

# NARUKI MASUDA

<https://nmasuda2.github.io>

Department of Mathematics, Johns Hopkins University, 3400 N. Charles Street, MD 21218, USA

(+1)4103364776  $\diamond$  nmasuda2@jhu.edu

## RESEARCH INTERESTS

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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

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**Johns Hopkins University**

*September 2018 - Present*

Ph.D. in Mathematics

Advisor: David Gepner

**Université Sorbonne Paris Nord**

*September 2017 - November 2017*

Visitor

Host/Advisor: Bruno Vallette

**The University of Tokyo**

*April 2014 - March 2018*

B.S. in Mathematics

Advisor: Takuya Sakasai

## PAPERS AND PREPRINTS

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N. Masuda, *Tensor product of categorical spectra*, in preparation.

T. Kinjo, N. Masuda, *Global critical chart for local Calabi-Yau threefolds*, 2023, International Mathematics Research Notices, rna135.

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.

## RESEARCH TALKS

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**Northwestern 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

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**Ambidexterity Learning Seminar**

*October 2023*

Johns Hopkins University, USA

Dieudonné Modules

<b>Prismatic Cohomology Learning Seminar</b> Johns Hopkins University, USA TC <sup>-</sup> and TP of perfectoid rings, Nygaard filtration	<i>April 2023</i>
<b>TQFT Learning Seminar</b> Johns Hopkins University, USA Tangle Hypothesis	<i>April 2023</i>
<b>Prismatic Cohomology Learning Seminar</b> Johns Hopkins University, USA Hodge-Tate comparison	<i>March 2023</i>
<b>Goodwillie Calculus Learning Seminar</b> Johns Hopkins University, USA Higher Excision and Analytic Functors	<i>October 2022</i>
<b>Number Theory Learning Seminar</b> Johns Hopkins University, USA A Short Course in Higher Algebra	<i>September-October 2021</i>
<b>Category Theory Seminar</b> Johns Hopkins University, USA Stable Category Theory(??) and Absolute Algebra(???)	<i>December 2021</i>
<b>Number Theory Learning Seminar</b> Johns Hopkins University, USA “Serre–Tate local moduli” by Katz	<i>April 2021</i>
<b>Oral exam</b> Johns Hopkins University, USA “Towards Derived Absolute Algebraic Geometry”	<i>March 2021</i>
<b>Number Theory Learning Seminar</b> Johns Hopkins University, USA “Relèvements modulo $p^2$ et decomposition du complexe de de Rham” by Deline–Illusie	<i>December 2020</i>
<b>eKan Seminar</b> Online “Algebraic K-theory and Etale Cohomology” by Thomason	<i>November 2019</i>
<b>Category Theory Seminar</b> Johns Hopkins University, USA Geometric Morphisms	<i>October 2019</i>
<b>Category Theory Seminar</b> Johns Hopkins University, USA Initial Algebras and Free Monads (from “Infinity Operads as Analytic Monads” by Gepner, Haugseng, Kock)	<i>April 2019</i>
<b>Category Theory Seminar</b> Johns Hopkins University, USA Bar-cobar and Koszul duality for algebraic operads II	<i>February 2019</i>
<b>Category Theory Seminar</b> Johns Hopkins University, USA Bar-cobar and Koszul duality for algebraic operads I	<i>December 2018</i>
<b>Fifth Spring School on Algebraic Topology in Shinshu</b> Shinshu University, Japan Infinity Categories	<i>March 2017</i>
<b>Fourth Spring School on Algebraic Topology in Shinshu</b>	<i>March 2016</i>

## CONFERENCES AND WORKSHOPS ATTENDED

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<b>Recent Advances in Algebraic K-theory</b> IHES, France	<i>July 2023</i>
<b>Homotopy Theory in honor of Paul Goerss</b> Northwestern University, USA	<i>March 2023</i>
<b>Arithmetic geometry, cycles, Hodge theory, regulators, periods and heights</b> Isaac Newton Institute, UK	<i>June 2022</i>
<b>Barcelona Conference on Higher Structures</b> Universitat de Barcelona, Spain	<i>June 2022</i>
<b>Workshop on Derived Geometry</b> Centre de Recerca Matemàtica (CRM), Spain	<i>June 2022</i>
<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 College 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</b> on factorization homology Shinshu University, Japan	<i>March 2017</i>
<b>The fourth Spring School on Algebraic Topology</b> on operads Shinshu University, Japan	<i>March 2016</i>
<b>The third Spring School on Algebraic Topology</b> on infinity categories Shinshu University, Japan	<i>March 2015</i>

## FELLOWSHIPS AND AWARDS

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The Owen Scholars Fellowship (Johns Hopkins University)	<i>2018-2020</i>
Study and Visit Abroad Program (University of Tokyo)	<i>March 2017</i>
Silver medal, the 54th International Mathematical Olympiad	<i>July 2013</i>

## TEACHING

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### Johns Hopkins University

- Teaching Assistant
  - Calculus III *Spring 2022, Fall 2023*
  - Introduction to Abstract Algebra *Spring 2020*
  - Elementary Number Theory *Spring 2020*
  - Calculus II *Fall 2019, Fall 2020, Spring 2021, Fall 2021*
  - Methods of Complex Analysis *Fall 2018*
  - Honors Linear Algebra *Fall 2020*
- Directed Reading Program Mentorship
  - Introduction to Homotopy Theory *Spring 2020*

### 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

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