

DOHYUN KIM

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Nationality: **Korean**



RESEARCH INTEREST

Finite Element Methods, Numerical Optimization, Nonconforming Methods, Fluid Dynamics, Scientific Computing, Reinforcement Learning



PROFESSIONAL EXPERIENCE

Postdoctoral Research Associate | Brown University, USA

Supervisor: Brendan Keith, Brown University

2023 JAN –

Postdoctoral Researcher | Hong Kong Centre for Cerebro-Cardiovascular Health Engineering, Hong Kong

Supervisor: Raymond Chan, City University of Hong Kong

Co-supervisor: Lina Zhao, City University of Hong Kong

2021 DEC – 2022 OCT

Postdoctoral Researcher - Computational Science and Engineering | Yonsei University, South Korea

Supervisor: Eun-Jae Park, Yonsei University

2021 MAR – 2021 DEC



EDUCATION

Ph.D. Computational Science and Engineering – Mathematics | Yonsei University, South Korea

Advisor: Eun-Jae Park, Yonsei University

2015 MAR – 2021 FEB

B.S. Mathematics | Hanyang University, South Korea

2011 MAR – 2015 FEB



AWARDS AND GRANTS

Excellent Dissertation Award | Korean Mathematical Society 2021

Excellent Thesis Award | Yonsei University 2021

Excellent Paper Encouragement Award | Yonsei University 2019

Poster Excellence Award | KSIAM 2017

KSIAM-MathWorks Problem Challenge-Award of Excellence | KSIAM 2018

BK21Plus Scholarship | Brain Korea 21 Plus (2015-2020)

Research Competency Scholarship | Yonsei University 2019



PUBLICATIONS

Finite element approximation to the non-stationary quasi-geostrophic equation

ESIAM: Mathematical Modelling and Numerical Analysis

Dohyun Kim, Amiya K. Pani, Eun-Jae Park,

Remapping Through Direct Interpolation and Optimization for Finite Element ALE Hydrodynamics

(In Publication) Large-Scale Scientific Computation, 15th International Conference, LSSC 2025,

Brendan Keith, Dohyun Kim, Boyan Lazarov, Cosmin Petra, Mathias Schmidt, Vladimir Z Tomov,

A Simple Introduction to the SiMPL Method for Density-Based Topology Optimization

Structural and Multidisciplinary Optimization, 68, Article number 74 (2025)

Dohyun Kim, Boyan S. Lazarov, Thomas M. Surowiec, Brendan Keith

Analysis of the SiMPL Method for Density-Based Topology Optimization

SIAM Journal on Optimization, 35, pp. 1134-1164 (2025)

Brendan Keith, Dohyun Kim, Boyan S. Lazarov, Thomas M. Surowiec,

**DYNAMO: MULTI-AGENT REINFORCEMENT LEARNING FOR DYNAMIC ANTICIPATORY MESH
OPTIMIZATION WITH APPLICATIONS TO HYPERBOLIC CONSERVATION LAWS**

Journal of Computational Physics, 112924, 2024

Tarik Dzanic, Ketan Mittal, **Dohyun Kim**, Jiachen Yang, Socratis Petrides, Brendan Keith, Robert Anderson

Staggered DG method with small edges for Darcy flows in fractured porous media

Journal of Scientific Computing, 90, Article number 83 (2022)

Lina Zhao, **Dohyun Kim**, Eun-Jae Park, Eric Chung

Review and implementation of staggered DG methods on polygonal meshes

Journal of the Korean Society and Applied Mathematics, 25, pp. 66-81 (2021)

Dohyun Kim, Lina Zhao, Eun-Jae Park

Polygonal staggered discontinuous Galerkin methods

Oberwolfach Reports, 3/2021, 25-27 (2021)

Eun-Jae Park, Lina Zhao, **Dohyun Kim**

Morley finite element methods for the stationary quasi-geostrophic equation

Computer Methods in Applied Mechanics and Engineering, 375, 113639 (2021)

Dohyun Kim, Amiya K. Pani, Eun-Jae Park

Staggered DG methods for the pseudostress-velocity formulation of the Stokes equations on general meshes

SIAM Journal on Scientific Computing, 42, pp. A2537-A2560 (2020)

Dohyun Kim, Lina Zhao, Eun-Jae Park

Error estimates of B-spline based finite-element methods for the stationary quasi-geostrophic equations of the ocean

Computer Methods in Applied Mechanics and Engineering, 335, pp. 255-272 (2018)

Dohyun Kim, Tae-Yeon Kim, Eun-Jae Park, Dong-wook Shin



ORGANIZED CONFERENCE

**Special Session on Constrained Optimization and Optimal Control | 2025 AMS
Sectional Meeting**

March 12-13, 2025, University of Kansas, Lawrence, Kansas, USA

Mini-symposium: Recent developments in mathematical analysis and numerics for incompressible flow and related problems | 2022 SIAM Annual Meeting
June 11-15, 2022, Pittsburgh, Pennsylvania, USA (Online-Offline Hybrid)



INVITED TALKS

Latent Variable Mirror Descent for Topology Optimization | The European Conference on Numerical Mathematics and Advanced Applications
September 1-5, 2025, Heidelberg, Germany

SiMPL Method for Topology Optimization | 2025 International Conference on Continuous Optimization
July 19-20, 2025, Los Angeles, USA

A Simple Introduction to the SiMPL Method for Density-Based Topology Optimization | The 30th Biennial Numerical Analysis Conference
June 24-27, 2025, Glasgow, UK

SiMPL Method for Topology Optimization | 2025 SIAM CSE
March 3-7, 2025, Fort Worth, Texas, USA

DynAMO: Dynamic Anticipatory Mesh Optimization with Reinforcement Learning | 17th U. S. National Congress on Computational Mechanics
July 23-27, 2023, Albuquerque, NM, USA

DynAMO: Dynamic Anticipatory Mesh Optimization with Reinforcement Learning | 9th International Conference on High Order Finite Element and Isogeometric Methods
May 29-June 1, 2023, Larnaca, Cyprus

A pressure-robust staggered DG methods for the stationary Stokes and Navier-Stokes problems | AMS Sectional Meeting: 2023 Spring Southeastern Sectional Meeting
March 18-19, 2023, Atlanta, GA, USA

Pressure-Robust Staggered DG Method for Navier-Stokes Equations | SIAM Conference on Analysis of Partial Differential Equations (PD22)
March 14-18, 2022, Berlin, Germany (Online)

Staggered DG Methods on General Meshes | SIAM Conference on Mathematical & Computational Issues in the Geosciences
June 21-24, 2021, Italy (Online)

Staggered DG method for Darcy flows in fractured porous media on general meshes | International Conference on Computational Science 2021
June 16-18, 2021, Krakow, Poland (Online)

Staggered discontinuous Galerkin methods for the Stokes equations on general polygonal meshes | The 26th International Domain Decomposition Conference
December 7-12, 2020, Hong Kong, China (Online)

Error estimates of B-spline based finite-element methods for the stationary quasi-geostrophic equations of the ocean | The Week of Applied Mathematics and Mathematical Modelling
October 7-11, 2019, Vladivostok, Russia

A C0-discontinuous Galerkin method for quasi-geostrophic equations | International Conference on Computational Mathematics – Advances in Computational PDEs
September 29-October 2, 2018, Seoul, South Korea



PRESENTATIONS

SiMPL Method for Topology Optimization | The 16th World Congress of Structural and Multidisciplinary Optimization
May 18-23, 2025, Kobe, Japan

(POSTER) DynAMO: Dynamic Anticipatory Mesh Optimization with Reinforcement Learning | Mathematical and Scientific Machine Learning
Jun 5-9, 2023, Providence, RI, USA

Pressure robust staggered DG methods | KSIAM 2021 Annual Meeting
Dec 2-5, 2021, Busan, Korea (Online-Offline Hybrid)

A staggered DG method for the Darcy flow in fractured porous media on polygonal meshes | International Conference on Spectral and High Order Methods
July 12-16, 2021, Vienna, Austria (Online)

Staggered DG method with small edges for Darcy flows in fractured porous media | KSIAM 2021 Spring Meeting
June 25-27, 2021, Gangneung, South Korea

C0-interior penalty methods for stationary quasi-geostrophic equations | KSIAM
2018 Annual Meeting
November 2-4, 2018, Jeju, South Korea

**Finite element methods for wind-driven large scale ocean circulation with
spline basis | 2017 KSIAM Annual Meeting**
November 3-5, 2017, Busan, South Korea

**(POSTER) B-spline based finite element method for a large scale ocean
circulation | KSIAM 2017 Spring Conference Joint with EASIAM**
June 23-24, 2017, Seoul, South Korea

**Discontinuous Galerkin methods for Hodgkin-Huxley model | 2017 KMS Spring
Meeting**
April 28-30, 2017, Gwangju, South Korea



COMPUTER SKILLS

- MATLAB
- Python
- C++



NATIONALITY & LANGUAGE

- Advanced level in **English**
- Native proficiency in **Korean**