Judah Ryoo

Applied Math (Ph.D. in progress)

- Located in New York, NY
- Nationality: US

Skills

Software engineering/Coding 3 yrs

Scientific computing 3 yrs.

Numerical Methods 5 yrs.

Teaching/Lecturing 4 yrs.

Research 4 yrs.

Knowledge acquisition 9 yrs.

Reading and Writing 9 yrs.

Biography

My name is Judah, and I am currently working with Kyle Mandli at Columbia University on a research project that seeks to model storm surge protections. Many talks of building barriers to protect coastal cities have been made in light of the high population density in these areas, the high cost of damage incurred by storms, and forecasted sea level rises and storm surges. We would like to provide an open sourceware (clawpack.org) that models the protective effectiveness of barriers in case of a storm hitting a city. My part in this research is modeling the water movement near the barrier, calculating whether the water will overtop the barrier or be contained by the barrier. To this end, I have been learning and using not only the math behind the fluid movements but also programming through Python and Fortran. As such, I enjoy computational modeling and seeing mathematical methods in action. I am learning more programming tools to be more agile in the computational side of things and am currently learning Python, C^{++}, R, and SQL. I wish to be fluent in these languages to be able to program things in not only scientific modeling but in other areas as well, such as machine learning for data analysis or financial analysis.

Work experience

Research assistant | PhD student **09/2018 - today**

Department of Applied Mathematics (Kyle Mandli)
Columbia University

Surge barrier modeling: developing numerical methods for solving physical equations. Working "under the hood" of open software called Clawpack (clawpack.org). Coding in Fortran and Python.

Teaching assistant **09/2017 - 09/2018**

Department of Applied Mathematics
Columbia University

Taught and graded homework for scientific computation, partial differential equation, multivariate calculus

Research master's student **06/2015 - 12/2015**

Courant Institute of Mathematical Sciences (Miranda Holmes-Cerfon)
New York University

"Napkin problem" of random parking in 1D. Finding patterns and inference methods to guess order of parking (coded in MATLAB). Resulted in a thesis which was awarded best master's thesis. See personal blog for copy of thesis.

Teaching assistant **09/2014 - 12/2015**

Courant Institute of Mathematical Sciences
New York University

Taught calculus, discrete math, basic statistics

Systems assistant **01/2014- 06/2014**

Heaviside Wealth Management
(*No longer operational*)

Updated junk bonds database, sent newsletters to clients.

Education

09/2017 - Today

Applied Mathematics (Ph.D.)

Columbia University

GPA:3.9
Advisor: Kyle Mandli
Topic: Surge barrier simulation, finite volume methods.

09/2014 - 01/2016

Mathematics (M.Sc.)

New York University

GPA: 3.9
Master's thesis: *Inference Studies on 1D Random Sequential Adsorption with Periodic Boundary Condition*.
Awarded "Best Master's Thesis". Copy available at personal blog, under 'Previous work'.

08/2009 - 12/2013

Applied Mathematics (B.A.)
Concentration: Chemistry, Physics

University of California, Berkeley

GPA: 3.9

Interests

- Languages
- Cooking

Contact

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Publications

- Y. Miura, & H. Qureshi, & C. Ryoo, & et. al. "A methodological framework for determining an optimal coastal protection strategy against storm surges and sea level". In: *Natural Hazards*, 106 (2021).

Theses

- Master's: "Inference Studies on 1D Random Sequential Adsorption with Periodic Boundary Condition". The primary research question was, If several cars were parked in a linear segment, would you be able to say something about their order? This thesis was a collection of using data analysis, simple simulation with random sampling in MATLAB, statistics, and calculus in order to develop methods to solve guessing problems. It was awarded the best master's thesis in mathematics in 2016 at the Courant Institute (NYU).
- Doctoral: "Application of cut cell methods to simulations of surge barriers in 1D/2D". The primary research question is, "How can we simulate the effectiveness of surge barriers in protecting the city against a storm surge, while doing less computation than what would usually be required in such simulations?" The usual computation required is a lot; there needs to be fine resolution near the barrier. We are developing a method where we will not have to refine near the barrier but instead approximate the barrier as a line interface. This thesis is a collection of using methods for solving partial differential equations called finite volume methods and special methods called cut cell methods and object oriented programming using both Fortran (for fast, compiled codes) and Python (for user interface).

Programming languages

- Fortran
- Python
- Matlab
- R (Novice)
- C++ (Novice)
- SQL (Novice)