Gwendolyn J.Y. Chee

CONTACT INFORMATION

PhD Student
University of Illinois at Urbana-Champaign
Nuclear, Plasma, and Radiological Engineering

e-mail: gchee2@illinois.com
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RESEARCH INTERESTS

Advanced nuclear reactors, multi-physics simulation, nuclear fuel cycle analysis, scientific computation, high performance computing

PHD

University of Illinois at Urbana-Champaign, NUCLEAR ENGINEERING **Jan 2020 - Dec 2022**

- Thesis: Fluoride-Salt-Cooled High Temperature Reactor Generative Design Optimization with Evolutionary Algorithms
- Advisors: Dr. Kathryn D. Huff and Dr. Madicken Munk
- Graduate Concentration in Computational Science and Engineering

MS

University of Illinois at Urbana-Champaign, NUCLEAR ENGINEERING **Aug 2017 - Dec 2019**

- Thesis: Sensitivity Analysis of Nuclear Fuel Cycle Transitions
- Advisor: Dr. Kathryn D. Huff

BASC

Queen's University at Kingston, Canada, ENGINEERING PHYSICS **Sept 2013 – May 2017**

- Thesis: Designing a System to Gaseous Hydrogen Charge Zirconium Alloys
- Concentration in Material Science

RESEARCH EXPERIENCE

University of Illinois at Urbana-Champaign, Urbana, IL **Aug 2017 – Dec 2022**
Graduate Research Assistant, Nuclear Plasma and Radiological Engineering

- Leveraged artificial intelligence genetic algorithms to optimize fluoride salt-cooled reactor geometry using Python package DEAP, and open-source OpenMC and Moltres tools
- Collaborated with 14 scientists to benchmark the Fluoride-salt High-temperature Reactor by modeling the design in OpenMC
- Led analysis, code and test development of the "Demand-Driven CYCAMORE Archetypes" NEUP project to construct demand-driven deployment algorithms and time series models in Python and C++ open-source tools, d3ploy and CYCLUS

Argonne National Laboratory, Lemont, IL **June 2020 - Aug 2020**
Research Aide, Advanced Nuclear Energy Systems Group

- Implemented variable salt-feed functionality and tests in ANL's NQA-1 certified Reactor Fuel Management and Depletion Python tool, ADDER
- Conducted a code verification of ADDER's MSR depletion capability against published results from SCALE

Argonne National Laboratory, Lemont, IL **May 2019 - Aug 2019**
Research Aide, Reactor Physics and Fuel Cycle Analysis Group

- Investigated fuel cycle sensitivity analysis and optimization methods for the Department of Energy's Nuclear Fuel Cycle Options Campaign by coupling ANL's fuel cycle simulator, Dymond, with Sandia National Lab's optimization and uncertainty quantification tool, Dakota, using Python

Queen's University at Kingston, Canada, Kingston, ON **Sept 2016 - May 2017**
Research Assistant, Nuclear Materials Research Group

- Designed a Sieverts Apparatus to gaseously charge hydrogen gas into zirconium alloys to mimic hydrogen embrittlement of zirconium alloys used in nuclear reactors.

National University of Singapore, Singapore **May 2016 - Aug 2016**
Research Assistant, Centre for Advanced 2D Materials

- Developed a MATLAB script to study the effect of Berry Curvature on electrons in graphene and the effects of changing the geometry of graphene devices on their electric fields.

Nanyang Technological University, Singapore **May 2015 - Aug 2015**
Research Assistant, Polymeric Biomaterials Group

- Conducted experiments to characterize nanoparticle enhanced polymer materials

Industry Experience

Meta, Menlo Park, CA **May 2021 - Aug 2021**

PhD Software Engineer Intern (ML Track), FB Creators Wellbeing Team

- Implemented a viewer-personalized ML model in Facebook's comment ranking infrastructure resulting in 1% increase in user-engagement
- Constructed an end-to-end ML pipeline: dataset generation with DataSwarm, Gradient-boosting decision tree classifier training with PyTorch, A/B testing with online performance monitoring, and backend infrastructure support with Hack

Honors and Awards

Women in Nuclear Chapter Excellence Award **2019**

Queen's University Dean Scholar **2014-2017**

Queen's University Principal's Entrance Scholarship **2013**

Journal Publications

[1] **Chee, G.**, Agosta, R.E.F., Bae, J.W., Flanagan, R.R., Scopatz, A.M., Huff, K.D. "**Demand Driven Deployment Capabilities in Cyclus, a Fuel Cycle Simulator**," Nuclear Technology. https://doi.org/10.1080/00295450.2020.1753444, Jul 2020

[2] Bae, J.W., Rykhlevskii, A., **Chee, G.**, Huff, K.D. "Deep Learning Approach to Nuclear Fuel Transmutation in a Fuel Cycle Simulator." **Annals of Nuclear Energy**, vol. 139. https://doi.org/10.1016/j.anucene.2019.107230, May 2020.

Refereed Conference Proceedings

[3] Petrovic, B., Ramey, K., Hill, I., Losa, E., Elsawi, M., Lu, C. Gonzalez, J., Novog, D., **Chee, G.**, Huff, K., Margulis, M., Read, N., Shwageraus, E. "Preliminary Results of the NEA FHR Benchmark Phase I-A AND I-B (Fuel Element 2-D Benchmark)" **ANS M&C 2021 - The International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering**, Raleign, NC. Oct 2021.

[4] Nelson, A.G., **Chee, G.**, M.G. Jarrett. "Molten Salt Reactor Depletion Techniques in the ADDER Reactor Depletion and Fuel Management Analysis Code" **ANS M&C 2021 - The International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering**, Raleign, NC. Oct 2021.

[5] **Chee, G.**, Bae, J.W., Flanagan, R.R., Agosta, R.E.F., Huff, K.D. "Demonstration of Demand-Driven Deployment Capabilities in Cyclus" **Global/TopFuel**, Seattle, WA. Sept 2019.

[6] Flanagan, R.R., **Chee, G.**, Bae, J.W., Agosta, R.E.F., Huff, K.D. "Methods for automated fuel cycle facility deployment" **Global/TopFuel**, Seattle, WA. Sept 2019.

[7] **Chee, G.**, Park, G. T., Huff, K.D. "Validation of Spent Nuclear Fuel Output byCyclus, a Fuel Cycle Simulator Code" **American Nuclear Society Winter Meeting**, Orlando, FL, November 2018

[8] **Chee, G.**, Bae, J.W., Huff, K.D. "Validation of Spent Nuclear Fuel Output byCyclus, a Fuel Cycle Simulator Code" **American Nuclear Society National Student Conference**, Gainesville, FL, April 2018.

Refereed Conference Abstracts

[9] **Chee, G.**, Huff, K.D. " Simulation of Spent Nuclear Fuel loading into a Final Waste Repository", **WM Symposia**, Phoenix, AZ, April 2019.

Technical Reports

[10] **Chee, G.J.**, Agosta, R.E.F., Huff, K., "Transition Scenario Demonstrations of CYCAMORE Demand Driven Deployment Capabilities." **Advanced Reactors and Fuel Cycles Report Series**, Nuclear Plasma and Radiological Engineering, University of Illinois. Report UIUC-ARFC-2018-03, http://arfc.github.io/papers/chee_transition_2019.pdf Sept.2019.

[11] **Chee, G.J.**, Bae, J.W., Huff, K., "Numerical Experiments For Verifying Demand Driven Deployment Algorithms." **Advanced Reactors and Fuel Cycles Report Series**, Nuclear Plasma and Radiological Engineering, University of Illinois. Report UIUC-ARFC-2018-01, http://arfc.github.io/papers/bae_numerical_2018.pdf Apr.2018.

Other Publications

[12] **Chee, G.J.Y.** Fluoride-Salt-Cooled High Temperature Reactor Generative Design Optimization with Evolutionary Algorithms. PhD Dissertation –Nuclear, Plasma, and Radiological Engineering. University of Illinois, Urbana-Champaign. December 2022.

[13] **Chee, G.J.Y.** Sensitivity Analysis of Nuclear Fuel Cycle Transitions. M.S. Thesis –Nuclear, Plasma, and Radiological Engineering. University of Illinois, Urbana-Champaign. December 2019.

[14] **Chee, G.** "Designing a System to Gaseously Hydrogen Charge Zirconium Alloys" Undergraduate Thesis. Queen's University at Kingston. May 2017.

Software Products

[15] **Chee, G.**, Bae, J.W., Flanagan, R.R., Agosta, R.E.F., Scopatz, A.M., Huff, K.D. d3ploy v1.0.1. **zenodo**, Sept 2019. 10.5281/zenodo.3464123.

Media Coverage

[16] Sopkin, J. "NPRE Graduate Student Spotlight: Gwendolyn Chee" **NPRE News**, Urbana, IL: Illinois Engineering, Oct 22, 2019.https://npre.illinois.edu/news/34609.

[17] Mumm, S. "Great response for NPRE's "Ask Me Anything!"" **NPRE News**, Urbana, IL: Illinois Engineering, Oct 17, 2019.https://npre.illinois.edu/news/34590.

Engineering Teaching

University of Illinois at Urbana-Champaign
Dept. of Nuclear, Plasma, and Radiological Engineering
NPRE 412, Nuclear Power Economics and Fuel Management **Spring 2020**
Teaching Assistant, Marked Assignments and taught three 1-hour classes

Queen's University at Kingston
Dept. of Physics, Engineering Physics, and Astronomy
PHYS 104/106, Fundamental Physics **Fall 2015 - Spring 2017**
Teaching Assistant, Conducted weekly office hours

Scientific Computing Skills

Languages	Python, C++, bash, CUDA, XML
Build Systems	make, CMake
Databases	HDF5, SQL
Test Frameworks	pytest, nose
Version Control	git, svn
Other Tools	MS Virtual Studio, Sphinx, RAI, LaTeX, MatLab
Nuclear Software	OpenMC, MCNP, MOOSE, Moltres, Cyclus, DYMOND

Editing and Reviewing

Manuscript Referee *International Journal of Energy Research*

Professional Service

Advisor, Women in Nuclear (UIUC Chapter) **2020-2021**
President, Women in Nuclear (UIUC Chapter) **2019-2020**
Professional Development Chair, Women in Nuclear (UIUC Chapter) **2018-2019**

Departmental Service

Graduate Student Advisory Committee **2020-2022**

References

Available upon request