Research area

Algebraic geometry, especially enumerative and logarithmic. Also a little light statistics, such as Markov bases and environmental modelling.

Academic positions

2021 ≤ Associate Professor (UHD), University of Leiden.
2014 - 2021 Assistant Professor (UD), University of Leiden, (tenured since June 2017).
2012 - 2014 Postdoc, University of Leiden.
4 - 8/2012 Visiting researcher, University of Hamburg.
2008 - 2012 PhD with Samir Siksek, University of Warwick, awarded 10 Dec 2012.
2004 - 2007 BSc Mathematics, University of Warwick, 1st class Hons.

Publications (peer reviewed international journals)

2021 Infinitesimal structure of the pluricanonical double ramification locus (with Johannes Schmitt),
2337.

2020 Fine compactified moduli of enriched structures on stable curves (with Owen
Biesel),

2020 Fields of definition of curves of a given degree (with Nick Rome),

2020 The norm of the saturation of a binomial ideal, and applications to Markov
bases,

2019 Extending the double ramification cycle by resolving the Abel-Jacobi map,
the Institute of Mathematics of Jussieu.

2019 Multiplicativity of the double ramification cycle (with Aaron Pixton and Jo-
hannes Schmitt),
562.

2019 Empirical and dynamic approaches for modelling the yield and N content of
European grasslands (with Martha Dellar, Kairsty Topp, Guillermo Pardo, Agustin
del Prado, Nuala Fitton, Georgios Banos, Eileen Wall),
https://doi.org/10.1016/j.envsoft.2019.104562, Environmental Modelling
and Software.

2019 Explicit arithmetic intersection theory and computation of Néron-Tate
heights (with Steffen Muller and Raymond van Bommel),

2019 Torsion points and height jumping in higher-dimensional families of abelian
varieties,
arXiv:1604.04563, https://doi.org/10.1142/S179304211950101X, Inter-
national Journal of Number Theory.

2019 Néron models of jacobians over base schemes of dimension greater than 1,

2018 Singularity of the biextension metric for families of abelian varieties (with J.
Burgos Gil and R. de Jong),

2018 Extending the Double Ramification Cycle using Jacobians (with J. Kass and
2017  **Positivity of the height jump divisor** *(with J. Burgos Gil and R. de Jong)*,

2017  **Néron models and the height jump divisor** *(with O. Biesel and R. de Jong)*,

2016  **Quasi-compactness of Néron models, and an application to torsion points,**

2015  **The Brauer-Manin obstruction on Kummer varieties and ranks of twists of abelian varieties** *(with R. Pannekoek)*,

2015  **Asymptotics of the Néron height pairing** *(with R. de Jong)*,

2014  **An Arakelov-theoretic approach to naïve heights on hyperelliptic jacobians,**

2012  **Computing Néron-Tate heights of points on hyperelliptic jacobians,**

Other publications

2022  **Steps towards openness and fairness in scientific publishing** *(with J. Briët and R.J. Kang)*,
https://ir.cwi.nl/pub/31565, Nieuw Archief voor Wiskunde, 5(23), 53 - 55. ISSN 0028-9825.

2012  **Néron-Tate heights on the jacobians of high-genus hyperelliptic curves,**
PhD thesis.

Preprints

2022  **Logarithmic double ramification cycles** *(with S. Molcho, R. Pandharipande, A. Pixton, J. Schmitt)*,

2022  **On the shapes of functions generated by random neural networks,**
davidholmes.nl/images/pdfs/geometric_simplicity.pdf, draft version.

2022  **A tale of two moduli spaces: logarithmic and multi-scale differentials** *(with D. Chen, S. Grushevsky, M. Möller, J.Schmitt)*,

2022  **Rings of Siegel-Jacobi forms of bounded relative index are not finitely generated** *(with A. M, Botero, J. I. Burgos Gil, R. de Jong)*,

2021  **Divisorial and geometric gonality of higher-rank tropical curves** *(with J. van Dobben de Bruyn and D. van der Vorm)*,

International conference talks
Coefficients of higher powers of $r$ in Chiodo classes, 
"Moduli spaces of curves workshop, Les Diablerets."

Detecting when a line bundle is (log) trivial, 
"Workshop Logarithmic Geometry and Moduli Spaces, Frankfurt."

Double ramification cycles, 
"Recent Advances on Moduli Spaces of Curves, Leysin."

Formulae for logarithmic double ramification cycles, 
"Recent Advances on Moduli Spaces of Curves, Leysin."

Introduction to LogChow, 
"Coding Intersection theory, Les Diablerets."

Piecewise polynomials on the moduli space of curves, 
"Helvetic Algebraic Geometry workshop, Geneva."

$m$-fold universal logarithmic double ramification cycles, 
"AIM workshop on Double Ramification Cycles and Integrable Systems, Workshop at AIM."

Arithmetic Intersection Theory and Computation of Néron-Tate heights, 
"Rational Points 2019, (contributed talk), Workshop at Franken-Akademie Schloss Schney."

A universal resolution of the Abel-Jacobi map, 
"Moduli of curves in Gothenburg, Chalmers University of Technology, Gothenburg."

A universal resolution of the Abel-Jacobi map, 
"Workshop on Moduli spaces of Curves, Integrable Systems and related subjects, Institut de Mathématiques de Bourgogne, Dijon."

Arakelov geometry of hyperelliptic curves, 
"Workshop on Arithmetic of Hyperelliptic Curves, ICTP Trieste."

Numerical verification of the Conjecture of Birch and Swinnerton-Dyer for some hyperelliptic Jacobians, 
"Rational Points 2017, (contributed talk), Workshop at Franken-Akademie Schloss Schney."

A Néron model of the universal jacobian, 
"Summer Research Institute in Algebraic Geometry, (contributed talk), Salt Lake City."

Néron models and heights in families, 
"Rational Points 2015, (contributed talk), Workshop at Franken-Akademie Schloss Schney."
2014 **Néron models of jacobians over base-schemes of dimension greater than 1**, 
_AriVaF - ARithmétique des VAriétés en Familles, closing conference_, (invited speaker), Bordeaux.

2013 **Rational points on Kummer varieties**, 
_Rational Points - Geometric, Analytic and Explicit Approaches_, (invited speaker), University of Warwick.

2013 **Heights in families of abelian varieties**, 
_Rational Points 2013_, (contributed talk), Bayreuth.

2011 **Computations on the jacobians of high-genus curves**, 
_Foundations of Computational Mathematics_, (invited speaker), Budapest.

2010 **Canonical heights on hyperelliptic curves**, 
_Rational Points 3_, (contributed talk), Bayreuth.

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**Seminar and colloquium talks**

2022 **Introduction to adic spaces, after Huber**, 
_Intercity geometry seminar_, UvA.

2022 **Spin DR cycles**, 
_Tropical/algebraic geometry seminar_, Jussieu, Paris.

2021 **The double-double ramification cycle**, 
_Algebraic geometry seminar (online)_
HU Berlin.

2021 **The double-double ramification cycle**, 
_Algebraic geometry seminar (online)_
Padova.

2020 **Geometry of the double ramification cycle**, 
_Algebraic geometry seminar (online)_
Milano.

2020 **Geometry of the double ramification cycle**, 
_Algebraic geometry seminar_, Cambridge University.

2019 **The universal double ramification cycle**, 
_Algebraic geometry and moduli seminar_, ETH Zürich.

2019 **Tropical divisors and the double ramification cycle**, 
_Algebraic geometry and moduli seminar_, ETH Zürich.

2019 **Geometry of the double ramification cycle**, 
Grenoble.
2019  Geometry of the double ramification cycle,
       Algebraic geometry seminar,
       Imperial College.
2019  Geometry of the double ramification cycle,
       Algebraic geometry seminar,
       Universiteit van Amsterdam.
2018  A formula for the canonical double ramification cycle,
       Algebraic geometry seminar,
       ETH Zürich.
2018  Néron models over bases of higher dimension,
       Arithmetic geometry seminar,
       Bayreuth.
2018  The Abel-Jacobi map and the double ramification cycle,
       Algebraic geometry seminar,
       Regensburg.
2018  Extending the Abel-Jacobi map,
       Algebraic geometry seminar,
       University of Colorado at Boulder.
2018  Extending the Abel-Jacobi map,
       Algebraic geometry seminar,
       Colorado State.
2018  Extending the Abel-Jacobi map,
       Algebraic geometry seminar,
       Liverpool.
2017  Compactifying the double ramification cycle,
       Algebraic geometry seminar,
       ETH Zürich.
2017  Compactifying the double ramification cycle,
       IRTG1800 summer school,
       Texel island.
2017  Enriched structures on stable curves,
       Algebraic geometry seminar,
       Roma III.
2017  Rational torsion points and String theory,
       Number theory seminar,
       Copenhagen.
2017  Rational torsion points and String theory,
       Linfoot Seminar,
       Bristol.
2017  Rational torsion points and Gromov-Witten theory,
       Number Theory Seminar,
       Oldenburg.

2016 Compactifying the double ramification locus, *Algebraic geometry seminar*, Dijon.


2016 Torsion points, Néron models and height jumping, *MAGIC seminar*, Imperial College London.

2015 Degenerating families of jacobians, *Dutch-Belgian algebraic geometry seminar*, Leiden, Netherlands.

2015 A Néron model of the universal jacobian, *Algebraic geometry seminar*, Mainz, Germany.

2015 A Néron model of the universal jacobian, *Seminarium z Arytmetyki, Geometrii i Algebry*, Poznan, Poland.


2015 Néron models over higher dimensional bases, *Algebra seminar*, Leiden University.
Degenerations of jacobians of algebraic curves over high-dimensional bases,
Research Trimester on Multiple Zeta Values, Multiple Polylogarithms, and Quantum Field Theory,
ICMAT, Madrid.

Rational points on Kummer varieties,
Intercity number theory seminar,
University of Leiden.

Distribution of rational points on Kummer varieties,
Algebra, geometry and number theory seminar,
University of Leiden.

Rational points on Kummer varieties,
Number theory seminar,
KU Leuven.

Explicit Arakelov theory for Néron-Tate heights on the jacobians of curves,
Intercity number theory seminar,
University of Leiden.

Néron-Tate heights and Arakelov theory,
Algebra, geometry and number theory seminar,
University of Leiden.

Computing Néron-Tate heights using Arakelov intersection theory,
Number theory seminar,
University of Hamburg.

Applications of intersection theory to Diophantine geometry,
Oberseminar algebraische geometrie,
Universität Zürich (UZH).

Applications of intersection theory to number theory,
Oberseminar algebraische geometrie,
Ludwig Maximilians Universität München.

Jacobians of hyperelliptic curves,
Junior Cambridge-Oxford-Warwick algebraic geometry seminar,
University of Cambridge.

Arithmetic surfaces and intersection theory,
Number theory seminar,
University of Warwick.

Genus 3 jacobians,
Number theory seminar,
University of Warwick.

Grants and awards

Van Gogh Programme grant, ‘Spin double ramification cycles and applications’,
with Adrien Sauvaget.

NWO Vidi grant, ‘Degeneration of group structures in families of algebraic varieties’.
2019 Foundation Composito Mathematica conference grant, to support a workshop organised with Lenny Taelman and Tim Dokchitser (postponed due to COVID).

2019 DIAMANT conference grant, to support a workshop organised with Lenny Taelman and Tim Dokchitser.

2019 DIAMANT small grant, to support the Intercity Geometry Seminar, and the visit of Samouil Molcho.

2015 Clay Mathematics Institute grant, to attend the 2015 Summer Research Institute in Algebraic Geometry, Salt Lake City.

2008-2012 EPSRC scholarship: full funding for the Ph.D. programme, awarded by the University of Warwick Mathematics Institute.

2011 Various grants for the conference ‘Young Researchers in Mathematics’, total £16,350.

2008 Bachelor Scholarship of Christ’s College Cambridge.

2008 Christ’s College Whelan Prize in Mathematics.

Teaching and supervising

Qualifications

2015 Basis kwalificatie onderwijs, (basic Dutch university teaching qualification), Leiden.

Postdocs

2022-2024 Leo Herr, Leiden.
2021-2022 Lawrence Barrott, Leiden.
2021-2022 Remy van Dobben de Bruyn, Leiden, moved to Utrecht for Veni.

PhD students in progress

2022-2026 George Politopoulos, Combinatorics and geometry of moduli of curves, (cosupervised with Adrien Sauvaget), Leiden/l’Université de Cergy Pontoise.
2020-2023 Pim Spellier, Logarithmic geometry and moduli of curves, Leiden.
2018-2023 Rosa Schwarz, Gromov Witten theory of Artin Stacks, Leiden, funded by NWO.

PhD students graduated:

2016-2019 Garnet Akeyr, Alignment in families with higher-dimensional fibres, Leiden, funded by NSERC scholarship.

PhD defence committees

2022 Stefan van der Lugt (Leiden).
2019 Ties Laarakker (Utrecht).
2018 Chloe Martindale (Leiden/Bordeaux), Ale Beshenov (Leiden/Bordeaux), Nicola Damjanovic (Leiden/Bordeaux).

2016 Dino Festi (Leiden/Milan).

2014 Mai Hoang Bien (Leiden/Padova).

Master's students

2021 Giorgio Spadaccini, Algebraic Statistics, University of Leiden.

2017 Rosa Schwarz, Intersection theory on Picard stacks of genus-0 curves, University of Leiden.

2017 Martin Heemskerk, Derived equivalence of singular varieties, University of Leiden.

2017 Sergej Monavari, Line bundles on twisted curves, University of Leiden.

2016 Arend de Jonge, Minimal desingularisations of aligned nodal curves, University of Leiden.

2014 Raymond van Bommel, Almost all hyperelliptic jacobians have a bad semi-abelian prime, University of Leiden.

2014 Erik Visse, Local computations on the Cassels-Tate pairing on an elliptic curve, (with R. Newton), University of Leiden.

2013 Michele Serra, Smooth models of curves, University of Leiden.

Numerous additional master's thesis committees

Bachelor students supervised

2022 Jorre The, Enriched categories as metric spaces, University of Leiden.

2020 David van der Vorm, Gonalities of metric graphs, University of Leiden.

2018 Wim Nijgh, Differential geometry via sheaves, University of Leiden.

2015 Floris Ruijter, Homotopy types of non-Hausdorff manifolds, University of Leiden.

2014 Anne Hommelberg, Compact non-Hausdorff manifolds, University of Leiden.

Interns

2016 Noémie Gaveau, Origami and constructible numbers, ENS Rennes.

Courses taught (at the University of Leiden unless otherwise stated)

Spring 2023 Topics in Algebraic Geometry, graduate seminar course.

Autumn 2022 Commutative Algebra, national graduate course, (with Marta Pieropan).

Spring 2022 Topics in Algebraic Geometry, graduate seminar course.

Autumn 2021 Algebraic Curves, bachelor/master's course.

Autumn 2021 Commutative Algebra, national graduate course, (with Simon Pepin Lehalleur).

Spring 2021 Topics in Algebraic Geometry, graduate seminar course.

Autumn 2020 Algebraic Curves, bachelor/master's course.

Autumn 2020 Commutative Algebra, national graduate course, (with Arno Kret).

Spring 2020 Topics in Algebraic Geometry, graduate seminar course.

Spring 2020 Lineaire Algebra 2, undergraduate course.

Autumn 2019 Commutative Algebra, national graduate course, (with Arno Kret).

Autumn 2019 Lineaire Algebra 1, undergraduate course.
Spring 2019  Curves, jacobians and moduli, 4 lectures at the GQT summer school.
Spring 2019  Topics in Algebraic Geometry, graduate seminar course.
Spring 2019  Lineaire Algebra 2, undergraduate course.
Autumn 2018  Commutative Algebra, national graduate course, (with Arno Kret).
Autumn 2018  Lineaire Algebra 1, undergraduate course.
Spring 2018  Topics in Algebraic Geometry, graduate seminar course, (with Bas Edixhoven).
Spring 2018  Lineaire Algebra 2, undergraduate course.
Autumn 2018  Commutative Algebra, national graduate course, (with Rob de Jeu).
Autumn 2017  Lineaire Algebra 1, undergraduate course.
Spring 2017  Lineaire Algebra 2, undergraduate course.
Autumn 2016  Algebraic Geometry, national graduate course, (with R. de Jong).
Spring 2016  Algebraic Geometry, national graduate course, (with R. de Jong).
Spring 2016  Lineaire Algebra en Beeldverwerking, undergraduate course.
Spring 2016  Lineaire Algebra 2, undergraduate course.
Spring 2016  Lineaire Algebra 1, undergraduate course.
2015  Elliptic Curves, graduate course.
2015  Lineaire Algebra en Beeldverwerking, undergraduate course.
2014  Modular forms, graduate reading course.
2014  Lineaire Algebra en Beeldverwerking, undergraduate course, (with C. Kalle).
2014  Advanced algebraic geometry, graduate course, (with B. Edixhoven).
2013  Cohomology of coherent sheaves, graduate reading course.
2013  Topics in algebraic geometry, graduate course, (with L. Taelman).
2013  Extra topics in elliptic curves, graduate reading course, (with R. Newton).
2012  Elliptic curves, graduate course, (with R. Newton).

Assistantships
2012  Modular forms, graduate course, University of Hamburg.
2012  Algebra, second year undergraduate, University of Hamburg (in German).
2012  Galois theory, third year undergraduate, University of Warwick.
2010  Topics in number theory, second year undergraduate, University of Warwick.
2008-2009  Undergraduate supervisions, University of Warwick.

Service

Within Leiden MI

2022 - Diversity and Inclusion committee of the MI (founding member).
2022 -2023 Selection committee for Full Professor in Mathematics of Artificial Intelligence.
2021 -2023 Instituutsradij, vice-chair from 2022.
2017-2022 Studiedadviseur, masterstudents in algebra, geometry and number theory.
2017-2022 Opleidingscommissie Wiskunde, member.
2021 Member of working group on tenure and promotion conditions.
2021-2022 Assisted organisation of MI-wide UD/UHD meetings.
2020 Offline timetabling for mathematics teaching during COVID.
2020-2021 ‘Keep warm activities’ for master’s programme in mathematics.
2020-2021 Publicity for master’s programme in mathematics.

External
2021- Managing editor for journal Compositio Mathematica.
2022 Selection committee for certain NWO grants.
2020- Member of Publications Committee of Platform Wiskunde Nederland.
2019 Project reviewer for DFG.
2018 Book proposal reviewer for OUP.
2017 Project reviewer for Hungarian National Research, Development and Innovation Office.

2017-2019 Leiden Algebra YouTube channel.
2014 Selection committee for host for Young Researchers in Mathematics 2016.
2010-2011 Virtual member of the Scientific Committee of the British Mathematical Colloquium.

Seminars and conferences organised

2022 Intercity Geometry Seminar on Condensed mathematics (with B. Moonen, L. Taelman, R. van Dobben de Bruyn).
2021 Dutch Algebraic Geometry Seminar (online, local organiser for Leiden).
2020-2021 Differentials and b-Chow seminar (online, with Johannes Schmitt (MPI Bonn)).
2019 Intercity Geometry Seminar: The logarithmic Picard group and its tropicalization (national seminar, with Chris Lazda (UvA), Adrien Sauvaget (UU) and Arne Smeets (RUN)).
2019 DIAMANT meets GQT: Arithmetic and geometry (session of the NMC (Dutch Mathematical Congress), with Martijn Kool (UU)).
2018 Intercity Geometry Seminar: Mirror Symmetry and moduli spaces of Higgs bundles (national seminar, with Chris Lazda (UvA) and Arne Smeets (RUN)).
2013 The Shafarevich conjecture (seminar, with R. de Jong, A. Javanpeykar and S. Müller), University of Leiden.
2012 Arithmetic intersection theory (seminar, with M. Streng and D. Patel), University of Leiden and Vrije Universiteit Amsterdam.
2011 Young Researchers in Mathematics 2011 (conference, chair of organising committee), this is the UK’s largest postgraduate mathematics conference, covering all areas of mathematics and with approximately 200 participants. In 2011 it was held at the University of Warwick.

2011 Deformations of Galois representations (seminar, with B. Banwait), University of Warwick.

2010 Néron models of modular curves (seminar), University of Warwick.

Languages

- English (native speaker)
- Dutch (European level A2, given talks and supervised theses in Dutch.)
- German (GCSE qualification and teaching experience.)