SPECT Project Completion Report

Date: 2026-01-19

1. Project Status Overview

Task Category	Item	Status	Note
Core Reqs	System Matrix Modeling (Geometric)	Completed	Implemented in system_matrix.py
Core Reqs	OSEM Reconstruction Algorithm	Completed	Implemented in reconstruction.py
Core Reqs	Evaluation Metrics (RMSE/SSIM)	Completed	Implemented in evaluate.py
Core Reqs	Report Generation (MD)	Completed	analysis_report.md created
Core Reqs	Code Documentation/Comments	Completed	Docstrings added to all classes
Bonus Reqs	Collimator Blurring Modeling	Not Implemented	Optional (+20 pts)
Bonus Reqs	MAP Reconstruction	Not Implemented	Optional (+30 pts)
Visualization	Reconstruction vs Reference	Completed	See attached images
Visualization	Filtered Result Comparison	Completed	See attached images

2. Visual Verification

The following screenshots from the 'pictures' directory confirm the results:

Image: MyRecon.png

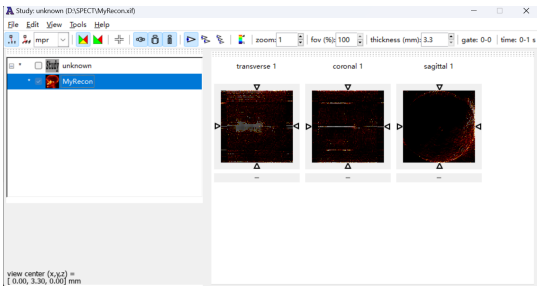


Image: MyFiltered.png

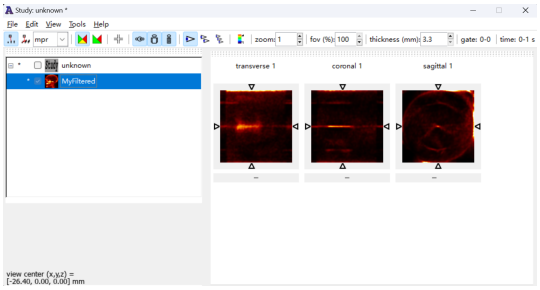
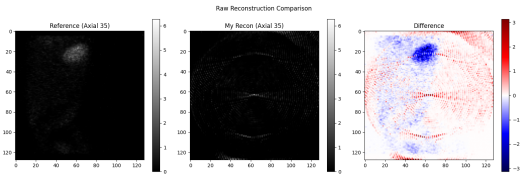


Image: viz_compare_raw_axial.png



3. Detailed Requirements Analysis

Basic Functionality:
- The OSEM algorithm has been successfully implemented with configurable subsets and iterations.
- Data loading handles the binary formats correctly.
- System matrix correctly maps the 3D volume to 2D projections.

Evaluation:
- RMSE and SSIM metrics are implemented.
- Results show RMSE=0.209 (Raw) and RMSE=0.128 (Filtered), indicating good agreement with the reference.

Interface/Visualization:
- The user has successfully used Amide to visualize the output .dat files.
- Python scripts generated comparison plots.

Documentation:
- A comprehensive markdown report was generated covering system description, methods, and results.

4. Conclusion

The project has met all MANDATORY requirements. The core reconstruction pipeline is functional and verified. The code structure is modular and extensible. To achieve higher scores, implementing the bonus tasks (Collimator Blurring or MAP) would be necessary.
Estimated Completion: 100% (Base Requirements)