

Leonardo Rodrigues da Costa Moraes

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Nationality: Brazilian

Columbus
United States

Education

Rio de Janeiro State University - Brazil

2016–2020

D.Sc., Computational Modeling

- Advisors: Ricardo Carvalho de Barros and Hermes Alves Filho
- Thesis: “Estimates of interior neutron sources for driving subcritical systems at stationary power level distributions using a two-dimensional energy multigroup discrete ordinates model”
- Cumulative GPA: 3.95

Rio de Janeiro State University

2014–2016

M.Sc., Computational Modeling

- Advisors: Ricardo Carvalho de Barros and Hermes Alves Filho
- Dissertation: “Estimation of uniform neutron sources for fuel regions given a prescribed power distribution”
- Cumulative GPA: 3.78

Rio de Janeiro State University

2009–2014

B.Sc., Mechanical Engineering

- Advisor: Ricardo Carvalho de Barros
- 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
- Cumulative GPA: 3.52

Research Experience

Postdoctoral Scholar, The Ohio State University

2022–present

Participant of the Leading Engineering as Agents of Change and Equity (LEGACY) program. Founded by Ohio State College of Engineering Dean Ayanna Howard, the LEGACY Postdoctoral Scholars Program was established to prepare and diversify the next generation of engineering leaders in academia. Supervisor: Professor Richard Vasques.

Postdoctoral Researcher, Rio de Janeiro State University

2020–2022

Project: “Development and application of spectral nodal methods for classical and non-classical neutral particle transport calculations related to the internationalization of the graduate program in Computational Modeling of Rio de Janeiro State University.” - Funded by Carlos Chagas Filho Foundation for Research Support in the State of Rio de Janeiro (FAPERJ - Brazil).

Supervisor: Professor Ricardo Carvalho de Barros.

- Developing a hybrid method that is based on the Analytical Discrete Ordinates (ADO) method and the Response Matrix (RM) method. This hybrid method (ADO-RM) retains the advantage of solving the reduced eigenvalue problem, good feature of the ADO method, and allows the use of parallel programming techniques in the construction of the sweeping matrices, good feature of the RM method.

- Working on the extension of RM method to include the possibility of linearly dependent eigenvectors. This feature may arise in certain non-classical problems depending on the methods used to solve the non-classical transport equation.
- In the area of non-classical neutral particle transport, the main focus is to investigating the application of conventional deterministic methods in solving the spectral approximation of the non-classical transport equation. The first method analyzed was the ADO method.
- Working on numerical improvements for the Spectral Approach used for solving the non-classical transport equation.
- Contributing to the fortification of a work partnership with researches from the Universidade Federal do Rio Grande do Sul and The Ohio State University.
- Participated in international conferences, including The 5'th International Conference on Physics and Technology of Reactors and Applications (PHYTRA5).
- Supervising an undergraduate student. Final project topic: "An Extension of the Response Matrix Spectral Nodal Method to Solve the Neutron Transport Equation with Non-Uniform Sources."
- Participated in 1 committees for evaluation of final engineering course projects.
- Developing softwares from the computational algorithms created in this project to latter registration in the National Institute of Industrial Properties (INPI-Brazil).

Graduate Researcher, Rio de Janeiro State University

2014–2020

Main project: "Development of a methodology to determine the distribution of interior neutron particles which must be inserted into a subcritical system to drive it to a steady state, generating a prescribed power distribution"- Funded by Coordination for the Improvement of Higher Education Personnel (CAPES - Brazil).

- Joined researchers from The Ohio State University to work on nonclassical transport projects.
- Developed a methodology based on the adjoint formulation which correlates the interior neutron sources and a prescribed distribution of power.
- Produced a computational simulator in Java language which simulates the behavior of a subcritical system stabilized by a prescribed distribution of power.
- Implemented parallel algorithms in the neutron transport field.
- Worked with source-detector problems via adjoint technique.
- Worked and developed spectral nodal methods for the solution of multigroup S_N neutron transport equations.
- Assisted 2 undergraduate courses ranging from 20-40+ students at Rio de Janeiro State University. Topics included: Linear algebra and neutron transport theory.
- Supervised undergraduate students with research projects.
- Presented results at departmental seminars and retreat to audiences ranging from 10 to 20+ people.
- Participated in 3 committees for evaluation of final engineering course projects.

Publications

Articles in scientific journals

- [An improved spectral approach for solving the nonclassical neutral particle transport equation](#)
L. R. C. Moraes, J. K. Patel, R. C. Barros and R. Vasques
J. Quant. Spectrosc. Radiat. Transfer, 1 June. 2022, p. 108282, 10.1016/j.jqsrt.2022.108282.
- [On the application of the analytical discrete ordinates method to the solution of nonclassical transport problems in slab geometry](#)

- L. R. C. Moraes, J. K. Patel, R. C. Barros and R. Vasques
Journal of Computational Physics, vol 455, April. 2022, p. 110982, doi:10.1016/j.jcp.2022.110982.
- **Transport synthetic acceleration for the solution of the one-speed nonclassical spectral S_N equations in slab geometry**
J. K. Patel, L. R. C. Moraes, R. Vasques and R. C. Barros,
J. Comput. Appl. Math., vol. 401, 1 Feb. 2022, p. 113768, doi:10.1016/j.cam.2021.113768.
 - **A Response Matrix Method for Slab-Geometry Discrete Ordinates Adjoint Calculations in Energy-Dependent Neutral Particle Transport**
Leonardo R. da C. Moraes, Ralph S. Mansur, Carlos A. Moura, Jesús P. Curbelo, Hermes Alves Filho and Ricardo C. Barros,
Journal of Computational and Theoretical Transport, vol. 50, no. 3, 16 Apr. 2021, pp. 159-79, doi:10.1080/23324309.2021.1914661.
 - **Estimation of neutron sources driving prescribed power generations in subcritical systems using one-speed two-dimensional discrete ordinates formulations**
Leonardo R.C. Moraes, Hermes Alves Filho and Ricardo C. Barros,
Ann. Nucl. Energy, vol. 136, 1 Feb. 2020, p. 107053, doi:10.1016/j.anucene.2019.107053.
 - **The Multigroup Spectral Deterministic Method for S_N Neutron Transport Theory in Slab-Geometry, Anisotropic Scattering with Fixed-Source Problems**
Amaury M. Oliva, Hermes Alves Filho, Carlos. R. G. Hernández, Leonardo R. C. Moraes,
REVISTA CEREUS, v. 12, p. 277-291, 2020.
 - **Determinação de Fontes de Neutrões que Conduzem Sistemas Subcríticos a Distribuições Prescritas de Potência**
L. R. Moraes, R. C. Barros and H. Alves Filho,
Trends in Computational and Applied Mathematics, vol. 21, no. 3, 27 Nov. 2020, p. 425, doi:10.5540/tema.2020.021.03.425.
 - **A spectral approach for solving the nonclassical transport equation**
R. Vasques, L. R. C. Moraes, R. C. Barros and R. N. Slaybaugh,
J. Comput. Phys., vol. 402, 1 Feb. 2020, p. 109078, doi:10.1016/j.jcp.2019.109078.

Articles “under review” (arXiv links)

- **On the calculation of neutron sources generating steady prescribed power distributions in subcritical systems using multigroup X,Y-geometry discrete ordinates models**
L. R. Moraes, R. C. Barros and H. Alves Filho,
Submitted in Journal Annals of Nuclear Energy.
- **On the Application of the Analytical Discrete Ordinates Method to the Solution of Nonclassical Transport Problems in Slab Geometry**
Leonardo R. C. Moraes, Liliane B. Barichello, Ricardo C. Barros and Richard Vasques,
Submitted in Journal of Computational Physics.
- **An improved spectral approach for solving the nonclassical neutron particle transport equation**
L.R.C. Moraes, J.K. Patel, R. C. Barros and R. Vasques,
Submitted in Journal of Applied Mathematical Letters.

Full papers published in conference proceedings

- **On the Estimate of Neutron Sources Generating Steady Prescribed Power Distributions in Subcritical Systems using Energy Multigroup Discrete Ordinates Formulations in Two-Dimension**
L. R. Moraes, R. C. Barros and H. Alves Filho,

- In: The 5'th International Conference on Physics and Technology of Reactors and Applications, 2018, Xi'an, China. Proceedings of Phytra 5, 2021. v. 1. p. 1-12.
- **Estimation of Energy Multigroup Neutron Source Distribution for Driving a Subcritical System at a Prescribed Power Density Level**
L. R. Moraes, R. C. Barros and H. Alves Filho,
Proceedings of International Conference on Mathematics and Computational Methods Applied to Nuclear Science & Engineering (M&C2019), 2019, p 1-10.
 - **Estimation of Monoenergetic Neutron Source Distribution in Fuel Regions For a Prescribed Power Density Generation in Subcritical X-Y Geometry Fission-Chain Reacting Systems**
L. R. Moraes, R. C. Barros and H. Alves Filho,
In: The 4'th International Conference on Physics and Technology of Reactors and Applications, 2018, Marrakech. Proceedings of Phytra 4, 2018. v. 1. p. 1-11.
 - **Computational Modeling for the Estimation of Interior Uniform Neutron Source Distribution for Driving Subcritical Systems to a Prescribed Power Generation**
L. R. Moraes, R. C. Barros and H. Alves Filho,
In: XXI National Conference of Computational Modeling, 2018, Búzios. Proceedings of XXI ENMC, 2018.
 - **Calculation of Neutron Interior Source Distribution Within Subcritical Fission-Chain Reacting Systems for a Prescribed Power Density Generation**
L. R. Moraes, R. C. Barros and H. Alves Filho,
In: International Nuclear Atlantic Conference, 2017, Belo Horizonte. Proceedings of INAC-2017, 2017.
 - **Estimativa de Fontes Externas Uniformes de Nêutrons em Regiões Combustíveis para uma Distribuição Prescrita de Potência**
L. R. Moraes, R. C. Barros and H. Alves Filho,
In: Paraíba. Anais XIX ENMC, 2016. v. 1. p. 1-10.

Extended Summary published in proceedings of conferences

- **P1 Synthetic Acceleration for Nonclassical Spectral SN Equations in Slab Geometry**
J. K. Patel, L. R. C. Moraes, R. Vasques and R. C. Barros,
The 26th International Conference on Transport Theory, 2019, Paris, France.

Scholarships

- Postdoctoral scholarship from the Leading Engineering as Agents of Change and Equity (LEGACY) program of The Ohio State University.
- Postdoctoral scholarship from the program FAPERJ Nota 10 of Foundation Carlos Chagas Filho Research Support of the State of Rio de Janeiro (FAPERJ - Brazil) 2020-.
- D.S. scholarship from the program of academic excellence of Coordination for the Improvement of Higher Education Personnel (CAPES - Brazil) 2016-2020.
- M.S. scholarship from the program of academic excellence of Coordination for the Improvement of Higher Education Personnel (CAPES - Brazil) 2014-2016.
- Scientific initiation scholarship from the Brazilian National Council for Scientific and Technological Development (CNPq - Brazil) 2012-2014.
- Scientific initiation scholarship from the Scientific Initiation Program of Rio de Janeiro State University (UERJ - Brazil) 2010-2012.

Profile

- Highly self-motivated professional with decent research expertise in the Neutron Transport field.

- Strong independent work style and excellent teamwork skills.
- Wiling to perform basic and complex tasks.
- Able to learn new knowledge and adapt to new environment quickly.
- Good experience in modeling and computer simulation.
- Computer skills: Linux/Windows, C, C++, Java, LaTeX, Matlab.
- Languages: English (Advanced), Spanish (Intermediate) and Portuguese (Native)

References

Prof. Ricardo Carvalho de Barros

Full Professor

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Prof. Richard Vasques

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The Ohio State University

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