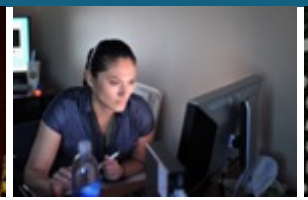
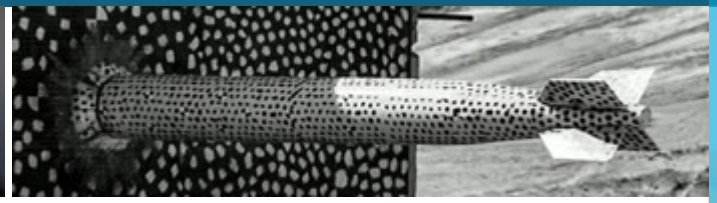
KU Mathematics in Industry Careers Talk 2021





KU Mathematics in Industry Careers Day (November 20, 2021)

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SAND2021-14704 PE

Career Path (everybody's is different) I/II

Broad Stroke

- BS in Mathematics (U. of MN, Spring 2009).
- PhD in Mathematics, advisor: by Erik Van Vleck (KU, Fall 2010 – Summer 2016).
- Postdoctoral Appointee @ Sandia National Laboratories (August 2016 – September 2017) working with Mark Taylor.
- Senior Member of the Technical Staff (September 2017 – Now).

More specifics on academic/grad. school experience (overall positive)

- My interests were (are?) mainly academic (though some work on toy climate/weather/atm. problems).
- Hard to work on "real applications" i.e. models actually used in practice by scientists and engineers.
- I didn't do an internship, but I recommend it. (I did apply to one and went to summer schools/conferences).
- Limited industry skills when I graduated (not a software engineer…yet!).
- National lab (NatLab) postdocs have lots of advantages – can stay in a NatLab, return to academia, move to industry.

Career Path (everybody's is different) II/II

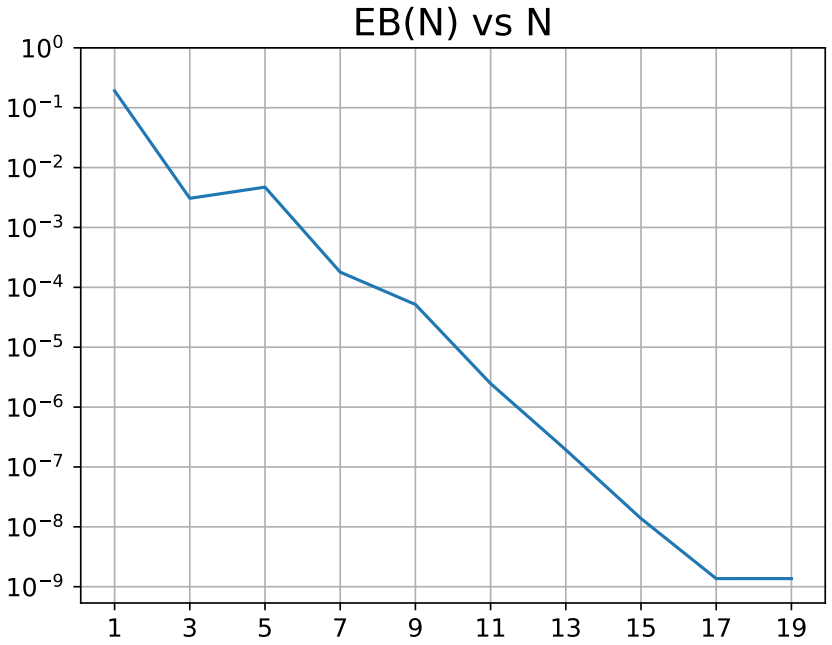
Time at Sandia:

- Great experience as a postdoc – many advantages over academic postdocs!
- Work/life balance.
- Get to work in relevant "real world" applications (large production climate model, plasma physics, structural dynamics) and do professional software development.
- Fun to work with and alongside engineers, scientists, and other non-mathematicians.
- Learn new applications and ideas, build new skills.
- You can still publish and have a scientific research career in mathematics outside of universities.

Some general advice to mathematicians departing academia

- Learn finite elements and numerical linear algebra, consider learning a few application areas e.g. fluids.
- Be open to learning new skills, application areas, and non-mathematical ideas.
- Learn to code (C++, Python, Julia, others), but don't expect to be an expert software developer (at least right away).
- Work in teams ("communication skills" are important esp. communication to non-mathematicians).
- Think about the value that formal/rigorous ideas and thinking brings to the table.
- Augment rather than compete with engineers and scientists (math is general, but doesn't make you a subject matter expert is everything).

Let's do some math!



"Exponentially fast" convergence in terms of the number of approximated harmonics.

Compute periodic solution to $M\ddot{u} + C\dot{u} + Ku = f(u,t)$ with the harmonic balance Fourier-Galerkin method.

- Can we prove convergence, including for physically relevant and realistic problems?
- Does the formal proof inform how to set parameters or choose initial guesses or how the accuracy relates to physics?
- How does the theory relate to practical computations (e.g. efficiency and parallelization) are we in the asymptotic regime?
- Can the theory inform algorithmic improvements and/or predict performance?
- Does the theory match the empirical results?

$$\text{error} \leq Ke^{-\alpha N}, \quad \forall N \geq N_0$$

These guys is important too!

Postdoc and internship opportunities!

Summer intern and postdoc opportunities are available! www.sandia.gov/careers

https://www.sandia.gov/careers/career-possibilities/students-and-postdocs/internships-co-ops/

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Summer Internships

Future of Research for Climate, Earth, and Energy (FORCEE) - Climate Science and National Security

- 679256 Intern - FORCEE R&D Graduate Summer
- 679254 Intern - FORCEE R&D Undergraduate Summer

Computer Science Research Institute (CSRI)

- 678708 Intern - Computer Science Research Institute (CSRI) R&D Graduate Summer
- 678709 Intern - Computer Science Research Institute (CSRI) R&D Undergraduate Summer

The CSRI interns have some requirements: weekly seminar series and a proceedings paper on what they did.

CLDERA - CLimate impact: Determining Etiology thRough pAthways (PI Diana Bull)

Will have 2 post-doc postings out soon!