

FAHIMA F. ISLAM

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SUMMARY

5+ years of experience in computational design and analysis.
5+ years of experience in computer aided detection (CAD) algorithm development.
5+ years of experience in Monte Carlo simulation.
4+ year of experience in neutron scattering.

EDUCATION

Ph.D., Nuclear Engineering

July, 2017

Missouri University of Science and Technology, Rolla, MO, USA

Advisor: Hyoung Koo Lee

Dissertation: "Studies on neutron diffraction and x-ray radiography for material inspection"

M.S., Nuclear Engineering

Dec., 2013

Missouri University of Science and Technology, Rolla, MO, USA

Advisor: Hyoung Koo Lee

Thesis: "Insufficient CT data reconstruction based on directional total variation (DTV) regularized maximum likelihood expectation maximization (MLEM) method"

B.Sc., Civil Engineering

Oct, 2010

Bangladesh University of Engineering Technology, Dhaka, Bangladesh

WORK

EXPERIENCE

Neutronics Scientist

Dec., 2020-Present

Instrument Development and Neutronics Group,
Neutron Technology Division,
Oak Ridge National Laboratory, Oak Ridge, TN, USA

Postdoctoral Research Associate

Sep., 2017-Aug., 2020

Research Software Engineering Group,
Computer Science and Mathematics Division,
Oak Ridge National Laboratory, Oak Ridge, TN, USA

- **Analyzing the Performance of Neutron High Pressure Diffractometer by Modelling and Testing Different Collimator configurations**- Improved high pressure diffraction capabilities for SNAP by modeling, testing and analyzing the performance of 3D printed collimators optimized for various sample environments. The model incorporated the full integration of SNAP's configuration and high-pressure sample environments with 3D models of B4C and polymer collimators. (<https://github.com/Fahima-Islam/c3dp/tree/documentation>)
- **Developed Algorithmic Concept for Super Resolution of Neutron Scattering Data**- Adapted techniques in super-resolution optical imagery to enhance resolution and reduce noise for a neutron spectroscopy. Demonstrated applying these methods to phonon density of states data for a graphite sample can enhance contrast, reduce noise, and improve resolution ~5-fold over nominal resolution.

- **Simulated Neutron Choppers for Imaging**- modelled choppers for Versatile Neutron Imaging Instrument (VENUS)
(<https://github.com/ornlneutronimaging/VENUS-chopper-design>)
- **Modelled a Neutron Reflectometer**- modelled the reflectivity sample component for Quite Intense Kinetics Reflectometer (QIKR).
(<https://github.com/neutrons/Qikr/blob/master/TestSample.py>)
- **Published Scientific Software Packages**- `Multiphonon` (Phonon Density of States tools for Inelastic Neutron Scattering Powder Data) and `idpflex` (Analysis of Intrinsically Disordered Proteins by Comparing Simulations to Experiments)
- **Contributed to develop SANS reduction software**- modelled arbitrary assembly of cylindrical detectors and find the beam center by incorporating variable area correction for EQSANS. Fixed the script to reduce BIOSANS data from Shaman.
- **Contributed to SNAP Reduction algorithm** : Fixed the Mantid reduction algorithm for SNAP, "SNAPReduce" for data chunking issues.
<https://github.com/mantidproject/mantid/pull/26809#pullrequestreview-289259651>
- **Contributed to develop Engineering Diffractometer Data Reduction Software**: Wrote algorithm for "PyRS" for reducing the data for HB2B beamline at ORNL.
- **Modelled Four Circle Single Crystal Neutron Diffractometer**: Used McStas software to model "HB3A" beamline at ORNL.

Graduate Research Assistant

June,2012- July,2017

Advanced Radiography and Tomography Laboratory (ARTLAB)
Missouri University of Science and Technology, Rolla, MO, USA

- **Developed Computer Aided Detection algorithms** - collaborated with VATECH for developing CAD (Computer Aided Detection) algorithms using OpenCV/C++ for the automatic detection of lesions from panoramic dental images.
- **Modelled a Neutron Diffractometer** - designed a neutron diffractometer for the North Radiography Station at Idaho National Laboratories with Monte Carlo Neutron Ray-tracing simulation codes (McStas).
- **Developed CT Reconstruction Algorithms**- developed statistical CT reconstruction algorithms using MATLAB based on the Bayesian approach for x-ray and neutron CT of nuclear fuels.

Graduate Research Intern

January,2016-August,2016

Materials and Fuels Complex,
Idaho National Laboratory (INL), Idaho Falls, ID,USA

- **Studied Feasibility of a Diffractometer**- evaluated the feasibility of operating a neutron diffractometer with the Neutron Radiography reactor (NRAD) in its current state and proposed modifications to the beamline to optimize the diffractometer's performance.

Graduate Teaching Assistant

January,2015-July,2017

Missouri University of Science and Technology, Rolla, MO, USA

- **Image Processing**-taught CT reconstruction algorithms, image processing methods using MATLAB.
- **Radiation Detection**- taught radiation measurement and spectroscopy laboratory for beta, gamma, and neutron detection using radiation detectors.

AwardsResearch Fellowship from department of Nuclear
Engineering at Missouri S&T

June,2012- July,2017

Center for Biomedical Science and Engineering
(CBSE) Research Symposium Award

May,2015

Student award at Council of Ionizing Radiation and
Measurements (CIRMS) conference

Oct.,2012

Peoples Republic of Bangladesh Govt. Scholarship

2005-2009

**RELEVANT
GRADUATE
COURSES
TAKEN**Machine vision
Design and analysis of experiments
Introduction to neural network and application
Digital image processing
Computational intelligence
Applications of MCNP**COMPUTER
SKILLS**MATLAB,
C++, OpenCV
Python/Numpy
Octopus
Avizo/Amira
Solid Works
OpenSCADLinux
ImageJ
3D-SLICER
Mantid
McStas/MCvINE
Scale
HPCSAS
JMP Pro
Minitab
Dakota optimizer
Git
Vim/Nano
HTML/XML

OTHER ACTIVITIES

Summer camp at Missouri S&T

Member of American Nuclear Society.

Website development for Missouri S&T Nuclear Engineering department. (<http://web.mst.edu/~leehk/links.html>)

PUBLICATIONS

Islam F., Haberl B., Lin J., Anderson D., Granroth G., "Novel data analysis method for obtaining better performance from a complex 3D-printed collimator," (manuscript in review).

Al-Qasir I., Campbell A., Sala G., Lin J., Cheng Y., **Islam F.**, Abernathy D. and Stone M., "Neutron Thermalization in Nuclear Graphite: A Modern Story of a Classic Moderator," (manuscript in review).

Islam F., Haberl B., Lin J., Anderson D., Granroth G., "Computational Optimization of A 3D Printed Collimator.," Journal of Neutron Research, 2020.

Al-Qasir I., Campbell A., Sala G., Lin J., Cheng Y., **Islam F.**, Abernathy D. and Stone M., "Variations in the Phonon Density of States of Irradiated Nuclear Graphite," Carbon, 2020.

Islam F., Lin J., Granroth G., Archibald R., Abernathy D., Qasir I., "Super resolution Reconstruction of Density of States Measured at Neutron Direct Geometry Spectrum," Review of Scientific Instruments, 2019.

Islam F., Haberl B., Lin J., Anderson D., Granroth G., "Understanding hydrocarbon collimators," (manuscript in preparation).

Lin, J., **Islam, F.**, Sala, G., Lumsden, I., Smith, H., Doucet, M., Stone, M., Abernathy, D., Ehlers, G., Ankner, J., Granroth, G., "Recent developments of MCViNE and its applications at SNS," Journal of Physics Communications, 2019.

Lin J., **Islam F.**, Kresch M., "Multiphonon: Phonon Density of States Tools for Inelastic Neutron Scattering Powder Data," Journal of Open Source Software, 2018.

Lin J., Banerjee A., **Islam F.**, "Energy Dependence of the Flux and Elastic Resolution for the ARCS Neutron Spectrometer," Physica B: Condensed Matter, 2018.

Borreguero J., **Islam F.**, Shrestha U., Petridis L., "idpflex: Analysis of Intrinsically Disordered Proteins by Comparing Simulations to Small Angle Scattering Experiments," Journal of Open Source Software, 2018.

Islam F., Norris E., Abir M., Meyer M., Lee H.K., Williams W., Craft A., "Design of a Neutron Diffractometer for the North Radiography Station at Idaho National Laboratories," (under review).

Islam F., Norris E., Randy M., Lee H.K., "Computer Aided Automatic Detection of Periodontal Cysts from Dental Panorama Images," (under review).

Abir M., **Islam F.**, Wachs D., Keiser D., "Quantitative evaluation of thin uranium foils using x-ray radiography," Nuclear Engineering and Design. Nuclear Engineering and Design, 2017

Abir M., **Islam F.**, Craft A., Williams W., Wachs D., Chichester D., Meyer M, and Lee H.K., "Determination of optimal imaging parameters for the reconstruction of a nuclear fuel assembly using limited angle neutron tomography," *Journal of Instrumentation*, 2016.

Galib S., **Islam F.**, Abir M., Wachs D., Lee H.K., "Computer aided detection of oral lesions on CT images," *Journal of Instrumentation*, 2016.

Abir M., **Islam F.**, Wachs D., Lee H.K., "Sparse-view neutron CT reconstruction of irradiated fuel assembly using total variation minimization with Poisson statistics," *Journal of Radioanalytical and Nuclear Chemistry*, 2015.

Abir M., **Islam F.**, Wachs D., Lee H.K., "Multiscale based Adaptive Contrast Enhancement," *SPIE Electronic Imaging*, SPIE Vol. 8657, pp. 86570X-1-9, 2013.

CONFERENCE PROCEEDINGS

Islam F., Abir M., Lee H.K., "Insufficient CT Data Reconstruction Based on MLEM-DTV Method," *Transactions at the American Nuclear Society*, Anaheim, CA (2014).

Abir M., **Islam F.**, Wachs D., Lee H.K., "Sparse Sampling Tomographic Reconstruction of Radioactive Fuel Assembly," *Transactions at the American Nuclear Society*, Anaheim, CA (2014).

Abir M., **Islam F.**, Wachs D., Lee H.K., "Assessment of Nuclear Fuels using Radiographic Thickness Measurement Method," *Transactions at the American Nuclear Society*, Anaheim, CA(2014).

Galib S., **Islam F.**, Lee H.K., "A novel approach to automatic detection of oral lesions from CT images," *Transactions at the American Nuclear Society*, Anaheim, CA (2014).

Islam F., Abir M., and Lee H. K., "Optimally Regularized Globally Convergent Iterative Reconstruction Method for Neutron Tomosynthesis," *Annual Conference of the Council on Ionizing Radiation Measurements and Standards (CIRMS)*, Gaithersburg, MD, 10/23/2012.

TALKS

"Direct Transfer of Monte Carlo Ray Tracing Models to Additive Manufacturing Systems," International Collaboration on Advanced Neutron Sources, Chattanooga, TN, 10/15/2019

"A Novel Automated Optimized, 3-D Printed Collimator Design for High Pressure Scattering," American Crystallographic Association, Northern Kentucky, KY, 07/20/2019

"Super Resolution Reconstruction of Phonon Density of States Measured by Neutron Direct Geometry Spectrometers," American Conference on Neutron Scattering, College Park, MD, 07/26/2018.

"Insufficient CT Data Reconstruction Based on MLEM-DTV Method," American Nuclear Society, Anaheim, CA, 11/11/2014.

"A novel approach

to automatic detection of oral lesions from CT images, " American Nuclear Society, Anaheim, CA, 11/11/2014.

GRANTS

Contribution to the renewal of grant proposal submitted to LDRD, awarded to Principal Investigator Bianca Haberl, 2017-2019.

***Reference available upon request*