Jackson Van Dyke

University of Texas, Austin
Department of Mathematics,
PMA 11.156
2515 Speedway, Stop C 1200
Austin, Texas 78712-1202

Phone: (952) 818-9448
Email: jacksontvandyke@utexas.edu
Homepage: math.utexas.edu/users/vandyke

Education

UT Austin 2019-Present
Ph.D. in Mathematics

UC Berkeley 2015-2019
B.A. in Mathematics
Honors thesis title: Non-sectorial gluing of Fukaya categories

Interests

Mirror symmetry (2d and 3d), algebraic geometry (derived and categorical), category theory, symplectic geometry, low-dimensional topology, geometric Langlands.

Honors and Awards

Frank Gerth III teaching excellence awards: Fall 2019-Spring 2020
Departmental awards which are "given each year to students who are proven teaching assistants or assistant instructors."

NSF Graduate Research Fellowship Program: Spring 2020
Honorable Mention

Dean's Honors List - College of Letters and Science:
UC Berkeley Spring 2018-2019
The Dean's Honors List recognizes outstanding academic achievement each fall and spring semester. To earn Dean's Honors for a semester, the criteria are: (1) 13 or more letter-graded units that semester, and (2) semester GPA in the top 10% of L&S undergraduates.

International Dean's Summer Scholarship:
University College London Summer 2017
I spent the summer of 2017 doing research under Professor Michael Singer with support from the International Dean's Summer Scholarship from UCL. This is analogous to an REU opportunity in the United States.

Research Experience

Rozansky-Witten theory and the metaplectic anomaly
UT Austin Fall 2019-Present
Under the guidance of Professor David Ben-Zvi, I have been thinking about Rozansky-Witten theory. Specifically about the details involved in extending it down to a point. Some specific things I work with are sheaves of categories, anomalies, and higher gerbes.

Undergraduate senior thesis:
UC Berkeley Fall 2018, Spring 2019
Under the guidance of Professor Vivek Shende, I used microlocal sheaf theory, homotopy theory, and other tools to study certain symplectic manifold arising in low-dimensional topology. This resulted in two works in preparation [5, 6].

Research project on Dean's Scholarship:
University College London Summer 2017
I was awarded the Dean's Summer Scholarship at UCL for the summer of 2017. **This opportunity was effectively equivalent to an REU.** I completed a research project under the supervision of Professor Michael Singer investigating the asymptotic behavior of partial density functions on hermitian line bundles. My particular work primarily involved Kähler geometry and complex analysis, and resulted in some original contributions [3].

Fission Reaction Event Yield Algorithm:
Lawrence Berkeley National Laboratory Spring 2017 - Present
Over the past year I have worked on developing an analysis methodology that allows us to fix the parameters in the fission simulator FREYA.

Publications

[1] Antonio Alfieri and Jackson Van Dyke, *An introduction to knot Floer homology and curved bordered algebras*, arXiv e-prints (2018), arXiv:1811.07348.

[2] J. Van Dyke, L.A. Bernstein, and R. Vogt, *Parameter optimization and uncertainty analysis of freyafor spontaneous fission*, Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment **922** (2019), 36 – 46.

[3] J. Ross, M. Singer, and J. Van Dyke, *Asymptotics of partial density functions*, In preparation. 2

[4] A. Schmah, N. Buechel, S. Garrett, M. Lomnitz, X. Sun, J. Van Dyke, J. Xu, and J. Zhang, *Radiation Hardness Test of Eljen EJ-500 Optical Cement*, ArXiv e-prints (2017).

[5] J. Van Dyke, *The Fukaya category of some objects in low-dimensional topology*, In preparation (2019). 2

[6] ———, *Non-sectorial gluing of fukaya categories*, In preparation (2019). 2

Teaching Experience

Assistant instructor (IBL format): **Topology I**
University of Texas, Austin **Fall 2020**
This course implemented the **inquiry based learning (IBL)** method. This is a successful contemporary teaching technique which is particularly well-represented at UT. The class was separated into two halves, which would meet separately. I taught one half, and the other assistant taught the other half. **My responsibilities included:** independently holding class over Zoom, grading exams, and managing an IBL-based in-class discussion every day. Throughout the semester our IBL-style teaching techniques improved with the help of Professor Michael Starbird and many other IBL-related resources at UT.

Teaching assistant: **Multivariable Calculus, Series, Sequences**
University of Texas, Austin **Fall 2019, Spring 2020**
I held section, wrote and administered quizzes, graded assignments, and held office hours.

Undergraduate Student Instructor: **Calculus, ODEs, Linear Algebra**
University of California, Berkeley **Fall 2018**
I held section, wrote and administered quizzes, graded assignments, and held office hours.

Summer Program in Nuclear Physics:
University of Oslo, Oslo, Norway **May 2017**
I helped developed the curriculum for, and teach a course concerning the physics of nuclear fission and our ability to model it. This happened in conjunction with my research in theoretical nuclear physics developing the fission event algorithm FREYA.

Outreach

Sunday Morning Math Group:
UT Austin Spring 2021-Present
I began running the Sunday Morning Math Group (SMMG) in Spring 2021. The SMMG is a UT sponsored outreach program aimed at junior high and high school students. The AMC and AIME exams are also hosted by the SMMG. My responsibilities include organizing and hosting 6-8 public "general sessions" for the community, organizing the AMC and AIME, returning exam scores, and other miscellaneous organizational responsibilities. Note that I took and held this position during the COVID-19 pandemic, meaning I had the extra experience of arranging an online version of all of the above events.
Directed reading program:
UT Austin Fall 2019-Present
Each semester since starting my Ph.D. at UT I have mentored an undergraduate through the directed reading program (DRP). The DRP is an RTG program of the Department of Mathematics at the University of Texas at Austin. DRP pairs undergraduate students with graduate student mentors to undertake independent projects in mathematics. So far, I have mentored three students who completed high-level projects by the end of the semester.

Seminars organized

Jr. Geometry seminar
UT Austin Spring 2021

Talks Given

Chromatic Homotopy Theory Seminar
UT Austin Spring 2021

Geometric Representation Theory Seminar
UT Austin Fall 2020, Spring 2021

Junior Geometry Seminar
UT Austin Spring 2020, Fall 2020, Spring 2021

Basic algebraic geometry seminar
UT Austin Spring 2020, Fall 2020, Spring 2021

Junior Geometry and String Theory Seminar
UT Austin Fall 2019, Spring 2020, Fall 2020, Spring 2021

Triangulation conjecture Seminar
UT Austin Fall 2019

Scholarship Project Presentation
University College London August 2017

University Program Review (UPR) Presentation
University of Michigan, Ann Arbor June 2018

Nuclear Fission Conference (NA22 collaboration):
Santa Fe, NM March 2017

Conferences Attended

New Perspectives in Gromov-Witten Theory:
IMJ-PRG, Sorbonne Universit, Paris June 3 - June 7, 2019

Princeton Summer School in Low-dimensional Topology and Symplectic Geometry:
Princeton University, Princeton, NJ June 11 - June 29, 2018

Enumerative Geometry Beyond Numbers:
MSRI, Berkeley CA January 22, 2018 - January 26, 2018

Skills

Type-setting: I have been typesetting all of my assignments and notes with LaTeX for multiple years. I take a large majority of my notes in real time.

Computer science: High level: Python, Low-level: C++, fortran, bash. I have also worked extensively with clusters and techniques such as parallel processing for working with computationally intensive projects. Specifically I have had experience with both computational geometry and analysis of large data sets.