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Streaming reconstruction for time evolving tomography experiments

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In tomography, a series of 2D projections are acquired as a 3D object is rotated about one or more axes, after which a 3D reconstruction of the object is obtained. Implicit in the approach is the idea that the only differences between the projections are the known rotational angles, with no additional motions or distortions of the object. This condition is easy to meet in traditional forms of tomography at millimeter length scales when using precision rotation stages and low-dose imaging systems; however, it is not easy to meet at the sub-100 nanometer length scale of synchrotron or electron tomography, where one uses high-resolution microscopes to obtain 2D projections revealing nanoscale features. At these fine length scales, imperfections in rotary stage motion become more noticeable, and high-dose radiation exposure could induce changes in sample. In this talk, I will compare conventional tomography algorithms and lay stress on the limitations of these algorithms for reconstructing slowly-changing samples. I will then present how streaming algorithms based on iterative refinement can alleviate these issues in practice, and allow us to visualize motion in experiments.

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