

## DANIEL YORGOV

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### Education

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#### **Ph.D., Applied Mathematics, Concentration in Statistics** (2016)

Department of Mathematical and Statistical Sciences, University of Colorado, Denver, CO

Thesis Title: Combined Admixture and Association Mapping for Complex Traits

Thesis Advisor: Dr. Stephanie A. Santorico

**M.S., Mathematical Sciences** (2006) Michigan Technological University, Houghton, MI

**M.A., Finance** (2003), **B.A., Banking** (2001) University of Economics, Varna, Bulgaria

### Research Interests

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Statistical Genetics and Computational Genomics

- Statistical methods for combining admixture mapping and association for population and family designs
- Linear mixed models; adjusting for the effect of population stratification
- Local ancestry assignment and imputation in admixed individuals; MCMC and machine learning approaches
- Collaborative work on the autoimmune vitiligo disease; polygenic prediction

High-Performance and Cloud Computing (> 6.5 mln. CPU core hours utilized, mostly at Janus supercomputer at CU)

- HPC pipelines for genetic studies
- Efficient search algorithms for discrete combinatorial structures
- GPU/CUDA implementations

### Publications

*Google Scholar Profile*: <https://goo.gl/931VoR>

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#### Peer Reviewed:

1. Roberts GH, Paul S, Yorgov D, Santorico SA, Spritz RA. Family clustering of autoimmune vitiligo results principally from polygenic inheritance of common risk alleles. *Am J Hum Genet.* 2019; 105(2):364-72.
2. Jin Y, Anderson G, Yorgov D, Ferrara TM, Ben S, Brownson KM, ..., Santorico SA, & Spritz RA: Genome-wide association studies of autoimmune vitiligo identify 23 new risk loci and highlight key pathways and regulatory variants. *Nat. Genet.* 2016; 48(11): 1418-24.
3. Cavalli G, Hayashi M, Jin Y, Yorgov D, Santorico SA, Holcomb C, Rastrou M, Erlich H, Tengedal IW, Dagna L, Neff CP, Palmer BE, Spritz RA, Dinarello CA: MHC class II super-enhancer increases surface expression of HLA-DR and HLA-DQ and affects cytokine production in autoimmune vitiligo. *Proc Natl Acad Sci U S A* 2016; 113(5):1363-8.
4. Hayashi M, Jin Y, Yorgov D, Santorico SA, Hagman J, Ferrara TM, Jones KL, Cavalli G, Dinarello CA, Spritz RA: Autoimmune vitiligo is associated with gain-of-function by a transcriptional regulator that elevates expression of HLA-A\*02:01 in vivo. *Proc Natl Acad Sci U S A* 2016; 113(5):1357-62.
5. Yorgov V and Yorgov D: The Automorphism Group of a Self-Dual [72, 36, 16] Code does not contain  $Z_4$ . *IEEE Trans. Inf. Theory* 2014; 60(6):3302-3307.
6. Yorgov D, Edwards KL, Santorico SA: Use of admixture and association for detection of quantitative trait loci in the type 2 diabetes genetic exploration by next-generation sequencing in ethnic samples (T2D-GENES) study. *BMC Proc* 2014; 8(S1):S6.

## Work in Progress:

7. Yorgov D. Comparing Methods for Familial Relationship Inference in Populations with Complex Demographic History. *Preliminary results presented at JSM 2019; additional results at JSM 2021*
8. Yorgov D. Novel Machine Learning Approaches to Disease Risk Prediction. How much data do you really need?
9. Yorgov D and Santorico SA. Combined Admixture and Association Mapping after Imputation. Control for Confounding in Admixed Samples with Complex Genetic Correlations.

## Awards, Grants, and Scholarships

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- 2020 Fort Wayne Sigma Xi Science Teacher of the Year award, April 2020: \$1,000.
- CELT Summer 2020 Instructional Development Grant. *Enhancing Learning for Diverse Student Audience in a New Introduction to Statistical Programming Course.*, May 2020: \$2,500.
- Purdue Fort Wayne Institute for Research, Scholarship and Creative Endeavors *Faculty Travel Grant*, July 2019: \$1,000.
- Yorgov, D. Amazon Research Cloud *AWS Cloud Credits* for Research grant, \$7,600 in AWS research cloud computing credits, approved January 2019
- Yorgov, D. *Machine Learning Disease Prediction via Neural Networks* (Purdue IRB protocol 1805020545) Purdue Research Foundation, *Summer Faculty Grant*, funded for summer 2018: \$ 9,499.
- Principal Investigator for *The IPFW Actuarial Science Program's Next Phase*, Lincoln Financial Foundation Academic Support Grant. Co-PI: Dr. Yihao Deng. Funded for 2017-18 academic year: \$35,000
- Yorgov, D. *Incorporating Ancestral Information in Genome-Wide Association Studies*, Purdue Research Foundation, *Summer Faculty Grant*, funded for summer 2017: \$ 9,403
- Advanced Gene Mapping Course *Travel Fellowship*, Rockefeller University, New York, Spring 2014, one out of the four travel stipends, \$800
- Bateman Memorial Fellowship, University of Colorado Denver (*full support* for 2013-2014 academic year)
- Summer Institute in Statistical Genetics *Tuition and Travel Scholarships*, University of Washington (2013 and 2012)
- Bateman Memorial *Outstanding Graduate Student Teaching Award*, University of Colorado Denver (2012)
- Bateman Memorial *Teaching Assistantship*, University of Colorado Denver (Fall 2010 – Spring 2013)
- *Top Student Award* (2 courses), Michigan Technological University, Houghton, MI (Fall 2009, Spring 2010)

## Meeting Abstracts

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August 2021, JSM2021: *Enhancing Familial Relationship Inference in Admixed Populations*, Yorgov D (abstract ID #318837), The 2021 Joint Statistical Meetings, 7 – 12 August 2021, virtual meeting

February 2020, Fort Wayne Teaching & Learning Conference: *Partially flipping the classroom for service courses. Will the students do the work?* Yorgov D, February 21, 2020

July 2019, JSM2019: *Comparing Methods for Familial Relationship Inference in Populations with Complex Demographic History*, Yorgov D (abstract 307220). The 2019 Joint Statistical Meetings, 27 July – 1 August 2019, Denver, CO

October 2016, ASHG2016: *Effects of Imputation on Combined Admixture and Association Mapping*, Yorgov D, Santorico SA (Abstract/Program #574), The 2016 Annual Meeting of the American Society of Human Genetics, October 18-22, Vancouver, BC, Canada. *Peer Reviewed Abstract*

October 2016, IGES2016: *A Comparison of Genetic Risk Prediction and Subtyping for Generalized Vitiligo*, Santorico S, Paul S, Yorgov D, Jin Y, Ferrara T, Spritz R, The 2016 Annual Meeting of the International Genetic Epidemiology Society, Abstract published in *Genetic Epidemiology* 40, No. 7 (2016) *Peer Reviewed Abstract*

October 2016, ASHG2016: *Genetic risk prediction and subtyping for generalized vitiligo*. (Abstract/Program #1301), Santorico S, Paul S, Yorgov D, Jin Y, Ferrara T, Spritz R, The 2016 Annual Meeting of the American Society of Human Genetics, October 18-22, Vancouver, BC, Canada. *Peer Reviewed Abstract*

October 2015, IGES2015: *Optimized genetic risk prediction for vitiligo and its use to define disease subtypes*; Santorico SA, J Ying, Yorgov D, Paul S, Ferrara T, Spritz RA. *Peer Reviewed Abstract*

October 2015, ASHG2015: *Genome-wide association studies of vitiligo implicate 100 loci in disease risk*; Santorico SA, J Ying, Yorgov D, Ferrara T, Spritz RA. *Peer Reviewed Abstract*

## Professional Experience

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- Aug 2016 – present     **Assistant Professor of Applied Statistics**  
Department of Mathematical Sciences, Purdue University Fort Wayne, IN (formerly IPFW)
- June 2014 – June 2016   **Graduate Research Assistant (NIH funded)**  
Department of Mathematical and Statistical Sciences, University of Colorado, Denver, CO  
- work on the Vitiligo project (<https://vitiligocover.com/dr-spritzs-vitiligo-genetic-study/>)
- Aug 2010 – July 2013   **Graduate Teaching Instructor**  
Department of Mathematical and Statistical Sciences, University of Colorado, Denver, CO  
Courses taught as instructor of record: *Mathematics for Liberal Arts, Polynomial Calculus, Calculus II, Introductory Statistics, and Applied Linear Algebra*
- Jan 2005 – May 2010    **Graduate Teaching Instructor**  
Department of Mathematical Sciences, Michigan Technological University, Houghton, MI  
Courses taught as instructor of record: *Data, Functions and Graphs, Calculus I Plus, Calculus II, Elementary Linear Algebra, and Elementary Differential Equations*
- Sept 2004 – Dec 2004   **Graduate Teaching Assistant**  
Department of Mathematical Sciences, Michigan Technological University, Houghton, MI  
*Joint recitation sessions and grading support for Multivariable Calculus with Technology*

**Various Computing Related Industrial Experiences, Bulgaria:** System Administrator; programming and computer related consulting work; sole proprietorship: leasing, sale, software, and hardware PC support; Graphic Designer and Lead Graphic Designer for TV post-production and pre-press; Software Sales Manager at an Apple dealership

## Presentations and Talks

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- The Joint Statistical Meetings (virtual event), August 2021, JSM2021  
- *Enhancing Familial Relationship Inference in Admixed Populations (8/12/2021)*
- Fort Wayne Teaching & Learning Conference (2/21/2020)  
- *Roundtable organizer and moderator: Partially flipping the classroom for service courses. Will the students do the work?*
- The Joint Statistical Meetings, Denver, JSM2019 talk and poster (7/29/2019)  
- *Comparing Methods for Familial Relationship Inference in Populations with Complex Demographic History*
- Guest lecture in STAT 512 Applied Regression Analysis (9/12/2018) - *Quick Course in R*
- Purdue Fort Wayne Mathematical Sciences New Student Orientation (8/17/2018)  
- *The Data Science and Applied Statistics Degree in Purdue Fort Wayne*
- IPFW Mathematical Sciences New Student Orientation (8/18/2017)  
- *The New B.S. Data Science and Applied Statistics Degree*
- CU Denver, Downtown Statistical Genetics Seminar (11/20/2015)  
- *Intro to High Performance Computing and Janus Supercomputer Tutorial*

- Butcher Symposium 2015, Westminster, CO, poster (11/6/2015)
- *Combined Association and Admixture Mapping*
- Fall 2015 CO/WY ASA meeting, Aurora, CO (10/16/2015)
- *Augmented Genome-Wide Association Studies of Autoimmune Vitiligo Disorder Identify 25 Novel Chromosome Locations*
- CU Denver, Downtown Statistical Genetics Seminar (5/22/2015)
- *Research in Progress: Admixture Mapping and Simulations*
- 17th Annual Research & Creative Activities Symposium University of Colorado Denver, poster (4/25/2014)
- *Combined Association and Admixture Mapping for Complex Traits*
- Statistical Genetics / Genetic Epidemiology journal club paper presentation, Aurora, CO (2/6/2014)
- doi:10.1038/srep01815, *The Benefits of Selecting Phenotype-specific Variants for Applications of Mixed Models in Genomics*
- CU Denver, Downtown Statistics Seminar (10/10/2013)
- *Admixture mapping*
- ASA's CO/WY Chapter American Statistical Association Fall Meeting, Aurora, CO (10/18/2013)
- *Combined Association and Admixture Mapping for Complex Traits*
- Genetic Analysis Workshop 18, Stevenson, Washington (10/14/2012)
- *Admixture Mapping group; contribution: Use of Admixture and Association for Detection of QTL*
- Seminar on Emerging Computational Tools, Mathematical Sciences, Michigan Technological University, Houghton:
- *Registers Use and Built-in Functions* (6/23/2009)
  - *CUDA Architecture, Memory Types* (5/19/2009)
  - *Registers Usage, Compiler options, CUDA Occupancy Calculator* (4/16/2009)
  - *Exhaustive search construction of small binary code. Code optimization* 4/9/2009)
- MAA's Fall Upper Peninsula Zonal Meeting, Lake Superior State University, Sault Ste. Marie, MI (9/12/2008)
- *CUDA-Based Exhaustive Search Construction of Golay Binary [24, 12, 8] Self-Dual Code*

## **Classes Taught as Instructor of Record with Full Course Responsibility**

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### **Purdue Fort Wayne (Formerly IPFW)**

CMP 400 – Introduction to Statistical Computing with R ( <i>Division of Continuing Studies</i> )	Fall 2020, Fall 2019
STAT 125 – Communicating with Statistics	Fall 2020 (2 sections), Summer 2020, Fall 2019 (2 sections), Fall 2018 (2 sections), Spring 2017, Fall 2016 (2 sections)
STAT 240 – Statistical Methods for Biology	Summer 2021, Summer 2020, Spring 2020 (2 sections), Spring 2019, Spring 2018, Spring 2017
STAT 490 / MA 490 – Probability Exam Practicum	Spring 2021, Spring 2020, Spring 2019
STAT 490 – Intro to Statistical Computing with R	Fall 2020, Fall 2019
STAT 516 – Basic Probability and Applications	Fall 2020, Fall 2019, Fall 2018, Fall 2017, Fall 2016
STAT 517 – Statistical Inference	Spring 2021, Spring 2019, Spring 2018, Spring 2017

### **CU Denver**

MATH 1010 – Mathematics for Liberal Arts	Summer 2012, Fall 2011
MATH 1080 – Polynomial Calculus (Common Final)	Fall 2010
MATH 2411 – Calculus II (Common Final)	Fall 2011, Spring 2012
MATH 2830 – Introductory Statistics	Summer 2011, Summer 2012 (online)
MATH 3191 – Applied Linear Algebra	Spring 2011, Spring 2013, Summer 2013

## Michigan Tech

MA1032 – Data, Functions & Graphs (Common Final)	Fall 2005, Fall 2006, Fall 2009 (2 sections)
MA1151 – Calculus I Plus	Spring 2005
MA2160 – Calculus with Technology II (Common Final)	Spring 2006, Spring 2007, Fall 2007, Spring 2008 (2 sections), Summer 2009, Spring 2010
MA2320 – Elementary Linear Algebra	Summer 2006, Summer 2008, Spring 2009
MA2321 – Elementary Linear Algebra	Spring 2009 (150 students end-of-course enrollment)
MA3520 – Elementary Differential Equations	Summer 2005, Summer 2007, Fall 2008 (135 students end-of-course enrollment)

For student evaluations, please see <http://users.pfw.edu/yorgovd/teaching.html>.

## Professional Memberships (Current)

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American Statistical Association; American Society of Human Genetics

## Service

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### Professional:

- Ad-hoc referee for Genetic Epidemiology (2019 Impact Factor: 1.954): 2020, 2019, 2018, 2017
- Educational Testing Service Reader for Advanced Placement AP Statistics Exam, Kansas City, June 2019
- Ad-hoc referee for PLOS One (2019 Impact Factor: 2.740): 2018, 2015

### University:

- University Resources Policy Committees, Fall 2021
- International Education Advisory Subcommittee, Fall 2021
- Honors program, 6 students (H-options)
- University Advancement Advisory Subcommittee, Fall 2019 – current
- Commencement 2019 Head Student Marshal (COAS, GNST-PSY majors)
- Faculty Judge for 2019 Student Research and Creative Endeavor Symposium
- Commencement 2018 Marshal for COAS, Engineering, and Nursing graduate students
- Sponsor of a Top 50 Student Award Recipient 2018

### College:

- Student Affairs Committee, COAS, Fall 2017 – Spring 2021
- Embedded tutor host/ tutor mentor for STAT125 College of Visual and Performing Arts designated sections Fall 2020, R06, and Fall 2019, R07.

### Departmental:

- Ad Hoc Assessment Taskforce June-August 2021
- Faculty Advisor for 2-9 Actuarial and DSAS majors (since Spring 2018)
- Reference for 12 students, graduate school applications
- Curriculum development for the Data Science and Applied Statistics and Actuarial Science programs, PFW/IPFW Mathematical Sciences, Fall 2016 – current
  - o Introduction to Statistical Computing with R practicum, Fall 2019 – current
  - o Probability Exam Practicum, Spring 2019 – current
- Student Posters Jury Chairman and Organizer, Data Science Week, December 2020 and December 2019
- Statistics Curriculum Committee, PFW/IPFW Mathematical Sciences, Fall 2016 – current
- Technology Committee, PFW/IPFW Mathematical Sciences, Fall 2017 – current

- Colloquium Committee, PFW/IPFW Mathematical Sciences, Fall 2017 – current
- Graduate committee member for MS student Ha Le, Summer 2019 – August 2020
- REU advisor and Pi Mu Epsilon presentation mentor for N. Nguyen, Spring 2019
- Program Review Committee, PFW Mathematical Sciences, Fall 2018 – Spring 2019
- Placement Committee, PFW/IPFW Mathematical Sciences, Fall 2016 – Spring 2017, Fall 2018 – Spring 19
- Awards and Scholarship Committee, PFW/IPFW Mathematical Sciences, Fall 2016 – Spring 2019
- Academic Affairs Committee, IPFW Mathematical Sciences, Spring 2018
- Graduate Student Representative in the Graduate Committee, CU Denver Mathematical and Statistical Sciences, Fall 2015
- Teaching Mentor for “Promoting Success in Early College Mathematics Through Graduate Teacher Training” project, CU Denver Mathematical and Statistical Sciences, 2015/2016 academic year
- Co-organizer, First Year Graduate Students Seminar, CU Denver Mathematical and Statistical Sciences, Fall 2015, Fall 2014
- Observed and provided feedback for new TA lecturers, CU Denver Mathematical and Statistical Sciences, Fall 2015, Fall 2014, Fall 2013
- Helped with departmental recruitment effort for new graduate students, CU Denver Mathematical and Statistical Sciences, Spring 2015, Spring 2014
- Undergraduate final exams review sessions. CU Denver Mathematical and Statistical Sciences 2010-2013
- Teaching panel member for the new TAs teaching seminar, CU Denver Mathematical Sciences, Fall 2013
- Optional Recitation Sessions: Linear Algebra, Fall 2008, Fall 2007 and Differential Equations, Fall 2007, Michigan Technological University

### **Community and Outreach:**

- Division of Continuing Studies course offered, 2019 – current
- Faculty co-advisor PFW/IPFW Actuarial Club, 2017 – current
- Statistical consulting work, August 2020, October 2018, July and March 2017
- Scoring and logistics help for MATHCOUNTS Fort Wayne Competition, February 2020 and February 2019
- Grader for MATHCOUNTS Fort Wayne Competition, February 2018, February 2017
- Table Activity Leader, Julia Robinson Math Festival Denver September 2015 (more than 320 middle school students), September 2015

### **Citizenship Status**

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Bulgarian Citizen, U.S. Permanent Resident (national interest waiver, self-petition)

### **Languages Spoken**

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English (fluent), Russian (conversational), Bulgarian (native speaker)

### **Programming and Computational Background**

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Currently Using: C; AWK and bash scripting; R/RStudio; Python and SciPy, NumPy, Keras, TensorFlow; PBS, SLURM; Mathematica; Impute2; Shapeit; plink; RFMix; gtool; qctool; admixture; King; GCTA; PC-Relate; Ibis

Experience with: SAS; CUDA; MPI; LaTeX; MySQL; C++; MATLAB; HTML; network protocols; various graphic design packages; Bioconductor; LAMP-LD, GemTools, JAGS; BC|SNP; Jupyter; LD Score

Educational Software: D2L Brightspace, Blackboard/WebCT, and Canvas learning management systems; CourseCompass, MyMathLab/MyStatLab, DataCamp, Coaching Actuaries, and ACTEX Learning Academic GOAL learning platforms