

A decorative graphic on the left side of the slide consisting of two overlapping parallelograms. The front one is blue and the back one is a light greenish-blue. They are positioned diagonally, with the blue one partially covering the green one.

Topographic Medical Image Reconstruction Using Deep Learning

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Task Matrix for Milestone 3

Task	Completion	Asher	Chris	Ty
Generate 1,000 sinograms using the model pipeline	100%	10%	10%	80%
Develop a new machine learning model to classify the generated sinograms	100%	40%	40%	20%
Train and tune the PyTorch AED model to start reconstructing the sinograms based on the data we have currently	90%	35%	35%	30%
Figure out how to run OpenGate on a multithreading program.	100%	10%	10%	80%




Generate 1,000 sinograms using the model pipeline

- Artificial data generation using the OpenGate pipeline from the previous milestone
- Added data augmentation to multiply our sinogram output by 50



Develop a new machine learning model to classify the generated sinograms

- Used pre-existing neural network
 - Developed for mouse images
- Adapted for sinograms



Train and tune the PyTorch AED model to start reconstructing the sinograms based on the data we have currently

- Main focus of this milestone - discussed in upcoming slides
- Good results - see demo


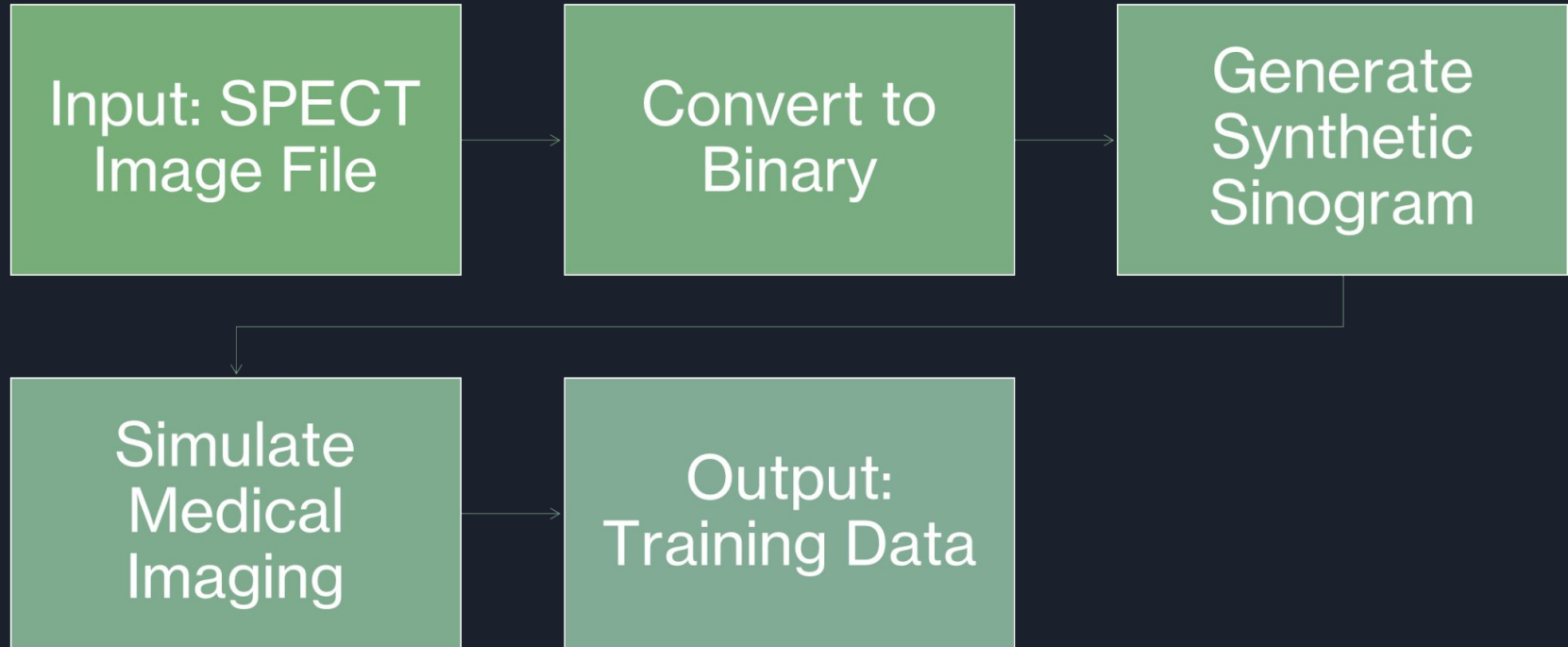


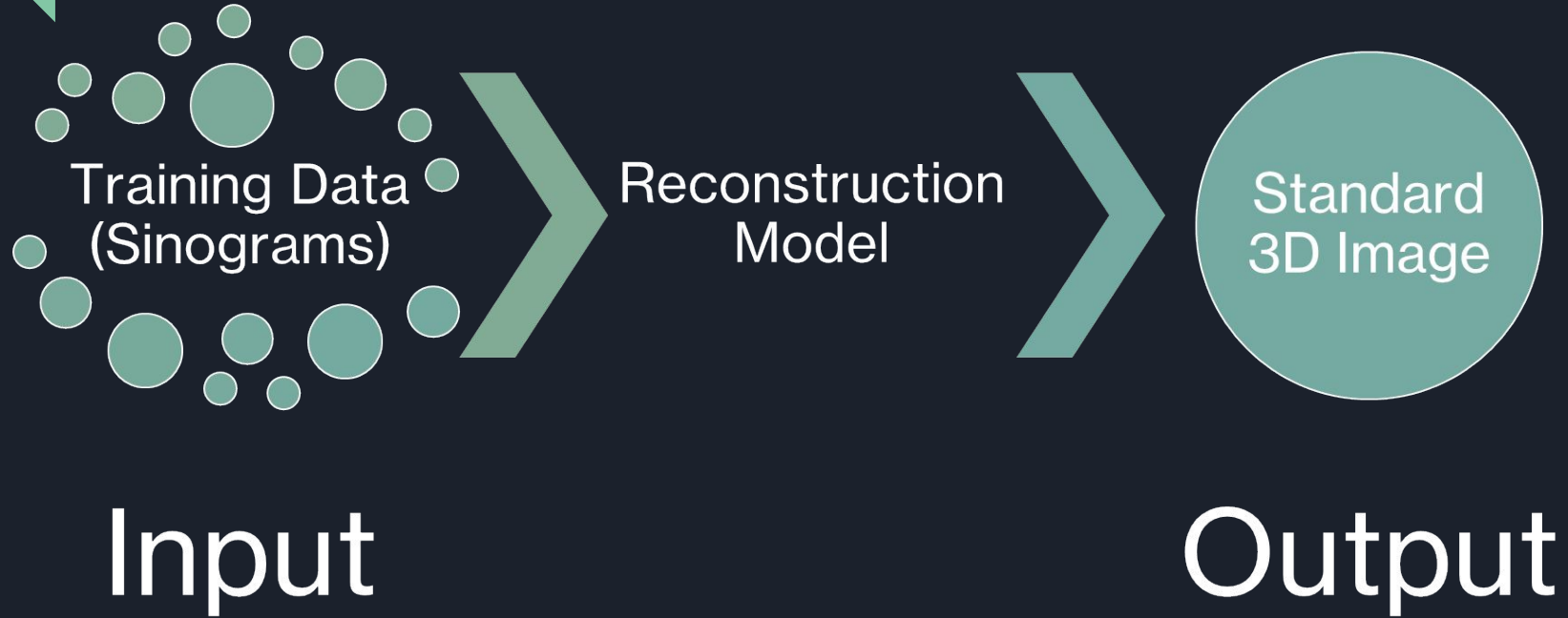
Figure out how to run OpenGate on a multithreading program.


- It runs with multithreading now
- Also runs on multiple computers

Process to Produce Training Data



Model Inferencing Process

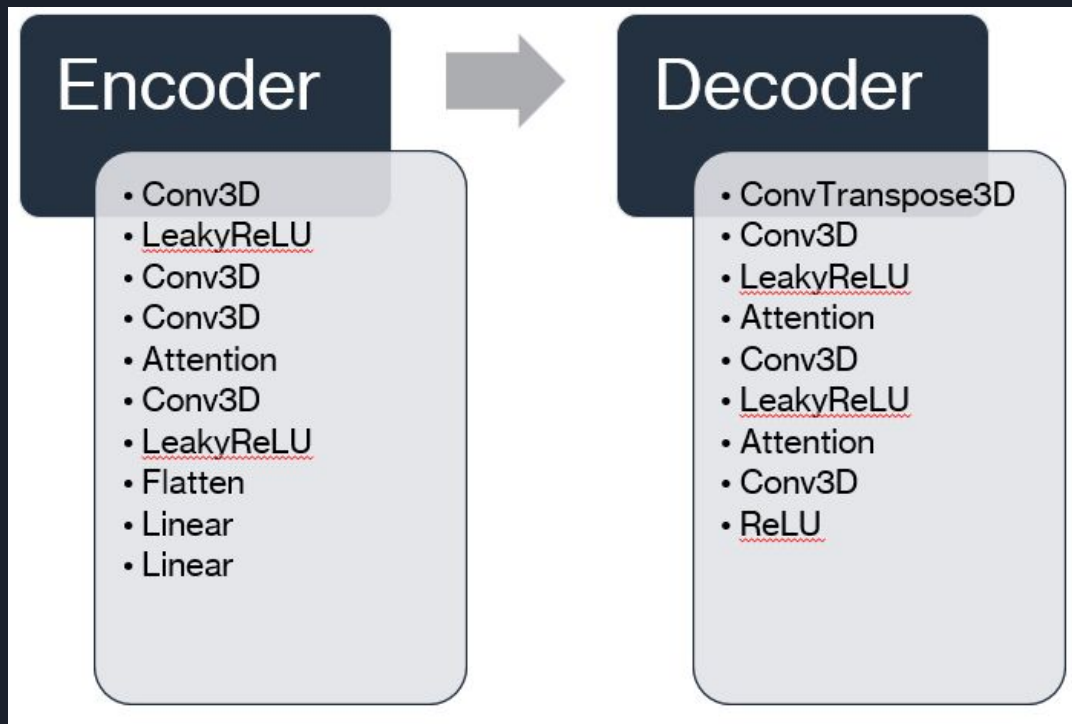




Characteristics of Training Data (Model Input)

- The training data serves as the input to our model.
- Each sample has three main features: width, height, and number of cross sections.
- Input dimensions: 128x128x120
 - 128 is the width of the sinogram
 - 128 is the number of cross sections (rotational space)
 - 120 is the height of the sinogram
- Each sample is a representation of the cross section of the patient.

Neural Network Architecture Design





Characteristics of Output Data

- The output data is a standard 3D image reconstruction in Euclidean space.
- Each sample has three main features: width, height, and length.
- Input dimensions: 128x128x64
 - 128 is the width of the sinogram
 - 128 is the number of cross sections
 - 64 is the height of the sinogram



Task Matrix for Milestone 4

Task Matrix for Milestone 4	Asher	Chris	Ty
Generate 3,000 sinograms using the model pipeline	10%	10%	80%
Train and tune the PyTorch AED model to start reconstructing real sinograms based on the data we have currently	35%	35%	30%
Validate the model on synthetic data through AI Panther	45%	45%	10%
Incorporate the validation scoring method for reconstruction quality	40%	40%	20%



Video Demo

<https://youtu.be/s4wkpU0U93w>



Questions?