

Award Justification

Yu Xiao (born in 1983) is a tenure-track assistant professor at Department of Communications and Networking at Aalto University. Since she started her research career at Aalto University as a PhD candidate in 2007, she has shown excellent academic performance and conducted innovative research with a high practical impact.

As a PhD candidate, her work focused on energy-efficient mobile computing. In this field she invented a practical method for modelling and managing the energy consumption of wireless data transmission on mobile devices. Her work on energy-efficient mobile computing has been widely cited, awarded with two best paper awards and two Nokia scholarships, and included in a text book on energy-efficient mobile computing.

After receiving her doctoral degree in computer science in January 2012, she directed her work towards the fields of ubiquitous cloud computing and Internet-of-things (IoT). For conducting this work, she received the competitive Academy of Finland postdoc grant, and published the work in top-tier academic journals (e.g. IEEE Transactions on Mobile Computing) and conferences (e.g. ACM MobiSys/SenSys/IPSN).

In early 2014, Yu Xiao established a research project that aimed at developing a scalable and cost efficient indoor mapping and navigation solution. During the past 3 years, she and her group have invented and demonstrated novel approaches of utilizing crowdsourced photos, videos and inertial sensor data for fine-grained indoor mapping and localization services. In this work, they have been able to overcome some of the long-standing challenges of mobile crowdsensing, such as the lack of data during bootstrapping, and the varying data quality.

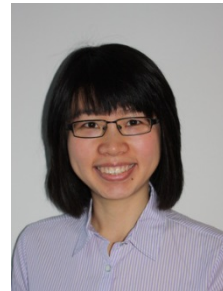
The prototype system allows smartphone users to locate themselves by simply taking a photo from where they are, and to navigate to their destinations following visual instructions. While providing localization and navigation services, the crowdsourced indoor maps are continuously updated with new photos and user trajectories. This research is currently being commercialized in a Tekes TUTL (New Knowledge and Business from Research Ideas) project, and first deployments of the system are scheduled to take place in 2017, in Finnish shopping centers.

We believe the crowdsourced indoor mapping and navigation project is just one example that demonstrates Professor Xiao's contribution of high-impact scientific research. As a young researcher, she has shown her potential for an outstanding career. Therefore, it is our pleasure to recommend her for the TES Young Researcher Award.

Curriculum Vitae

Personal Information

Surname: Xiao **Given Name:** Yu **Gender:** Female
Date of Birth: 10.11.1983 **Place of Birth:** China **Citizenship:** China
Home Address: Melkonkatu 15 A8, 00210 Helsinki, Finland
Mobile: +358 50 3205507 **Email:** yu.xiao@aalto.fi



Education and Degrees Awarded

31.01.2012 D.Sc. (Tech.) in Computer Science, Aalto University, Finland (Supervisor: Prof. Antti Ylä-Jääski)
 Topic: Modeling and Managing Energy Consumption of Mobile Devices (Grade: *Pass with distinction*)
 Opponent: Prof. Jon Crowcroft (University of Cambridge)
 10.04.2007 M.S. in Computer Science, Beijing University of Posts and Telecommunications, China
 03.07.2004 B.S. in Computer Science, Beijing University of Posts and Telecommunications, China

Current Positions

06.2016 – **Tenure-track Assistant Professor**, Department of Communications and Networking, Aalto University, Finland

Previous Work Experience

01.2012 – 05.2016 **Postdoc Researcher**, Department of Computer Science, Aalto University, Finland
 Conducting experimental systems research on scalable mobile crowdsensing, mobile edge computing, and energy-efficient mobile computing, taking charge of two graduate-level courses, and instructing doctoral/master/bachelor theses in the field of mobile and cloud computing.
 08.2014 – 02.2015 Maternity leave
 08.2013 – 01.2015 **Senior Researcher in Context-awareness** (part-time), **Huawei Finland R&D Center**, Helsinki
 Applied machine learning techniques to develop algorithms of user activity recognition based on continuous sensing on smartphones.
 05.2012 – 06.2013 Visiting Researcher, School of Computer Science, **Carnegie Mellon University**, USA (Hosted by Prof. Mahadev Satyanarayanan)
 Conducted research on cloudlet-based mobile computing (A cloudlet is a new architectural element that arises from the convergence of mobile computing and cloud computing. It represents the middle tier of a 3-tier hierarchy: mobile device-cloudlet-cloud.). The results included methodology and techniques for scalable crowdsourcing of video, and a deployment model that lowers the barriers to large-scale mobile crowdsensing.
 Collaborated with Prof. Nigel Davis from Lancaster University in developing a flexible approach to display and application placement by combining pervasive public display networks with distributed cloudlets. The results were demonstrated in PerDis 2013.
 09.2007– 12.2011 **Doctoral student**, Aalto University, Helsinki, Finland
 Participated in a nation-wide research program on future Internet from 2008 to 2011, and contributed to the research on energy-efficient wireless networking and power management for smartphones.

Key research results included the first work on power modeling of data transmission via 802.11g/n which describes the impact of traffic patterns and varying network conditions, context-aware power saving mechanisms for wireless data transmission, and a complex event processing based power management framework for smartphones.

- 09.2011 – 11.2011 Visiting Researcher, Intelligent Systems Center, **Nanyang Technological University**, Singapore (Hosted by Dr. Lim Hock Beng)
- Participated in a future urban mobility project, a joint work with Singapore-MIT alliance for research and technology.
- Conducted research on transportation activity analysis using smartphone-based crowdsensing, and developed data analysis modules of the backend server using Ruby and MySQL. The work was demonstrated in CCNC 2012.
- 01.2011 – 04.2011 Visiting student, **Deutsche Telekom Laboratories**, Germany (Hosted by Dr. Pan Hui)
- Conducted research on cloud-assisted power management for smartphones, and initiated the collaboration on energy-efficient code offloading, focusing on constraint analysis of code offloading.
- 04.2006 – 12.2006 Intern, **Microsoft China R&D Center**, Office 2007 Project
- 07.2005 – 03.2006 Intern, **Intel China Research Center**, Intelligent Platform Management Project

Research Funding

- 10.2016 – 09.2018 Intelligent Construction Site, Tekes
- 08.2016 – 05.2017 Image-based Indoor Product Navigation System, Tekes
- 09.2013 – 03.2017 Postdoctoral Grant, Academy of Finland (Grant No.: 268096)
- 01.2009 – 12.2011 Helsinki Graduate School in Computer Science and Engineering Fellowship
- 12.2010 Nokia Foundation Scholarship
- 12.2009 Nokia Foundation Scholarship

Leadership

- 08.2016 – 05.2017 Co-PI and technical lead of the Image-based Indoor Product Navigation System project, funded by Tekes.
- 09.2014 – 08.2017 Scientific advisor of the Mobile Crowdsensing in Ubiquitous Cloud Environment project, funded by Academy of Finland (Grant number: 277498, Principal Investigator: Prof. Antti Ylä-Jääski). I contributed to the preparation of the funding application, and lead the research on crowdsourced indoor mapping and navigation.

Student Supervision

- 09.2016 – Co-supervisor of Chao Zhu's and Jiayue Xu's doctoral theses on edge computing
- 08.2016 – Supervisor of Kai Wang's doctoral thesis on efficient and trustable mobile crowdsensing
- 01.2014 – Advisor of Jiang Dong's doctoral thesis on crowdsourced indoor mapping and navigation
- 01.2008 – 04.2016 Instructed 3 bachelor theses and 11 master theses or equivalent, Aalto University (formerly Helsinki University of Technology)
- 01.2016 – 04.2016 Mentor for two student projects related to indoor navigation at T-110.5130 Mobile System Programming course, Aalto University
- 09.2012 – 12.2012 Mentor for a student project on network measurement and analysis at 15-821/18-843 Mobile and Pervasive Computing course, Carnegie Mellon University

Course Teaching Experience

- Spring 2017 Responsible teacher, ELEC-E7320 Internet Protocols (5 ECTS)
 Spring 2016 Responsible teacher, CSE-E5440 Energy-efficient Mobile Computing (5 ECTS)
 Autumn 2015 Responsible teacher, T-110.5121 Mobile Cloud Computing (5 ECTS)
 Spring 2014 Responsible teacher, T-110.6120 Special Course in Data Communications Software (5 ECTS)

Pedagogical Training

- 11.2016 – 01.2017 Providing and Utilizing Feedback (3 ETCS), Aalto University
 09.2016 – 12.2016 Course design (5 ECTS), Aalto University
 03.2016 – 05.2016 Learning and teaching in higher education (5 ECTS), Aalto University
 01.2014 – 03.2014 Compiling a teaching portfolio (3 ECTS), Aalto University
 10.2013 – 12.2013 A! Peda Intro (5 ECTS). Part of Aalto University pedagogical development programme

Awards

- 12.2015 **Best Paper Award** from the 34th IEEE International Performance Computing and Communications Conference (IPCCC'15)
 04.2010 **Best Paper Award** from 1st International Conference on Energy-efficient Computing and Networking (E-Energy'10)
 10.2009 **Best Paper Award** from 3rd International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies (Ubicomm'09)

Invited Talks

- 7.11.2016 Crowdsourced indoor mapping and navigation. Carnegie Mellon University, US.
 31.10.2016 Crowdsourced indoor mapping and navigation. Arizona State University, US.
 21.9.2016 Scalable Mobile Crowdsensing in Ubiquitous Cloud Environment, Fudan University, Shanghai, China.
 09.9.2016 Scalable Mobile Crowdsensing in Ubiquitous Cloud Environment, State Key Laboratory of Networking and Switching Technology, Beijing, China.
 28.7.2016 Crowdsourced indoor mapping and navigation. Helsinki-HKUST-Tsinghua workshop on mobile services and edge computing. Helsinki.
 30.5.2016 Green datacenter networks. The CleanSky Summer School 2016. Helsinki.
 6.11.2015 Ubiquitous cloud computing for scalable mobile crowdsensing. Laboratory for Communication Networks. KTH.

Other Academic Merits

- Guest Editor** IEEE Internet of Things Journal Special Issue on Trust, Security and Privacy in Crowdsourcing, Wireless Communications and Mobile Computing Journal Special Issue on Big Data Driven Mobile Computing.
TPC member The first ACM/IEEE Symposium on Edge Computing (SEC'16), IEEE ICC 2016/2017 Social Networks Track, IEEE Globecom 2016/2017 Social Networking Track, MOBIMEDIA 2016, the 4th – 9th International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies (UBICOMM 2010-2015), the 3rd International Workshop on Hot Topics in Peer-to-peer Computing and Online Social Networking (HotPost'11), and the 2nd International Workshop on Peer-to-peer Networking (P2PNet'10).
Reviewer IEEE Transactions on Mobile Computing, IEEE Transactions on Cloud Computing, IEEE Transactions on Network and Service Management, IEEE Transactions on Vehicle Technology, IEEE Communications Magazine, Sensors, IEEE Internet Computing, IEEE UbiComp 2017, IEEE WoWMoM 2014, and IEEE CCNC 2014.

Scientific and Societal Impact of Research

Total number of publications: 30 **H-index** (Google Scholar): 13 **Citations** (Google Scholar): 653

A Scientific book

[1] Tarkoma, S., Siekkinen M., Lagerspetz, E., and Xiao, Y. **Smartphone energy consumption: modelling and optimization**. Cambridge University Press. September 2014. ISBN: 9781107042339.

B Journal articles

[2] Hoque, M., Siekkinen, M., Khan, K., Xiao, Y., and Tarkoma, S. Modeling, Profiling, and Debugging the Energy Consumption of Mobile Devices. *ACM Computing Surveys*. Vol. 48, no. 3, 2016.

[3] Satyanarayanan, M., Simoens, P., Xiao, Y., Padmanabhan P., Chen, Z., Ha, K., Hu, W., and Amos, B. Edge Analytics in the Interest of Things. *IEEE Pervasive Computing*. vol. 14, no. 2, April-June 2015.

[4] Xiao, Y; Cui, Y.; Savolainen, P.; Siekkinen, M.; Wang, A.; Yang, L.; Ylä-Jääski, A.; Tarkoma, S. Modeling Energy Consumption of Data Transmission over Wi-Fi. *IEEE Transactions on Mobile Computing*, vol.13, no.8, pp.1760-1773, August 2014.

[5] Xiao, Y; Li, W.; Siekkinen, M.; Savolainen, P.; Ylä-Jääski, A.; Hui, P. Power Management for Mobile Devices Using Complex Event Processing. *IEEE Transactions on Computers*. vol.61, no.12, pp.1765,1777, December 2012.

[6] Saarinen, A.; Siekkinen, M.; Xiao, Y.; Nurminen, J.; Kemppainen, M.; Hui, P. SmartDiet: offloading popular apps to save energy. *SIGCOMM Computer Communication Review*, 42, 4, pp. 297-298, August 2012.

[7] Sri Kalyanaraman, R.; Xiao, Y.; Ylä-Jääski, A. Network Prediction for Energy-aware Transmission in Mobile Applications. *Intl. Journal on Advances in Telecommunications*. vol 3, no. 1&2, pp.72-82, September 2010.

C Conference Proceedings

[8] Noreikis, Marius; Xiao, Yu. QoS-oriented Capacity Planning of a Hierarchical Edge Cloud Infrastructure: Principles and Case Studies. to appear in the *Proceedings of IEEE International Conference on Communications (ICC'17)*. 6 pages. May 2017.

[9] Xiao, Yu. Zhu, Chao. Vehicular Fog Computing: Vision and Challenges. to appear in the *Proceedings of IEEE Conference on Pervasive Computing and Communications workshops (Percom'17 WiP)*. 4 pages. March 2017.

[10] Dong, Jiang; Xiao, Yu; Cui, Yong; Ou, Zhonghong; Ylä-Jääski, Antti. **Indoor Tracking using Crowdsourced Maps**. in the *Proceedings of the 15th ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN'16)*. 6 pages. 11-14 April, 2016.

[11] Zhu, Chao; Xiao, Yu; Cui, Yong; Yang, Zhenjie; Xiao, Shihan; Ylä-Jääski, Antti. Dynamic Flow Consolidation for Energy Savings in Green DCNs. in the *Proceedings of 34th IEEE International Performance Computing and Communications Conference (IPCCC'15)*. 8 pages. 14-16 Dec. 2015. **(Best Paper Award)**

[12] Dong, Jiang; Xiao, Yu; Noreikis, Marius; Ou, Zhonghong; Ylä-Jääski, Antti. **iMoon: Using Smartphones for Image-based Indoor Navigation**. in the *Proceedings of the 13th ACM Conference on Embedded Networked Sensor Systems (SenSys'15)*. 12 pages. 1-4 Nov. 2015.

[13] Looga, Vilen; Ou, Zhonghong; Xiao, Yu; Ylä-Jääski, Antti. The Great Expectations of Smartphone Traffic Scheduling. In the *Proceedings of the 20th IEEE Symposium on Computers and Communications (ISCC'15)*, pp.1-7, 6-9 Jul. 2015.

[14] Dong, Jiang; Xiao, Yu; Ou, Zhonghong; Ylä-Jääski, Antti. **Utilizing Internet Photos for Indoor Mapping and Localization - Opportunities and Challenges**. In *Proceedings of the 1st International Workshop on Smart Cities and Urban Informatics (SmartCity'15, co-located with Infocom'15)*, 6 pages.

[15] Kamarainen, Teemu; Siekkinen, Matti; Xiao, Yu; Ylä-Jääski, Antti. Towards pervasive and mobile gaming with distributed cloud infrastructure. In *Proceedings of 13th Annual Workshop on Network and Systems Support for Games (NetGames 2014)*, pp.1-6, 4-5 Dec. 2014.

[16] Simoens, Pieter; Xiao, Yu; Pillai, Padmanabhan; Chen, Zhuo; Ha, Kiryong; Satyanarayanan, Mahadev. Scalable crowd-sourcing of video from mobile devices. In *Proceedings of the 11th annual international conference on Mobile systems, applications, and services (MobiSys '13)*. ACM, New York, NY, USA, 139-152.

- [17] Ding, Yi; Han, Bo; Xiao, Yu; Hui, Pan; Srinivasan, Aravind; Kojo, Markku; Tarkoma, Sasu. Enabling energy-aware collaborative mobile data offloading for smartphones. In *Proceedings of 10th Annual IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON'13)*, pp.487-495, 24-27 June 2013.
- [18] Xiao, Yu; Simoens, Pieter; Pillai, Padmanabhan; Ha, Kiryong; Satyanarayanan, Mahadev. Lowering the barriers to large-scale mobile crowdsensing. In *Proceedings of the 14th Workshop on Mobile Computing Systems and Applications (HotMobile '13)*. ACM, New York, NY, USA, Article 9, 6 pages.
- [19] Saarinen, Aki; Siekkinen, Matti; Xiao, Yu; Nurminen, Jukka K.; Kemppainen, Matti; Hui, Pan. Can offloading save energy for popular apps?. In *Proceedings of the seventh ACM international workshop on Mobility in the evolving internet architecture (MobiArch '12)*. ACM, New York, NY, USA, 3-10.
- [20] Looga, Vilen; Xiao, Yu; Ou, Zhonghong; Ylä-Jääski, Antti. Exploiting traffic scheduling mechanisms to reduce transmission cost on mobile devices. In *Proceedings of 2012 IEEE Conference on Wireless Communications and Networking Conference (WCNC'12)*, pp.1766-1770, 1-4 April 2012.
- [21] Xiao, Yu; Hui, Pan; Savolainen, Petri; Ylä-Jääski, Antti. CasCap: cloud-assisted context-aware power management for mobile devices. In *Proceedings of the 2nd international workshop on Mobile cloud computing and services (MCS '11)*. ACM, New York, NY, USA, 13-18.
- [22] Xiao, Yu; Bhaumik, Rijubrata; Yang, Zhirong; Siekkinen, Matti; Savolainen, Petri; Ylä-Jääski, Antti. A System-Level Model for Runtime Power Estimation on Mobile Devices. In *Proceedings of 2010 IEEE/ACM International Conference on Green Computing and Communications (GreenCom'10)*, pp.27-34, 18-20 Dec. 2010.
- [23] Xiao, Yu; Siekkinen, Matti; Ylä-Jääski, Antti. Framework for Energy-Aware Lossless Compression in Mobile Services: The Case of E-Mail. In *Proceedings of 2010 IEEE International Conference on Communications (ICC'10)*, pp.1,6, 23-27 May 2010.
- [24] Xiao, Yu; Savolainen, Petri; Karppanen, Arto; Siekkinen, Matti; Ylä-Jääski, Antti. Practical power modeling of data transmission over 802.11g for wireless applications. In *Proceedings of the 1st International Conference on Energy-Efficient Computing and Networking (e-Energy '10)*. ACM, New York, NY, USA, 75-84. **(Best Paper Award)**
- [25] Kalyanaraman Sri, Ramya; Xiao, Yu; Ylä-Jääski, Antti. Network Prediction for Adaptive Mobile Applications. In *Proceedings of the 3rd International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies (UBICOMM '09)*. pp.141,146, 11-16 Oct. 2009. **(Best Paper Award)**
- [26] Xiao, Yu; Kalyanaraman Sri, Ramya; Ylä-Jääski, Antti. Middleware for energy-awareness in mobile devices. In *Proceedings of the 4th International ICST Conference on COMMunication System softWARE and middleware (COMSWARE '09)*. ACM, New York, NY, USA, Article 13 , 6 pages.
- [27] Xiao, Yu; Kalyanaraman Sri, Ramya; Ylä-Jääski, Antti. Energy Consumption of Mobile YouTube: Quantitative Measurement and Analysis. In *Proceedings of 2nd International Conference on Next Generation Mobile Applications, Services and Technologies (NGMAST '08)*, pp.61,69, 16-19 Sept. 2008.

D Book Section

- [28] Brace, W., Ruotsalo, T., Storgards, J.H., Villi, M., Xiao, Y., Vainio, M.(2009). Life Unwired – The Future of Telecommunications and Networks. In Yrjö Neuvo and Sami Ylönen (Eds.) *BitBang – Rays to the Future* (pp. 42-62). Helsinki: Helsinki University of Technology Press.
- [29] Kuikkaniemi, K., Lin, R., Ruotsalo, T., Siikavirta, S., Xiao, Y., Vainio, M.(2009). The Future of Media – Free or Fantastic? In Yrjö Neuvo and Sami Ylönen (Eds.) *BitBang – Rays to the Future* (pp. 142-173). Helsinki: Helsinki University of Technology Press.

E Doctoral Dissertation (article)

- [30] Xiao, Yu. Modeling and managing energy consumption of mobile devices. Aalto University publication series DOCTORAL DISSERTATIONS, 139/2011. ISBN 978-952-60-4430-9 (pdf). Available on <https://aaltdoc.aalto.fi/handle/123456789/5096>.