

Dongsu Han

Associate Professor
School of Electrical Engineering,
Korea Advanced Institute of Science and Technology (KAIST)
291 Daehak-ro, Yuseong-gu, Daejeon 305-701, Korea
+82 (10) 4797-9735
dongsuh@ee.kaist.ac.kr



EXECUTIVE SUMMARY

Dongsu Han has actively worked in the area of systems and networking focusing on problems that arise from the fact that modern networking applications often run on the cloud at scale, such as high-speed network and application design, low-latency congestion control, and security and privacy of network applications. He has published numerous technical papers at premier peer-reviewed conferences and workshops, including two SIGCOMM, eight NSDI, three HotNets, ATC, two NDSS, CCS, Mobisys, two CoNEXT, EuroSys, and SoCC papers, all regarded as well-established venues in systems and networking. In particular, he has consistently published papers in flagship conferences (SIGCOMM or NSDI). He has also actively engaged in worldwide collaborations with researchers from UC Berkeley, Georgia Tech, Carnegie Mellon University, and HKUST. He has served as a program committee member or chair for a number of outstanding workshops and conferences, including CoNEXT, INFOCOM, APSys, ICNP, ACM ANCS, and HotMiddlebox 2016 (co-chair).

Research Funding. He has secured over 890 Million KRW of research funds from various sources including National Research Foundation of Korea, IITP of Korea, and AOARD (Asian Office of Aerospace Research and Development) of USA, as well as industry funding from Samsung Electronics. He has been a PI for an Early Career Program of NRF and a multi-year IITP (Institute for Information and communications Technology Promotion) project.

EDUCATION

- | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Ph.D. in Computer Science
Carnegie Mellon University, Pittsburgh, PA
Dissertation title: <i>“Supporting Long Term Evolution in an Internet Architecture”</i>
Advisor: Srinivasan Seshan | December 2012 |
| M.S. in Computer Science
Carnegie Mellon University, Pittsburgh, PA
Degree offered as part of the Ph.D program | December 2010 |
| B.S. in Computer Science (summa cum laude)
Korea Advanced Institute of Science and Technology (KAIST), Korea
Chairman of KAIST Board of Trustees Award | February 2004 |

RESEARCH INTERESTS

Networked systems, cloud computing, and security

EMPLOYMENT HISTORY

School of Electrical Engineering, KAIST Associate Professor (March 2017 – Current) Assistant Professor (June 2013 – February 2017)	June 2013 – Current
Graduate School of Information Security, KAIST Adjunct Professor	October 2013 – Current
Computer Science Department, Carnegie Mellon University Post-doctoral Associate with Prof. Peter Steenkiste	Jan 2013 – May 2013
Computer Science Department, Carnegie Mellon University Graduate Research Assistant (Advisor: Prof. Srinivasan Seshan) Major projects related to my dissertation include eXpressive Internet Architecture (XIA), Redundant Packet Transmission (RPT), and a neighborhood-assisted on-demand video distribution system.	Aug 2007 – Dec 2012
Intel Labs Pittsburgh Intern (Mentors: Dina Papagiannaki and Michael Kaminsky)	Jun 2009 – Aug 2009
Intel Labs Pittsburgh Intern (Mentors: Dina Papagiannaki and Michael Kaminsky)	Jun 2008 – Aug 2008
FUTURE SYSTEMS, INC., Korea Software Engineer	March 2004 – December 2006

PUBLICATIONS

Conference and Workshop Papers

Students advised and post-doctorate fellow hosted by myself are underlined

[C-32] Enhancing Security and Privacy of Tor's Ecosystem by using Trusted Execution Environments

Seongmin Kim, Juhyeng Han, Jaehyeong Ha, Taesoo Kim, **Dongsu Han**
USENIX NSDI 2017 (Acceptance rate: 18%)

[C-31] mOS: A Reusable Networking Stack for Flow Monitoring Middleboxes [pdf][code]

Muhammad Asim Jamshed, YoungGyoun Moon, Donghwi Kim, **Dongsu Han**, KyoungSoo Park
USENIX NSDI 2017 (Acceptance rate: 18%)

[C-30] Rate-Aware Flow Scheduling for Commodity Data Center Networks [pdf]

Ziyang Li, Wei Bai, Kai Chen, **Dongsu Han**, Yiming Zhang, Dongsheng Li, Hongfang Yu
IEEE Infocom 2017

[C-29] SGX-Shield: Enabling Address Space Layout Randomization for SGX Programs

Jaebaek Seo, Byoungyoung Lee, Sungmin Kim, Ming-Wei Shih, Insik Shin, **Dongsu Han**, Taesoo Kim
NDSS 2017 (Acceptance rate: 16%)

- [C-28] Enabling Automatic Protocol Behavior Analysis for Android Applications**
Jeongmin Kim*, Hyunwoo Choi, Hun Namkung, Woohyun Choi, Byungkwon Choi, Hyunwook Hong, Yongdae Kim, Jonghyup Lee, **Dongsu Han**
In proceedings of the **ACM CoNEXT 2016** (Acceptance rate: 18.4%)
* co-first authors
- [C-27] Expeditus: Congestion-aware Load Balancing in Clos Data Center Networks**
Peng Wang, Hong Xu, Zhixiong Niu, **Dongsu Han**, Yongqiang Xiong
In proceedings of the **ACM Symposium on Cloud Computing 2016** (Acceptance rate: 25.1%)
- [C-26] U-HAUL: Efficient State Migration in NFV**
Libin Liu, Hong Xu, Zhixiong Niu, Peng Wang, **Dongsu Han**
In proceedings of the **ACM APSys 2016**
- [C-25] DFC: Accelerating String Pattern Matching for Network Applications**
Byungkwon Choi, Jongwook Chae, Muhammad Jamshed, Kyoungsoo Park, **Dongsu Han**
In proceedings of the **USENIX NSDI** (Symposium on Networked Systems Design and Implementation) 2016 (Acceptance rate: 19.7%)
- [C-24] OpenSGX: An Open Platform for SGX Research**
Prerit Jain, Soham Desai, Seongmin Kim*, Ming-Wei Shih, JaeHyuk Lee, Changho Choi, Youjung Shin, Taesoo Kim, Brent Byunghoon Kang, **Dongsu Han**
In proceedings of the Network and Distributed System Security (**NDSS**) Symposium 2016 (Acceptance rate: 15.4%)
* Presenting author at NDSS
- [C-23] A First Step Towards Leveraging Commodity Trusted Execution Environments for Network Applications**
Seongmin Kim, Youjung Shin, Jaehyung Ha, Taesoo Kim, **Dongsu Han**
In proceedings of the ACM Workshop on Hot Topics in Networks (**HotNets**) 2015 (Acceptance rate: 18.6%)
- [C-22] Practical Message-passing Framework for Large-scale Combinatorial Optimization**
Inho Cho*, Soya Park*, Sejun Park, **Dongsu Han**, Jinwoo Shin
(*co-first authors)
In proceedings of the IEEE International Conference on Big Data (**IEEE BigData**) 2015 (Acceptance rate: 18%)
- [C-21] Haetae: Scaling the Performance of Network Intrusion Detection with Many-core Processors**
Jaehyun Nam, Muhammad Jamshed, Byungkwon Choi, **Dongsu Han**, and KyoungSoo Park
In proceedings of the International Symposium on Research in Attacks, Intrusions and Defenses (**RAID**) 2015 (Acceptance rate: 23.5%)
- [C-20] Breaking and Fixing VoLTE: Exploiting Hidden Data Channels and Mis-implementations**
Hongil Kim, Dongkwan Kim, Minhee Kwon, Hyungseok Han, Yeongin Jang, **Dongsu Han**, Taesoo Kim, Yongdae Kim
In proceedings of the ACM Conference on Computer and Communications Security (**CCS**) 2015 (Acceptance rate: 19.8%)

- [C-19] MemScope: Analyzing Memory Duplication on Android Systems**
Byeoksan Lee, Seong Min Kim, Eru Park, **Dongsu Han**
In proceedings of the ACM SIGOPS Asia-Pacific Workshop on Systems (**APSys**) 2015
(Acceptance rate: 29.9%)
- [C-18] Practical, Real-time Centralized Control for CDN-based Live Video Delivery**
Matthew K. Mukerjee, David Naylor, Junchen Jiang, **Dongsu Han**, Srinivasan Seshan, Hui Zhang
In proceedings of the **ACM SIGCOMM** 2015 (Acceptance rate: 15.3%)
(Initiated the project while Dongsu Han was a post-doc fellow at Carnegie Mellon)
- [C-17] Accurate Latency-based Congestion Feedback for Datacenters**
Changhyun Lee*, Chunjong Park+, Keon Jang#, Sue Moon, **Dongsu Han**
In proceedings of the **USENIX** Annual Technical Conference (**ATC**) 2015 (Acceptance rate: 15.8%)
(*Co-advised student with Sue Moon, +Undergrad student advised, #Post-doc advised)
- [C-16] Information-Agnostic Flow Scheduling for Commodity Data Center**
Wei Bai, Li Chen, Kai Chen, **Dongsu Han**, Chen Tian, Weicheng Sun
In proceedings of the **USENIX NSDI** (Symposium on Networked Systems Design and Implementation) 2015 (Acceptance rate: 19.7%)
- [C-15] Guaranteeing Deadlines for Inter-Datacenter Transfers**
Hong Zhang, Kai Chen, Wei Bai, **Dongsu Han**, Chen Tian, Hao Wang, Haibing Guan, Ming Zhang
In proceedings of the ACM European Conference on Computer Systems (**Eurosys**) 2015
(Acceptance rate: 20.7%)
- [C-14] PIAS: Practical Information-Agnostic Flow Scheduling for Data Center Networks**
Wei Bai, Li Chen, Kai Chen, **Dongsu Han**, Chen Tian, Weicheng Sun
In proceedings of the ACM Workshop on Hot Topics in Networks (**HotNets**) 2014
(Acceptance rate: 22%)
- [C-13] MICA: A Holistic Approach to Near-Line-Rate In-Memory Key-Value Caching on General-Purpose Hardware**
Hyeontaek Lim, **Dongsu Han**, David G. Andersen, Michael Kaminsky
In proceedings of the **USENIX NSDI** (Symposium on Networked Systems Design and Implementation) 2014 (Acceptance rate: 17.8%)
- [C-12] mTCP: a Highly Scalable User-level TCP Stack for Multicore Systems**
EunYoung Jeong, Shinae Woo, Muhammad Asim Jamshed, Haewon Jeong, Sunghwan Ihm, **Dongsu Han**,
Kyoungsoo Park
In proceedings of the **USENIX NSDI** (*Symposium on Networked Systems Design and Implementation*) 2014 (Acceptance rate: 17.8%)
NSDI community award
- [C-11] Understanding Tradeoffs in Incremental Deployment of New Network Architectures**
Matthew Mukerjee, **Dongsu Han**, Srinivasan Seshan, and Peter Steenkiste.
In proceedings of the International Conference on emerging Networking EXperiments and Technologies (**ACM CoNEXT**) 2013 (Acceptance rate 20.2%)

[C-10] FCP: A Flexible Transport Framework for Accomodating Diversity

Dongsu Han, Robert Grandl, Aditya Akella, and Srinivasan Seshan.

In proceedings of the **ACM SIGCOMM** 2013 (Acceptance rate 15.8%)

[C-9] CAMEO: A Middleware for Mobile Advertisement Delivery

Azeem J. Khan, Kasthuri Jayarajah, **Dongsu Han**, Archan Misra, Rajesh Balan, and Srinivasan Seshan.

In proceedings 11th **ACM MobiSys** (International Conference on Mobile Systems, Applications, and Services), 2013 (Acceptane Rate: 15.7%)

[C-8] RPT: Re-architecting Loss Protection for Content-Aware Networks

Dongsu Han, Ashok Anand, Aditya Akella, and Srinivasan Seshan.

In proceedings of the 9th **USENIX NSDI** (Symposium on Networked Systems Design and Implementation), 2012 (Acceptance rate: 17.8%)

[C-7] XIA: Efficient Support for Evolvable Internetworking

Dongsu Han, Ashok Anand, Fahad Dogar, Boyan Li, Hyeontaek Lim, Michel Machado, Arvind Mukundan, Wenfei Wu, Aditya Akella, David G. Andersen, John W. Byers, Srinivasan Seshan, and Peter Steenkiste.

In proceedings of the 9th **USENIX NSDI** (Symposium on Networked Systems Design and Implementation), 2012 (Acceptance rate: 17.8%)

[C-6] XIA: An Architecture for an Evolvable and Trustworthy Internet

Ashok Anand, Fahad Dogar, **Dongsu Han**, Boyan Li, Hyeontaek Lim, Michel Machado, Wenfei Wu, Aditya Akella, David G. Andersen, John W. Byers, Srinivasan Seshan, and Peter Steenkiste.

In proceedings of the tenth ACM Workshop on Hot Topics in Networks (**HotNets**), November, 2011 (Acceptance rate: 20%)

[C-5] The Hare and the Tortoise: Tackling Wireless Losses by Exploiting Wired Reliability

Anirudh Badam, **Dongsu Han**, Dave Andersen, Michael Kaminsky, Dina Papagiannaki, and Srinivasan Seshan.

In proceedings 12th **ACM MobiHoc** (International Symposium on Mobile Ad Hoc Networking and Computing, May 2011 (Acceptance rate: 19.7%)

[C-4] Predicting Handoffs in 3G Networks

Umar Javed, **Dongsu Han**, Ramon Caceres, Jeffery Pang, Srinivasan Seshan, and Alexander Varshavsky. *ACM Operating Systems Review (OSR)* 45(3): 65-70, January 2012

Also appears in proceedings of the third ACM SOSP Workshop on Networking, Systems, and Applications on Mobile Handhelds (**MobiHeld**), October 2011

[C-3] ATLAS: A Scalable and High-Performance Scheduling Algorithm for Multiple Memory Controllers

Yoongu Kim, **Dongsu Han**, Onur Mutlu, and Mor Harchol-Balter.

In proceedings of the 16th **IEEE HPCA** (International Symposium on High-Performance Computer Architecture), January, 2010 (Acceptance rate: 18%; one of the four papers nominated for the Best Paper Award)

[C-2] Access Point Localization using Local Signal Strength Gradient

Dongsu Han, David G. Andersen, Michael Kaminsky, Konstantina Papagiannaki, and Srinivasan Seshan.

In proceedings of the Passive Active Measurement Conference (**PAM**), April 2009 (Acceptance rate: 28.6%)

[C-1] Mark-and-Sweep: Getting the Inside Scoop on Neighborhood Networks

Dongsu Han, David G. Andersen, Michael Kaminsky, Konstantina Papagiannaki, and Srinivasan Seshan.
In proceedings of the **ACM IMC** (Internet Measurement Conference), October 2008 (Acceptance rate: 17.3%)

Journal Publications

[J-1] Accelerating Network Middlebox Applications with High Speed String Matching

Byungkwon Choi, Jongwook Chae, Muhammad Jamshed, Kyoungsoo Park, **Dongsu Han**
Under revision in IEEE/ACM Transactions on Networking

[J-2] Large-scale Combinatorial Optimization via Belief Propagation: Practical Perspective

Inho Cho, Soya Park, Sejun Park, Jinwoo Shin, **Dongsu Han**
In preparation

[J-3] DX: Latency-based Congestion Control for Datacenters

Changhyun Lee, Chunjong Park, Keon Jang, Sue Moon, **Dongsu Han**
IEEE/ACM Transactions on Networking 2017 Issue 1

[J-4] Guaranteeing Deadlines for Inter-Datacenter Transfers

Hong Zhang, Kai Chen, Wei Bai, **Dongsu Han**, Chen Tian, Hao Wang, Haibing Guan, Ming Zhang
Accepted to IEEE/ACM Transactions on Networking

[J-5] XIA: architecting a more trustworthy and evolvable internet

David Naylor, Matthew K. Mukerjee, Patrick Agyapong, Robert Grandl, Ruogu Kang, Michel Machado, Stephanie Brown, Cody Doucette, Hsu-Chun Hsiao, **Dongsu Han**, Tiffany Hyun-Jin Kim, Hyeontaek Lim, Carol Ovon, Dong Zhou, Soo Bum Lee, Yue-Hsun Lin, Colleen Stuart, Dan Barrett, Aditya Akella, David Andersen, John Byers, Laura Dabbish, Michael Kaminsky, Sara Kiesler, John Peha, Adrian Perrig, Srinivasan Seshan, Marvin Sirbu, and Peter Steenkiste
ACM SIGCOMM Computer Communication Review, Volume 44 Issue 3, pp. 50-57, July 2015.

Other non-major publications

[O-1] Application-specific Acceleration Framework for Mobile Applications

Byungkwon Choi, Jeongmin Kim, **Dongsu Han**
In proceedings of the **ACM SIGCOMM** 2016 (poster session)

[O-2] Extractocol: Automatic Extraction of Application-level Protocol Behaviors for Android Applications

Hyunwoo Choi*, Jeongmin Kim*, Hyunwook Hong, Yongdae Kim, Jonghyup Lee, and Dongsu Han
In proceedings of the **ACM SIGCOMM** 2015 (poster session) (*co-first authors)

[O-3] A Case for a Stateful Middlebox Networking Stack

Muhammad Jamshed, Donghwi Kim, YoungGyoum Moon, Dongsu Han, and KyoungSoo Park
In proceedings of the **ACM SIGCOMM** 2015 (poster session)

[O-4] Supporting Network Evolution and Incremental Deployment with XIA (demo)

Robert Grandl, **Dongsu Han**, Suk-Bok Lee, Hyeontaek Lim, Michel Machado, Matthew Mukerjee, and David Naylor.

In proceedings of the ACM SIGCOMM (Demo session) 2012, Helsinki, Finland

[O-5] Hulu in the Neighborhood (Invited Paper)

Dongsu Han, David Andersen, Michael Kaminsky, Konstantina Papagiannaki, and Srinivasan Seshan

In proceedings of the Conference on COMMunication Systems and NETWORKS (COMSNETS), 2011

SOFTWARE PUBLISHED

1. SGX-Tor: Intel SGX-enabled Tor anonymity network (<https://github.com/kaist-ina/SGX-Tor/>)
2. Extractocol: Automatic protocol behavior analysis for Android application (https://github.com/kaist-ina/Extractocol_public)
3. mOS: Framework for Middlebox Development (<https://github.com/ndsl-kaist/mOS-networking-stack>)
4. DFC: High-speed string pattern matching library (<https://github.com/nfsp3k/DFC>)
5. OpenSGX: Open-source Intel SGX emulator (<https://github.com/sslab-gatech/opensgx>)
6. Belief Propagation-based parallel optimization tool (https://github.com/kaist-ina/bp_solver)
7. MemScope: memory duplication analysis tool for x86-android (<https://github.com/kaist-ina/MemScope>)
8. mTCP: high-performance user-level TCP stack for multicore systems (<http://shader.kaist.edu/mtcp/>)
9. XIA: eXpressive Internet Architecture (<https://github.com/XIA-Project/xia-core/>)

SERVICES AND PROFESSIONAL ACTIVITIES

Program Committee:

- ITC 29
- HotMiddlebox 2016 (co-chair), 2015
- ACM CoNEXT 2016, 2017
- IEEE INFOCOM 2016
- IEEE ICNP 2015
- ACM ANCS 2015, 2016, 2017
- ACM APSys 2016
- IEEE LANMAN 2014-2016
- PAM 2015
- ICCCN 2014

Reviewer

- IEEE/ACM Transactions on Networking
- Journal of Communications and Networks

Professional services:

- CFI 2015 Web chair
- APSys 2015 Poster chair
- APNet 2017 Publication chair
- ACM CoNEXT 2017 Publication chair
- ACM SIGCOMM 2016 Poster PC

TEACHING AND MENTORING

Korea Advanced Institute of Science and Technology, Daejeon, Korea:

Contribution in undergraduate education

- Offered four different undergraduate courses in the CNS (computing, networking, and security) group
- Consistently achieved high evaluation ratings

EE415 Operating Systems and System Programming (given in English)

- Spring 2015: 18 students, evaluation rating 4.42/5.0

- Spring 2016: 18 students, evaluation rating 4.41/5.0

EE209 Programming Structures for Electrical Engineering (given in English)

- Fall 2014: 84 students, evaluation rating 4.15/5.0

EE323 Computer Networks

- Spring 2014: 27 students, evaluation rating 4.24/5.0

EE324 Network Programming (Undergraduate Distributed Systems, given in English)

- Fall 2013: 10 students, evaluation rating 4.67/5.0

- Fall 2015: 21 students, evaluation rating 4.38/5.0

IS511 Introduction to Information Security (co-teaching with 3 other instructors, given in Korean)

- Spring 2015: 30 students, evaluation rating 4.24/5.0

- Spring 2016: 14 students, current semester 4.03/5.0

EE5505 Electronics Design Lab. (co-teaching with 3 other instructors)

- Fall 2015: 73 students, evaluation rating 3.71/5.0

Carnegie Mellon University (Teaching Assistant):

- Advanced and Distributed Operating Systems (15-712), Carnegie Mellon University, 2011

- Distributed Systems (15-446), Carnegie Mellon University, 2009

Students Supervised/Under-supervision:

Ph.D students:

Seongmin Kim

Byoungkwon Choi

Jungmin Kim

Changhyun Kim (Ph.D. 2015, now at NSRI, Korea. Co-advised with Sue Moon)

M.S students:

Jongwook Chae

Woohyun Choi

Inho Cho

Keonhong Lee (M.S. 2016, co-advised with Sue Moon)

Byoungkwon Choi (M.S. 2016, now in Ph.D. program under my supervision)

Jungmin Kim (M.S. 2016, now in Ph.D. program under my supervision)

Undergraduate students:

Inho Cho (B.S 2015. Advised URP, published a paper at IEEE BigData)

Soya Park (Advised URP, published a paper at IEEE BigData)

Eru Park (B.S 2015. Published a paper at ACM APSys)

Namkung Hun (B.S. 2016. Now a Ph.D student at Carnegie Mellon University)

Post-Docs: Keon Jang, 2014 (Now at Google)

AWARDS AND HONORS

Silver award, Samsung Human Tech Paper Award 2016 (Advisor)
NSDI Community Award 2014

SELECTED (INVITED) TALKS

- Schloss Dagstuhl Seminar on Network Latency Control in Data Centres
- Keynote, A3 Foresight Program, 2016
- ACM HotNets 2015
- Invited talk at ICTC 2015
- Interdisciplinary Information Sciences (IIIS), Tsinghua University 2015
- KRNAT 2016, 2015, 2014, 2013
- Computer Science Department Colloquium, City University of Hong Kong, 2015
- Computer Science Department, HKUST 2015
- Graduate School of Information Security, KAIST 2014
- Computer Science Department, HKUST 2014
- Computer Science Department, POSTECH 2014
- Computer Science Department, Seoul National University 2014
- KIISE SIGCS Winter Workshop 2014
- Information Engineering Department, Chinese University of Hong Kong 2013
- ASIA FI Summer School 2013

RESEARCH FUNDING RECEIVED

No	Agency	Title	Period	Amount (KRW)	Role
1	NRF	Centralized Control Plane for Efficient Internet Content Distribution Network	2013-09-01 ~2013-10-31	5,000,000	PI
2	NRF	Engineering Internet Video Quality of Experience (QoE): Understanding User Experience and Research in CDN Control Plane	2013-12-01 ~2016-11-30	177,741,000	PI
3	IITP	Development of an NFV-inspired networked switch and an operating system for multi-middlebox services	2014-04-01 ~2017-02-28	194,391,000	Researcher
4	IITP	Creation of PEP based on automatic protocol behavior analysis and Resource management for hyper connected IoT Services	2015-03-01 ~2017-02-29	239,631,000	PI
5	IITP	KOR-US SDN/NFV WAN Network Reliability and Testbed Deployment	2015-06-01 ~2017-05-31	35,323,000	Researcher
6	NRF	Optimization Research with Big Data and OPEL Data Analysis	2015-09-01 ~2016-06-30	21,206,000	Researcher
7	Samsung Electronics	QoE Guarantees under B4G networks for Content Delivery	2013-10-11 ~2014-08-31	50,000,000	PI
8	AOARD	Large-scale Linear Optimization through Machine Learning: From	2015-05-28 ~2016-05-27	27,362,500	Researcher

		Theory to Practical System Design and Implementation			
9	KAIST	Achieving Sustainability in Internet Content Delivery through Intelligent Control Plane	2013-06-17 ~2016-12-31	130,000,000	PI
10	KAIST	Distributed Optimization with Belief propagation: Case study for maximum weight matching	2014-12-22 ~2015-06-19	2,500,000	PI
11	KAIST	Augmented Reality with StreetView Images	2015-07-13 ~2015-12-11	6,000,000	PI
12	KAIST	Large-scale Linear Optimization through Machine Learning	2014-03-01 ~2014-10-31	4,500,000	PI