Defect Prediction in Powder Bed Fusion , PSED Cluster 2020-2021

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RESEARCH OBJECTIVE

- A defect prediction system to identify part defects at the current layer and predict potential defects in future layers
- Using in-situ monitored thermal signatures of parts
- Incorporated deep learning methods
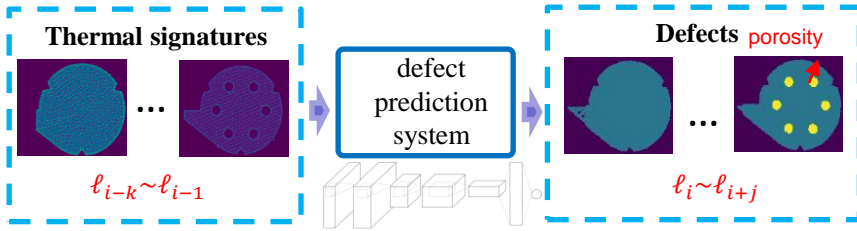
Thermal signatures	
TEP	Temperature of the energy deposition region
TED	Input process parameters/material response
TEP Sigma	Standard deviation of TEP
TED Sigma	Standard deviation of TED
Counts	How many laser hits on each cell (measurement times)
TEP_sums	Sum up all TEP measurements

Detection-prediction Framework
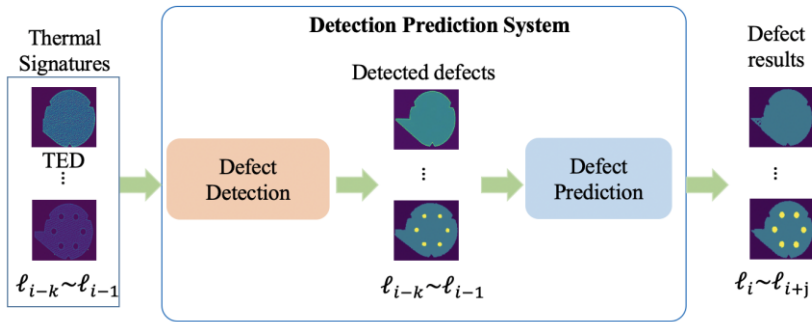
① Detect defects at the current layer;
② Predict defects at the future layers based on previous layers' defects.

Prediction-detection Framework
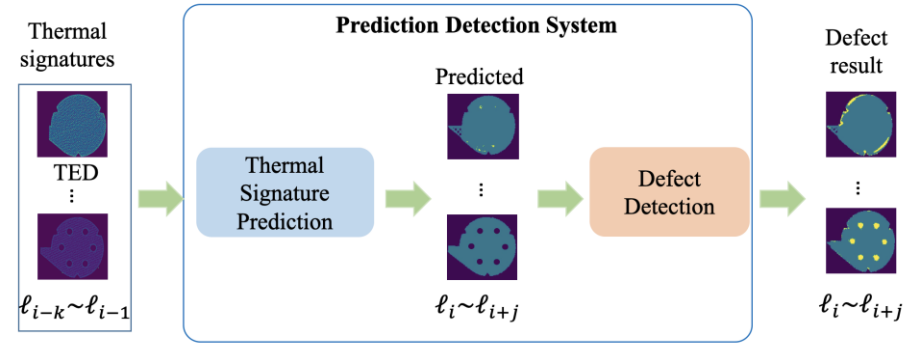
① Predict current layers' features according to previous layers' features;
② Detect defects based on monitored or predicted features.

Results

True   DP prediction   PD prediction

	MSE	ROC AUC	PR AUC for defect class
DP framework	0.0094	0.8785	0.6944
PD framework	0.0169	0.6373	0.2309