

Curriculum Vitae

Eddie Nijholt



EMPLOYMENT

- Oct 2024 - Present* Principal Investigator in Mathematics
University of São Paulo, Brazil
Funded by FAPESP Young Investigator grant
- Oct 2022 - Oct 2024* [Chapman Fellow](#)
Imperial College London, UK
- Mar 2020 - Oct 2022* Co-PI in the [ReconNeCT Project](#)
Led by Prof. Tiago Pereira
University of São Paulo, Brazil
- Jan 2018 - Jan 2020* Postdoctoral Researcher in Mathematics
University of Illinois at Urbana-Champaign, USA
Mentor: Prof. Lee DeVille
Funded by NWO Rubicon grant
- Sep 2013 - Sep 2017* PhD position in Mathematics
Vrije Universiteit Amsterdam, the Netherlands

EDUCATION

- Mar 2018* PhD in Mathematics
Vrije Universiteit Amsterdam
Cum laude
Thesis: *Bifurcations in Network Dynamical Systems*
Supervisors: Prof. B. W. Rink & Prof. J. B. van den Berg
- Oct 2013* Master of Science, Mathematical Physics
University of Amsterdam
Cum laude
Thesis: *Integrable systems on Coxeter symplectic leaves in $SL(n, \mathbb{C})$*
Supervisor: Prof. N. Reshetikhin
- Oct 2011* Bachelor of Science, Mathematics
University of Amsterdam
Cum laude, cum honore
Thesis: *Bruhat cells and double Bruhat cells for GL_n*
Supervisor: Prof. N. Reshetikhin
- Oct 2011* Bachelor of Science, Physics
University of Amsterdam
Cum laude, cum honore

RESEARCH GRANTS & PRIZES

Oct 2024	Jovem Pesquisador (Young Investigator) Grant by FAPESP (São Paulo Research Foundation) for proposal <i>Hidden Symmetries in Networked Systems</i> (approx. R\$ 1.300.000 \approx € 212.000)
Oct 2022	Chapman Fellowship in Mathematics at Imperial College London
Oct 2022	Accommodation grant by the University of California, Los Angeles, USA (approx. \$1.500)
Aug 2022	The publication <i>Emergent hypernetworks in weakly coupled oscillators</i> is featured on a Nature Communications Editors' Highlights webpage (titled <i>Applied physics and mathematics</i>)
Jan 2020	FAS - Post-Doctoral/Continuous Funding Stream (FAPESP CEPID, Brazil) for project <i>Normal Forms and Centre manifold reduction for networks</i> , with principal investigator Tiago Pereira (approx. R\$ 175.000 \approx € 28.500)
July 2019	Traveling grant by Lorentz Center for participating in the summer school Data Science for Dynamical Systems in Leiden, the Netherlands (€ 400)
June 2019	Traveling grant by Imperial College London, UK (approx. € 180)
Jan 2019	NDNS+ (Nonlinear Dynamics in Natural Systems) visiting scholarship (approx. € 2.500)
Sep 2018	The publication <i>Center Manifolds of Coupled Cell Networks</i> selected as SIGEST outstanding paper of general interest to appear in SIAM Review (SIREV)
July 2017	Rubicon Grant by NWO (Dutch Science Foundation) for proposal <i>Designing Network Dynamical Systems through Algebra</i> , highest ranking proposal (approx. € 134.000)
Apr 2017	Conference support grant by NWO, together with Prof. B. Rink and Dr. C. Bick (approx. € 2.000)
Dec 2016	Conference support grant by Lorentz Center , together with Prof. B. Rink and Dr. C. Bick (approx. € 30.000)
May 2016	Traveling grant by BREUDS (Brazilian-European Partnership in Dynamical Systems, approx. € 600)
Feb 2016	Traveling grant by NDNS+ (approx. € 2.000)
Nov 2014	Traveling grant by NDNS+ (approx. € 2.000)
July 2011	Perfect score (10) for Bachelor thesis. In addition, received split first prize for best Bachelor thesis presentation in mathematics at the University of Amsterdam
July 2009	Honorable mention at the IMC, International Mathematics Competition in Budapest, Hungary
June 2009	Member of best first year's team at LIMO, Landelijke Interuniversitaire Mathematische Olympiade (Dutch mathematics competition between universities)
June 2008	Top 20 in the Dutch Chemistry Olympiad
Sep 2007	19th in the Dutch Mathematics Olympiad

PUBLICATIONS

S. von der Gracht, E. Nijholt and B. Rink, **Higher order interactions lead to “reluctant” synchrony breaking**, **Proceedings of the Royal Society A**, *Volume 480, Issue 2301*, (2024)

S. von der Gracht, E. Nijholt and B. Rink, **Hypernetworks: Cluster Synchronization Is a Higher-Order Effect**, **SIAM Journal on Applied Mathematics (SIAP)**, *Volume 83, Issue 6, Pages 2329–2353*, (2023)

E. Nijholt, N. Sieben and J. W. Swift, **Invariant Synchrony and Anti-Synchrony Subspaces of Weighted Networks**, **Journal of Nonlinear Science (JNLS)**, *Volume 33, Number 4*, (2023)

E. Nijholt, T. Pereira, F. Queiroz and D. Turaev, **Chaotic Behavior in Diffusively Coupled Systems**, **Communications in Mathematical Physics**, *Pages 1–42*, (2023)

- L. DeVille and E. Nijholt, [Dynamical systems defined on simplicial complexes: symmetries, conjugacies, and invariant subspaces](#), **Chaos**, *Volume 32, Number 9*, (2022)
- D. Eroglu, J. Espindola, I. Kiss, E. Nijholt and T. Pereira, [Emergent hypernetworks in weakly coupled oscillators](#), **Nature Communications**, *Volume 13, Number 1*, (2022)
- S. von der Gracht, E. Nijholt and B. Rink, [Amplified steady state bifurcations in feedforward networks](#), **Nonlinearity**, *Volume 35, Issue 4, Pages 2073-2120*, (2022)
- E. Nijholt, B. Rink and S. Schwenker, [A new algorithm for computing idempotents of \$\mathcal{R}\$ -trivial monoids](#), **Journal of Algebra and its Applications**, *Volume 20, Issue 12, Article Number 2150227*, (2021)
- L. DeVille and E. Nijholt, [Circulant Type Formulas for the Eigenvalues of Linear Network Maps](#), **Linear Algebra and its Applications**, *Volume 610, Pages 379-439*, (2021)
- E. Nijholt, B. Rink and S. Schwenker, [Quiver representations and dimension reduction in dynamical systems](#), **SIAM Journal on Applied Dynamical Systems (SIADS)**, *Volume 19, Issue 4, Pages 2428-2468*, (2020)
- E. Nijholt, B. Rink and S. Schwenker, [Generalised symmetry in network dynamics](#), **DSWeb Magazine**, *April 2020*
- E. Nijholt, B. Rink and J. Sanders, [Center manifolds of coupled cell networks](#), **SIAM Review**, **SIGEST section**, *Volume 61, Issue 1, Pages 121-155*, (2019)
- E. Nijholt, B. Rink and J. Sanders, [Center manifolds of coupled cell networks](#), **SIAM Journal on Mathematical Analysis (SIMA)**, *Volume 49, Issue 5, Pages 4117-4148*, (2017)
- E. Nijholt, B. Rink and J. Sanders, [Projection blocks in homogeneous coupled cell networks](#), **Dynamical Systems**, *Volume 32, Issue 1, Pages 164-186*, (2017)
- E. Nijholt, B. Rink and J. Sanders, [Graph fibrations and symmetries of network dynamics](#), **Journal of Differential Equations**, *Volume 261, Issue 9, Pages 4861-4896*, (2016)

PREPRINTS

- E. Nijholt, D. Sclosa, [Dimension Bounds for Systems of Equations with Graph Structure](#)
- S. von der Gracht, E. Nijholt and B. Rink, [A parametrisation method for high-order phase reduction in coupled oscillator networks](#)
- E. Nijholt and B. Rink, [Transversality in Dynamical Systems with Generalized Symmetry](#)

ORGANIZATION

<i>Oct 2022 - Oct 2024</i>	Dynamical Systems Seminar (weekly) at Imperial College London, UK (DynamIC), together with Dr. Dongchen Li and Dr. Iacopo Longo
<i>May 2023</i>	Mini-symposium The Why and How of (Hyper)Networks at the SIAM Conference on Applications of Dynamical Systems in Portland, Oregon, USA
<i>May 2021</i>	Mini-symposium Dynamics of and on Networks at the SIAM Conference on Applications of Dynamical Systems , digital
<i>2019</i>	Co-organizer of the Operator Algebra Learning Seminar at the University of Illinois in Urbana-Champaign. In addition, I gave lectures on Riemannian geometry, spin manifolds and the Dirac operator.
<i>May 2019</i>	Mini-symposium Novel Directions in Network Dynamical Systems (part I and part II) at the SIAM Conference on Applications of Dynamical Systems in Snowbird, Utah, USA
<i>June 2017</i>	Lorentz Center Workshop Emerging Topics in Network Dynamical Systems in Leiden, the Netherlands (week long workshop, with 25 participants)
<i>May 2017</i>	Mini-symposium Mathematical Analysis of Classical and Asynchronous Network Dynamical Systems (part I and part II) at the SIAM Conference on Applications of Dynamical Systems in Snowbird, Utah, USA
<i>May 2015</i>	Mini-symposium Analysis of Network Dynamical Systems at the SIAM Conference on Applications of Dynamical Systems in Snowbird, Utah, USA

ACADEMIC VISITS

<i>Jan 2024</i>	Weierstrass Institute (WIAS) in Berlin, Germany. Host: Prof. Matthias Wolfrum
<i>Sep 2023</i>	Kadir Has University in Istanbul, Turkey. Host: Prof. Deniz Eroglu
<i>May 2023</i>	University of Warwick, UK. Host: Prof. Ian Stewart
<i>July 2022</i>	2 weeks at the Nesin Mathematics Village, Turkey
<i>Feb 2020</i>	University of Copenhagen, Denmark. Host: Dr. Adam Dor-On
<i>Jan 2020</i>	Imperial College London, UK. Host: Prof. Jeroen Lamb
<i>Apr 2019</i>	Imperial College London, UK. Host: Prof. Jeroen Lamb
<i>Mar 2019</i>	Universität Hamburg, Germany. Host: Prof. Reiner Lauterbach
<i>Feb 2019</i>	University of Minnesota, USA. Host: Prof. Arnd Scheel
<i>Jan 2019</i>	4 weeks at the Vrije Universiteit Amsterdam, the Netherlands. Host: Prof. Bob Rink
<i>May 2016</i>	ICMC (Institute of Mathematics and Computer Sciences) in São Carlos, Brazil. Host: Prof. Tiago Pereira
<i>Feb 2016</i>	5 weeks at the Ohio State University in Columbus, Ohio, USA, as part of the MBI's emphasis semester on dynamics of biologically inspired networks . Host: Prof. Martin Golubitsky
<i>Nov 2014</i>	4 weeks at Imperial College London, UK. Host: Prof. Michael Field
<i>May 2014</i>	2 weeks at Rice University in Houston, Texas, USA. Host: Prof. Michael Field
<i>May 2012</i>	3 weeks at Retreat for QGM and GEOMAPS PhD students at Aarhus University, Denmark

CONFERENCES & PRESENTATIONS

<i>Sep 2024</i>	Conference DinAmicI in Rio, Dynamics, Applications, Interactions at the Instituto de Matemática Pura e Aplicada (IMPA), Rio de Janeiro, Brazil
<i>July 2024</i>	Invited talk in the Workshop on Nonlinear Dynamics in celebration of the 70th birthday of Reiner Lauterbach, at the University of Hamburg, Germany
<i>June 2024</i>	Invited talk in the mini-symposium <i>Synchronisation and reduction techniques of coupled oscillators</i> at Equadiff 2024 in Karlstad, Sweden
<i>Apr 2024</i>	Invited talk in the dynamical systems seminar at the University of Leeds, UK
<i>Jan 2024</i>	Workshop on Networks, Synchronisation and Control at the Vrije Universiteit Amsterdam, the Netherlands

<i>Jan 2024</i>	Invited talk at the Weierstrass Institute (WIAS) in Berlin, Germany
<i>Nov 2023</i>	Invited talk in the International Workshop: Dynamics in Coupled Network Systems at the Weierstrass Institute (WIAS) in Berlin, Germany
<i>Nov 2023</i>	Invited talk in the Dynamics Seminar at the University of Exeter, UK
<i>Oct 2023</i>	Invited talk at the workshop Computing combinatorial dynamics in high dimensional biological networks at the Lorentz Center in Leiden, the Netherlands
<i>Oct 2023</i>	Invited talk at the University of Sydney, Australia
<i>Sep 2023</i>	Invited talk at the Chaos workshop in celebration of the 60th birthday of Dmitry Turaev, at the Nesin Mathematics Village, Turkey
<i>Sep 2023</i>	Invited talk at Kadir Has University, Turkey
<i>Aug 2023</i>	Invited talk in the mini-symposium Hypernetworks and their dynamics in theory and applications at the 10th International Congress on Industrial and Applied Mathematics (ICIAM) in Tokyo, Japan
<i>June 2023</i>	Invited talk at the University of Amsterdam, the Netherlands, digital
<i>May 2023</i>	Invited talk in the mini-symposium Dynamics of and on Networks with Varying Topologies at the SIAM Conference on Applications of Dynamical Systems in Portland, Oregon, USA
<i>May 2023</i>	Invited talk in the Ergodic Theory and Dynamical Systems Seminar at the University of Warwick, UK
<i>Mar 2023</i>	Conference Nonlinear Data Analysis and Modeling: Advances, Applications, Perspectives in Potsdam, Germany (on the occasion of Prof. Jürgen Kurths' 70th birthday)
<i>Mar 2023</i>	Invited talk at the Centre for Complexity Science at Imperial College London, UK
<i>Oct 2022</i>	International Conference on Dynamical Systems (Celebrating the 60th Birthday of Marcelo Viana) at IMPA, Rio de Janeiro, Brazil
<i>Aug 2022</i>	Workshop Reconstructing Network Dynamics from Data: Applications to Neuroscience and Beyond at UCLA, Los Angeles, USA
<i>July 2022</i>	Invited lecture at the Nesin Mathematics Village, Turkey
<i>Feb 2022</i>	Participant in the 2nd International Meeting of Young Researchers in Singularity Theory and Related Fields , digital
<i>Jan 2022</i>	Invited talk at Imperial College London, UK, digital
<i>July 2021</i>	Invited talk at Utrecht University, the Netherlands, digital
<i>May 2021</i>	Invited talk in the mini-symposium Noise and Heterogeneity Effects in Network Dynamics, Part II at the SIAM Conference on Applications of Dynamical Systems , digital
<i>May 2021</i>	Invited talk in the mini-symposium Normal Forms and Algebraic Structures for Dynamical Systems at the SIAM Conference on Applications of Dynamical Systems , digital
<i>Apr 2021</i>	Invited talk in the Oberseminar Nonlinear Dynamics at the Free University Berlin, digital
<i>Mar 2021</i>	Invited talk in the One World Dynamics seminar, digital
<i>Jan 2021</i>	Invited talk at Imperial College London, UK, digital
<i>Sep 2020</i>	Invited talk in the Mathematics Colloquium at the University of Groningen, digital
<i>Aug 2020</i>	Participant in the Dynamics Days Digital 2020
<i>June 2020</i>	Participant in the NDNS+ online meeting 2020
<i>Jan 2020</i>	Invited talk at the Dynamics, geometry and C^* algebras seminar at the University of Copenhagen, Denmark
<i>July 2019</i>	30 minute talk at the mini-symposium Dynamics and Topology at Equadiff in Leiden, the Netherlands
<i>July 2019</i>	Summer school Data Science for Dynamical Systems at the Lorentz Center in Leiden, the Netherlands
<i>May 2019</i>	Invited talk in the mini-symposium Influence of Network Structure and Symmetry on Dynamics, Part II at the SIAM Conference on Applications of Dynamical Systems in Snowbird, Utah, USA

<i>May 2019</i>	20 minute talk in the mini-symposium Novel Directions in Network Dynamical Systems, Part I at the SIAM Conference on Applications of Dynamical Systems in Snowbird, Utah, USA
<i>Apr 2019</i>	Talk at the DynamIC Seminar (Dynamical Systems at Imperial College London) in the UK
<i>Mar 2019</i>	Talk at the Universität Hamburg in Germany
<i>Feb 2019</i>	Invited talk at the Dynamical Systems Seminar at the University of Minnesota
<i>Jan 2019</i>	30 minute talk at the Vrije Universiteit Amsterdam, the Netherlands
<i>June 2018</i>	SIAM Conference on Nonlinear Waves and Coherent Structures in Anaheim, California, USA
<i>2013 - 2017</i>	Multiple talks at the Most Informal Nonlinear Dynamics Seminar (MINDS) at the Vrije Universiteit Amsterdam
<i>June 2017</i>	15 minute talk at the Lorentz Center Workshop Emerging Topics in Network Dynamical Systems in Leiden, the Netherlands
<i>May 2017</i>	25 minute talk in the mini-symposium Mathematical Analysis of Classical and Asynchronous Network Dynamical Systems, Part I at the SIAM Conference on Applications of Dynamical Systems in Snowbird, Utah, USA
<i>Nov 2016</i>	Invited talk at the dynamical systems seminar at the University of Leiden, the Netherlands
<i>July 2016</i>	Summer school Introductory Workshop on the Representation of Finite Groups at the EPFL in Lausanne, Switzerland
<i>May 2016</i>	30 minute talk at the 6th international conference on nonlinear science and complexity in São José dos Campos, Brazil
<i>Feb 2016</i>	Talk at the generalized Network Structures & Dynamics workshop in Columbus, Ohio, USA
<i>Aug 2015</i>	Two talks at the International Summer School in Nonlinear Dynamics in Peyresq, France
<i>May 2015</i>	Workshop on Applied Dynamical Systems: Equivariance and Beyond at the MBI (Ohio State University) in Columbus, Ohio, USA
<i>May 2015</i>	25 minute talk in the mini-symposium Analysis of Network Dynamical Systems at the SIAM Conference on Applications of Dynamical Systems in Snowbird, Utah, USA
<i>Feb 2014</i>	Workshop on Coupled Cell Networks and Dynamics at the University of Porto, Portugal
<i>July 2013</i>	Summer school Integrable Systems and Semiclassical Analysis at the EPFL in Lausanne, Switzerland
<i>May 2012</i>	Talk at Retreat for QGM and GEOMAPS PhD students at Aarhus University, Denmark
<i>July 2009</i>	Participated in the 16th International Mathematics Competition for University Students (IMC), in Budapest, Hungary

TEACHING

<i>Spring 2023 - Fall 2024</i>	Personal tutor for 7 undergraduate students and a MSc student at Imperial College London, UK, with regular individual meetings
<i>Fall 2023</i>	Lectured and organized the course “Mathematics and Physics 1” for undergraduate chemistry students at Imperial College London, UK
<i>Sep 2023</i>	Lecture series on <i>Dimension Reduction for Dynamical Systems with Exotic Symmetries</i> for PhD students and postdocs at the Kadir Has University, Turkey
<i>Summer 2023</i>	Individual Research Project 2022-2023. Mathematics first year poster project at Imperial College London, UK. I gave 5 plenary lectures on a topic of my choice (Morse theory) to first year students, and graded their posters.

- Fall 2022 - Spring 2023* Personal tutor for 10 students at Imperial College London, UK. I taught biweekly and had regular individual meetings.
- Spring 2022* Lectured and organized a semester-long course on *Bifurcation Theory* for PhD students and postdocs at the University of São Paulo, Brazil
- Fall 2021* Semester-long lecture series on *Dimension Reduction for Dynamical Systems with Quiver Symmetry* for PhD students and postdocs at the University of São Paulo, Brazil
- Fall 2019* Designed and lectured an [Advanced Topics Course on Quiver Representations](#) for master's and PhD students at the University of Illinois at Urbana-Champaign, USA
- 2013 - 2017* Teaching assistant (teacher/supervisor during exercise classes) for
- Differential Geometry (BSc mathematics, year 3), 3 times
 - Rings and Fields (BSc mathematics, year 2)
 - Ordinary Differential Equations (BSc mathematics, year 2)
 - Linear Algebra (BSc Science, Business and Innovation (SBI), year 2)
 - Mathematical Methods (BSc Medical Natural Sciences (MNW), year 1; BSc Pharmaceutical Sciences, year 2)
 - Sets and Combinatorics (BSc Business Analytics, year 1)

SUPERVISING EXPERIENCE

- Oct 2024 - Present* Supervision of three undergraduate (Scientific Initiation) students at USP (University of São Paulo), São Carlos, Brazil:
- Felipe Nascimento Ferreira
 - Mateus Freitas de Vasconcelos
 - Raphael Cássio Moreira
- 2023 - 2024* Advisor of master's student Cary Ding at Imperial College London, UK
Thesis: Robust SINDy Autoencoder
- 2021 - 2022* Co-adviser of PhD-student Fernando Cordeiro de Queiroz
USP (University of São Paulo), Brazil
Thesis: [Chaotic behaviour in diffusively coupled systems](#)
Defense: 10/10/2022
Winner of the [Marco Antônio Raupp Prize](#) for best doctoral thesis
- Fall 2019* Running an IGL (Illinois Geometry Lab) project. This includes supervising a team of two graduate students and four undergraduate students on a project of my design.
Title of the project: How Strange are Networks?

ASSESSMENT OF OTHERS' WORK

- June 2021 - Present* Review editor [Frontiers in Systems Neuroscience](#)
- Oct 2019* Served on doctoral committee of James Schmidt.
University of Illinois at Urbana-Champaign, USA
Thesis: *Morphisms of Networks of Hybrid Open Systems*
- Nov 2018* Committee member for the prelim exam of James Schmidt (examination in the USA to determine if a graduate students is qualified to begin working on a doctoral thesis), at the University of Illinois at Urbana-Champaign. The project is on understanding network systems from a categorical perspective.
Title: *Maps of Networks of Hybrid Open Systems*

2017 - Present Peer reviewer for various journals, including PLOS ONE, Communication Physics, SIAM Journal on Applied Dynamical Systems (SIADS), SIAM Journal on Mathematical Analysis (SIMA), Journal of Nonlinear Science, Mathematical Biosciences and MathSciNet

OUTREACH

Sep 2024 - Present Volunteering at a weekly mathematics class for interested people, among whom high-school and engineering students. We mainly cover analysis from the book “Principles of Mathematical Analysis” by Walter Rudin. I both teach and oversee the class

2009 - Present Volunteering for [Pythagoras](#), a Dutch mathematics magazine for high school students. Tasks include creating exercises for the competition section (‘Pythagoras Olympiade’), grading exercises and writing solutions

Mar 2017 Competition leader for the second round of the Dutch Mathematics Olympiad at the Vrije Universiteit Amsterdam

2015 - 2016 Coordination of the Vrije Universiteit Amsterdam [Wiskunde D](#) (Mathematics D) project for outstanding high school students. I was the contact person for high school teachers and coordinated grading of homework exercises.

2017/2016/2009 Volunteering at a training for the second round of the Dutch Mathematics Olympiad

MISCELLANEOUS

Feb 2021 Completed the Coursera Machine Learning course ([certificate](#))

Mar 2012 Released the book *Bruhat cells and double Bruhat cells for GL_n*

LANGUAGE SKILLS

Dutch (native language), English (fluent), German (basic), French (basic)