


# Nivedita Bhaskhar

Mathematician and Programmer

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## 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)

## Appointments



- 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
- $\text{\LaTeX}$ , 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  $6 \times 6$  test-puzzles completely.
- Deployed an interactive web-app for the solver on Heroku  

### The First R - A Flask 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](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/> 🌐 🔄

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## Publications and preprints

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

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## 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

## Teaching Experience

### Instructor at USC

- 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

## Activities

- 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*

## Talks and presentations

### 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

Feb 2017 10th annual symposium for Women in Mathematics in Southern California, LA  
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  
Apr 2014 Poster session in Texas Algebraic Geometry Symposium at Rice University, Houston  
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