Ruiyuan Chen

Department of Mathematics
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Research interests

Mathematical logic, centered around descriptive set theory and connections with dynamical systems and category theory, including countable group actions, Polish groups, connections with model theory, lattices and locales, and topos theory.

Employment

Postdoctoral Assistant Professor
University of Michigan, August 2022–present.

CRM–Simons Postdoctoral Fellow
McGill University, September 2021–August 2022.

J.L. Doob Research Assistant Professor (postdoc)
University of Illinois at Urbana–Champaign, August 2018–August 2021.

Education

Ph.D. in Mathematics
California Institute of Technology, June 2018.
Advisor: Alexander Kechris.
Thesis: *Definability and classification of equivalence relations and logical theories.*

B.Sc. in Computer Science and Mathematics (with distinction)
University of British Columbia, May 2013.

Grants & awards

NSF Grant DMS-2224709, "Descriptive Set Theory and Categorical Logic"
2021–2024.

NSERC Postdoctoral Fellowship (declined)
2018–2020.

Scott Russell Johnson Prize for Excellence in a Graduate Dissertation
California Institute of Technology, 2018.

NSERC Postgraduate Scholarship (doctoral)
California Institute of Technology, 2014–2017.

NSERC Postgraduate Scholarship (masters)
California Institute of Technology, 2013–2014.

Governor-General's Silver Medal in Science
University of British Columbia, 2013.

NSERC Undergraduate Student Research Award
University of British Columbia, summers of 2011, 2012, 2013.

Publications & preprints

R. Chen, *Cardinal algebras, Borel fields of structures, and ℓ^2-Betti numbers*
in preparation, 2022+.

R. Chen, *Cardinal algebras, $[0,\infty]$-enriched frames, and valuation locales*
in preparation, 2022+.

R. Chen, *A universal characterization of standard Borel spaces*
to appear in **J. Symb. Logic**, https://www.doi.org/10.1017/jsl.2022.85, 2022, 28pp.

R. Chen, G. Terlov, and A. Tserunyan, *Nonamenable subforests of multi-ended quasi-pmp graphs*
preprint, https://arxiv.org/abs/2211.07908, 2022, 31pp.

R. Chen, *Structural, point-free, non-Hausdorff topological realization of Borel groupoid actions*
preprint, https://arxiv.org/abs/2209.06319, 2022, 59pp.

R. Chen, *On sifted colimits in the presence of pullbacks*
Theory Appl. Categ. 37 (2021), 1176–1193.

R. Chen, *Decompositions and measures on countable Borel equivalence relations*
Ergodic Theory Dynam. Systems 41 (2021), 3671–3703.

R. Chen, *On the Pettis–Johnstone theorem for localic groups*
submitted, https://arxiv.org/abs/2109.12721, 2021, 12pp.

R. Chen, *Borel and analytic sets in locales*
preprint, https://arxiv.org/abs/2011.00437, 2020, 121pp.

W. Chan and R. Chen, *Bounds on continuous Scott rank*
Proc. Amer. Math. Soc. 148 (2020), 3591–3605.

R. Chen, *Representing Polish groupoids via metric structures*
submitted, https://arxiv.org/abs/1908.03268, 2019, 70pp.

R. Chen, *Borel functors, interpretations, and strong conceptual completeness for $\mathcal{L}_{\omega_1\omega}$*
Trans. Amer. Math. Soc. 372 (2019), 8955–8983.

R. Chen, *Amalgamable diagram shapes*
J. Symb. Logic 84 (2019), 88–101.

R. Chen, *Notes on quasi-Polish spaces*
preprint, https://arxiv.org/abs/1809.07440, 2018, 21pp.

R. Chen, *Borel structurability by locally finite simplicial complexes*
Proc. Amer. Math. Soc. 146 (2018), 3085–3096.

R. Chen and A. S. Kechris, *Structurable equivalence relations*
Fund. Math. 242 (2018), 109–185.

R. P. Anstee and R. Chen, *Forbidden submatrices: some new bounds and constructions*
Electron. J. Combin. 20 (2013), Paper 5, 13pp.

INVITED TALKS

TBD
IMPAN Special Semester on STRUCTURES, August 2023 (upcoming).

Topology versus Borel structure for actions
Cornell logic seminar, October 2022.

Topology versus Borel structure for actions
McGill DDC seminar, October 2022.

A representation theorem for cardinal algebras
ASL North American Annual Meeting, April 2022.

Infinitary logic, Polish groupoids, and classification of structures
University of Maryland logic seminar, December 2021.

Categorical aspects of descriptive set theory (tutorial)
Dagstuhl Seminar on DST and Computable Topology, November 2021.

Some results in descriptive locale theory
ASL North American Annual Meeting, June 2021.

Some results in descriptive locale theory
Cornell logic seminar, April 2021.

Categorical and descriptive perspectives on classification (keynote)
Graduate Student Conference in Logic XXII, March 2021.

Gabriel–Ulmer duality for continuous categories
UWO topology seminar, March 2021.

A universal characterization of standard Borel spaces
CMS Winter Meeting, December 2020.

Borel and analytic sets in locales
Caltech logic seminar, October 2020.

Stone duality and strong conceptual completeness for infinitary logic
SIU Online logic seminar, July 2020.

Imaginary sorts and strong conceptual completeness for $\mathcal{L}_{\omega_1\omega}$
SEALS conference at the University of Florida, March 2020.

Polish groupoids and $\mathcal{L}_{\omega_1\omega}$*-theories*
Joint Mathematics Meetings, Denver, January 2020.

A universal characterization of standard Borel spaces
UCLA logic seminar, January 2020.

Polish groupoids and $\mathcal{L}_{\omega_1\omega}$*-theories*
UIC logic seminar, October 2019.

Stone duality for infinitary logic (plenary)
BLAST conference at the University of Colorado Boulder, May 2019.

Polish groupoids and continuous logic
UIUC logic seminar, April 2018.

Structurability by simplicial complexes
SEALS conference at the University of Florida, March 2018.

Strong conceptual completeness for $\mathcal{L}_{\omega_1\omega}$
UIUC logic seminar, October 2017.

Structurability by locally finite contractible simplicial complexes
UCLA logic seminar, October 2016.

Structurable equivalence relations
Logic in Southern California conference at UCLA, May 2016.

Teaching

Teaching at Michigan:

- Math 419 (Linear Spaces and Matrix Theory), spring 2023 (upcoming).
- Math 582 (Intro to Set Theory), spring 2023 (upcoming).
- Math 417 (Matrix Algebra I), fall 2022.
- Math 481 (Intro to Mathematical Logic), fall 2022.

Teaching at UIUC:

- Math 414 (Mathematical Logic), spring 2021 (online).
- Math 416 (Abstract Linear Algebra), spring 2021 (online).
- Math 347 Honors (Fundamental Mathematics), fall 2020 (online).
- Math 414 (Mathematical Logic), spring 2020 (transitioned to online).
- Math 595 (Advanced Topics: Categorical Logic), fall 2019.
- Math 416 (Abstract Linear Algebra), fall 2019.
- Math 347 Honors (Fundamental Mathematics), spring 2019.
- Math 403 (Euclidean Geometry), fall 2018.

Teaching assistantships at Caltech:

- Ma1b (Linear Algebra), winter 2018 (head TA).
- Ma116a (Model Theory), fall 2017.
- Ma6c (Introduction to Mathematical Logic), spring 2017.
- Ma117a (Computability Theory), fall 2016.
- Ma1b (Linear Algebra), winter 2016.
- Ma116a (Model Theory), fall 2015.
- Ma144a (Probability), winter 2015.
- Ma1a (Calculus of One Variable), fall 2014.
- Ma2b (Introduction to Probability and Statistics), winter 2014.
- Ma2a (Differential Equations), fall 2013.

Teaching assistantships at UBC:

- CPSC121 (Models of Computation), summer 2010.

Service

Supervised:

- Muthana Alshaikhmubarak (M.Sc. reading course), spring–summer 2020.

Refereeing for: NSF, Advances in Mathematics, Israel Journal of Mathematics, Transactions of the AMS, Journal of Symbolic Logic, Fundamenta Mathematicae, Topology Proceedings, Mathematical Logic Quarterly

Organizer of UIUC logic seminars, 2019–2020.

Organizer of McGill DDC seminars, 2021–2022.

CITIZENSHIP Canadian