

NARUKI MASUDA

<https://nmasuda2.github.io>

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RESEARCH INTERESTS

Homotopy theory, categorification and application to functorial field theories. Some keywords are (∞, ∞) -categories, categorical spectra, TQFT, derived algebraic geometry, noncommutative motives, ∞ -topos.

ACADEMIC POSITIONS

Universität Hamburg

October 2024 - present

Postdoctoral researcher at CRC 1624: Higher structures, moduli spaces and integrability

EDUCATION

Johns Hopkins University

September 2018 - August 2024

Ph.D. in Mathematics

Advisor: David Gepner

The University of Tokyo

April 2014 - March 2018

B.S. in Mathematics

Advisor: Takuya Sakasai

PAPERS AND PREPRINTS

N. Masuda, *The Algebra of Categorical Spectra*, 2024, Ph.D. Thesis.

T. Kinjo, N. Masuda, *Global critical chart for local Calabi-Yau threefolds*, 2023, International Mathematics Research Notices, rnad135.

N. Masuda, H. Thomas, A. Tonks, B. Vallette, *The diagonal of the associahedra*, 2021, Journal de l'École polytechnique — Mathématiques, Volume 8 (2021), pp. 121-146.

FELLOWSHIPS AND AWARDS

The Owen Scholars Fellowship (Johns Hopkins University)

2018-2020

Study and Visit Abroad Program (University of Tokyo)

March 2017

Silver medal, the 54th International Mathematical Olympiad

July 2013

TEACHING

Universität Hamburg

- Higher category theory

March 2025

Johns Hopkins University

- Teaching Assistant

- Calculus III

Spring 2022, Fall 2023 (head TA)

- Introduction to Abstract Algebra

Spring 2020

- Elementary Number Theory

Spring 2020

- Calculus II *Fall 2019, Fall 2020, Spring 2021, Fall 2021 (head TA)*
- Methods of Complex Analysis *Fall 2018*
- Honors Linear Algebra *Fall 2020*
- Directed Reading Program Mentorship
 - Introduction to Homotopy Theory *Spring 2020*
- Algebra Qualifying Exam Review Sessions *Spring 2020, Summer 2021, Spring 2023*

Miscellaneous

- Lecturer at Kawai-Juku *2014-2018*
 Supplementary school for middle- and high- school students: materials include highschool mathematics, calculus, linear algebra, problem solving, sheaves and cohomology, general topology, functional analysis, discrete geometry, manifolds, differential geometry, elementary number theory, elliptic curves, singular homology, homotopy theory.
- Math tutor at Scientific Education Group (SEG) *2014-2017*
- Tutor/Trainer at Japan Mathematical Olympiad Foundation *2014-2018*

SERVICE

- Seminar Coorganizer** *2024-*
 Research Seminar on Quantum Topology and Categorification
- Seminar Organizer** *Spring 2023*
 Prismatic Cohomology Learning Seminar
- Seminar Coorganizer** *2022-2024*
 Johns Hopkins Topology Seminar
- Workshop Coorganizer** *September 2017*
 Summer Workshop on Spectral Sequences, Shinshu University, Japan
- Japan Team Observer** *September 2016*
 57th International Mathematical Olympiad at Hong Kong
- Summer Camp Organizer** *August 2015*
 One-week intensive learning seminar on a chosen book by small groups of highschool students, organized by Japan Mathematical Olympiad Foundation

RESEARCH TALKS

- Mathematical Structures in Physics Seminar** *May 2025*
 Max Planck Institute for Mathematics in the Sciences, Germany
 The Cobordism Categories with Defects
- Research Seminar on Quantum Topology and Categorification** *November 2024*
 Universität Hamburg, Germany
 Stability of categorical spectra and an application to TQFT
- Kochi Autumn Workshop on Stable homotopy theory** *September 2024*
 Kochi University of Technology, Japan
 Categorical spectra and the Stability
- (∞, n) -categories and their applications** *April 2024*
 Utrecht University, Netherlands
 Tensor product of categorical spectra and the Spanier-Whitehead duality
- Algebraic Topology Seminar** *February 2024*

Chicago University, USA
Categorical spectra and their tensor product

Algebra/Topology Seminar

January 2024

University of Copenhagen, Denmark
Categorical spectra and their tensor product

Number Theory and Representation Theory Seminar

December 2023

University of Maryland, USA
Categorical spectra and higher Galois theory

Topology Seminar

November 2023

Northwestern University, USA
Tensor product of categorical spectra and applications

TGTS Tetrahedral Geometry/Topology Seminar

September 2023

Elizabethtown College, USA
Tensor product of categorical spectra: The first step towards higher² algebra

Kochi homotopy theory workshop

December 2022

Kochi University, Japan
Tensor product of categorical spectra

UPenn Deformation Theory Seminar

November 2021

University of Pennsylvania, USA
The diagonal of the associahedra

EXPOSITORY PRESENTATIONS

Yatsugatake Workshop on Chromatic Homotopy Theory

September 2024

Kobuchizawa, Japan
Chromatic localizations of spectra

Factorization Algebras and Related Topics

August 2024

Hakone, Japan
An Introduction to (∞, n) -categories

Analytic Stacks Learning Seminar

April 2024

Six functor formalism and the $!$ -topology
Johns Hopkins University, USA

Ambidexterity Learning Seminar

October 2023

Johns Hopkins University, USA
Dieudonné Modules

Prismatic Cohomology Learning Seminar

April 2023

Johns Hopkins University, USA
 TC^- and TP of perfectoid rings, Nygaard filtration

TQFT Learning Seminar

April 2023

Johns Hopkins University, USA
Tangle Hypothesis

Prismatic Cohomology Learning Seminar

March 2023

Johns Hopkins University, USA
Hodge-Tate comparison

Goodwillie Calculus Learning Seminar

October 2022

Johns Hopkins University, USA
Higher Excision and Analytic Functors

Number Theory Learning Seminar

September-October 2021

Johns Hopkins University, USA

A Short Course in Higher Algebra

Category Theory Seminar

December 2021

Johns Hopkins University, USA

Stable Category Theory(??) and Absolute Algebra(???)

Number Theory Learning Seminar

April 2021

Johns Hopkins University, USA

“Serre–Tate local moduli” by Katz

Oral exam

March 2021

Johns Hopkins University, USA

“Towards Derived Absolute Algebraic Geometry”

Number Theory Learning Seminar

December 2020

Johns Hopkins University, USA

“Relèvements modulo p^2 et decomposition du complexe de de Rham” by Deline–Illusie

eKan Seminar

November 2019

Online

“Algebraic K-theory and Etale Cohomology” by Thomason

Category Theory Seminar

October 2019

Johns Hopkins University, USA

Geometric Morphisms

Category Theory Seminar

April 2019

Johns Hopkins University, USA

Initial Algebras and Free Monads (from “Infinity Operads as Analytic Monads” by Gepner, Haugseng, Kock)

Category Theory Seminar

February 2019

Johns Hopkins University, USA

Bar-cobar and Koszul duality for algebraic operads II

Category Theory Seminar

December 2018

Johns Hopkins University, USA

Bar-cobar and Koszul duality for algebraic operads I

Fifth Spring School on Algebraic Topology in Shinshu

March 2017

Shinshu University, Japan

Infinity Categories

Fourth Spring School on Algebraic Topology in Shinshu

March 2016

Shinshu University, Japan

Loop Spaces and A_∞ -spaces

CONFERENCES AND WORKSHOPS ATTENDED

35th NRW Topology Meeting

May 2025

University of Osnabrück, Germany

“Hot Topics” Conference on “Quantum Topology”

May 2025

Max Planck Institute for Mathematics, Germany

Masterclass on Cobordism Categories

February 2025

University of Copenhagen, Denmark

Workshop on “Unstable Homotopy Theory”

November 2024

Max Planck Institute for Mathematics, Germany

Kochi Autumn Workshop on Stable homotopy theory and Related topics

September 2024

Kochi University of Technology, Japan	
Yatsugatake Workshop on Chromatic Homotopy Theory Kobuchizawa, Japan	<i>September 2024</i>
Factorization Algebras and Related Topics Hakone, Japan	<i>August 2024</i>
Masterclass on Continuous K-theory, dualizable and rigid categories University of Copenhagen, Denmark	<i>June 2024</i>
(∞, n)-categories and their applications Utrecht University, Netherlands	<i>April 2024</i>
Recent Advances in Algebraic K-theory IHES, France	<i>July 2023</i>
Homotopy Theory in honor of Paul Goerss Northwestern University, USA	<i>March 2023</i>
Arithmetic geometry, cycles, Hodge theory, regulators, periods and heights Isaac Newton Institute, UK	<i>June 2022</i>
Barcelona Conference on Higher Structures Universitat de Barcelona, Spain	<i>June 2022</i>
Workshop on Derived Geometry Centre de Recerca Matemàtica (CRM), Spain	<i>June 2022</i>
Homotopical Methods in Geometry and Physics Northwestern University, USA	<i>March 2022</i>
Category Theory Octoberfest Johns Hopkins University, USA	<i>October 2019</i>
Riemann-Roch in characteristic one and related topics Johns Hopkins University, USA	<i>September 2019</i>
IWoAT 2019 and Summer School on Equivariant Homotopy Theory Shanghai Center for Mathematical Sciences, China	<i>August 2019</i>
Young Topologists Meeting École polytechnique fédérale de Lausanne, Switzerland	<i>July 2019</i>
The fifth European Talbot Workshop Rheinböllen, Germany	<i>July 2019</i>
Workshop on Functor Calculus Ohio State University, USA	<i>March 2019</i>
Higher Structures Centre International de Rencontres Mathématiques, France	<i>January 2019</i>
Vladimir Voevodsky Memorial Conference Institute of Advanced Study, USA	<i>October 2018</i>
Rigidity and Algebraic Models in Stable Homotopy Theory University of Copenhagen, Denmark	<i>April 2018</i>
Geometry and Combinatorics of Associativity Hamilton Mathematics Institute, Trinity College Dublin, Ireland	<i>October 2017</i>
Colloque du GDR de Topologie Algébrique Paris Diderot University, France	<i>October 2017</i>
Workshop on Motivic and Equivariant Homotopy Theory University of Osnabrück, Germany	<i>October 2017</i>

Categories in Homotopy Theory and Rewriting Centre International de Rencontres Mathématiques, France	<i>September 2017</i>
Summer Workshop on Spectral Sequences Shinshu University, Japan	<i>September 2017</i>
Homotopy Theory: Tools and Applications University of Illinois at Urbana-Champaign, USA	<i>July 2017</i>
Summer School on Floer Homology and Homotopy Theory University of California at Los Angeles, USA	<i>July 2017</i>
The fifth Spring School on Algebraic Topology on factorization homology Shinshu University, Japan	<i>March 2017</i>
The fourth Spring School on Algebraic Topology on operads Shinshu University, Japan	<i>March 2016</i>
The third Spring School on Algebraic Topology on infinity categories Shinshu University, Japan	<i>March 2015</i>