Jordy Lopez ACT2019 Application

- A document with:
  - An explanation of any relevant background you have in category theory or any of the specific projects areas

My category theory background is based on reading the CT articles in the Math3ma blog of Tai-Danae Bradley; however, as for research experience, I am grateful of having the opportunity to produce new developments in mathematics. I attended The University of Texas Rio Grande Valley (UTRGV) in Brownsville, Texas, and my Master thesis, advised by Dr. Paul-Hermann Zieschang, contains original work where I found four hypergroups (up to isomorphism) that arise from association schemes. Besides my thesis course, I also took the Graduate Math Project capstone, advised by Dr. Alexey Glazyrin, and surveyed the Baker-Campbell-Hausdorff Formula of Lie Theory. During the Fall 2018 semester at UTRGV, Dr. Oleg Musin and I co-advised math projects for two senior math majors: they created posters on the Isoperimetric Problem of Polyhedra and Two-Distance sets, respectively. Dr. Musin and I are currently co-advising seven students this Spring 2019 semester.

  - The date you completed or expect to complete your Ph.D and a one-sentence summary of its subject matter.

    I currently work as a lecturer at The University of Texas Rio Grande Valley in Brownsville, Texas (USA), and as a math teacher at Valley Christian High School in the same city. Nonetheless, I am currently applying to doctorate programs in Mathematics to start in Fall 2019. I recently received admission to the Mathematics Ph. D. Program at Texas A&M University in College Station, TX, and I am applying to the Mathematics DPhil program at Oxford University.

    I expect to complete by Ph. D. on May 2023 and my dissertation interests are in Buildings, Category Theory, Representation Theory, Algebraic Topology and Homological Algebra.

  - Order of project preference (top=most preferred)

    -Toward a mathematical foundation for autopoiesis

-Formal and experimental methods to reason about dialogue and discourse using categorical models of vector spaces

-Partial evaluations, the bar construction, and second-order stochastic dominance

- To what extent can you commit to coming to Oxford (availability of funding is uncertain at this time)

  Yes, I am available to go to Oxford on the Summer dates July 22-26, 2019.

Statement of Purpose

I am interested in the ACT2019 School because I would like to explore the applications of category theory in fields different from mathematics, particularly in semantics, autopoiesis and partial evaluations. The School can contribute to my research goals because I plan to involve category theory in my mathematics dissertation and/or minor thesis. Currently, my research interests are Hypergroups, Buildings, Representation Theory, Category Theory, Algebraic Topology and Homological Algebra.

After completion of the doctorate in math, I plan to pursue a post-doctorate position and then a professor appointment to continue exposing and encouraging undergraduate students to study modern mathematics. The ACT2019 School can help me in my career my broadening my mathematical interests to employ category theoretic notions in linguistics and the arts. As an Art minor, I would like to apply category theoretic notions to the visual arts and color theory.

Thank you for reading my application, I hope to be a potential student of the Applied Category Theory 2019 School. Please do not hesitate to contact me at jordy.c.lopez01@utrgv.edu or cheyem_27@hotmail.com.

Thank you for your time, God bless you!

Jordy Lopez

Jordy Cheyem Lopez Garcia

Curriculum Vitae

Personal Information

Address: 1900 University Boulevard Apt. 1-E
Brownsville, Texas 78520, United States
Telephone: +1 956 335 7101
E-mail: university: jordy.c.lopez01@utrgv.edu personal: cheyem_27@hotmail.com

Place of Birth: Matamoros, Tamaulipas, Mexico
Date of Birth: 27^{th} August 1993

Current Position

09/2016–to date **Lecturer I**, *The University of Texas Rio Grande Valley*, Brownsville TX, USA.
Taught a variety of courses (see Courses Taught Section)

08/2016–to date **High School Teacher**, *Valley Christian High School*, Brownsville TX, USA.
Taught Dual Enrollment College Algebra, Advanced Math, Algebra II and volunteered to teach Oil Painting

09/2017–to date **Sunday School Teacher Volunteer**, *Restauracion y Poder Church*, Brownsville TX, USA.
Bible Teacher for Migrant Children

Education

01/14–05/16 **Master of Science in Mathematics**, *The University of Texas Rio Grande Valley*, Brownsville, Texas, *GPA 4.00/4.00*.
Thesis: *On Hypergroups of Order at Most 6*

Relevant Coursework

MATH 7300: Thesis I and MATH 7301: Thesis II.

MATH 6391: Master's Project, *Textbook: Lie Groups, Lie Algebras and Representations, An Elementary Introduction*, Author: Brian C. Hall.

MATH 6352: Analysis I, *Textbook: Real Analysis and Foundations (3rd Edition)*, Author: Steven G. Krantz.

MATH 6330: Linear Algebra, *Textbook: Linear Algebra*, Author: Serge Lang.

MATH 5339: Topology, *Textbook: Topology (2nd Edition)*, Author: James Munkres.

MATH 5323: Group Theory, *Lecture Notes*, Author: Paul-Hermann Zieschang.

MATH 5331: Contemporary Geometry, *Lecture Notes*, Author: Oleg Musin.

MATH 5321: Abstract Algebra, *Lecture Notes*, Author: Paul-Hermann Zieschang.

MATH 5329: Number Theory, *Lecture Notes*, Author: Paul-Hermann Zieschang.

08/11–05/16 **Bachelor of Science in Mathematics**, *The University of Texas Rio Grande Valley*, Brownsville,Texas, *GPA 3.94/4.00*.
Summa Cum Laude and Minor in Art

Relevant Coursework

MATH 3341: Real Analysis, *Textbook: Real Mathematical Analysis*, Author: Charles Chapman Pugh.

MATH 3339: Topology, *Textbook: Topology*, Author: James Munkres.

MATH 4342: Complex Analysis, *Textbook: A First Course in Undergraduate Complex Analysis*, Author: Richard Spindler.

MATH 3331: Geometry I, *Textbook: Euclidean and Transformational Geometry*, Author: Shlomo Libeskind.

MATH 4321: Advanced Topics in Algebra: Algebra II (Galois Theory), *Lecture Notes*, Author: Paul-Hermann Zieschang.

MATH 3349: Differential Equations, *Textbook: Elementary Differential Equations and Boundary Value Problems (8th edition)*, Author: William E. Boyce and Richard C. DiPrima.

MATH 3306: Foundations of Mathematics, *Textbook: The Foundations of Mathematics*, Author: Thomas Q. Sibley.

MATH 3321: Algebra I, *Lectures Notes*, Author: Paul-Hermann Zieschang.

MATH 2318: Linear Algebra, *Textbook: Linear Algebra with Applications (5th edition)*, Author: Gareth Williams.

MATH 3381: Statistics, *Textbook: Probability and Statistics for Engineering anf the Sciences*, Author: Jay L. Devore.

MATH 2305: Discrete Mathematics, *Lecture Notes*, Author: Paul-Hermann Zieschang.

MATH 2413, 2414, 2415: Calculus I, II, III (respectively), *Textbook: Calculus* , Author: Robert Smith and Roland Minton.

09/13–06/15 **Worship Music Certificate**, *Instituto de Musica Alabanza Total*, Brownsville, Texas.

08/07–05/11 **High School Diploma**, *Valley Christian High School*, Brownsville, Texas, GPA 98.82/100.00.
Valedictorian

08/00–07/14 **Visual Arts Practice**, *Academia de Artes Visuales*, Matamoros, Tamps., Mexico.

Publication

Lopez, Jordy C., On Hypergroups of Order at Most 6. Master of Science (MS), May, 2016, 38 pp., 51 tables, references, 8 titles.

Work Experience

02/17–05/17 **Adjunct Instructor**, *Texas Southmost College*, Brownsville TX, USA, I taught Dual Enrollment College Algebra at Valley Christian High School.

09/15–05/16 **Graduate Teaching Assistant**, *The University of Texas Rio Grande Valley*, Brownsville TX, USA, As a GTA, I proctored exams, graded papers and tutored.

06/15–08/15 **College of Sciences Graduate Assistant**, *The University of Texas Rio Grande Valley*, Brownsville TX, USA.
I created the MathJax code for a pool of questions for Math Education courses.

09/14–05/15 **Teaching Assistant**, *The University of Texas at Brownsville*, Brownsville TX, USA, I proctored exams, graded papers and tutored.

07/14–08/14 **College of Sciences Tutor**, *The University of Texas at Brownsville*, Brownsville TX, USA.
I tutored students in a Precalculus JumpStart course and held two workshops prior to their exams. Additionally, I held an Algebra II workshop for high school students of the Math and Science Academy of UT Brownsville.

01/14–05/14 **Title V Calculus Tutor**, *The University of Texas at Brownsville*, Brownsville TX, USA.
Certified CRLA Level 1. I held weekly workshops for Calculus I students.

08/13–12/13 **Learning Enrichment Tutor**, *The University of Texas at Brownsville*, Brownsville TX, USA, I tutored a variety of courses ranging from College Algebra to Calculus.

08/12–05/13 **Teaching Assistant**, *The University of Texas at Brownsville*, Brownsville TX, USA, I tutored a variety of courses ranging from College Algebra to Calculus.

03/12–05/12 **Instructor Assistant**, *The University of Texas at Brownsville*, Brownsville TX, USA.
I created pools of problems of Elementary Statistics and monitored the Facebook page of the Math Department of UT Brownsville.

Courses Taught

- Math Project(co-advisor)
- Calculus I
- Precalculus
- Fundamentals of Mathematics I
- Elementary Statistical Methods
- Math for Liberal Arts
- Calculus II
- College Algebra
- Fundamentals of Mathematics II
- Pre-Statistics

Courses Tutored

- College Algebra
- Precalculus
- Calculus II
- Statistics
- Modern Algebra
- Real Analysis
- Graduate Analysis I
- Graduate Complex Analysis
- Contemporary Mathematics
- Calculus I
- Calculus III
- Linear Algebra
- Discrete Mathematics
- Point-Set Topology
- Graduate Linear Algebra
- Graduate Algebra I

Advised Math Projects

05/12/18 **Poster: The Isoperimetric Problem of Polyhedra by Aldo Gonzalez**, *The University of Texas Rio Grande Valley*, I co-advised the project with Dr. Oleg Musin.

05/12/18 **Poster: Two-Distance Sets by Jessica Juarez**, *The University of Texas Rio Grande Valley*, I co-advised the project with Dr. Oleg Musin.

Presentations

May 2016 **The Baker-Campbell-Hausdorff Formula**, *The University of Texas Rio Grande Valley*, Master Project Capstone, Brownsville,Texas.

April 2016 **On Hypergroups of Order at Most 6**, *The University of Texas Rio Grande Valley*, Thesis Defense, Brownsville,Texas.

Spring 2015 **Hypergroups and Buildings 2**, *The University of Texas at Brownsville*, Pure Math Seminar, Brownsville,Texas.

Spring 2015 **Hypergroups and Buildings 1**, *The University of Texas at Brownsville*, Pure Math Seminar, Brownsville,Texas.

Spring 2013 **On Galois Theory**, *The University of Texas at Brownsville*, Algebra Day, Brownsville,Texas.

Public Lectures Attended

Spring 2017 **"Elementary Billiard Technique Applied in Convex and Symplectic Geometry" by Alexey Balitskiy (MIT)**, *Convention Center of South Padre Island, TX. The talk was part of the Ninth Discrete Geometry and Algebraic Combinatorics Conference hosted by the UTRGV School of Mathematics and Statistical Sciences.*

Spring 2017 **"The World in a Grain of Salt" by Dr. Marjorie Senechal (Smith College)**, *The lecture opened the Ninth Discrete Geometry and Algebraic Combinatorics Conference hosted by the UTRGV School of Mathematics and Statistical Sciences.*

Fall 2015 **"Enumeration of Ribbon and Mobius Graphs with Real, Complex, and Quaternionic Gaussian Random Variables" by Virgil Pierce, Ph. D.**, *Pure Math Seminar of the UTRGV School of Mathematics and Statistical Sciences.*

Spring 2014 **"Straight Line Motion with Rigid Sets" by Dr. Luis Montejano Peimbert (UNAM)**, *Sixth Discrete Geometry and Algebraic Combinatorics Conference hosted by the UT Brownsville Math Department.*

Spring 2013 **"Voting in Agreeable Societies" by Dr. Francis Edward Su (Harvey Mudd College)**, *Fifth Discrete Geometry and Algebraic Combinatorics Conference hosted by the UT Brownsville Math department .*

Honors and Awards

08/11–05/16 **BS Summa Cum Laude**, *The University of Texas Rio Grande Valley.*

01/15–05/16 **Baptist Student Ministry member**, *The University of Texas Rio Grande Valley*, Volunteered in several community events and gave a talk on the life of King David from the Bible.

01/14–05/16 **4+1 BS/MS in Math**, *The University of Texas Rio Grande Valley.*

08/11–05/16 **Scorpion Scholar**, *The University of Texas at Brownsville*, I received full financial support for the Bachelor degree and part for the Master degree in Mathematics.

08/11–05/14 **Scholastic Excellence Award in Mathematics**, *The University of Texas at Brownsville*, Academic Achievement in the Mathematics Department.

05/14 **Student Juried Show Exhibitor**, *The University of Texas at Brownsville.*

08/13–05/14 **Chi Alpha member**, *The University of Texas at Brownsville.*

08/13–12/13 **College Reading and Learning Association Level 1**, *The University of Texas at Brownsville/Texas Southmost College*.

08/11–05/12, 05/13 **President's List**, *The University of Texas at Brownsville/Texas Southmost College*.

08/12–12/12 **Dean's List**, *The University of Texas at Brownsville/Texas Southmost College*.

01/12–05/12 **Provost Essay Finalist**, *The University of Texas at Brownsville/Texas Southmost College*, My essay on why Mexican-Americans cheer the Mexican soccer team when playing the US Team got to the finalist category.

05/11 **Paul Hanson Memorial Spiritual Leadership Award**, *Valley Christian High School*.

05/11 **Valedictorian**, *Valley Christian High School*.

05/11 **Distinguished Lecture Series Essay finalist**, *The University of Texas at Brownsville/Texas Southmost College*, Toms Shoes founder Blake Mycoskie selected my essay on the importance of giving to be in the finalist tier.

08/10–05/11 **Student Council President**, *Valley Christian High School*.

08/10–05/11 **Brownsville Jr. Leadership member**, *City of Brownsville, Texas, USA*, Hosted the "We CAN Rock Brownsville" concert to collect non-perishable items to give to families in need in the border cities of Matamoros, Mexico and Brownsville, USA.

Languages

Spanish	Mother Tongue
English	Fluent
French	Basic

Computer skills

Typeset	LaTeXand Beamer *I create articles, assignments and presentations using TeXshop, Overleaf, TeXworks, Schoology*
MS Office	Outlook, Word, Excel, Powerpoint, OneNote, OneDrive, Forms, Lens
Google	Gmail, Drive, Docs, Sheets
Learning Platforms	Blackboard, Schoology, ALEKS, Alta, Quizlet Live, Factile
Graphical	Geogebra, Desmos, Adobe Photoshop

References

- Dr. Paul-Hermann Zieschang
  Professor, Habilitation
  School of Mathematics and Statistical Sciences
  The University of Texas Rio Grande Valley
  Edinburg, Texas 78539-2999
  Phone: +1 (956) 665-7063
  Email: paulhermann.zieschang@utrgv.edu

- Dr. Alexey Glazyrin
  Associate Professor
  School of Mathematics and Statistical Sciences
  The University of Texas Rio Grande Valley
  Brownsville, Texas 78520
  Phone: +1 (956) 882-6610
  Email: alexey.glazyrin@utrgv.edu

- Dr. Jerzy Mogilski
  Associate Director
  School of Mathematics and Statistical Sciences
  The University of Texas Rio Grande Valley
  Brownsville, Texas 78520
  Phone: +1 (956) 882-6628
  Email: jerzy.mogilski@utrgv.edu

- Dr. Oleg Musin
  Professor
  School of Mathematics and Statistical Sciences
  The University of Texas Rio Grande Valley
  Brownsville, Texas 78520
  Phone: +1 (956) 882-6627
  Email: oleg.musin@utrgv.edu

Relevant Coursework

Jordy Cheyem Lopez Garcia
The University of Texas Rio Grande Valley

Some courses have maximum possible grade A and others A+. The reason is because UT Brownsville had a grading system that included +/-; however, once UT Brownsville merged with UT Pan-American to form UTRGV, the grading system became letters only. I have specified which courses have as maximum grade A or A+.

Graduate Courses

The following courses have A as maximum grade.

MATH 7300: Thesis I and MATH 7301: Thesis II,
Original work on Hypergroup classification, advised by Dr. Paul-Hermann Zieschang.
Grade received on both sections: A.

MATH 6391: Master's Project, Textbook: *Lie Groups, Lie Algebras and Representations, An Elementary Introduction*, Author: Brian C. Hall.
Master Project that surveyed the Baker-Campbell-Hausdorff Formalua of Lie Theory.
Grade: P (passed...not only graded as passed or not passed).

MATH 6352: Analysis I, Textbook: *Real Analysis and Foundations* (3rd Edition), Author: Steven G. Krantz.
Topics include metric spaces, sequences, limits, continuity, function spaces, series, differentiation and the Riemann integral.
Grade: A.

MATH 6330: Linear Algebra, Textbook: *Linear Algebra*, Author: Serge Lang.
Topics include the proof-based theory of matrices, determinants, vector spaces, linear spaces, linear transformations and their matrix representations, linear systems, linear operators and eigenvalues and eigenvectors.
Grade: A.

The following courses have A+ as maximum grade.

MATH 5346: Functional Analysis, Textbook: *Introductory Functional Analysis with Applications*, Author: Erwin Kreyszig.
Topics include: Metric Spaces, Banach Spaces, Hilbert Spaces, Fundamental Theorems for Banach Spaces (Uniform Boundedness Principle, Open Mapping Theorem, Closed Graph Theorem) and Applications.
Grade: A+.

MATH 5341: Measure and Integration, Textbook: *Real Analysis for Graduate Students*, Author: Richard Bass.
Topics include: Measures, Measurable sets and functions, Lebesgue Integral and its Properties, Limit Theorems, Riemann Integral, Types of Convergence, Product Measures and Signed Measures.
Grade: A+.

MATH 5339: Topology, Textbook: *Topology* (2nd Edition), Author: James Munkres.
Topics include: Topological Spaces and Continuous Functions, Connected Spaces, Connected Subspaces of the Real Line, Components and Local-Connectedness, Compact Spaces, Compact Subspaces of the Real Line, Limit Point Compactness, Homotopy of Paths, the Fundamental Group, Covering Spaces, the Fundamental Group of a Circle, Retractions and Fixed Points and the Fundamental Theorem of Algebra.
Grade: A+.

MATH 5323: Group Theory, *Lecture Notes*, Author: Paul-Hermann Zieschang.
Topics include: Lagrange's Theorem on finite groups, the Homomorphism Theorem and Second Isomorphism Theorem for groups, Sylow's Theorems on finite groups, the Theorem of Schur-Zassenhaus, Wielandt's Theorem on Subnormal Subrgroups, the Fundamental Lemma for finite groups, the Thompson-Wielandt Theorem, Thompson's $p \times q$ -Lemma, the Hall-Higman Theorem, and Burnside's Theorem on finite groups of order $p^{\alpha}q^{\beta}$.
Grade: A+.

MATH 5331: Contemporary Geometry, *Lecture Notes*, Author: Oleg Musin.
Topics include: Introduction to computational geometry, Voronoi diagrams, Delaunay triangulations and their applications, plane curves and curvatures, surfaces, planar and space combinatorial geometry, the Euler characteristic, regular and convex polytopes and polyhedrons.
Grade: A.

MATH 5321: Abstract Algebra, *Lecture Notes*, Author: Paul-Hermann Zieschang
Topics include: Polynomial rings over a field and finite field extensions.
Grade: A+.

MATH 5329: Number Theory, *Lecture Notes*, Author: Paul-Hermann Zieschang.
Topics include: Basic theorems of Fermat, Euler, and Wilson, quadratic number fields, the ring of the Gaussian integers, Pythagorean triples, Fermats Theorem for multiples of 3 and 4, the Theorem of Sophie Germain and the Gauss quadratic reciprocity law.
Grade: A.

Undegraduate Courses

The following courses have A+ as maximum grade.

MATH 3341: Real Analysis, Textbook: *Real Mathematical Analysis*. Author: Charles Chapman Pugh.
Topics include: sequences, series, limits, continuity, derivatives and Riemann integration.
Grade: A.

MATH 3339: Topology, Textbook: *Topology* (2nd edition). Author: James Munkres.
Topics include: a study of metric spaces, separation axioms, topological spaces, and topological properties of point sets and mappings.
Grade: A.

MATH 4342: Complex Analysis, *Lecture Notes*. Author: Richard Spindler (UW-Eau Claire).
Topics include: Complez numbers and their algebraic properties, analytic functions and elementary complex functions.
Grade: A+.

MATH 3331: Geometry I, Textbook: *Euclidean an Transformational Geometry*. Author: Shlomo Libeskind.
Topics include: axiomatic introduction into Geometry, area and the Pythagorean theorem, geometry of a triangle, polygons, isometry, similarity, and transformational geometry.
Grade: A.

MATH 4321: Advanced Topics in Algebra: Algebra II, *Lecture Notes*. Author: Paul-Hermann Zieschang.
Topics include: General Galois correspondence and its applications to monoids and automorphism groups, ring homomorphisms and ring automorphisms, integral and transcendental elements, the minimal polynomial of an algebraic element, roots, splitting fields of polynomials, normality, separability and galois subfields.
Grade: A.

MATH 3349: Differential Equations, Textbook: *Elementary Differential Equations and Boundary Value Problems* (8th edition). Author: William E. Boyce and Richard C. DiPrima.
Topics include: first-order and linear second-order differential equations, Laplace transforms, power series solutions and first order linear systems. Grade: A.

MATH 3321: Algebra I, *Lecture Notes*. Author: Paul-Hermann Zieschang.
Topics include: Lagranges Theorem on finite groups, the Homomorphism Theorem and the Isomorphism Theorem for groups and rings, Sylows Theorems on finite groups, and the theorems that euclidean rings are principal ideal domains and that principal ideal domains are unique factorization domains.
Grade: A+.

MATH 2318: Linear Algebra, Textbook: *Linear Algebra with Applications* (5th edition). Author: Gareth Williams.
Topics include: systems of linear equations, matrices and their algebraic properties, determinants, vectors, Euclidean n-space, linear transformations and their matrix representations, vector spaces, eigenvalues and eigenvectors and applications to the sciences and business.
Grade: A.

The following courses have A as maximum grade.

MATH 3381: Statistics. Textbook: *Probability and Statistics for Engineering and the Sciences*. Author: Jay L. Devore
Topics include: Probability, Discrete Random Variables, Probability Distributions, Continuous Random Variables, Random Samples, Point Estimation, Statistical Intervals, Hypotheses Testing, Regression and Correlation.
Grade: A.

Professor Oleg R. Musin
School of Mathematical and Statistical Sciences
University of Texas Rio Grande Valley
One West Blvd.
Brownsville, TX, 78520, USA
phone: (956)-882-6627
fax: (956)-882-6637
E-mail: oleg.musin@utrgv.edu

January 30, 2019

Letter of recommendation for Jordy Lopez

This letter gives me an immense pleasure in recommending Mr. Jordy Lopez to your summer program.

I have known Jordy since 2013 as a student of UTB. I have worked with Jordy in my position as Professor at the University of Texas at Brownsville (now UT Rio Grande Valley). He took with me two classes Calculus III and Contemporary Geometry (graduate class). Mr. Lopez was one of the best students in my classes. He gave several presentations. All of his presentations were very engaging and visually appealing as he integrated the use of various software such as Matlab, WinEdt, and Geogebra.

In the Fall semester of 2018, Jordy was my co-adviser for two student projects: "Two–distance sets" and "Isoperimetric problem for polyhedra". He did a great job at a high mathematical level and the students prepared good and interesting projects. In Spring 2019 semester we already advise together seven students.

I think that Mr. Jordy Lopez can be a good student. Also he is an excellent person to communicate with. He is extremely reliable and friendly. I recommend him in the strongest terms for this program.

Sincerely yours,

Oleg Musin