Joseph Aaron Gene Diaz

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EDUCATION

- **San Diego State University** — San Diego, CA
  Master of Science in Applied Mathematics; GPA: 3.725 — *Jan 2021 – Aug 2022*
  Thesis title: A Study on Quantifying Effective Training of DLDMD

- **San Diego State University** — San Diego, CA
  Bachelor of Science in Applied Mathematics; GPA: 3.71 — *Aug 2018 – Dec 2020*

RESEARCH INTERESTS

- **Neural Network Evolution**: The principle focus of my thesis is modeling Neural Network evolution using statistical methods and density estimation to generate empirical probability distributions affliated with each layer and examine the change in information content between training epochs by computing the entropy and relative entropy. This modeling is used to quantify the effectiveness of training for Machine Learning models where standard metrics such as accuracy, recall, Mean Squared Error and others fails.

- **Data Visualization**: This is germane to my work with Neural Network evolution and the intent is to re-express the data associated with the thousands of trainable parameters of a Neural Network model into a new form that can be readily visualized and understood for the sake of furthering analysis and exhibiting network behavior.

PROGRAMMING SKILLS

- **Languages/APIs**: Python, Java, C/C++, MATLAB, Numpy, Git, Matplotlib, Scipy, Pandas, TensorFlow, Numba, Streamlit, LaTeX, Markdown, SQL, Scikit-Learn.

SOFT SKILLS

- Creativity and problem solving.

- Effective oral and written communication.

- Good sense of urgency and prioritization with respect to the task at hand.

- Capable of working independently or collaboratively.

- The ability to lead and competently direct others.

EXPERIENCE

- **San Diego State University** — San Diego, CA
  Graduate Teaching Assistant — *Aug 2019 - Aug 2022*
  - **Teaching**: I wrote interactive code lectures that utilized the Python and markdown features of Jupyter Notebooks to provide supplementary instruction in a course on introductory Python programming, data analysis, visualization, and the employment of Python packages such as Numpy, Scipy, Pandas, and Matplotlib.
  - **Tutoring**: I coached my students in foundational material required to understand critical course content in addition to clarifying misconceptions and supplementing student's learning by tying new material to the foundational material.
  - **Automated Grading**: I leveraged the Python Unit Test framework to develop and deploy an automated homework grader compatible with the Gradescope online grading platform.

- **San Diego State University** — San Diego, CA
  Student Researcher — *Jan 2019 – May 2022*
  - **Machine Learning**: I explored and investigated neural network architectures in the TensorFlow API to create sequential network models to approximate statistical functions and predict future states of dynamical systems. I examined applying well understood statistical methods such as fittings and density estimation to the evolution of individual layers in a neural network model.

- - **Data Visualization**: I implemented analytical methods from the statistics submodule of Scipy and Numpy to represent and visualize the evolution of Machine Learning models as training takes place with the goal of quantifying good training when standard metric are unavailable. I translated R code for visualizing climate data into a Python using Matplotlib as supplementary material for a course on climate statistics.

- **Cryogenic Exploitation of Radio Frequency (CERF) Lab**   San Diego, CA
  Data Analyst/Scientist   *May 2021 – Nov 2021*
  - **Automation**: I utilized the Socket API in Python to create interfaces for electronic lab equipment to automate the running of experiments and data collection.
  - **Web Programming**: I assisted in the creation of web-based applets for data visualization and analysis by using Python implementations of the QT, Dash, and Streamlit interfaces.
  - **Signal Processing**: I operated signal processing equipment for network analysis, spectrum analysis, noise-figure characterization, and arbitrary waveform generation, and bolstered efforts to use these for testing the efficacy of experimental electrical circuits.

PROJECTS

- **Thesis and future work**: My Masters thesis was on exploring new statistical methods to quantify effective training of Neural Network Machine Learning models and I am working on a general Python toolkit for the relevant analysis and a full scientific publication with my research advisor Professor of Mathematics Christopher Curtis.
- **Professional webpage**: I am currently working on a webpage hosted on GitHub that uses Streamlit and Javascript to exhibit all of my research, interactive examples of my teaching work and research methods, and my professional profile. Here is a link to the site and there is another at the top of this resume.

REFERENCES

- **Christopher Curtis**:
  Professor of Mathematics at SDSU
  ccurtis@sdsu.edu
- **Nicholas Ferrante**:
  Research Scientist at the Naval Information Warfare Center - CERF lab
  (619) 820-0438 - nicholas.b.ferrante.civ@us.navy.mil
- **Daniel Jay Alford-Lago**:
  Research Scientist at the Naval Information Warfare Center - Atmospheric Propagation Branch
  (619) 553-1426 - daniel.j.alford-lago.civ@us.navy.mil

RELEVANT COURSEWORK

- C++ Programming
- Data Structures
- Java Programming
- Linear Algebra
- Differential Equations

- Numerical Analysis
- Dynamical Systems
- Numerical Matrix Analysis
- Applied Real Analysis
- Computational Modeling

- Applied Probability/Statistics
- Computational PDEs
- Applied Fourier Analysis
- Computational Optimization
- Abstract Algebra