Edge-Augmented and Entropy Map-Guided HLAC with Gaussian Distribution-Based Weighted Feature Extraction for 1-ms Abnormal Detection System in Logistics

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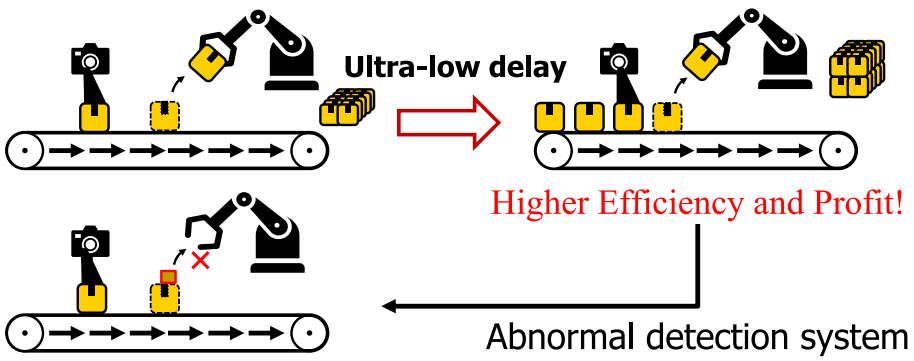
Background

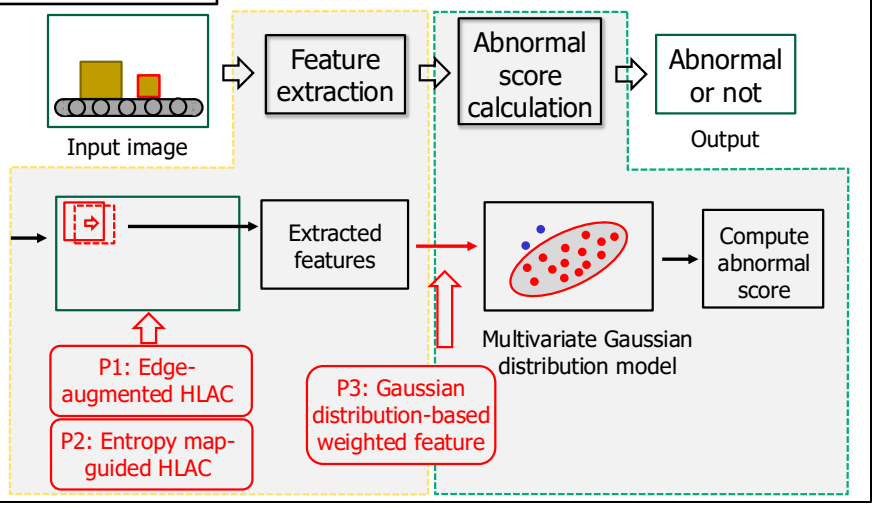
- Abnormal detection in logistics



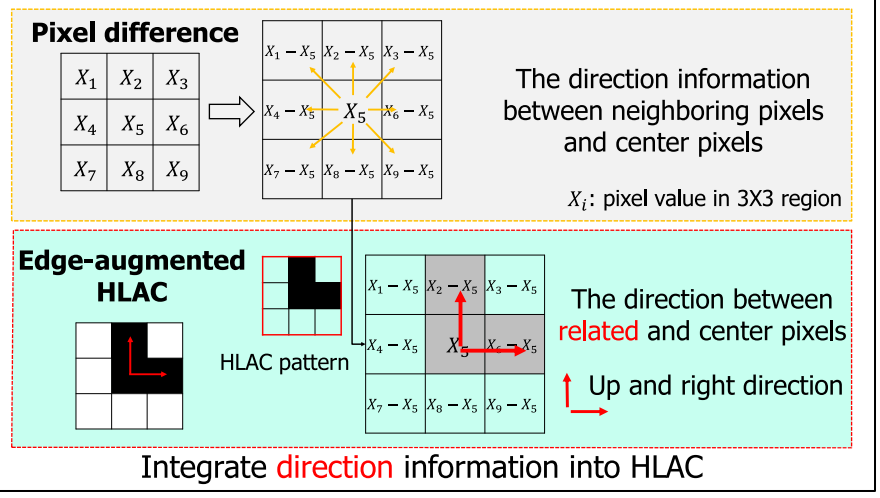
- Previous abnormal detection system
  - Gaussian AD based transfer learning and MVG system
  - Complex feature extraction network and hard to realize ultra-low delay
- Target
  - HLAC and MVG based ultra-low delay vision abnormal detection system in logistics

Proposals

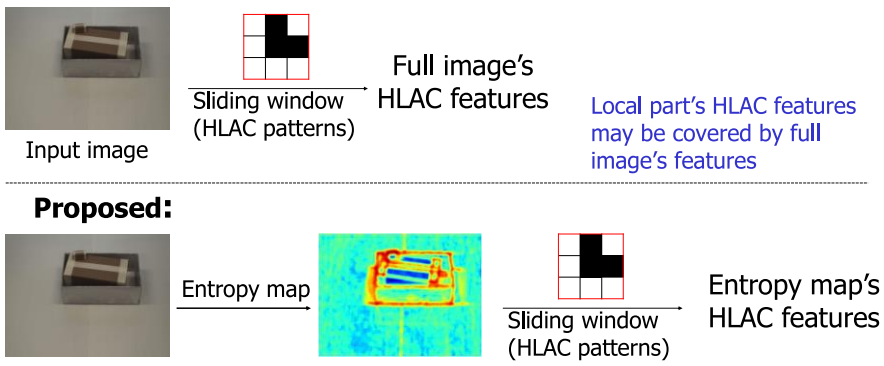
Framework



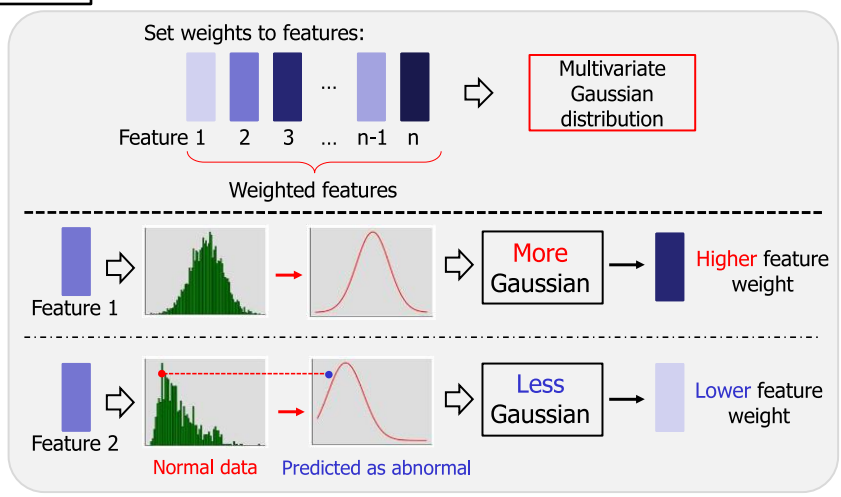
P1



P2



P3



Experiment Results

	Precision	Recall	AUROC
Baseline	0.9897	0.7237	0.9661
+ P1	0.9961	0.8541	0.9807
+ P1,P2	0.9962	0.8850	0.9822
+ P1,P2,P3	0.9938	0.9018	0.9823
GaussianAD	0.9947	0.8992	0.9851

Device		ZCU104
Resource utilization	LUT	19064(8.27%)
	BRAM	13(4.17%)
	IO	125(34.72%)
Performance	Frequency	300 MHz
	Delay	0.961ms

Conclusion

- The proposed system achieves better performance in terms of Precision, Recall, and AUROC. Additionally, these hardware-friendly algorithms have been implemented on an FPGA with an ultra-low delay of 0.961ms.

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