Tsuyoshi Ide (井手 剛), Ph.D.

Business Address

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Professional Experience Summary

Currently I am in the position of Senior Technical Staff Member (STSM) in IBM, the third highest technical position after IBM Fellow and Distinguished Engineer. My 10+ years of experience in artificial intelligence (AI) includes:

- Continued world-class research achievements for more than a decade
- Pioneering work in sensor data analytics, or AI for IoT (Internet-of-Things), especially in anomaly detection
- Broad project and people management experience in both the US and Japan through hundreds of customer engagements across a variety of industries

As a researcher in machine learning and data mining, I have published many papers in world's top conferences and journals such as KDD, ICDM, SDM, IJCAI, and AAAI mostly as the first author. The major research topics include

- Anomaly and change detection
- Questionnaire data analysis for service sciences
- Transportation network analysis

For more details, see my publication list.

I am a green card holder. I am open to new and exciting job opportunities in the US and Japan.

Education

- 2000 Ph.D. in Physics, The University of Tokyo, Japan.
  - Thesis: “Theoretical Study on Nonlocal Effects in Resonant X-Ray Emission Spectra of Strongly-Correlated Systems”
  - Supervisor: Prof. Kotani Akio
- 1997 MSc. in Physics Science, University of Tokyo, Japan.
- 1993 BEng in Mechanical Engineering, Tohoku University, Japan.

Employment

*Tsuyoshi Idé is a **green card holder**. He is open to new job opportunities in the US and Japan.*

- Today-07/12/2016, **IBM Thomas J. Watson Research Center** (Full-time regular employment, 40 hours/week)
    - **Senior Technical Staff Member**
        - Lead customer engagements and provide the team with technical guidance.
        - Play a role of technical evangelist to influence IBM's technical roadmap based on a broad range of experiences on real business.
        - Perform basic and applied research in AI to publish research outcomes in world premier conferences and journals as well as patents.
- 07/11/2016-09/04/2013, **IBM Thomas J. Watson Research Center** (full-time, 40 hours/week, on international assignment from IBM Japan)
    - **Senior Technical Staff Member** (09/2014-07/2016).
        - Led several customer engagements to success as the technical leader in AI. Industries
        - engaged include oil, mining, and chemical industries.
        - Developed innovative machine learning methods for industrial sensor data.
        - Published six first-authored papers in world's premier conference and journals in AI.
    - **Manager, Service Delivery & Risk Analytics** (09/2013-09/2014).
        - Engaged in people, project, and research strategy management of the team.
        - Proposed new AI-based approaches to IT (information technology) system development.
        - Awarded two Outstanding Technical Achievement Awards by IBM Corporation for that work.
- 09/03/2013-04/01/2000, **IBM Research - Tokyo** (full-time, 38 hours/week).
    - **Manager, Analytics & Optimization** (09/2010-09/2013).
        - Supervised the entire area of analytics at IBM Research { Tokyo (except for speech and text analytics).
        - Successfully established an organizational management model that balances business contribution and academic reputation.
        - Proposed a new business strategy based on AI technologies and led various customer engagements. Major successful projects include the development of intelligent transportation system in Kenya and a monitoring system for ocean-going vessels. The latter won General Manager Award of IBM Japan.
    - **Senior Researcher** (2010-2013), **Advisory Researcher** (2008-2010), **Staff Researcher** (2005-2008)

        - Led basic and applied research in AI as a technical leader.
        - Proposed to focus on sensor data as a promising area of AI applications.
        - Major research achievements include the establishment of dependency-based anomaly detection method, which was awarded Outstanding Technical Achievement Award later.
    - Researcher (2000-2005)
        - Engaged in improving existing IBM products using mathematical science technologies.
        - Major contributions include a major improvement of luminance uniformity of IBM ThinkPad displays and the development anomaly detection solution of computer systems.

Executive/Board Membership

- Today-2013 IBM Academy of Technology.
- 2015-2011 Secretary, Machine Learning Activity Group of the Japan Society for Industrial and Applied Mathematics (JSIAM-ML).
- 2014-2012 Board of Directors, The Japanese Society for Artificial Intelligence.
- 2010-2008 Vice Chair, Technical Committee on Information-Based Induction Sciences, IEICE.

Awards/Honors

- 2017 Best Author Award, The Japan Society for Industrial and Applied Mathematics.
- 2016 Outstanding Technical Achievement Award (x2), IBM Corporation.
- 2015 Outstanding Technical Achievement Award, IBM Corporation.
- 2013 General Manager Award, IBM Japan.
- 2007 Winner, ICDM Data Mining Contest, The 2007 Seventh IEEE International Conference on Data Mining.
- 2006 JSAI Annual Conference Award, The 20th Annual Conference of the Japanese Society for Artificial Intelligence.
- 2004 JSAI Annual Conference Award, The 18th Annual Conference of the Japanese Society for Artificial Intelligence.
- 1993 Hatakeyama Award, The Japan Society of Mechanical Engineers.
- 1990 Hatakeyama Award, The Japan Society of Mechanical Engineers.

List of Invited Talks

- 2015
  - "Towards consumable analytics: Challenges and recent advances," IEEE International Workshop on Data Mining for Service (DMS 2015), Atlantic City, USA.
- 2014
  - "Formalizing expert knowledge through machine learning," Big Data in Service, New York, USA.
- 2012
  - "Formalizing expert knowledge through machine learning," Service Science Research Forum, Tokyo, Japan.
  - "Historical Perspectives towards Analytics Revolution," The 56th Annual Symposium of the Institute of Systems, Control and Information Engineers (SCI'12), Kyoto, Japan.
  - "Trajectory regression on networks," Japanese-French Frontiers of Science Symposium (JFFoS), Nice, France.
  - "Machine Learning for Anomaly Detection and Risk Analysis, II," IBISML Tutorial, Jan. 12, 2012, Tokyo, Japan.
- 2011
  - "Solving real business problems with math sciences," SIG Service Science, The Operating Research Society of Japan, Dec. 19, 2011, Tsukuba, Japan.
- 2010
  - "Anomaly detection using sparse structure learning," Adachi Lab Seminar, Keio University, Dec. 12, 2010, Tokyo, Japan.
  - "On recent advances in machine learning for system identification," DoE Conference 2010, Nov. 15, 2010, Tokyo, Japan.
  - "On the trajectory regression problem on networks," Sugiyama Lab. Seminar, Department of Computer Science, Tokyo Institute of Technology, Oct. 7, 2010, Tokyo, Japan.
  - "On a regression problem for path cost," ERATO Seminar, Hokkaido University (Sep. 27, 2010), Sapporo, Japan.
  - "Detecting Anomalies from Latent Graph Structures," The 1st Workshop on Latent Dynamics (LD-1), (Jun 16, 2010), Tokyo, Japan.
  - "On the problem of cost estimation for paths," Mathematical Informatics Colloquium, University of Tokyo (Feb. 24, 2010), Tokyo, Japan.
- 2007
  - "Applying Machine Learning Techniques to Sensor Data Analysis," Global COE `CompView' Kickoff Event, Tokyo Institute of Technology (Dec. 13, 2007), Tokyo, Japan.

- 2006
    - "Why does subsequence time-series clustering produce sine waves?," Departmental Colloquium, Max Planck Institute for Biological Cybernetics, Sep. 13, 2006, Tübingen, Germany.
- 2005
    - "A Spectral Approach to Anomaly Detection in Computer Systems," Scientific Computing Seminar, Berkeley Lab (April 25, 2005), Berkeley, USA.
- 2004
    - "Feature Extraction and Anomaly Detection in Web-based Computer Systems," The Seventh Workshop on Information-Based Induction Sciences (IBIS2004), November 8 -10, 2004, Tokyo, Japan.

Publications: Conference proceedings (refereed)

- **Tsuyoshi Idé**, Dzung T. Phan, and Jayant Kalagnanam
  Multi-task Multi-modal Models for Collective Anomaly Detection
  In Proceedings of 2017 IEEE International Conference on Data Mining (ICDM 17), pp. TBD, 2017.
- Dzung T. Phan, **Tsuyoshi Idé**, Jayant Kalagnanam, Matt Menickelly, Katya Scheinberg
  Proceedings of the 17th International Conference on Data Mining Workshops (ICDMW 2017), pp.TBD, 2017
- **Tsuyoshi Idé**, Ankush Khandelwal, and Jayant Kalagnanam
  Sparse Gaussian Markov random field mixtures for anomaly detection
  In Proceedings of 2016 IEEE International Conference on Data Mining (ICDM 16), pp. 955-960, 2016.
- Takayuki Katsuki, Tetsuro Morimura, and **Tsuyoshi Idé**
  Unsupervised object counting without object recognition.
  In Proceedings of the 23rd International Conference on Pattern Recognition (ICPR 2016), pp. 3616-3621, 2016.
- **Tsuyoshi Idé**, Dzung T. Phan, and Jayant Kalagnanam
  Change detection using directional statistics
  In Proceedings of the Twenty-Fifth International Joint Conference on Artificial Intelligence (IJCAI 16), pp. 1613-1619, 2016.
- **Tsuyoshi Idé** and Amit Dhurandhar
  Informative prediction based on ordinal questionnaire data
  In Proceedings of 2015 IEEE International Conference on Data Mining (ICDM 15), pp.191-200, 2015.

- Kuan-Yu Chen, Ee-Ea Jan, and **Tsuyoshi Idé**
  Probabilistic text analytics framework for information technology service desk tickets
  In Proceedings of the 14th IFIP/IEEE International Symposium on Integrated Network Management (IM 2015), pp.870-873, 2015.
- **Tsuyoshi Idé**, Sinem Güuven, Ee-Ea Jan, Sergey Makogon, and Alejandro Venegas
  Latent trait analysis for risk management of complex information technology projects
  In Proceedings of the 14th IFIP/IEEE International Symposium on Integrated Network Management (IM 2015), pp.305-312, 2015.
- Bin Tong, Tetsuro Morimura, Einoshin Suzuki, and **Tsuyoshi Idé**
  Probabilistic two-level anomaly detection for correlated systems
  In Proceedings of the 21st European Conference on Artificial Intelligence (ECAI 2014), pp.21-23, 2014.
- Sinem Güuven, Mathias Steiner, **Tsuyoshi Idé**, Sergey Makogon, and Alejandro Venegas
  Mining for gold: How to predict service contract performance with optimal accuracy based on ordinal risk assessment data
  In Proceedings of the 11th IEEE International Conference on Services Computing (IEEE SCC 2014), pp.315-322, 2014.
- Tetsuro Morimura, Takayuki Osogami, and **Tsuyoshi Idé**
  Solving inverse problem of Markov chain with partial observations. In Proceedings of Neural Information and Processing Systems (NIPS 2013), pp.1655-1663, 2013.
- **Tsuyoshi Idé**, Takayuki Katsuki, Tetsuro Morimura, and Robert Morris
  Monitoring entire-city traffic using low-resolution web cameras
  In Proceedings of ITS World Congress Tokyo 2013, Number 3143, 2013.
- Takayuki Osogami, Hideyuki Mizuta, and **Tsuyoshi Idé**
  Identifying the optimal road closure with simulation
  In Proceedings of ITS World Congress Tokyo 2013, Number 3178, 2013.
- Toshiro Takahashi and **Tsuyoshi Idé**
  Predicting battery life from usage trajectory patterns
  In Proceedings of the 19th International Conference on Pattern Recognition (ICPR 2012), pp.2946-2949, 2012.
- T. Suzumura, S. Kato, T. Imamichi, M. Takeuchi, H. Kanezashi, **Tsuyoshi Idé**, and T. Onodera
  X10-based massive parallel large-scale traffic flow simulation
  In Proceedings of the ACM SIGPLAN 2012 X10 Workshop (X10 '12), pp.3:1-3:4, 2012.
- Takashi Imamichi, Hidetoshi Numata, Hideyuki Mizuta, and **Tsuyoshi Idé**
  Nonlinear optimization to generate non-overlapping random dot patterns
  In Proceedings of the Winter Simulation Conference 2011 (WSC 11), pp.2419-2430, 2012.

- **Tsuyoshi Idé** and Masashi Sugiyama
  Trajectory regression on road networks
  In Proceedings of AAAI Conference on Arti_cial Intelligence (AAAI 11), pp.203-208, 2011/
- **Tsuyoshi Idé**, Aurelie C. Lozano, Naoki Abe, and Yan Liu
  Proximity-based anomaly detection using sparse structure learning
  In Proceedings of 2009 SIAM International Conference on Data Mining (SDM 09), pp.97-108, 2009.
- **Tsuyoshi Idé** and Sei Kato
  Travel-time prediction using Gaussian process regression: A trajectory-based approach
  In Proceedings of 2009 SIAM International Conference on Data Mining (SDM 09), pp.1185-1196, 2009.
- Masashi Sugiyama, **Tsuyoshi Idé**, Shinichi Nakajima, and Jun Sese
  Semi-supervised local Fisher discriminant analysis for dimensionality reduction
  In Proceedings of the Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD 08), pp.333-344, 2008.
- Shohei Hido, **Tsuyoshi Idé**, Hisashi Kashima, Harunobu Kubo, and Hirofumi Matsuzawa
  Unsupervised change analysis using supervised learning
  In Proceedings of the Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD 08), pp.148-159, 2008.
- **Tsuyoshi Idé**, Spiros Papadimitriou, and Michail Vlachos
  Computing correlation anomaly scores using stochastic nearest neighbors
  In Proceedings of the Seventh IEEE International Conference on Data Mining (ICDM 07), pp.523-528, 2007.
- **Tsuyoshi Idé** and Koji Tsuda
  Change-point detection using Krylov subspace learning
  In Proceedings of 2007 SIAM International Conference on Data Mining (SDM 07), pp.515-520, 2007.
- **Tsuyoshi Idé**
  Why does subsequence time-series clustering produce sine waves?
  In Proceedings of the 10th European Conference on Principles and Practice of Knowledge Discovery in Databases (PKDD 06), pp.311-322, 2006.
- H. Kashima, T. Tsumura, **Tsuyoshi Idé**, T. Nogayama, R. Hirade, H. Etoh, and T. Fukuda
  Network-based problem detection for distributed systems
  In Proceedings of the 21st International Conference on Data Engineering (ICDE 2005), pp.978-989, 2005.
- **Tsuyoshi Idé**
  Pairwise symmetry decomposition method for generalized covariance analysis

In Proceedings of the Fifth IEEE International Conference in Data Mining (ICDM 05), pp.657-660, 2005.

- **Tsuyoshi Idé** and Keisuke Inoue
  Knowledge discovery from heterogeneous dynamic systems using change-point correlations
  In Proceedings of 2005 SIAM International Conference on Data Mining (SDM 05), pp.571-575, 2005.
- **Tsuyoshi Idé** and Hisashi Kashima.
  Eigenspace-based anomaly detection in computer systems
  In Proceedings of ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD '04), pp.440-449, 2004.
- **Tsuyoshi Idé**, H. Numata, H. Mizuta, Y. Taira, M. Suzuki, M. Noguchi, and Y. Katsu
  Moiré-free collimating light guide with low-discrepancy dot patterns
  In Digest of Technical Papers of Society for Information Display 2002 (SID '02), pp.1232-1235, 2002.

Publications: Journal (refereed)

- **Tsuyoshi Idé**, Tetsuro Morimura Takayuki Katsuki, and Robert Morris
  City-wide traffic flow estimation from limited number of low quality cameras
  IEEE Transactions on Intelligent Transportation Systems, 2016 (accepted).
- **Tsuyoshi Idé** and Amit Dhurandhar
  Supervised item response models for informative prediction. Knowledge and Information Systems, 51:235-257, 2017.
- Takayuki Osogami, Takaashi Imamichi, Hideyuki Mizuta, and **Tsuyoshi Idé**
  Toward simulating entire cities with behavioral models of traffic
  IBM Journal of Research and Development, 57:6:1-6:10, 2013
- Tetsuro Morimura, Yusuke Tanizawa, Shinya yamasaki, and **Tsuyoshi Idé**
  Vehicle near-miss situation prediction from probe-car data using statistical machine learning
  Journal of Information Processing, 43:573-578, 2012
- Shohei Hido, Shoko Suzuki, Risa Nishiyama, Takashi Imamichi, Rikiya Takahashi, Tetsuya Nasukawa, **Tsuyoshi Idé**, Yusuke Kanehira, Rinju Yohda, Takeshi Ueno, Akira Tajima, and Toshiya Watanabe
  Modeling patent quality: A system for large-scale patentability analysis using text mining
  Journal of Information Processing, 20:667-671, 2010.
- **Tsuyoshi Idé** and Sei Kato
  Trajectory regression for travel-time prediction
  Transactions of the Japanese Society for Arti_cial Intelligence, 25:377-382, 2010.

- H. Matsuzawa, S. Hido, **Tsuyoshi Idé**, and H. Kashima
  Unsupervised change analysis using supervised learning
  The IEICE Transactions on Information and Systems, E93-D:816-825, 2010.
- M. Sugiyama, **Tsuyoshi Idé**, S. Nakajima, and J. Sese
  Semi-supervised local Fisher discriminant analysis for dimensionality reduction
  Machine Learning, 78:35-61, 2010.
- H. Kashima, **Tsuyoshi Idé**, T. Kato, and M. Sugiyama
  Recent advances and trends in large-scale kernel methods
  IEICE Transactions on Information and Systems, E92-D:1338-1353, 2009.
- H. Kashima, T. Tsumura, **Tsuyoshi Idé**, T. Nogayama, R. Hirade, H. Etoh, and T. Fukuda
  Network-based problem detection for distributed systems
  IEICE Transactions on Information and Systems, J89-D:183-198, 2006.
- **Tsuyoshi Idé**, H. Mizuta, H. Numata, Y. Taira, M. Suzuki, M. Noguchi, and Y. Katsu
  Dot pattern generation technique using molecular dynamics
  Journal of the Optical Society of America, A, 20:242-255, 2003.
- **Tsuyoshi Idé**, H. Numata, H. Mizuta, Y. Taira, M. Suzuki, M. Noguchi, and Y. Katsu
  A novel dot-pattern generation to improve luminance uniformity of an LCD backlight
  Journal of the Society for Information Display, 11:659-665, 2003.
- **Tsuyoshi Idé** and Akio Kotani
  Nonlocal screening effect in Cu 4*p*-1*s* resonant X-ray emission spectra of Nd_2CuO_4
  Journal of the Physical Society of Japan, 69:3107-3114, 2000.
- **Tsuyoshi Idé** and Akio Kotani
  Interplay between raman and uorescence-like components in resonant X-ray emission spectra of degenerate d_0 and d_1 systems
  Journal of the Physical Society of Japan, 69:1895-1906, 2000.
- K. Hämäläinen, J. P. Hill, S. Huotari, C. C. Kao, L. E. Berman, A. Kotani, **Tsuyoshi Idé**, J. L. Peng, and R. L. Greene
  Polarization and momentum dependence of a charge-transfer excitation in Nd_2CuO_4
  Physical Review, B61:1836-1840, 2000.
- **Tsuyoshi Idé** and Akio Kotani
  Local and nonlocal excitations in Cu 4*p*-1*s* resonant X-ray emission spectra of Nd_2CuO_4
  Journal of the Physical Society of Japan, 68:3100-3109, 1999.
- Akio Kotani and **Tsuyoshi Idé**
  Theoretical study on cluster size effects on X-ray absorption and resonant X-ray emission spectra in *d* and *f* electron systems
  Journal of Synchrotron Radiation, 6: 208-309, 1999.

- **Tsuyoshi Idé** and Akio Kotani
  A model study on cluster size effects of resonant X-ray emission spectra
  Journal of the Physical Society of Japan, 67:3621-3629, 1998.

Publications: Book authorship

- **Tsuyoshi Idé**, *Introduction to Anomaly Detection using Machine Learning — A Practical Guide with R*, Corona Publishing, 2015.

- **Tsuyoshi Idé** and Masashi Sugiyama, *Anomaly Detection and Change Detection*, Kodansha Scientific, 2015.

Publications: Book chapters

- **Tsuyoshi Idé**, Formalizing expert knowledge through machine learning. In S. K. Kwan, J. C. Spohrer, and Y. Sawatani, ed., Global Perspectives on Service Science: Japan, pp.157-175, Springer, 2016.
- **Tsuyoshi Idé**, Change detection from heterogeneous data sources. In Katsutoshi Yada, ed., Data Mining for Service. Springer Verlag, pp.221-243, 2014.

Publications: Book editor

- H. Hattori, T. Kawamura, **Tsuyoshi Idé**, M. Yokoo, and Y. Murakami, editors. New Frontiers in Artificial Intelligence: JSAI 2008 Conference and Workshops, Revised Selected Papers, volume 5447 of Lecture Notes in Artificial Intelligence. Springer Verlag, 2009.

Publications: Book translation

- M. Sugiyama, **Tsuyoshi Idé**, T. Kamishima, T. Kurita, and E. Maeda
  The Elements of Statistical Learning (Japanese translation). Kyoritsu, 2014.
- **Tsuyoshi Ide**. Chap. 12, Continuous Latent Variables. In H. Motoda, T. Kurita, T. Higuchi, Y. Matsumoto, and N. Murata, ed., Pattern Recognition and Machine Learning. Maruzen, 2006.

List of Patents: Granted US Parents (as of 12/2016)

PAT. NO.	Title
9,495,330	Anomaly detection method, program, and system
9,354,381	Information processing apparatus, calculation method, program, and storage medium
9,329,329	Information processing apparatus, calculation method, program, and storage medium
9,317,804	Calculating risk assessment value of event sequence
8,983,890	Calculating risk assessment value of event sequence
8,682,633	Cost evaluation and prediction
8,640,015	Anomaly detection based on directional data
8,600,721	Cost evaluation and prediction
8,595,155	Kernel regression system, method, and program
8,405,551	Location estimation system, method and program
8,138,974	Location estimation system, method and program
7,849,124	Method and system for detecting difference between plural observed results
7,720,640	Diagnostic data detection and control
7,702,714	Pairwise symmetry decomposition method for generalized covariance analysis
7,647,524	Anomaly detection
7,529,991	Scoring method for correlation anomalies
7,493,361	Computer operation analysis
7,483,934	Methods involving computing correlation anomaly scores
7,475,052	Malfunction condition judgment apparatus, control method, automobile and program method
7,406,653	Anomaly detection based on directional data
7,346,803	Anomaly detection
7,181,365	Diagnostic data detection and control
6,865,325	Discrete pattern, apparatus, method, and program storage device for generating and implementing the discrete pattern
6,754,419	Discrete pattern

List of Patents: Granted Japanese Parents (as of 12/2016)

PAT NO.	Title (English translation)
5,984,142	Analysis apparatus, analysis method, and their program
5,852,399	System, method, and program for battery state prediction
5,839,970	Method, apparatus, and computer program for calculating the risk of event sequences

5,802,041	Information processing system, calculation method, program, and storage device
5,695,763	Method, apparatus, and computer program for calculating the risk of event sequences
5,651,129	System, method, and program for evaluating costs
5,576,567	Method, apparatus, and computer program for detecting occurrence of anomalies
5,570,008	System, method, and program for kernel regression
5,203,670	System, method, and program for estimating locations
5,198,994	System, method, and program for estimating travel time
5,186,322	System, method, and program for analyzing time-series data
5,159,368	System, method, and program for change detection
4,953,239	Method for detecting anomalies of subjects observed
4,652,741	Method, apparatus, computer program, and storage device for detecting anomalies
4,201,027	Method, apparatus, and computer program for detecting discrepancies between plural objects
4,183,185	Diagnosis apparatus, detection apparatus, control method, detection method, program, and storage device
4,170,315	Diagnosis apparatus, control method, automobile, and program
4,148,524	System and method for evaluating dependencies
4,093,483	System and method for analysis
3,922,375	System and method for detecting anomalies

List of Patents: Granted Taiwanese Parents (as of 12/2016)

PAT. NO.	Title
I524280	Method, apparatus and computer program for detecting occurrence of anomaly
I224698	Discrete pattern, optical member, light guide plate, side light device and light-transmitting liquid crystal display device using the discrete pattern, method and program for generating the discrete pattern, computer-readable storage medium on which computer-readable program for generating the discrete pattern is stored, and discrete pattern generation system
201316266	Method, apparatus and computer program for detecting occurrence of anomaly

List of Patents: Granted Chinese Parents (as of 12/2016)

PAT. NO.	Title (English translation)
CN102656427 B	Cost evaluation system and method

CN 103975327 B	The method used to visualize the sequence of events in the risk assessment of value and equipment
CN 103827653 B	A method of detecting an abnormal occurrence, equipment and computer programs
CN 102736319 B	Information processing apparatus, and calculation method