Spencer Wallace

520 461 4480 | spencerw530@gmail.com | LinkedIn | GitHub | Portfolio | Tucson, AZ

Education

University of Washington — Seattle, Washington
PhD Astronomy — *Oct 2015 – Summer 2023 (Expected, flexible)*

University of Arizona — Tucson, Arizona
BS Computer Science, Astronomy and Physics — *Aug 2009 – May 2014*

Work Experience

Simulating the assembly of terrestrial planets

University of Washington, Astronomy Department — *Jan 2018 – Present*

- Designed, ran and analyzed a suite of N-body simulations that follow the planet formation process from 10^6 asteroid-sized bodies up to full terrestrial worlds (Python, Numpy, Pandas, Git)
- Extended an existing large-scale hydrodynamics code to model collisions between solid bodies (C++, Git)
- Tested, debugged and ran large-scale simulations across multiple compute nodes on a variety of national supercomputers (C++, Git, Bash)
- Created and developed set of analysis tools to track the orbits of particles and follow their collision histories (Python, Numpy, Pandas, Git)

Detecting stellar flares with the Transiting Exoplanet Survey Satellite

University of Washington, DIRAC Institute — *Jun 2019 – Jun 2020*

- Designed, tested and used an analysis pipeline to construct a catalog of non-periodic flaring events in time series data of brightness for tens of thousands of stars (Python, Numpy, Pandas, Git)
- Used a gaussian process machine learning model to automatically remove periodic signals and quantify the reliability of flare detections

Synthesizing new data from existing simulation results

University of Washington, eScience Institute — *Jan 2023 – Present*

- Designed a pipeline to train a generative adverarial neutral network to produce an infinite supply of qualitatively similar, but numerically distinct simulation results (Python, PyTorch, Pandas, Numpy, Git)
- Verified the accuracy and robustness of the model through a combination of statistical tests and additional simulations

Verifying the robustness of galaxy simulation codes

University of Washington, Astronomy Department — *Oct 2015 – Dec 2016*

- Ran and analyzed a set of hydrodynamics simulations to assess the scientific validity of the most commonly used galaxy simulation codes (C++, Python, Numpy, Bash, Git)
- Worked with a mult-national team from over thirty institutions to highlight and understand and reconcile differences between state-of-the-art galaxy simulation codes asked to solve an identical problem

Graduate teaching assistant

University of Washington, Astronomy Department — *Oct 2015 – Jun 2020*

- Led weekly discussion sections, graded assignments and occasionally preformed lectures and designed homework exercises for undergraduate students
- Collaborated with a team of other teaching assistants to ensure assignments, quizzes and exams were graded consistently and fairly

Work Experience

SESTEK Speech Enabled Software Technologies — Istanbul, Turkey

Natural Language Processing R&D Intern — *Jan 2022 – Feb 2022*

- Implemented common NLP tasks using transformers such as named-entity recognition (NER), part-of-speech (POS) tagging, sentiment analysis, text classification, and extractive/generative question answering.
- Built a generative question answering system via Dense Passage Retrieval (DPR) and Retrieval-Augmented Generation (RAG) using the Haystack framework with Python.
- Worked on a custom Turkish open-domain question answering system by fine-tuning a BERT base model transformer. Evaluated the exact match and F1 scores using different Turkish data sets and compared the evaluation results.

Meteksan Defense Industry Inc. — Ankara, Turkey

Analog Design Engineering Intern — *Jul 2021 – Aug 2021*

- Designed numerous analog circuits such as voltage-mode controlled buck converter, phase-shifted full-bridge isolated DC-DC converter, and EMI filters with LTspice. Integrated these circuits and implemented a 320 W power distribution unit to be used in a radar system's power circuit board.
- Researched real-world compatible electronic components to be used in such circuits including GaNFETs, high-side gate drivers, and Schottky diodes.
- Assembled PCBs of both common and differential mode filters and used VNA Bode 100 to measure the cut-off frequencies.

Awards & Achievements

National University Admission Exam (YKS): Ranked 75^{th} in Mathematics and Science among ca. 2.3 million candidates with a test score of 489.92/500.

KYK Outstanding Success Scholarship: Awarded to undergraduate students who have been ranked in the top 100 on National University Admission Exam by Higher Education Credit and Hostels Institution (KYK).

Boğaziçi University Success Scholarship: Awarded to undergraduate students who have been ranked in the top 100 on National University Admission Exam by Boğaziçi University.

TÜBİTAK 2247-C Intern Researcher Scholarship: Awarded to undergraduate students who take part in research projects carried out by the Scientific and Technological Research Council of Turkey (TÜBİTAK).

Duolingo English Test (DET): Overall Score: 135/160

Kocaeli Science High School Salutatorian Award: Graduated as the second-highest ranked student in my class.

Projects

Filters and Fractals | *GitHub*

- A C project which implements a variety of image processing operations that manipulate the size, filter, brightness, contrast, saturation, and other properties of PPM images from scratch.
- Added recursive fractal generation functions to model popular fractals including Mandelbrot set, Julia set, Koch curve, Barnsley fern, and Sierpinski triangle in PPM format.

Chess Bot | *GitHub*

- A C++ project in which you can play chess against an AI with a specified decision tree depth that uses alpha-beta pruning algorithm to predict the optimal move.
- Aside from basic moves, this mini chess engine also implements chess rules such as castling, en passant, fifty-move rule, threefold repetition, and pawn promotion.

Rocket Flight Simulator | *GitHub*

- A Simulink project which can accurately simulate the motion of a flying rocket in one-dimensional space.
- The project implements the forces acting on a rocket which are drag, weight, and thrust as subsystems that take time-variant parameters into consideration such as distance from the center of Earth, mass and velocity of the rocket, and air density at different layers of Earth's atmosphere.

Netlist Solver | *GitHub*

- A MATLAB project that uses modified nodal analysis (MNA) algorithm to calculate the node voltages of any analog circuit without dependent sources given in netlist format.

- Added a module that sweeps the resistance of a load resistor, plots power dissipation as a function of load resistance, and finds the resistance value corresponding to maximum power.

CMPE 250 Projects | *GitHub*

- Five Java projects assigned for the Data Structures and Algorithms (CMPE 250) course in the Fall 2021-22 semester.
- These projects apply DS&A concepts such as discrete-event simulation (DES) using priority queues, Dijkstra's shortest path algorithm, Prim's algorithm to find the minimum spanning tree (MST), Dinic's algorithm for maximum flow problems, and weighted job scheduling with dynamic programming to real-world problems.

Skills

Programming: C, C++, Java, Python, MATLAB, R, MySQL, VHDL

Technologies: Git, Arduino, ROS, Simulink, LTspice, Xilinx ISE

Languages: Turkish (Native), English (Professional), German (Elementary)

Relevant Coursework

Major coursework: Calculus I-II, Matrix Theory, Differential Equations, Materials Science, Electrical Circuits I-II, Digital System Design, Numerical Methods, Probability Theory, Electronics I-II, Signals and Systems, Electromagnetic Field Theory, Energy Conversion, System Dynamics and Control, Communication Engineering

Minor coursework: Discrete Computational Structures, Introduction to Object-Oriented Programming, Data Structures and Algorithms