Oleksandr Vlasiuk

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Contact information

Department of Mathematics, 1326 Stevenson Center,
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Education

Vanderbilt University, Ph.D. in Mathematics 2018

Université de Toulon, Master I Mathématiques 2013

Taras Shevchenko National University of Kyiv, B.Sc. 2013

Appointments

Vanderbilt University, Postdoctoral Scholar 2021–2022

Florida State University, Postdoctoral Scholar 2018–2021

Long-term visits

ICERM, Brown University Feb 2018–Apr 2018

Research interests

Optimization over spaces of measures, point distributions, geometric measure theory, potential theory, computational and convex geometry.

Publications

1. with D. Bilyk, A. Glazyrin, R. Matzke, and J. Park, **Energy on spheres and discreteness of minimizing measures**, J. Funct. Anal., doi:10.1016/j.jfa.2021.108995 arXiv:1908.10354.

2. with A. Reznikov, **Riesz energy on self-similar sets**, Proc. Am. Math. Soc., accepted. doi:10.1090/proc/14663, arXiv:1810.01557

3. with T. Michaels, N. Flyer, and B. Fornberg, **Fast high-dimensional node generation with variable density**, Comput. Math. Appl. 76 (2018), no. 7, 1739–1757. doi:10.1016/j.camwa.2018.07.026, arXiv:1710.05011

4. with A. Reznikov and E. B. Saff, **A minimum principle for potentials with application to Chebyshev constants**, Potential Anal. 47 (2017), no. 2, 235–244. doi:10.1007/s11118-017-9618-x, arXiv:1607.07283

Updated: November 7, 2021.

5. with D. P. Hardin and E. B. Saff, **Generating Point Configurations via Hypersingular Riesz Energy with an External Field**, SIAM J. Math. Anal. 49 (2017), no. 1, 646–673. doi:10.1137/16m107414x, arXiv:1605.03840

6. with D. Leviatan and I. A. Shevchuk, **Positive results and counterexamples in comonotone approximation II**, J. Approx. Theory 179 (2014), 1–23. doi:10.1016/j.jat.2013.11.004

Preprints

7. with D. Bilyk, R. Matzke, **Positive definiteness and the Stolarsky invariance principle**, arXiv:2110.04138, 30 pp.

8. with A. Reznikov, A. Anderson, E. White, **Polarization and covering on sets of low smoothness**, arXiv:2106.11956, 9 pp.

9. with D. Bilyk, D. Ferizović, A. Glazyrin, R. Matzke, and J. Park, **Potential theory with multivariate kernels**, arXiv:2104.03410, 23 pp.

10. with D. P. Hardin and E. B. Saff, **Asymptotic properties of short-range interaction functionals**, arXiv:2010.11937, 62 pp.

11. **Discreteness of the minimizers of weakly repulsive interaction energies on Riemannian manifolds**, arXiv:2003.01597, 8 pp.

12. with D. Bilyk, A. Glazyrin, R. Matzke, and J. Park, **Optimal measures for p-frame energies on spheres**, arXiv:1908.00885, 38 pp.

Papers in preparation

13. with D. Hardin, E. Saff, **Asymptotics of k-nearest neighbor Riesz energies**, 35 pp.

Grants and awards

1. AMS-Simons Travel Grant 2020, $5000

2. Collaborate@ICERM "Codes and Designs: Optimal Discrete Measures", August 2021. Joint with Dmitriy Bilyk, Alexey Glazyrin, Ryan Matzke, and Josiah Park.

3. Florida State University Postdoctoral Travel Award, September 2019, $1000

4. Vanderbilt Graduate Travel Award, September 2016, $500

Presentations and talks

1. Conference presentations

    1) (upcoming, date tentative) Point Configurations: Deformations and Rigidity, LMS Research School, University College London, July 2022

    2) (upcoming, date tentative) CBMS Conference, Florida State University, 2022, *poster presentation*

3) (upcoming) ESI Program on "Optimal Point Configurations on Manifolds", January 2022

4) "Clustering phenomena for short-range interactions", SIAM Texas-Louisiana Section, University of Texas Rio Grande Valley, November 2021

5) "Optimizing short-range interactions for point cloud generation" SIAM SEAS Sectional meeting, Auburn University, September 2021

6) "Short-range interactions in nature, geometry, and information theory", Southern Georgia Mathematics Conference, Online, April 2021

7) "Asymptotic properties of short-range interaction functionals", MAAM Conference, Online, October 2020

8) "Asymptotic properties of short-range interaction functionals", Point Distributions Webinar, October 2020

9) "Properties of measures that minimize integral energy functionals on the sphere", AMS Sectional meeting, Gainesville FL, November 2019

10) "Sparsity of supports of measures minimizing integral energy functionals", SIAM-SEAS, Knoxville, September 2019

11) "Properties of minimizers of quadratic functionals over probability measures on homogeneous spaces", Barcelona Analysis Conference, University of Barcelona, June 2019

12) "Minimizers of quadratic functionals over probability measures on the sphere", Approximation, sampling, and compression in high dimensional problems (workshop), *poster presentation*, INI Cambridge, June 2019

13) "Minimizing p-frame energies (and other continuous functionals with radial kernels)" Approximation Theory 16, Vanderbilt University, Nashville, May 2019

14) "Minimizers of quadratic functionals over probability measures on the sphere", Madison Lectures in Fourier Analysis, *poster presentation*, UW Madison, May 2019

15) "Minimizing continuous functionals over probability measures", Shanks Workshop on Energy, Packing, and Covering, Vanderbilt University, Nashville, May 2019

16) "Minimizing p-frame energies", SEAM, University of Alabama, Tuscaloosa, March 2019

17) "Γ-convergence of hypersingular Riesz energy functionals", Multivariate Algorithms and their Foundations in Number Theory, Johann Radon Institute, Linz, November 2018

18) "Γ-convergence of hypersingular Riesz energy functionals", Texas Analysis and Mathematical Physics Symposium, Baylor University, October 2018

19) "High-dimensional node generation with variable density", Fast Algorithms for Generating Static and Dynamically Changing Point Configurations, ICERM, March 2018

20) "Variable density node distribution: Riesz minimizers and irrational lattices", Computational Methods and Function Theory, Lublin, July 2017

21) "Generating point configurations via hypersingular Riesz energy with an external field", Joint Mathematics Meetings, Atlanta, January 2017

22) 1st Northeastern Analysis Meeting, the College at Brockport, SUNY, October 2016

23) Optimal and random point configurations, Institut Henri Poincaré, Paris, June-July 2016, *poster presentation*

2. Seminar and non-research talks

1) Fourier transform, sparsity, and compressed sensing, FSU Machine Learning seminar, November 2019

2) Sphere Packings and Optimal Configurations (summer school), Hausdorff Center for Mathematics, September 2019

3) "Minimizing p-frame energies", Mathematics Colloquium, Florida State University, Tallahassee, January 2019

4) "Sumset estimates and the Menger's theorem", Analysis seminar, Florida State University, November 2018

5) "Variable density node distribution: Riesz minimizers and irrational lattices", Computational and Applied Mathematics seminar, Oak Ridge National Laboratory, January 2018

6) "Discretizing distributions with Riesz minimizers and irrational lattices", Analysis seminar, Florida State University, November 2017

7) "Basics of large deviations and Cramér's theorem", Analysis seminar, Vanderbilt University, June 2017,

8) "Ball multiplier problem", Analysis seminar, Vanderbilt University, April 2017,

9) "Finite Grassmannian frames, spherical codes, and equiangular lines", Analysis seminar, Vanderbilt University, April 2016,

10) "Riesz energy with an external field", Analysis seminar, Vanderbilt University, April 2015.

3. Workshop visits

1) (online) Minimal energy problems with Riesz potentials, American Institute of Mathematics, May 2021

2) (online) Combinatorial and Geometric Discrepancy, BIRS, September 2020

3) (online) Online Summer School on Optimization, Interpolation and Modular Forms, EPFL, August 2020

4) (online) Optimal transport and applications to machine learning and statistics, MSRI, May 2020

5) Midwestern Workshop on Asymptotic Analysis, Indiana University in Bloomington, October 2015

6) Minimal Energy Point Sets, Lattices, and Designs, ESI, Vienna, October 2014

7) Recent Methods in Sphere Packing and Optimization, Oberwolfach, June 2014

Teaching

1. Calculus III, Vanderbilt University, Fall 2021
2. Measure and Integration, Florida State University, Fall 2020–Spring 2021
   (*One of the basic courses in the graduate program at FSU. Followed by a prelim.*)
3. Calculus II, Florida State University, Spring 2019–Spring 2021
4. Calculus II, Vanderbilt University, Fall 2017 (*TA*)
5. Statistical learning, Vanderbilt University, Fall 2017 (*TA*)
6. Calculus I, Vanderbilt University, Fall 2015–Spring 2017 (*TA*)
7. Analysis, Vanderbilt University, Fall 2014–Spring 2015 (*TA*)

Service

1. Coorganizer of the minisymposium on "Point configurations on curves and surfaces and related energy problems" at the 10th International Conference on Curves and Surfaces, Arcachon, France, June 2022
2. Coorganizer of Point Distributions Webinar, Summer 2020–Fall 2021
3. Coorganizer of the minisymposium "Applications of discrete and continuous energy", Shanks Conference, Vanderbilt University, May 2021
4. Coorganizer of the International Conference on Approximation and Potential Theory, Georgia Southern University, March 2022 (tentative date)
5. Coorganizer of the special section "Frames, designs, and optimal spherical configurations", Joint Mathematics Meetings, Denver, January 2020
6. Reviewer for AMS Mathematical Reviews, Potential Analysis, Discrete & Computational Geometry, Constructive Approximation, Journal of Approximation Theory.

Outreach

1. Lecturer at the Nashville Math Club at Vanderbilt University
2. Participant of STEM nights at Pineview Elementary School, Tallahassee FL, organized by the National MagLab
3. Advising undergraduate students through the UROP research program at FSU:
   1) Will Driscoll, Fall 2019–Spring 2020
   2) Evelyn Castillo, Fall 2020–Spring 2021
4. Organized the Undergraduate Mathematics Seminar at FSU in Fall 2019–Spring 2020
5. Participant of the Math Fun Day at Florida State University in 2018, one of the biggest scientific outreach events at FSU with over 1400 visitors
6. Lecturer at the Undergraduate Math and Pizza Seminar at Vanderbilt University

Language proficiency and technical skills

1. Natural languages: English, Russian, Ukrainian (fluent); French (intermediate), Polish (beginner)
2. Programming languages: C++, CUDA C++, Python, Matlab, R
3. Development tools: Git, Make, GDB, common Linux CLI tools