

CURRICULUM VITAE

Hiroki IMABAYASHI

Ph.D. Candidate

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Education

Ph.D. Candidate, Computer Science and Communications Engineering, Waseda University.

April 2017 – Present

PhD course in Computer Science, a member of the project run by JST CREST called “Secure data sharing and distribution platform for integrated big data utilization”. Researching on conceptual combination of Attribute Based Encryption (ABE) and Fully Homomorphic Encryption (FHE) called Attribute Based Fully Homomorphic Encryption (ABFHE), which enables fine-granted access control using users’ attributes while assuring integrity of computations over encrypted data. Targeting real world applications, planning to improve a time and space complexities of current ABFHE schemes from theoretical level to application level.

M.S., Computer Science and Communications Engineering, Waseda University.

Apr 2015 – Aug 2015 & Apr 2016 – Mar 2017 (LOA for a half year)

Master’s degree of Computer Science, studied Cryptography in particular. Joined a project run by JST CREST called “Secure data sharing and distribution platform for integrated big data utilization”. Surveyed deeply on secure computing and Fully Homomorphic Encryption (FHE) schemes, and selected a research theme on the acceleration of secure data mining protocol using FHE. Implemented a frequent pattern mining algorithm called Apriori over FHE, and successfully accelerated the secure mining protocol more than 500x in execution time by adopting FHE’s SIMD operation, stream processing and caching mechanism. Published or presented four main works including a journal and four co-author works, and resulted in early graduation with Graduate Award from Waseda University.

B.S., Life Science and Medical Bioscience, Waseda University.

Apr 2011 – Mar 2015

Bachelor’s degree in Life Science and Medical Bioscience, with a focus on neuroscience. Wrote senior thesis on “The effect of 7 α -hydroxypregnenolone (drug) on synaptic plasticity in the hippocampus neurons.” Research includes original experiments utilizing electrophysiology to measure the potential change in the hippocampus and lead to the discovery of new mechanisms in the information transfer in the hippocampus. Repeated trial and error in experiments by changing the protocols, and accumulated more than 40 data (enough to show statistical difference) to be used for thesis.

Publications

International Conferences, Symposiums and Workshops

- Yu Ishimaki, **Hiroki Imabayashi**, Hayato Yamana: Private Substring Search on Homomorphically Encrypted Data, *In Proc. of the 1st IEEE International Workshop on Big Data and IoT Security in Smart Computing*, pp. 1-6, 2017.
- **Hiroki Imabayashi**, Yu Ishimaki, Akira Umayabara and Hayato Yamana: Fast and Space-Efficient Secure Frequent Pattern Mining by FHE, *In Proc. of the IEEE International Conference on Big Data 2016*, pp. 3983-3985, 2016.
- Yu Ishimaki, **Hiroki Imabayashi**, Kana Shimizu and Hayato Yamana: Privacy-Preserving String Search for Genome Sequences with FHE bootstrapping optimization, *In Proc. of the IEEE International Conference on Big Data 2016*, pp. 3989-3991, 2016.
- **Hiroki Imabayashi**, Yu Ishimaki, Akira Umayabara, Hiroki Sato and Hayato Yamana: Secure Frequent Pattern Mining by Fully Homomorphic Encryption with Ciphertext Packing, *In Proc. of the 11th DPM International Workshop on Data Privacy Management (DPM)*, LNCS, vol. 9963, pp. 181-195, 2016.

Domestic Journals

- **Hiroki Imabayashi**, Yu Ishimaki, Akira Umayabara, Hiroki Sato and Hayato Yamana: Streamline Computation of Secure Frequent Pattern Mining by Fully Homomorphic Encryption, *IPSJ Transactions of Databases (TOD)*, vol. 10, no. 1, pp. 1-12, 2017. (In Japanese)

Domestic Conferences, Symposiums and Workshops

- **Hiroki Imabayashi**, Yu Ishimaki, Akira Umayabara, Hiroki Sato and Hayato Yamana: Acceleration of Secure Frequent Pattern Mining by Stream Processing, *In Proc. of the 9th Forum on Data Engineering and Information Management (DEIM)*, 2017. (In Japanese)
- Akira Umayabara, **Hiroki Imabayashi** and Hayato Yamana: Acceleration of Secure Frequent Pattern Mining by Fully Homomorphic Encryption on NUMA machine, *In Proc. of the 9th Forum on Data Engineering and Information Management (DEIM)*, 2017. (In Japanese)
- Yoshiko Yasumura, Yu Ishimaki, **Hiroki Imabayashi** and Hayato Yamana: A Survey on Attribute-based Encryption and its Application in Cloud and Mobile Environment, *In Proc. of the 15th Forum on Information Technology (FIT)*, L-009, 2016.
- Hiroki Sato, Akira Umayabara, Yu Ishimaki, **Hiroki Imabayashi** and Hayato Yamana: Research Trend on Applications of Fully Homomorphic Encryption for Data Mining, *In Proc. of the 15th Forum on Information Technology (FIT)*, F-002, 2016. (In Japanese)

Honors and Awards

- i) The 9th Forum on Data Engineering and Information Management (DEIM) (Domestic Conference) Student presentation award (2017)
- ii) Waseda University Graduate award (2017)

Work Experience

Founder and CEO, EAGLYS, Inc.

Dec 2016 – Present

Research and development (R&D) on machine learning algorithm, and provides services for companies.

Research Assistant, Waseda University

Apr 2016 – Present

Working as a research assistant for the project “Secure Data Sharing and Distribution Platform for Integrated Big Data Utilization” run by JST CREST.

Software Engineering/Research Intern, Digital Garage US, Inc.

Sep 2015 – Mar 2016

Contributed to three things below.

- Surveyed and summarize recent technical progress on “Bigdata Analysis” and “Machine Learning” for both R&D and investment departments.
- Built an automation tool for data analysis, which reduces redundant everyday-tasks.
- Planned and directed a large anniversary event on “Crypto-Currency” and “Bio-technology”. Contributed to attract people more than 10 times than previous year.

Founding Member, WILLFU CORPORATION

Oct 2013 - Sep 2014

Member of founding team for Japanese company that provides business training and invests in Japanese startups. Willfu has enjoyed wide attention in Japan and been covered in various media (NHK, WORLD BUSINESS SATELLITE, The NIKKEI, etc.). Commended twice by the president for outstanding individual contributions as below.

- Launched new media on “startup companies”, and researched, wrote and distributed a weekly series of online articles, which drove a 50x increase in visits to the homepage.
- Launched a twice-monthly speaking program featuring famous entrepreneurs.

Software Engineering Intern, WORKS APPLICATIONS Co., LTD.

Sep 2013 – Oct 2013

Conceived and developed a simple prototype solution for HR management, and received full-time offer based upon the prototype I developed and problem-solving abilities.

Marketing Intern, MACROMILL, INC.

Aug 2013

Selected for short-term internship with market research company, and led team charged with developing plans for a new deodorant based on market research data.

RISO KYOIKU CO., LTD.

Oct 2011 - Dec 2012

Part-time instructor of mathematics and physics at TOMAS cram school operated by Riso Kyoiku Co., Ltd..

Research Project

[Secure Data Sharing and Distribution Platform for Integrated Big Data Utilization](#)
(JST CREST)

Skills and Interests

Skills

Language:

Python, C, C++, Java, HTML/CSS, Javascript, Node.js, PHP

Library/Framework:

FHE Library (HElib, TFHE), Machine Learning Library (Chainer, Tensorflow, Caffe),
Web Framework (Django, FuelPHP, Express)

Background & Knowledge:

Cryptography, Data Analysis, Data Mining, Machine Learning (including Deep Learning),
Algebra/Linear Algebra, Neuro Science

Qualifications:

SecCap10: Security Specialist” from Japanese Government’s Project called “enPiT SecCap”.

Interests

Research interest includes secure computing, cryptography, big data analysis, data mining and machine learning. Personal interest includes playing basketball, cycling and searching on technology-based startups.