江波龙 - 广东工业大学
2025 技术联合开发项目介绍

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A Proactive Failure Tolerant Mechanism for SSDs Storage Systems based on Unsupervised Learning

1. *Background*

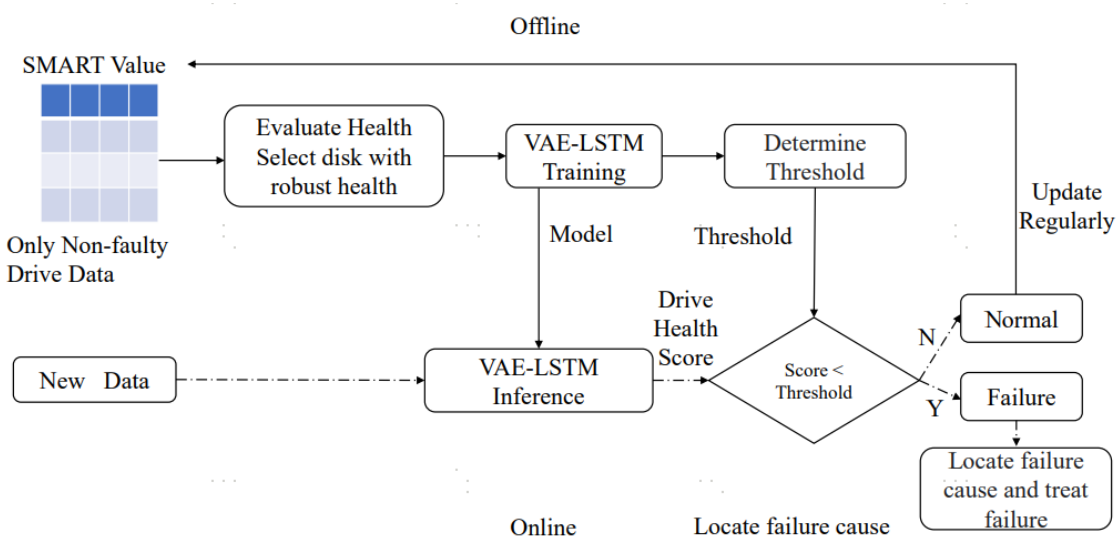
- Frequent drive failures bring high management costs to the enterprise
- Recent studies use SMART attributes for proactive drive failure prediction

2. *Problem*

- Insufficient positive samples – faulty drive
- How to train a robust model on SSDs data
- How to locate the cause of SSD failures

3. *Solution*

- Only use healthy drives data to train the model
- Design an auxiliary strategy to make failure prediction model more robust
- Propose a method for locating the cause of SSD failures



Multi-view Feature-based SSD Failure Prediction: What, When, and Why

1. *Background*

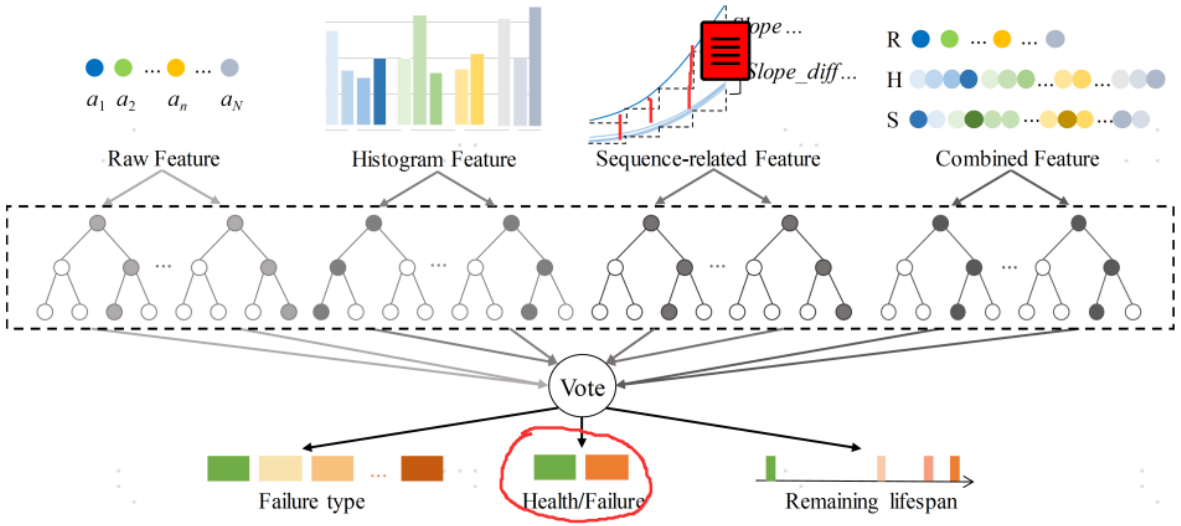
- For SSD failure prediction algorithms, most current schemes are based on supervised learning

2. *Problem*

- Current prediction use several short-term monitoring logs, and pay less attention to the long-term logs of SSDs
- Current prediction lacks instructive suggestions for verifying and handling failures

3. *Solution*

- Introduce histogram features from long-term data
- Concatenate three features together to form a global view
- Obtain key decisions to find the failure causes



Improving 3D NAND Flash Memory Lifetime by Tolerating Early Retention Loss and Process Variation

1. Background

- Unlike planar NAND flash memory, 3D NAND flash features a new cell design, stacking dozens of silicon layers vertically
- 3D NAND's circuit and structure changes greatly impact error sources' effects on reliability.

2. Problem

- layer-to-layer process variation
- early retention loss，the number of errors due to charge leakage increases quickly within several hours after programming
- retention interference，the rate at which charge leaks from a flash cell is dependent on the data value stored in the neighboring cell

3. Solution

- **Identify and understand the new error characteristics of 3D NAND flash memory**
- Develop new techniques to mitigate prevailing 3D NAND flash memory errors

Health-Binning: Maximizing the Performance and the Endurance of Consumer-Level NAND Flash Management of Next-Generation NAND Flash to Achieve Enterprise-Level Endurance and Latency Targets

1. Background

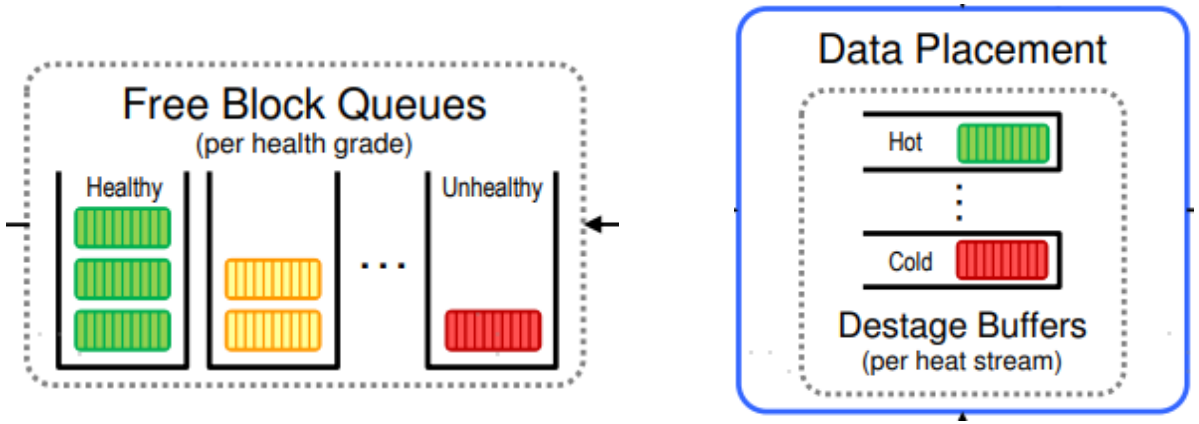
- Increased storage density， lower cost per GiB
- Reduced endurance， larger variations across blocks，longer latencies，high error rates

2. Problem

- Decrease in the specified program-erase cycles
- Increase in access time
- Weaker data retention

3. Solution

- Introduce the RBER as a metric of block age
- Present Health Binning
- Show how the use of Block Grading



Everything for Memory