Derek DeSantis

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EDUCATION

Ph.D. in Mathematics 2014 – 2018

- University of Nebraska - Lincoln
  - Thesis Advisor: David Pitts
  - Thesis Title: Operator Algebras Generated by Left Invertibles

Masters in Mathematics 2012 – 2014

- University of Nebraska - Lincoln

B.S. in Mathematics and Applied Physics 2007 – 2012

- California State University - Channel Islands
  - Graduated with both Mathematics and Physics Program Honors
  - Advanced Math GPA: 4.00 / 4.00, Advanced Physics GPA: 3.9 / 4.00

RESEARCH INTERESTS

- Mathematics:
  Non-self adjoint operator algebras and operator theory. In particular, interactions between operator theory and harmonic analysis.
- Machine Learning/Data Science:
  Large scale unsupervised learning problems. I am also interested in connections the between single operator theory and machine learning.

SELECT AWARDS & SCHOLARSHIPS

- NSF Mathematics Sciences Graduate Internship 2018
  Competitive internship giving graduate students in mathematics the chance to work on problems at a national lab.
  Worked at Los Alamos designing a large scale unsupervised machine learning model to predict where climate biomes are changing.
- Emeritus Faculty Fellow 2016 – 2017
  Departmental award given to doctoral students in support of research.
- Chancellor's Fellowship 2012 – 2014
  Chancellor's Fellowships are designed to assist departments with the recruitment of superior graduate students by adding fellowship funds to an assistantship.
- Sally Casanova Scholar 2012 – 2014
  Competitive grant that provided funds for summer research at a doctoral granting institution of choice, along with funds for travel and graduate school applications.
  Worked with Dr. Akemann at UC Santa Barbra on the Kadison-Singer problem.
- NSF-LSAMP Scholar 2009 – 2010
  Grant geared towards STEM students in disadvantaged socioeconomic backgrounds

PUBLICATIONS

[5] D. DeSantis, "A Wavelet Based Approach to Climate Biome Clustering," *In preparation*.

[4] D. DeSantis, "Operator Algebras Generated by Left Invertibles," *Submitted for publication*.

[3] D. DeSantis, K. Leonard, "Error Correction for Fire Growth Modeling," *Proceedings of the International Workshop on Agricultural and Environmental Information and Decision Support Systems (IAEIDSS 2013)*, Springer Lecture Notes in Computer Science, pp. 216–227, 2013.

[2] D. DeSantis, R. Field, W. Hough, B. Jones, R. Meissen, J. Ziefle, "Permutation Pattern Avoidance and the Catalan Triangle," *Missouri Journal of Mathematical Sciences*, vol. 25, is. 1, pp. 50-–60, 2013.

[1] L. Contreras, D. DeSantis, K. Leonard, "On the geometric deformations of functions in $L^2(D)$," *Involve*, vol. 6, no. 2, pp. 233-–241, Sep 2013.

SELECT TALKS

Conference and Seminar Talks:

- Climate, Ocean, and Sea Ice Modeling Seminar Summer 2018
  A Wavelet Based Approach to Climate Biome Clustering - Los Alamos National Labs, NM
- Great Plains Operator Theory Symposium Summer 2018
  Operator Algebras Generated by Left Invertibles - Oxford, OH
- Joint Mathematics Meetings Winter 2018
  Operator Algebras Generated by Left Invertibles - San Diego, CA
- Nebraska-Iowa Functional Analysis Seminar Fall 2017
  Operator Algebras Generated by Left Invertibles - Des Moines, IA
- Operator Theory Reading Seminar 2014 – Current

Two to four talks given per semester. Subject of talk depend on the topic of semester.

- Operator Algebra Seminar 2014 – Current
  Frequently contribute three seminar talks per semester. Previous topics span from elementary operator theory, to recent papers, to personal research.

General Talks:

- Creighton Mathematics Conference for Undergraduates Fall 2017
  Turning Hard Problems Into (Infinitely Many) Easy Ones - Creighton University, Omaha, NE
- Great Plains Alliance Speaker Fall 2017
  Turning Hard Problems Into (Infinitely Many) Easy Ones - Dordt College, Sioux Center, IA
- All Girls/All Math Instructor Summer 2014
  A week long mathematics summer camp for high school girls. I provided an interactive lecture on geometry.
- Graduate Student Seminar Summer 2014
  Presented three lectures. Topics included, *Math and Music*, *Introduction to Operator Theory*, *Connections Between Analysis and Algebra*.

PROGRAMING EXPERIENCES

- Köppen-Geiger Climate Model Package - Los Alamos National Labs Fall 2018
  - Wrote a python package to implement the Köppen-Geiger Climate Model.
  - Language: Python - dask, numpy, pandas, xarray
- Learning changes in climate biomes - Los Alamos National Labs Summer 2018
  - Developed a large scale unsupervised learning model to predict climate biomes.
  - Language: Python - dask, numpy, pandas, pywavelet, scipy, sklearn, xarray
- Wildfire boundary modeling - California State University 2011
  - Modeled the boundary of wildfire using level-set methods.
  - Language: Matlab
- LaTeX- Various 2008-Now
  - Have written numerous papers, talks, notes and documents in LaTeX.
  - Language: LaTeX

SERVICES

- Operator Theory Reading Seminar Founder 2014 – 2018
  Co-founder of graduate student organized seminar in operator theory. The focus of the seminar alternates between elementary operator theory and focused topics (such as group C*-algebras, CB maps and operator algebras, quantum computing, etc.)
  I have been the organizer or co-organizer each semester up until the start of the Fall 2018 semester.
- Graduate Student Seminar Organizer 2013 – 2014
  A seminar run for, and by, mathematics graduate students. Presentation topics include, but are not limited to: introductions to research areas, math history, funding opportunities and summer internships.
- Nebraska Conference for Undergraduate Women in Math 2012 – 2018
  Volunteered in various capacity for the annual Nebraska Conference for Undergraduate Women in Math (NCUWM). NCUWM's overall goal is to arm participants with knowledge, self-confidence and a network of peers to help them become successful mathematicians.
- Math Day 2012 – 2018
  An event created to stimulate interest in mathematics in Nebraska high school students. Various grants are awarded through mathematics competitions. I often volunteered in administering quiz bowls.

TEACHING

Instructor of Record:

- College Algebra Three Sections
  Freshman course designed to prepare students for applied calculus.
- College Algebra + Trig. Three Sections
  Freshman course meeting five days a week that combines college algebra and trigonometry. The course is designed to prepare students for calculus.
  Course convener Spring 2016.
- Applied Calculus One Section
  Rudiments of differential and integral calculus with applications to problems from business, economics, and social sciences.
- Calculus I One Section
  Differential calculus in one variable with basic integration theory.
- Calculus II One Section
  Integration theory techniques and applications, infinite series, power series and Taylor series.
- Differential Equations One Section
  First and second-order methods for ordinary differential equations including: separable, linear, Laplace transforms, linear systems, and some applications.
- Geometry Matters One Section

Highly interactive upper division math course designed for secondary school teachers. The focus is pedagogy, covering geometry and measurements.

- Math Modeling — One Section
  Highly interactive upper division math course designed for primary school teachers. Course focus is pedagogy - covering topics seen in elementary and middle school mathematics classes.
- Contemporary Math — Three Sections
  Course covers quantitative reasoning methods and decision making in the areas of management, statistics, and social choice. Topics include voting theory, probability, and graph theory.
  Designed interactive course packet which included outline of notes and small group exercises.

Teaching Assistant:

- Calculus II Recitation — Eight Sections
- Calculus III Recitation — One Section
- Advanced Matrix Theory Grader — One Section

ADDITIONAL EDUCATION

- MSRI Summer School:
  Representations of High Dimensional Data — July 2018
  Topics included compressed sensing, data mining, compression, classification, topic modeling, and large-scale stochastic optimization.
- Great Plains Operator Theory Symposium
  - Miami University — 2018
  - Texas Christen University — 2017
  - Urbana-Champaign — 2016
- Rocky Mountain Mathematics Consortium — June 2015
  The focus of the 2015 RMMC Summer school was on the classification program for C*-algebras.
- Nebraska-Iowa Functional Analysis Seminar — 2013-Current
  NIFAS is a biannual functional analysis conference.