

# Gabriel Mongaras

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**OBJECTIVE:** Enthusiastic artificial intelligence engineering student seeking to do research in the AI industry and become a leading contributor to the AI field.

**EDUCATION:** **Southern Methodist University – Lyle School of Engineering** Dallas, TX  
Masters/Bachelors of Science in Computer Science Expected Grad Date: May 2025  
Masters/Bachelors of Science in Statistical Science GPA: 3.83  
Bachelor of Science in Data Science  
Bachelor of Arts in Mathematics

**Austin Community College** Dallas, TX  
Associates of Science in Computer Programming Grad Date: May 2021  
Occupational Skills Award – Computer Programming GPA: 3.9

**RELEVANT COURSES:** Graduate Artificial Intelligence, Applied Machine Learning, Data Structures, Algorithms, Assembly Programming, Calculus I, II & III, Graduate OS and System Software, Digital Logic Design, Linear Algebra, Digital History, Discrete Computational Structures, Applied Statistics, Harvard CS50 AI: Intro to AI with Python, Engineering Design

## **SKILLS:**

**Coding:** Python, Django, Flask, C, C++, HTML, CSS, JavaScript, SQL, PL/SQL, AWS, Linux, Arduino, ARM, Android SDK, Java

**AI:** Neural Networks, PyTorch 🤗, scikit-learn, NumPy, CNNs, Transformers, GANs, NEAT  
Diffusion Models, Object Detection, TensorFlow

**Blockchain:** Smart Contracts, Solidity, Remix IDE

## **EXPERIENCE:**

**Southern Methodist University., Undergraduate Research Assistant, Dallas, TX** Fall 2021-Present

- Molecules have various stable equilibrium positions. When changing from one of these states to another, the molecule goes through a transition state which is observed using MP3 (Moller-Plesset Perturbation Theory)
- MP3 is a very accurate computation, but also very expensive. So, it can be approximated using THC (Tensor Hypercontraction) which reduces the computation time, but also reduces the accuracy.
- To bridge the gap between accuracy and computation speed, I use machine learning to make a Multi Layer Perceptron (MLP) model that takes in the THC data and molecular structure data and outputs the predicted MP3 values which is faster than computing the MP3 computation, but more accurate than the THC measures.
- I am in charge of making this MLP and have been working on improving accuracy and performance. Our results have shown to achieve 2 orders of magnitude better than THC in terms of the MP3 value.

**Amazon, Intern, Sunnyvale, CA** May 2023-August 2023

- On the Amazon Alexa team, working to improve algorithm that detects which Alexa is closest to a user after saying the wake word based on audio signals coming from all devices in a household using deep learning techniques.
- Researching different methods to keep the model smaller, faster, and more accurate at the same time.
- Looking into different types of data that can be fed into the model to improve model accuracy.

**Meta, Intern, Menlo Park, CA** May 2022-August 2022

- Created a working mobile app using the Android SDK for a project assigned by Meta University.
- Researched and created an AI model to generate random sentences from Gaussian noise for the app.
- Worked with team members to implement rules and strategies to deal with security on data and database applications.

**ACTIVITIES:** Artificial Intelligence Club, President  
Cybersecurity Club, Member  
Computer Science Club, Member  
Commons Council, Member

**AWARDS:** Hunt Scholars  
Rotunda Scholars  
University Honor Role  
Accelerated Pathways Masters Degree Program  
Hyer Society Member  
Hilltop Scholar  
Discovery Scholar

## **ENGINEERING PROJECTS:**

### **Diffusion Models From Scratch**

Fall 2022/Spring 2023

- Coded a Diffusion Model from pure PyTorch that learns how to produce images given random noise from a Gaussian distribution.
- On top of the basic DDPM model, I improved the speed of image generation by converting the model to a DDIMs, which removes the Markov chain restriction of the basic DDPM model.
- Added Classifier-Free guidance to improve model FID score.
- Saved several pre-trained models that generate images with a minimum FID score of around 30
- [https://github.com/gmongaras/Diffusion\\_models\\_from\\_scratch](https://github.com/gmongaras/Diffusion_models_from_scratch)

### **MetaU Capstone**

Summer 2022

- Created an app that gave daily fortunes to users which can be shared with friends found on the app.
- Added privacy features.
- Added dark mode.
- Added localization for 40+ countries.
- Built a model using a Transformer WGAN to generate random fortunes from Gaussian noise.
- [https://github.com/gmongaras/MetaU\\_Capstone](https://github.com/gmongaras/MetaU_Capstone)

### **YOLOX From Scratch**

Spring 2022/Summer 2022

- Coded an AI from scratch that learns how to detect objects given an image by putting bounding boxes around objects in the image.
- To detect objects, the algorithm predicts three attributes: The location of a bounding box to put around an object, how confident the model is that there's an object in that bounding box, and what object is in that bounding box.
- The algorithm is one of the many from the YOLO series which has proved to be one of the best for object detection.
- The project can be found here: [https://github.com/gmongaras/YOLOX\\_From\\_Scratch](https://github.com/gmongaras/YOLOX_From_Scratch)
- Additionally, I wrote an article series explaining all the parts to this algorithm: <https://gmongaras.medium.com/list/yolox-explantation-1bff11aa9911>

### **Visualizing Gradient Descent**

Summer/Fall 2021

- Using only NumPy in Python, a neural network with forward and backward methods classifies a given point (x1, x2) to a color of red or blue based on the training data
- The network is trained using gradient descent which I coded from scratch with basic NumPy operations
- The model created represents how other models in the real world learn as they use the same algorithm
- The project can be found here: [https://github.com/gmongaras/Visualizing\\_Gradient\\_Descent\\_For\\_BCE\\_Loss](https://github.com/gmongaras/Visualizing_Gradient_Descent_For_BCE_Loss)

## **ARTICLES:**

### Diffusion Models — DDPMs, DDIMs, and Classifier Free Guidance

- Wrote about the evolution of base Diffusion Models and how they work.
- This article has been published by [Better Programming](#)
- <https://betterprogramming.pub/diffusion-models-ddpms-ddims-and-classifier-free-guidance-e07b297b2869>

### Coding An AI Girlfriend

- Explains how I coded a virtual AI girlfriend using an assortment of AI technologies
- <https://medium.com/mlearning-ai/coding-a-virtual-ai-girlfriend-f951e648aa46>

### How Do Self-Attention Masks Work?

- How do masks in the self-attention function work? This article attempts to explain how they work.
- This article has been published by [MLearning.ai](#)
- <https://medium.com/mlearning-ai/how-do-self-attention-masks-work-72ed9382510f>

### YOLOX Explanation Series:

- Explains how the YOLOX object detection algorithm works through 4 different articles
- These articles have been published by [MLearning.ai](#)
- <https://gmongaras.medium.com/list/yolox-explantation-1bff11aa9911>

### Community Detection with Neural Networks:

- Explains how neural networks can be used to detect communities in a graph and how this algorithm performs against the Girvan Newman algorithm.
- <https://medium.com/smucs/community-detection-with-neural-networks-2e6c79a28d0c>