Andrei A. Klishin, Ph.D.

Postdoctoral Scholar

I study emergent phenomena in complex systems and design problems. I use a variety of theoretical, numerical, and data tools including statistical mechanics, stochastic processes, network theory, tensor networks, and sparse inference.

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✉ AI Institute in Dynamic Systems, Box 352137, Seattle, WA 98195, USA

EDUCATION

Ph.D. in Physics
M.Sc. in Physics
Certificate in Complex Systems

🏛 University of Michigan
📅 2015–2020   📍 Ann Arbor, MI, USA

- Advisor: Prof. Greg van Anders (Queen's University)
- Dissertation: *Statistical Physics of Design*
- **Kurt M. Terwilliger Memorial Thesis Prize**

B.Sc. in Physics

🏛 Massachusetts Institute of Technology (MIT)
📅 2012–2015   📍 Cambridge, MA, USA

- Minor in Anthropology

Specialist in Physics

🏛 Belarusian State University (BSU)
📅 2010–2012   📍 Minsk, Belarus

- Four semesters completed

RESEARCH EXPERIENCE

Postdoctoral Scholar

▦ University of Washington, AI Institute in Dynamic Systems
📅 Oct. 2022 – present   📍 Seattle, WA, USA

UW Data Science Postdoctoral Fellow
Supervisor: Profs. Krithika Manohar and J. Nathan Kutz

Postdoctoral Researcher

▦ University of Pennsylvania, Department of Bioengineering
📅 Sep. 2020 – Aug. 2022   📍 Philadelphia, PA, USA

Supervisor: Prof. Dani S. Bassett

Graduate Student Research Assistant

▦ University of Michigan, Department of Physics
📅 Sep. 2016 – Aug. 2020   📍 Ann Arbor, MI, USA

Supervisor: Prof. Greg van Anders

Fellow of School of Applied Sciences

▦ Harvard University, School of Engineering and Applied Science
📅 Sep. 2018 – Aug. 2020   📍 Cambridge, MA, USA

Supervisor: Prof. Michael P. Brenner

Undergraduate Research Assistant

▦ Harvard-Smithsonian Center for Astrophysics
📅 Aug. 2014 – May 2015   📍 Cambridge, MA, USA

Supervisor: Dr. Igor Chilingarian

▦ MIT, Department of Physics
📅 Jun. – Aug. 2014   📍 Cambridge, MA, USA

Supervisor: Prof. Jeremy L. England

▦ MIT, Department of Materials Science and Engineering
📅 Jan. – Dec. 2013   📍 Cambridge, MA, USA

Supervisor: Prof. Michael J. Demkowicz

▦ Chemnitz University of Technology
📅 Jun. – Aug. 2013   📍 Chemnitz, Germany

Supervisor: Prof. Dr. Peter Mayr

PUBLICATIONS

Preprints

4. P. Chitnelawong, **A. A. Klishin**, N. MacKay, D. J. Singer, G. van Anders, *No Free Lunch for Avoiding Clustering Vulnerabilities in Distributed Systems*, `arXiv:2308.05196`

3. **A. A. Klishin**, J. N. Kutz, K. Manohar, *Data-Induced Interactions of Sparse Sensors*, `arXiv:2307.11838`

2. **A. A. Klishin**, N. H. Christianson, C. S. Q. Siew, D. S. Bassett, *Learning Dynamic Graphs, Too Slow*, `arXiv:2207.02177`

1. **A. A. Klishin** and M. P. Brenner, *Topological Design of Heterogeneous Self-Assembly*, submitted, `arXiv:2103.02010`

Peer-reviewed

8. **A. A. Klishin** and D. S. Bassett, *Exposure theory for learning complex networks with random walks*, Journal of Complex Networks, 10.5 (2022): cnac029

7. E. G. Teich, J. Z. Kim, C. W. Lynn, S. C. Simon, **A. A. Klishin**, K. P. Szymula, P. Srivastava, L. C. Bassett, P. Zurn, J. D. Dworkin, D. S. Bassett, *Citation inequity and gendered citation practices in contemporary physics*, Nature Physics, 18.10 (2022): 1161-1170

6. W. Qian, C. W. Lynn, **A. A. Klishin**, J. Stiso, N. H. Christianson, D. S. Bassett, *Optimizing the Human Learnability of Abstract Network Representations*, Proceedings of the National Academy of Sciences, 119.35 (2022): e2121338119

5. **A. A. Klishin**, D. J. Singer, and G. van Anders, *Avoidance, Adjacency, and Association in Distributed Systems Design*, Journal of Physics: Complexity, 2.2 (2021): 025015

4. **A. A. Klishin**, A. Kirkley, D. J. Singer, and G. van Anders, *Robust Design from Systems Physics*, Scientific Reports, 10.1 (2020): 14334

3. **A. A. Klishin** and G. van Anders, *When Does Entropy Promote Local Organization?*, Soft Matter, 16.28 (2020): 6523-6531

2. **A. A. Klishin**, C. P. F. Shields, D. J. Singer, and G. van Anders, *Statistical Physics of Design*, New Journal of Physics, 20.10 (2018): 103038

1. **A. A. Klishin** and I. Chilingarian, *Explaining the stellar initial mass function with the theory of spatial networks*, The Astrophysical Journal, 824.1 (2016): 17

Research software

1. P. Chitnelawong, **A. A. Klishin**, N. MacKay, G. van Anders, *Lachesis* (2023), `https://zenodo.org/record/8088164`

AWARDS

- Kurt M. Terwilliger Memorial Thesis Prize, U. of Michigan Physics Dept. (Apr. 2021)
- Frank Sevcik Prize for enhancing the international environment of the University, U. of Michigan Physics Dept. (Apr. 2019)
- Peter Franken Prize for outstanding 1st/2nd year graduate student in Physics, U. of Michigan Physics Dept. (Apr. 2017)
- James Howe Prize for best essay, MIT Anthropology (Apr. 2015)
- Gold Medal, 41st International Physics Olympiad (IPhO), Zagreb, Croatia (Jul. 2010)

RESEARCH TALKS

Invited

18. *Human learning of semantic networks*, Physics Seminar, Queen's University, Kingston, ON, Canada (Jun. 13, 2023)

17. *Learning in Design Problems, Semantic Networks, and Nonlinear Dynamics*, Department of Electrical and & Computer Engineering, University of Hawaiʻi at Mānoa, Honolulu, HI, USA (Mar. 20, 2023)

16. *Exposure theory for learning complex networks with random walks*, Networks Seminar, University of Oxford (virtual), Oxford, UK (Mar. 15, 2022)

15. *Human learning of semantic networks*, Physics Colloquium, Syracuse University, Syracuse, NY, USA (Mar. 1, 2022)

14. *Knowledge Structures for Design Problems and Statistical Mechanics*, Complex Systems Lab meeting, University of Pennsylvania (virtual), Philadelphia, PA, USA (Mar. 31, 2020)

13. *Knowledge Structures in Design Problems and Statistical Mechanics* (in Russian), Seminar of the Institute for Applied Physical Problems, BSU, Minsk, Belarus (Jul. 26, 2019)

12. *Knowledge Structures in Design Problems and Statistical Mechanics*, LASSP & AEP Seminar, Cornell University, Ithaca, NY, USA (Jun. 11, 2019)

11. *Directional Entropic Forces from Lattice Dimers*, Complex Systems Seminar, University of Michigan, Ann Arbor, MI, USA (Apr. 2, 2019)

10. *Knowledge Structures, Path Dependence, and Entropy Trajectories in Design Problems*, Non-equilibrium Statistical Mechanics Seminar, Massachusetts Institute of Technology, Cambridge, MA, USA (Mar. 20, 2019)

9. *Statistical Physics of Design*, Condensed Matter Physics Seminar, Queen's University, Kingston, ON, Canada (Feb. 14, 2019)

8. *Statistical Physics of Design*, Seminar of Centro de Ciencias de la Complejidad, Universidad Nacional Autónoma de México, Mexico City, Mexico (Jan. 23, 2019)

7. *Tensor Network Adventures*, Kavli Discussion, Harvard University, Cambridge, MA, USA (Oct. 17, 2018)

6. *Statistical Physics of Design*, Physics Seminar, Universidad de Chile, Santiago, Chile (Jan. 24, 2018)

5. *Statistical Physics of Design*, Physics Seminar, Universidad de Santiago de Chile, Santiago, Chile (Jan. 22, 2018)

4. *An analytic explanation of the stellar initial mass function from the theory of spatial networks* (in Russian), Sternberg Astronomical Institute Colloquium, Moscow, Russia (Jun. 24, 2016)

3. *Statistical Physics and Network Theory* (in Russian), Seminar of Council of Young Scientists, Belarusian State University, Minsk, Belarus (Jun. 21, 2016)

2. *An analytic explanation of the stellar initial mass function from the theory of spatial networks*, European Southern Observatory, Santiago, Chile (Jul. 27, 2015)

1. *An analytic explanation of the stellar initial mass function from the theory of spatial networks*, OIR Seminar, Harvard-Smithsonian CfA, Cambridge, MA, USA (Apr. 15, 2015)

Contributed

17. *Data-Induced Interactions of Sparse Sensors*, 17th US National Congress on Computational Mechanics, Albuquerque, NM, USA (Jul. 26, 2023)

16. *Statistical Mechanics of Wicked Design Problems*, SIAM Optimization 2023, Seattle, WA, USA (Jun. 3, 2023)

15. *Industrial design process as scientific discovery*, AAAI Spring Symposium on Computational Approaches to Scientific Discovery, Burlingame, CA, USA (Mar. 29, 2023)

14. *Learning Dynamic Graphs, Too Slow*, APS March Meeting 2023, Las Vegas, NV, USA (Mar. 7, 2023)

13. *Exposure predicts learning of complex networks by random walks*, APS March Meeting 2022, Chicago, IL, USA (Mar. 14, 2022)

12. *Topological Design of Heterogeneous Self-Assembly*, APS March Meeting 2021 (virtual) (Mar. 18, 2021)

11. *When does entropy promote local organization?*, Soft Matter Canada 2020 (virtual) (Jun. 17, 2020)

10. *Arrangement Problems: Between Field Theory and Network Theory*, Complex Space 2019, satellite of CCS 2019, Singapore (Oct. 3, 2019)

9. *Spatial and Network Effects in Distributed System Design*, Conference on Complex Systems 2019, Singapore (Sep. 30, 2019)

8. *Spatial and Network Effects in Distributed System Design*, StatPhys 27, Buenos Aires, Argentina (Jul. 11, 2019)

7. *Spatial and Network Effects in Distributed System Design*, APS March Meeting 2019, Boston, MA, USA (Mar. 7, 2019)

6. *Statistical Physics of Design*, Greater Boston Area Statistical Mechanics Meeting 2018, Brandeis University, Waltham, MA, USA (Oct. 27, 2018)

5. *Mathematical Recasting of Integrated System Design Problems*, Conference on Complex Systems 2018, Thessaloniki, Greece (Sep. 25, 2018)

4. *Mathematical Recasting of Integrated System Design Problems*, Great Lakes SIAM 2018, Detroit, MI, USA (Apr. 21, 2018)

3. *Design Pressure and Stress in Systems Physics*, APS March Meeting 2018, Los Angeles, CA, USA (Mar. 6, 2018)

2. *Generalized statistical mechanics and its applications to distributed system design problems*, Physics Graduate Student Symposium, U of Michigan, Ann Arbor, MI, USA (August 16, 2017)

1. *Phase-field Method in Analysis of Nanocomposite Morphological Stability*, COMSOL Conference Boston 2013, Newton, MA, USA (Oct. 10, 2013)

Posters

2. *Data-Induced Interactions of Sparse Sensors*, StatPhys 28, Tokyo, Japan (Aug. 7, 2023)

1. *Design is not an Optimization Problem*, Conference on Complex Systems 2020 (virtual) (Dec. 8, 2020)

TEACHING EXPERIENCE

Graduate Student Instructor

🏛 University of Michigan, Department of Physics   📅 Sep. 2015 – May 2017   📍 Ann Arbor, MI, USA

• PHYS136 Life Sciences Laboratory I (2 sections)	Winter 2017
• PHYS141 Elementary Laboratory I (2 sections)	Winter 2017
• PHYS161 Honors Mechanics Laboratory (1 section)	Fall 2016
• PHYS136 Life Sciences Laboratory I (2 sections)	Winter 2016
• PHYS136 Life Sciences Laboratory I (2 sections)	Fall 2015

Grader/Tutor/Outreach

🏛 Massachusetts Institute of Technology   📅 Nov. 2012 – May 2015   📍 Cambridge, MA, USA

• 8.06 Quantum Physics 3, grader	Spring 2014, 2015
• 8.044 Statistical Physics 1, tutor	Spring 2014, 2015
• 8.03 Physics III, tutor	Fall 2014
• Volunteer teacher for Splash and Spark high school student programs	2012–2014

Exchange teacher

🏢 Tec de Monterrey Campus Central de Veracruz (ITESM CCV)   📅 Jan. 2015   📍 Córdoba, VER, Mexico

• Electricidad y Magnetismo, lectures and lab sessions (in Spanish)
• Assisted with English classes and held regular office hours

Physics elective teacher

🏛 Gymnasium 29 and Lyceum BSU   📅 Sep. 2010 – May 2012   📍 Minsk, Belarus

• Designed and presented a course of lectures in physics and math to high school students (in Russian)
• Supervised long-term research projects in physics, organized experimental and theoretical research process
• Coached the teams in public, refereed presentations of their research

National IPhO team lecturer

🏛 Lyceum BSU and BSU Physics Department   📅 Apr.– Jun. 2012, Jun. 2014   📍 Minsk, Belarus

SCHOOLS AND WORKSHOPS

Instructor

• *Workshop for IYPT México 2019*, principal lecturer and coordinator (in Spanish), Aguascalientes, AGU, Mexico (Jan. 14–Feb. 1, 2019)
• *Summer Workshop for IYPT Chile 2018*, principal lecturer (in Spanish), Santiago, Chile (Jan. 8–26, 2018)
• *Workshop for IYPT Chile 2015*, original start-up idea, fundraiser, principal lecturer and coordinator (in Spanish), Santiago, Chile (Jul.–Aug. 2015)

Attendee

• *What is Biological Computation?*, Santa Fe Institute, Santa Fe, NM, USA (Sep. 11–13, 2019)
• *69th Lindau Nobel Laureate Meeting*, Lindau, Germany (Jul. 1–5, 2019)
• *IAP-Madrid*, 4-week intense Spanish course, Instituto Internacional, Madrid, Spain (Jan. 2014)

SCHOLARSHIPS, FELLOWSHIPS, AND GRANTS

- UW: UW Data Science Postdoctoral Fellow, $2,000 (Mar. 2023)
- UM: Rackham Conference Travel Grant for CCS 2019, $1,300 (Sep. 2019)
- NSF: Travel support for StatPhys 27, $1,000 (May 2019)
- UM: Rackham Conference Travel Grant for CCS 2018, $1,050 (Aug. 2018)
- Conference on Complex Systems 2018 travel award, €295 (Jun. 2018)
- UM: Physics Dept. Chair grant for US IYPT team 2018, $1,500 (May 2018)
- UM: Rackham Conference Travel Grant for APS 2018, $800 (Mar. 2018)
- UM: Center for Latin American and Caribbean Studies grant for IYPT Chile Summer Workshop, $500 (Dec. 2017)
- UM: Rackham Professional Devt. Grant for IYPT Chile Summer Workshop, $400 (Nov. 2017)
- American Institute of Physics: Meggers Grant for US IYPT team 2018, $12,000 (Aug. 2017)
- UM: Physics Dept. Chair grant for US IYPT team 2017, $3,000 (May 2017)
- UM: Physics Dept. Chair grant for US IYPT team 2016, $2,500 (May 2016)
- UM: Physics Dept. Fellowship for PhD studies, one year (Feb. 2015)
- MIT: EASE PSC Fellowship for project IYPT Chile, $2,000 (Apr. 2015)
- MIT: Physics Dept. Grant for project IYPT Chile, $3,750 (Apr. 2015)
- MIT: Scholarship for undergraduate studies (2012-2015)
- MIT: Li & Fung Scholarship for IAP-Madrid 2014, $3,200 (Jan. 2014)
- MIT: Kelly Douglas Summer Travel Fellow, $1,000 (May 2013)

ACADEMIC SERVICE

Symposia organized
- *Collective Decisions and Entropy in Data-Driven Optimization Landscapes*, with A. Bizyaeva, K. Manohar, J. N. Kutz
  SIAM Optimization 2023, Seattle, WA, USA   Jun. 3, 2023

AI Institute in Dynamic Systems, University of Washington
- Workshop on Common Task Frameworks for Science and Engineering 2023,
  co-moderator of a panel discussion on careers and ethics in AI   Feb. 16, 2023

Deparment of Physics, University of Michigan
- Colloquium Committee Student Member   AY 2017-18

PROFESSIONAL SOCIETY MEMBERSHIP

American Physical Society
Since Sep. 2017

Society for Industrial and Applied Mathematics
Since Apr. 2023

Complex Systems Society
Since Sep. 2018

US Association for Computational Mechanics
Since Apr. 2023

PEER REVIEW

Physical Review X

Complex Network 2021 conference

Physical Review Letters

Complex Network 2022 conference

OUTREACH ACTIVITIES

Belarusian Association of Educators and Researchers Abroad (BAREA)

BAREA (`http://bareafund.org`) supports the Belarusian scientific and educational community within the country and abroad and assists repressed students and scholars.

   → *Member of Board of Directors*   since Aug. 2021

Advising displaced students, writing and translating letters, advocating to other nat'l and int'l organizations.

→ *Co-organizer of Belarusian Interdisciplinary Seminar*   since Oct. 2021
→ *Co-organizer of Belarusian Interdisciplinary Conference*   Sep. 23–25, 2022
Inviting speakers, promoting diversity in discipline and identity, arranging schedules, moderating discussion.

Popular and outreach presentations and talks

10. *Complex Systems and Physics* (in Belarusian), Belarusian Interdisciplinary Seminar, inaugural lecture, online (Oct. 17, 2021)

9. *Physics Competition Startups: Lessons from Chile and United States*, APS March Meeting 2018, Los Angeles, CA, USA (Mar. 6, 2018)

8. *Physics of Network Theory* (in Russian), Cultural-Enlightenment Center "Arhe", Moscow State Pedagogical University, Moscow, Russia (Jun. 24, 2016)

7. *How to give an IYPT Talk*, US IYPT 2015, keynote speaker, Phoenixville Area High School, Phoenixville, PA, USA (Mar. 14, 2015)

6. *How to fight your way through physics*, MIT, Cambridge, MA, USA, for Splash 2014 (Nov. 22, 2014)

5. *What is life? A biophysics perspective*, MIT, Cambridge, MA, USA, for Splash 2014 (Nov. 22, 2014)

4. *How to give a science talk*, Lyceum BSU, Minsk, Belarus, (Jun. 7, 2014) and MIT, Cambridge, MA, USA, for Splash 2014 (Nov. 23, 2014)

3. *Elementary Forms of Religious Life*, MIT, Cambridge, MA, USA, for Splash 2013 (Nov. 23, 2013), Spark 2014 (March 16, 2014), Splash 2014 (Nov. 24, 2014)

2. *Pictogram Introduction to Political Philosophy*, MIT, Cambridge, MA, USA, for Splash 2013 (Nov. 23, 2013), Spark 2014 (March 16, 2014), Splash 2014 (Nov. 24, 2014)

1. Lecture in experimental physics for high school students, Belarusian State U. Physics Department, Minsk, Belarus (Feb. 2012)

Popular and outreach publications

3. A. Iantaffi, M.-J. Barker, J. Scheele, S. M. van Anders, *Mapping Your Sexuality: From Sexual Orientation to Sexual Configurations Theory* (2018), translated into Belarusian by **A. A. Klishin** and U. Harbacki (2022), `https://www.queensu.ca/psychology/van-anders-lab/sct.html`

2. M. De Domenico et al., *Complexity Explained* (2019), translated into Belarusian by S. K. Barodka and **A. A. Klishin** (2021), `https://complexityexplained.github.io`

1. **A. A. Klishin**, A. Churikova, M. Stepanova, *IYPT Chile: A Start-up Tournament*, *IYPT Magazine*, 6 (2018)

International Young Physicists' Tournament (IYPT)

IYPT (`http://iypt.org/`) is an annual world-wide team competition for high school students in solving complex open-ended physics problems, presenting and discussing solutions.

18. IYPT México 2019: *January Workshop principal instructor, juror, jury chairman, administrator, consultant*, Aguascalientes, AGU, Mexico (Jan. 14–Feb. 1, 2019)

17. IYPT 2018: *independent juror, jury chairman, problem author*, Beijing, China, Jul. 19–27, 2018

16. US IYPT 2018: *administrator*, Philadelphia, PA, USA, Apr. 14, 2018

15. IYPT Chile 2018: *Summer Workshop principal instructor, juror, administrator, consultant*, Santiago, Chile, Jan. 8–26 and May 26–27, 2018

14. IYPT 2017: *independent juror, jury chairman, problem author*, Singapore, Jul. 5–14, 2017

13. US IYPT 2017: *juror, administrator*, Downingtown, PA, USA, Apr. 1, 2017

12. IYPT 2016: *independent juror*, Ekaterinburg, Russia, Jun. 26–Jul. 4, 2016

11. IYPT Chile 2016: *consultant, fundraiser*

10. US IYPT 2016: *Executive Director, national selection coordinator*, online, April 2016

9. IYPT Chile 2015: *original start-up idea, fundraiser, head organizer, juror, jury chairman*, Santiago, Chile, July–August 2015

8. IYPT 2015: *team leader for USA, juror*, Nakhon Ratchasima, Thailand, Jun. 27–Jul. 4, 2015

7. US IYPT 2015: *invited speaker and juror*, Phoenixville, PA, USA, Mar. 14, 2015

6. IYPT 2012: *team leader for Belarus*, Bad Saulgau, Germany, July 2010

5. AYPT 2012: *team leader for Belarus*, Leoben, Austria, April 2012

4. BYPT 2011, 2012: *team leader, juror*, Minsk, Belarus, March 2011, 2012

3. IYPT 2010, 2011, 2013, 2014: *team consultant for Belarus*, Minsk, Belarus

2. IYPT 2013, 2014, 2015, 2017 Reference Kit (*I. Martchenko, A. A. Klishin et al.*), `http://kit.ilyam.org/` (2012, 2013, 2014, 2016)

1. *Volunteer assistant* in maintenance of the IYPT Archive website, `http://archive.iypt.org/` (2011-2017)

International Young Naturalists' Tournament (IYNT)

IYNT (`http://iynt.org/`) is an annual international team competition for students aged 12-16 in solving complex open-ended problems from a variety of natural sciences, presenting and discussing solutions.

   → *Chairman of the IYNT Situation Center*   Dec. 2014 – Jul. 2017
     In charge of data management, team registration, coordination, guidance and monitoring.

3. IYNT 2017: *inspector, administrator, juror, jury chairman, problem author*, Nanjing, China, Jun. 30–Jul. 4, 2017

2. IYNT 2016: *administrator, juror, jury chairman*, Shiraz, Iran, Jul. 16–22, 2016

1. IYNT 2015: *administrator, juror, jury chairman*, Belgrade, Serbia, Jun. 16–25, 2015

Other Outreach

2. Science Fair presenter (in Spanish), En Nuestra Lengua school, Ann Arbor, MI, USA (Jun. 2, 2018)

1. Science Fair presenter (in Spanish), Telesecundaria 20 de noviembre, Real del Monte, VER, Mexico (Jan. 28, 2015)

COMPUTER SKILLS

Python	**Matlab**	**Wolfram Mathematica**	**LaTeX**	**COMSOL**

LANGUAGES

Belarusian	*Russian*	*English*	*Spanish*	*Other Romance and Slavic languages*
Native	Native	Fluent	Fluent	Moderate reading