Building Generative Adversarial Networks

Project Purposes:

- Develop group members' knowledge of neural networks and AI concepts
- Design a reliable and practical image generator

Goal Statement:

Develop a functional generative adversarial network, capable of producing convincing images of real-life phenomena.

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Abstract

Our project will utilize neural networks to produce data that can reliably trick a human into thinking the data is real rather than artificially generated. After setting up a generator and discriminator model, we will be able to provide a collection of existing image and begin training them. The generator will seek out patterns to generate original images, while the discriminator will train to get better at determining whether the images it receives are real or fake. Ultimately, they will improve each other in an adversarial "zero-sum game." Depending on the application, this kind of deep learning can be used to provide unique and realistic images, videos, text, and other types of data to users.

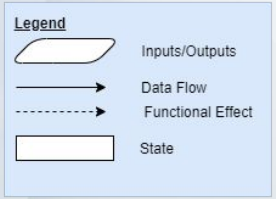
User Stories

- As an artist, I want zoological subjects to use as inspiration for paintings and sculptures.
- As a computer scientist, I want to demonstrate the capabilities of GANs for non-technical audiences to appreciate and remember.
- As a dungeon master, I want to find new and unique creatures so that my Dungeons & Dragons campaign is more interesting.

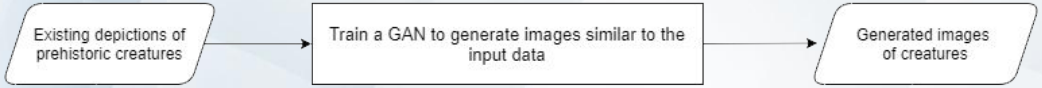
Design Diagrams

Generative Adversarial Network for Prehistoric Creatures

Goal: Create a system that can realistically generate and display unique depictions of prehistoric animals



D0



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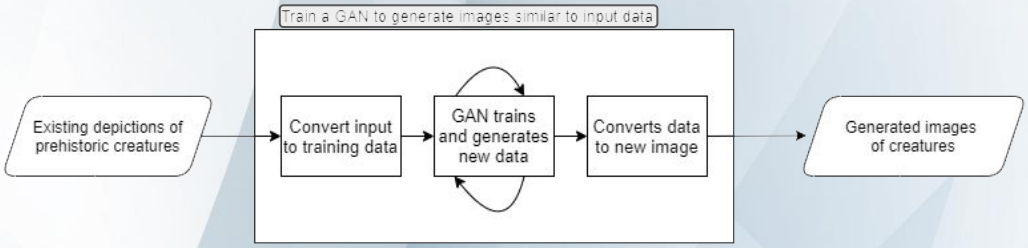

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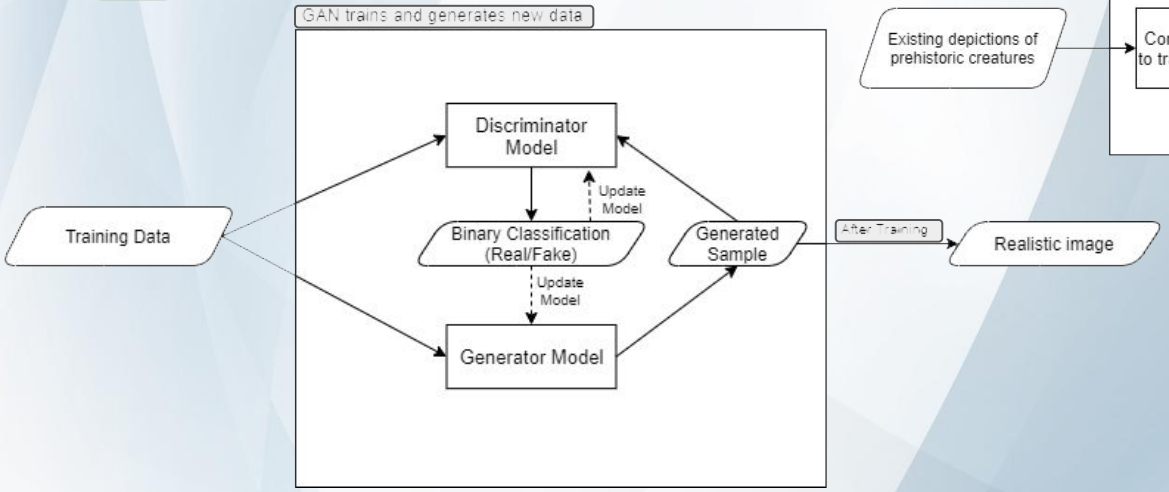


Project Constraints

Computing Resources

With how computationally complex neural networks are, our group is not sure whether the computers currently available to us will be able to handle our project. This constraint may lower our possible outcomes and deliverables depending on what resources we can attain. The threshold of acceptability may need to be lowered to accommodate the lack of resources in this area.

Technical Knowledge

Given that our experience with neural networks, machine learning, and GANs are extremely limited as of the start of this project, the proficiency of our work may be adversely affected. A large amount of time will need to be dedicated towards increasing our theoretical understanding of GANs and practical usage of the software platforms used to develop and train them. Additional time may be required to learn the programming language we choose to use, as well as the appropriate software libraries for it.

Project Scope

With how varied the individual components to our project are, our group members may need to spend a longer amount of time researching and tweaking them to work properly. To ensure our group does not overstate a realistic scope, we will most likely be considering an underestimated scope at the beginning of our project. Once further research and development has been done, the scope may be modified to reflect how the final deliverables of the project could look like.

Current Project Progress

- Research has been conducted on the high level components and structure of GANs

- Project scope has been thoroughly considered, and brainstorming for possible GANs has been done

Accomplishments for End of Term

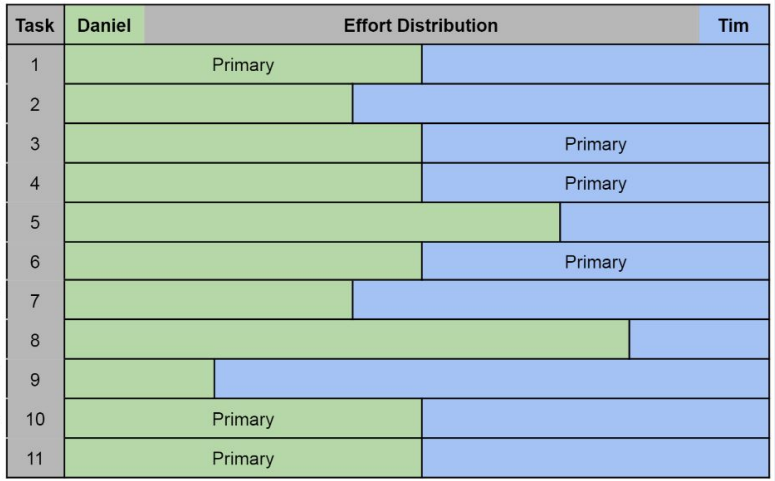
- Prep for code generation, choose ideal language
- Code for a smaller GAN with a relaxed scope (proof of concept)
- Research image processing
- Research Neural Networks
- Research resources to train GANs effectively

Division of Work

Task Timeline:

#	Task Name	Milestone	Date Range
1	Research GANs	Research	9/8/21 - 1/10/22
2	Research Images Processing	Research	9/8/21 - 1/10/22
3	Research programming language to start with	Research	9/8/21 - 1/10/22
4	Research Neural Networks	Research	9/8/21 - 1/10/22
5	Investigate other feasible resources to train GANs effectively	Research	9/8/21 - 1/10/22
6	Gather training data	Training Data	1/10/22 - 1/16/22
7	Implement image processing and converting image into usable data	Image Processing	1/16/22 - 1/30/22
8	Implement a generator model	Generator Model	1/30/22 - 2/13/22
9	Implement a discriminator model	Discriminator Model	2/13/22 - 2/27/22
10	Test efficacy of the generator model output	Generate Images	2/27/22 - 3/27/22
11	Refine training and classification algorithm	Generate Images	2/27/22 - 3/27/22

Effort Matrix:



Expected Demo at Expo

- Poster with GAN-generated images, inviting viewers to guess which are real or fake.
- Information about what GANs are, how they work, and where they can be applied
- Demonstration of image generation using GANs on a laptop