Bongsuk Kwon

Curriculum Vitae

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Professional Experience

2024 - present **Dean of College of Natural Science**
Ulsan National Institute of Science and Technology, Ulsan, Korea

2012 - present **Full, Associate, Assistant Professor of Mathematics**
Ulsan National Institute of Science and Technology, Ulsan, Korea

2009 - 2012 **Visiting Assistant Professor**
Texas A&M University, College Station, Texas

Education

2009 **Ph.D.**, Indiana University, Bloomington, Indiana

2002 **M.S.**, Pohang University of Science and Technology, Pohang, Korea

2000 **B.S.**, Korea University, Seoul, Korea

Areas of interest

- Analysis of Partial Differential Equations
- Hyperbolic conservation laws, Kinetic theory
- Stability of nonlinear waves

Publications

2025+ • (with Y. Kim and J. Yoon) Sharp regularity of gradient blow-up solutions in the Camassa-Holm equation, (2024), preprint, (40pp), https://arxiv.org/abs/2412.00558

• (with Y. Kim and W. Shim) Asymptotic self-similar blow-up for the regularized Saint-Venant equations, (2025), preprint, 47pp

• (with J. Bae and Y. Kim) Structure of singularities for the Euler-Poisson system of ion dynamics (2024), preprint, (57pp), https://arxiv.org/pdf/2405.02557

• (with C. Jung, M. Suzuki and M. Takayama) Zero Debye length limit for the Euler-Poisson system: Global solutions near plasma sheath, preprint (73 pp)

2025 • (with J. Bae and Y. Kim) Delta-shock for the pressureless Euler-Poisson system, SIAM J. Math. Anal. (2025), Volume 57, Issue 3, Pages: 3255-3296 DOI: 10.1137/24M1682956 https://arxiv.org/pdf/2407.15669

• (with M.-J. Kang and W. Shim) Long-time behavior towards shock profiles for the Navier-Stokes-Poisson system, J. Differential Equations, (2025) Volume 442 113479 https://arxiv.org/abs/2411.09094

• (with J. Bae and J. Choi) Formation of singularities in collision-free hydromagnetic waves, Applied Math Letters, Volume 160, 2025, 109344

2024 • (with C.-Y. Jung, M. Suzuki and M. Takayama) Approximate solutions for the Vlasov–Poisson system with boundary layers, Physica D: Nonlinear Phenomena, (2024) 30pp, arXiv:2401.06928

• (with J. Bae and J. Choi) Formation of singularities in plasma ion dynamics, Nonlinearity 37 (2024) 045011 (29pp), arXiv:2012.09657

2022 • (with J. Bae) Linear stability of solitary waves for the Euler-Poisson system, Arch. Ration. Mech. Anal., 243 (2022) 257-327, arXiv:2012.07687

• (with C.-H. Hsia, C.-Y. Jung and S. Moon) Synchronization of Kuramoto oscillators with the distributed time-delays and inertia effect, Applicable Analysis, online https://doi.org/10.1080/00036811.2022.2107917, (2022)

2021 • (with H.-M. Woo, Y. Hong, and B.-J. Yoon) Accelerating Optimal Experimental Design for Robust Synchronization of Uncertain Kuramoto Oscillator Model Using Machine Learning, IEEE Transactions on Signal Processing, vol. 69, pp. 6473-6487, 2021, doi: 10.1109/TSP.2021.3130967, arXiv:2106.00332, 12pp

• (with C. Jung and M. Suzuki) On approximate solutions to the Euler-Poisson system with boundary layers, Commun Nonlinear Sci Numer Simulat, (2021) Volume 96, 105717

• (with Y. Hong and B.-J. Yoon), Optimal Experimental Design for Uncertain Systems Based on Coupled Differential Equations, (2021), IEEE Access (Volume: 9) Page(s): 53804 - 53810 https://ieeexplore.ieee.org/document/9395128

2020 • (with C. Jung and M. Suzuki) Quasi-neutral limit for the Euler-Poisson system in the presence of boundary layers in an annular domain, J. Differential Equations, (2020), Vol 269, Issue 10, 8007-8054

• (with C.-H. Hsia, C.-Y. Jung, and Y. Ueda) Synchronization of Kuramoto oscillators with time-delayed interactions and phase lag effect, (22pp), J. Differential Equations, (2020), Vol 268, Issue 12, 7897-7939

2019 • (with J. Bae) Small amplitude limit of solitary waves for the Euler-Poisson system, J. Differential Equations, (2019), Volume 266, Issue 6, 3450-3478

• (with C.-H. Hsia and C.-Y. Jung) On the synchronization theory of Kumamoto oscillators under the effect of inertia, J. Differential Equations, (2019), Volume 267, Issue 2, 742-775

• (with C.-H. Hsia and C.-Y. Jung) On the global convergence of frequency synchronization for Kuramoto and Winfree oscillators, Discrete Contin. Dyn. Syst. B, (2019), Vol 24, No 7, 3319-3334

2018 • (with P. Howard and S. Jung) The Maslov index and spectral counts for Hamiltonian systems on $[0, 1]$, Journal of Dynamics and Differential Equations, (2018), Volume 30, Issue 4, pp 1703-1729

• (with J. Bae and S. Moon) Reconstruction of the initial state from the data measured on a sphere for plasma-acoustic wave equations, Inverse Problems, (2018), Volume 34, Number 10, 105004

• (with S. Moon and Y. Hristova) Single scattering tomography with curved detectors, Biomedical Physics & Engineering Express, (2018) Volume 4, Number 4, 045040

• (with C.-Y. Jung and M. Suzuki) Stability analysis and quasi-neutral limit for the Euler-Poisson equations, (2018), Kyoto Univ. RIMS Kokyuroku, No.2066, 137-147

2017 • (with S.-H. Chen, C.-H. Hsia, and C.-Y. Jung) Asymptotic stability and bifurcations of time-periodic solutions for the viscous Burgers' equation, J. Math. Anal. Appl. 445 (2017), 655–676

2016 • (with C.-Y. Jung and M. Suzuki) Quasi-neutral limit for the Euler-Poisson system in the presence of plasma sheaths with spherical symmetry, Math. Models Methods Appl. Sci., Vol. 26, No. 12 (2016) 2369–2392

• (with Y.-P. Choi) The Cauchy problem for the pressureless Euler/isentropic Navier-Stokes equations, J. Differential Equations, Volume 261, Issue 1, (2016), 654–711

2015 • (with P. Howard) Stability of transition front solutions in Cahn-Hilliard systems, Proceedings of the Research Institute of Mathematical Sciences, RIMS Kokyuroku, No.1985, Mathematical Analysis in Fluid and Gas Dynamics, (2015), 20-41

• (with S.-Y. Ha and M.-J. Kang) Emergent dynamics for the hydrodynamic Cucker-Smale system in a moving domain, SIAM J. Math. Anal. 47-5 (2015), 3813–3831

• (with Y.-P. Choi) Global well-posedness and large-time behavior for the inhomogeneous Vlasov-Navier-Stokes equations, Nonlinearity 28, (2015), 3309–3336

2014 • (with S.-Y. Ha and M.-J. Kang) A hydrodynamic model for the interaction of Cucker-Smale particles and incompressible fluid, Mathematical Models and Methods in Applied Sciences, Vol. 24, No. 11, (2014), 2311– 2359

• (with C.-Y. Jung, A. Mahalov and T. B. Nguyen) Maxwell solutions in media with multiple random interfaces, International Journal of Numerical Analysis and Modeling, Volume 11, Number 1, (2014), 193–212

2013 • (with Y.-P. Choi) Two-species flocking particles immersed in a fluid, Communications in Information and Systems, Volume 13 Number 2, (2013), 123–149

• (with M. Suzuki and M. Takayama) Large-time behavior of solutions to an outflow problem for a shallow water model, J. Differential Equations, Volume 255, Issue 7, (2013), 1883–1904

2012 • (with P. Howard) Asymptotic stability analysis for transition wave solutions in Cahn-Hilliard systems, Physica D, Vol. 241, Issue 14, (2012), 1193–1222

• (with P. Howard) Asymptotic L^p stability for transition fronts in Cahn-Hilliard systems, J. Differential Equations 252 (2012), 5814-5831

• (with P. Howard) Spectral analysis for transition front solutions in Cahn-Hilliard systems, Discrete and Continuous Dynamical Systems Ser. A, Volume 32, Number 1, (2012), 125–166

2009–2011 • Stability of planar shock fronts for multidimensional systems of relaxation equations, J. Differential Equations 251 (2011), no. 8, 2226–2261

• (with K. Zumbrun) Asymptotic behavior of multidimensional scalar relaxation shocks, J. of Hyperbolic Diff. Eqns., Vol 6, Issue 4, (2009), 663-708

• Structural conditions for full MHD equations, Quart. Appl. Math. 67, (2009), 593-600

Grants

March 2025 – Feb. 2030 **National Research Foundation of Korea**, *(NRF-2025-00560003), PI*, (1,150 million KW)

June 2022–Feb. 2025 **Basic Research Laboratory (BRL), National Research Foundation of Korea**, *(NRF-2022R1A4A1032094), co-PI*, (1,375 million kw)

March 2020 – Feb. 2025 **National Research Foundation of Korea**, *(NRF-2020R1A2C1A01009184), PI*, (650 million KW)

Sep. 2017 – August 2020 **National Research Foundation of Korea**, *(NRF-2017R1E1A1A03070406), PI*, (USD 240,000)

July 2015 – June 2018 **National Research Foundation of Korea**, *(NRF-2015R1C1A1A02037662), PI*, (USD 120,000)

May 2012 – April 2015 **National Research Foundation of Korea**, *(NRF-2012R1A1A1015116), PI*, (USD 150,000)

Students

Junsik Bae (PhD, 2019), Wanyong Shim (PhD, 2023), Yunjoo Kim (PhD, current)

International Workshops, Conferences organized∗/Talks

Feb. 6-7, 2025	Conference on recent advances in Harmonic Analysis and Partial Differential Equations, Jeonju, Korea
Nov 25-27, 2024	Workshop on nonlinear partial differential equations related to fluid dynamics, Institute of Science Tokyo, Japan
June 10-14, 2024	The Equadiff conference 2024, Karlstad, Sweden
May 20-24, 2024	International Conference on Elliptic and Parabolic Problems: GAETA 2024, Gaeta, Italy
Feb 19-23, 2024	The 10th Korea PDE Winter School (3 hours), Formation and stability of singularities arising in compressible fluid flow, KAIST, Korea
August 16-19, 2022	KAIST PDE lecture series (8 hours), Singularity formation for nonlinear hyperbolic equations, Math Dept. at KAIST, Korea
March 14-18, 2022	SIAM conference on Analysis of PDE, Berlin, Germany
Nov 11, 2021	Analysis and PDE Seminar, The Chinese University of Hong Kong
July 7-9, 2021	Workshop Mathematical Analysis in Fluid and Gas Dynamics, RIMS, Kyoto University
June 24, 2021	Online Workshop for Nonlinear Partial Differential Equations, Tokyo Institute of Technology
Dec 11-14, 2019	∗ SIAM conference on Analysis of PDE, Recent Developments on Analysis and Computations in Fluid Dynamics, La Quinta, CA
Nov 24, 2019	PDE seminar, Tokyo Institute of Technology
Oct 2019	PDE seminar, University of Illinois at Chicago
Sep 2018	PDE workshop, University of Illinois at Chicago
March 5-10,2018	Workshop on Compressible Navier-Stokes Systems and Related Problems, The Institute of Mathematics, The Chinese University of Hong Kong, Hong Kong
Feb 11-13, 2018	∗ 2nd workshop on Recent development of mathematical fluid dynamics and hyperbolic conservation laws, Pukyung National University, Busan, Korea
August 24-25, 2017	Ito workshop on Partial Differential Equations, Kyushu University, Fukuoka, Japan
July 13-18, 2015	∗ UNIST Workshop on Nonlinear Partial Differential Equations, UNIPARK, Jeju, Korea
March 25-27, 2015	∗ Recent development of mathematical fluid dynamics and hyperbolic conservation laws, National Institute of Mathematical Sciences, Daejeon, Korea
Jan. 26-30, 2015	∗ Intensive lecture series on Oscillatory Integrals and their applications, Ulsan, Korea
May 30-31, 2014	∗ Workshop on Nonlinear Partial Differential Equations, UNIST, Ulsan, Korea

Academic visits

2019	• SDSU, UCSD (sabatical)
2018	• UIC, Chicago (Sep.); • CUHK, Hong Kong (March 5-10)
2017	• Kumamoto Univ., Japan (Nov. 18); • NTU, Taiwan (Sep. 4-7): • Kyushu Univ., Japan (August 24-25)
2015	• Univ. of Tokyo, Japan (August 10-14); • RIMS, Kyoto Univ., Japan (July 8-10); • SNU, Korea (June 22-25); • 5th Korea PDE school, NIMS, Korea (February 9-13); • Tokyo Institute of Technology, Japan (Jan. 21-23)
2014	• KAIST, Korea (Sep.18-20); • KIAS, Korea (Nov. 28);
2013	• NIMS, Korea (Nov. 6); • NCTS, Taiwan (Oct 17); • Univ. of Seoul (Oct)