

Enabling online phase retrieval for in-situ and operando x-ray holography

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Applying for measurements at large X-ray sources like PETRA III at DESY or BESSY II at HZB is highly competitive. If granted beam time, numerous samples need to be measured. These measurements often occur under in-situ or operando conditions, such as studying the degradation of a biodegradable Mg wire or structural changes in a battery during charging. These changes happen at a sub-micron scale, requiring computationally intensive techniques like phase-sensitive X-ray microscopy. However, these techniques don't provide immediate feedback, increasing the risk of failed measurements and wasted beam time. The Helmholtz imaging project SmartPhase aims to address this issue by providing online reconstruction of measurement data. We are implementing self-optimizing phase-retrieval algorithms based on conventional and physics-informed machine learning approaches.

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