Michael DiPasquale

Contact Information

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Date of Birth: August 2, 1987

Research Interests

Computational commutative algebra and algebraic geometry. Emphasis on pure and applied problems which can be approached with the tools of algebraic geometry and commutative algebra.

Education

University of Illinois Urbana-Champaign (UIUC), Urbana, IL
Ph.D., Mathematics, May 2015
Advisor: Professor Hal Schenck
Thesis: Splines on Polytopal Complexes

Wheaton College, Wheaton, IL
B.S., Mathematics, May 2009

Academic Appointments

Oklahoma State University, Stillwater, OK
Visiting Assistant Professor August 2015 -

Publications and Preprints

14. *A homological characterization for freeness of multi-arrangements*, submitted. arXiv:1806.05295
13. *Free and Non-free Multiplicities on the A_3 Arrangement* (with C. Francisco, J. Mermin, and J. Schweig), submitted. arXiv:1609.00337
12. *Free Multiplicities on the Moduli of X_3* (with M. Wakefield), to appear in J. Pure Appl. Algebra. arXiv:1707.03961
11. *The Rees Algebra of a Two-Borel Ideal is Koszul* (with C. Francisco, J. Mermin, J. Schweig, and G. Sosa), to appear in Proc. Amer. Math. Soc. arXiv:1706.07462
10. *Inequalities for Free Multi-Braid Arrangements*, Proc. Japan Acad. Ser. A Math. Sci. 94 (2018), no. 4, 36-41. arXiv:1705.02409
9. *Dimension of Mixed Splines on Polytopal Cells*, Math. Comp. 87 (2018), no. 310, 905-939. arXiv:1411.2176
8. *Semialgebraic Splines* (with F. Sottile and L. Sun), Comput. Aided Geom. Design 55 (2017), 26-47. arXiv:1604.05947
7. *Generalized Splines and Graphic Arrangements*, J. Algebraic Combin. (2016), 1-19. arXiv:1606.03091
6. *Associated Primes of Spline Complexes*, J. Symb. Comput. (2016), 158-199. arXiv:1410.6894
5. *Splines on polytopal complexes.* Thesis (Ph.D.) University of Illinois at Urbana-Champaign (2015). 148 pp. ISBN: 978-1339-32551-4, ProQuest LLC.
4. *Lattice-Supported Splines on Polytopal Complexes*, Adv. in Appl. Math. 55 (2014), 1-21. arXiv:1312.3294
3. *Shellability and Freeness of Continuous Splines*, J. Pure Appl. Algebra. 216 (2012), 2519-2523.
2. *Asymptotic Connectivity of Hyperbolic Planar Graphs* (with P. Bahls), Discrete Math. 310 (2010), 3462-3472.
1. *On the Order of a Group Containing Nontrivial Gassmann Equivalent Subgroups*, Rose-Hulman Undergraduate Mathematics Journal 10, Issue 1 (2009).

Grants

AMS-Simons travel grant (2015-2018)
$4,000 for 3 years to support collaborative research

Dissemination of Research

Lead co-author of the package AlgebraicSplines for the computer algebra system Macaulay2. This package is currently used by several researchers, including Julianna Tymoczko, who employs this package in research with undergraduates at Smith College.

Conference Presentations

1. *Freeness of Multi-arrangements via Acyclicity* 06/2018
   Research Institute for Mathematical Sciences (RIMS), Kyoto, Japan
   Matroids, reflection groups, and free hyperplane arrangements
2. *A Homological Approach to Freeness of Multi-arrangements* 04/2018
   AMS Sectional Meeting, Boston, MA
   Special Session on Arrangements of Hypersurfaces
3. *The Toric Ring of a Two-Borel ideal is Koszul* 01/2018
   AMS-MAA Joint Mathematics Meetings, San Diego, CA
   AMS Special Session on Combinatorial Commutative Algebra and Polytopes
4. *Freeness of Multi-Coxeter Arrangements of type A* 09/2017
   AMS Sectional Meeting, Denton, TX
   Special Session on Algebraic Combinatorics of Flag Varieties
5. *Splines on planar semi-algebraic partitions* 09/2017
   AMS Sectional Meeting, Denton, TX
   Special Session on Applicable and Computational Algebraic Geometry
6. *Algebraic Methods in Spline Theory* 08/2017
   SIAM Conference on Applied Algebraic Geometry, Atlanta, GA
   Minisymposium on Multivariate Splines and Algebraic Geometry
7. *Multi-derivations on the moduli of the X_3 arrangement* 04/2017
   AMS Sectional Meeting, Pullman, WA
   Special Session on Combinatorial and Computational Commutative Algebra and Algebraic Geometry
8. *Splines on Tetrahedral Decompositions* 05/2016
   15th International Conference on Approximation Theory, San Antonio, TX
   Minisymposium on Approximation Theory and Algebraic Geometry
9. *Generalized Splines and Graphic Multi-Arrangements* 10/2015
   AMS Sectional Meeting, Chicago, IL
   Special Session on Combinatorial and Computational Algebra
10. *Piecewise Polynomials and Regularity* 04/2015
    Mathematisches Forschungsinstitut Oberwolfach, Germany
    Workshop on Multivariate Splines and Algebraic Geometry
11. *Castelnuovo-Mumford Regularity of Mixed Spline Spaces* 01/2015
    AMS-MAA Joint Mathematics Meetings, San Antonio, TX
    Session on Commutative Algebra
12. *Regularity of Planar Splines* 04/2014
    AMS Sectional Meeting, Lubbock, TX
    Special Session on Commutative Algebra and Algebraic Geometry
13. *Regularity and Piecewise Polynomial Functions* 04/2014
    KUMUNU jr, Lincoln, NE
14. *Local Properties of Splines* 03/2014
    Southwest Local Algebra Meeting, College Station, TX
    Graduate Student Poster Session
15. *Lattice-Supported Splines on Polytopal Complexes* 01/2014
    AMS-MAA Joint Mathematics Meetings, Baltimore, MD
    AMS Special Session on Hyperplane Arrangements and Applications
16. *Lattice-Supported Bases for Polyhedral Splines* 08/2013
    SIAM Conference on Applied Algebraic Geometry, Fort Collins, CO
    Session on Approximation Theory, Geometric Modeling, and Algebraic Geometry
17. *Bivariate Continuous Splines on Polyhedral Complexes* 04/2013
    14th International Conference on Approximation Theory, San Antonio, TX
    Minisymposium on Multivariate Splines
18. *Shellability and Freeness of Continuous Splines* 10/2012
    AMS Sectional Meeting, Tulane, LA
    Special Session on Approximation Theory, Geometric Modelling, and Algebraic Geometry

19. *Exploring Gassmann Triples* 01/2009
AMS-MAA Joint Mathematics Meetings
Undergraduate Student Poster Session ($100 prize)

Seminar & Colloquium Talks

1. *Commutative Algebra and Piecewise Polynomials* 02/2018
Colloquium, Marquette University, Milwaukee, WI
2. *Commutative Algebra and Approximation Theory* 01/2018
Colloquium, University of Nebraska-Lincoln, Lincoln, NE
3. *Homological Obstructions to Freeness of Multi-Arrangements* 10/2017
Geometry Seminar, Texas A&M University, College Station, TX
4. *Free Multi-Braid Arrangements and Resolutions* 03/2017
Algebra Seminar, University of Arkansas, Fayetteville, AK
5. *Dimensions of Spline Spaces and Commutative Algebra* 11/2016
Colloquium, Towson University, Towson, MD
6. *Two Tales of Freeness* 11/2016
Colloquium, US Naval Academy, Annapolis, MD
7. *Multi-Derivations of Braid Arrangements* 09/2016
Combinatorics Seminar, University of Kansas, Lawrence, KS
8. *Piecewise Polynomials and Algebraic Geometry* 04/2016
Colloquium, University of Idaho, Moscow, ID
9. *Semialgebraic Splines* 03/2016
Valley Geometry Seminar, University of Massachusetts, Amherst, MA
10. *Counting Piecewise Linear Functions* 03/2016
Center for Women in Mathematics, Smith College, Northampton, MA
11. *Commutative Algebra meets Approximation Theory* 11/2015
Numerical Analysis Seminar, Oklahoma State University, Stillwater, OK
12. *Commutative Algebra and Approximation Theory* 09/2015
Colloquium, Oklahoma State University, Stillwater, OK
13. *Splines, Syzygies, and Freeness* 09/2015
Algebra Seminar, Oklahoma State University, Stillwater, OK
14. *Regularity of Planar Splines* 09/2015
Geometry Seminar, Texas A&M University, College Station, TX
15. *Algebraic Geometry and Approximation Theory* 02/2015
Colloquium, University of South Florida, Tampa, FL
16. *Jumping Dimensions and Projecting Polytopes* 12/2014
Colloquium, Bradley University, Peoria, IL
17. *Associated Primes of Complexes Arising in Approximation Theory* 11/2014
Commutative Algebra Seminar, UIUC
18. *Castelnuovo-Mumford Regularity in Approximation Theory* 11/2014
Algebraic Geometry Seminar, UIUC
19. *Continuous Piecewise Polynomials and Static Equilibrium* 10/2014
Rose-Hulman Mathematics Seminar, Terra-Haute, IN
20. *Lehmer's Picturesque Exponential Sums with a Twist (with Daniel Schultz)* 02/2010
Number Theory Seminar, UIUC

Selected Workshops Attended

Macaulay 2 workshop on coding in the computer algebra system Macaulay2 07/2017
Berkeley, CA

CMO workshop on Ordinary and Symbolic Powers of Ideals 05/2017
Oaxaca, Mexico

Macaulay2 workshop on coding in the computer algebra system Macaulay2 05/2015
Boise, ID

MFO workshop on Multivariate Splines and Algebraic Geometry 04/2015
Oberwolfach, Germany

MSRI workshop on Combinatorial Commutative Algebra 12/2012
San Francisco, CA
IMA summer school in Applied Algebraic Geometry at Georgia Tech 06-07/2012
Atlanta, GA

Funded Awards

Bourgin Fellowship, UIUC Spring 2013
REGS Summer Fellowships, UIUC Summer 2009-2013
REU Summer Fellowships, UNC Asheville & LSU Summer 2008-2009

Conference-Specific Grants

Supported Participant 05/2017
at CMO Workshop on Symbolic and Ordinary Powers in Oaxaca, Mexico
Oberwolfach Liebniz Graduate Students grant 04/2015
to attend MFO workshop in Oberwolfach, Germany
AMS Student Travel Grant 04/2014
for presentation at AMS Sectional Meeting at Texas Tech
AMS Student Travel Grant 01/2014
for presentation at AMS-MAA Joint Mathematics Meetings
Student Travel Award 08/2013
for presentation at SIAM Conference on Applied Algebraic Geometry
Travel Award 04/2013
for presentation at 14th International Conference on Approximation Theory
Supported Participant 12/2012
at MSRI Workshop on Combinatorial Commutative Algebra
AMS Student Travel Grant 10/2012
for presentation at the AMS Sectional Meeting at Tulane
Supported Participant 06-07/2012
at IMA summer school in Applied Algebraic Geometry at Georgia Tech

Professional Service

Co-organizer (with Frank Sottile)
Minisymposium on Multivariate Splines and Algebraic Geometry at the SIAM conference on Applied Algebraic Geometry in Atlanta, GA, August 2017.
Co-organizer (with Tatyana Sorokina)
Minisymposium on Approximation Theory and Algebraic Geometry at the 15th International Conference on Approximation Theory in San Antonio, TX, May 2016.
Organizer
reading seminar on *The Geometry of Syzygies* in Fall 2011, Spring 2012
Guest Referee
Mathematische Annalen, *Constructive Approximation*, *Computer-Aided Geometric Design*, *Journal of Algebraic Combinatorics*, *Graphs and Combinatorics*, *Proceedings of 15th International Conference on Approximation Theory*
Reviewer
Zentralblatt MATH, Mathematical Reviews

Mentoring

Mentor in the Illinois Geometry Lab Spring 2014, Fall 2014
Co-led undergraduate research on minimal energy configurations of particles.
Teaching mentor for junior graduate students Fall 2013
Mentored several first-year graduate students, visited classes and offered teaching feedback.

Teaching Experience

Oklahoma State University, Stillwater, OK

Instructor for Calculus I[5]	Fall 2015, Spring 2016, Fall 2016, Fall 2017
Instructor for Introduction to Real Analysis[3]	Spring 2017

University of Illinois Urbana-Champaign, Urbana, IL

Instructor for A Mathematical World[3]	Fall 2014
Instructor for College Algebra[3,4]	Fall 2013
Head Teaching Assistant for Calculus III	Fall 2011, Spring 2012, Fall 2012[1], Spring 2015
Teaching Assistant for Calculus III[1]	Spring 2011
Merit Workshop Instructor for Calculus I[2]	Fall 2010
Teaching Assistant for Calculus II[1]	Spring 2010
Grader for Differential Equations	Spring 2010
Teaching Assistant for Calculus I	Fall 2009

[1] Appeared on the *List of Teachers Ranked as Excellent* by their students.
[2] Created worksheets for and led 2 hour group-oriented workshops twice each week.
[3] Instructor of record with full course responsibilities, including writing exams.
[4] Course intended for students of historically underrepresented backgrounds.
[5] Instructor of record with full course responsibilities, except writing exams.

Wheaton College, Wheaton, IL

Teaching Assistant for Analysis I	Fall 2008
Teaching Assistant for Algebra I	Spring 2008
Teaching Assistant for Discrete Mathematics	Spring 2007

References

Hal Schenck
Iowa State University
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Frank Sottile
Texas A&M University
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Michael Stillman
Cornell University
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