

# Joel Zirkle

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## Education

2015–2020 **Ph.D in Applied Mathematics**, *Purdue University*, Indianapolis.

Advisor: Dr. Leonid Rubchinsky. Graduating in August 2020. My area is dynamical systems as they apply in computational neuroscience. My research involves:

1. Mathematical modeling of biological phenomena. Specifically using systems of ordinary or stochastic differential equations.
2. Extensive use of Python for numerical simulations, scientific computing and analysis of data. Extensive use of various packages, including: NumPy, SciPy, SymPy, PuLP.
3. Data visualization (Matplotlib).

2017–2020 **MS in Applied Statistics**, *Purdue University*, Indianapolis.

2011–2015 **BS with Highest Distinction in Pure Mathematics**, *Purdue University*, Indianapolis, 3.95 GPA.

2011–2015 **BS with Highest Distinction in Physics**, *Purdue University*, Indianapolis.

2011–2014 **Minor in Chemistry**, *Purdue University*, Indianapolis.

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## Employment History

2015–2020 **Instructor**, *Purdue University*, Department of Mathematics, Indianapolis.

I have taught the following courses:

1. Business Calculus (M119) Spring 2016, Summer 2016.
2. Trigonometry (MA15400) Fall 2016, Spring 2017, Fall 2017, Summer 2018.
3. Fundamentals of Algebra I (MA11000) Fall 2017.
4. Calculus I (MA16500) Spring 2018, Fall 2018.
5. College Algebra (MA15300) Spring 2019.
6. Multidimensional Math (MA17100) Summer 2019.
7. Calculus I for Life Sciences (MA23100) Fall 2019.
8. Calculus II for Life Sciences (MA23200) Spring 2020, Summer 2020.

2014–2015 **Assistant Manager**, *Mathematics Assistance Center*, Indianapolis.

1. Managed daily operations for a facility that employed 100+ persons.
2. Directly managed a team of approximately 10-15 students who tutored calculus.
3. Spearheaded the conversion of out-of-date Word documents to L<sup>A</sup>T<sub>E</sub>X.
4. Produced a 150+ page study reference for calculus.

2013–2014 **Calculus Tutor**, *Mathematics Assistance Center*, Indianapolis.

Tutored mathematics ranging from basic algebra to differential equations.

2012–2013 **Physics Tutor**, *Physics Learning Space*, Indianapolis.

Tutored students taking first-year physics courses.

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## Publications

1. J. Zirkle, L.L. Rubchinsky (2019). Exploring mechanisms of intermittent patterns of neural synchrony. *BMC Neuroscience*, 20(Suppl 1): P270.
2. J. Zirkle, L.L. Rubchinsky (2020). Spike-Timing Dependent Plasticity Effect on the Temporal Patterning of Neural Synchronization. *Front. Comput. Neurosc.*, **14**: 52.
3. J. Zirkle, L.L. Rubchinsky. Stochastic Effects on the Temporal Patterns of Neural Synchronization. (in preparation)

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## Presentations

- Fall 2015 Graduate Student Seminar, Purdue University, Indianapolis. *Bernoulli Polynomials and Numbers*.
- Fall 2016 Graduate Student Seminar, Purdue University, Indianapolis. *State of Stress and Strain*.
- Spring 2017 Graduate Student Seminar, Purdue University, Indianapolis. *Pattern Formation Mechanisms*.
- Fall 2017 On-campus SIAM event, Indianapolis. *Synchronization between Weakly Coupled Neurons*.
- Fall 2017 Graduate Student Seminar, Purdue University, Indianapolis. *Molecular Dynamics*.
- Spring 2018 Annual Meeting for Greater Indiana Society for Neuroscience. *Spike-timing-dependent plasticity effect on the patterns of neural synchrony*. (poster)
- Spring 2018 Computational and Systems Neuroscience Symposium, Purdue University, Indianapolis. *Spike-timing-dependent plasticity effect on the patterns of neural synchrony*. (poster)
- Spring 2019 Graduate Student Seminar, Purdue University, Indianapolis. *Introduction to Stochastic Differential Equations*.
- Fall 2019 Graduate Student Seminar, Purdue University, Indianapolis. *Single Neuron Dynamics*.
- Spring 2020 Graduate Student Seminar, Purdue University, Indianapolis. *Structural Stability of Nonlinear ODE Systems*.

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## Awards

- 2015 2015 Yuri Abramovich Memorial Scholarship.
- 2015 Pure Math Outstanding Senior.
- Spring 2018 Graduate Student Teaching Award

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## Computer Skills

- Languages Python (5 years), R (2 years)
- Software Git, MATLAB, XPP, SAS, L<sup>A</sup>T<sub>E</sub>X

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## Personal Technical Projects

- Ongoing Project Euler. Currently 50 problems solved. Hardest difficulty level: 80%.  
Examples here.
- 2014–2016 L<sup>A</sup>T<sub>E</sub>XReference Guide. A project that details the correct syntax and implementation of a wide variety of L<sup>A</sup>T<sub>E</sub>X's uses, ranging from basic text manipulation to three-dimensional graphing.

## Professional Affiliations

AMS, SIAM

## References

- Research and Academic Dr. Leonid Rubchinsky (doctoral advisor). *Professor of Applied Mathematics at IUPUI*. Affiliated with Stark Neurosciences Research Institute and IU School of Medicine. 317 274 9745 or lrubchin@iupui.edu
- Academic Dr. Julia Arciero. *Associate Professor of Applied Mathematics at IUPUI*. 317 274 6998 or jarciero@iupui.edu.
- Academic Dr. Jared Barber. *Assistant Professor of Applied Mathematics at IUPUI*. 317 274 6936 or jarobarb@iupui.edu.
- Teaching Dr. Jeffrey X. Watt, *Dept. Chair, Mathematical Sciences at IUPUI*. 317 274 4070 or jwatt@iupui.edu
- Professional Dr. Kevin Berkopes, *CEO of Crossroads Education* (former Director of the Mathematics Assistance Center @ IUPUI). 765 894 0093 or kevin.berkopes@crossroadseducation.org