General Audience Abstract

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X-ray tomography, enabled by the Advanced Photon Source (APS), is an important part of the scientific research carried out at Argonne National Laboratory. Though, to make use of the data gathered at the APS, reconstruction algorithms must be used. However, all the reconstruction algorithms have their own their own strengths and weaknesses, and it is very difficult for a user to know which algorithm to use for their project if they are not familiar with the mathematics of each algorithm. This project's purpose is to provide benchmarks and documentation that give a user an idea of what algorithms are best suited for their own particular task. The benchmarks consist of simulating tomographic projections of a digital image to generate simulated tomography data. The reconstruction algorithms then attempt to reconstruct the image using the simulated data. After reconstruction, the quality of the reconstruction is judged using the multi-scale structural similarity index (MS-SSIM) and plotted against the time required to achieve the given quality. The graphs and reconstructed images are then uploaded to a GitHub repository for TomoPy users to view and analyze. These benchmarks also have accompanying documentation to ensure that the data presented is clear and easy to understand. To ensure that these benchmarks are always up-to-date with the current state of TomoPy and its dependencies, these benchmarks are programmed to run at regularly scheduled intervals on the Microsoft Azure Pipelines framework.