

Muhammad Ramzy Altahhan

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Nuclear Engineering Codes Developer

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Dedicated nuclear engineer with strong foundation of research and development, project management, and teamwork illustrated over a successful academic career. Hardworking with voracious appetite for knowledge. Have more than 10 years of experience in institutional settings, and more than 4 years hands-on experience performing computational modeling and simulation for the nuclear industry sector. Proven history of success in nuclear reactor analysis and computational fluid dynamics (CFD) research with strong knowledge base in nuclear engineering.

SKILLS

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| Coding Languages and Tools | Fortran, MATLAB, Julia, Python, C++, Shell, Maple, Git, \LaTeX |
| Nuclear Engineering Codes | NEM, CTF, GeN-Foam, Serpent, VERA-CS, SCALE |
| CFD Simulation and CAD Design | OpenFOAM, ANSYS Workbench, SolidWorks, AutoCAD, Trelis, Gmsh |
| Data & Statistical Analysis Codes | Graphpad Prism, RAVEN, SPSS |
| Projects Oriented | Project Management, Research Design and Analysis, Faculty and Industry Collaboration |

TECHNICAL EXPERIENCE

Postdoctoral Research Scholar **JAN 2022 — Current**
North Carolina State University USA

- Lead developer of the NEM reactor simulator Fortran computer code used in 30+ theses.
- Added parallelization for NEM resulting in speedups by three folds.
- Developed the MPI Coupling interface for NEM used to couple with the sub-channel thermal-hydraulics code COBRA-TF (CTF).
- Provided dedicated academic advising for three PhD students on projects related to NEM/Serpent coupling, acceleration of pin-resolved simulations in NEM, and coupling NEM/CTF/Serpent to RAVEN for ML and UQ analysis.
- Modernized NEM Fortran programming to a readable concise code reducing code size by 15%.
- Applied software version control to NEM using Git maintaining the repository on both GitLab and GitHub.
- Applied modern build systems like CMake for deployment of the code on 3 different OS distributions.
- Initiated the Julia for Enhancing Nuclear Simulations (JENES) project for using Julia computer language in nuclear engineering.

Graduate Research Assistant **JAN 2017 — DEC 2021**
North Carolina State University USA

- Conducted own research in field of expertise of nuclear reactor analysis publishing 11+ journal/conference papers.
- Developed an adjoint methodology and programmed a computer code for nuclear reactor analysis under a project funded by Framatome, Inc and Framatome, GmbH.
- Developed a higher-order adjoint methodology for 3 sensitivity analysis studies showing enhanced predictions of the developed method when compared to low-order adjoint methodology.
- Augmented the OpenFOAM-based simulation tool GeN-Foam by adding and debugging 2 different procedures.
- Worked on CFD and coupled multiphysics transient simulations of liquid fuel MSRs within a collaboration among 7+ researchers from different academic institutes.
- Performed research work requested in 3 different projects and proposed new research prospects that resulted in funding acquisition from 3 different industrial companies.

Doctoral Student **OCT 2019 — SEP 2020**
Framatome, GmbH Germany, Remote

- Produced, as a core-design department Erlangen branch (FDC-E) member, a theory for adjoint analysis enabling speedups of 50-folds.
- Expanded a low-order adjoint model to a higher-order model implemented in a Fortran 10000+ lines code.
- Improved linear-perturbation accuracy by introducing new numerical algorithms with ability to reach 100% perturbations.

Full-time Assistant Teacher **SEP 2011 — DEC 2016**
Nuclear Engineering and Radiation Department, Alexandria University Egypt

- Delivered interactive problem-solving sessions and discussion sections in 14 different undergraduate and graduate courses.
- Encouraged dynamic and pleasant educational environment by promoting both gentle discipline and cooperation.
- Maintained and managed the department's computer laboratory of 27 computers (including 2 single nodes workstations).

EDUCATION

- Ph.D. in Nuclear Engineering**, North Carolina State University, USA DEC 2021
GPA: 4.00/4.00
Developed higher-order nodal adjoint method, and perturbation-based accuracy enhancement algorithms
Thesis Title "Extension and Optimization of a Nodal Adjoint Methodology for Nuclear Reactors Analysis"
- M.Sc. in Nuclear Engineering**, Alexandria University, Egypt AUG 2015
Dissertation title "Formulation of a point Reactor Kinetics Theory based on the Neutron Telegraph Equation"
- B.Sc. in Nuclear and Radiation Engineering**, Alexandria University, Egypt NOV 2011
Valedictorian, graduated top of the 2011-class, and made it to the dean's list for 4 consecutive years.

SELECTED PUBLICATIONS

- **Altahhan, Muhammad Ramzy**, René van Geemert, Maria Avramova, and Kostadin Ivanov. "Development and verification of a higher-order mathematical adjoint nodal diffusion solver." *Annals of Nuclear Energy* 163 (2021): 108548.
- **Altahhan, Muhammad Ramzy**, René van Geemert, Maria Avramova, and Kostadin Ivanov. "Extending a low-order inhomogeneous adjoint equations model to a higher-order model with verification on integral applications." *Annals of Nuclear Energy* 177 (2022): 109277.
- **Altahhan, Muhammad Ramzy**, Gregory Delipei, David Holler, Jason Hou, Maria Avramova, Kostadin Ivanov. "Julia for Enhancing Nuclear Engineering Simulations (JENES): Introduction to the JENES Project and Platform." In *Proc. of the International Conference on Physics of Reactors (PHYSOR 2022)*.
- **Altahhan, Muhammad Ramzy**, Sandesh Bhaskar, Devshibhai Ziyad, Paolo Balestra, Carlo Fiorina, Jason Hou, Nicholas Smith, and Maria Avramova. "Preliminary design and analysis of Liquid Fuel Molten Salt Reactor using multi-physics code GeN-Foam." *Nuclear Engineering and Design* 369 (2020): 110826.
- **Altahhan, Muhammad Ramzy**, Maria Avramova, and Kostadin Ivanov. "Reactor dynamics model for the Molten Salt Reactor based on P1 approximation." In *Proc. of the International Conference on Physics of Reactors (PHYSOR 2018)*.
- **Altahhan, Muhammad Ramzy**, Mohamed S. Nagy, Hanaa H. Abou-Gabal, and Ahmed E. Aboanber. "Formulation of a point reactor kinetics model based on the neutron telegraph equation." *Annals of Nuclear Energy* 91 (2016): 176-188.

AWARDS AND HONORS

Best Paper Award

ASME's International Conference on Nuclear Engineering (ICONE)-26 *London, England*
• Won for paper titled "Multiphysics Analysis of Silicon Carbide and Zircaloy Cladding".

Graduate Student Support Plan (GSSP)

North Carolina State University *Raleigh, NC, USA*
• A competitive package used to attract top students at NCSU. Awarded for each semester of the PhD program.

Sawan Top Student Award

Nuclear Engineering and Radiation Department (NERD) *Alexandria, Egypt*
• Given to NERD undergraduate student maintaining a 3.75+ GPA consecutive for program duration.

Valedictorian

Nuclear Engineering 2011-class *Alexandria, Egypt*
• Ranked First on a class of 40+ students.

Dean's List

Faculty of Engineering, Alexandria university *Alexandria, Egypt*
• Placed on the Dean's list for 4 consecutive years of undergraduate studies.

RELEVANT PROFESSIONAL ACTIVITIES

- Member, Reactor Physics Division (RPD) of the American Nuclear Society (ANS).
- Member, Mathematics & Computation Division (MCD) of the ANS.
- Member, Young Members Group, ANS.
- Member, American Society of Mechanical Engineers (ASME).
- Reviewer in *Progress in Nuclear Energy*, *Annals of Nuclear Energy*, and *Nuclear Engineering and Design*.

REFERENCES

- References are available upon request.