

Luigi Ferraro

Curriculum Vitae

Contacts

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Department of Mathematics
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Education

- Aug. 2011 – July 2017 Ph.D in Mathematics, University of Nebraska-Lincoln.
Advisors: Luchezar L. Avramov and Srikanth B. Iyengar
Thesis: “Stable cohomology of local rings and Castelnuovo-Mumford regularity of graded modules”
- July 2011 M.S. in Mathematics, Summa cum Laude,
University of Pisa
Advisor: Aldo Conca
Thesis: “Homological properties of Noetherian rings”
- July 2009 B.S. in Mathematics, Summa cum Laude,
University of Pisa
Advisor: Ilaria del Corso
Thesis: “Regular local rings are UFD”

Positions

- Aug. 2017 – present Teacher-Scholar Postdoctoral Fellow, Wake Forest University.
- Aug. 2011 – July 2017 Graduate Teaching Assistant, University of Nebraska-Lincoln.

Research Interests

Commutative algebra and homological algebra. So far my research has focused mainly on the structure of the stable cohomology of a local ring and on the Castelnuovo-Mumford regularity of graded modules.

Non-commutative algebra. So far my research has focused on studying actions of groups and, more generally, actions of Hopf algebras on noncommutative rings. My research has also focused on the study of the homological properties of quotients of skew polynomial rings by ideals generated by normal elements, through the use of color DG algebra resolutions.

Publications

- [1] *Regularity of Tor for weakly stable ideals*
(with K. Anzaldi and N. Clarke), *Le Matematiche* Vol. 70 N. 1 (2015), 301–310.
- [2] *Modules of infinite regularity over commutative graded rings*,
Proc. Amer. Math. Soc. 147 (2019), no. 5, 1929–1939.
- [3] *A bimodule structure for the bounded cohomology of commutative local rings*,
accepted for publication in *Journal of Algebra*.

- [4] *Three infinite families of reflection Hopf algebras*,
(with E. Kirkman, W. F. Moore and R. Won), submitted.
- [5] *Differential graded algebra over quotients of skew polynomial rings by normal elements*,
(with W. F. Moore), submitted.
- [6] *Simple \mathbb{Z} -graded domains of Gelfand-Kirillov dimension two*,
(with J. Gaddis and R. Won), submitted.
- [7] *Semisimple reflection Hopf algebras of dimension 16*,
(with E. Kirkman, W. F. Moore and R. Won), in preparation.
- [8] *Counterexamples to the Noether bound over noncommutative rings*
(with E. Kirkman and K. Peng), in preparation.
- [9] *A decomposition of the stable cohomology of a local ring*
(with L. L. Avramov and Srikanth B. Iyengar), in preparation.

Invited Talks at Conferences and Workshops

A color Hopf algebra structure on the Ext algebra of quotients of skew polynomial rings by normal elements
Special Session on Hopf Algebras and Their Applications, AMS, Auburn, AL, March 2019.

Hopf algebra actions on some AS regular algebras of small GK dimension
Special Session on Commutative Algebra, AMS, Fayetteville, AR, November 2018.

Hopf algebra actions on some AS regular algebras of small GK dimension
Special Session on Commutative Algebra, AMS, Newark, DE, September 2018.

A bimodule structure for the bounded cohomology of commutative local rings
"Stable cohomology: foundations and applications", Snowbird, UT, May 2018.

Modules of infinite regularity over graded commutative rings
Special Session on Commutative Algebra: Interactions with Algebraic Geometry and Algebraic Topology, AMS, Orlando, FL, September 2017.

Modules of infinite regularity over graded commutative rings
Special Session on Commutative Algebra, AMS, Pullman, WA, April 2017.

Modules of infinite regularity over graded commutative rings
AMS Contributed Paper Session on Commutative Algebra, Linear and Multilinear Algebra and Matrix Theory, Joint Mathematics Meetings, Atlanta GA, January 2017.

Modules of infinite regularity over graded commutative rings
Route 81 Conference, Syracuse, NY, September 2016.

On the bimodule structure of bounded cohomology
AMS Special Session on Commutative Algebra, Joint Mathematics Meetings, Seattle WA, January 2016.

On the bimodule structure of bounded cohomology
Commutative Algebra, AMS, Loyola IL, October 2015.

Regularity of Tor for weakly stable ideals
KUMUNUJr, University of Nebraska-Lincoln, April 25th 2015.

Non-vanishing of Exts

KUMUNUjr, University of Nebraska-Lincoln, April 2014.

Conferences Organized

- Nov. 2-3 2019 Co-organizer of the AMS Special Session on Homological methods in Algebra, University of Florida, Gainesville, FL.
- April 7-9 2017 Co-organizer of KUMUNUjr, University of Nebraska-Lincoln.
- April 23-24 2016 Co-organizer of KUMUNUjr, University of Nebraska-Lincoln.

Algebra Seminars Given*Hopf algebra actions on some AS regular algebras of small GK dimension*

University of South Carolina, SC, August 2018.

Hopf algebra actions on some AS regular algebras of small GK dimension

Clemson University, SC, March 2018.

On the bimodule structure of the bounded cohomology of local rings

Syracuse University, NY, September 2016.

Modules with infinite regularity

University of Nebraska-Lincoln, September 2016.

On the bimodule structure of the bounded cohomology of local rings

University of Bologna, Italy, July 2016.

On the bimodule structure of the bounded cohomology of local rings

University of Genova, Italy, May 2016.

Nuovi teoremi sulla coomologia stabile degli anelli locali

University of Pisa, Italy, May 2016.

On the bimodule structure of the bounded cohomology of local rings

University of Lubbock, TX, February 2016.

On the bimodule structure of the bounded cohomology of local rings

University of Nebraska-Lincoln, February 2016.

Regularity of Tor for weakly stable ideals

University of Nebraska-Lincoln, April 23rd 2015.

Non-vanishing of Exts

Università di Genova, Italy, June 2014.

A characterization of Gorenstein rings

Università di Bologna, Italy, May 2014.

Non-vanishing of Exts

University of Nebraska-Lincoln, February 2014.

Colloquia*Noncommutative invariant theory*

Wake Forest University, NC, September 2019.

Poster Sessions

Non-vanishing of Exts

University of Nebraska-Lincoln, Graduate Research Fair April 2014.

Special Workshops and Conferences via invitation only

- 19 Aug. – 23 Aug. 2019 “Structure of length 3 resolutions”,
San Diego, CA.
- 28 May – 1 June 2018 “Stable cohomology: foundations and applications”,
Snowbird, UT.
- 12 Mar. – 16 Mar. 2018 “Hot topics: the homological conjectures”,
MSRI, Berkeley, CA.
- 26 Oct. – 28 Oct. 2017 “Structures on Free Resolutions”,
Lubbock, TX.
- 29 May – 4 June 2016 “Homological and computational methods in commutative
algebra”, INdAM meeting,
Cortona, Italy.
- 7 June – 13 June 2015 Mathematics Research Communities.
Snowbird, Utah.
- 16 Feb. – 20 Feb. 2015 “Homological bonds between Commutative Algebra and
Representation Theory”
Universitat de Barcelona, Barcelona, Spain.
- 9 Feb. – 13 Feb. 2015 “(Re)emerging methods in Commutative Algebra and
Representation Theory”
Centre de Recerca Matemàtica, Bellaterra, Spain.
- 23 June – 11 July 2014 Pragmatic 2014, Research school in Algebraic Geometry and
Commutative Algebra
“Local cohomology and syzygies of affine algebras”.
Catania, Italy.
- 14–25 May 2012 Pan American Advanced Studies Institute,
“Commutative algebra and its interactions with Algebraic
Geometry, Representation Theory, and Physics”,
Guanajuato, Mexico.

Honors

- 2012 Winner of the final prize for the scholarship of the National Institute of Advanced
Mathematics (INdAM) Francesco Severi.
- 2010 Second place in the contest for 6 scholarships for the students of Master’s Degree of the
INdAM Francesco Severi.
The contest was open to all the students in Italy at the beginning of their Master’s Degree
and consisted in two sets of problems (algebra and analysis) to be solved in 6 hours.
- 2006 Third place, International Pythagoras Prize, for writing the essay “The curvature: from
geometry to the Einsteinian relativity going through non-Euclidean geometries up to the
definition of the characteristics of a real time machine”.

Graduate Students

January 2019– Present Desiree Martin. Co-advised with F. Moore. Working on free resolutions of monomial ideals over skew polynomial rings.

Undergraduate Students

May 2018– May 2019 Kewen Peng. Co-advised with E. Kirkman. We worked on the paper *Counterexamples to the Noether bound over noncommutative rings*.

Teaching Experience, Instructor of Record, Graduate

MST 3/683, 1 sec., WFU *Advanced Topics in Mathematics: Introduction to Commutative Algebra*. Noetherian rings and modules, Hilbert basis theorem, Cayley-Hamilton theorem, integral dependence, localization, primary decomposition and tensor products.

MST 722, 1 sec., WFU *Abstract Algebra II*. More on rings and fields, fields extensions, Euclidean domains, polynomial rings, vector spaces and Galois theory.

MST 721, 1 sec., WFU *Abstract Algebra I*. Groups, rings, fields.

Teaching Experience, Instructor of Record, Undergraduate

MST 113, 1 sec., WFU *Multivariable Calculus*. The calculus of vector functions, including geometry of Euclidean space, differentiation, extrema, line integrals, multiple integrals, and Green's, Stokes', and divergence theorems.

MST 251, 4 sec., WFU *Ordinary Differential Equations*. Linear equations with constant coefficients, linear equations with variable coefficients, and existence and uniqueness theorems for first order equations.

MST 112, 2 sec., WFU *Calculus with Analytic Geometry II*. Techniques of integration, indeterminate forms, improper integrals, transcendental functions, sequences, Taylors formula, and infinite series, including power series.

MST 321, 1 sec., WFU *Modern Algebra I*. Introduction to modern abstract algebra through the study of groups, rings, integral domains, and fields.

MST 121, 2 sec., WFU *Linear Algebra I*. Vectors and vector spaces, linear transformations and matrices, determinants, eigenvalues, and eigenvectors.

MST 111, 2 sec., WFU *Calculus with Analytic Geometry I*. Functions, trigonometric functions, limits, continuity, differentiation, applications of derivatives, introduction to integration, and the fundamental theorem of calculus.

Math 103, 2 sec., UNL *College algebra and Trigonometry*. First and second degree equations and inequalities, absolute value, functions, polynomial and rational functions, exponential and logarithmic functions, trigonometric functions and identities, laws of sines and cosines,

applications, polar coordinates, systems of equations, graphing, conic sections.

Math 203, 2 sec., UNL *Contemporary Mathematics*. Applications of quantitative reasoning and methods to problems and decision making in the areas of management, statistics, and social choice. Includes networks, critical paths, linear programming, sampling, central tendency, inference, voting methods, power index, game theory, and fair division problems.

Math 221, 3 sec., UNL *Differential Equations*. First- and second-order methods for ordinary differential equations including: separable, linear, Laplace transforms, linear systems, and some applications.

Teaching Experience, Recitations

Math 106, 3 sec., UNL *Calculus I*. Functions of one variable, limits, differentiation, exponential, trigonometric and inverse trigonometric functions, maximum-minimum, and basic integration theory (Riemann sums) with some applications.

Math 107, 3 sec., UNL *Calculus II*. Integration theory; techniques of integration; applications of definite integrals; series, Taylor series, vectors, cross and dot products, lines and planes, space curves.

Grading

Math 901/902 *Algebra I/Algebra II*. A graduate class on groups, rings, modules, algebraic field extensions, Galois theory, multilinear products, categories.

Tutoring

Aug. 2011 – May 2017 Tutor at the MRC, University of Nebraska-Lincoln. The Mathematics Resource Center (MRC) is a free tutoring service and is the primary facility for undergraduate students who have questions related to any precalculus or calculus course offered by the department.

Service

Aug. 2017 – present Reviewer for zbMATH.

Aug. 2017 – Aug. 2018 Member of the Undergraduate Committee at Wake Forest University.

Aug. 2011 – May 2017 Volunteer for Math Day, University of Nebraska-Lincoln. Math Day is a competition that recognizes high school students and exceptional middle school students who are interested in mathematics.

Computer Skills

Macaulay2. An open source computer algebra system for research in commutative algebra and algebraic geometry.

Attended a course on Programming at the University of Pisa. The course content included: programming in C, automaton theory, computational complexity theory, cryptography, dynamic programming.

Languages Known

Fluent in Italian and English. Basic knowledge of French.

Professional Memberships

American Mathematical Society.

GNSAGA - Gruppo Nazionale per le Strutture Algebriche, Geometriche e le loro Applicazioni. National Group for the Geometric, Algebraic Structures and their Applications. This is a national group of INdAM (National Institute of Advanced Mathematics Francesco Severi, Rome, Italy).