

Michael Chmutov

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<http://mchmutov.net>

<https://github.com/mchmutov>

<https://www.kaggle.com/mchmutov>

EDUCATION

- **University of Michigan** Ann Arbor, MI
Ph.D. in Mathematics 2008 – 2014
- **University of Utrecht** Utrecht, Netherlands
International Master Class: Quantum groups, affine Lie algebras and their applications 2007 – 2008
- **The Ohio State University** Columbus, OH
B.S. in Mathematics and Physics; Minor: Computer Science; GPA: 3.9/4 2003 – 2007
- **Past MOOCs**
 - **fast.ai Practical Deep Learning for Coders:** Taught by Jeremy Howard. An introduction to practical aspects of deep learning for image classification, sentiment analysis, and structured data models, with emphasis on creating state-of-the-art models with few lines of code and on Kaggle competitions.
 - **Coursera Machine Learning Specialization:** Taught by Carlos Guestrin and Emily Fox. An introduction to Machine Learning using Python. Course titles: Foundations, Regression, Classification, Clustering and Retrieval.
 - **Coursera Machine Learning:** Taught by Andrew Ng. An introduction to Machine Learning using MATLAB.
- **Current MOOCs**
 - **fast.ai Cutting Edge Deep Learning for Coders:** Taught by Jeremy Howard. Similar to the first course in the series, but with more advanced topics such as GANs, high resolution images, and neural translation.
 - **Coursera deeplearning.ai Specialization:** Taught by Andrew Ng. An introduction to deep learning which complements the fast.ai course with better explanations of the theory (uses Python and Tensorflow).

PROGRAMMING SKILLS

- **Languages:** Python, MATLAB, Java, C++, Maple, HTML
- **Technologies:** pytorch, fast.ai library, tensorflow, keras, pandas, scikit-learn, numpy, scipy, matplotlib, AWS, Paperspace, git, L^AT_EX

EXPERIENCE

- **Consulting**
 - **CyberOptics corporation:** Investigate the applicability of certain deep learning methods to 3D reconstruction. Responsibilities included surveying recent research literature on the topic, implementation of the methods and training of the models described therein, regular meetings with the core group, and a presentation to the larger team regarding my findings. Most of the work has been done in Python on a collection of machines in the cloud (Paperspace), with a shared data drive and a GitHub repository for source code management. (Aug. 2018 - Oct. 2018)
- **Kaggle competitions**
 - **Whales:** I came in 18-th out of 528 in a competition whose goal was to identify individual humpback whales based on images of tail markings. The particular challenge was that the number of whales in the training set is very large (~ 4500) and the number of images per whale is very small (most whales have just one image). My approach involved training a segmentation CNN to make tight crops of the tails, using a fine-tuned pre-trained CNN with standard image augmentation for classification, and a careful treatment of the “unknown whale” class.
 - **Invasive species monitoring:** The goal of the competition was to create an image classifier for whether invasive hydrangea is present in an image. The actual competition ended Summer 2017, so my entries do not appear on the leaderboard, but my score was in the top 18%. With a small training set, I used 5-fold cross-validation with ResNeXt50 deep convolutional nets.

• **Department of Mathematics, University of Minnesota**

NSF Postdoctoral Fellow

Minneapolis, MN

Sept. 2014 - May. 2018

- **Research:** Supervised by Prof. Pavlo Pylyavskyy. As part of an effort to generalize my results from graduate school, I worked with six coauthors to extend the tableau insertion algorithm of Robinson, Schensted, and Knuth, to the case of infinite periodic words. An implementation of the resulting algorithm is available here. Three research papers related to the project have been completed and one is still in the works. The full list of my papers appears here. The research was presented at numerous conferences, both by myself and by my coauthors. Most of the necessary coding done in Java; I chose it because it was cross-platform, widely available, and offered superior graphical capabilities to Maple.
- **Teaching:** Taught courses including Calculus for freshmen, Modern Algebra for math majors, and Enumerative Combinatorics for advanced math majors. Also taught a course Advanced Topics, similar to Enumerative Combinatorics above, through a program for very advanced high-school students.
- **Supervision:** One of my calculus classes had about 120 students, so it involved being in charge of two TAs who ran discussion sessions with small groups and graded the homework assignments. In addition, I have supervised two students for an REU summer research project and one student for a senior thesis.

• **Department of Mathematics, University of Michigan**

Teaching & Research Assistant

Ann Arbor, MI

Sept. 2008 - May. 2014

- **Research:** Supervised by Prof. John R. Stembridge. I worked on research on the intersection of Combinatorics (i.e. discrete math) and Representation Theory. The latter is a study of how certain objects, such as symmetries, may be represented by matrices so that composition of symmetries translates to matrix multiplication; it has a wide range of applications including being one of the foundations of quantum theory. I studied a special class of such representations which are called W -graph representation because they are associated to certain directed graphs, and proved several results toward combinatorially classifying which directed graphs can appear in this way. As a side project, I worked on representations of Lie superalgebras, another algebraic object which came from the theory of supersymmetry in physics. Most of the necessary coding done in Maple as my advisor had an extensive code base in it.
- **Teaching:** Taught single variable calculus; TA'd multi-variable calculus (with a lab component in Maple) and differential equations (with a lab component in MATLAB).

AWARDS

- **NSF Postdoctoral Fellowship:** A postdoctoral fellowship for three years administered by the National Science Foundation; only about 40 are given out nationwide each year.
- **Best Student Paper at FPSAC '13:** The conference "Formal Power Series and Algebraic Combinatorics" is the largest annual gathering of people interested in algebraic combinatorics, usually attracting about 200 people. The award is for the best research paper all of whose authors are students.
- **National Defense Science and Engineering Graduate Fellowship:** A full 3-year graduate studies fellowship administered by the Department of Defense.