

YunKyong Hyon

CONTACT INFORMATION National Institute for Mathematical Sciences,
Division of Mathematical Models,
Advanced Mathematical Data-Analytics,
70, Yuseong-daero, Daejeon, Korea, 305-811 *Voice:* +82-42-717-5736
Fax: +82-42-864-5734
E-mail: hyon@nims.re.kr
Homepage: <http://data.nims.re.kr/~hyon>

CITIZENSHIP Republic of Korea (South)

RESEARCH INTERESTS **Mathematical Modeling and Advanced Analytics for Data and Its Applications:**

- Mathematical Models for Data
- Mathematical Data Analytics
- Data Visualization

Mathematical Modeling for Complex Fluids in Polymeric Physics, (Electro-) Physiology, and Biology:

- Complex Fluids of Viscoelastic Polymeric Molecules
- Ion Channels and Electrical Activities in Biological Cell Membranes
- Hydrodynamic Electrorheological Fluids
- Swimming Microorganisms in Complex Fluids and Heterogeneous Environments

Numerical Analysis and Scientific Computations:

- Finite Element Methods
- Boundary Element Methods
- Numerical Methods for Solving Linear Systems
- Parallel Computations in MPI and CUDA (GPU)

ACADEMIC & PROFESSIONAL EXPERIENCE

National Institute for Mathematical Sciences, Daejeon, Korea

- *Senior Researcher, Project Group Leader (Division of Integrated Mathematics)* January 2016 to Present
- *Senior Researcher, Division Leader (Division of Mathematical Models)* January 2013 to 2015
- *Researcher (Division of Computational Sciences in Mathematics)* April 2012 to December 2012
 - Area of Research : Mathematical Data-Analytics, Immersed Interface Finite Element Method, Mathematical Model of Elastic Flagella Hook in Viscoelastic Complex Fluids, Swimming Microorganisms, Ion Dynamics of Ionic Fluids in Cell Membrane, Numerical Analysis and Scientific Computations, GPU Computing

Department of Mechanical Engineering, University of Nevada, Reno, Reno, Nevada, USA

- *Postdoctoral Fellow* September 2010 to February 2012
 - Area of Research : Micro Swimmer Model in Viscoelastic Complex Fluids, Ion Channel in Cell Membrane, Numerical Analysis and Scientific Computations

Institute for Mathematics and Its Applications (IMA), University of Minnesota, Minneapolis, Minnesota USA

- *Postdoctoral Fellow* September 2008 to August 2010
 - Area of Research : Viscoelastic Complex Fluids, Ion Channel in Cell Membrane, Numerical Analysis and Scientific Computations

Department of Mathematics, Pennsylvania State University, University Park, Pennsylvania USA

- *Postdoctoral Fellow* September 2007 to May 2008
 - Advisor : Dr. Chun Liu.
 - Area of Research : Mathematical Modeling and Scientific Computations for Complex Fluids.
- *Lecturer* September 2007 to May 2008
 - Calculus with Analytic Geometry II (MATH141).
 - Associate Coordinator of the Final Exam.
- *Instructor* January 2007 to May 2007
 - Matrices (MATH220)
- *Visiting Scholar and Research Assistant* *September 2005 to May 2007*
(during in Ph.D course at KAIST, supported by the Korea Research Foundation)
 - Advisor : Dr. Chun Liu.
 - Area of Research : Mathematical Modeling and Scientific Computations for Complex Fluids.

Department of Mathematical Sciences, Korea Advanced Institute of Science and Technology (KAIST), Taejeon, Korea

- *Research Assistant* September 2002 to July 2004
 - Innovative Approaches to Various Fluid Computations
- *Teaching Assistant* September 2002 to July 2005
 - Calculus, Advanced Calculus, Vector Calculus, Introduction to Linear Algebra, Differential Equations.

Department of Mathematics, Hanyang University, Seoul, Korea

- *System Manager of Computational Lab.* March 1997 to February 1999
in Department of Mathematics
 - Manager of Departmental Computational Laboratory
 - Coordinator of Summer School for the Information Technology, 1998

Poiesis System (Jinsol) Co., Seoul, Korea

- Team-Leader for Development of a Software for Auto-Generation of xhtml Based on XML, 2001-2002

AWARDS

Korea Research Council for Fundamental Sciences and Technology

- KRCF Research Fellowship for Young Scientists, March 2012

TeraGrid Project

- Startup Allocation for “Energy Variational Analysis of Ions in Water and Channels: Field theory”, November 2010

Korea Research Foundation

- International Joint Research Fellowship, 2005

Hanyang University

- The Departmental Graduation Honor Prize (cum laude), 1997
- Scholarship, Department of Mathematics, 1994-1995

EDUCATION

The Korea Advanced Institute of Science and Technology (KAIST), Taejeon, Korea

- Ph.D., Department of Mathematical Sciences (August 2007)
 - Thesis: “*New Mixed Finite Element for Elliptic Problem on Quadrilateral Grid*”
 - Advisor: Professor Do Young Kwak
 - Area of Study: Numerical Methods for Elliptic Partial Differential Equations

The Hanyang University, Seoul, Korea

- M.S., Mathematics, March 1999
 - Thesis: “*Preconditioned Conjugate Gradient Solver for Generalized Eigenvalue Problem*”
 - Advisor: Professor Ho-Jong Jang
 - Area of Study: Numerical Analysis
- B.S., Mathematics, March 1997

PUBLICATIONS

Published and accepted

- D. Y. KWAK, S. LEE AND Y. HYON, *A New Finite Element For Interface Problems Having Robin Type Jump*, International Journal Of Numerical Analysis and Modeling, 14(4), pp.532–549, 2017.
- C. LEE, H. LEE, Y. HYON, T. LIN, AND C. LIU, *Boundary Layer solutions of Charge Conserving Poisson-Boltzmann Equations: one-dimensional case*, Communications in Mathematical Sciences, 14(4), pp.911–940, 2016.
- C. HSIEH, Y. HYON, H. LEE, T. LIN, AND C. LIU, *Transport of Charged Particles: Entropy Production and Maximum Dissipation Principle*, Journal of Mathematical Analysis and Applications, 422, pp.309–336, 2015.
- M. JABBARZADEH, Y. HYON, AND H. C. FU, *Swimming fluctuations of micro-organisms due to heterogeneous microstructure*, Physical Review E 90, 043021 2014.
- Y. HYON, *Hysteretic Behavior of Moment-Closure Approximation for FENE Model*, Kinetic and Related Models, 7(3), pp.493–507, 2014.
- Y. HYON, B. EISENBERG, AND C. LIU, *An Energetic Variational Approach To Ion Channel Dynamics*, Mathematical Methods in the Applied Sciences, 37(7), pp.952–961, 2014.
- Y. HYON, MARCOS, T. R. POWERS, R. STOCKER, AND H. C. FU, *The Wiggling Trajectories of Bacteria*, Journal of Fluid Mechanics, 705, pp.58–76, 2012.
- Y. HYON, J. FONSECA, B. EISENBERG, AND C. LIU, *Energy Variational Approach to Study Charge Inversion (Layering) near Charged Walls*, DCDS-B, 17(8), pp.2725–2743, 2012.
- Y. HYON, B. EISENBERG, AND C. LIU, *A Mathematical Model for the Hard Sphere Repulsion in Ionic Solutions*, Communications in Mathematical Sciences, vol.9, no.2, pp.459–475, 2011.

- Y. HYON, D. Y. KWAK, *Superconvergence of New Mixed Finite Element Spaces*, Journal of Computational and Applied Mathematics, vol.235, pp.4265–4271, 2011.
- C-C. LEE, H. LEE, Y. HYON, T-C. LIN, AND C. LIU, *New Poisson-Boltzmann Type Equations: One-Dimensional Solutions*, Nonlinearity, vol.24, pp.431–458, 2011.
- Y. HYON, B. EISENBERG, AND C. LIU, *Energy Variational Analysis EnVarA of Ions in Water and Channels: Field Theory for Primitive Models of Complex Ionic Fluids*, Journal of Chemical Physics, vol.133, pp.104104-1–23, 2010.
- Y. HYON, , D. Y. KWAK AND C. LIU, *Energetic Variational Approach in Complex Fluids: Maximum Dissipation Principle*, DCDS-A, vol.26, no.4, pp.1291–1304, 2010.
- Y. HYON, D. Y. KWAK, *New Quadrilateral Mixed Finite Elements*, Electronic Transactions on Numerical Analysis, vol.37, pp.189–201, 2010.
- Y. HYON, Q. DU, AND C. LIU, *On Some PDF Based Moment Closure Approximations of Micro-Macro Models for Viscoelastic Polymeric Fluids*, the special issue of J. Comput. and Theo. Nanoscience, vol.7, pp.756–765, 2010.
- Y. HYON, J. A. CARRILLO, Q. DU, AND C. LIU, *A Maximum Entropy Principle Based Closure Method for Macro-Micro Models of Polymeric Materials*, Kinetic and Related Models, vol.1, no.2, p.171–184, 2008.
- Y. HYON, Q. DU, AND C. LIU, *An Enhanced Macroscopic Closure Approximation to the Micro-Macro FENE Models for Polymeric Materials*, Multi. Model. Simul., vol.7, no.2, p.978–1002, 2008.
- P. A. KRUTITSKII, Y. HYON, AND D. Y. KWAK, *Numerical Treatment of a Skew Derivative Problem for the Laplace Equation in the Exterior of an Open Arc*, Journal of Engineering Mathematics, vol.59, p.25–60, 2007.
- Y. HYON, H-J. JANG AND D. Y. KWAK, *A Nonconforming Covolume Method for Elliptic Problems*, Applied Mathematics and Computation, vol.196, p.60–66, 2008.
- Y. HYON, AND H-J. JANG, *An Accelerated Deflation Technique for Large Symmetric Generalized Eigenproblems*, Journal of Korean Society for Industrial and Applied Mathematics, vol.3, no.1, p.99–106, 1999.

TECHNICAL SKILLS **Programming**

- C/C++, Fortran, Message Passing Interface (MPI-Parallel Computing) , Compute Unified Device Architecture (CUDA - NVIDIA GPU Computing), Matlab, Octave, PHP (Web-programming), SQL (Database)

Packages

- LAPACK, BLAS, SuperLU, FreeFEM, CUDA, CULA (LAPACK type package in CUDA), MAGMA(LAPACK type package in CUDA), FreeFEM++, Matlab/ Octave (linear algebra, nonlinear numerical methods, polynomials, visualization, symbolic mathematics)

Systems

- Cray XT5, Cray XE6, Unix/Linux multi-processor sever