

Contact Information

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Personal

Nationality: Japanese

Education

- 03/2011 **PhD. in Mathematics**
Mathematical Institute, Tohoku University, JAPAN
(Advisors: *Kazuyuki Tanaka*, and *Takeshi Yamazaki*)
- 03/2009 **MSc. in Mathematics**
Mathematical Institute, Tohoku University, JAPAN
(Advisor: *Takeshi Yamazaki*)
- 03/2007 **BSc. in Mathematics**
Mathematical Institute, Tohoku University, JAPAN

Career

- 03/2020 – Today **Associate Professor**
Graduate School of Informatics, Nagoya University, JAPAN
- 04/2017 – 02/2020 **Lecturer**
Graduate School of Informatics, Nagoya University, JAPAN
- 05/2015 – 03/2017 **JSPS Postdoctoral Fellow**
Department of Mathematics, University of California, Berkeley, USA
(Mentor: *Antonio Montalbán*)
- 04/2012 – 03/2015 **JSPS Postdoctoral Fellow**
Japan Advanced Institute of Science and Technology, JAPAN
(Mentor: *Hajime Ishihara*)
- 04/2011 – 03/2012 **JSPS Postdoctoral Fellow**
Mathematical Institute, Tohoku University, JAPAN
(Mentor: *Takeshi Yamazaki*)

Awards

- 01/2013 **The 11th LA/EATCS Japan Best Presentation Award**
European Association for Theoretical Computer Science, Japan Chapter
- 03/2011 **Kawai Prize for PhD thesis**
Kawai Mathematical Sciences Foundation
- 03/2009 **Yūsyū-sōsetsu-Ronbun-Syō (Prize for Master's thesis)**
Kawai Mathematical Sciences Foundation

Publications and Preprints

Journal Articles

1. Takayuki Kihara, Keng Meng Ng and Arno Pauly, Enumeration degrees and non-metrizable topology, to appear in *Memoirs of the American Mathematical Society*.

2. Matthew de Brecht, Takayuki Kihara and Victor Selivanov, Ideal presentations and numberings of some classes of effective quasi-Polish spaces, to appear in *Computability*.
3. Mathieu Hoyrup, Takayuki Kihara, and Victor Selivanov, Degree spectra of homeomorphism types of compact Polish spaces, to appear in *Journal of Symbolic Logic*.
4. Takayuki Kihara, Lawvere-Tierney topologies for computability theorists, *Transactions of the American Mathematical Society, Series B*, **10** (2023), pp. 48–85.
5. Nikolay Bazhenov, Takayuki Kihara, Svetlana Selivanova and Dieter Spreen, On the main scientific achievements of Victor Selivanov, *Computability*, **12** (2023), no. 4, pp. 301–314.
6. Takayuki Kihara and Kenta Sasaki, A syntactic approach to Borel functions: Some extensions of Louveau's theorem, *Archive for Mathematical Logic*, **62** (2023), pp. 1041–1082.
7. Takayuki Kihara and Arno Pauly, Point degree spectra of represented spaces, *Forum of Mathematics, Sigma*, **10** (2022), e31, pp. 1–27.
8. Takayuki Kihara and Victor Selivanov, Wadge-like degrees of Borel bqo-valued functions, *Proceedings of the American Mathematical Society*, **150** (2022), no. 9, pp. 3989–4003.
9. Takayuki Kihara, Topological reducibilities for discontinuous functions and their structures, *Israel Journal of Mathematics*, **252** (2022), pp. 461–500.
10. Paul-Elliot Anglès D'Auriac, and Takayuki Kihara, A comparison of various analytic choice principles, *Journal of Symbolic Logic* **86** (2021), no. 4, pp. 1452–1485.
11. Vassilios Gregoriades, Takayuki Kihara and Keng Meng Ng, Turing degrees in Polish spaces and decomposability of Borel functions, *Journal of Mathematical Logic* **21** (2021), no. 1, 2050021, 41 pages.
12. Takayuki Kihara, Alberto Marcone and Arno Pauly, Searching for an analogue of ATR_0 in the Weihrauch lattice, *Journal of Symbolic Logic* **85** (2020), no. 3, pp. 1006–1043 .
13. Longyun Ding, Takayuki Kihara, Brian Semmes and Jiafei Zhao, Decomposing functions of Baire class 2 on Polish spaces, *Journal of Symbolic Logic* **85** (2020), no. 3, pp. 960–971.
14. Takayuki Kihara, The Brouwer invariance theorems in reverse mathematics, submitted, *Forum of Mathematics, Sigma* **8** (2020), Paper No. e51, 12 pages.
15. Takayuki Kihara, On a metric generalization of the tt-degrees and effective dimension theory, *Journal of Symbolic Logic* **84** (2) (2019), pp. 726–749.
16. Takayuki Kihara and Antonio Montalbán, On the structure of the Wadge degrees of BQO-valued Borel functions, *Transactions of the American Mathematical Society* **371** (11) (2019), pp. 7885–7923.
17. Josef Berger, Hajime Ishihara, Takayuki Kihara and Takako Nemoto, The binary expansion and the intermediate value theorem in constructive reverse mathematics, *Archive for Mathematical Logic* **58** (1-2) (2019), pp. 203–217.
18. Takayuki Kihara and Antonio Montalbán, The uniform Martin's conjecture for many-one degrees, *Transactions of the American Mathematical Society* **370** (12) (2018), pp. 9025–9044.
19. Takayuki Kihara, Borel-piecewise continuous reducibility for uniformization problems, *Logical Methods in Computer Science* **12** (4) (2016), pp. 1–35.
20. Takayuki Kihara, Decomposing Borel functions using the Shore-Slaman join theorem, *Fundamenta Mathematicae* **230** (2015), pp. 1–13.
21. Takayuki Kihara and Kenshi Miyabe, Unified characterizations of lowness properties via Kolmogorov complexity, *Archive for Mathematical Logic* **54** (2015), pp. 329–358.
22. Takayuki Kihara, Comparing the Medvedev and Turing degrees of Π_1^0 classes, *Mathematical Structures in Computer Science* **25** (8) (2015), pp. 1649–1668.
23. Kojiro Higuchi and Takayuki Kihara, Inside the Muchnik degrees I: Discontinuity, learnability, and constructivism, *Annals of Pure and Applied Logic* **165** (2014), pp. 1058–1114.

24. Kojiro Higuchi and Takayuki Kihara, Inside the Muchnik degrees II: The degree structures induced by the arithmetical hierarchy of countably continuous functions, *Annals of Pure and Applied Logic* **165** (2014), pp. 1201–1241.
25. Kojiro Higuchi and Takayuki Kihara, On effectively closed sets of effective strong measure zero, *Annals of Pure and Applied Logic* **165** (2014), pp. 1445–1469.
26. Takayuki Kihara and Kenshi Miyabe, Uniform Kurtz randomness, *Journal of Logic and Computation* **24** (2014), pp. 863–882.
27. Makoto Fujiwara, Kojiro Higuchi and Takayuki Kihara, On the strength of marriage theorems and uniformity, *Mathematical Logic Quarterly* **60** (2014), pp. 136–153.
28. Takayuki Kihara, Incomputability of simply connected planar continua, *Computability* **1** (2012), pp. 131–152.
29. Joshua A. Cole and Takayuki Kihara, The AE -theory of the effectively closed Medvedev degrees is decidable, *Archive for Mathematical Logic*, **49** (2010), pp. 1–16.
30. Douglas Cenzer, Takayuki Kihara, Rebecca Weber and Guohua Wu, Immunity and non-cupping for closed sets, *Tbilisi Mathematical Journal*, **2** (2009), pp. 77–94.

Proceedings

31. Arno Pauly and Takayuki Kihara, De Groot duality for represented spaces, In Proceedings of CiE 2023, *Lecture Notes in Computer Science*, **13967** (2023), pp. 89–101.
32. Matthew de Brecht, Takayuki Kihara and Victor Selivanov, Enumerating classes of effective quasi-Polish spaces, In Proceedings of CiE 2022, *Lecture Notes in Computer Science*, **13359** (2022), pp. 88–102.
33. Mathieu Hoyrup, Takayuki Kihara, and Victor Selivanov, Degrees of non-computability of homeomorphism types of Polish spaces, In Beyond the Horizon of Computability (CiE 2020), *Lecture Notes in Computer Science* **12098** (2020), pp. 189–192.
34. Takayuki Kihara, and Arno Pauly, Finite choice, convex choice and sorting, In Proceedings of the 15th Annual Conference on Theory and Applications of Models of Computation (TAMC 2019), *Lecture Notes in Computer Science* **11436** (2019), pp. 378–393.
35. Takayuki Kihara, Higher randomness and lim-sup forcing within and beyond hyperarithmetic, Sets and Computations, *Lecture Notes Series, Institute for Mathematical Sciences, National University of Singapore* **33** (2017), pp. 117–155.
36. Takayuki Kihara and Arno Pauly, Dividing by zero – how bad is it, really? In Proceedings of the 41st International Symposium on Mathematical Foundations of Computer Science (MFCS 2016), *Leibniz International Proceedings in Informatics* **58** (2016), pp. 58:1–58:14.
37. Kojiro Higuchi and Takayuki Kihara, Effective strong nullness and effectively closed sets, In How the World Computes (CiE 2012), *Lecture Notes in Computer Science*, **7318** (2012), pp. 304–313.
38. Takayuki Kihara, A hierarchy of immunity and density for sets of reals, In How the World Computes (CiE 2012), *Lecture Notes in Computer Science*, **7318** (2012), pp. 385–395.

Book Chapters

39. Zvonko Iljazović and Takayuki Kihara, Computability of subsets of metric spaces, In: Brattka V., Hertling P. (eds) *Handbook of Computability and Complexity in Analysis*, Theory and Applications of Computability (In cooperation with the association Computability in Europe). Springer, Cham., pp. 29–69.

Unpublished Articles

40. Takayuki Kihara and Keng Meng Ng, The subTuring degrees, in preparation.
41. Takayuki Kihara, Many-one reducibility with realizability, in preparation.
42. Takayuki Kihara and Arno Pauly, De Groot-like duality for represented spaces, in preparation.
43. Mitsumasa Ikeda, Yoriyuki Yamagata and Takayuki Kihara, On the metric temporal logic for continuous stochastic processes, submitted.

44. Takayuki Kihara, Rethinking the notion of oracle: A prequel to Lawvere-Tierney topologies for computability theorists, submitted.
45. Takayuki Kihara, Rethinking the notion of oracle: A link between synthetic descriptive set theory and effective topos theory, in preparation.
46. Takayuki Kihara, On some topics around the Wadge rank ω_2 , in preparation.
47. Takayuki Kihara, Degrees of incomputability, realizability and constructive reverse mathematics, in preparation.
48. Takayuki Kihara and Arno Pauly, Convex choice, finite choice, and sorting, submitted.
49. Takayuki Kihara, Effective forcing with Cantor manifolds, unpublished.
50. Takayuki Kihara and Kenshi Miyabe, Null additivity in the theory of algorithmic randomness, unpublished.
51. Takayuki Kihara and Wei Wang, Notes on AEI-conservation, unpublished.

Research Articles in Japanese

52. Takayuki Kihara, An application of computability theory to decomposability problem on Borel functions: an extended abstract, *New Trends in Theoretical Computer Science, RIMS Kokyuroku (proceedings)*, 1849 (2013), pp. 32–36.
53. Takayuki Kihara, Set theory of the real line and algorithmic randomness: a survey, *Proof Theory and Complexity, RIMS Kokyuroku (proceedings)*, 1832 (2013), pp. 97–113.
54. Takayuki Kihara, Computability theory of continua, *Formal Systems and Computability Theory, RIMS Kokyuroku (proceedings)*, 1729 (2011), pp. 48–66.
55. Takayuki Kihara, Notes on reverse recursion theory and reverse mathematics, *Proof Theoretical Study of the Structure of Logic and Computation, RIMS Kokyuroku (proceedings)*, 1635 (2009), pp. 51–59.

Magazine Articles in Japanese

56. Takayuki Kihara, Hilbert's Tenth Problem and its Companions, in "Mathematicians' Picks: Selected Gems in Mathematics", Nippon Hyoron Sha, 2023.
57. Takayuki Kihara, Rigor, Abstraction, and Development of "Computability" in Mathematics *Gendai Siso* (Contemporary Philosophy) Jul. 2023 Issue, Seido Sha, pp. 51-63.
58. Takayuki Kihara, Descriptive Set Theory / Beyond Borel Sets, *Suuri Kagaku* (Mathematical Sciences Magazine) Jun. 2022 Issue, Science-Sha.
59. Takayuki Kihara, Foundations of Mathematics and Computability, *Suuri Kagaku* (Mathematical Sciences Magazine) Aug. 2021 Issue, Science-Sha, pp.58–64.
60. Takayuki Kihara, The Heart of Reverse Mathematics / Don't be Monochrome, Be Colorful, *Sugaku Seminar* (Math Seminar Magazine) Feb. 2021 Issue, Nippon Hyoron Sha, pp.15-19.
61. Takayuki Kihara, Hilbert's Tenth Problem and its Companions, *Sugaku Seminar* (Math Seminar Magazine) Nov. 2020 Issue, Nippon Hyoron Sha, pp.24-26.
62. Takayuki Kihara, Calling the Name of Infinity: A Short History of Mathematics Surrounding Fast Growing Functions, *Gendai Siso* (Contemporary Philosophy) Dec. 2019 Issue, Seido Sha, pp.19–28.
63. Takayuki Kihara, The Ackermann Function and Hilbert, *Sugaku Seminar* (Math Seminar Magazine) Jul. 2019 Issue, Nippon Hyoron Sha, pp.22–27.