

# Hongxun Hui

Post-doctoral Fellow  
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## Research Interests

- **Demand Response in Smart Grid:** Modeling, optimization and control of flexible loads for providing frequency regulation, operating reserve and peak-shaving services.
- **Communication Technologies and Internet of Things:** Developing non-invasive measurement equipment and smart controllers for data acquisition, load regulation, distributed energy storage and photovoltaic utilization.
- **Electricity Market:** Incentive mechanism design for motivating consumers to participate in demand response.

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## Education

<b>Ph.D., College of Electrical Engineering, Zhejiang University</b> Supervisor: Prof. Yonghua Song & Prof. Yi Ding	Hangzhou, China 09/2015 – 06/2020
<b>Visiting Scholar, Advanced Research Institute, Virginia Tech</b> Supervisor: Prof. Saifur Rahman	Arlington, USA 10/2018 – 10/2019
<b>Visiting Scholar, CURENT Research Center, University of Tennessee</b> Supervisor: Prof. Fangxing (Fran) Li	Knoxville, USA 06/2019 – 07/2019
<b>B.S., College of Electrical Engineering, Zhejiang University</b> Outstanding Graduates, Overall GPA: 3.88/4.0 ( <b>Top 3%</b> )	Hangzhou, China 09/2011 – 06/2015

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## Working Experience

<b>Post-doctoral Fellow, SKL-IoTSC, University of Macau</b> Supervisor: Prof. Yonghua Song	Macau, China 10/2010 – Present
<b>Researcher, Zhuhai UM Science &amp; Technology Research Institute</b> Smart City Research Center	Zhuhai, China 07/2020 – 09/2020

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## Publications

### Books

1. Yi Ding, Yonghua Song, **Hongxun Hui** and Changzheng Shao. Integration of Air Conditioning and Heating into Modern Power Systems. *Springer*, 2019. (All eight chapters)

### Journal Publications

1. **Hongxun Hui**, Yi Ding, Yonghua Song, “Adaptive Time-Delay Control of Flexible Loads in Power Systems Facing Accidental Outages,” *Applied Energy*, vol. 275, pp. 115321, Oct. 2020. [SCI, EI] (IF: 9.086)
2. **Hongxun Hui**, Yi Ding, Tao Chen, Saifur Rahman, Yonghua Song, “Dynamic and Stability Analysis of the Power System with the Control Loop of Inverter Air Conditioners,” *IEEE Transactions on Industrial Electronics*, Early Access, Feb. 2020. [SCI, EI] (IF: 7.515)
3. **Hongxun Hui**, Yi Ding, Zhenzhi Lin, Pierluigi Siano, Yonghua Song, “Capacity Allocation and Optimal Control of Inverter Air Conditioners in Multi-area Power Systems,” *IEEE Transactions on Power Systems*, vol. 35, no. 1, pp. 332-345, Jan. 2020. [SCI, EI] (IF: 6.074)
4. **Hongxun Hui**, Yi Ding, Menglian Zheng, “Equivalent Modeling of Inverter Air Conditioners for Providing Frequency Regulation Service”, *IEEE Transactions on Industrial Electronics*, vol. 66, no. 2, pp. 1413-23, Feb. 2019. [SCI, EI] (IF: 7.515)
5. **Hongxun Hui**, Yi Ding, Qingxin Shi, Fangxing Li, Yonghua Song, Jinyue Yan, “5G Network-based Internet of Things for Demand Response in Smart Grid: A Survey on Application Potential,” *Applied Energy*, vol. 257, pp. 113972, Jan. 2020. [SCI, EI] (IF: 9.086) (**ESI Highly Cited Paper**)
6. **Hongxun Hui**, Yi Ding, Yonghua Song, Saifur Rahman, “Modeling and Control of Flexible Loads for Frequency Regulation Services Considering Communication Latency and Detection Error,” *Applied Energy*, vol. 250, pp. 161-74, Sep. 2019. [SCI, EI] (IF: 9.086)
7. **Hongxun Hui**, Yi Ding, Weidong Liu, You Lin, Yonghua Song, “Operating Reserve Evaluation of Aggregated Air Conditioners”, *Applied Energy*, vol. 196, pp. 218-228, Jun. 2017. [SCI, EI] (IF: 9.086)
8. **Hongxun Hui**, Yi Ding, Tao Chen, Saifur Rahman, Yonghua Song, “Coupon-Based Demand Response for

Consumers Facing the Flat-Rate Retail Pricing,” *Energy Policy*, Accepted, Feb. 2021. [SCI, EI] (IF: 5.042)

9. Yi Ding, **Hongxun Hui\***, Zhenzhi Lin, Menglian Zheng, Xinyao Qu and Wenqi Cui, “Design of Business Model and Market Framework Oriented to Active Demand Response,” *Automation of Electric Power Systems*, vol. 41, no. 14, Jul. 2017. [ISTIC, EI] (TOP 5 Highly Cited Papers in 3 Years)
10. Yi Ding, Kaining Luan, **Hongxun Hui\***, “Energy Saving and Emission Reduction From the Glowworm Project—Coupon-based Demand Response Demonstration in Flat Rate Market,” *IEEE Spectrum*, vol. 78, pp. 76-78, Jan. 2019. (Invited Paper)
11. Yi Ding, Huahua Wu, **Hongxun Hui\***, Jun Zhang, “Analysis and Related Suggestions on Power Market Mechanism of Demand Side Response in China,” *Southern Power System Technology*, vol. 10, no. 3, pp. 24-31, Mar. 2016. [ISTIC, EI]
12. Weidong Liu, **Hongxun Hui\***, Lijun Zhang, Chenbo Xu, Yikai Sun, Yi Ding, “Analysis on Peak Load Regulation Potential and Evaluation Model of Residential Loads,” *Southern Power System Technology*, vol. 10, suppl. 1, pp. 256-263, Dec. 2016. [ISTIC, EI]
13. Dunjian Xie, **Hongxun Hui**, Yi Ding, Zhenzhi Lin, “Operating Reserve Capacity Evaluation of Aggregated Heterogeneous TCLs with Price Signals,” *Applied Energy*, vol. 216, pp. 338-47, Apr. 2018. [SCI, EI] (IF: 9.086)
14. Qiangqiang Xie, **Hongxun Hui**, Yi Ding, Chengjin Ye, Zhenzhi Lin, Jiadong Cui and Peng Wang, “Use of Demand Response for Voltage Regulation in Power Distribution Systems with Flexible Resources,” *IET Generation, Transmission & Distribution*, vol. 14, no. 5, pp. 883-92, Jan. 2020. [SCI, EI] (IF: 2.862)
15. Kang Xie, **Hongxun Hui**, Yi Ding, “Modeling and Control Strategy of Thermostatically Controlled Loads for Virtual Energy Storage System,” *Protection and Control of Modern Power Systems*, Oct. 2019. [SCI, EI]
16. Yi Ding, Dunjian Xie, **Hongxun Hui**, Yan Xu, Pierluigi Siano, “Game-Theoretic Demand Side Management of TCLs for Smoothing Tie-line Power of Microgrids,” *IEEE Transactions on Power Systems*, Accepted, Mar. 2021. [SCI, EI] (IF: 6.074)
17. Wenqi Cui, Yi Ding, **Hongxun Hui**, Zhenzhi Lin, Pengwei Du, Yonghua Song, Changzheng Shao, “Evaluation and Sequential Dispatch of Operating Reserve Provided by Air Conditioners Considering Lead-Lag Rebound Effect,” *IEEE Transactions on Power Systems*, vol. 33, no. 6, pp. 6935-50, Nov. 2018. [SCI, EI] (IF: 6.074)
18. Yi Ding, Wenqi Cui, Shujun Zhang, **Hongxun Hui**, Yiwei Qiu, Yonghua Song, “Multi-state Operating Reserve Model of Aggregate Thermostatically-Controlled-Loads for Power System Short-term Reliability Evaluation,” *Applied Energy*, vol. 241, pp. 46-58, May 2019. [SCI, EI] (IF: 9.086)
19. Xinran Zhuang, Chengjin Ye, Yi Ding, **Hongxun Hui**, “Data-driven Reserve Allocation with Frequency Security Constraint Considering Inverter Air Conditioners,” *IEEE Access*, Aug. 2019. [SCI, EI] (IF: 3.745)
20. Taoyi Qi, **Hongxun Hui**, Lizhong Xu, Xiang Ma, Yi Ding, “Modeling and Control of Generalized Demand Response in Micro-grids Based on GridLAB-D,” *Distribution & Utilization*, vol. 37, no. 7, pp. 3-10, Aug. 2020.
21. Shuyang Xu, Xingying Chen, Jun Xie, Saifur Rahman, Jixiang Wang, **Hongxun Hui**, Tao Chen, “Agent-based Modelling of Electricity Market with Residential DR,” *CSEE Journal of Power and Energy Systems*, Early Access, Jul. 2020. [SCI, EI] (IF: 3.115)
22. Kang Xie, Kaijie Zhang, Kaining Luan, **Hongxun Hui**, Yishuang Hu, Yi Ding, “Exploration of Demand Response Score Scheme Under Electric Power System Reform,” *Power Demand Side Management*, vol. 21, no. 3, May 2019. [ISTIC]
23. Zuofeng Li, Wenqi Cui, Zhenyu Chen, **Hongxun Hui**, Kaining Luan, Bin Yang, Yi Ding, “Research and Practice of Interruptible Load in the Market Environment (I),” *Power Demand Side Management*, vol. 18, no. 6, Nov. 2016. [ISTIC]
24. Zhenyu Chen, Wenqi Cui, **Hongxun Hui**, Bin Yang, Kaining Luan, Yi Ding, “Research and Practice of Interruptible Load in the Market Environment (II),” *Power Demand Side Management*, vol. 19, no. 1, Jan. 2017. [ISTIC]

## International Conference

25. **Hongxun Hui**, Yi Ding, Shihai Yang, “Modeling and Analysis of Inverter Air Conditioners for Primary Frequency Control Considering Signal Delays and Detection Errors,” *Energy Procedia*, vol. 158, pp. 4003-4010, Feb. 2019.
26. **Hongxun Hui**, Yi Ding, Yonghua Song and Saifur Rahman, “Modelling and Dynamic Performance Analysis of the Power System Under Unit Contingency Shutdown Accidents Considering DR,” *Energy Proceedings*, vol. 3, pp. 1-6, Aug. 2019.
27. **Hongxun Hui**, Yi Ding, Kaining Luan and Daoqiang Xu, “Analysis of 815 Blackout in Taiwan and the Improvement Method of Contingency Reserve Capacity Through DLC”, *IEEE PES General Meeting*, Portland, USA, 2018.
28. **Hongxun Hui**, Xing Jiang, Yi Ding, Yonghua Song and Li Guo, “Demonstration of Friendly Interactive Grid

Under the Background of Electricity Market Reform in China”, *EEEIC/I&CPS Europe*, pp. 1-5. *IEEE*, Milan, Italy, 2017.

29. **Hongxun Hui**, Weidong Liu and Yi Ding, “Quantitative Analysis of Air Conditioner Aggregation for Providing Operating Reserve”, *Energy Procedia*, vol. 104, pp. 50-55, Dec. 2016.
30. Xinyao Qu, **Hongxun Hui**, Yi Ding and Kaining Luan, “Optimal Control of Intelligent Electricity Consumption for Residential Customers Considering Demand Response”, *Energy Procedia*, vol. 145, pp. 510-515, Jul. 2018.
31. Sheng Wang, **Hongxun Hui**, Yi Ding and Chengzhi Zhu, “Cooperation of Demand Response and Traditional Power Generations for Providing Spinning Reserve”, *Energy Procedia*, vol. 421, pp. 2035-2041, Dec. 2017.
32. Xinyao Qu, **Hongxun Hui**, Shengchun Yang, Yaping Li and Yi Ding, “Price Elasticity Matrix of Demand in Power System Considering Demand Response Programs”, *IOP Conf. Series: Earth and Environmental Science*, vol. 121, no. 5, Feb. 2018.
33. Wenqi Cui, Yi Ding, **Hongxun Hui** and Maozhen Li, “Two-stage Payback Model for the Assessment of Curtailment Services Provided by Air Conditioners,” *Energy Procedia*, vol. 142, pp. 2050-2056, Dec. 2017.
34. Haiyue Yu, Kang Xie, **Hongxun Hui**, Yi Ding, “Review of Flexible Loads for Participating in Frequency Regulation,” *IEEE Conf. on Energy Internet and Energy system Integration*, Wuhan, China, pp. 1-5, Oct. 2020.

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### Invited Talks

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1. Control of Thermostatically Controlled Loads for Providing Regulation Services in Power Systems, *International Conference on Renewable Energy*, Rome, Italy, Nov. 2020. (**Plenary Speaker**)
2. Equivalent Modeling and Control of Inverter Air Conditioners for Providing Frequency Regulation Service, the *4th IEEE Conference on Energy Internet and Energy System Integration (EI2 2020)*, Wuhan, China, Oct. 2020. (**Outstanding Presentation**)
3. Modelling and Dynamic Performance Analysis of the Power System Under Unit Contingency Shutdown Accidents Considering DR, *International Conference on Applied Energy*, Västerås, Sweden, Aug. 2019.
4. Modeling and Analysis of Inverter Air Conditioners for Primary Frequency Control Considering Signal Delays and Detection Errors, *International Conference on Applied Energy*, Hong Kong, China, Aug. 2018.
5. Demonstration of Friendly Interactive Grid Under the Background of Electricity Market Reform in China, *IEEE EEEIC17 and I&CPS Europe*, Milan, Italy, Jun. 2017.
6. Electricity Distribution Pricing Mechanism in China. *IEEE PES General Meeting*, Boston, USA, Jul. 2016.
7. Quantitative Analysis of Air Conditioner Aggregation for Providing Operating Reserve, *Low-carbon Cities & Urban Energy*, Jinan, China, Jun. 2016.

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### Issued Invention Patents (已授权中国发明专利)

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1. **Hongxun Hui**, Yi Ding, Weidong Liu, Lijun Zhang, Yikai Sun and Chenbo Xu, “A Calculation Method of Aggregated Air Conditioners for Providing Regulation Services for Power Systems,” No. CN201610821647.X, Dec. 2018.
2. **Hongxun Hui** and Chuangxin Guo, “A Self-powered Pinch Meter Based on Micro-generator and SCM,” No. CN201410009920.X, Jul. 2016.
3. **Hongxun Hui** and Chuangxin Guo, “A Dismantling Equipment for Electronic Devices Based on SCM,” No. CN201410010721.0, May 2016.
4. **Hongxun Hui**, Yibai Lu, Lequan Yu, Litong Lv and Hui Sun, “An Electrocardiogram Detection Device Based on Bluetooth Communication,” No. CN201410094326.5, Mar. 2016.
5. Yi Ding, **Hongxun Hui**, Zhenyu Chen, Kaining Luan, Chunyu Xie, Wenqi Cui, Kang Xie, “One Demand Response Method Considering the Total Cost Risk of Power System,” No. CN201811050910.5, Jul. 2020.
6. Yi Ding, **Hongxun Hui**, Yonghua Song, “Hybrid Control Method of Integrated Inverter Air Conditioners for Providing Frequency Regulation Services,” No. CN201910511062.1, Nov. 2020.
7. Yi Ding, **Hongxun Hui** and Yonghua Song, “An Intelligent Meter with Multi-time Scale Electricity Prices,” No. CN201610543375.1, May 2019.
8. Yi Ding, Kang Xie, **Hongxun Hui**, Kaijie Zhang, “Frequency Regulation Controller of Inverter Air Conditioners Considering Incentive Signals,” No. CN201910576119.6, Oct. 2020.

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### Computer Skills and Software Copyrights

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#### Computer Skills

- Programming languages: Matlab, C, C++, Java, Python
- Professional software: LabVIEW, Altium Designer, OrCAD, Altera Quartus, AutoCAD

## Software Copyrights (软件著作权)

- **Hongxun Hui**, Yi Ding and Wenqi Cui, “Software for Coupon Computing and Settlement in Friendly Interactive Smart Grid,” No. 2018SR449433, May 2018.  
城区用户与电网供需友好互动系统示范工程积分政策计算与用户积分值结算软件
- Yi Ding, Dunjian Xie and **Hongxun Hui**, “Software for Game Theory-Based Collaborative Optimization Control of Thermostatically Controlled Loads,” No. 2019SR0481590, Mar. 2019.  
一种基于博弈框架的温控负荷能量协同优化管理控制器软件
- Dunjian Xie, Yi Ding and **Hongxun Hui**, “Simulation Software for Optimal Coordination of Thermostatically Controlled Loads for Demand Response,” No. 2019SR0450852, Mar. 2019.  
一种实现空负荷最优协同的需求响应博弈仿真软件

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## Research Projects

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**Friendly Interactive Smart Grid Between Supply- and Demand-Sides, \$1100K** Nanjing, China  
*Supported by Ministry of Science and Technology of China (国家科技部 No. 2016YFB0901100)* 07/2016 – 06/2020

**Principal Student Investigator (实施负责人)**

- Cooperative control strategies of supply-side (generating units) and demand-side (flexible loads).
- Business model design for flexible loads participating in demand response, including electricity prices, transaction method, and settlement method.
- Field demonstration in Suzhou and Changzhou Cities, around 110,000 customers are equipped with smart devices to participate in this project. It is one of the largest demand response projects in the world.

**Reliability Analysis and Optimization of Smart Grid Considering the Coordinated Operation of Flexible Resources and Wind Power, \$130K** Hangzhou, China  
*Supported by National Natural Science Foundation of China (国家自然科学基金 No. 51577167)* 01/2016 – 12/2019

**Principal Student Investigator (实施负责人)**

- Multiple uncertainties' analysis of various flexible resources, especially HVACs.
- Reliability models and optimization of power systems, considering wind power and flexible resources.

**Control Method and Peak-shaving Capacity Evaluation of Flexible Loads, \$160K** Hangzhou, China  
*Supported by State Grid Zhejiang Electric Power Company (国网浙江省公司 No. 5211JY15001S)* 01/2016 – 12/2017

**Principal Student Investigator (实施负责人)**

- Control method of flexible loads, especially air conditioners, considering user's behavior and comfort.
- Quantitative evaluation of peak-shaving capacities provided by flexible loads, considering multiple uncertainties.
- Comparison of reliability and economy of the power system before and after integrating demand response.

**Research and Application of Consumer Demand Response, \$120K** Nanjing, China  
*Supported by State Grid Jiangsu Electric Power Company (国网江苏省公司 No. KH20161699)* 03/2016 – 11/2016

**Principal Student Investigator (实施负责人)**

- Market mechanism and implementation plan of demand response for the existing electricity market in China.
- The new spike price policy is proposed and implemented for the first time in China.
- According to the energy efficiency evaluation report by State Grid Jiangsu Electric Power Company, the construction investments in power plants and transmission lines are postponed around 16.78 billion Chinese Yuan.

**Modeling and Regulation Potential Evaluation of Air Conditioners, EVs, and Batteries, \$50K** Nanjing, China  
*Supported by China Electric Power Research Institute (中国电力科学研究院 No. DZ71-15-004)* 09/2015 – 06/2016

**Principal Student Investigator (实施负责人)**

- Mathematical and physical model of typical flexible loads, including air conditionings, EVs and batteries.
- The operation performance and regulation potential of flexible loads with dynamic electricity prices.
- The proposed models and methods were tested and implemented in State Grid Jiangsu Electric Power Company.

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## Additional Information

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### Professional Services

- **Vice President:** IEEE Industry Applications Society Student Branch Chapter in Zhejiang University (2018-2020)
- **Program Committees:** 2021 International Conference on Power System and Energy Internet
- **Member of a Council:** IEEE PES China Electric Vehicle Technical Committee, Technical Sub-Committee on Integration of Electric Vehicle and Energy Transportation System
- **Journal Reviewers:** IEEE Transactions on Industrial Electronics (Since 2017), International Journal of Electrical Power & Energy Systems (Since 2017), Applied Energy (Since 2018), Journal of Modern Power Systems and Clean Energy (Since 2018), IEEE Transactions on Sustainable Energy (Since 2019), IEEE Transactions on Power Systems (Since 2019), IEEE Transactions on Smart Grid (Since 2019), IEEE Access



(Since 2019), *CSEE Journal of Power & Energy Systems* (Since 2019), *Journal of Electrical Engineering & Technology* (Since 2019), *International Transactions on Electrical Energy Systems* (Since 2019), *Renewable & Sustainable Energy Reviews* (Since 2019), *Economic Alternatives* (Since 2019), *IET Energy Systems Integration* (Since 2019), *IEEE Transactions on Industry Applications* (Since 2019), *IEEE Transactions on Circuits and Systems I: Regular Papers* (Since 2019)

- **Conference Reviewers:** *IEEE PES General Meeting*, *International Conference on Applied Energy*, *IEEE Sustainable Power & Energy Conference*, *International Conference on Smart Energy Systems and Technologies*, *IEEE International Conference on Environment and Electrical Engineering* and *IEEE Industrial and Commercial Power Systems Europe*.

## Teaching

- Teaching Fellow, *Power System Operation and Control* (Instructor: Prof. Yi Ding and Prof. Pierluigi Siano), College of Electrical Engineering, Zhejiang University, 2016.

## Selected Honors & Rewards

- National Scholarship, 2019. (The first ranking among 58 Ph.D. students in the major of power systems)  
国家奖学金, 58 位电气工程专业博士生中排名第 1 位
- First Batch of the Academic Rising Star Program, ZJU, 2018. (3 students among 180 Ph.D. students in EE)  
首届学术新星计划入选者, 浙江大学电气工程学院 180 位博士生遴选 3 位
- Wang Guo Song Scholarship, 2019. (The highest honor in College of EE, 4 students among 180 Ph.D. students)  
王国松奖学金, 浙江大学电气工程学院最高荣誉, 180 位博士生遴选 4 位
- Tang Lixin Scholarship (唐立新奖学金, 电气工程学院首位/年度唯一获奖者), 2017.
- Excellent Postgraduate Students' Award (浙江省优秀毕业生 及 浙江大学优秀毕业研究生), 2020.
- Postgraduate Students' Scholarship (毕业研究生奖学金), 2020.
- Outstanding Reviewer Award from *Journal of Modern Power Systems and Clean Energy*, 2018.
- Award of Honor for Graduate (浙江大学优秀研究生), 2016, 2017, 2018, 2019.
- Graduate of Merit/Triple A graduate (浙江大学三好研究生), 2016, 2019.
- Outstanding Graduates of Zhejiang University (浙江大学优秀毕业本科生), 2015.
- Excellent Honor in Edison Class, Zhejiang University (爱迪生班优秀荣誉), 2015.
- Scholarship for Excellence in Research and Innovation (浙江大学创新创业奖学金), 2015.
- Meritorious, Interdisciplinary Contest in Modeling (ICM), Consortium for Mathematics and Its Application (国际数学建模 ICM 竞赛一等奖), 2014.
- First Price, 7th Science Contest on Energy Saving & Emission Reduction (浙江大学节能减排竞赛一等奖), 2014.
- Fifth (5/149), 9th University Student Robot Contest (My Super Shopper) (机器人竞赛 149 队伍第 5 名), 2014.
- Best Design Award, 9th University Student Robot Contest (My Super Shopper) (机器人竞赛最佳设计奖), 2014.
- Third Price, 7th Intelligent Car Competition of Zhejiang University (浙江大学智能车竞赛三等奖), 2014.
- Bosch Scholarship (博世奖学金), 2015.
- Outstanding Student Leader Awards (浙江大学优秀学生干部), 2012, 2014.
- Excellent Student Awards (浙江大学优秀学生奖学金), 2012, 2013, 2014.
- First-Class Scholarship for Outstanding Merits/Students (浙江大学一等奖学金), 2012.