Nivedita Bhaskhar

Mathematician and Programmer

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nivbhaskhar nivbhaskhar

Education

2011-2016 **PhD in Mathematics**, *Emory University*, Atlanta, GA (CGPA 4/4)

2009-2011 **Masters in Mathematics**, *Northeastern University*, Boston, MA (CGPA 4/4)

2006-2009 **B.Sc. Honours in Mathematics & Computer Science**, *Chennai Mathematical Institute*, Chennai, India (CGPA 9.76/10)

Experience

2019-Present **RTPC Assistant Professor of Mathematics**, *USC*, Los Angeles, CA

2016-2019 **Hedrick Assistant Adjunct Professor of Mathematics**, *UCLA*, Los Angeles, CA

Skills

- Math, Machine Learning, Programming, Data Analysis
- Python, PyTorch, Flask, JavaScript, SQL
- Pandas, Scipy, Seaborn, scikit-learn
- LaTeX, Git, HTML/CSS
- Mentoring, Presentations,Teaching, Exposition

Projects

Unpuzzled - A jigsaw puzzle solver using AI

- Launched *Unpuzzler* : an app at https://unpuzzler.herokuapp.com/ that takes an input image, generates a puzzle from it and solves it.
- Built and trained ML based models (a simple convolutional neural network, fine-tuned ResNet18) and a hand-engineered model to check adjacency of puzzle pieces. Created custom datasets of puzzle-piece-pairs from over 6000 bird-images from the CUB-200 dataset for training and evaluation. Achieved $> 99\%$ test-accuracy with the best model.
- Constructed a puzzle-generator and built puzzle-solvers by integrating the models with a custom-designed search algorithm. The best solver was able to solve 87.5% of the 6×6 test-puzzles completely.
- Deployed an interactive web-app for the solver on Heroku

The First R - A web-app for book readers

- Designed a Flask web application for book readers to rate and review books.
- Utilized the Goodreads API to integrate Goodreads data with the web application and provided API access for users to query details about books with their ISBNs.

Find My Train - A JavaScript visualization of the LA Metro Rail

- Created a clean visual representation of the LA Metro Rail's current vehicular data at https://nivbhaskhar.github.io/find_my_train.html
- Carried out an initial exploration of the LA-Metro REST API in Python to understand the track layout. Constructed a simple projection function to locate the nearest stations of trains using their coordinates.
- Designed static linear representations of tracks and trains by employing the Canvas API and made them interactive via the Fabric JS library. Accessed current vehicular data through Fetch API, asynchronously processed them using Promises and rendered the train icons in their calculated positions.

Max Matching - A Python implementation of Blossoms algorithm

- Implemented Blossoms algorithm to find maximum matching in any undirected graph and wrote unit tests to check code functionality.
- Deployed an interactive Gradio interface for the algorithm on Heroku at `https://maxmatcher.herokuapp.com/`

Publications

2020 **Brauer p-dimension of complete discretely valued fields**,
(with Bastian Haase), Transactions of the AMS (373): 3709-3732

2019 **The norm principle for type D_n groups over complete discretely valued fields**,
(with V. Chernousov and A. Merkurjev), Transactions of the AMS (372): 97-117

2016 **R-equivalence and norm principles in algebraic groups (Thesis)**

- Investigated rationality questions and norm principles of algebraic groups.
- Solved Serre's injectivity question (posed in 1962) for classical groups of type A,B,C.
- Produced scalar obstructions whose vanishing would imply a +ve answer for type D.

2016 **On Serre's injectivity question and norm principle**,
Commentarii Mathematici Helvetici (91):145-161

2014 **More examples of non-rational adjoint groups**,
Journal of Algebra (397):39-46

2013 **Hasse principle for G-quadratic forms**,
(with Eva Bayer-Fluckiger and R. Parimala), Documenta Mathematica (18):383-392

Preprints

2018 **Reduced Whitehead groups of prime exponent algebras over p-adic curves**,
arXiv:1808.09021 (pre-print), *submitted*.

Fellowships and Awards

2016 **Graduate Student Research Award**, Emory University

2009-11 **University Excellence Fellowship**, Northeastern University

2009 **Medal of Excellence for Math & CS**, Chennai Mathematical Institute

2006 **Indian National Olympiad in Informatics**, Finalist

2005-06 **Indian National Mathematical Olympiad**, Finalist

2004 **National Talent Search Examination scholarship**, Govt of India

2004 **Kishore Vaigyanik Protsahan Yojana scholarship**, Govt of India

Seminar Organizer

Fall 2019 Algebra working seminar series at USC, *Co-organizer and speaker*

2018-19 Distinguished Women in Math Lecture series at UCLA, *Organizer*

Spring 2015 Linear Algebraic Groups weekly seminar at Emory, *Organizer and speaker*

Spring 2014 Lectures on division algebras weekly seminar at Emory, *Co-organizer and speaker*

Teaching Experience

Instructor at USC

Spring 2021 Statistical Inference and Data Analysis II (M308)

Fall 2020 Theory of numbers (M430) & Statistical Inference and Data Analysis I (M307)

Spring 2020 Calculus I (M125)

Fall 2019 Contemporary precalculus (M108)

Instructor at UCLA

Spring 2019 Mathematical cryptology (M116) & Analysis (M31A)

Fall 2018 Algebra Honors (M110AH)

Spring 2018 Linear Algebra and applications (M33A) & Integration and Infinite series (M31B)

Fall 2017 Commutative algebra (M215A)

Sum. 2017 Linear Algebra and applications (M33A) & Algebra (M110A)

Spring 2017 Linear Algebra (M115B)

Winter 2017 Discrete structures (M61)

Fall 2016 Calculus for Life Sciences (M3A) & Algebra (M110A)

Instructor at Emory University

Spring 2015 Calculus II

Fall 2014 Life Science Calculus I (Classes and Labs)

Spring 2014 Life Science Calculus I and II (Labs)

Fall 2013 Life Science Calculus I and II (Labs)

Fall 2012 Calculus I (two sections)

Fall 2011 Life Science Calculus (Labs)

Instructor at Northeastern University

Spring 2011 College Algebra

2009-10 Mathematical Thinking

Invited talks

Reduced Whitehead groups of algebras over p-adic curves

Feb 2021 Arithmetic Geometry Seminar, Ohio State University, Columbus

SK1 triviality for l-torsion algebras over p-adic curves

Sep 2020 Arithmetic Aspects of Algebraic Groups, BIRS, Banff (Online)

Reduced Whitehead groups of algebras

Oct 2019 Number Theory Seminar, Caltech, Los Angeles
Oct 2019 Southern California Algebraic Geometry Seminar, Los Angeles
Mar 2019 AMS Special Session on Algebraic Groups et al., Honolulu
Dec 2018 Colloquium, Tata Institute of Fundamental Research, Mumbai
Dec 2018 Algebraic Geometry Seminar, University of Utah, Salt Lake City, December 2018

On rational points, zero cycles and norm principles

Oct 2019 Algebra seminar, University of Southern California, Los Angeles
Sep 2019 Emerging Research in Algebraic Groups, Motives, and K-theory, St Petersburg
Dec 2018 Colloquium, Institute of Mathematical Sciences, Chennai
Dec 2018 Colloquium, University of Virginia, Charlottesville
Dec 2018 Special colloquium, University of Utah, Salt Lake City

The norm principle for type D_n groups over complete discretely valued fields

Oct 2018 AMS Special Session on Homological Aspects of NonComm alg. & geo, SF
Sep 2018 Affine Algebraic Groups, Motives and Cohomological Invariants, BIRS, Banff

Brauer p dimension of complete discretely valued fields

Jun 2020 CMI Online Seminar Series
Jun 2018 The 13th Brauer group conference at Pingree Park, Colorado
Nov 2017 Algebraic geometry and number theory seminar at Rice University, Houston
May 2017 Emory Conference on Higher Obstructions to Rational Points, Emory, Atlanta

Motivic cohomology - a survey

Feb 2017 Algebra seminar at UCLA, Los Angeles, February 2017

Reduced Whitehead groups of division algebras over function fields of p-adic curves

Sep 2015 The Use of Linear Algebraic Groups in Geometry & Number Theory, BIRS, Banff

Serre's injectivity question for reductive groups

Nov 2016 Algebra seminar at UCLA, Los Angeles
Jul 2015 International Conference on Algebra & Geometry, CMI, Chennai
Jun 2015 The 12th Brauer group conference at Pingree Park, Colorado

A proof by patching of the cyclicity of prime degree algebras over p-adic curves

Mar 2015 AMS Special Session on Quadratic Forms in Arithmetic and Geometry, Huntsville

Borel-Tits compactification of affine groups over perfect fields

Jun 2014 Algebraic Groups and Representations workshop, Lyon

More examples of non-rational adjoint groups

Nov 2014 Algebraic geometry seminar at Rice University, Houston

Jul 2014 Young Women and Mathematics (YWM), Pune

Jun 2014 Algebra seminar at EPFL, Lausanne

Mar 2014 AMS Special Session on Galois Cohomology and the Brauer Group, Knoxville

Rationality of varieties of adjoint groups

Jan 2014 Algebra seminar at Emory University, Atlanta