

# Curriculum Vitae

## Henry Kvinge

Office Address: Mathematics Department  
Colorado State University  
Fort Collins, CO 80523-1874

Email Address: [henry.kvinge@colostate.edu](mailto:henry.kvinge@colostate.edu)  
Homepage: <https://hkvinge.github.io>  
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### Education/Employment

- 2017 – **Postdoctoral Fellow**, Pattern Analysis Lab, Colorado State University  
2011-2017 **Ph.D. in Mathematics**, University of California, Davis.  
Advisor: Monica Vazirani.  
Thesis: *A Categorification of the Crystal Isomorphism  $B^{1,1} \otimes B(\Lambda_i) \cong B(\Lambda_{\sigma(i)})$  and a Graphical Calculus for the Shifted Symmetric Functions*  
2004-2010 **B.S. in Mathematics, B.A. in Biochemistry**, University of Washington,  
*Magna Cum Laude*  
Advisor: Sara Billey.

### Research interests

**Representation theory and combinatorics:** categorification, crystal graphs, Heisenberg categories and Kac-Moody 2-categories, symmetric groups and their generalizations, symmetric functions, connections to noncommutative probability theory.

**Data science:** Geometric data analysis, use of Grassmannian manifolds and flag manifolds in data analysis and machine learning, dimensionality reduction methods, hyperspectral imaging, compressive sensing, GPU computing.

### Publications and preprints

#### Representation theory and combinatorics:

- Henry Kvinge, Can Ozan Oguz, and Michael Reeks, *The center of the twisted Heisenberg category, factorial Schur  $Q$ -functions, and transition functions on the Schur graph* (submitted) arXiv:1712.09626 (2017).

Extended abstract to appear in Proceedings of the 30th International Conference on Formal Power Series and Algebraic Combinatorics, Sminaire Lotharingien de Combinatoire, June 2018.

- Henry Kvinge, Anthony Licata, and Stuart Mitchell *Khovanov's Heisenberg category, moments in free probability, and shifted symmetric functions*, (Submitted) arXiv:1610.04571 (2016).

Extended abstract in Proceedings of the 29th International Conference on Formal Power Series and Algebraic Combinatorics, Sminaire Lotharingien de Combinatoire, 78B.63 (2017), 12 pp.

- Henry Kvinge and Monica Vazirani, *Categorifying the tensor product of the Kirillov-Reshetikhin crystal  $B^{1,1}$  and a fundamental crystal*, Algebras and representation theory (2017) pp. 1-55.

Extended abstract in Proceedings of the 28th International Conference on Formal Power Series and Algebraic Combinatorics, Discrete Math. Theor. Comput. Sci. Proc. (2016), pp. 719-730.

#### Geometric data analysis:

- Henry Kvinge, Elin Farnell, Michael Kirby and Chris Peterson, *Too many secants: a hierarchical approach to secant-based dimensionality reduction on large data sets*, (Submitted).
- Henry Kvinge, Elin Farnell, Michael Kirby and Chris Peterson, *A GPU-Oriented Algorithm Design for Secant-Based Dimensionality Reduction*, ISPDC 2018 17th IEEE International Symposium on Parallel and Distributed Computing, (2018).

- Elin Farnell, Henry Kvinge, Michael Kirby and Chris Peterson, Endmember Extraction on the Grassmannian, (DSW 2018) 2018 IEEE Data Science Workshop, (2018).

### Grants and fellowships

- 2017 Travel grant to speak at the Formal Power Series and Algebraic Combinatorics (FPSAC) Conference.
- 2016 Travel grant to present a poster at the Formal Power Series and Algebraic Combinatorics (FPSAC) Conference.
- 2015 Travel Grant to speak at AMS Fall Sectional at Loyola University
- 2013 Graduate Assistance in Areas of National Need Fellowship (summer)
- 2012 NSF VIGRE Fellowship (summer)

### Selected talks

- 2018 June, Conference: Interactions of quantum affine algebras with cluster algebras, current algebras and categorification  
*Heisenberg categories, towers of algebras, and symmetric functions*
- 2018 May, University of Washington Combinatorics Seminar  
*Symmetric functions, towers of algebras, and Heisenberg categories*
- 2018 May, University of Colorado Algebraic Lie Theory Seminar  
*Symmetric functions, towers of algebras, and centers of Heisenberg categories*
- 2018 March, Pacific Northwest Combinatorics Day  
*Centers of Heisenberg categories, symmetric functions, and the combinatorics of induction/restriction functors*
- 2017 October, University of Colorado Algebraic Lie Theory Seminar  
*The Kirillov-Reshetikhin crystal  $B^{1,1}$  and cyclotomic quiver Hecke algebras*
- 2017 September, University of Virginia Algebra Seminar  
*Khovanov's Heisenberg category, the asymptotic representation theory of symmetric groups, and shifted symmetric functions*
- 2017 September, Rocky Mountain Combinatorics Seminar - Colorado State University  
*Khovanov's Heisenberg category, moments in free probability, and shifted symmetric functions*
- 2017 July, Formal Power Series and Algebraic Combinatorics Conference (FPSAC), London  
*Khovanov's Heisenberg category, moments in free probability, and shifted symmetric functions*
- 2016 October, AMS Sectional - University of St. Thomas, Minneapolis (invited talk)  
Special Session on Combinatorial Representation Theory  
*A surprising connection between Khovanov's Heisenberg category and the asymptotic representation theory of symmetric groups.*
- 2016 September, Arizona State University Discrete Math Seminar  
*A graphical calculus for the shifted symmetric functions.*
- 2016 March, University of Oregon, Algebra Seminar  
*The influence of the Kirillov-Reshetikhin crystal  $B^{1,1}$  on the structure of simple cyclotomic KLR modules.*
- 2016 February, University of Washington, Algebra and Algebraic Geometry Seminar  
*The influence of the KR crystal  $B^{1,1}$  on the structure of simple cyclotomic KLR modules.*
- 2016 January, UC Berkeley (invited talk)  
Berkeley/Davis Combinatorics Gathering  
*The influence of the KR crystal  $B^{1,1}$  on the structure of simple cyclotomic KLR modules.*
- 2015 October, AMS Sectional - Loyola University, Chicago (invited talk)  
Special Session on Combinatorial and Geometric Representation Theory  
*The influence of the KR crystal  $B^{1,1}$  on the structure of simple cyclotomic KLR modules.*

2015 October, UC Davis Algebra and Discrete Math Seminar

*The influence of the KR crystal  $B^{1,1}$  on the structure of simple cyclotomic KLR modules.*

2013 September, Arizona State University Discrete Math Seminar

*The Okounkov-Vershik approach to the representation theory of the symmetric group*

### Poster presentations

2017 December, Future Directions in Representation Theory, University of Sydney

*The center of the twisted Heisenberg category, factorial Schur  $P$ -functions, and up/down transition functions on the Schur graph*

2016 July, Formal Power Series and Algebraic Combinatorics Conference (FPSAC), UBC

*Categorifying the tensor product of the KR crystal  $B^{1,1}$  and a fundamental crystal*

2016 June, US-Mexico Conference on Representation Theory, Categorification, and Noncommutative Algebra, USC

*Khovanov's Heisenberg category and the asymptotic representation theory of symmetric groups*

### Teaching activities

Courses taught at UC Davis

2016 Summer Combinatorics (Math 145)

2015 Winter Calculus for Biology and Medicine (Math 17B)

Discussion sections led at UC Davis as a teaching assistant

2017 Spring Calculus (Math 21A)

2017 Winter Calculus (Math 21A)

2016 Fall Calculus (Math 21A)

2016 Spring Calculus (Math 21C)

2016 Winter Calculus (Math 21A)

2015 Fall Calculus (Math 21A)

2015 Spring Euclidean Geometry (Math 141)

2014 Fall Vector Analysis (Math 21D)

2012 Spring Calculus (Math 21C)

2012 Winter Calculus (Math 21B)

2011 Fall Linear Algebra (Math 22A)

2011 Fall Calculus for Biology and Medicine (Math 17A)

**Management Positions**

- 2012 – 2014    Managed the UC Davis Calculus Rooms. This involved staffing the rooms with the ~30 teaching assistants who worked there, handling student feedback, acting as a liaison between teaching assistants and the department staff, and generally finding ways to make this resource more useful to students.

**Service**

- 2013 – 2016    Graduate mentor for the Women in Science and Engineering (WISE) Mentoring Program. WISE Mentoring Program aims to further gender equity in the fields of science, technology, engineering, and mathematics (STEM) by providing a supportive, gender positive environment in which students work together with mentors to achieve their academic and professional goals.
- 2011– 2016    Volunteer math tutor for STEM Café (formally known as Math Café), a tutoring center that serves women and other underrepresented groups in math. STEM Café provides a supportive and non-competitive study environment for women in the STEM fields. It involves weekly evening meetings, two hours in length, where members gather to study and do homework in groups.