DATE 25
DESIGN, AUTOMATION AND TEST IN EUROPE
THE EUROPEAN EVENT FOR ELECTRONIC SYSTEM DESIGN & TEST
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CENTRE DE CONGRÈS DE LYON

LaRED: Efficient IR Drop Predictor with Layout Preserving Rebuilder-Encoder-Decoder Architecture

Chengxuan Yu[1], Yanshuang Teng[1], Wenhao Dai[1], Yongjiang Li[1], Wei W. Xing[2], Xiao Wu[3], Dan Niu[4] and Zhou Jin[1]

1.SSSLab, Dept. of CST, China University of Petroleum-Beijing, Beijing, China

2. SoMaS, The University of Sheffield, Sheffield, United Kingdom

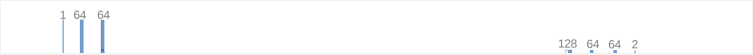
3. Huada Empyrean Software Co. Ltd, Beijing, China

4. School of Automation, Southeast University, Nanjing, China

Email：jinzhou@cup.edu.cn

IR Drop Analysis

IR Drop Analysis: The power distribution network (PDN) on a chip is composed of metal rails and strips, which distribute power (VDD and VSS) across the chip. Each metal layer has its own resistivity, making the occurrence of IR drop unavoidable. Therefore, it is necessary to analyze the IR drop in the PDN in order to ensure the reliability of the chip.



We focus on improving prediction accu

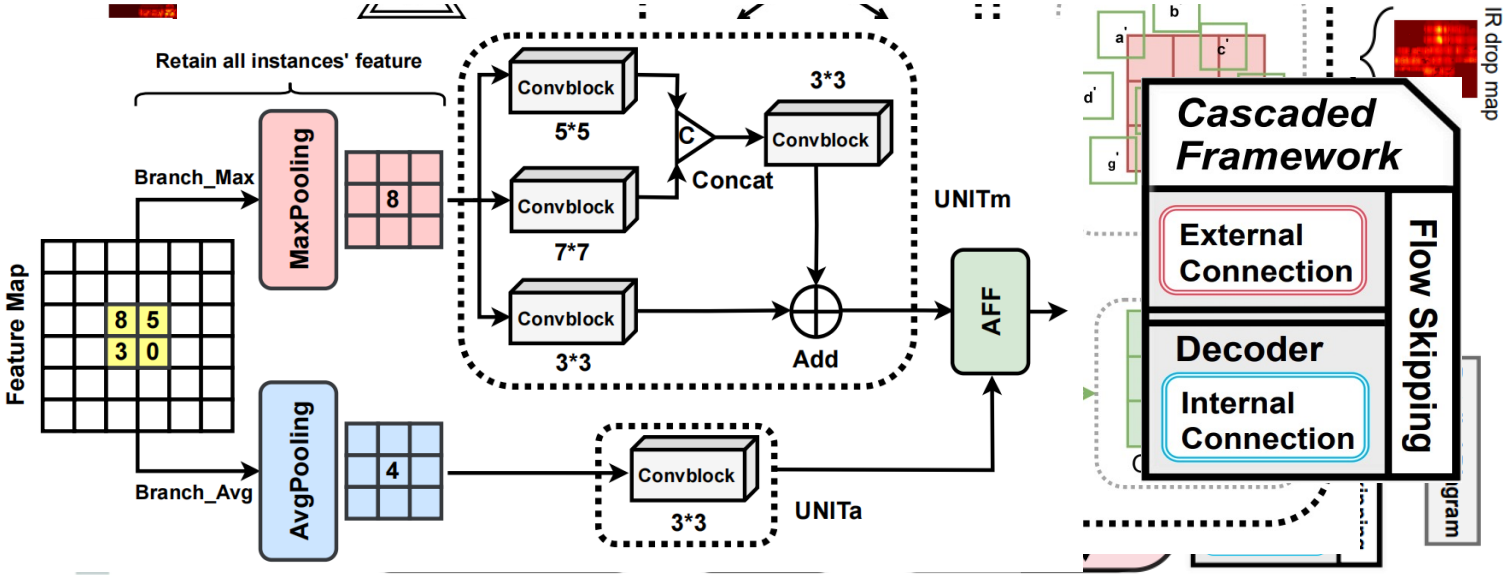
- **Mitigate the imbalance in**
- **Preserve features of all instance**
- **Enhance the upsampling transfer fra**

ML-based methods are fast, but they also have some shortcomings that limit prediction accuracy:

- **Neglecting imbalance between feature maps**
- **Incomplete instance feature transfer**
- **One-sided feature transfer mechanism**

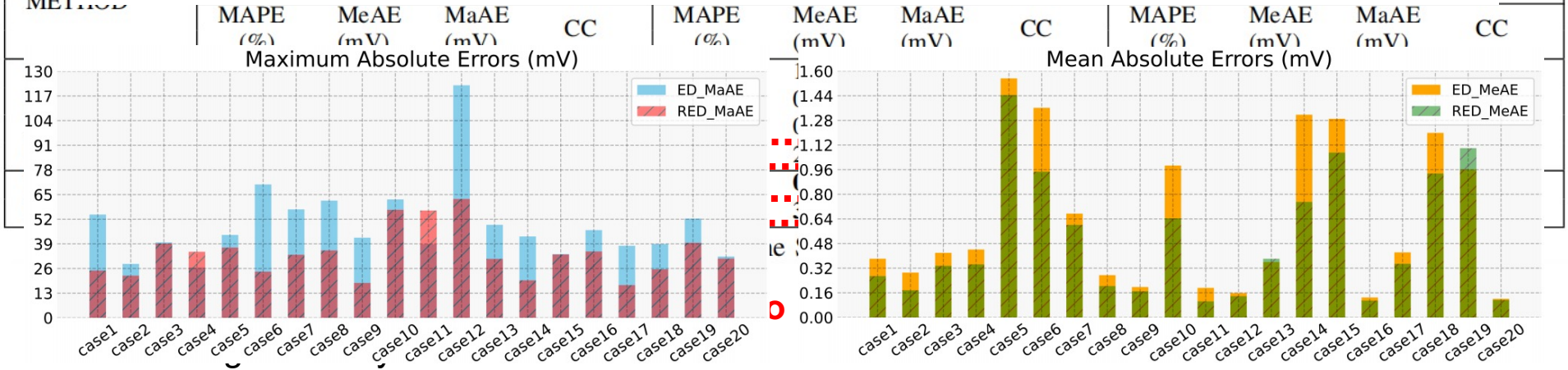
LaRED Architecture

- Rebuilder **mitigate imbalance** via group-wise processing of the raw input through slicing, convolution, and concatenation.
- Decoder uses a **cascaded framework** for upsampling, **extending** the one-side transmission mechanism.



Average Performance

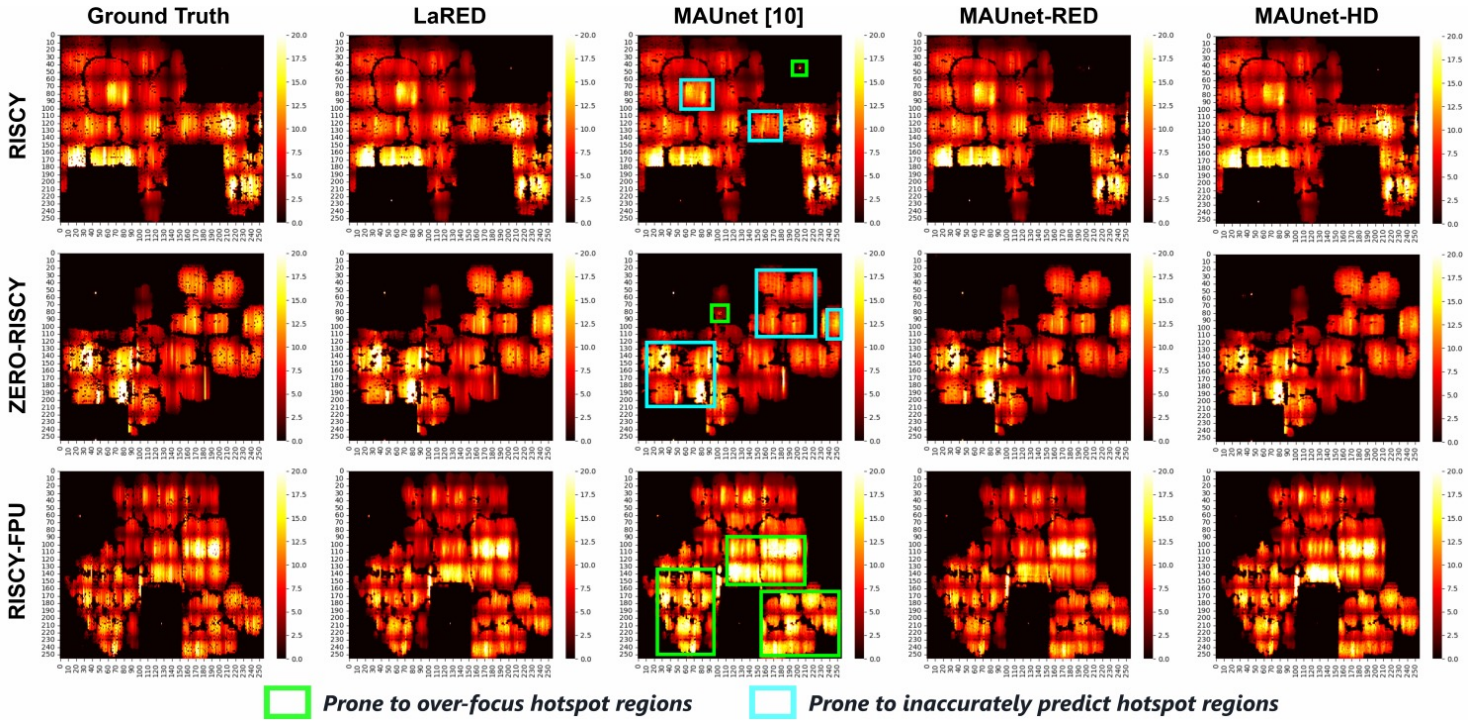
- **The RED architecture provides more consistent predictions in both worst-case and average-case scenarios.**



- **MAUnet-RED (MAUnet with rebuilder)** reduced the relative error by **18% to 27%**; the ma
- **MA** out of the three designs.
  - **RED** architecture can effectively reduce maximum error and average error. In cases 1, 6, 9, 12, 14, and 17, the reduction in maximum error **exceeded 50%**.

Hotspot Performance

- **In the hotspot areas, LaRED effectively alleviates the issues of over-focusing and neglecting hotspots.**



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We propose LaRED, a novel RED architecture for static IR drop prediction：

- **Rebuilder** is proposed to mitigate imbalance among feature maps.
- **Hybrid downsampling** ensures comprehensive feature transfer.
- **Cascaded framework** extends the feature transfer mechanism.

Email：jinzhou@cup.edu.cn