

# Fu Yongquan

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## Research Interests

I have broad interests in computer networks and distributed systems that consist of plenty of trade offs in design spaces. Recently, I have been working on machine learning driven network telemetry and self-running optimization for data center networks, online social networks, and erasure code distributed storage systems.

I prefer an empirical-driven research approach: Devising full-spectrum measurement methodology to identify bottlenecks and summarize stringent challenges, exempling the design spaces to trade off the performance metrics, and developing simple yet efficient approaches with fruitful mathematical backgrounds.

## Professional Experience

**Associate Professor**, National Key Laboratory for Parallel and Distributed Processing, National University of Defense Technology, 2018.12–Now.

**Assistant Professor**, National Key Laboratory for Parallel and Distributed Processing, National University of Defense Technology, 2012.12–2018.12.

**Adjunct researcher**, Department of Scientific Research, National University of Defense Technology, 2014.07–2017.07.

**Teaching Assistant**, Spring semester, College of Computer, National University of Defense Technology, 2008.

## Education

Ph.D. in Computer Science, National University of Defense Technology, March 2008 to December 2012.  
*Thesis: Research on Distributed Network Latency Measurement for the Internet Environment*  
Advisor: Prof. Wang Yijie

Joint Ph.D. student in Network and Security, EURECOM, France, September 2010 to September 2011.  
*Advisors: Prof. Ernst Biersack, Prof. Wang Yijie*

M.A. in Computer Applications, National University of Defense Technology, September 2005 to December 2007.  
*Thesis: Topology-awareness and unbiased sampling based flash dissemination*  
Advisor: Prof. Wang Yijie

B.S. in Computer Science, Shandong University, September 2001 to July 2005.

## Research Projects

I have worked on the following research projects categorized based on research themes:

### Systems:

- (i) *Network knowledge graph(2018-now)*.
- (ii) *Privacy-preserving social applications (2011-now)*.
- (iii) *Accelerated P2P file provisioning in data center (2012-2015)* .
- (iv) *Erasure-code file storage (2013-2015)*.
- (v) *Distributed Hash Tables (2005-2007)*.

### Networks:

- (i) *Self-driving networks(2018-now)*.
- (ii) *Network representation and learning (2017-now)*.
- (iii) *Streaming network telemetry (2013-now)*.
- (iv) *Sketch based data compression and query (2011-now)*.
- (v) *Distributed network proximity query (2009-now)*.
- (vi) *network-\*(delay, bandwidth, loss, hops, metric-space, inframe-tric-space, high-order) measurement and learning (2006-now)*.

## Funding

1. PI, "Research on key techniques for self-driving cloud service mesh architecture", NSFC award, Amount: RMB: 600,000, January 2020 – December 2023.
2. PI, "Research on the long-tail latency-optimized supporting techniques for the runtime environment of the online data intensive computing", NSFC Youth award, Amount: RMB: 240,000, January 2015 – December 2017.
3. PI, "Big-data Governance System", University Pilot Research Project. RMB: 200,000, January 2019– December 2020.
4. Senior Personnel, "Efficient and trusted virtual computing environment basic research", Ministry of science and technology of P.R.C, RMB: 29,720,000, January 2011 – December 2015. (PIs: Xicheng Lu, Jie Xu, Michael R Lyu, Donggang Cao, Xinran Liu).

## Selected Publications

### Book chapter

1. **Distributed organization of virtual resources** chapter edited jointly with Prof. Yiming Zhang, Internet-oriented Virtual Computing Environment, Science Press 2016.

### Surveys

1. **Fu Yongquan**, Li Dongsheng, Application Driven Latency Measurement and Optimization Techniques in Edge Computing Environment: A Survey, 2018, *Journal of Computer Research and Development*. (In Chinese). 55(3): 512–523

### Journal Articles

1. **Yongquan Fu**, Dongsheng Li, Pere Barlet-Ros, Chun Huang, Zhen Huang, Siqi Shen, Huayou Su. A Skewness-aware Matrix Factorization Approach for Mesh-structured Cloud Services. 2019, *IEEE/ACM Transactions on Networking*, 27(4): 1598–1611
2. **Fu Yongquan**, Pere Barlet-Ros, Dongsheng Li: Every Timestamp Counts: Accurate Tracking of Network Latencies using Reconcilable Difference Aggregator, 2018, *IEEE/ACM Transactions on Networking* 26(1): 90–103
3. **Fu Yongquan**, Ernst Biersack: MCR: Structure-aware Overlay based Latency-optimal Greedy Relay Search, 2017, *IEEE/ACM Transactions on Networking* 25(5): 3016–3029
4. **Fu Yongquan**, Xu Xiaoping: Self-Stabilized Distributed Network Distance Prediction, 2017, *IEEE/ACM Transactions on Networking* 25(1): 451–464
5. **Fu Yongquan**, Ernst Biersack: False-Positive Probability and Compression Optimization for Tree-Structured Bloom Filter, 2016, *ACM TOMPECS* 1 19:1–19:39
6. **Fu Yongquan** and Ernst Biersack. 2015. Tree-structured Bloom Filters for Joint Optimization of False Positive Probability and Transmission Bandwidth. *SIGMETRICS Perform. Eval. Rev.* 43, 1 (June 2015), 437–438
7. **Fu Yongquan**, Wang Yijie, Peng Wei, CommonFinder: A decentralized and privacy-preserving common-friend measurement method for the distributed online social networks, 2014, *Computer Networks* v 64, p 369–389.
8. **Fu Yongquan**, Wang Yijie, Biersack Ernst, A general scalable and accurate decentralized level monitoring method for large-scale dynamic service provision in hybrid clouds, 2013, *Future Generation Computer Systems*, 29(5), p 1235–1253.
9. **Fu Yongquan**, Wang Yijie, Biersack Ernst, HybridNN: An accurate and scalable network location service based on the inframetric model, 2013, *Future Generation Computer Systems*, v 29, n 6, p 1485–1504.
10. **Fu Yongquan**, Wang Yijie, DKNNS: Scalable and accurate distributed K nearest neighbor search for latency-sensitive applications, 2013, *Science China Information Sciences*, v 56, n 3, p 1–17.
11. **Fu Yongquan**, Wang Yijie, Scalable unbiased sampling method based on multi-peer adaptive random walk, 2009, *Ruan Jian Xue Bao/Journal of Software*, v 20, n 3, p 630–643. (In Chinese)
12. Liwen Peng, Siqi Shen, Jun Xu, **Yongquan Fu**, Dongsheng Li, Adele Lu Jia, Diting: An Author Disambiguation method based on Network Representation Learning, 2019, *IEEE Access*, Accepted.
13. Li Xiaoyong, Wang Yijie, **Fu Yongquan**, Li Xiaoling, Sun Weidong, BLOR: An efficient bandwidth and latency sensitive overlay routing approach for flash data dissemination, 2014, *Concurrency Computation Practice and Experience*.
14. Li Xiaoyong, Wang Yijie, **Fu Yongquan**, Sun Weidong, PNDP: Predicting Accurate Network Distance Based on Clustering, 2012, *Information, An International Interdisciplinary Journal*, v 15, n 1, p 267–274

### Conference Proceedings

1. **Yongquan Fu**, Dongsheng Li, Siqi Shen, Yiming Zhang, Kai Chen: Clustering-preserving Network Flow Sketching. 2020, *IEEE INFOCOM*, accepted.
2. **Yongquan Fu**, Dongsheng Li, Siqi Shen, Yiming Zhang, Kai Chen: Resilient Disaggregated Network Flow Monitoring. 2019, *ACM SIGCOMM (Poster)*, 54–56.

3. **Fu Yongquan**, Ernst Biersack: *Tree-structured Bloom Filters for Joint Optimization of False Positive Probability and Transmission Bandwidth*, 2015, *ACM SIGMETRICS* 437-438
4. **Fu Yongquan**, Wang Yijie, Pei Xiaoqiang, *Towards Latency-Optimal Distributed Relay Selection*, 2015, *IEEE/ACM CCGRID*, 433-442
5. **Fu Yongquan**, Wang Yijie, *On the feasibility of common-friend measurements for the distributed online social networks*, 2012, *7th International Conference on Communications and Networking in China*, p 24-29. (**Best Paper**)
6. **Fu Yongquan**, Wang Yijie, *BCE: a Privacy-preserving Common-friend Estimation Method for Distributed Online Social Networks Without Cryptography*, 2012, *7th International Conference on Communications and Networking in China*, p 212-217.
7. Adele Lu Jia, Xiaoxue Shen, Siqi Shen, **Yongquan Fu**, Liwen Peng: *User Donations in a User Generated Video System*. *WWW (Companion Volume) 2019*: 1055-1062
8. Liwen Peng, Siqi Shen, Dongsheng Li, Jun Xu, **Yongquan Fu**, and Huayou Su. *Author Disambiguation through Adversarial Network Representation Learning*. *IJCNN 2019*, accepted.
9. Jun Xu, Siqi Shen, Dongsheng Li and **Yongquan Fu**, *A Network-embedding based method for Author Disambiguation*, 2018, *CIKM*, to appear.
10. Pei Xiaoqiang, Wang Yijie, Ma Xingkong, **Fu Yongquan**, and Xu Fangliang, *Cooperative Repair Based on Tree Structure for Multiple Failures in Distributed Storage Systems with Regenerating Codes*, 2015, *ACM Conf. Computing Frontiers*.
11. Wei Lichao, **Fu Yongquan**, Liu Feng, Peng Yuxing, *Research on the Similar-File Assisted P2P based Image Delivery Technique in the Data Center Environment*, 2015, *HPC China*. (In Chinese)
12. Pei Xiaoqiang, Wang Yijie, Ma Xingkong, **Fu Yongquan**, and Xu Fangliang, *MCRTREE: A Mutually Cooperative Recovery Scheme for Multiple Losses in Distributed Storage Systems Based on Tree Structure*, 2014, *9th IEEE International Conference on Networking, Architecture, and Storage*, p 158-167.
13. Lin Xuan, Wang Yijie, Pei Xiaoqiang, Xu Fangliang, **Fu Yongquan**, *GRC: A High Fault-Tolerance and Low Recovery-Overhead Erasure Code for Multiple Losses*, 2014, *CCF BigData*.
14. Li Xiaoyong, Wang Yijie, **Fu Yongquan**, Li Xiaoling, Sun Weidong, *BLOR: Bandwidth and Latency Sensitive Overlay Routing for Flash Data Dissemination*, 2012, *International Heterogeneity in Computing Workshop*, p 53-64.

### Workshop

1. **Fu Yongquan**, Wang Yijie, *iRank: Supporting proximity ranking for peer-to-peer applications*, 2009, *International Workshop on Peer-to-Peer Networked Virtual Environments*, p 836-841.
2. **Fu Yongquan**, Wang Yijie, *HyperSpring: Accurate and stable latency estimation in the hyperbolic space*, 2009, *International Workshop on Internet-based Virtual Computing Environment*, p 864-869.
3. Sun Weidong, Wang Yijie, **Fu Yongquan**, Pei Xiaoqiang, *A discrete data dividing approach for erasure-code-based storage applications*, 2014, *International Workshop on Internet-based Virtual Computing Environment*, p 308-313.

## Patents

1. **Locality-sensitive counter sketch method and device for network anomaly detection**, China patent pending (CN201910361101.4), **Yongquan Fu**, Dongsheng Li, Chun Huang, Siqi Shen.
2. **An erasure code based count-min sketch method and device**, China patent pending (CN201811389708.5), **Yongquan Fu**, Dongsheng Li, Xiaoping Xu, Chun Huang, Siqi Shen, Songzhu Mei, Qinglin Wang, Xiaoge Deng.
3. **Network performance staging representation method**, China patent pending (CN201811389396.8), **Yongquan Fu**, Dongsheng Li, Xiaoping Xu, Chun Huang, Siqi Shen, Songzhu Mei, Qinglin Wang, Xiaoge Deng.
4. **A similar-file coordinated BitTorrent data dissemination system and method**, China patent pending (CN201611144224.5), **Yongquan Fu**, Wei Lichao, Liu Feng, Peng Yuxing, Dongsheng Li.
5. **A large-scale network environment oriented distributed K nearest neighbor search method**, China patent (CN201010168975.7), Wang Yijie, **Yongquan Fu**, Sun Weidong, Li Xiaoyong, Ma Xingkong, Li Dongsheng, Chu Rui, Zhang Yiming, Chen Zhenbang, Peng Yuxing, Che Yonggang, Xu Chuanfu, Wang Yongxian.
6. **An improved erasure-code based corrupted data repairing method**, China patent (CN201410019879.4), Wang Yijie, Sun Weidong, Pei Xiaoqiang, Xu Fangliang, **Yongquan Fu**, Cheng Li, Li Xiaoyong, Ma Xingkong, Wang Yuan, Zhao Yue, Lin Xuan, Xiong Zeyu.
7. **An erasure-code based linear repair method for corrupted data**, China patent (CN201310593541.5), Wang Yijie, Xu Fangliang, Pei Xiaoqiang, **Yongquan Fu**, Sun Weidong, Cheng Li, Li Xiaoyong, Ma Xingkong, Wang Yuan, Zhao Yue, Lin Xuan, Xiong Zeyu.
8. **An erasure-code oriented data placement method**, China patent (CN201410269720.8), Wang Yijie, Xu Fangliang, Pei Xiaoqiang, **Yongquan Fu**, Sun Weidong, Cheng Li, Li Xiaoyong, Ma Xingkong, Wang Yuan, Zhao Yue, Lin Xuan, Xiong Zeyu.
9. **An erasure-code based file appending method**, China patent (CN201410331144.5), Wang Yijie, Pei Xiaoqiang, Xu Fangliang, **Yongquan Fu**, Sun Weidong, Cheng Li, Li Xiaoyong, Ma Xingkong, Wang Yuan, Zhao Yue, Lin Xuan, Xiong Zeyu.
10. **A location fusion based distributed collaborative network coordinate derivation method**, China patent (CN200710035565.3), Wang Yijie, **Yongquan Fu**, Zhong Zheng, Yongtao Yang, Weidong Sun, Xiaoyong Li.

## Students

I have advised the following students at National University of Defense Technology:

Wei Lichao (Large scale data dissemination acceleration in data centers, master student, co-advised with Prof. Liu Feng, now engineer at China Mobile)

Li Ruijiang (Streaming telemetry in programmable networks, bachelor thesis supervisor, now master student at NUDT)

Zhu Xiancong (Network monitoring in data center networks, bachelor thesis supervisor, graduated from NUDT)

I have worked closely with the following students at NUDT:

Li Xiaoyong (Skyline query optimization in big data, advised by Prof. Wang Yijie, assistant professor at NUDT)

Ma Xingkong (Pub/Sub algorithmic optimization in distributed systems, advised by Prof. Wang Yijie, assistant professor at NUDT)

Pei Xiaoqiang (Erasure coding in big data analytics systems, advised by Prof. Wang Yijie)

Xu Fangliang (Erasure coding algorithm design, advised by Prof. Wang Yijie)

Zhou Jingwen (Distributed system tracing and debugging, advised by Prof. Ji Wang)

## Awards and Honors

**Faculty Award (2013, 2015, 2018)**, College of Computer, National University of Defense Technology.

**On the feasibility of common-friend measurements for the distributed online social networks (2012)**, Best Paper Award, Proc. of Chinacom 2012.

**Joint PhD student scholarship granted by China Scholarship Council (2010-2011)**.

**Topology-awareness and unbiased sampling based flash dissemination (2010)**, Excellent Master Thesis, Hunan Province.

**Ph.D Innovation Scholarship (2008)**, National University of Defense Technology.

**GuangHua Graduate Student Scholarship (2007)**, National University of Defense Technology.

**Student Scholarship for Excellence in High-education Entrance Examination (2001-2005)**, second degree, including four-year tuition fees and graduate-candidate exempt from admission exam, Shandong University.

## Invited Reviewers

*IEEE/ACM Transactions on Networking (four papers)*

*IEEE Transactions on Knowledge and Data Engineering (one paper)*

*Computer Networks (four papers)*

*Future Generation Computer Systems (one paper)*

*Concurrency Computation Practice and Experience (two papers)*

*IEEE Communications Letters (one paper)*

*IEEE Access (one paper)*

*Frontiers (two papers)*