

Jea-Hyun Park

VISITING ASSITANT PROFESSOR

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Education

PhD in Mathematics

UNIVERSITY OF TENNESSEE KNOXVILLE

- Advisors: Steven M. Wise, Abner J. Salgado.
- Thesis: Preconditioned Nesterov's Accelerated Gradient Descent Method and Its Applications to Nonlinear PDE.

Knoxville, Tennessee USA

2021-07-31

MS in Mathematics Education

KOREA NATIONAL UNIVERSITY OF EDUCATION

- Thesis: A Case-Study on Creative Exploring Activities for Uncomplicated Routine Problems.

Cheongju-si, Chungbuk Korea

2014-02-01

BS in Mathematics Education

KONGJU NATIONAL UNIVERSITY

Kongju-si, Chungnam Korea

2007-02-01

Positions

Visiting Assistant Professor

UNIVERSITY OF CALIFORNIA SANTA BARBARA

Department of Mathematics

08/2021 - present

Graduate Teaching and Research Assistant

UNIVERSITY OF TENNESSEE KNOXVILLE

Department of Mathematics

08/2016-07/2021

High school teacher

CHUNGNAM, KOREA

Hapdeok Steel High School

08/2010-02/2012

Middle school teacher

CHUNGNAM, KOREA

Geunheung Middle School

03/2008-07/2009

High school teacher

CHUNGNAM, KOREA

Deacheon Women's High School

03/2007-02/2008

Teaching

Introduction to Numerical Analysis

UNIVERSITY OF CALIFORNIA SANTA BARBARA

- Main instructor

Math 104A

2023 Fall

Vector Calculus 1

UNIVERSITY OF CALIFORNIA SANTA BARBARA

- Main instructor (150 students)

Math 6A

2023 Spring

Vector Calculus 1

UNIVERSITY OF CALIFORNIA SANTA BARBARA

- Main instructor (150 students)

Math 6A

2023 Winter

Introduction to Higher Mathematics

UNIVERSITY OF CALIFORNIA SANTA BARBARA

- Main instructor

Math 8

2023 Winter

Introduction to Numerical Analysis

UNIVERSITY OF CALIFORNIA SANTA BARBARA

- Main instructor (two sections of 65 students)

Math 104A

2022 Fall

Calculus 2 (Univariate Integral Calculus)

UNIVERSITY OF CALIFORNIA SANTA BARBARA

- Main instructor

Math 3B

2022 Spring

Calculus 2 (Univariate Integral Calculus)

UNIVERSITY OF CALIFORNIA SANTA BARBARA

- Main instructor (150 students)

Math 3B

2022 Winter

Linear Algebra

UNIVERSITY OF CALIFORNIA SANTA BARBARA

- Main instructor (150 students)

Math 4A

2021 Fall

Calculus 2 (Univariate Integral Calculus)

UNIVERSITY OF CALIFORNIA SANTA BARBARA

- Main instructor (150 students)

Math 3B

2021 Fall

Various

UNIVERSITY TENNESSEE KNOXVILLE

- Online exam proctor for pandemic

Proctor

2021 Spring

Differential Equation 1

UNIVERSITY TENNESSEE KNOXVILLE

- Teaching assistant (grading, office hours)

Math 231

2020 Fall

Differential Equation 1

UNIVERSITY TENNESSEE KNOXVILLE

- Teaching assistant (grading, office hours)

Math 231

2020 Spring

Finite Mathematics

UNIVERSITY TENNESSEE KNOXVILLE

- Recitation leader of a section

Math 123

2019 Fall

Basic Calculus

UNIVERSITY TENNESSEE KNOXVILLE

- Section leader of a half-flipped course

Math 125

2019 Spring

Differential Equation 1

UNIVERSITY TENNESSEE KNOXVILLE

- Teaching assistant (grading, office hours)

Math 231

2018 Fall

Basic Calculus

UNIVERSITY TENNESSEE KNOXVILLE

- Section leader of a half-flipped course

Math 125

2018 Spring

Basic Calculus

UNIVERSITY TENNESSEE KNOXVILLE

- Section leader of a half-flipped course

Math 125

2017 Fall

Basic Calculus

UNIVERSITY TENNESSEE KNOXVILLE

- Section leader of a half-flipped course

Math 125

2017 Spring

College Algebra

UNIVERSITY TENNESSEE KNOXVILLE

- Section leader of a half-flipped course

Math 119

2016 Fall

10- and 11-th grade Mathematics

HAPDEOK STEEL HIGH SCHOOL

- High school teacher

Mathematics

08/2010-02/2012

7-9th grade Mathematics

GEUNHEUNG MIDDLE SCHOOL

- Middle school teacher

Mathematics

03/2008-07/2009

11-th grade Mathematics

DEACHEON WOMEN'S HIGH SCHOOL

- High school teacher

Mathematics 1

03/2007-02/2008

Mentoring

First-gen and transfer mentoring

CAREER/LIFE

- Giving transfer/first-generation college students advice and information on how to get involved in research, how to balance work/academic/life, and how to get involved K-12 education program.

Successful, fulfilling college life and self-conception

2023 Fall

REU (self-organized)

UNDERGRADUATE RESEARCH

- Mentor 2 undergraduate scholars

Mobility discovery of Cahn-Hilliard equation.

2023 Summer

Directed Reading Program

UNDERGRADUATE EXPLORATORY STUDY MENTORING

- Mentor 2 undergraduate students for producing a poster about a tool that is used in real world

Hamiltonian Monte Carlo Method.

2023 Winter-Spring

Wisdom hours

CAREER/LIFE

- Weekly walk-in hours for personal discussions

Successful and fulfilling college life and career plan

2023 Spring

Growth hours

CAREER/LIFE

- Weekly walk-in hours for personal discussions

Successful and fulfilling college life and career plan

2023 Winter

Friendship hours

CAREER/LIFE

- Weekly walk-in hours for personal discussions

Successful and fulfilling college life and career plan

2022 Fall

Small gathering

CAREER/LIFE

- Monthly gathering with 8 undergraduate students for informal discussions on college life

Successful and fulfilling college life.

2022 Spring

REU at UCSB

UNDERGRADUATE RESEARCH

- Co-mentor 6 undergraduate scholars

Data-driven dynamic discovery of multi-agent systems

2021 Summer

Research Interests

Optimization
Continuous model for discrete methods
Fast numerical solver for high order, nonlinear PDE
Phase Field Models and Numerical Methods
Inference on PDE and Stochastic Models
Inverse problem
Methods for Bayesian inference (MCMC, HMC, coupling, etc)
Mathematical Aspect of Machine Learning and Neural Network

Publications

1. Park, J.-H., Salgado, A. J., & Wise, S. M. (2021). Preconditioned accelerated gradient descent methods for locally Lipschitz smooth objectives with applications to the solution of nonlinear PDEs. *J. Sci. Comput.*, 89(1), Paper No. 17, 37. <https://doi.org/10.1007/s10915-021-01615-8>
2. Park, J.-H., Salgado, A. J., & Wise, S. M. (2023). Benchmark computations of the phase field crystal and functionalized Cahn-Hilliard equations via fully implicit, Nesterov accelerated schemes. *Communications in Computational Physics*, 33(2), 367–398. <https://doi.org/10.4208/cicp.OA-2022-0117>
3. Park, J.-H., Salgado, A. J., & Wise, S. M. (2024). Nondegenerate convergence of the preconditioned gradient descent method for generic local Lipschitz objectives beyond Sobolev embedding. *In progress.*
4. Park, J.-H., Salgado, A. J., & Wise, S. M. (2024). Perturbed preconditioned gradient descent methods for Cahn-Hilliard equation with variable mobility. *In progress.*

Perturbed Preconditioned Gradient Descent Methods for Stationary Cahn-Hilliard Equation with Variable Mobility (submitted)

SAIM CONFERENCE ON MATHEMATICAL ASPECTS OF MATERIAL SCIENCE

Pittsburgh, PA

05/19/2024-05/24/2024

- Contributed talk if accepted

Subjective questions through back channels in college math classes

2022 MICHIGAN COUNCIL OF TEACHERS OF MATHEMATICS (MCTM) ANNUAL CONFERENCE

Michigan (online)

10/22/2022

- Contributed talk

Subjective Questions via Clickers for Engagement and Equity

ENGAGING TEACHING SYMPOSIUM

UC Santa Barbara

10/07/2022

- Contributed talk

Preconditioned Accelerated Gradient Descent Methods for Locally Lipschitz Smooth Objectives with Applications to the Solution of Nonlinear Partial Differential Equations

6TH ANNUAL MEETING OF SIAM CENTRAL STATES SECTION: MINISYMPOSIUM-8: RECENT ADVANCES IN NUMERICAL METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS

University of Kansas (online)

10/02/2021

- Contributed talk

Preconditioned Nesterov's acceleration for locally Lipschitz functions and its applications to phase field models

PDE/DATA SCIENCE/APPLIED MATH SEMIAR

UC Santa Barbara

10/01/2021

- Departmental Seminar talk

Stable and Fast Adaptive Solvers for the Functionalized Cahn-Hilliard (FCH) Equation

SAIM CONFERENCE ON MATHEMATICAL ASPECTS OF MATERIAL SCIENCE

Online

05/27/2021

- Contributed talk

Preconditioned Nesterov's acceleration for locally Lipschitz functions and its applications to phase field models

DOCTORAL DEFENSE

Knoxville (online)

04/05/2021

Numerical Comparison of Some Semi-implicit and Fully Implicit Solvers for Functionalized Cahn-Hilliard and Phase Field Crystal Equations

HONG KONG POLYTECHNIC UNIVERSITY NUMERICAL ANALYSIS SEMINAR

Hongkong (online)

03/01/2021

- Invited talk

Numerical approximations of the phase field crystal equation and the functionalized Cahn-Hilliard equation using time-adaptive BDF2 coupled with a preconditioned accelerated gradient descent method.

DEPARTMENTAL COMPUTATIONAL AND APPLIED MATHEMATICS SEMINAR

University of Tennessee Knoxville

11/11/2020

- Departmental Seminar talk

Preconditioned accelerated gradient descent methods for locally Lipschitz smooth objectives with applications to the solution of nonlinear PDEs.

SAYAS NUMERICS SEMINAR

Online

11/10/2020

- Contributed talk (this seminar is organized by mathematics departments of several universities to connect researchers of computational mathematics in VA, MD, DC, DE and adjacent areas to provide opportunities to students, postdocs and other early career researchers)

Preconditioned accelerated gradient descent methods for locally Lipschitz smooth objectives with applications to the solution of nonlinear PDEs.

SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY NUMERICAL SEMINAR

China (online)

10/21/2020

- Invited talk

Preconditioned accelerated gradient descent methods for locally Lipschitz smooth objectives with applications to the solution of nonlinear PDEs.

ILLINOIS INSTITUTE OF TECHNOLOGY NUMERICAL SEMINAR

Illinois (online)

10/16/2020

- Invited talk

A generic picture of research in numerical PDE: modeling, analysis, discrete analysis, and solver development (with the example of Cahn-Hilliard equation)

DEPARTMENTAL GRADUATE RESEARCH SHOWCASE

University of Tennessee Knoxville

11/21/2019

An ODE model for Nesterov's accelerated gradient descent method for Lipschitz smooth, strongly convex objective functionals.

DEPARTMENTAL COMPUTATIONAL AND APPLIED MATHEMATICS SEMINAR

- Departmental Seminar talk

University of Tennessee Knoxville

10/02/2019

Preconditioned Nesterov's Accelerated Gradient Descent Method For Strongly Convex, Lipschitz Smooth Objectives.

THE 43RD ANNUAL MEETING SIAM SOUTHEASTERN ATLANTIC SECTION MINI-SYMPOSIUM

- Contributed talk

University of Tennessee Knoxville

09/21/2019

Nesterov's Acceleration.

DEPARTMENTAL COMPUTATIONAL AND APPLIED MATHEMATICS SEMINAR

- Departmental Seminar talk

University of Tennessee Knoxville

09/11/2019

A mixed method for some fourth order elliptic equations related to Cahn-Hilliard equation. University of Tennessee Knoxville

ORAL SPECIALTY EXAM

University of Tennessee Knoxville

01/09/2019

Discrete Gagliardo-Nirenberg inequality.

DEPARTMENTAL COMPUTATIONAL AND APPLIED MATHEMATICS SEMINAR

- Departmental Seminar talk

University of Tennessee Knoxville

02/14/2018

Finite element approximation of p-Laplacian.

DEPARTMENTAL COMPUTATIONAL AND APPLIED MATHEMATICS SEMINAR

- Departmental Seminar talk

University of Tennessee Knoxville

12/06/2017

Berry phase estimation in gate-based adiabatic quantum simulation.

QUANTUM COMPUTING CLASS PROJECT PRESENTATION

- Class presentation

University of Tennessee Knoxville

04/21/2020

Interpolation spaces.

ADVANCED METHODS IN NUMERICAL PDE CLASS PROJECT PRESENTATION

- Class presentation

University of Tennessee Knoxville

11/29/2018

Hamiltonian Monte Carlo – theory and application.

STATISTICS CLASS PROJECT PRESENTATION

- Class presentation

University of Tennessee Knoxville

11/28/2017

Conferences/Workshop Attended

Engaging Teaching Symposium

UC SANTA BARBARA

10/13/2023

MAA OPEN: Redesigning Your Course for Mastery Grading

ONLINE

07/24/2023-07/28/2023

- Workshop for redesigning courses so that course outcomes and assessments are aligned

2022 Michigan Council of Teachers of Mathematics (MCTM) Annual Conference.

MICHIGAN (ONLINE)

10/22/2022

Engaging Teaching Symposium

UC SANTA BARBARA

10/07/2022

SIAM Annual Meeting and Joint Conference on Applied Mathematics Education

ONLINE

07/11/2022-07/15/2022

PDE/Data Science/Applied Math Semiar

UC SANTA BARBARA

10/02/2021-present

The 50th Barrett Lectures: Approximation, Applications, and Analysis of Nonlocal, Nonlinear Models

UNIVERSITY OF TENNESSEE KOXVILLE (ONLINE)

05/17/2021-05/19/2021

Finite Element Circus

ONLINE

11/06/2020-11/07/2020

AMS Fall Sectional Meeting (East)

ONLINE

10/03/2020-10/04/2020

University of Washington's Data-Driven Methods for Science and Engineering Seminar (bi-weekly)

ONLINE

10/02/2020-12/2020

Sayas Numerics Seminar (weekly)

ONLINE

09/2020-12/2020

Springer Nature PDE and Applications Webinar (weekly)

ONLINE

08/2020-10/2020

SIAM/CAIMS Annual Meeting

ONLINE

07/06/2020-07/17/2020

Quantum Computing Seminar

UNIVERSITY OF TENNESSEE KOXVILLE

01/2020-05/2020

Householder Lecture

UNIVERSITY OF TENNESSEE KOXVILLE

11/16/2018

Finite Element Circus

UNIVERSITY OF TENNESSEE KOXVILLE

03/16/2018-03/17/2018

Householder Lecture

OAK RIDGE NATIONAL LABORATORY

10/25/2017

Departmental Computational and Applied Mathematics Seminar (weekly)

UNIVERSITY OF TENNESSEE KOXVILLE

08/2017-05/2021

Technology/Skills

Prog	C, GPU computing with PyTorch, Matlab (OOP), Python (OOP)/NumPy/Pandas/Matplotlib
Stat	SAS/JMP, Matlab with statistics-related toolboxes
OS	Linux, Mac, Windows
Math	Mathematica, SageMath, GeoGebra, Mac Grapher
Doc	LaTeX, R/RStudio, Google documents, Microsoft office, Libre Office
Ver	Git/Github
Teaching	WebWork, iClicker, GradeScope, Canvas/Moodle,

Service

Departmental Seminar Organizer

UNIVERSITY OF CALIFORNIA SANTA BARBARA

10/2021-06/2023

- Managing speaker invitations, announcements, website for the PDE/Applied/Data Science Seminar

Awards/Scholarships

Randall E. Cline Award

UNIVERSITY OF TENNESSEE KNOXVILLE

04/11/2019

- This award was established by friends and colleagues in memory of Dr. Randall E. Cline. It is to provide student aid for scholarly activities associated with graduate student work at The University of Tennessee Department of Mathematics

Chancellor's Fellows

UNIVERSITY OF TENNESSEE KNOXVILLE

2016-2020

- The fellowships are available for new graduate students entering the Mathematics PhD program. The fellowship provides additional funding for the first 4 years of the program contingent upon normal progress in the graduate studies and satisfactory performance of assistantship duties

Certificates

2007	License of Teaching Secondary School Mathematics - 2nd class	Chungnam Office of Education (Korea)
2011	License of Teaching Secondary School Mathematics - 1st class (Awarded for teachers with three or more years teaching experience and with a special summer-long training completed)	Chungnam Office of Education (Korea)

Genetic Algorithm

Business and Statistics department

UNIVERSITY OF TENNESSEE KNOXVILLE

2019 Spring

- I got to learn about genetic algorithm (a quasi-optimizing tool for non-convex functionals that mimics the evolution of living creatures) during a course offered at the Business department in 2019 Spring.

Interest in Quantum Computing

Physics department, Electric Engineering and Computer Science department

UNIVERSITY OF TENNESSEE KNOXVILLE

2020 Spring

- Besides classical computation, I keep an eye on quantum computing, which may provide a breakthrough to our computational capacity. I learned the basics from a course titled quantum information and followed state-of-the-art discussions by attending quantum computing seminar offered by the physics department during the Spring semester 2020 at the University of Tennessee Knoxville

Cryptography coding

Mathematics department

UNIVERSITY OF TENNESSEE KNOXVILLE

2020 Spring

- I learned, coded (using Python and Sage), and enjoyed classical and current coding cryptography techniques such as ElGamal, RSA, and elliptic curve DSA (a technique used for block chains) from an excellent course titled computational number theory, especially in 2020 Spring