Aaron **Beisaw**, Physics B.S.

Curriculum Vitae

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ABOUT ME

The Technical Side

- I enjoy working with anything that has to do with numbers and data, but in particular I enjoy optimization, simulation, and applying my math and coding skills to anything I am doing.
- I have worked on modeling and analyzing raw data from the Large Hadron Collider, numerical simulation of quantum spin chains, Supersymmetry, and have even applied my skills to identify problems in an automotive dealership based on data supported trends. In many of these situations, I have either ended up teaching myself something new to be able to accomplish my goals, or finding unexpected insights or problems along the way.
- It's safe to say math and coding are passions of mine, and I plan to keep developing my skills as I move through my career, no matter the industry.

The Personal Side

- I am definitely a more quiet person. I enjoy working with a smaller team (10-15 people as an upper bound) as a subset of a larger group. I feel like this leads to better interpersonal relationships which in turn lead to better, more productive problem solving.
- Outside of work, I also enjoy a wide range of music, from heavy metal, to EDM, to traditional style Chinese and more. I played the trombone for eight years growing up, and my grandfather was in a Beatles cover band, so music is definitely a big part of my life. I also love being out in nature - whether that means hiking, running, fishing with friends, playing backyard sports, or taking the scenic route to appreciate the natural beauty even if it is a little bit slower.

EDUCATION

Gateway Community College | A.S. in Science and Mathematics

- Self studied some advanced topics in physics under Prof. Tom Mannino
- Performed physics 2 labs one on one with Prof. Mannino prior to the lab meeting in order to assist students as an unofficial lab TA.

University of Maryland | Progress towards B.S. in Physics

- Took part in a two semester honors sequence in computing and research in physics, during which I first learned Linux, data cleaning and analysis, and worked on a project under an advisor (see research section below for more details)

University of Connecticut | B.S. in Physics

- March 2024, attended and gave a talk at the American Physical Society's March Meeting on the topic of quantum spin chain systems and numerical simulation.

PERSONAL WORK

Systems Administration and Troubleshooting

- I deployed Arch Linux (Manjaro) on two personal computer systems and successfully troubleshooted various errors that prevented boot after failed driver updates. In particular, recovery was successful after failed Nvidia driver updates without loss of data.
- I have successfully built 5 computer systems since 2013, along with several hardware upgrades and OS installs along the way
- When living on campus, I set up my home desktop to be accessible from my laptop via SSH and SFTP
- I successfully troubleshooted and solved memory corruption issues with Riot Games's Vanguard kernel anticheat and windows 11 version 23H2, which was resulting in repeated BSOD. Troubleshooting involved looking through the windows memory dump and testing my memory to rule it out as a culprit, eventually leading me to vanguard as the source of the problem.

Computational and Numerical Coding

- Lexus Service Data Analysis In progress: Developing a Python program that takes CSV data from three sources at work, cleans them, properly links the rows from each source together (this is all customer based data, so this is crucial), and outputs a new CSV with all of the relevant data for further analysis. This is going to be used to analyze shop performance and identify problem areas and to guide us in identifying root causes.
- Quantum Spin Chain project (physics overview given on page 4): Refactored my research group's code to be modular and, as a result, much more flexible than how we initially wrote it. This resulted in us being able to run simulations faster and on a much wider range of systems without having to double the amount of backend code. In particular, we were able to jump straight into the second phase of the project and begin analysis and simulation of two dimensional systems.

WORK EXPERIENCE

Specialty Fundraising Agent | Lester Inc. 2019 - 2020

Responsibilities

- I worked as a fundraising agent for Lester Inc. on their specialty team, calling for universities and non-profit groups to solicit donations and service renewals. These donations fell on average in the $100 to $1,000 range. Often times the most successful course of action would be to go off script based on the individual customer and their needs, which allowed me to overcome objections. Outside of my explicit job responsibilities, I would keep track of what works well and what does not and, depending on which account I was working on, advise on customer complaints, and relay this information to my supervisors.

Parts Counterman | McDermott / Crabtree Chevrolet 2023 - 2025

Responsibilities

- I fulfilled customer and in-house auto shop special orders on a daily basis.
- I ensured an accurate inventory was kept, in terms of both records and stocking locations.
- Morning check in and stocking consisted of an average of 50-100 parts, while each special order I put together for delivery could range from 5-30 parts per order. Special orders would be put together in the morning and in the afternoon each day, usually 3-5 orders at once for a total of 15-90 parts depending on the day.
- During the CDK cyber attack in June 2024, I collected all documentation for incoming special and stock orders as well as sales made while CDK was still down and was responsible for keeping all records properly organized to be uploaded into our systems upon relaunch. This amounted to keeping track of tens of thousands of dollars in sale orders, and we were able to successfully recover from the incident in a timely fashion. Within one week of systems returning, I had all paper records input into CDK and stored for future reference.
- I managed General Motors return orders, core claims, and damaged goods claims for the Chevrolet parts department. Return orders were done on a monthly basis, averaging $3,000 each month. Daily core claims were an average of $50 per non-engine core and typically there would be 5-10 on a given day.
- Helped facilitate a smooth transition of daily tasks during the transfer of ownership from East Haven Cars LLC to Bobby Crabtree.
- Ensured proper handling and storage of hazardous materials, including motor oils, old and new automotive batteries, and airbag safety devices.

FastTrac Assistant Manager | Crabtree Lexus 2025 - Present

Responsibilities

- Oversee loaner fleet of 105 cars with an average value of around $65,000, ensuring that cars are checked in, cleaned, and fully fueled each morning.
- Manage recalls for loaner vehicles, ensuring cars are put on hold for safety recalls and then writing and billing out warranty repair orders when the recall remedies become available.
- Training for the service advisor role
- Assist in training service advisors on Dealerware and MobilityCloud valet services.
- Create and manage pickup and dropoff runs for valet customers.
- Resolve pending, overdue, or incorrect contracts and ensure customer balances are taken care of.
- Set up new cars for the loaner fleet, including plating, fueling, and cleaning to get them on the road.
- Assist service department with writing and billing out repair orders when needed, and perform extensive road tests for technicians (>50 miles)
- Coordinate with technicians to ensure valet jobs are prioritized and completed in a timely fashion

RESEARCH

Particle Theory | Advisor: Dr. Kaustubh Agashe, UMD 02 2021-05 2021

Background

- Part of a two-student team working to build up the theory behind Dr. Agashe's paper arXiv:1209.0772 and reproduce the plots to verify the theory and its predictions

Theory

- Demonstrates that the laboratory frame energy distribution of a daughter particle in a two-body decay contains a peak which corresponds to the energy of the daughter particle in the rest frame of the parent. I found that this peak remains invariant under changes to the parent particle's boost distribution and that this method is model independent, thus it can be useful in analyzing data from the Large Hadron Collider in searching for new physics. This method was later used by the CMS team at LHC to measure the top quark mass.

Simulation

- I made use of MadGraph5 to generate proton-proton collisions which result in the generation of a top and an anti-top quark that further decay into $w+$ boson and bottom quark, and $w-$ boson and anti-bottom quark. This process was generated for various collider energy levels ranging from 630 GeV to 100 TeV, after which MadAnalysis was used to plot the energy distribution histograms on top of each other. The plots generated were what I expected to see, with a common peak at 68 GeV which was the rest frame energy of the bottom quark that I calculated using the theory.

Field Theory | Led By: Dr. S. James Gates Jr. et. al., Brown University June 1, 2021 - June 25, 2021

Overview

- Brown University's Summer Student Theoretical Physics Research Session (SSTPRS) for 2021 took place online through Zoom, with Dr. Konstantinos Koutrolipos and Dr. Kory Stiffler (both from Brown University) alongside Dr. Gates, as well as two student mentors: Aleksander Cianciara (Brown University, PhD Student) and Gabe Yerger (UMD, Undergraduate). Each week covered a different topic:
  - Week 1: Lie Group Theory
  - Week 2: Differential Geometry
  - Week 3: Lagrangian Dynamics, Clifford Algebra, and Spinors
  - Week 4: Introduction to Supersymmetry
- Each week students worked in groups of three to complete the assigned homework, typically done individually with a discussion before class to come to a consensus on the results. These groups were changed each week so that we ended up working with and communicating with different people throughout the program.

Supersymmetry | Led By: Dr. S. James Gates Jr., Brown University June, 2021 - June, 2022

Overview

- I worked on a research project under the lead of Dr. S. James Gates Jr. with a small subset of the SSTPRS group described above. My work on this project was heavily computational; after reading through various relevant papers describing variations of supersymmetric field theories, I used Mathematica and Python to verify the results, create an algorithm to generate explicit matrices from those results, and then mapped the matrices to the fields being described to generate graphical representations of each theory, known as Adinkras. To be sure of the validity of our results, we split the group into several subgroups who worked independently on the same task so that we could come back together and cross examine each other's results to make sure our findings matched and our codes made logical sense.

Quantum Spin Chains | Led By: Dr. Lea Ferreira dos Santos, University of Connecticut June, 2023 - Present

Overview

- The goal of this research project was to be able to simulate and understand how one and two dimensional spin chains act under a given hamiltonian, and how they evolve through time. I simulated these systems classically in one dimension using a combination of Mathematica and Python. While the focus of this work was for the 1D case, the 2D case was also studied and I found that the same behaviors arise - bound pairs of quantum spin particles are robust, and do not want to separate under the action of a hamiltonian. In the future, this subject could be studied using alternate algorithms in a quantum computing system, but this was beyond the scope of our project at the time. At the American Physical Society's March Meeting 2024 in Minneapolis, I gave a talk on our findings.
- I also aided Dr. Santos in the onboarding of a new undergraduate student into the project and helped them get caught up on the six months of progress I had made at that point.

SKILLS

- Python
- LaTeX
- Matlab
- Mathematica
- Linux, MacOS, Windows
- Numerical Simulation
- Algorithms
- Critical Inquiry
- Electronic Circuits
- Using multimeters, oscilloscopes, signal generators
- Customer satisfaction
- CDK Parts & CDK Service
- Dealerware
- MobilityCloud Drop Car
- Toyota Technical Information System
- Excel / Google Sheets
- Customer Service
- SQLite3