

# NATHAN WALTER

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Current Address: 120 Talbot Laboratory, 104 S. Wright St. ◇ Urbana, Illinois 61801

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## EDUCATION

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**University of Illinois at Champaign-Urbana (UIUC)** August, 2013 – present  
*Master of Science* in Nuclear, Plasma, and Radiological Engineering (NPRE)  
*PhD Candidate* in Nuclear, Plasma, and Radiological Engineering (NPRE)  
Computational Science and Engineering Certificate  
Expected Master's Degree Completion: August, 2016  
Expected PhD Completion: May, 2018

Advisor: Yang Zhang

**University of Illinois at Champaign-Urbana (UIUC)** August, 2010 – January, 2014  
*Bachelor of Science* in Nuclear, Plasma, and Radiological Engineering (NPRE)  
Minor in Mathematics  
Overall GPA: 3.84/4.00

## RESEARCH INTERESTS

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Understanding slow material processes from a atomistic scale; Neutron and X-ray scattering; Classical and Ab Initio molecular dynamics for modeling and simulation; Materials undergoing irradiation; Large deformation constitutive material equations. Machine Learning algorithms

## APPOINTMENTS

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**Research Assistant** Yang Zhang's Research Group January, 2014 – present  
**Nuclear Regulatory Commission Graduate Fellowship** January 2014 – present  
**Teaching Assistant** August, 2013 – January, 2014  
NPRE 448: Nuclear Systems Engineering and Design

## RESEARCH EXPERIENCE

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**Master's Degree Research** January 2014 – present

- Implemented a method of directly sampling the energy landscape into the molecular dynamics package GROMACS in order to study the activation barrier statistics of various systems
- Developed reduction codes to extract quantities from classical and ab initio molecular dynamics simulations relevant for comparing simulations to scattering experiments (i.e. intermediate scattering function, density of states, etc.).
- Developed an open-source package, *LiquidLib*, to analyze molecular dynamics trajectories to study the structure and dynamics of liquids and compare the results to neutron scattering experiments
- Performed ab initio molecular dynamic simulations to study the vibrational modes in D<sub>2</sub>O and compare to neutron scattering experiments conducted at SEQUOIA, SNS, ORNL.

- Performed ab initio molecular dynamic simulations to study the effects of hydrogen impurities on liquid lithium transport properties
- Created a high dimensional molecular dynamics package to study the dimensionality of various quantities

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## Machine Learning Experience

Fall 2015

- Enrolled in several high level statistics courses, including the course on machine learning
- Participated in the Kaggle competition for Springleaf as a team.
- For the competition, used various machine learning methods to reduce the data space, and build predictive models
- Used several machine learning regression and clustering methods to create a model to predict the value of a hand written input number

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## Neutron and X-ray Scattering Summer School

June 2015

- Studied x-ray scattering methods at the Advanced Photon Source, APS, Argonne National Laboratory (ANL)
- Studied neutron scattering methods at SNS and HFIR, Oak Ridge National Laboratory (ORNL)

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## Scattering Experiments

May 2014 - May 2016

- Participated in pair distribution experiments on glass forming metallic liquids using a neutron electrostatic levitator performed at NOMAD, SNS, Oak Ridge National Laboratory (ORNL)
- Participated on Inelastic Neutron Scattering experiments on liquid metals performed at CNCS, SNS, Oak Ridge National Laboratory (ORNL)
- Analyzed scattering data on D<sub>2</sub>O performed at SEQUOIA, SNS, Oak Ridge National Laboratory (ORNL)

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## Los Alamos Computational Physics Student Summer Workshop

Summer 2014

- Implemented a strain-based constituent equation for large material deformation under high strain-rates into a production hydrocode
- Developed concepts for extending the strain-based formulation from perfectly plastic materials to rate-hardening materials.
- Studied the advantages of the strain-based with pertaining to advection in Lagrangian mode, finite material rotations, and artificial viscosity.

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## Institute for Genomic Biology

Summer 2012

Undergraduate Research Assistant to Biofuel Lab Research

Champaign, IL

- Worked on British Petroleum (BP) Biofuel Project
- Analyzed soil samples for carbon/nitrogen make-up
- Studied different plants' potential as a biofuel

- Implemented Java code to simulate contact points
- Developed mathematical and programming algorithms for the project

## TECHNICAL STRENGTHS

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|---------------------------------------|---|
| <b>Computer Programming Languages</b> | C, C++, Matlab, Python, Fortran, Java, L <sup>A</sup> T <sub>E</sub> X, Swift, AJAX, R, OpenMP, MPI, HTML, Julia (novice) |
| <b>Software</b>                       | GROMACS, LAMMPS, VASP, SRIM/TRIM, FLAG, VMD, IGOR Pro, Dave, gnuplot, Adobe Photoshop, Illustrator, Flash, SPSS           |

## PUBLICATIONS

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**Nathan Walter**, Paul Friedrichsen, Scott Runnels, “*Extending a Strain Space Formulation for Plasticity to Rate-Hardening Materials and Finite Rotations*”, submitted to Mathematics and Computers in Simulation .

**Nathan Walter**, Paul Friedrichsen, Scott Runnels, “*Extending a Strain Space Formulation for Plasticity to Rate-Hardening Materials and Finite Rotations*”, LA-UR-15-23329, Los Alamos Unlimited Release (2015).

Zhikun Cai, **Nathan Walter**, Yang Zhang, “*Energy Landscape Statistics And Coarsening In Liquids: A Relaxation Mode Analysis*”, to be submitted.

**Nathan Walter**, Paul Friedrichsen, “*Improving Plasticity Modeling in Hydrocodes with Hypoelastic Frameworks*”, LA-UR-14-26946, Los Alamos Unlimited Release (2014).

## PRESENTATIONS

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Discussion, The Hacker Within: University of Illinois Urbana-Champaign, “*Understanding Classification of Hand-Written Numbers with Machine Learning Techniques*” May, 2016

Talk, University of Illinois Urbana-Champaign Nuclear Engineering Undergraduate Seminar, “*Homogenous Nucleation and Crystal Growth in a Model Liquid from Direct Energy Landscape Sampling Simulations*” April, 2016

Talk, American Physical Society March Meeting, “*Homogenous Nucleation and Crystal Growth in a Model Liquid from Direct Energy Landscape Sampling Simulations*” March, 2016

Poster, American Physical Society March Meeting, “*Energy Landscape Statistics of Kob-Andersen Liquid From Direct Energy Barrier Sampling*” March, 2015

Contributed Talk, Los Alamos Student Summer Symposium, “*A New Strain-Based Method for Plastic Flow Simulations*” August, 2014

## AWARDS, HONORS, CLUBS, AND CERTIFICATES

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U.S. Department of Energy, Naval Reactors (NR), *Rickover Fellowship Program in Nuclear Engineering*  
Honorable Mention April, 2014

Nuclear Regulatory Commission Undergraduate Scholarship Fall, 2011 – Spring, 2013

University of Illinois at Champaign-Urbana Dean's List Recipient Spring, 2011 – Spring, 2013

*The Hacker Within: University of Illinois Urbana-Champaign*, A organization for computational sciences to share and practice computational skills. August, 2015 – present

Successfully completed the following Coursera and Udemy online courses:

- Become a Certified Web Developer (Udemy)
- The Data Scientist's ToolBox (Coursera)
- Statistical Inference (Coursera)