

# Dmitry Gritsenko

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## Education

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### University of Illinois at Chicago

Chicago, USA

PHD. IN MECHANICAL ENGINEERING (EXPECTED, AUGUST 2019)

Sep. 2014 - PRESENT

Thesis: *Theoretical approaches to the dynamics of fluid-structure interactions in various applications*

GPA: 3.72/4.00

### Lomonosov Moscow State University

Moscow, Russia

M.S. IN PHYSICS

Sep. 2011 - Jun. 2013

- Thesis: *Disc resonators with surface vibration modes*
- Diploma with Honors
- GPA: 4.92/5.00

### Lomonosov Moscow State University

Moscow, Russia

B.S. IN PHYSICS

Sep. 2007 - Jun. 2011

- Thesis: *Disc resonators with surface acoustic waves*
- GPA: 4.21/5.00

## Research Experience

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### UIC, Complex Fluids and Advanced Algorithms Laboratory

Chicago, USA

RESEARCH ASSISTANT

Summer 2018-PRESENT

Advisor: Dr. R. Paoli

- Multiscale Modeling of Complex Flows
  - Developed powerful approach for significant simplification of existing beam theories
  - Derived analytical solutions for displacements and stresses of thin cantilever beams

### UIC, Microfluidics Laboratory

Chicago, USA

RESEARCH ASSISTANT

Fall 2014-PRESENT

Advisor: Dr. J. Xu

Projects involved:

- PIPES: Piezoelectric Instrument for Precision Exploration Sampling
  - Developed theoretical model to define the modes of a single bubble trapped in circular cavity
  - Described the behavior of coupled bubble pair
  - Verified proposed theory experimentally and demonstrated excellent agreement
- Bubble-Based Acoustic Metamaterials
  - Developed theoretical model for the prediction of resonant frequencies and dissipation factors for bubble arrays
  - Modeled an influence of a reflector on transmission level of sound waves through bubble metascreen
- Development of a Novel High Throughput Zebrafish Model for the Study of Noise-Induced Hearing Loss
  - Designed and implemented a single-box solution for precise control and manipulation of acoustic signal to induce trauma in zebrafish lateral line
  - Contributed to overall design optimization
- Continuous Liquid Interface Production of 3D Objects with Wide Solid Cross Sections
  - Developed theoretical model for the prediction of separation force at constant and accelerated elevation of printing platform
  - Demonstrated the possibility of significant separation force reduction via surface texturing of the permeable window for continuous 3D printing
  - Optimized 3D printing process with respect to elevation velocity, acceleration and surface texturing
  - Validated proposed model with numerical simulation and showed excellent agreement
- Acoustic Bubbles for Sensing Enhancement
  - Contributed to design optimization
  - Performed data processing and statistical analysis

Advisor: Dr. J. Xu

- Acoustic Metamaterials (Joshua Chavez, Elias El Metennani, David Cartalano, Krisli Dimo)
- Soundproofing Metamaterials (Denis Dmitruk, Vladimir Hovorka, Winston Lai, Kevin Trevino)
- 3D Acoustic Pump (Tammy Nguyen, William Wong, Parth Patel, Maria Ruiz)

STUDENT ADVISOR

2015-2016

- Andrea De Vellis (graduate student)
  - Sensing Enhancement of Surface-Based Graphene Nanosensors Using Acoustic Bubbles
- Akshay Vijayaganesh (undergraduate student)
  - Acoustic Boiling
- Borna Mali (undergraduate student)
  - Acoustic Bubbles for Blood Separation

### V.A. Trapeznikov Institute of Control Sciences of Russian Academy of Sciences

Moscow, Russia

SENIOR MATHEMATICIAN

2013-2014

Advisor: Dr. A.G. Kushner

- Completely described the field of rational differential invariants of second-order ODEs with scalar control parameter with respect to Lie pseudo-group of feedback transformations

### MSU, Quantum and Precise Measurements Group

Moscow, Russia

GRADUATE RESEARCHER

Fall 2011–Spring 2013

Advisor: Prof. V.P. Mitrofanov

- Disc Resonators with Surface Vibration Modes
  - Designed and implemented an optical system for precise detection of SAWs in silicon wafers
  - Identified and verified major losses mechanisms for non-axisymmetric flexural vibrations of circular silicon wafers

UNDERGRADUATE RESEARCHER

Fall 2009–Spring 2011

Advisor: Prof. V.P. Mitrofanov

- Disc Resonators with Surface Acoustic Waves
  - Designed and implemented a capacitive sensor for detection of SAWs excited in clamped aluminum discs
  - Investigated excited modes and its properties

## Teaching Experience

### UIC, Department of Mechanical and Industrial Engineering

Chicago, USA

TEACHING ASSISTANT

Spring 2015–PRESENT

- ME205 Introduction to Thermodynamics (Fall 16, Spring 18, Summer 18, Spring 19)
- ME415 Propulsion Theory (Spring 16)
- ME595 Mechanical Engineering Seminar (Fall 15, Spring 16)
- ME396 Senior Design (Fall 15)
- ME321 Heat Transfer (Spring 15)

## Publications

1. Dmitriev, A. V., **Gritsenko, D. S.**, and Mitrofanov, V. P. (2014). Surface vibrational modes in disk-shaped resonators. *Ultrasonics*, **54**(3), 905-913
2. Dmitriev, A. V., **Gritsenko, D. S.**, and Mitrofanov, V. P. (2014). Non-axisymmetric flexural vibrations of free-edge circular silicon wafers. *Physics Letters A*, **378**(9), 673-676
3. Lin, Y., **Gritsenko, D.**, Feng, S., Teh, Y. C., Lu, X., and Xu, J. (2016). Detection of heavy metal by paper-based microfluidics. *Biosensors and Bioelectronics*, **83**, 256-266
4. Lin, Y., **Gritsenko, D.**, Liu, Q., Lu, X., and Xu, J. (2016). Recent advancements in functionalized paper-based electronics. *Applied Materials and Interfaces*, **8**(32), 20501-20515

5. De Vellis, A., **Gritsenko, D.**, Lin, Y., Wu, Z., Zhang, X., Pan, Y., Xue, W. and Xu, J. (2017). Drastic sensing enhancement using acoustic bubbles for surface-based microfluidic sensors. *Sensors and Actuators B: Chemical*, **243**, 298-302
6. **Gritsenko, D. S.**, and Kiriukhin, O. M. (2017). Differential invariants of feedback transformations for quasi-harmonic oscillation equations. *Journal of Geometry and Physics*, **113**, 65-72
7. Majidi, L., **Gritsenko, D.**, and Xu, J. (2017). Gallium based room-temperature liquid metals: actuation and manipulation of droplets and flows. *Frontiers in Mechanical Engineering*, **3**, 1-7
8. **Gritsenko, D.**, Yazdi, A. A., Lin, Y., Hovorka, V., Pan, Y., and Xu, J. (2017). On characterization of separation force for resin replenishment enhancement in 3D printing. *Additive Manufacturing*, **17**, 151–156
9. **Gritsenko, D.**, Lin, Y., Hovorka, V., Zhang, Z., Yazdi, A. A., and Xu, J. (2018). Vibrational modes prediction for water-air bubbles trapped in circular microcavities. *Physics of Fluids*, **30(8)**, 082001
10. Uribe, P.M., Villapando, B.K., Lawton, K.J., Fang, Z., **Gritsenko, D.**, Bhandiwad, A., Sisneros, J.A., Xu, J. and Coffin, A.B. (2018). Larval Zebrafish Lateral Line as a Model for Acoustic Trauma. *eNeuro*, ENEURO-0206
11. Lin, Y., Gao, C., **Gritsenko, D.**, Zhou, R., and Xu, J. (2018). Soft lithography based on photolithography and two-photon polymerization. *Microfluidics and Nanofluidics*, **22(9)**, 97
12. Zhang, Z., Drapaca C., **Gritsenko, D.** and Xu, J. (2018). Pressure of a viscous droplet Squeezing through a short circular constriction: an analytical model. *Physics of Fluids*, **30(10)**, 102004
13. Coffin A., B., Xu J., **Gritsenko, D.**, Lawton K., Villapando B., Sisneros J., Bhandivad, A.A. and Uribe, P. (2018). A new model for underwater noise research in larval fishes: Biomedical and ecological implications. *J. Acoust. Soc. Am.*, **144(3)**, 1844–1845

## Service

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### Physical Review E

AD HOC REVIEWER

2019

### Physical Review Applied

AD HOC REVIEWER

2019

### Physical Review Fluids

AD HOC REVIEWER

2019

### 17th International Conference on Nanochannels, Microchannels and Minichannels

AD HOC REVIEWER

USA

2018

### Scientific Reports

AD HOC REVIEWER

2017

## Honors & Awards

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### INTERNATIONAL

2015 **Winner**, Sigma Xi Award (Grants-in-Aid)

USA

### DOMESTIC

2013 **Gold medal**, MS in Physics diploma with honors

Moscow, Russia

2007 **Gold medal**, First class diploma for special achievements in studies

Moscow, Russia

## Conference Presentations

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## Acoustofluidics 2017

PRESENTER (ORAL TALK)

Drastic Sensing Enhancement Using Acoustic Bubble-Induced Agitation

San Diego, USA

2017

## 9th Annual AIChE Midwest Regional Conference

PRESENTER (ORAL TALK)

Use of Acoustic Microstreaming for Drastic Sensing Enhancement

Chicago, USA

2017

## International Conference “Delta-GEOMETRY”

PRESENTER (ORAL TALK)

Differential Invariants of Quasi-Harmonic Oscillation Equations with Respect to Feedback Transformations

Astrakhan, Russia

2014

## International Youth Conference “GEOMETRY AND CONTROL”

PRESENTER (ORAL TALK)

Differential Invariants of Feedback Transformations for Quasi-Harmonic Oscillation Equations

Moscow, Russia

2014

## International Student, Postgraduate and Young Scientist Conference “Lomonosov-2013”

PRESENTER (POSTER)

Classification of Oscillation Equations with Respect to Feedback Transformations

Moscow, Russia

2013

## International Conference “Computer and Analytical Methods in Control Sciences and Mathematical Physics”

PRESENTER (ORAL TALK)

Classification of Parametric Oscillation Equations with Respect to Feedback Transformations

Moscow, Russia

2013

## X International Workshop “Physical and Mathematical Modeling of Systems”

PRESENTER (ORAL TALK)

Classification of Quasi-Harmonic Oscillation Equations with Respect to Feedback Transformations

Voronezh, Russia

2013

## IX International Workshop “Physical and Mathematical Modeling of Systems”

PRESENTER (ORAL TALK)

Surface Modes of Elastic Vibrations in Thin Discs

Voronezh, Russia

2012

## International Conference “Geometry. Invariants. Control”

PRESENTER (ORAL TALK)

Differential Invariants of Quasi-Harmonic Oscillation Equations with Control Parameter

Moscow, Russia

2012

## Skills

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**Software**  $\LaTeX$ , Maple, Wolfram Mathematica, Origin, Microsoft Office

**Languages** Russian (native), German (basic)

## Memberships

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2018–2019 **Student Member**, American Society of Mechanical Engineers (ASME)

USA

2017–2019 **Associate Member**, The Scientific Research Society Sigma Xi

USA