1. Project Title: Tomographic Medical Image Reconstruction using Deep Learning
   Group Members: Asher Burrell (aburrel2022@my.fit.edu), Christopher Hinton (chinton2022@my.fit.edu), Ty Mercer (tmercer2022@my.fit.edu)
2. Faculty Advisor: Dr. Debasis Mitra, dmitra@fit.edu
3. Client: See Faculty Advisor
4. See progress chart below:

Task	Completion	Asher	Chris	Ty	Todo
Learn about medical imaging	100%	50%	0%	50%	None
Learn about project technology	70%	30%	10%	30%	Learn Open-GATE simulation
Create machine learning demo	80%	0%	80%	0%	We have a demo, but still need to learn some PyTorch syntax
Set aside validation data	100%	0%	100%	0%	None
Make requirement document	100%	0%	0%	100%	None
Make design document	100%	100%	0%	0%	None
Make test document	100%	0%	100%	0%	None

5. Task Discussion

   Asher and Ty did not have very much background knowledge about medical imaging, so they had to learn about it in order to better understand the project. Chris had prior experience from working in Dr. Mitra's lab.

   All three group members needed to learn about the technology we would be using for this project. Asher and Ty learned about our existing methods of reconstructing medical images, and we all learned more about the Open-GATE simulation software, which none

of us have used before. This task is not quite complete, as we still need to learn more about Open-GATE, but we currently know enough to plan out our project.

The machine learning demo was a "hello world"-level demo of a CNN-based AED, which will most likely be the type of AI we use for our project. We wanted to do something with medical images like the ones we would be training our final AI on, so we could learn how an AED would respond to our exact type of input; However, because we had to demo it to the class we could not use medical data, so instead we made a demo based on an example from pytorch's website. This turned out to be mostly copy/pasting, so Chris was able to do it relatively quickly on his own. As such, we still need to learn more about how Pytorch interacts with different types of images, as well as what exactly the different variables that can be changed for a neural network do.

Chris was already working on reconstructions for real SPECT data in Dr. Mitra's lab, so he was able to select data for validation testing for our future AED. We have 160 real data reconstructions that we can use for validation, but some of those images are of a better quality than others. The high/low quality images have been identified as such on an internal spreadsheet.

We divided the requirements, design, and test documents between ourselves, having each person work on a different document as described in the progress chart. While we all discussed and checked the contents of these documents, each one is entirely or almost entirely written by the group member who is credited with it in the progress chart.

6. Discussion of Team Member Contribution

Asher: Asher's primary tasks during this milestone were to learn more about SPECT reconstruction and our methods in Dr. Mitra's lab, and to write the design document. He successfully completed all of these tasks with time to spare.

Chris: Chris's primary tasks during this milestone were to create a demo for this milestone's presentation, reconstruct data to be used as a validation set, and create the test document. He successfully completed all of these tasks.

Ty: Ty's primary tasks during this milestone were to learn more about SPECT reconstruction and our methods in Dr. Mitra's lab, and to write the requirements document. Ty did not successfully complete the requirements document and this had to be completed by Chris.

7. Task Matrix for Milestone 2

Task	Asher	Chris	Ty
Learn how to use Open-GATE	33%	33%	33%

simulation			
Learn Pytorch syntax (secondary)	33%	33%	33%
Generate synthetic SPECT data	33%	33%	33%

8. Discussion of Task Matrix

   Learning how to use Open-GATE is technically a part of generating synthetic SPECT data, but as a carry-over from this milestone it has been listed separately. We will be meeting with Tommy Galletta, who has been working with Open-GATE in Dr. Mitra's lab, early in the month in order to do this.

   Learning PyTorch syntax is listed as secondary because it does not contribute to our goals for this milestone. It will, however, give us a head start on Milestone 3, which involves making a first version of our CNN-based AED. That being said, if it takes longer than expected to generate the synthetic SPECT data, this task may be pushed back without affecting the success of Milestone 2.

   Generating synthetic SPECT data is the main goal of this milestone. Using statistical data provided by Dr. Mitra's lab, we will use the Open-GATE software to simulate tomographic medical imaging, which should give us realistic, artificial SPECT data. This is the data we will be training our AI on. There are some technical challenges involved with this task, which we will learn more about as we learn about the Open-GATE software, but these challenges should be resolvable by the Milestone 2 due date.

9. Dates of Meetings with Client: 9/11/24, 9/27/24
10. Client feedback: See Faculty Advisor Feedback below
11. Date(s) of meeting(s) with Faculty Advisor during the current milestone: 9/11/24, 9/27/24

12. Faculty Advisor feedback on each task for the current Milestone

    Learn About Medical Imaging:

    Learn About Project Technology:

    Create Machine Learning Demo:

    Set Aside Validation Data:

Make Requirements/Design/Test Documents:

Faculty Advisor Signature: _____ Date: _____

13.

1. Evaluation by Faculty Advisor
    - Faculty Advisor: detach and return this page to Dr. Chan (HC 209) or email the scores to pkc@cs.fit.edu

○ Score (0-10) for each member: circle a score (or circle two adjacent scores for .25 or write down a real number between 0 and 10)

Ty Mercer	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
Asher Burrell	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
Christopher Hinton	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10

Facutly Advisor Signature: _____ Date: _____