Songyuan **Li**

PH.D. CANDIDATE IN COMPUTER SCIENCE · UNIVERSITY OF EXETER, U.K.

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Short Bio

Songyuan Li is currently a Ph.D. candidate in Computer Science within the Faculty of Environment, Science and Economy at the University of Exeter, U.K., supervised by Assoc. Prof. Jia Hu and Prof. Geyong Min. His current research interests include distributed systems and networks, services/cloud/edge Computing, applied machine learning, and QoS evaluation and optimization.

Before that, Songyuan received the B.Eng. and M.Eng. degrees in Computer Science and Technology from the Beijing University of Posts and Telecommunications, China, in 2018 and 2021, respectively. During his Master's journey, he worked with Prof. Jiwei Huang and Prof. Bo Cheng, at the State Key Laboratory of Networking and Switching Technology, Beijing, China.

Thus far, Songyuan has published several articles in reputable international conferences and journals, including IEEE *Transactions on Cognitive Communications and Networking*, IEEE *Transactions on Network and Service Management*, IEEE *ICWS*, IEEE *SCC*, IEEE *ISPA*. He serves as the organization/technical program committee member of many international conferences, such as, IEEE *SmartCNS*, ACM *ICSED*, *UbiSec*, etc. He is also the reviewer for more than 20 international journals and conferences, including IEEE *Transactions on Mobile Computing*, IEEE *Internet of Things Journal*, IEEE/ACM *CCGrid*, IEEE *VTC*, EAI *CollaborateCom*, IEEE *TrustCom*.

Research Interests

- Distributed Systems and Networks
- Applied Machine Learning
- Services/Cloud/Edge Computing
- QoS Evaluation and Optimization

Education

Ph.D. in Computer Science *September 2021 - present*
Faculty of Environment, Science and Economy, University of Exeter *Exeter, U.K.*
- Supervisors: Dr. Jia Hu, and Prof. Geyong Min.
- Research Focus: Edge Computing and Communications, Distributed Machine Learning, Resource Optimization.

M.Eng. in Computer Science and Technology *September 2018 - June 2021*
School of Computer Science, Beijing University of Posts and Telecommunications *Beijing, China*
- Supervisors: Prof. Jiwei Huang, and Prof. Bo Cheng.
- Thesis: "QoS-Aware Service Resource Scheduling and Optimization".

B.Eng. in Computer Science and Technology *September 2014 - June 2018*
School of Computer Science, Beijing University of Posts and Telecommunications *Beijing, China*
- Cumulative Overall GPA: 85/100; Major GPA: 88/100.
- Thesis: "QoS Evaluation and Optimization for IoT Services in Edge Computing Architecture".

Research Experience

High Performance Computing and Networking (HPCN) Research Group *September 2021 - present*
University of Exeter *Exeter, U.K.*
- Multi-dimensional resource optimization for multi-exit DNN inference acceleration at edge
- Incentive mechanism for device-edge synergistic DNN training

State Key Laboratory of Networking and Switching Technology *March 2016 - August 2021*
Beijing University of Posts and Telecommunications *Beijing, China*
- QoS-aware service selection/composition based on service ecosystem.
- Market-oriented resource pricing, and demand allocation in cloud environments.
- QoS/QoE-aware decentralized resource management and task scheduling in IoT-edge-cloud systems.

Research Projects (Selected)

Performance Evaluation and Optimization of IoT Service System based on Edge Computing Architecture

National Natural Science Foundation of China (No. 61972414)   *January 2020 - present*

- Adopt the potential game theory to solve the edge resource allocation problem with QoE maximization in a decentralized manner.
- Study the dynamic QoS-aware task scheduling and resource management problem in mobile edge computing, through designing an efficient optimization algorithm with LP relaxation techniques.

Self-Adaptive Scheme of Software Ecosystem with Collaborative Learning among Humans, Machines and Services

National Key Research and Development Program of China (No. 2018YFB1003804)   *October 2018 – December 2021*

- Propose a price-incentive resource auction mechanism, with the objective of stimulating maximum users willing to purchase cloud resources.
- Design a market-oriented cloud pricing strategy which solves the resource pricing and demand allocation for revenue maximization.
- Develop a QoS-aware concurrent service selection approach, with the max-min fairness across multiple service requests achieved.

QoS Evaluation Research for Large-Scale Dynamic Service Environment   *March 2016 - December 2018*

National Natural Science Foundation of China (No. 61502043)

- Design queueing network models for QoS evaluation of IoT services in edge-cloud systems.
- Conduct reliability-aware QoS evaluation for recoverable IoT edge services using the modeling techniques of generalized stochastic Petri nets.

Service Composition in IoT Environment   *March 2016 - December 2018*

Beijing Natural Science Foundation (No. 4162042)

- Manipulate the Markov-Decision-Process-based resource allocation and task scheduling in edge computing paradigm weighing energy costs against QoS requirements.

Publications

Journal Publications

J6. **[ToN'23] S. Li**, J. Hu, G. Min, H. Huang, and J. Huang, **Dynamic Pricing for On-Demand DNN Inference in the Edge-AI Market**, IEEE/ACM Transactions on Networking (Under Review), 2023.

J5. **[TCCN'22] S. Li**, J. Huang, J. Hu, and B. Cheng, **QoE-DEER: A QoE-Aware Decentralized Resource Allocation Scheme for Edge Computing**, IEEE Transactions on Cognitive Communications and Networking, *vol. 8, no. 2, pp. 1059-1073, 2022.*

J4. **[TNSM'21] S. Li**, J. Huang, and B. Cheng, **Resource Pricing and Demand Allocation for Revenue Maximization in IaaS Clouds: A Market-Oriented Approach**, IEEE Transactions on Network and Service Management, *vol. 18, no. 3, pp. 3460-3475, 2021.*

J3. **[TNSM'21] S. Li**, J. Huang, and B. Cheng, **A Price-Incentive Resource Auction Mechanism Balancing the Interests Between Users and Cloud Service Provider**, IEEE Transactions on Network and Service Management, *vol. 18, no. 2, pp. 2030-2045, 2021.*

J2. **[PPNA'20]** J. Huang, **S. Li**, and Y. Chen, **Revenue-Optimal Task Scheduling and Resource Management for IoT Batch Jobs in Mobile Edge Computing**, Peer-to-Peer Networking and Applications, *vol. 13, no. 5, pp. 1776-1787, 2020.*

J1. **[IJWGS'18]** J. Huang, **S. Li**, Y. Chen, and J. Chen, **Performance Modelling and Analysis for IoT Services**, International Journal of Web and Grid Services, *vol. 14, no. 2, pp. 146-169, 2018.*

Conference Publications

C3. **[ICWS'19] S. Li**, J. Huang, B. Cheng, L. Cui and Y. Shi, **FASS: A Fairness-Aware Approach for Concurrent Service Selection with Constraints**, Proc. of IEEE International Conference on Web Services, *July 8-13, 2019, Milan, Italy.*

C2. **[ISPA'17] S. Li**, and J. Huang, **Energy Efficient Resource Management and Task Scheduling for IoT Services in Edge Computing Paradigm**, Proc. of IEEE International Symposium on Parallel and Distributed Processing with Applications, *December 12-15, 2017, Guangzhou, China.*

C1. **[SCC'17] S. Li**, and J. Huang, **GSPN-Based Reliability-Aware Performance Evaluation of IoT Services**, Proc. of IEEE International Conference on Service Computing, *June 25-30, 2017, Honolulu, Hawaii, USA.*

Invited Talks (Selected)

- **Models and Solutions of QoS Optimization for Services Ecosystem**   *July 2021*
  Services Computing Seminar, China University of Petroleum - Beijing, China
- **FASS: A Fairness-Aware Approach for Concurrent Service Selection with Constraints**   *May 2019*
  CCF ICSS'19 Outstanding Young Scholar Symposium, Tianjin, China

Professional Services

Professional Membership
- IEEE (Institute of Electrical and Electronics Engineers, 2021-present)
- CCF (China Computer Federation, 2021-present)

Conference Organization
- **Publicity Chair** of ACM International Conference on Software Engineering and Development, ICSED 2023
- **Local Arrangement Chair** of International Conference on Ubiquitous Security (Springer), UbiSec 2023
- **Session Chair** of IEEE International Conference on Trust, Security and Privacy in Computing and Communications, TrustCom 2023
- **Session Chair** of International Symposium on Intelligent and Trustworthy Computing, Communications, and Networking, ITCCN 2023

Technical Program Committee
- 2023 ACM 5th International Conference on Software Engineering and Development, ICSED 2023
- 2023 3rd International Conference on Computer Engineering and Artificial Intelligence, ICCEAI 2023
- 2023 IEEE 3rd International Conference on Software Engineering and Artificial Intelligence, SEAI 2023
- 2022 IEEE 2nd International Conference on Software Engineering and Artificial Intelligence, SEAI 2022
- 2021 IEEE 11th International Conference on Smart Computing, Networking and Services, SmartCNS 2021
- 2021 1st International Conference on Computer Engineering and Artificial Intelligence, ICCEAI 2021

Journal Reviewer
- 2023: IEEE Transactions on Mobile Computing
- 2023, 2022: IEEE Transactions on Cognitive Communications and Networking
- 2023: IEEE Transactions on Network and Service Management
- 2023, 2022: IEEE Internet of Things Journal
- 2023, 2022: Computer Communications (Elsevier)
- 2023, 2022: Chinese Journal of Electronics
- 2023, 2022, 2021, 2020: IEEE Access
- 2022: Intelligent Automation & Soft Computing (Taylor & Francis)
- 2022: IETE Journal of Research
- 2022: Computational Intelligence and Neuroscience (Hindawi)
- 2022: International Journal of Communication Systems (Wiley)
- 2021, 2020: Scientific Programming (Hindawi)
- 2020: Behaviour & Information Technology (Taylor & Francis)

Conference Reviewer
- 2023 IEEE 22nd International Conference on Trust, Security and Privacy in Computing and Communications, TrustCom 2023
- 2023 EAI 19th International Conference on Collaborative Computing, CollaborateCom 2023
- 2022 IEEE 19th International Conference on Ubiquitous Intelligence and Computing, UIC 2022
- 2022 EAI 18th International Conference on Collaborative Computing, CollaborateCom 2022
- 2022 IEEE/ACM 22nd International Symposium on Cluster, Cloud and Internet Computing, CCGrid 2022
- 2021 IEEE 20th International Conference on Ubiquitous Computing and Communications, IUCC 2021
- 2021 IEEE 4th International Conference on Data Science and Computational Intelligence, DSCI 2021
- 2021 IEEE International Conference on Electrical, Computer, Communications, and Mechatronics Engineering, ICECCME 2021
- 2021 IEEE International Conference on Electrical, Computer, and Energy Technologies, ICECET 2021
- 2020 EAI 16th International Conference on Collaborative Computing, CollaborateCom 2020
- 2020 IEEE 92nd Vehicular Technology Conference, VTC2020-Fall

Honours & Awards

- **Outstanding Master Dissertation Award (top 1%)** *2021*
  Beijing University of Posts and Telecommunications, China
- **Outstanding Postgraduate Student Award (top 5%)** *2021*
  Beijing Municipal Education Commission, China
- **First-Class Postgraduate Scholarship** *2018, 2019, 2020*
  Beijing University of Posts and Telecommunications, China
- **China National Scholarship (top 2%)** *2019*
  Ministry of Education of the P.R. China
- **Outstanding Postgraduate Student Award** *2019*
  State Key Laboratory of Network and Switching Technology, Beijing University of Posts and Telecommunications, China
- **Outstanding Bachelor Dissertation Award (top 3%)** *2018*
  Beijing University of Posts and Telecommunications, China
- **First Prize in China Undergraduate Mathematical Contest in Modeling (Beijing Region)** *2016*

Student Mentoring

- **Yuxin Chen** (2023-present), M.Eng. Student at the China University of Petroleum-Beijing. Topic: Joint DNN model placement and inference task assignment in edge-cloud environments.

Teaching

- **Researcher Development Programme** (Ph.D. Student Level)   *2023/24 Academic Year*
  Role: Co-deliver tutorials and workshops   *Doctoral College, University of Exeter, U.K.*
- **ECMM445 - Learning from Data** (Postgraduate Level)   *Autumn 2023*
  Role: Co-design the practical session, deliver workshops, and coursework & exam assessment.
  Department of Computer Science, University of Exeter, U.K.
- **ECM3420 - Learning from Data** (3rd-year Undergraduate Level)   *Autumn 2023*
  Role: Co-design the practical session, deliver workshops, and coursework & exam assessment.
  Department of Computer Science, University of Exeter, U.K.