ANS Mathematics and Computation

2024 MCD NEWSLETTER

What's the Word on MCD:
By Vincent Novellino
(MCD Student Liason)

MCD Hot Takes:

🧝 : *Ah, so here's my hot take, I am not saying that I necessarily believe this, but there are some that do. Nuclear, especially Math and Comp, should not be using AI/ML methods since we won't be able to take advantage of them.*

👨‍🍳: So, I would say you should embrace AI and especially the next level AI that's coming in maybe one year, two years, five years from now. But you should do it in an ethical manner.

Can you guess the previous/current chairs' favorite computational method?

🧝 : *"I am pretty confident it is a deterministic method, a radiation transport deterministic method. And I am going to go with in general that his favorite computational method is related to JFNK, Jacobian Free Newton Krylov. That's what I am going with".*

👨‍🍳: " To me it's so obvious but then I say this and I'm afraid I might say something silly. It has to be the Monte Carlo method for radiation transport, I can't see it any other way!".

On a scale of 1-7, how do you rate student involvement in MCD?

🧝 : *"In general, we have very strong student participation in terms of papers, that is like definitely a 7… As far as student involvement in division leadership or other activities associated with service to MCD, I would say that maybe a 4, so medium involvement".*

👨‍🍳: "Well, I can never give seven. That's just you know, you know. Seven being too close to Perfection and I think we can always do better and things change over time. So, you know, I'll be somewhere in the middle, I'll be a 4. Because I believe there's room for improvement and we should be working on this … But I think we do a really good job on the paper [submissions] and putting the students' name first and having them as a speaker. So, you know, we are doing excellent, but I will not give ourselves a seven, but I'll give ourselves a six".

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See the full interview videos here:
Jean's : https://youtu.be/nP5twMO1_go
Tara's : https://youtu.be/6KUAiBJDODo
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Interviews with Chairs, Jean Ragusa and Tara Pandya

How/when did you get involved with MCD and its leadership?

🧝 : *"I became involved with attending topical and national meetings when I was a student at Texas A&M. Once I started working at [ORNL], I had colleagues who were on the MDC nominating committee and they [asked] if I was interested to serve on the executive committee. From there, I was elected to serve on the EC, then I was asked to be secretary, and then it snowballed from serving as vice chair, chair, and past chair. That's kind of my story of how I got involved with leadership in MCD".*

👨‍🍳: "Fairly quickly when I became a member of ANS, it was one of the two divisions that I naturally gravitated towards, it was RPD and MCD, and I was twice a member of the executive committee, though I don't quite remember the exact date, somewhere around 2005/6 and again a few years later. Those were two year terms and more recently I was elected vice chair and now I am chair. Me and MCD is a story that is almost 20 years old".

Challenges to student involvement:

🧝 : *"the biggest challenge is keeping the momentum moving whenever students move on or graduate to do other things…[also] trying to come up with small tasks to help out with MCD such that they can take responsibility for that task and meet what we are interested in".*

Ideas to improve student involvement:

👨‍🍳: "There is an MCD organization and we haven't done anything in years and I think you know that with students doing software development and learning numerical methods and now there's machine learning and AI, so to me, handing over a little bit of that GitHub organization to the student body… you would need to have a committee and a board with procedures of reviewing pull requests and those types of things. But you know handing over that GitHub organization to students who could create tutorials to help other students and having a discussion board would be great"

Credit to student member Nathan Ryan for contributing this MCD "family photo"

Fun Fact Matching Game…..*these were not the tasers you were looking for*

1. I like to make Tatin pie
2. I was on Jeopardy
3. I am a founding member of the Bathtub Row Brewing Co-op in Los Alamos
4. I spent 10 days on and helped crew a 3-masted tall ship
5. I have a twin brother who works in the car industry
6. I have hung out with Otto Frisch
7. My favorite animal is the Panda Express
8. I was an NRC-licensed SRO at RPI's research reactor as a student there
9. I grew up in France and Morocco until I was 18
10. My wife and I have written and produced 2 plays at the SF fringe festival
11. I am the only person in the world with my name
12. I can type 170 wpm
13. I am a part owner of an English football (soccer) club… at the heavy cost of £25/yr
14. I hate cilantro
15. I love visiting large international airports around the world

A. Dr. Tara Pandya
B. Dr. Temi Taiwo
C. Dr. Adam Nelson
D. Dr. Jean Ragusa
E. Dr. Madicken Munk
F. Dr. Anil Prinja
G. Dr. Miriam Kreher
H. Dr. Ryan McClarren
I. Dr. Brendan Kochunas
J. Dr. Zeyun Wu
K. Dr. Gabe Kooreman
L. Dr. Brian Kiedrowski
M. Dr. Kelly Rowland
N. Dr. Sebastian Schunert
O. Dr. Nick Gentile

ANS Meetings Best Papers

***Annual* 2022:** "Verification and Scaling of Time-Dependent Shift Using the AZURV1 Benchmark," Aaron J. Reynolds, Todd S. Palmer

***Winter* 2022:** "A Sampling-Based Approach to Solve Sobol Indices Using Variance Deconvolution for Arbitrary Uncertainty Distributions," Aaron Olson, Kayla Clements, James Petticrew

***Student* 2023**
Undergraduate: "pyMAISE: A Machine Learning and Artificial Intelligence Benchmarking Software for Nuclear Reactor Applications", Patrick Myers, Connor C. Craig, and Veda G. Joynt
Graduate: "Simulating Photoelectric Radiation Transport in Cylindrical Gas Filled Photoemission Driven Cavities," Ravi Shastri

***Annual* 2023:** "Transport Corrected Diffusion Reduced Order Model for Thermal Radiative Transfer", Joseph M. Coale, Dmitriy Y. Anistratov

***Winter* 2023:** "Termination of Picard Iteration for Coupled Neutronics/Thermal-Hydraulics Simulations," Dean Wang, Paul Romano
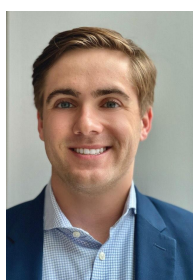
M&C 2023

Oral presentation:
1st Yoshinari Harada, "Uncertainty Quantification of Prompt Neutron Decay Constant α due to Thermal Neutron Scattering Law of Water"
2nd Kayla Clements, "Global Sensitivity Analysis in Monte Carlo Radiation Transport"
3rd Jawad Moussa, "Deterministic Computation of Leakage Neutron Multiplicity Moments in PARTISN"

Poster presentation:
1st Tuan Tran, "Verification of two-step code MCS/RAST-F for ANTS-100e"
2nd John Ross, "A Coupled Deterministic Transport Calculation in Comsol Using Proper Orthogonal Decomposition'
3rd Thomas Folk, "MPACT/PARCS Verification with the OECD/NEA Watts Bar Benchmark"

VIZ CONTEST

Do you consider yourself an expert in *~aesthetic~*? Do you have a side gig creating color maps from Taylor Swift album covers? Do you secretly (or not so secretly) enjoy causing your colleagues irreversible eye strain?! Read on!

Here's the challenge: we have posted our division's "snapshot" data at our MCD newsletter github repository. We've included some excellent examples of this data visualized in MCD executive committee meetings, but now we call on YOU to "yes, and" these plots. Can you show us division data trends in neon colors only? Or do you want to create a dashboard to visualize the data using only function keys? DO IT. We want to see your skills! We reserve the right to select winners in multiple categories (easiest to read, most (or least) reader friendly color scheme, etc.).

The contest is open from now until June 1st. Submit your entries (image file only, no raw data or scripts needed) via the google form HERE. Images from the winner(s) will be posted in a future issue of the newsletter. Happy plotting!

2022 Viz Contest Winners (Pictured Left)

Let's all congratulate our last newsletter's viz contest winners, **Will Wieselquist** and **Seth Johnson**. We had a number of *amazing, incredible,* and *innovative* visualizations submitted to our last contest, and this visualization really stood out. Have you ever marveled at the beauty of excel? Well now's your chance! Will and Seth have graced us with data as art. Let's take a look at their description of their C5G7 benchmark visualization.

Describe your visualization:

The ORNL SCALE development team was discussing ideas for wacky visualizations on Slack and Seth proposed using emojis. I had already copied the values into Excel and I wondered, how could you integrate emojis? You can assign custom formatting based on value ranges but it was news to me that you the formats can include emojis! 5/5 would waste 20 minutes on this again.

Please list which packages you used to create this visualization:

Excel and the wealth of knowledge on the internet
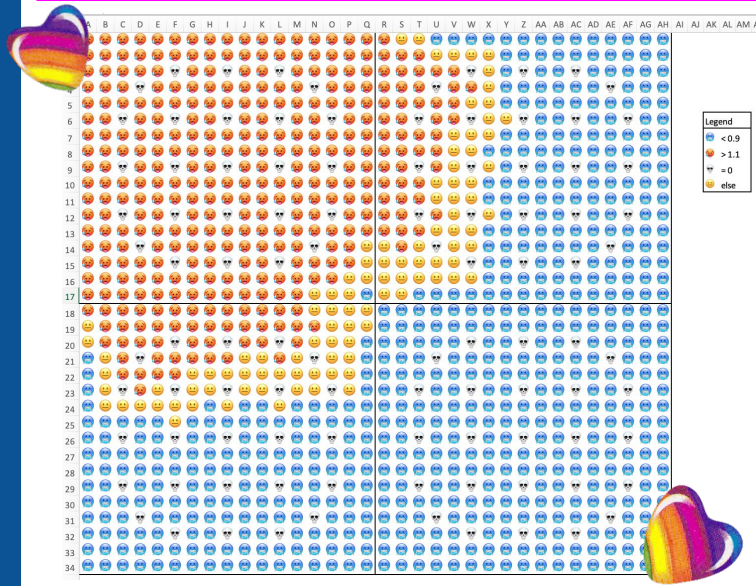
Professor Ali Haghighat (pictured left)

For pioneering contributions to development of high fidelity computational deterministic, stochastic, and high fidelity and fast hybrid particle transport methods and their application to complex nuclear systems; design of multi-modal detection systems for monitoring and safeguards, and image reconstruction for radiation diagnosis; the consistent adjoint driven importance sampling (CADIS) technique for automated variance reduction of Monte Carlo; and automated multigroup cross sections generation: and for his dedication to nuclear education.

Pomraning Award Winners

Professor Bill Martin (pictured right): In recognition of outstanding contributions to the advancement of nuclear engineering and science, including sustained support for providing the transport theory basis for advanced computational methods, innovative advances in Monte Carlo and deterministic computational methods, and state-of-the-art advances in Monte Carlo methods for high-performance computing systems.

MCD Officers and Executive Committee

Chair: Dr. Jean Ragusa is a Professor in the Nuclear Engineering Department at TAMU and Associate Director, Institute for Scientific Computation.

Vice Chair/Chair-Elect: Dr. Ryan McClarren is a Professor in the Aerospace and Mechanical Engineering Department at the University of Notre Dame

Treasurer: Dr. Brian Kiedrowski is an Associate Professor in the Nuclear Engineering and Radiological Sciences Department at the University of Michigan

Secretary: Dr. Madicken Munk is a Research Scientist in the Nuclear, Plasma, and Radiological Engineering Department at UIUC

Ex-Officio: Dr. Tara Pandya is the Radiation Transport Group Lead at ORNL

TPC: Dr. Sebastian Schunert is a Senior Nuclear Engineer at Radiant

Assistant TPC: Dr. Koroush Shirvan is the Atlantic Richfield Career Development Professor in Energy Studies in the Nuclear Science and Engineering Department at MIT

Executive Committee:

Dr. Kelli Humbird is a Design Physicist at LLNL

Dr. Farzad Rahnema is a Distinguished Professor at Georgia Tech University

Dr. Jaakko Leppanen is a Research Professor at VTT

Dr. Adam Nelson is a Technical Leader of Fast Reactor Neutronics and Methods with GE Hitachi

Dr. Gabe Kooreman is a Principal Nuclear Engineer and Physicist at NNL

Dr. Brendan Kochunas is an Assistant Professor in the Nuclear Engineering and Radiological Sciences Department at the University of Michigan

Dr. Nick Gentile is a Code Physicist at LLNL

Dr. Miriam Kreher is a Metropolis Postdoc Fellow at LANL

Dr. Kelly Rowland is a Computer Systems Engineer at NERSC/LBNL

Dr. Zeyun Wu is an Associate Professor at Virginia Commonwealth University

Dr. Anil Prinja is a Distinguished Professor (Emeritus) of Nuclear Engineering at the University of New Mexico

Board Rep: Dr. Temi Taiwo is the Division Director of Nuclear Science and Engineering at ANL
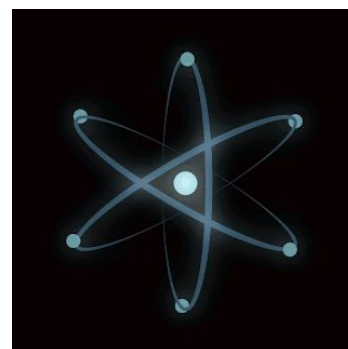
Newsletter editors:
Madicken Munk, Tara Pandya
Vincent Novellino, Nathan Ryan

Fun Fact Answers: 1-D,2-H,3-L,4-E,5-N,6-F,7-J,8-M,9-G,10-O,11-I,12-K,13-C,14-A,15-B