Machine Learning Assisted Smart Flow Boiling

Tech ID: 34247 / UC Case 2021-708-0

BRIEF DESCRIPTION

An advanced system leveraging machine learning and computer vision for real-time, smart control of flow boiling processes to optimize thermal management.

FULL DESCRIPTION

This technology integrates advanced computer vision and deep learning techniques to analyze boiling images in real time, extracting bubble characteristics and image features to predict boiling heat characteristics. By correlating visual data with physical boiling parameters, it enables smart, active control of flow boiling systems to optimize thermal management, reduce pressure drops, and enhance energy efficiency in high-power density applications.

SUGGESTED USES

- Cooling solutions for high-power electronic chips and data center hardware.
- Thermal management in machine learning accelerators and AI processors.
- Advanced cooling systems for consumer electronics such as smartphones and laptops.
- Industrial heat transfer systems requiring precise and adaptive boiling control.
- Research and development tools for studying boiling heat transfer phenomena.

ADVANTAGES

- Real-time, non-intrusive monitoring and control of flow boiling conditions.
- Automated extraction of bubble dynamics using convolutional neural networks and object detection.
- Reduction of maximum junction temperature and pressure, enhancing system reliability.
- Faster and more accurate analysis of large datasets through automated image-feature extraction.
- Resource-effective cooling solution reducing operational costs and environmental impact.

PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Reference for National Filings	2022/072875	04/07/2022	2021-708

Patent Pending

CONTACT

Ben Chu
ben.chu@uci.edu
tel: .



OTHER INFORMATION

KEYWORDS

Thermal Management, Computer Vision, Physics-Reinforced Deep Learning, Convolutional Neural Networks

CATEGORIZED AS

- **Imaging**
  - Remote Sensing
  - Software
- **Semiconductors**
  - Processing and Production
- **Sensors & Instrumentation**
  - Environmental Sensors
  - Process Control

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5270 California Avenue / Irvine,CA
92697-7700 / Tel: 949.824.2683

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