Leonardo Rodrigues da Costa Moraes

Department of Mechanical & Aerospace Engineering - The Ohio State University
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Education

State University of Rio de Janeiro *Rio de Janeiro, RJ, Brazil*
DSc Computational Modeling *2020*

- Dissertation: Estimates of interior neutron sources for driving subcritical systems at stationary power level distributions using a two-dimensional energy multigroup discrete ordinates model
- Advisors: Dr. Ricardo Carvalho de Barros
  Dr. Hermes Alves Filho

State University of Rio de Janeiro *Rio de Janeiro, RJ, Brazil*
MSc Computational Modeling *2016*

- Thesis: Estimation of uniform neutron sources for fuel regions given a prescribed power distribution
- Advisors: Dr. Ricardo Carvalho de Barros
  Dr. Hermes Alves Filho

State University of Rio de Janeiro *Rio de Janeiro, RJ, Brazil*
BSc Mechanical Engineering *2014*

- Final project: Deterministic computational modeling of neutron transport in non-multiplying media with the multigroup slab-geometry discrete ordinates formulation
- Minor in Petroleum and Gas
- Advisor: Dr. Ricardo Carvalho de Barros

Employment

2022-present	**Postdoctoral Scholar**, Nuclear Engineering Graduate Program, The Ohio State University
2021-2022	**Adjunct Professor**, Computational Modeling Graduate Program, State University of Rio de Janeiro
2020-2022	**Postdoctoral Scholar**, Computational Modeling Graduate Program, State University of Rio de Janeiro
2020-2020	**Postdoctoral Scholar**, Applied Mathematics Graduate Program, Federal University of Rio Grande do Sul

Publications (29 Total: 11 J, 13 C, 2 B, 3 P)

Refereed Journal Publications (J)

J11. Moraes, L. R. C., Barros, R. C., and Vasques, R. (2023). On a Response Matrix Solver for Slab-Geometry Neutral Particle Transport Problems in the Discrete Ordinates and Energy Multigroup Formulations Considering Non-Uniform Interior Sources. Journal of Computational and Theoretical Transport, 52(1), 55–77.

J10. Moraes, L. R. C., Vasques, R., and Barros, R. C. (2023). On the occurrence of linearly dependent eigenvectors in non-classical transport calculations. J. Quant. Spectrosc. Radiat. Transfer, 295, 108407.

J9. Patel, J. K., Moraes, L. R. C., Vasques, R., and Barros, R. C. (2022). Transport synthetic acceleration for the solution of the one-speed nonclassical spectral SN equations in slab geometry. J. Comput. Appl. Math., 401, 113768.

J8. Moraes, L. R. C., Filho, H. A., and Barros, R. C. (2022). On the calculation of neutron sources generating steady prescribed power distributions in subcritical systems using multigroup X,Y-geometry discrete ordinates models. Ann. Nucl. Energy, 168, 108854.

J7. Moraes, L. R. C., Patel, J. K., Barros, R. C., and Vasques, R. (2022). An improved spectral approach for solving the non-classical neutral particle transport equation. J. Quant. Spectrosc. Radiat. Transfer, 290, 108282.

J6. Moraes, L. R. C., Barichello, L. B., Barros, R. C., and Vasques, R. (2022). On the application of the analytical discrete ordinates method to the solution of nonclassical transport problems in slab geometry. J. Comput. Phys., 455, 110982.

J5. Moraes, L. R. C., Mansur, R. S., Moura, C. A., Curbelo, J. P., Filho, H. A., and Barros, R. C. (2021). A Response Matrix Method for Slab-Geometry Discrete Ordinates Adjoint Calculations in Energy-Dependent Neutral Particle Transport. Journal of Computational and Theoretical Transport, 50(3), 159–179.

J4. Moraes, L. R. C., Alves Filho, H., and Barros, R. C. (2020). Estimation of neutron sources driving prescribed power generations in subcritical systems using one-speed two-dimensional discrete ordinates formulations. Ann. Nucl. Energy, 136, 107053.

J3. Oliva, A. M., Filho, H. A., Hernández, C. R. G., and Moraes, L. R. C (2020). The multigroup spectral deterministic method for S_N neutron transport theory in slab geometry, anisotropic scattering with fixed-source problems. Revista Cereus. 1., 12(2), 277–291.

J2. Moraes, L. R., Barros, R. C., and Filho, H. A. (2020). Determinação de fontes de neutrons que conduzem sistemas subcríticos a distribuições prescritas de potência. Trends in Computational and Applied Mathematics, 21(3), 425.

J1. Vasques, R., Moraes, L. R. C., Barros, R. C., and Slaybaugh, R. N. (2020). A spectral approach for solving the nonclassical transport equation. J. Comput. Phys., 402, 109078.

Refereed Conference Proceedings and Transactions (C)

C13. Wiggins, J., Cox, M. F., Howard, A., Leveni, M., Cuellar-Gaviria, T. Z., Hisey, C. L., Ewim, D. R. E., Moraes, L.R.C., B. Saba, S. Patrick (2023). Doing Academia Differently: The Creation of a Cohort-Based Postdoctoral Scholars Program for Emerging Engineering Faculty. In: 2023 ASEE Annual Conference & Exposition, Baltimore. Proceedings of the 2023 ASEE Annual Conference & Exposition.

C12. T. M. Paganin, S. Schunert, Moraes, L. R. C., and R. Vasques (2023). An initial study of the convergence rate of Griffin?s pebble bed reactors algorithm. In: International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering, Ontario. Proceedings of the International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering.

C11. S. A. Agbo, Moraes, L. R. C., and R. Vasques (2023). Derivation of Spherical Harmonic Equations for Nonclassical Particle Transport. In: International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering, Ontario. Proceedings of the International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering.

C10. Alan S. S., Moraes, L. R. C., R. C. Barros, and R. Vasques (2023). P1 Synthetic Acceleration and Convergence Analysis for the Solution of the One-Speed Non-Classical Spectral SN Equations in Slab Geometry. In: International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering, Ontario. Proceedings of the International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering.

C9. Moraes, L. R. C., R. C. Barros, and R. Vasques (2023). A linear programming-based methodology to determine the minimal neutron source distribution in subcritical systems. In: International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering, Ontario. Proceedings of the International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering.

C8. Moraes, L. R. C., R. C. Barros, and VASQUES, R. (2021). A review of the deterministic solution of nonclassical transport problems. In: International Nuclear Atlantic Conference. Proceedings of the International Nuclear Atlantic Conference.

C7. Moraes, L. R. C., H. Alves, and R. C. Barros (2021). On the Estimate of Neutron Sources Generating Steady Prescribed Power Distributtions in Subcritical Systems Using Energy Multigroup Discrete Ordinates Formulations in Two-Dimensional Rectangular Geometry. In: The Fifth International Conference on Physics and Technology of Reactors and Applications, Xi'an. PHYTRA5. The Fifth International Conference on Physics and Technology of Reactors and Applications.

C6. P. Japan, Moraes, L. R. C., R. Vasques, and R. C. Barros (2019). P1 Synthetic Acceleration for Nonclassical Spectral SN Equations in Slab Geometry. In: The 26th International Conference on Transport Theory, Paris, França. The 26th International Conference on Transport Theory.

C5. Moraes, L. R. C., H. Alves, and R. C. Barros (2019). Estimation of Energy Multigroup Neutron Source Distribution for Driving a Subcritical System at a Prescribed Power Density Level. In: The International Conference on Mathematics and Computational Methods applied to Nuclear Science and Engineering, Portland. Proceedings of International Conference on Mathematics and Computational Methods Applied to Nuclear Science & Engineering.

C4. Moraes, L. R. C., H. Alves, and R. C. Barros (2018). Modelagem Computacional para Estimativa de Distribuição de Fontes Internas Uniformes de Nêutrons que Guiam um Sistema Subcrítico a uma Geração Prescrita de Potência. In: XXI Encontro Nacional de Modelagem Computacional, Búzios, Anais do XXI ENMC.

C3. Moraes, L. R. C., H. Alves, and R. C. Barros (2018). Estimation of Monoenergetic Neutron Source Distribution in Fuel Regions For a Prescribed Power Density Generation in Subcritical X-Y Geometry Fission-Chain Reacting Systems. In: The 4'th International Conference on Physics and Technology of Reactors and Applications, Marrakech. Phytra 4 Proceedings.

C2. Moraes, L. R. C., H. Alves , and R. C. Barros (2017). Calculation of Neutron Interior Source Distribution Within Subcritical Fission-Chain Reacting Systems for a Prescribed Power Density Generation. In: International Nuclear Atlantic Conference, Belo Horizonte, Proceedings of INAC-2017.

C1. Moraes, L. R. C., H. Alves , and R. C. Barros (2016). Estimativa de Fontes Externas Uniformes de Nêutrons em Regiões Combustíveis para uma Distribuição Prescrita de Potência. In: XIX Encontro Nacional de Modelagem Computacional, Paraíba. Anais XIX ENMC.

Book Chapters (B)

B2. Moraes, L. R. C., and Barros, R. C. (2023). Recipes for computer implementation of a response matrix spatial spectral nodal method for three-dimensional discrete ordinates neutral particle transport modeling. Integral Methods in Science and Engineering. Birkhäuser.

B1. Moraes, L. R. C., and Barros, R. C. (2022). On the use of the adjoint technique to the estimation of neutron source distributions in the context of subcritical nuclear reactors. integral methods in science and engineering. Birkhäuser.

PrePrints (P)

P3. Moraes, L. R. C., Japan K. Patel, R. C. Barros, and R. Vasques. Generating Optimal Configurations for the Neutron Source Distribution in Subcritical Systems. A Linear-Programming Approach Submitted to Journal Publication, 2023.

P2. Moraes, L. R. C., Japan K. Patel, R. C. Barros, and R. Vasques. A Hybrid Analytical Discrete Ordinates-Response Matrix Constant Nodal Method for One-Speed X,Y-Geometry Transport Problems. Submitted to Journal Publication, 2023.

P1. Moraes, L. R. C., R. C. Barros, and R. Vasques. A nonclassical model to eigenvalue neutron transport calculations. Submitted to Journal Publication, 2023.

Projects & Fellowships

Projects

2023-present — **Modular and Innovative Nuclear Reactors (Participant)**, National Council for Scientific and Technological Development - Brazil.

2021-present — **Adequation and Modernization Infrastructure of the UERJ Polytechnic Institute (Participant)**, Carlos Chagas Filho Foundation for Supporting Research in the State of Rio de Janeiro - Brazil.

2018-2022 — **Program for Institutional Internationalization - Nonclassical Transport (Participant)**, Coordination for the Improvement of Higher Education Personnel (CAPES - Brazil).

2018-2020 — **Nuclear Energy and Biosphere: Computational Modeling for Reactor Physics and Radiation Shielding (Participant)**, Carlos Chagas Filho Foundation for Supporting Research in the State of Rio de Janeiro - Brazil.

2016-2018 — **Computational Modeling of Subcritical Systems Driven by Steady-State External Neutron Sources in the Context of Gen IV Nuclear Reactors (Participant)**, The National Council for Scientific and Technological Development - Brazil.

2014-2016 — **Computational Neutronics for the Reactor Physics of Innovative Reactors (Participant)**, Carlos Chagas Filho Foundation for Supporting Research in the State of Rio de Janeiro - Brazil.

Fellowships

2016-2020 **CAPES Doctoral Fellowship**, Ministry of Education, Brazil.

2014-2016 **CAPES Masters Fellowship**, Ministry of Education, Brazil.

2012-2014 **CNPq Scientific Initiation Fellowship**, Ministry of Science and Technology, Brazil.

2010-2012 **UERJ Scientific Initiation Fellowship**, State University of Rio de Janeiro.

Patent

2021 **Moraes, L. R. C., and R. C. Barros . Simulador para a estimativa de fontes internas de nêutrons no contexto dos reatores nucleares subcríticos**, Patente: Programa de Computador. Número do registro: BR512021001997-0, data de registro: 13/07/2021, Title: Simulator for the estimate of internal neutron sources in the context of subcritical nuclear reactors. National Institute of Industrial Property - Brazil.

Teaching Experience

Spring 2022 **Introduction to Programming**, Adjunct Faculty, course ranging from 20-30 students. State University of Rio de Janeiro.

Spring 2022 **Differential and Integral Calculus II**, Adjunct Faculty, course ranging from 10-20 students. State University of Rio de Janeiro.

Spring 2022 **Computability**, Adjunct Faculty, course ranging from 5-10 students. State University of Rio de Janeiro.

2014-2020 **Linear Algebra**, Graduate Teaching Assistant. State University of Rio de Janeiro.

2014-2020 **Neutron Transport Theory**, Graduate Teaching Assistant. State University of Rio de Janeiro.

Mentoring

2023-present **Gustavo A. Lorensi**, Graduate student in the Applied Mathematics program of the Federal University of Rio Grande do Sul. Topic: Development of Successive Over-Relaxation (SOR) variants for iterative schemes used in conjunction to the Response Matrix method.

2022-2023 **Tomas M. Paganin**, Graduate student in the Nuclear Engineering program of The Ohio State University. Topic: An initial study of the convergence rate of Griffin's pebble bed reactors algorithm.

2022-present **Sunday A. Agbo**, Graduate student in the Nuclear Engineering program of The Ohio State University. Topic: Derivation of spherical harmonic equations for nonclassical particle transport.

2022-present **Alan S. Silva**, Graduate student in the Computational Modeling program of the State University of Rio de Janeiro. Topic: P_1 synthetic acceleration and convergence analysis for the solution of the one-speed nonclassical spectral S_N equation in slab geometry.

2022-present **Leonardo P. Silva**, Undergraduate student in the Computational Engineering course the State University of Rio de Janeiro. Topic: An Extension of the Response Matrix Spectral Nodal Method to Solve the Neutron Transport Equation with Non-Uniform Sources.

Professional Service

Committee work for Final Project, Dissertation and Thesis Defenses, Qualifying and Candidacy Exams

2023 **Doctoral Qualifying Exam in Computational Modeling**, Lisa S. Enomoto, State University of Rio de Janeiro.

2023 **Doctoral Qualifying Exam in Computational Modeling**, Alan S. da Silva, State University of Rio de Janeiro.

2018 **Final Project of the Undergraduate Course in Mechanical Engineering**, Leonardo Faria e Silva, State University of Rio de Janeiro.

2016 **Final Project of the Undergraduate Course in Mechanical Engineering**, Edenilson Reis Narciso, State University of Rio de Janeiro.

2016 **Final Project of the Undergraduate Course in Mechanical Engineering**, Rodrigo Carletto Callado, State University of Rio de Janeiro.

Conference Activities (Organizing, Technical and Scientific Advisory Committees, etc.)

- M&C 2023: International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering, Ontario, Canada (Aug. 13-17, 2023). Member of the Technical Program Extended Committee.

Refereeing Activities

- Reviewer for the following Journals:
  - Progress in Nuclear Energy
  - Journal of Quantitative Spectroscopy and Radiative Transfer
  - IEEE Transactions on Nuclear Science
  - Brazilian Journal of Radiation Sciences
- Reviewer for the following Technical Conferences:
  - International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering, 2023.
  - XXVI Encontro Nacional de Modelagem Computacional (XXVI ENMC), 2023.
  - XXV Encontro Nacional de Modelagem Computacional (XXV ENMC), 2022.

Professional Societies

- American Nuclear Society
  - Education, Training & Workforce Development Division
  - Mathematics & Computation Division
  - Nuclear Criticality Safety Division
  - Radiation Protection & Shielding Division
- Society for Industrial and Applied Mathematics
  - SIAG on Applied Mathematics Education
  - SIAG on Orthogonal Polynomials and Special Functions