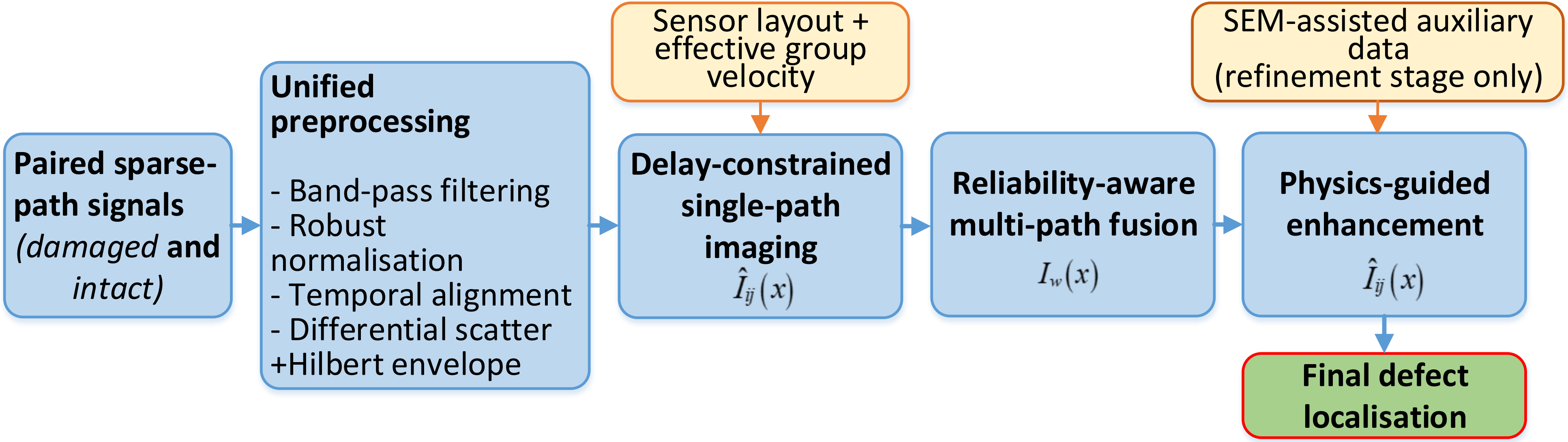
Paired sparse-path signals (damaged and intact)
Unified preprocessing
- Band-pass filtering
- Robust normalisation
- Temporal alignment
- Differential scatter +Hilbert envelope
Sensor layout + effective group velocity
Delay-constrained single-path imaging
$\hat{I}_{ij}(x)$
Reliability-aware multi-path fusion
$I_w(x)$
SEM-assisted auxiliary data (refinement stage only)
Physics-guided enhancement
$\hat{I}_{ij}(x)$
Final defect localisation