

湊 真一 (みなと しんいち)

**現職：**

京都大学 大学院 情報学研究科 通信情報システム専攻 教授.  
(工学部 情報学科 計算機科学コース 兼担)

**学歴：**

1984年 京都大学工学部情報工学科 入学  
1988年 同上 卒業  
1988年 京都大学 大学院 工学研究科 情報工学専攻 修士課程 入学  
1990年 同上 修了  
1994年 同上 博士後期課程 (社会人) 入学  
1995年 同上 修了 博士 (工学)

**職歴：**

1990年度～2003年度まで NTT 研究所に勤務。  
1997年1月～12月 米国スタンフォード大学 計算機科学科 客員研究員。  
1999年 NTT 未来ねっと研究所 主任研究員。  
1999～2000年度 慶応義塾大学 湘南藤沢キャンパス(SFC) 兼任非常勤講師。  
2004年度より北海道大学 大学院 情報科学研究科 アルゴリズム研究室 助教授。(2007年  
准教授に名称変更)  
2010年10月 同研究室 教授。  
2015年度 同研究科 大規模知識処理研究室 教授。  
2018年4月 京都大学 大学院情報学研究科 教授 (現職)  
2009年10月～2016年3月 科学技術振興機構(JST) ERATO 湊離散構造処理系プロジェクト 研究総括 (兼務)  
2015年4月～2020年3月 科研費基盤(S) 離散構造処理系プロジェクト 研究代表者。  
2011年度より 早稲田大学 先進グリッド技術研究所 招聘研究員 (兼務)。  
2014年度より 国立情報学研究所 客員教授 (兼務)。  
2015年度より北海道大学 電子科学研究所 附属社会創造数学研究センター 教授 (兼務)。  
2015年度より産業技術総合研究所 人工知能研究センター 客員研究員 (兼務)。  
2017年より京都大学 数理解析研究所 専門委員 (兼務)。  
2017年10月より日本学術会議 連携会員 (兼務)。  
2018年度より 北海道大学 電子科学研究所 客員教授 (兼務)。  
2018年5月より情報処理学会 理事 (兼務)。

## 受賞：

1992年 情報処理学会 全国大会 奨励賞  
1992年 電子情報通信学会 回路とシステム軽井沢ワークショップ 奨励賞  
1992年 電子情報通信学会 75周年記念論文 優秀賞  
2000年 情報処理学会 システムLSI設計技術研究会 研究賞  
2000年 情報処理学会 山下記念研究賞  
2005年 人工知能学会 研究会優秀賞  
2008年 人工知能学会 研究会優秀賞  
2010年 電子情報通信学会 情報・システムソサイエティ論文賞（先見論文）  
2012年 電子情報通信学会 情報ネットワーク研究会 研究賞  
2013年 電子情報通信学会 基礎・境界ソサイエティ  
Fundamentals Review ベストオーサー賞  
2015年 電子情報通信学会 情報ネットワーク研究会 研究賞  
2017年 人工知能学会 研究会優秀賞

## 学会活動等：

2009年 Knuthの世界的名著 "The Art of Computer Programming" (Vol.4-1)において、  
湊が考案したデータ構造「ZDD」が独立項目として詳しく掲載（日本人初）  
2012年8月～2013年4月 日本科学未来館メディアラボ第11期展示「フカシギの数え方」  
監修（2013年7月～2014年4月 北海道大学総合博物館にて再展示。）  
2000年～2003年 情報処理学会論文誌 編集委員。  
2008～2014年 国際ワークショップ ALSIP2008, 2011, 2012, 2014  
Workshop Chair および Co-organizer.  
2012年～2016年 科研費新学術領域「計算限界解明」総括班連携研究者。  
2014年より JST さきがけ「社会と調和した情報基盤技術の構築」領域アドバイザー。  
2016年より JST ACT-I 「情報と未来」領域アドバイザー。  
2007年より 電子情報通信学会 情報ネットワーク(IN)研究会 専門委員。  
2014年より電子情報通信学会 コンピューテーション(COMP)研究会 専門委員。  
2010年～2014年 人工知能学会 評議員。

電子情報通信学会シニア会員, 情報処理学会シニア会員, IEEE, 人工知能学会 各会員

## 競争的外部資金：

1. 研究制度名：文部科学省（日本学術振興会）科学研究費補助金基盤研究(S)  
研究課題名：離散構造処理系の基盤アルゴリズムの研究  
研究資金の額（直接経費）：104,570千円（期間合計） 研究期間：H27～H31年度

該当課題における役割：研究代表者

2. 研究制度名：科学技術振興機構 ERATO プロジェクト

研究課題名：湊離散構造処理系

研究資金の額：約 1,100,000 千円（期間合計） 研究期間：H21～H26 年度

該当課題における役割：研究総括

3. 研究制度名：文部科学省（日本学術振興会） 科学研究費補助金挑戦的萌芽研究

研究課題名：極限的に簡潔な BDD データ構造の研究

研究資金の額：3,900 千円（期間合計） 研究期間：H24～H26 年度

該当課題における役割：研究代表者

4. 研究制度名：文部科学省（日本学術振興会） 科学研究費補助金基盤研究(B)

研究課題名：超大規模な単一実メモリ空間を活用する効率的データベース解析処理アルゴリズムの研究

研究資金の額（直接経費）：14,400 千円（期間合計） 研究期間：H20～H23 年度

該当課題における役割：研究代表者

5. 研究制度名：文部科学省（日本学術振興会） 科学研究費補助金挑戦的萌芽研究

研究課題名：二分決定グラフに基づく大規模ベイジアンネットワーク解析処理法の研究

研究資金の額：3,200 千円（期間合計） 研究期間：H20～H22 年度

該当課題における役割：研究代表者

6. 研究制度名：文部科学省（日本学術振興会） 科学研究費補助金基盤研究(B)

研究課題名：二分決定グラフに基づく大規模データベースの効率的解析処理アルゴリズムの研究

研究資金の額（直接経費）：9,200 千円（期間合計） 研究期間：H17～H19 年度

該当課題における役割：研究代表者

#### 論文等リスト：

##### 著書

1. Shin-ichi Minato: "[Binary Decision Diagrams and Applications for VLSI CAD](#)," Kluwer Academic Publishers, Nov. 1996.
2. Thomas Zeugmann, 湊真一, 大久保 好章: "[英語で学ぶ計算理論](#)," コロナ社, Mar. 2009.
3. 中村篤祥, 喜田拓也, 湊真一: "[基礎から学ぶ 情報理論](#)," ムイスリ出版, Mar. 2012.

##### 著書（一部執筆）

1. Shin-ichi Minato: "[Graph-Based Representations of Discrete Functions](#)," In T. Sasao, editor, "Representation of Discrete Functions," chapter 1, pp. 1-27, Kluwer Academic Publishers, May 1996.
2. Shin-ichi Minato and Saburo Muroga: "Binary Decision Diagrams," In W.-K.

- Chen, editor, "The VLSI Handbook," chapter 26, pp. 26.1-14, CRC/IEEE Press, 2000.
3. Shin-ichi Minato and Saburo Muroga: "Binary Decision Diagrams," In W.-K. Chen, editor, "[The VLSI Handbook, Second Edition](#)," chapter 29, pp. 29.1-14, CRC/IEEE Press, Dec. 2006.
  4. Shin-ichi Minato: "Data Mining Using Binary Decision Diagrams," In T. Sasao and J. Butler, editor, "[Progress in Representation of Boolean Functions](#) (Synthesis Lectures on Digital Circuits and Systems)," chapter 5, pp. 97-109, Morgan & Claypool Publishers, May 2010.
  5. 湊真一: "論理代数と論理関数," 知識ベース "知識の森" (<http://www.ieice-hbkb.org/portal/>), 1 群-8 編-1 章, pp. 1-30, 電子情報通信学会, Mar. 2011.
  6. Shin-ichi Minato: "Counting by ZDD," In Ming-Yang Kao, editor, "Encyclopedia of Algorithms," [http://dx.doi.org/10.1007/978-3-642-27848-8\\_734-1](http://dx.doi.org/10.1007/978-3-642-27848-8_734-1), pp. 1-6, Springer, Sep. 2014.
  7. Shin-ichi Minato: "The Power of Enumeration - BDD/ZDD-Based Algorithms for Tackling Combinatorial Explosion," In T. Sasao and J. Butler, editor, "[Applications of Zero-Suppressed Decision Diagrams](#) (Synthesis Lectures on Digital Circuits and Systems)," chapter 3, pp. 49-62, Morgan & Claypool Publishers, Nov. 2014.
  8. 湊真一: "「フカシギの数え方」と列挙アルゴリズム," 湊真一(編), "[超高速グラフ列挙アルゴリズムー〈フカシギの数え方〉が拓く, 組合せ問題への新アプローチ](#)," ISBN: 978-4627852617, 森北出版, pp. 3-8, Apr. 2015.
  9. 戸田貴久, 斎藤寿樹, 湊真一: "準備ーグラフに関する基礎知識," 湊真一(編), "[超高速グラフ列挙アルゴリズムー〈フカシギの数え方〉が拓く, 組合せ問題への新アプローチ](#)," ISBN: 978-4627852617, 森北出版, pp. 9-17, Apr. 2015.
  10. 湊真一: "BDD と ZDDー論理と集合に関する演算処理系の技法," 湊真一(編), "[超高速グラフ列挙アルゴリズムー〈フカシギの数え方〉が拓く, 組合せ問題への新アプローチ](#)," ISBN: 978-4627852617, 森北出版, pp. 117-130, Apr. 2015.
  11. 湊真一: "さらに広がる BDD/ZDD の応用," 湊真一(編), "[超高速グラフ列挙アルゴリズムー〈フカシギの数え方〉が拓く, 組合せ問題への新アプローチ](#)," ISBN: 978-4627852617, 森北出版, pp. 131-150, Apr. 2015.
  12. 湊真一: "離散構造処理の技法と確率モデル," 鈴木讓 (編著), "確率的グラフィカルモデル," 第 5 章, pp. 125-144, 共立出版, Jul. 2016.
  13. 湊真一: "BDD と ZDD," 人工知能学大事典, 人工知能学会編, 6 章-36 節, pp. 344-347, 共立出版, Jul. 2017.

## 編著

1. B. Becker, C. Meinel, S. Minato and F. Somenzi: "Decision Diagrams - Concepts and Applications," [Dagstuhl-Seminar-Report](#) 229, Jan. 1999.
2. S. Chawla, T. Washio, S. Minato, S. Tsumoto, T. Onoda, S. Yamada, A. Inokuchi, (Editors): "[New Frontiers in Applied Data Mining](#)," PAKDD 2008 International Workshops, Osaka, Japan, May 20-23, 2008, Revised Selected Papers, Lecture Notes in Artificial Intelligence, Vol. 5433, ISBN: 978-3-642-00398-1, Springer, Feb. 2009.
3. 湊真一(監修): "2010 年度 科学技術振興機構 ERATO 湊離散構造処理系プロジェクト講究録," ERATO 湊離散構造処理系プロジェクト, pp. 1-525, ISSN 2186-1846, June 2011.
4. 湊真一(監修): "2011 年度 科学技術振興機構 ERATO 湊離散構造処理系プロジェクト講究録," ERATO 湊離散構造処理系プロジェクト, pp. 1-666, ISSN 2186-1846, July 2012.
5. 湊真一(監修): "2012 年度 科学技術振興機構 ERATO 湊離散構造処理系プロジェクト講究録," ERATO 湊離散構造処理系プロジェクト, pp. 1-614, ISSN 2186-1846, July 2013.
6. 湊真一(監修): "2013 年度 科学技術振興機構 ERATO 湊離散構造処理系プロジェクト講究録," ERATO 湊離散構造処理系プロジェクト, pp. 1-721, ISSN 2186-1846, July 2014.
7. Shigeru Yamashita and Shin-ichi Minato (Editors): "[Reversible Computation](#)," 6th International Conference, RC 2014, Kyoto, Japan, July 10-11, 2014. Proceedings, Lecture Notes in Computer Science, Volume 8507, ISBN: 978-3-319-08493-0, Springer, July 2014.
8. 湊真一(編), ERATO 湊離散構造処理系プロジェクト(著): "[超高速グラフ列挙アルゴリズムー〈フカシギの 数え方〉が 拓く, 組合せ問題への新アプローチ](#)," ISBN: 978-4627852617, 森北出版, Apr. 2015.
9. 湊真一(監修): "2014 年度 科学技術振興機構 ERATO 湊離散構造処理系プロジェクト講究録," ERATO 湊離散構造処理系プロジェクト, pp. 1-750, ISSN 2186-1846, Jun. 2015.
10. 湊真一(監修): "2015 年度 JST ERATO 湊離散構造処理系プロジェクト / JSPS 科研費 基盤(S)「離散構造処理系の基盤アルゴリズムの研究」 講究録," 基盤(S)離散構造処理系プロジェクト, ISSN 2186-1846, Jun. 2016.
11. 湊真一(監修): "2016 年度 JSPS 科研費基盤(S)「離散構造処理系の基盤アルゴリズムの研究」 講究録," 基盤(S)離散構造処理系プロジェクト, ISSN 2186-1846, Jun. 2017.

## 学位論文

1. S. Minato: "Binary Decision Diagrams and Their Applications for VLSI CAD," 京都大学工学研究科, Jan. 1995.

## 学術論文

1. 湊 真一, 石浦 菜岐佐, 矢島 脩三: "論理関数の共有二分決定グラフによる表現とその効率的処理手法", 情報処理学会論文誌, Vol. 32, No. 1, pp. 77-85, Jan. 1991.
2. S. Minato: "Minimum-Width Method of Variable Ordering for Binary Decision Diagrams", IEICE Trans. Fundamentals, Vol. E75-A, No. 3, pp. 392-399, March 1992.
3. 湊 真一: "「わくわく」 —技術革新のキーワード—", 電子情報通信学会 75 周年記念論文 (優秀賞), 電子情報通信学会誌, Vol. 75, No. 11, pp. 1146-1149, Nov. 1992.
4. S. Minato: "Fast Generation of Prime-Irredundant Covers from Binary Decision Diagrams", IEICE Trans. Fundamentals, Vol. E76-A, No. 6, pp. 967-973, June 1993.
5. S. Minato: "BEM-II: An Arithmetic Boolean Expression Manipulator Using BDDs", IEICE Trans. Fundamentals, Vol. E76-A, No. 10, pp. 1721-1729, Oct. 1993.
6. 奥乃 博, 湊 真一: "二分決定グラフによる制約充足問題の解法", 情報処理学会論文誌, Vol. 36, No. 8, pp. 1789-1799, Aug. 1995.
7. S. Minato: "Fast Factorization Method for Implicit Cube Set Representation", IEEE Trans. on Computer-Aided Design of Integrated Circuits and Systems, VOL. 15, No. 4, pp. 377-384, Apr. 1996.
8. S. Minato: "Arithmetic Boolean Expression Manipulator Using BDDs", Formal Methods in System Design, No. 10, pp. 221-242, Kluwer Academic Publishers, Oct. 1997.
9. D. Rotter, K. Hamaguchi, S. Minato and S. Yajima: "Manipulation of Large-Scale Polynomials Using BMDs", IEICE Trans. Fundamentals, Vol. E80-A, No.10, pp.1774-1781, Oct. 1997.
10. S. Minato: "Zero-Suppressed BDDs and Their Applications", International Journal on Software Tools for Technology Transfer, Vol. 3, No. 2, pp. 156-170, Springer, May 2001.
11. S. Minato: "Streaming BDD Manipulation", IEEE Trans. on Computers, Vol. 51, No. 5, pp. 474-485, May 2002.
12. 谷 誠一郎, 宮崎 敏明, 高橋 紀之, 湊 真一: "Flexcast: 自己組織化多地点配信技術", NTT R&D, Vol. 52, No. 3, pp. 213-222, Mar. 2003.
13. S. Tani, T. Inoue, S. Minato, H. Takahashi, S. Kotabe, and T. Miyazaki: "Global

- Multi-Point Streaming Experiments Based on the Flexcast Protocol", NTT Technical Review, Vol. 1, No. 5, pp. 24-30, Aug. 2003.
14. 井上武, 谷誠一郎, 高橋宏和, 湊 真一, 宮崎敏明, 豊島鑑: "Flexcast による段階的導入に優れたマルチキャストシステムの設計と実装", 電子情報通信学会論文誌, Vol. J88-D-I, No. 2, pp. 272-291, Feb. 2005.
  15. 湊 真一, 有村博紀: "ゼロサプレス型二分決定グラフを用いたトランザクションデータベースの効率的解析手法", 電子情報通信学会論文誌, Vol. J89-D, No. 2, pp. 172-182, Feb. 2006.
  16. S. Minato and K. Ito: "Symmetric Item Set Mining Method Using Zero-suppressed BDDs and Application to Biological Data", Transaction of the Japanese Society of Artificial Intelligence, Vol. 22, No. 2, pp. 156-164, Feb. 2007.
  17. S. Minato and H. Arimura: "Frequent Closed Item Set Mining Based on Zero-suppressed BDDs", Transaction of the Japanese Society of Artificial Intelligence, Vol. 22, No. 2, pp. 165-172, Feb. 2007.
  18. 岩崎玄弥, 湊真一, ツオイクマントーマス: "頻出パターンマイニングのためのゼロサプレス型 BDD の変数順序付け方法とその評価," 電子情報通信学会論文誌, Vol. J91-D, No. 3, pp. 608-618, Mar. 2008.
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  20. Shin-ichi Minato: "Overview of ERATO Minato Project: The Art of Discrete Structure Manipulation between Science and Engineering," New Generation Computing, Vol. 29, No. 2, pp. 223-228, Ohmsha and Springer, Apr. 2011. (invited).
  21. Shigeru Yamashita, Shin-ichi Minato, and D. Michael Miller: "Synthesis of Semi-Classical Quantum Circuits," Journal of Multi-Valued Logic & Soft Computing, Vol. 18, No. 1, pp. 99-113, Old City Publishing, Jan. 2012.
  22. Ryo Yoshinaka, Toshiki Saitoh, Jun Kawahara, Koji Tsuruma, Hiroaki Iwashita, and Shin-ichi Minato: "Finding All Solutions and Instances of Numberlink and Slitherlink by ZDDs," [Algorithms](#), Vol.5, No. 2, pp. 176-213, MDPI, Apr. 2012.
  23. Takeru Inoue and Shin-ichi Minato: "On Tackling Flash Crowds with URL Shorteners and Examining User Behavior after Great East Japan Earthquake," IEICE Trans. Communications, special section on "Future Internet Technologies Against Present Crises," Vol. E95-B, No. 7, pp. 2210-2221, Jul. 2012.
  24. Yusaku Kaneta, Shingo Yoshizawa, Shin-ichi Minato, Hiroki Arimura, and

- Yoshikazu Miyanaga: "A Dynamically Reconfigurable FPGA-based Hardware for Large-Scale Regular Expression Matching," IEICE Trans. Inf. & Syst., Vol. E95-D, No. 7, pp. 1847-1857, Jul. 2012.
25. Shin-ichi Minato: "Techniques of BDD/ZDD: Brief History and Recent Activity," IEICE Trans. Inf. & Syst., Vol. E96-D, No. 7, pp. 1419-1429, Jul. 2013.
  26. Takeru Inoue, Keiji Takano, Takayuki Watanabe, Jun Kawahara, Ryo Yoshinaka, Akihiro Kishimoto, Koji Tsuda, Shin-ichi Minato, and Yasuhiro Hayashi: "Distribution Loss Minimization With Guaranteed Error Bound," IEEE Trans. Smart Grid, Vol. 5, No. 1, pp. 102-111, Jan. 2014.
  27. Yuma Inoue, Takahisa Toda, and Shin-ichi Minato: "Implicit Generation of Pattern-Avoiding Permutations by Using Permutation Decision Diagrams," IEICE Trans. Inf. & Syst., Vol. E97-A, No. 6, pp. 1171-1179, June 2014.
  28. Takeru Inoue, Norihito Yasuda, Shunsuke Kawano, Yuji Takenobu, Shin-ichi Minato, and Yasuhiro Hayashi: "Distribution Network Verification for Secure Restoration by Enumerating All Critical Failures," IEEE Trans. Smart Grid, Vol. 6, No. 2, pp. 843-852, DOI 10.1109/TSG.2014.2359114, Mar. 2015.
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