

# NARUKI MASUDA

<https://nmasuda2.github.io>

Department of Mathematics, Universität Hamburg, Collaborative Research Center CRC 1624  
Bundesstraße 55 20146 Hamburg, Germany

## RESEARCH INTERESTS

---

Homotopy theory, Higher categories and categorification. Some keywords are  $(\infty, \infty)$ -categories, Categorical spectra, Derived algebraic geometry, Algebraic  $K$ -theory, Noncommutative algebraic geometry, Functorial quantum field theory, Higher topos theory, Absolute algebraic geometry.

## EDUCATION

---

### Johns Hopkins University

Ph.D. in Mathematics

Advisor: David Gepner

*September 2018 - August 2024*

### Université Sorbonne Paris Nord

Visitor

Host/Advisor: Bruno Vallette

*September 2017 - November 2017*

### The University of Tokyo

B.S. in Mathematics

Advisor: Takuya Sakasai

*April 2014 - March 2018*

## PAPERS AND PREPRINTS

---

N. Masuda, *The Algebra of Categorical Spectra*, 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

---

### 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 Organizer** *Spring 2023*  
Prismatic Cohomology Learning Seminar
- Seminar Coorganizer** *Fall 2022-*  
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

---

- Kochi Autumn Workshop on Stable homotopy theory** *September 2024*  
Kochi University of Technology, Japan  
Categorical spectra and the Stability
- $(\infty, n)$ -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 higher<sup>2</sup> 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  $(\infty, n)$ -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  
Dieudonne 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  $A_\infty$ -spaces

---

**CONFERENCES AND WORKSHOPS ATTENDED**

---

**Kochi Autumn Workshop on Stable homotopy theory and Related topics** *September 2024*

Kochi University of Technology, Japan

**Yatsugatake Workshop on Chromatic Homotopy Theory** *September 2024*

Kobuchizawa, Japan

**Factorization Algebras and Related Topics** *August 2024*

Hakone, Japan

**Masterclass on Continuous K-theory, dualizable and rigid categories** *June 2024*

University of Copenhagen, Denmark

**$(\infty, n)$ -categories and their applications** *April 2024*

Utrecht University, Netherlands

**Recent Advances in Algebraic K-theory** *July 2023*

IHES, France

**Homotopy Theory in honor of Paul Goerss** *March 2023*

Northwestern University, USA

**Arithmetic geometry, cycles, Hodge theory, regulators, periods and heights** *June 2022*

Isaac Newton Institute, UK

**Barcelona Conference on Higher Structures** *June 2022*

Universitat de Barcelona, Spain

**Workshop on Derived Geometry** *June 2022*

Centre de Recerca Matemàtica (CRM), Spain

<b>Homotopical Methods in Geometry and Physics</b> Northwestern University, USA	<i>March 2022</i>
<b>Category Theory Octoberfest</b> Johns Hopkins University, USA	<i>October 2019</i>
<b>Riemann-Roch in characteristic one and related topics</b> Johns Hopkins University, USA	<i>September 2019</i>
<b>IWoAT 2019 and Summer School on Equivariant Homotopy Theory</b> Shanghai Center for Mathematical Sciences, China	<i>August 2019</i>
<b>Young Topologists Meeting</b> École polytechnique fédérale de Lausanne, Switzerland	<i>July 2019</i>
<b>The fifth European Talbot Workshop</b> Rheinböllen, Germany	<i>July 2019</i>
<b>Workshop on Functor Calculus</b> Ohio State University, USA	<i>March 2019</i>
<b>Higher Structures</b> Centre International de Rencontres Mathématiques, France	<i>January 2019</i>
<b>Vladimir Voevodsky Memorial Conference</b> Institute of Advanced Study, USA	<i>October 2018</i>
<b>Rigidity and Algebraic Models in Stable Homotopy Theory</b> University of Copenhagen, Denmark	<i>April 2018</i>
<b>Geometry and Combinatorics of Associativity</b> Hamilton Mathematics Institute, Trinity Colledge Dublin, Ireland	<i>October 2017</i>
<b>Colloque du GDR de Topologie Algébrique</b> Paris Diderot University, France	<i>October 2017</i>
<b>Workshop on Motivic and Equivariant Homotopy Theory</b> University of Osnabrück, Germany	<i>October 2017</i>
<b>Categories in Homotopy Theory and Rewriting</b> Centre International de Rencontres Mathématiques, France	<i>September 2017</i>
<b>Summer Workshop on Spectral Sequences</b> Shinshu University, Japan	<i>September 2017</i>
<b>Homotopy Theory: Tools and Applications</b> University of Illinois at Urbana-Champaign, USA	<i>July 2017</i>
<b>Summer School on Floer Homology and Homotopy Theory</b> University of California at Los Angeles, USA	<i>July 2017</i>
<b>The fifth Spring School on Algebraic Topology on factorization homology</b> Shinshu University, Japan	<i>March 2017</i>
<b>The fourth Spring School on Algebraic Topology on operads</b> Shinshu University, Japan	<i>March 2016</i>
<b>The third Spring School on Algebraic Topology on infinity categories</b> Shinshu University, Japan	<i>March 2015</i>