## Xinyu Feng

### May 2018

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Research Interests	My research interests are in the area of formal methods and programming languages. In particular, I am interested in developing theories, programming languages and tools to build formally certified <i>system software</i> , with rigorous guarantees of safety and correctness.					
Education	<ul> <li>Ph.D. in Computer Science, Yale University, 2007.</li> <li>Advisor: Professor Zhong Shao.</li> <li>Thesis title: An Open Framework for Certified System Software (Degree was officially conferred in May, 2008)</li> <li>M.Eng. in Computer Science, Nanjing University, 2002.</li> <li>Advisor: Professor Jian Lu.</li> <li>Thesis title: Design and Analysis of Mobile Agent Communication Protocols.</li> <li>B.S. in Computer Science, Nanjing University, 1999.</li> </ul>					
<b>Professional</b> <b>Experience</b>	<ul> <li>Nanjing University, China, 2018 – present, Professor.</li> <li>University of Science and Technology of China (USTC), China, 2010 - 2017, Professor.</li> <li>USTC-Guochuang Engineering Center for High-Confidence Software, Founding Director, 2014 - 2017.</li> <li>USTC-Yale Joint Research Center for High-Confidence Software, Co-Director, 2010 - 2017.</li> <li>Technical University of Denmark (DTU), Erasmus Mundus Scholar of the NordSec Mob Program (visiting scientist), November 2014 - January 2015.</li> <li>Samsung Electronics (China) Research Center, Consultant, July 2013 - July 2014.</li> <li>Toyota Technological Institute at Chicago, Chicago, IL, 2007 – 2010, Research Assistant Professor.</li> <li>Yale University, Department of Computer Science, New Haven, CT, 2003 – 2007, Research Assistant and Teaching Fellow.</li> <li>AT&amp;T Shannon Laboratory, Florham Park, NJ, Summer 2005, Research Intern.</li> <li>The Hong Kong Polytechnic University, Department of Computing, Hung Hom, Ko-</li> </ul>					

wloon, Hong Kong, July 2001 – January 2002, Visiting Research Assistant.

**Nanjing University**, Department of Computer Science, Nanjing, Jiangsu, China, July 1998 – May 2002, Research Assistant.

Teaching	Instructor, University of Science and Technology of China, 2010-present						
Experience	011167	Foundations of Programming Languages	undergraduate				
			(International Course)				
	CS05115	Theories of Programming Languages	graduate				
	011M0701	Frontier of Research on High-Confidence Software	graduate seminar				

Teaching Assistant, Yale University, 2004-2006.

Duties include mentoring students in office hours; leading weekly sections on advanced topics of programming (for CS112); and helping to design and grade projects, assignments and exams.

CS112	Introduction to Programming	Spring 2006
CS428/528	Language-Based Security	Spring 2005
CS424/524	Parallel Programming Techniques	Fall 2004

Tutor of Java Programming, for programmers in Nanjing Medicine Inc., 2001.

Teaching Assistant of Operating Systems, Nanjing University, Fall 1999.

**Instructor** of *Programming in BASIC*, Yuansheng Lane Primary School (volunteer work), 1999.

# ResearchFormal Verification Techniques on Spacecraft Embedded Safety-Critical Micro-Kernel Ope-<br/>rating Systems, National Natural Science of China (NSFC) Grant No. 61632005, CNY<br/>2,700,000 (USTC Component: CNY 1,134,000), Jan. 2017 – Dec. 2021.

Verification of Concurrent Program Refinement and Its Key Applications, National Natural Science of China (NSFC) Grant No. 61379039, CNY 750,000, Jan. 2014 – Dec. 2017.

Development and Verification of Clean-Slate High-Confidence OS Kernels (with Zhong Shao), National Natural Science of China (NSFC) Grant No. 61229201, CNY 2,000,000, Jan. 2013 – Dec. 2016.

Crash-Proof Verification for High-Confidence System Software, National Natural Science of China (NSFC) (USTC Component of the Grant No. 91318301), CNY 500,000, Jan. 2013 – Dec. 2016.

A Generic Specification and Verification Framework for Relaxed Memory Models, National Natural Science of China (NSFC) Grant No. 61073040, CNY 320,000, Jan. 2011 – Dec. 2013.

Provably Secure Embedded Systems, donation from Intel Semiconductor (US) Limited, US \$20,000, Dec. 2011 – Nov. 2012.

#### Publications On programming languages:

Refereed Journal Papers:

- [1] Yang Zhang, and **Xinyu Feng**. An operational happens-before memory model. *Frontiers of Computer Science*, 10(1): 54-81, 2016. (Journal version of [17])
- [2] Hongjin Liang, Xinyu Feng, and Ming Fu. Rely-Guarantee-Based Simulation for Compositional Verification of Concurrent Program Transformations. ACM Transactions on Programming Languages and Systems (TOPLAS), Vol. 36, No. 1, Article 3, March 2014. (Journal version of [20])
- [3] Xiaoxiao Yang, Yu Zhang, Ming Fu, and Xinyu Feng. A temporal programming model with atomic blocks based on projection temporal logic. *Frontiers of Computer Science*, 8(6): 958-976, 2014. (Journal version of [19])
- [4] Gang Tan, Zhong Shao, **Xinyu Feng**, and Hongxu Cai. Weak Updates and Separation Logic. *New Generation Comput.*, 29(1): 3-29, 2011. (Journal version of [24])
- [5] Xinyu Feng, Zhong Shao, Yu Guo and Yuan Dong. Certifying Low-Level Programs with Hardware Interrupts and Preemptive Threads. *Journal of Automated Reaso*ning, Special Issue on Operating Systems Verification (2008), 42 (2-4): 301-347, 2009. (Journal version of [28])

Refereed Conference and Workshop Papers:

- [6] Chunhui He, and Xinyu Feng. POMP: Protocol Oblivious SDN Programming with Automatic Multi-Table Pipelining. Proc. 2018 IEEE Conference on Computer Communications (INFOCOM'18), Honolulu, HI, USA. April 2018.
- [7] Hongjin Liang, and Xinyu Feng. Progress of Concurrent Objects with Partial Methods. Proc. 45th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL'18), article 20, Los Angeles, CA, USA, January 2018. Also as Proceedings of the ACM on Programming Languages (PACMPL), Vol. 2, No. POPL, Article 20. January 2018.
- [8] Zipeng Zhang, and Xinyu Feng. AndroidLeaker: A Hybrid Checker for Collusive Leak in Android Applications. Proc. of the Third International Symposium on Dependable Software Engineering. Theories, Tools, and Applications (SETTA'17), pages 164–180, Changsha, China, October 23-25, 2017.
- [9] Jiawei Wang, Ming Fu, Lei Qiao, and Xinyu Feng. Formalizing SPARCv8 Instruction Set Architecture in Coq. Proc. of the Third International Symposium on Dependable Software Engineering. Theories, Tools, and Applications (SETTA'17), pages 300–316, Changsha, China, October 23-25, 2017.
- [10] Fengwei Xu, Ming Fu, Xinyu Feng, Xiaoran Zhang, Hui Zhang, and Zhaohui Li. A Practical Verification Framework for Preemptive OS Kernels. Proc. 28th International Conference on Computer Aided Verification (CAV'16), Part II, pages 59–79, Toronto, Ontario, Canada. July 2016.
- [11] Hongjin Liang, and Xinyu Feng. A Program Logic for Concurrent Objects under Fair Scheduling. Proc. 43rd ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL'16), pages 385-399. St. Petersburg, FL, USA, January 2016.

- [12] Ximeng Li, Flemming Nielson, Hanne Riis Nielson, and Xinyu Feng. Disjunctive Information Flow for Communicating Processes. Proc. 10th International Symposium on Trustworthy Global Computing (TGC'15), pages 95–111. Madrid, Spain, August 2015.
- [13] Jingyuan Cao, Ming Fu, and Xinyu Feng. Practical Tactics for Verifying C Programs in Coq. Proc. 2015 Conference on Certified Programs and Proofs (CPP'15), pages 97– 108. Mumbai, India, January 2015.
- [14] Hongjin Liang, Xinyu Feng, and Zhong Shao. Compositional Verification of Termination-Preserving Refinement of Concurrent Programs. Proc. Joint Meeting of the 23rd EA-CSL Annual Conference on Computer Science Logic and the 29th Annual ACM/IEEE Symposium on Logic in Computer Science (CSL-LICS'14), pages 65:1–65:10. Vienna, Austria, July 2014.
- [15] Hongjin Liang, Jan Hoffmann, Xinyu Feng, and Zhong Shao. Characterizing Progress Properties of Concurrent Objects via Contextual Refinements. Proc. 24th International Conference on Concurrency Theory (CONCUR'13), Buenos Aires, Argentina, pages 227–241, August 2013.
- [16] Hongjin Liang and Xinyu Feng. Modular Verification of Linearizability with Non-Fixed Linearization Points. Proc. ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI'13), Seattle, WA, USA, pages 459–470, June 2013.
- [17] Yang Zhang, and Xinyu Feng. An Operational Approach to Happens-Before Memory Model, Proc. Seventh International Symposium on Theoretical Aspects of Software Engineering (TASE'13), Birmingham, UK, pages 121–128, July 2013.
- [18] Yu Guo, Xinyu Feng, Zhong Shao and Peizhi Shi. Modular Verification of Concurrent Thread Management. 10th Asian Symposium on Programming Languages and Systems (APLAS'12), Kyoto, Japan, pages 315–331, December 2012.
- [19] Xiaoxiao Yang, Yu Zhang, Ming Fu and Xinyu Feng. A Concurrent Temporal Programming Model with Atomic Blocks. Proc. 14th International Conference on Formal Engineering Methods (ICFEM'12), Kyoto, Japan, pages 22–37, November 2012.
- [20] Hongjin Liang, Xinyu Fengand Ming Fu. A Rely-Guarantee-Based Simulation for Verifying Concurrent Program Transformations. Proc. 39th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL'12), Philadelphia, Pennsylvania, USA, pages 455–468, January, 2012.
- [21] Zipeng Zhang, Xinyu Feng, Ming Fu, Zhong Shao, and Yong Li. A Structural Approach to Prophecy Variables. Proc. 9th Annual Conference on Theory and Applications of Models of Computation (TAMC'12), pages 61-71. Beijing, China, May 16-21, 2012.
- [22] Ming Fu, Yong Li, Xinyu Feng, Zhong Shao and Yu Zhang. Reasoning about Optimistic Concurrency Using a Program Logic for History. Proc. 21st International Conference on Concurrency Theory (CONCUR'10), Paris, France, pages 388–402, August 2010.
- [23] Rodrigo Ferreira, Xinyu Fengand Zhong Shao. Parameterized Memory Models and Concurrent Separation Logic. Proc. 19th European Symposium on Programming (ESOP'10), Paphos, Cyprus, pages 267–286, March 2010.

- [24] Gang Tan, Zhong Shao, Xinyu Fengand Hongxu Cai. Weak Updates and Separation Logic. Proc. 7th Asian Symposium on Programming Languages and Systems (APLAS'09), Seoul, Korea, December 2009.
- [25] Mike Dodds, Xinyu Feng, Matthew Parkinson and Viktor Vafeiadis. Deny-Guarantee Reasoning. Proceedings of 18th European Symposium on Programming (ESOP'09), York, UK, pages 363–377, March, 2009.
- [26] Xinyu Feng. Local Rely-Guarantee Reasoning. Proceedings of 36th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL'09), Savannah, Georgia, USA, pages 315–327, January, 2009.
- [27] Xinyu Feng, Zhong Shao, Yu Guo and Yuan Dong. Combining Domain-Specific and Foundational Logics to Verify Complete Software Systems. Proceedings of Second IFIP Working Conference on Verified Software: Theories, Tools, and Experiments (VSTTE'08), Toronto, Canada, pages 54–69, October 2008.
- [28] Xinyu Feng, Zhong Shao, Yuan Dong and Yu Guo. Certifying Low-Level Programs with Hardware Interrupts and Preemptive Threads. Proceedings of 2008 ACM SIG-PLAN Conference on Programming Language Design and Implementation (PLDI'08), Tucson, Arizona, pages 170–182, June 2008.
- [29] Xinyu Feng, Rodrigo Ferreira and Zhong Shao. On the Relationship Between Concurrent Separation Logic and Assume-Guarantee Reasoning. Proceedings of 16th European Symposium on Programming (ESOP'07), Braga, Portugal, pages 173–188, March 2007.
- [30] Xinyu Feng, Zhaozhong Ni, Zhong Shao and Yu Guo. An Open Framework for Foundational Proof-Carrying Code. Proceedings of 2007 ACM SIGPLAN International Workshop on Types in Language Design and Implementation (TLDI'07), Nice, France, pages 67–78, January 2007.
- [31] Xinyu Feng, Zhong Shao, Alexander Vaynberg, Sen Xiang and Zhaozhong Ni. Modular Verification of Assembly Code with Stack-Based Control Abstractions. Proceedings of 2006 ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI'06), Ottawa, Canada, pages 401–414, June 2006.
- [32] Xinyu Feng and Zhong Shao. Modular Verification of Concurrent Assembly Code with Dynamic Thread Creation and Termination. Proceedings of 2005 ACM SIG-PLAN International Conference on Functional Programming (ICFP'05), Tallinn, Estonia, pages 254–267, September 2005.
- PhD Thesis and Unrefereed Technical Reports:
- [33] Xinyu Feng. An Open Framework for Certified System Software. PhD Thesis, Yale University, December 2007. Also as Technical Report YALEU/DCS/TR-1397, Department of Computer Science, Yale University, New Haven, CT, December 2007.
- [34] Xinyu Feng. Local Rely-Guarantee Reasoning. *Technical Report TTIC-TR-2008-1* (extended version of [26]), Toyota Technological Institute at Chicago, Chicago, IL, October, 2008.
- [35] Xinyu Feng and Zhong Shao. Local Reasoning and Information Hiding in SCAP. Technical Report YALEU/DCS/TR-1398. Department of Computer Science, Yale University, New Haven, CT, February 2008.

- [36] Xinyu Feng, Zhong Shao, Yuan Dong and Yu Guo. Certifying Low-Level Programs with Hardware Interrupts and Preemptive Threads. *Technical Report YALEU/DCS/TR-1396* (extended version and Coq Implementation of [28]), Department of Computer Science, Yale University, New Haven, CT, November 2007.
- [37] Xinyu Feng, Rodrigo Ferreira and Zhong Shao. On the Relationship Between Concurrent Separation Logic and Assume-Guarantee Reasoning. *Technical Report YALEU/DCS/TR-1374* (extended version and Coq implementation for [29]), Department of Computer Science, Yale University, New Haven, CT, January 2007.
- [38] Xinyu Feng, Zhaozhong Ni, Zhong Shao and Yu Guo. An Open Framework for Foundational Proof-Carrying Code. *Technical Report YALEU/DCS/TR-1373* (extended version and Coq implementation for [30]), Department of Computer Science, Yale University, New Haven, CT, November 2006.
- [39] Xinyu Feng, Zhong Shao, Alexander Vaynberg, Sen Xiang and Zhaozhong Ni. Modular Verification of Assembly Code with Stack-Based Control Abstractions. *Technical Report YALEU/DCS/TR-1336* (extended version and Coq implementation for [31]), Department of Computer Science, Yale University, New Haven, CT, November 2005.
- [40] Xinyu Feng. Design of The Certifying Programming Language Vero, Technical Report, Department of Computer Science, Yale University, New Haven, CT, May 2004.

#### Earlier publications on mobile agent systems:

Refereed International Journal Papers:

- [41] Jiannong Cao, Xinyu Feng, Jian Lu, Henry Chan, and Sajal K. Das. Reliable Message Delivery for Mobile Agents: Push or Pull? *IEEE Transactions on Systems, Man,* and Cybernetics, Part A, 34(5), pages 577–587, September 2004.
- [42] Jiannong Cao, Liang Zhang, Xinyu Feng, and Sajal K. Das. Path Pruning in Mailboxbased Mobile Agent Communications. *Journal of Information Science and Engineering*, 20(3), pages 405–424, May 2004.
- [43] Jiannong Cao, Xinyu Feng, Jian Lu, and Sajal K. Das. Mailbox-Based Scheme for Designing Mobile Agent Communication Protocols. *IEEE Computer*, 35(9), pages 54–60, September 2002.

#### Refereed Conference and Workshop Papers:

- [44] Jiannong Cao, Liang Zhang, Xinyu Feng, and Sajal K. Das. Path Compression in Forwarding-Based Reliable Mobile Agent Communications. Proceedings of 32nd International Conference on Parallel Processing (ICPP'03), pages 313–320, October 2003.
- [45] Jiannong Cao, Xinyu Feng, Jian Lu, Henry Chan, and Sajal K. Das. Reliable Message Delivery for Mobile Agents: Push or Pull? Proceedings of 9th International Conference on Parallel and Distributed Systems (ICPADS'02), pages 314–320, December 2002

- [46] Jiannong Cao, Xinyu Feng, Jian Lu, and Sajal K. Das. Design of Adaptive and Reliable Mobile Agent Communication Protocols (Short Paper). Proceedings of 22nd International Conference on Distributed Computing Systems (ICDCS'02), pages 471– 472, July 2002.
- [47] Xinyu Feng, Jiannong Cao, Jian Lu, and Henry Chan. An Efficient Mailbox-Based Algorithm for Message Delivery in Mobile Agent Systems. Proceedings of 5th International Conference on Mobile Agents (MA'01), Published in Lecture Notes in Computer Science, volume 2240, pages 135–151, Springer-Verlag, 2001.

Others (Master Thesis and Refereed Chinese Journal Papers):

- [48] Xinyu Feng. Design and Analysis of Mobile Agent Communication Protocols. Master Thesis, Nanjing University, May 2002.
- [49] Xinyu Feng, Jian Lu, and Jiannong Cao. Design of a Generic Framework for Mobile Agent Communication. *Journal of Software*, 14(5), pages 984–990, May 2003.
- [50] Xin Li, Jian Lu, Chun Cao, Xinyu Feng, and Xianping Tao. Security of Mobile Agent Systems. Journal of Software, 13(10), pages 1991–2000, October 2002.
- [51] Xinyu Feng, Xianping Tao, Chun Cao, Xin Li, Guanqun Zhang, and Jian Lu. An Improved Mobile Agent Communication Algorithm. *Chinese Journal of Compu*ter, 25(4), pages 357–364, April 2002.
- [52] Guanqun Zhang, Xianping Tao, Xin Li, Xinyu Feng, and Jian Lu. Design and Implementation of the Migration Mechanism in the Mogent system. *Journal of Computer Research and Development*, 38(9), pages 1035–1041, September 2001.
- [53] Guanqun Zhang, Xianping Tao, Xin Li, Xinyu Feng, and Jian Lu. Research on Migration Mechanism in Mobile Agent Systems. *Computer Science*, 28(9), pages 69– 73, September 2001.
- [54] Xianping Tao, Xinyu Feng, Xin Li, Guanqun Zhang, and Jian Lu. Communication Mechanism in the Mogent System. *Journal of Software*, 11(8), pages 1060–1065, August 2000.

Awards 2016 NEUSoft-NASAC Innovation Award for Young Software Talents, granted jointly by CCF (China Computer Federation) Special Interest Group on System Software, CCF Special Interest Group on Software Engineering, and NEUSoft Company, 3 awardees in 2016.

2015 CVICSE Awards for Software Talents, granted by CVICSE Company to young Chinese researchers on Software Engineering, 3 awardees in 2015.

2015 CCF Distinguished PhD Dissertation Award (Advisor), granted by CCF, 10 awardees each year for all areas in computer science in China.

2015 CAS Distinguished PhD Dissertation Award (Advisor), granted by CAS (Chinese Academy of Science), 10 awardees in 2015 for all areas in computer science in CAS.

2015 Excellent Graduate Students' Advisor Award of CAS.

2014 Excellent	Graduate	Students'	Advisor	Award	of	USTC	(University	of	Science	and
Technology of C	hina).									

2014 Excellent Graduate Students' Advisor Award of CAS.

2013-2014 Annual Award for Excellent Educators in Suzhou Industrial Park.

2010 Program for New Century Excellent Talents in Universities (NCET), granted by Chinese Ministry of Education (MOE).

Invited Talks Certified Preemptive OS Kernels, Keynote of PLOS 2017 (co-located with SOSP 2017), Oct. 28, 2017. Shanghai, China.

Mechanized Verification of Preemptive OS Kernels, Keynote of CPP 2017 (co-located with POPL 2017), Jan. 17, 2017. Paris, France.

Reasoning about Progress of Concurrent Objects, (EC)2 2016: 9th International Workshop on Exploiting Concurrency Efficiently and Correctly (co-located with CAV 2016), July 18, 2016. Toronto, Canada.

Verifying Linearizability of Concurrent Objects, 2nd International Symposium on High Confidence Software (ISHCS 2012), Oct. 30, 2012. Qingdao, Shandong, China.

Professional PC Co-Chair of SETTA 2018

Activities

General Chair of APLAS 2017.

Guest editor of special issue on Frontier of Programming Languages and Systems, Journal of Software (Chinese journal), 28(4), 2017

Associate Editor of Formal Aspects of Computing (Springer), since 2015

Associate Editor of Journal of Software (Chinese journal), since 2015.

PC Chair of APLAS 2015.

Steering committee member of APLAS, since 2015.

Executive committee member of Asian Association for Foundation of Software (AAFS), since 2015

PC member for conferences:

SATE'18, CoqPL'18, POPL'18, SETTA'17, FMAC'17, ESOP'17, FMAC'16, SETTA'16, WWV'15, ICPP'15, ITP'15, ICALP'15, POPL'15 (ERC), TASE'14, LOLA'13, POPL'13, CPP'12, IC-TAC'12, TASE'12, 2012 Open64 Workshop, APLAS'11, LOLA'11, TASE'09, APLAS'08.

UniversityMember of Academic Board of School of Computer Science and Technology, USTC. 2016 –<br/>2017.

Member of Academic Degree Committee of School of Computer Science and Technology, USTC. 2016 – 2017.

Member of Faculty Recruitment Committee of School of Computer Science and Technology, USTC. 2016 – 2017.

Member of Graduate Curriculum Committee of School of Computer Science and Technology, USTC. 2016 – 2017.

Students Post-doctoral research associate: Ming Fu (2013-2016)

Former PhD students:

- Hongjin Liang (2014). Thesis Title: *Refinement Verification of Concurrent Programs and Its Applications*. Current Employment: Associate Researcher, University of Science and Technology of China.
- Yang Zhang (2015). Thesis Title: An Operational Memory Model and Program Logic for Concurrency Verification. Current Employment: Software Engineer, Microsoft.
- Fengwei Xu (2016). Thesis Title: *Design and Implementation of A Verification Framework for Preemptive OS Kernels*. Current Employment: Software Engineer, Bitmain.

Current PhD students: Zipeng Zhang (2010-present), Chunhui He (2013-present), Hanru Jiang (2013-present), Zhaohui Li (2014-present), Xiaoran Zhang (2014-present)

Former Master's students: Yongzhao Wang (2013), Lifei Zhao (2014), Hongxing Cao (2014), Jingyuan Cao (2015), Ling Zhu (2015), Xi Hao (2015), Hui Zhang (2015), Jiabiao Liang (2015), Jianchao Meng (2015), Wei Deng (2016), Weisheng Li (2016), Gang Jiang (2017)

Current Master's students: Chen Yang (2014-present), Huan Chang (2015-present), Ke Sun (2015-present), Haibo Gu (2015-present), Wenquan Sun (2015-present), Yanxiang Hu (2015-present), Ding Ma (2015-present), Jiuan Xu (2015-present), Junpeng Zha (2016present), Siyang Xiao (2016-present), Jiawei Wang (2017-present), Shijie Xu (2017-present), Xin Cheng (2017-present)

Senior project advisor of undergraduate students: Yucong Jin (2013), Chunhui He (2013), Hanru Jiang (2013), Zhaohui Li (2014), Liye Guo (2015), Zhenyu Huang (2015), Yuyang Sang (2016), Yigong Pan (2016), Hengruo Zhang (2016), Junpeng Zha (2016), Jiawei Wang (2017), Jiayi Wei (2017), Shijie Xu (2017), Zhen Zhang (2017)