

Muhammad Risyad Hasyim

Postdoctoral Fellow at New York University

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Research Interests

Investigating emergent phenomena from quantum and classical dynamics of condensed phases, ranging from supercooled liquids to chemical reactions in optical cavities. Leveraging machine learning, molecular simulations, and first-principles calculations to investigate condensed phases.

Education

- 8/2017 - 8/2023 📌 The University of California, Berkeley, USA
Ph.D. in Chemical Engineering
Thesis: *Understanding Glassy Dynamics in Supercooled Liquids*
Committee: Kranthi K. Mandadapu, Carlo Carraro, Mark Asta
- 8/2013 - 5/2017 📌 The Pennsylvania State University, USA
B.Sc. (Hons) in Chemical Engineering, summa cum laude
Minor in Mathematics
Thesis: *Mathematical Modeling of Electrochemical Capacitors*
Committee: Ramakrishnan Rajagopalan, Andrew Zydney
B.Sc. (Hons) in Engineering Science, summa cum laude
Thesis: *Experimental Studies and Modeling of Lithium Borate-Silica Composite Solid Electrolyte*
The Francis H. Fenlon Award for best thesis
Committee: Michael T. Lanagan, Corina S. Drapaca, Judith A. Todd

Scholarships and Fellowships

- 8/2023 - Present 📌 **Simons Postdoctoral Fellowship for Computational Physical Chemistry**
New York University, USA
- 8/2017 - 8/2019 📌 **Berkeley Fellowship for Graduate Study**
The University of California, Berkeley, USA
- 7/2013 - 12/2017 📌 **Exceptional Student Assistance 2013 Scholarship Program**
Chevron Pacific Indonesia, Indonesia
- 5/2016 - 8/2016 📌 **PPG/MRI Undergraduate Research Fellowship**
PPG Industries, Inc. and the Materials Research Institute, USA
- 1/2016 - 5/2016 📌 **College of Engineering Research Initiative (CERI)**
The Pennsylvania State University, USA
- 6/2015 - 8/2015 📌 **The RISE Scholarship**
Deutscher Akademischer Austauschdienst (DAAD), Germany

Honors and Awards

- 11/2022 📌 **Oral Presentation Prize at 2022 MRS Fall Meeting**, *Soft Matter – RSC, UK*
- 5/2017 📌 **The Francis H. Fenlon Award**, *The Pennsylvania State University, USA*
- 4/2016 📌 **The Peter T. Luckie Award**, *The Pennsylvania State University, USA*
- 12/2014 📌 **The President Sparks Award**, *The Pennsylvania State University, USA*
- 5/2014 📌 **The President's Freshman Award**, *The Pennsylvania State University, USA*

Preprints and Publications

†Denotes equal contributions

- 1 **Hasyim, M. R.** & Mandadapu, K. K. (2023, October). Emergent facilitation and glassy dynamics in supercooled liquids. arXiv:2310.06584. *Accepted in Proceedings of the National Academy of Sciences*. doi:[10.48550/arXiv.2310.06584](https://doi.org/10.48550/arXiv.2310.06584)
- 2 **Fraggedakis†, D., Hasyim†, M. R.,** & Mandadapu, K. K. (2023, February). Inherent-state melting and the onset of glassy dynamics in two-dimensional supercooled liquids. *Proceedings of the National Academy of Sciences*, 120(14), e2209144120. doi:[10.1073/pnas.2209144120](https://doi.org/10.1073/pnas.2209144120)
- 3 **Hasyim†, M. R.,** Batton†, C. H., & Mandadapu, K. K. (2022, November). Supervised learning and the finite-temperature string method for computing committor functions and reaction rates. *The Journal of Chemical Physics*, 157(18), 184111. doi:[10.1063/5.0102423](https://doi.org/10.1063/5.0102423)
- 4 **Hasyim, M. R.** & Mandadapu, K. K. (2021, July). A theory of localized excitations in supercooled liquids. *The Journal of Chemical Physics*, 155(4), 044504. **Selected as Editor's Pick and JCP Editor's Choice 2021**. doi:[10.1063/5.0056303](https://doi.org/10.1063/5.0056303)
- 5 **Hasyim, M. R.** & Mandadapu, K. K. (2020, July). Theory of crystallization versus vitrification. arXiv:2007.14968. *Submitted to Proceedings of the National Academy of Sciences*.
- 6 **Hasyim, M. R.** & Rajagopalan, R. (2020, January). Prediction of discharge performances of pseudocapacitors using their impedance characteristics. *Journal of the Electrochemical Society*, 167(1), 013536. doi:[10.1149/1945-7111/ab6722](https://doi.org/10.1149/1945-7111/ab6722)
- 7 **Hasyim, M. R.** & Lanagan, M. T. (2018, January). A new percolation model for composite solid electrolytes and dispersed ionic conductors. *Modelling and Simulation in Materials Science and Engineering*, 26(2), 025011. doi:[10.1088/1361-651x/aaa26f](https://doi.org/10.1088/1361-651x/aaa26f)
- 8 **Hasyim, M. R.,** Ma, D., Rajagopalan, R., & Randall, C. (2017, September). Prediction of charge-discharge and impedance characteristics of electric double-layer capacitors using porous electrode theory. *Journal of the Electrochemical Society*, 164(13), A2899–A2913. doi:[10.1149/2.0051713jes](https://doi.org/10.1149/2.0051713jes)
- 9 **Hasyim, M. R.,** Berbano, S. S., Cleary, R. M., Lanagan, M. T., & Agrawal, D. K. (2017, June). Impedance spectroscopy modeling of lithium borate with silica: A dispersed ionic conductor system. *Ceramics International*, 43(9), 6796–6806. doi:[10.1016/j.ceramint.2017.02.097](https://doi.org/10.1016/j.ceramint.2017.02.097)

Oral and Poster Presentations

- 1 **Hasyim, M. R.** & Mandadapu, K. K. (2024, March). Excitations, emergent facilitation and glassy dynamics in supercooled liquids. APS March Meeting 2024. (Oral) Minneapolis, MN.
- 2 **Hasyim, M. R.** & Mandadapu, K. K. (2023, March). A theory of high-temperature Arrhenius relaxation in two-dimensional glass-forming liquids. APS March Meeting 2023. (Oral) Las Vegas, NV.
- 3 **Hasyim, M. R.,** Fraggedakis, D., & Mandadapu, K. K. (2023, January). Inherent-state melting and the onset of glassy dynamics in two-dimensional supercooled liquids. The 2023 Berkeley Statistical Mechanics Meeting. (Poster) Berkeley, CA.
- 4 **Hasyim, M. R.,** Batton, C. H., & Mandadapu, K. K. (2022, November). Supervised learning and the finite-temperature string method for computing committor functions and reaction rates. The 2022 Annual American Institute of Chemical Engineers (AIChE) Meeting. (Oral) Phoenix, AZ.
- 5 **Hasyim, M. R.,** Fraggedakis, D., & Mandadapu, K. K. (2022, November). Inherent-state melting and the onset of glassy dynamics in two-dimensional supercooled liquids. The 2022 Annual American Institute of Chemical Engineers (AIChE) Meeting. (Oral) Phoenix, AZ.

- 6 **Hasyim, M. R.**, Fraggedakis, D., & Mandadapu, K. K. (2022, November). The onset of glassy dynamics as a Kosterlitz-Thouless transition. The 2022 Materials Research Society (MRS) Fall Meeting & Exhibit. (Oral) Boston, MA. **Oral Presentation Prize, sponsored by Soft Matter, the Royal Society of Chemistry, UK.**
- 7 **Hasyim, M. R.** (2022, September). A theory of localized excitations and onset temperature in supercooled liquids. The Pitzer Seminar for Theoretical Chemistry. (Oral, **Invited**) Berkeley, CA.
- 8 **Hasyim, M. R.** (2022, September). A theory of localized excitations and onset temperature in supercooled liquids. Special Seminar at the University of Cambridge, UK. (Oral, **Invited**) Virtual.
- 9 **Hasyim, M. R.** (2022, August). A theory of localized excitations and onset temperature in supercooled liquids. Special Seminar at Stanford University. (Oral, **Invited**) Stanford, CA.
- 10 **Hasyim, M. R.** (2022, July). A theory of localized excitations and onset temperature in supercooled liquids. Theory Club at Université Paris Diderot, France. (Oral, **Invited**) Virtual.
- 11 **Hasyim, M. R.** (2022, May). Understanding glassy dynamics. Department of Chemical and Biomolecular Engineering Spring 2022 Colloquium. (Oral) Berkeley, CA.
- 12 **Hasyim, M. R.** & Mandadapu, K. K. (2022, March). A theory of localized excitations in supercooled liquids. APS March Meeting 2022. (Oral) Chicago, IL.
- 13 **Hasyim, M. R.** & Mandadapu, K. K. (2022, January). A theory of localized excitations in supercooled liquids. The 2022 Berkeley Statistical Mechanics Meeting. (Poster) Berkeley, CA.
- 14 **Hasyim, M. R.** & Mandadapu, K. K. (2020, January). On a relation between theory of elasticity and dynamical facilitation theory of glass formers. The 2020 Berkeley Statistical Mechanics Meeting. (Poster) Berkeley, CA.
- 15 **Hasyim, M. R.** & Mandadapu, K. K. (2019, November). Statistical mechanics of crystallization and vitrification. The 2019 Annual American Institute of Chemical Engineers (AIChE) Meeting. (Oral) Orlando, FL.
- 16 **Hasyim, M. R.** & Mandadapu, K. K. (2019, August). Statistical mechanics of crystallization and vitrification. 2019 Chemistry and Physics of Liquids, Gordon Research Conference (GRC). (Poster) Holderness, NH.
- 17 **Hasyim, M. R.** & Mandadapu, K. K. (2019, March). Competition of crystallization and vitrification. APS March Meeting 2019. (Oral) Boston, MA.
- 18 **Hasyim, M. R.** & Mandadapu, K. K. (2019, January). Statistical mechanics of crystallization and vitrification. The 2019 Berkeley Statistical Mechanics Meeting. (Poster) Berkeley, CA.
- 19 **Hasyim, M. R.**, Ma, D., Rajagopalan, R., & Randall, C. A. (2017, May). *Ab-Initio* approach to model impedance and charge-discharge characteristics of electrical double layer capacitors. The 231st Electrochemical Society (ECS) Meeting. (Poster) New Orleans, LA. doi:[10.1149/ma2017-01/1/78](https://doi.org/10.1149/ma2017-01/1/78)
- 20 **Hasyim, M. R.**, Ma, D., Rajagopalan, R., & Randall, C. A. (2017, April). Mathematical Modeling of Electrochemical Capacitors. The 14th Annual College of Engineering Research Symposium. (Poster) University Park. **First-place afternoon poster.**
- 21 **Hasyim, M. R.**, Lanagan, M. T., & Rajagopalan, R. (2016, August). Development of polymeric coating for alkali-free thin glass. The 8th Annual Penn State REU/RET Symposium. (Poster) University Park, PA.
- 22 **Hasyim, M. R.**, Berbano, S., Cleary, R., Lanagan, M., & Agrawal, D. (2016, April). Ionic conductivity in two-phase composite Li⁺ solid electrolyte. The 13th Annual College of Engineering Research Symposium. (Poster) University Park, PA.
- 23 **Hasyim, M. R.** & Rajagopalan, R. (2016, April). Electrochemical evaluation of LaNiO₃/carbon composite for aqueous asymmetric capacitors. The 2016 Undergraduate Exhibition. (Poster) University Park, PA. **The Peter T. Luckie Award for best poster by a junior in the engineering and physical science category.**
- 24 **Hasyim, M. R.**, Berbano, S., Cleary, R., Lanagan, M., & Agrawal, D. (2015, April). Two-phase composite solid electrolyte for intermediate-temperature solid oxide fuel cell. The 12th Annual College of Engineering Research Symposium. (Poster) University Park, PA.

Teaching Experience

Department of Chemical and Biomolecular Engineering | The University of California, Berkeley, USA

8/2019 - 12/2019 ■ **Graduate Student Instructor**, Faculty Instructor: Prof. Carlo Carraro.
CHM ENG 141, Introduction to Chemical Engineering Thermodynamics

8/2018 - 12/2018 ■ **Graduate Student Instructor**, Faculty Instructor: Prof. Carlo Carraro.
CHM ENG 240, Graduate Statistical Thermodynamics

Professional Experience

Simons Center of Computational Physical Chemistry | New York University, USA

8/2023 - Present ■ **Postdoctoral Fellow**, Collaborators: Prof. Norah Hoffmann at NYU and Prof. David R. Reichman at Columbia University.

Department of Chemical and Biomolecular Engineering | The University of California, Berkeley, USA

8/2019 - 8/2023 ■ **Graduate Student Research Assistant**, Supervisor: Prof. Kranthi K. Mandadapu.

Department of Engineering Science and Mechanics | The Pennsylvania State University, USA

5/2016 - 5/2017 ■ **Undergraduate Research Assistant**, Supervisor: Prof. Ramakrishnan Rajagopalan.

8/2014 - 5/2017 ■ **Undergraduate Research Assistant**, Supervisor: Prof. Michael T. Lanagan.

Institut für Partikeltechnik | Technische Universität Braunschweig, Germany

6/2015 - 8/2015 ■ **Research Intern**, Supervisor: Dr. Apostolos Salmatonidis.

Outreach and Professional Development

The Pennsylvania State University, USA

8/2014 - 5/2017 ■ **Member**, [The Presidential Leadership Academy](#)

5/2014 - 5/2015 ■ **Secretary and Head of Display Committee**, The Indonesian Students Association

Reykjavik University, Iceland

5/2014 - 6/2014 ■ **Participant**, [The Green Program](#)

Open Source Projects

[ParallelSwapMC](#) ■ A plug-in for [HOOMD-Blue](#), a particle simulation toolkit, that allows parallel Monte Carlo simulation of interacting polydisperse particle system on CPUs.

[PolydisperseMD](#) ■ A plug-in for [HOOMD-Blue](#) that implements pair potential interactions of polydisperse particle system for molecular dynamics on CPUs and GPUs.

[PyGlassTools](#) ■ A Python module for performing data analysis of atomistic trajectories relevant for glasses and supercooled liquids.

[TPS-Torch](#) ■ A Python module that interfaces with PyTorch to implement deep learning of committor functions via rare-event sampling techniques.

Skills

Programming/HPC ■ C/C++, Python, Mathematica, OpenMP, OpenMPI, CUDA, CMake/Make, Bash, Vi/Vim, Git, SGE/PSB/SLURM, \LaTeX , Markdown, [RMarkdown](#), [Hugo](#)

Physics & Machine Learning ■ [HOOMD-Blue](#), [LAMMPS](#), [OpenMM](#), [PyTorch](#), [scikit-learn](#), [PETSc/SLEPc](#), finite-element methods

Visualization & Design ■ Tikz- \LaTeX , gnuplot, Matplotlib, [Ovito](#), Inkscape, Adobe Photoshop, Adobe Illustrator

Languages ■ English (full professional proficiency, ILR scale) and Bahasa Indonesia (native or bilingual proficiency, ILR scale)