Many-Layer Hotspot Detection by Layer-Attentioned Visual Question Answering

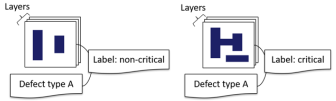
Yen-Shuo Chen and Iris Hui-Ru Jiang

National Taiwan University

DATE 22

BACKGROUND & MOTIVATION

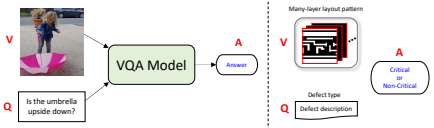
- **Motivation**
  - Defects are generated due to the compounding effects from different process and inter-layer process variations
- **Problem: Many-Layer Hotspot Detection**
  - Critical pattern to a defect type



- **Challenges**
  1) Pattern dimension varies for different defect types
  2) Polygons of a hotspot pattern reside over many layers
  3) The importance and relevance of each layer varies for different defect types

NEW INSIGHTS

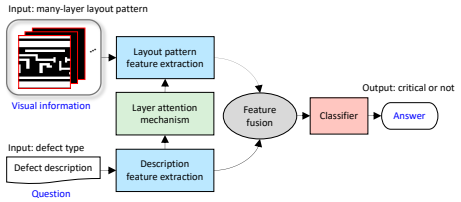
- **Remodeling: Visual Question Answering (VQA)**
  - Answer if a pattern is critical to a specific defect type
  - One model can answer all the defect types



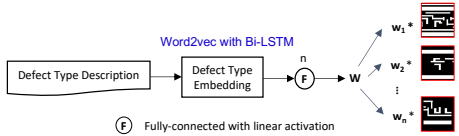
- **Objective: maximize the answering accuracy**
- **Solution: VQA with layer attention mechanism**
  - Identify the importance and relevance of each layer for different defect types

DESCRIPTION

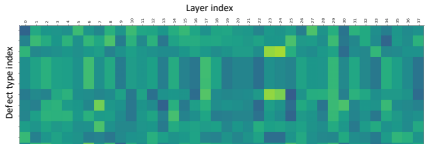
- **Overall Pipeline of Our VQA System**
  1. Feature extraction: layout representation, sentence embedding neural network
  2. Feature fusion: merge defect description and layout feature
  3. Classifier: answer critical or non-critical
  4. Layer attention mechanism: focus on the important layers



- **Layer Attention Mechanism**



- **The Layered Relevance Weights of Partial Defect Types**
  - Similar defect type descriptions have similar weights

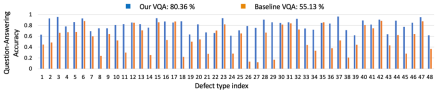


QUANTITATIVE IMPACT

- **Dataset**
  - 7 layouts with sub-14nm process, 79,593 triple data
  - V: a 38-layer layout pattern, Q: one of 57 defect types
  - 80-20 split for training and testing
- **The accuracies for different defect types**

	Defect type category	A	B	C	D	E	F
	# of patterns	1372	52	9159	2411	1738	664
Baseline VQA	Testing accuracy	93.88 %	94.23 %	96.99 %	97.35 %	98.39 %	98.80 %
	Miss	20	0	101	34	13	4
	False alarm	64	3	175	30	15	4
Our VQA	Testing accuracy	98.54 %	98.08 %	98.20 %	99.34 %	99.77 %	99.85 %
	Miss	1	0	64	3	0	0
	False alarm	19	1	101	13	4	1

- **The Average Question-Answering Accuracy**



SUMMARY AND CONCLUSION

- We address a new **many-layer hotspot pattern extraction** challenge
- We investigate the **linkage between many-layer hotspot patterns and potentially induced defect types**
- This is the first work that models the hotspot pattern extraction task as a **Visual Question Answering** problem
- We devise a **layer-attentioned VQA model** to identify the relevance of each layer for different defect types
- Experimental results show that the proposed model has superior question-answering ability

Author's Affiliation Logo

Paper Title

Authors

DATE 22

BACKGROUND & MOTIVATION

Current state-of-the-art. What problem are you trying to solve, or what improvement are you trying to make?

NEW INSIGHTS

Describe what is new about your approach. Try to address technology gaps. Why should people care?

DESCRIPTION

Main objectives, concept, achievements, how it works, assumptions and limitations

QUANTITATIVE IMPACT

What were your results and how do these compare with existing technologies / techniques? Insert table, graph etc.

SUMMARY AND CONCLUSION

Conclusions. Conclusion. Final results of your work. Where is this leading, and what are the next steps?