RAEHYUN KIM

University of California, Berkeley
1062 Evans Hall 3840, Berkeley, CA, USA, 94720-3840
rhkim79@math.berkeley.edu / kimrh3169@gmail.com

RESEARCH INTERESTS

Quantum Computational Chemistry; Numerical Linear Algebra; High Performance Computing

EDUCATION

University of California, Berkeley *United States of America*
Ph.D. in Department of Mathematical Sciences *September 2019 - Current*
Advisor: Professor Lin LIN

Seoul National University *Republic of Korea*
M.S. in Department of Mathematical Sciences *March 2016 - February 2018*
Advisor: Professor Dongwoo SHEEN

Seoul National University *Republic of Korea*
Double major in Mathematics Education and Computational Sciences *March 2010 - February 2016*

RESEARCH EXPERIENCE

University of California, Berkeley United States of America
Ph.D. Candidate *Feb 2021 - Current*

· Advisor : Professor Lin LIN
· Project : Multi-level parallelism and high-level *ab initio* dynamics for solution-phase redox chemistry at the exascale
  - Density Matrix Embedding Theory in the field of electronic structure theory
  - Developing an *ab initio* model for Twisted Bilayer Graphene

ByteDance Inc. United States of America
Research Intern *May - August 2022 & 2023*

· Project : Developing quantum embedding theory for large-scale molecular system in AI-lab
  - Enhance the accuracy of Density Matrix Embedding Theory using various optimization techniques

Soongsil University Foundation of University-Industry Cooperation Republic of Korea
Researcher *May 2016 - August 2019*

· Advisor : Professor Jaeyoung CHOI
· Project : LAMMA-Linear Algebra for Multicore and Manycore Architectures
  - Implement and optimize BLAS and LAPACK routines for Multicore and Manycore Architectures

Seoul National University Republic of Korea
Researcher *March 2017 - August 2019*

· Advisor : Professor Dongwoo SHEEN
· Project : In search of computationally efficient interface conditions arising from fractional-order multi-physics multi-scale problems
  - Develop Multi-scale Finite Element Method(MsFEM) for elliptic problems

Seoul National University Republic of Korea
Master Student *March 2016 - February 2018*

- Advisor : Professor Dongwoo SHEEN
- Thesis Title : Implementing general matrix-matrix multiplication algorithm on the Intel Xeon Phi Knights Landing processor

TECHNICAL STRENGTHS

Computer Languages	Python, C/C++(`AVX`), MATLAB, Fortran, Julia
Protocols & APIs	OpenMP, MPI
Libraries & Tools	`NumPy`, `pyscf`, `SciPy`, `CVXPY`, `scikit-learn`, `PyTorch`, `Intel Advisor`

LICENSES & CERTIFICATIONS

Graduate Certificate in Applied Data Science	*The School of Information, UC Berkeley*
Second-level Teacher's Certificate in Mathematics	*Ministry of Education, Republic of Korea*

PUBLICATIONS

- Z. H. Cui, J. Yang, J. Tölle, H. Z. Ye, H. Zhai, **R. Kim**, ... & G. K. Chan, Ab initio quantum many-body description of superconducting trends in the cuprates, *arXiv preprint arXiv:2306.16561*, 2023
- F. M. Faulstich, K. D. Stubbs, Q. Zhu, T. Soejima, R. Dilip, H. Zhai, **R. Kim**, ... & L. Lin, Interacting models for twisted bilayer graphene: A quantum chemistry approach, *Physical Review B*, 107(23), 235123, 2023.
- F. M. Faulstich, **R. Kim**, Z. H. Cui, Z. Wen, G. K. Chan, and L. Lin, Pure State v-Representability of Density Matrix Embedding Theory, *Journal of Chemical Theory and Computation*, 18 (2), 851-864, 2022.
- K. Cho, I. Kim, **R. Kim**, and D. Sheen, Algebraic Multiscale Method for two–dimensional elliptic problems, *Multiscale Modeling and Simulation*, Submitted (2022).
- Y. Park, **R. Kim**, T. Nguyen and J.Choi, Improving blocked matrix-matrix multiplication routine by utilizing AVX-512 instructions on intel knights landing and xeon scalable processors, *Cluster Computing*, 1-11, 2021.
- **R. Kim**, J. Choi and M. Lee, Optimizing parallel GEMM routines using auto-tuning with Intel AVX-512, *Proceedings of the International Conference on High Performance Computing in Asia-Pacific Region*, 101-110, 2019.
- R. Lim, Y. Lee, **R. Kim**, J. Choi and M.Lee, Auto-tuning GEMM kernels on the Intel KNL and Intel Skylake-SP Processors, *Journal of Supercomputing*, 1-14, 2018.
- R. Lim, Y. Lee, **R. Kim** and J. Choi, An implementation of matrix-matrix multiplication on the Intel KNL processor with AVX-512, *Cluster Computing*, 1-11, 2018.
- R. Lim, Y. Lee, **R. Kim** and J. Choi, OpenMP-based parallel implementation of matrix-matrix multiplication on the Intel Knights Landing, *Proceedings of Workshops of HPC ASIA*, 63-66, 2018.

HONORS & AWARDS

Scholarship

- BrainKorea 21 Plus Research Scholarship, 2017
- Alumni Scholarship, Chungkwan scholarship association, 2015
- National Work-Study scholarship 4, Seoul National University, 2015
- Eminence Scholarship, Seoul National University, 2015
- Honors Scholarship, Chunjae Education Inc., 2014

· National Scholarship For Science and Engineering, Korea Student Aid Foundation, 2010, 2011

Award

· 61^{st} Sanibel Symposium, IBM-Zerner Graduate Student Award, 2022
· Korea Supercomputing Conference 2018 Poster Session, 1st Prize, 2018

MISCELLANEOUS

Military Service: Republic of Korea Army *Dec 2011 - Sep 2013*
President of UC Berkeley SIAM Student Chapter *Aug 2022 - Present*