics and Optimization*, 56(3):379–394, 2007. (SCI, EI)
23. Zhi-Ping Liu, Ling-Yun Wu, Yong Wang, Luonan Chen, and Xiang-Sun Zhang. Predicting gene ontology functions from protein's regional surface structures. *BMC Bioinformatics*, 8:475, 2007. (SCI, PubMed: 18070366)
24. Ruxin Qin, Jing Chen, Naiyang Deng, and Ling-Yun Wu. New strategy for predicting protein structural class. *Journal of Harbin Institute of Technology (New Series)*, 14(S2):1–4, 2007. (EI)

25. Zhi-Ping Liu, Ling-Yun Wu, Yong Wang, Xiang-Sun Zhang, and Luonan Chen. Analysis of protein surface patterns by pocket similarity network. *Protein and Peptide Letters*, 15(5):448–455, 2008. (SCI, PubMed: 18537733)
26. Zhi-Ping Liu, Ling-Yun Wu, Yong Wang, Xiang-Sun Zhang, and Luonan Chen. Bridging protein local structures and protein functions. *Amino Acids*, 35(3):627–650, 2008. (SCI, PubMed: 18421562)
27. Ji-Hong Zhang, Ling-Yun Wu, Jian Chen, and Xiang-Sun Zhang. A fast haplotype inference method for large population genotype data. *Computational Statistics and Data Analysis*, 52(11):4891–4902, 2008. (SCI)
28. Zhi-Ping Liu, Ling-Yun Wu, Yong Wang, Luonan Chen, and Xiang-Sun Zhang. Protein cavity clustering based on community structure of pocket similarity network. *International Journal of Bioinformatics Research and Applications*, 4(4):445–460, 2008. (PubMed: 19008186)
29. Shu-Qin Zhang, Wai-Ki Ching, Yue Jiao, Ling-Yun Wu, and Raymond H. Chan. Construction and control of genetic regulatory networks: A multivariate Markov chain approach. *Journal of Biomedical Science and Engineering*, 1:15–21, 2008.
30. Ling-Yun Wu, Xiaobo Zhou, Fuhai Li, Xiaorong Yang, Chung-Che Chang, and Stephen T.C. Wong. Conditional random pattern algorithm for LOH inference and segmentation. *Bioinformatics*, 25(1):61–67, 2009. (SCI, PubMed: 18974074)
31. Xiao-Bo Wang, Ling-Yun Wu, Yong-Cui Wang, and Nai-Yang Deng. Prediction of palmitoylation sites using the composition of K-spaced amino acid pairs. *Protein Engineering, Design, and Selection*, 22(11):707–712, 2009. (SCI)
32. Yong Wang, Ling-Yun Wu, Ji-Hong Zhang, Zhong-Wei Zhan, Xiang-Sun Zhang, and Luonan Chen. Evaluating protein similarity from coarse structures. *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, 6(4):583–593, 2009. (SCI)
33. Wan-Ting Huang, Xiaorong Yang, Xiaobo Zhou, Federico A. Monzon, Jianguo Wen, Jill M. Hagenkord, Ling-Yun Wu, Carolyn Keever-Taylor, Louis Novoa-Takara, Stephen T.C. Wong, Kenneth Young, and Chung-Che Chang. Multiple distinct clones may co-exist in different lineages in myelodysplastic syndromes. *Leukemia Research*, 33(6):847–853, 2009. (SCI, PubMed: 19084271)
34. Ling-Yun Wu, Zhenping Li, Rui-Sheng Wang, Xiang-Sun Zhang, and Luonan Chen. Self-organizing map approaches for the haplotype assembly problem. *Mathematics and Computers in Simulation*, 79(10):3026–3037, 2009. (SCI)
35. Xiaojian Shao, Yingjie Tian, Lingyun Wu, Yong Wang, and Naiyang Deng. Predicting DNA- and RNA-binding proteins from sequences with kernel methods. *Journal of Theoretical Biology*, 258(2):289–293, 2009. (SCI)

36. Xiaorong Yang, Xiaobo Zhou, Wan-Ting Huang, Lingyun Wu, Federico A. Monzon, Chung-Che Chang, and Stephen T.C. Wong. Pattern-selection based power analysis and discrimination of low- and high-grade myelodysplastic syndromes study using SNP arrays. *PLoS ONE*, 4(4):e5054, 2009. (PubMed: 19352488)
37. Zhi-Ping Liu, Ling-Yun Wu, Yong Wang, Xiang-Sun Zhang, and Luonan Chen. Prediction of protein-RNA binding sites by a random forest method with combined features. *Bioinformatics*, 26(13):1616–1622, 2010. (SCI)
38. Xianwen Ren, Xiaobo Zhou, Ling-Yun Wu, and Xiang-Sun Zhang. An information-flow-based model with dissipation, saturation and direction for active pathway inference, *BMC Systems Biology*, 4:72, 2010. (SCI)
39. Zheng Xia, Ling-Yun Wu, Xiaobo Zhou, and Stephen TC Wong. Semi-supervised drug-protein interaction prediction from heterogeneous biological spaces. *BMC Systems Biology*, 4(S2):S6, 2010. (SCI)
40. Lin Wang, Ling-Yun Wu, Yong Wang, Xiang-Sun Zhang, and Luonan Chen. SANA: an algorithm for sequential and non-sequential protein structure alignment. *Amino Acids*, 39(2):417–425, 2010. (SCI)
41. Xing Chen, Yong Wang, Ling-Yun Wu, Gui-Ying Yan, and Wei Zhu. Emergency decision model with multiple stages, multiple objectives, and multidivisional cooperation. *Systems Engineering - Theory & Practice*, 30(11):1977–1985, 2010. (in Chinese)
42. Yan Xu, Xiao-Bo Wang, Jun Ding, Ling-Yun Wu, and Naiyang Deng. Lysine acetylation sites prediction using an ensemble of support vector machine classifiers. *Journal of Theoretical Biology*, 264(1):130–135, 2010. (SCI)
43. Jiguang Wang, Qiang Huang, Zhi-Ping Liu, Yong Wang, Ling-Yun Wu, Luonan Chen, and Xiang-Sun Zhang. NOA: a novel network ontology analysis method. *Nucleic Acids Research*, 39(13):e87, 2011. (SCI)
44. Qiang Huang, Ling-Yun Wu, and Xiang-Sun Zhang. An efficient network querying method based on conditional random fields. *Bioinformatics*, 27(22):3173–3178, 2011. (SCI)
45. Hui-Jia Li, Yong Wang, Ling-Yun Wu, Junhua Zhang, and Xiang-Sun Zhang. Potts model based on a Markov process computation solves the community structure problem effectively. *Physical Review E*, 86:016109, 2012. (SCI)
46. Hui-Jia Li, Yong Wang, Ling-Yun Wu, Zhi-Ping Liu, Luonan Chen, and Xiang-Sun Zhang. Community structure detection based on Potts model and network’s spectral characterization. *Europhysics Letters*, 97:48005, 2012. (SCI)
47. Yong Wang, Qiao-Feng Wu, Chen Chen, and Ling-Yun Wu, Xian-Zhong Yan, Shu-Guang Yu, Xiang-Sun Zhang, and Fan-Rong Liang. Revealing metabolite biomarkers for acupuncture treatment by linear programming based feature selection. *BMC Systems Biology*, 6(S1):S15, 2012. (SCI)

48. Junfei Zhao, Shihua Zhang, Ling-Yun Wu, and Xiang-Sun Zhang. Efficient methods for identifying mutated driver pathways in cancer. *Bioinformatics*, 28(22):2940–2947, 2012. (SCI)
49. Yan Xu, Jun Ding, Ling-Yun Wu, and Kuo-Chen Chou. iSNO-PseAAC: Predict cysteine s-nitrosylation sites in proteins by incorporating position specific amino acid propensity into pseudo amino acid composition. *PLoS ONE*, 8(2):e55844, 2013. (SCI)
50. Qiang Huang, Ling-Yun Wu, Yong Wang, and Xiang-Sun Zhang. GOMA: Functional enrichment analysis tool based on GO modules. *Chinese Journal of Cancer*, 32(4):195–204, 2013. (PubMed)
51. Qiang Huang, Ling-Yun Wu, and Xiang-Sun Zhang. Corbi: A new R package for biological network alignment and querying. *BMC Systems Biology*, 7(Suppl 2):S6, 2013. (SCI)
52. Yan Xu, Xiao-Jian Shao, Ling-Yun Wu, Nai-Yang Deng and Kuo-Chen Chou. iSNO-AAPair: incorporating amino acid pairwise coupling into PseAAC for predicting cysteine S-nitrosylation sites in proteins. *PeerJ*, 1:e171, 2013.
53. Peter Csermely, András London, Ling-Yun Wu, and Brian Uzzi. Structure and dynamics of core/periphery networks. *Journal of Complex Networks*, 1:93–123, 2013.
54. Yan Xu, Xiaobo Wang, Yongcui Wang, Yingjie Tian, Xiaojian Shao, Ling-Yun Wu, and Naiyang Deng. Prediction of posttranslational modification sites from amino acid sequences with kernel methods. *Journal of Theoretical Biology*, 344:78–87, 2014. (SCI)
55. Yan Xu, Xin Wen, Li-Shu Wen, Ling-Yun Wu, Nai-Yang Deng, and Kuo-Chen Chou. iNitro-Tyr: Prediction of nitrotyrosine sites in proteins with general pseudo amino acid composition, *PLoS ONE*, 9(8):e105018, 2014. (SCI)
56. Junhua Zhang, Ling-Yun Wu, Xiang-Sun Zhang, and Shihua Zhang. Discovery of co-occurring driver pathways in cancer, *BMC Bioinformatics*, 15:271, 2014. (SCI)
57. Peter Csermely, János Hódsági, Tamás Korcsmáros, Dezső Módos, Áron R. Perez-Lopez, Kristóf Szalay, Dániel V. Veres, Katalin Lenti, Ling-Yun Wu, and Xiang-Sun Zhang. Cancer stem cells display extremely large evolvability: alternating plastic and rigid networks as a potential mechanism. *Seminars in Cancer Biology*, 30:42–51, 2015. (SCI)
58. Yan Xu, Ya-Xin Ding, Jun Ding, Ya-Hui Lei, Ling-Yun Wu, and Nai-Yang Deng. iSuc-PseAAC: predicting lysine succinylation in proteins by incorporating peptide position-specific propensity. *Scientific Reports*, 5:10184, 2015. (SCI)
59. Yan Xu, Ya-Xin Ding, Jun Ding, Ling-Yun Wu, and Nai-Yang Deng. Phogly-PseAAC: prediction of lysine phosphoglycerylation in proteins incorporating with position-specific propensity. *Journal of Theoretical Biology*, 379:10–15, 2015. (SCI)
60. Yan Xu, Jun Ding, and Ling-Yun Wu. iSulf-Cys: prediction of S-sulfenylation sites in proteins with physicochemical properties of amino acids. *PLoS ONE*, 11(4): e0154237, 2016. (SCI)

61. Yan Xu, Ya-Xin Ding, Jun Ding, Ling-Yun Wu, and Yu Xue. Mal-Lys: prediction of lysine malonylation sites in proteins integrated sequence-based features with mRMR feature selection. *Scientific Reports*, 6:38318, 2016. (SCI)
62. Zhi-Ping Liu, Shutang Liu, Ruitang Chen, Xiaopeng Huang, and Ling-Yun Wu. Structure alignment-based classification of RNA-binding pockets reveals regional RNA recognition motifs on protein surfaces. *BMC Bioinformatics*, 18:27, 2017. (SCI)
63. Duanchen Sun, Yinliang Liu, Xiang-Sun Zhang, and Ling-Yun Wu. NetGen: a novel network-based probabilistic generative model for gene set functional enrichment analysis. *BMC Systems Biology*, 11(Suppl 4):75, 2017. (SCI)
64. Yan Xu, Li Li, Jun Ding, Ling-Yun Wu, Guoqin Mai, and Fengfeng Zhou. Gly-PseAAC: Identifying protein lysine glycation through sequences. *Gene*, 602:1–7, 2017. (SCI)
65. Duanchen Sun, Yinliang Liu, Xiang-Sun Zhang, and Ling-Yun Wu. CEA: Combination-based gene set functional enrichment analysis. *Scientific Reports*, 8:13085, 2018. (SCI)
66. Duanchen Sun, Xianwen Ren, Eszter Ari, Tamas Korcsmaros, Peter Csermely, and Ling-Yun Wu. Discovering cooperative biomarkers for heterogeneous complex disease diagnoses. *Briefings in Bioinformatics*, 20(1):89–101, 2019. (SCI)
67. Jiacheng Leng and Ling-Yun Wu. Review of the prediction of RNA editing sites based on machine learning. *Chinese Journal of Bioinformatics*, 17(1):1–8, 2019. (in Chinese)
68. Zhen-Ping Li, Xin-Ran Fan, and Ling-Yun Wu. Study on the storage allocation problem under cargo to person picking mode. *Operations Research and Management Science*, in press, 2020. (in Chinese)
69. Zhen-Ping Li, Hong-Ye Fu, Xiao-Qi Bu, Guo-Wei Zhang, and Ling-Yun Wu. Research on order batching problem of intelligent warehouse system based on AGV. *Operations Research and Management Science*, in press, 2020. (in Chinese)
70. Xu Wang, Guohua Gan, and Ling-Yun Wu. Quantitative analysis of blockchain performance. *Computer Engineering and Applications*, in press, 2020. (in Chinese)
71. Xu Wang, Guohua Gan, and Ling-Yun Wu. Framework and algorithms for identifying honest blocks in blockchain. *PLOS ONE*, in press, 2020. (SCI)

PROCEEDINGS ARTICLES

72. Ling-Yun Wu, Xiang-Sun Zhang, and Ju-Liang Zhang. Application of discrete Hopfield-type neural networks for max-cut problems. In *Proceedings of 8th International Conference on Neural Information Processing (ICONIP2001)*, 1439–1444, Fudan University Press, Shanghai, 2001. (ISTP: BU46F)

73. Ling-Yun Wu, Ji-Hong Zhang, and Xiang-Sun Zhang. Application of neural networks in the reconstruction of DNA sequencing by hybridization. In *Proceedings of 4th International Symposium on Operations Research and Its Applications, Lecture Notes in Operations Research*, 4:312–320, World Publishing Corporation, Beijing, 2002.
74. Ji-Hong Zhang, Ling-Yun Wu, Yong Wang, Zhen-Ping Li, and Xiang-Sun Zhang. A statistical method based on Markov chain for optimal reconstruction of haplotype from genotype data with SNP. In *Proceedings of 7th National Conference of ORSC*, 1268–1278, Global-Link Publishing Company, Hong Kong, 2004.
75. Rui-Sheng Wang, Ling-Yun Wu, Zhen-Ping Li, and Xiang-Sun Zhang. A genetic algorithm for the individual haplotyping problem. In *Proceedings of 7th National Conference of ORSC*, 814–823, Global-Link Publishing Company, Hong Kong, 2004.
76. Yu-Ying Zhao, Ling-Yun Wu, Rui-Sheng Wang, Zhen-Ping Li and Xiang-Sun Zhang. Haplotyping an individual from weighted SNPs fragments. In *Proceedings of 7th National Conference of ORSC*, 824–830, Global-Link Publishing Company, Hong Kong, 2004.
77. Zhong-Wei Zhan, Yong Wang, Ling-Yun Wu, and Xiang-Sun Zhang. Evaluation of e-government services based on data envelopment analysis. In *Proceedings of 7th National Conference of ORSC*, 348–354, Global-Link Publishing Company, Hong Kong, 2004. (in Chinese)
78. Xiang-Sun Zhang, Zhong-Wei Zhan, Yong Wang, and Ling-Yun Wu. An attempt to explore the similarity of two proteins by their surface shapes. In *Proceedings of 5th International Symposium on Operations Research and Its Applications, Lecture Notes in Operations Research*, 5:276–284, World Publishing Corporation, Beijing, 2005. (ISTP: BEI33)
79. Yong Wang, Ling-Yun Wu, Xiang-Sun Zhang, and Luonan Chen. Automatic classification of protein structures based on geometric patterns by integrated neural network. In *Proceedings of 3rd International Conference on Theory and Applications of Models of Computation (TAMC 2006), Lecture Notes in Computer Science*, 3959, Springer, 2006. (SCI: BEM07, EI)
80. Shi-Hua Zhang, Ling-Yun Wu, Guang-Xu Jin, and Xiang-Sun Zhang. A simple method for structural classification of proteins. In *Proceedings of 8th National Conference of ORSC*, 290–295, Global-Link Publishing Company, Hong Kong, 2006.
81. Zhen-Ping Li, Ling-Yun Wu, and Xiang-Sun Zhang. A kind of new inverse DEA model. In *Proceedings of 8th National Conference of ORSC*, 762–768, Global-Link Publishing Company, Hong Kong, 2006.
82. Yong Wang, Ling-Yun Wu, Xiang-Sun Zhang, and Luonan Chen. Protein comparison based on both structure and sequence data. In *Proceedings of World Congress of Medical Physics and Biomedical Engineering 2006 (WC2006), IFMBE Proceedings*, 14:172–175, Springer, 2006.

83. Xiang-Sun Zhang, Rui-Sheng Wang, Ling-Yun Wu, Shi-Hua Zhang, and Luonan Chen. Inferring protein-protein interactions by combinatorial models. In *Proceedings of World Congress of Medical Physics and Biomedical Engineering 2006 (WC2006)*, IOMP Proceedings, 2:181–184, Springer, 2006.
84. Ji-Hong Zhang, Ling-Yun Wu, and Xiang-Sun Zhang. A new statistical method for haplotype inference from genotype data. In *Proceedings of IASTED International Conference on Computational and Systems Biology (CASB 2006)*, 7–12, ACTA Press, 2006.
85. Zhi-Ping Liu, Ling-Yun Wu, Yong Wang, Xiang-Sun Zhang, and Luonan Chen. An approach for clustering protein pockets into similar groups. In *Proceedings of 1st International Symposium on Optimization and Systems Biology, Lecture Notes in Operations Research*, 7:204–212, World Publishing Corporation, Beijing, 2007. (ISTP)
86. Ling-Yun Wu, Ji-Hong Zhang, and Raymond Chan. Improved approach for haplotype inference based on Markov chain. In *Proceedings of 2nd International Symposium on Optimization and Systems Biology, Lecture Notes in Operations Research*, 9:204–215, World Publishing Corporation, Beijing, 2008. (ISTP)
87. Ling-Yun Wu, Xiaobo Zhou, Chung-Che Chang, and Stephen T.C. Wong. Model based probe fitting and selection for SNP array. In *Proceedings of 2nd International Symposium on Optimization and Systems Biology, Lecture Notes in Operations Research*, 9:216–223, World Publishing Corporation, Beijing, 2008. (ISTP)
88. Shu-Qin Zhang, Wai-Ki Ching, Yue Jiao, Ling-Yun Wu, and Raymond H. Chan. A simplified multivariate Markov chain model for the construction and control of genetic regulatory networks. In *Proceedings of the 2nd International Conference on Bioinformatics and Biomedical Engineering (iCBBE2008)*, 569–572, Shanghai, China, 2008.
89. Naiyang Deng, Ling-Yun Wu, and Xiaobo Wang. The prediction of protein post-translational modification sites. In *Proceedings of 3rd International Symposium on Optimization and Systems Biology, Lecture Notes in Operations Research*, 11:3–4, World Publishing Corporation, Beijing, 2009. (ISTP)
90. Zheng Xia, Xiaobo Zhou, Youxian Sun, and Ling-Yun Wu. Semi-supervised drug-protein interaction prediction from heterogeneous spaces. In *Proceedings of 3rd International Symposium on Optimization and Systems Biology, Lecture Notes in Operations Research*, 11:123–131, World Publishing Corporation, Beijing, 2009. (ISTP)
91. Ji-Bin Qu, Ling-Yun Wu, Xiaoping Liao, Yushu Xie, Bingxue Song, and Guiying Yan. DEA with weight constraints for evaluation of work safety supervision. In *Proceedings of 9th International Symposium on Operations Research and Its Applications, Lecture Notes in Operations Research*, 13:519–525, World Publishing Corporation, Beijing, 2010. (ISTP)
92. Yushu Xie, Bingxue Song, Baoqian Dai, Lingyun Wu, and Tong Wang. A method for evaluating the situation of safety production based on DEA and AHP. In *Proceedings of 2010 International Conference on Future Information Technology and Management Engineering (FITME)*, 3:104–107, IEEE, 2010. (EI)

93. Qiang Huang, Ling-Yun Wu, Ji-Bin Qu, and Xiang-Sun Zhang. Analyzing time-course gene expression data using profile-state hidden Markov model. In *Proceedings of 2011 IEEE International Conference on Systems Biology (ISB)*, 351–355, IEEE, 2011. (EI)
94. Ji-Bin Qu, Xiang-Sun Zhang, Ling-Yun Wu, Yong Wang, and Luonan Chen. Detecting coherent local patterns from time series gene expression data by a temporal biclustering method. In *Proceedings of 2011 IEEE International Conference on Systems Biology (ISB)*, 399–404, IEEE, 2011. (EI)
95. Qiang Huang, Ling-Yun Wu, and Xiang-Sun Zhang. CNetA: Network alignment by combining biological and topological features. In *Proceedings of 2012 IEEE International Conference on Systems Biology (ISB)*, 220–225, IEEE, 2012. (EI)
96. Yinliang Liu, Xiang-Sun Zhang, and Ling-Yun Wu. Enrichment set cover problem. In *Proceedings of 12th International Symposium on Operations Research and its Applications (ISORA 2015)*, 220–227, IET, 2015. (EI)