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Line Outage Identification Based on AC Power Flow and Synchronized Measurements

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Background

- Problems: inaccurate dc model, unrealistic assumptions, and misidentification
- Proposed method: Identification + Rejection Filter

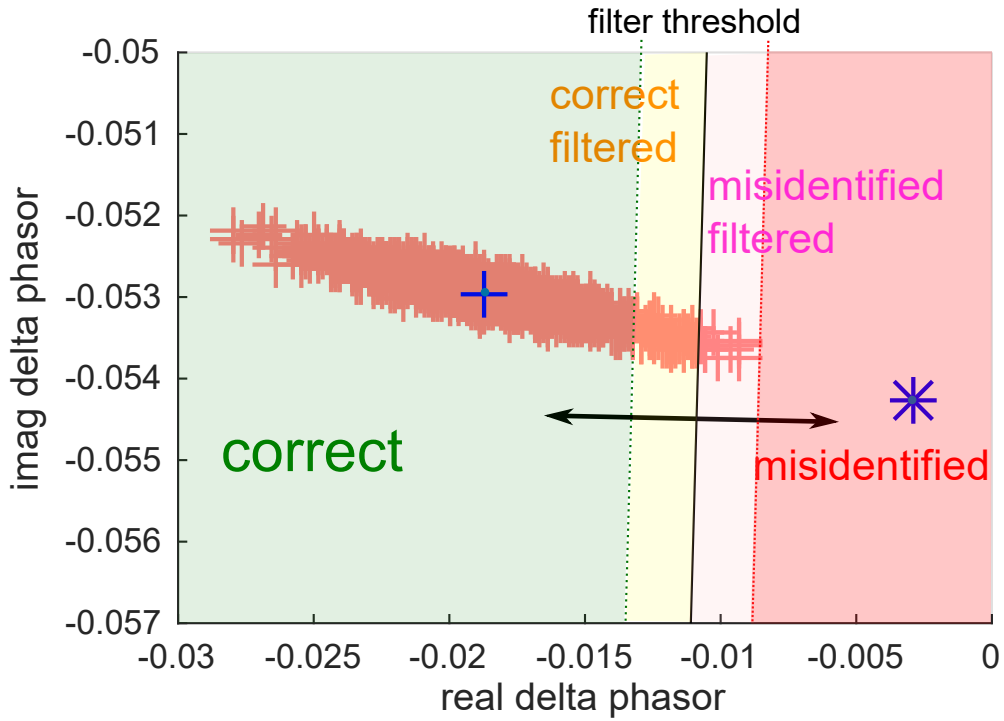


Fig. 1

Stage 1: ***Identification***

Compare expected **voltage changes** (via ac power flow) to **observations**

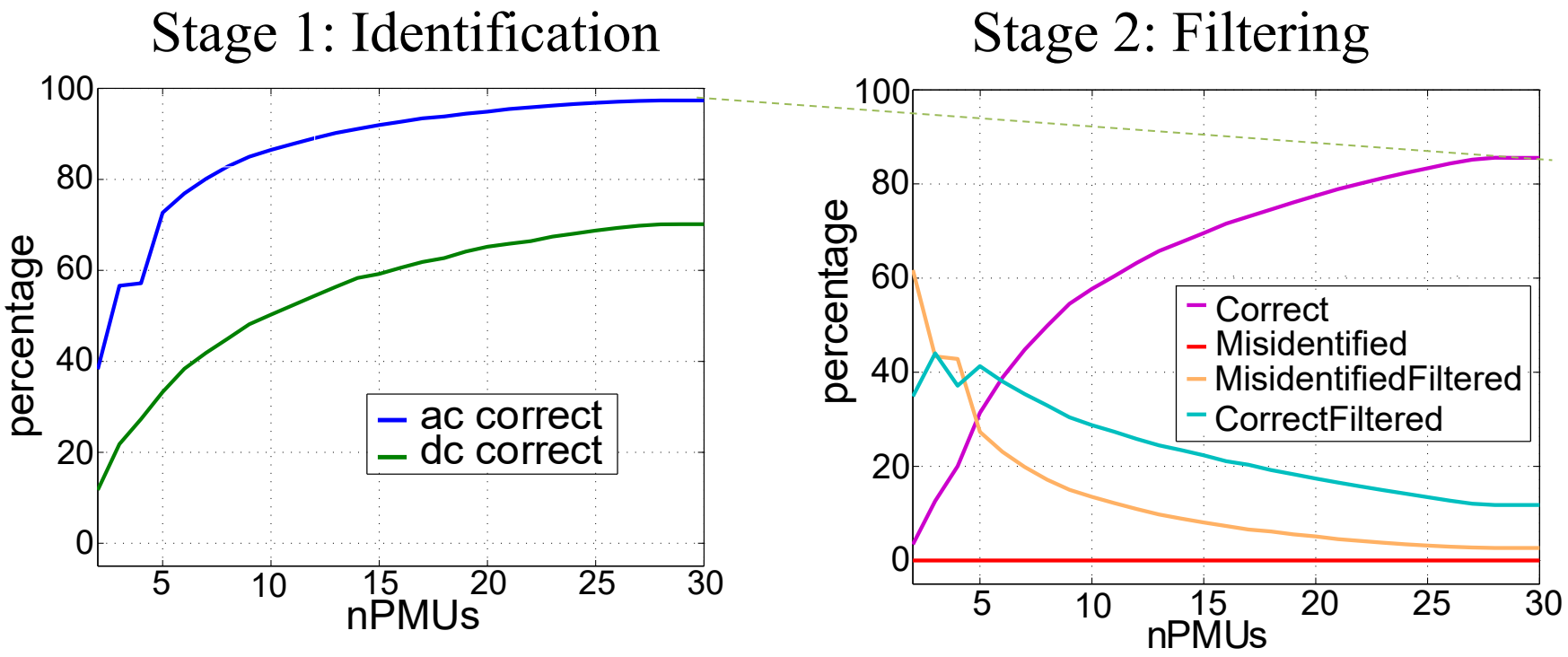
Stage 2: ***Rejection filter***

Examine the distance between the best candidate to the second best

Tested on various systems using random PMU placements and noisy measurements

Results

Comparison of the dc and ac approaches



- AC > DC
- Rejection filter

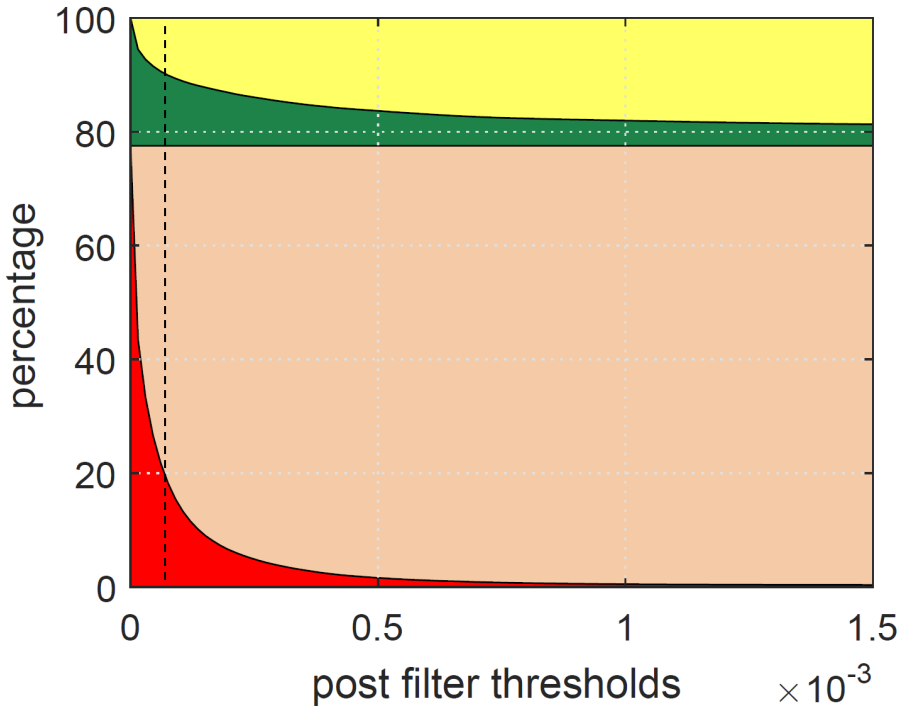
  Misidentified Filtered ↑
  Misidentified ↓
  Correct Filtered ↑
  Correct ↓
- More PMUs ✓

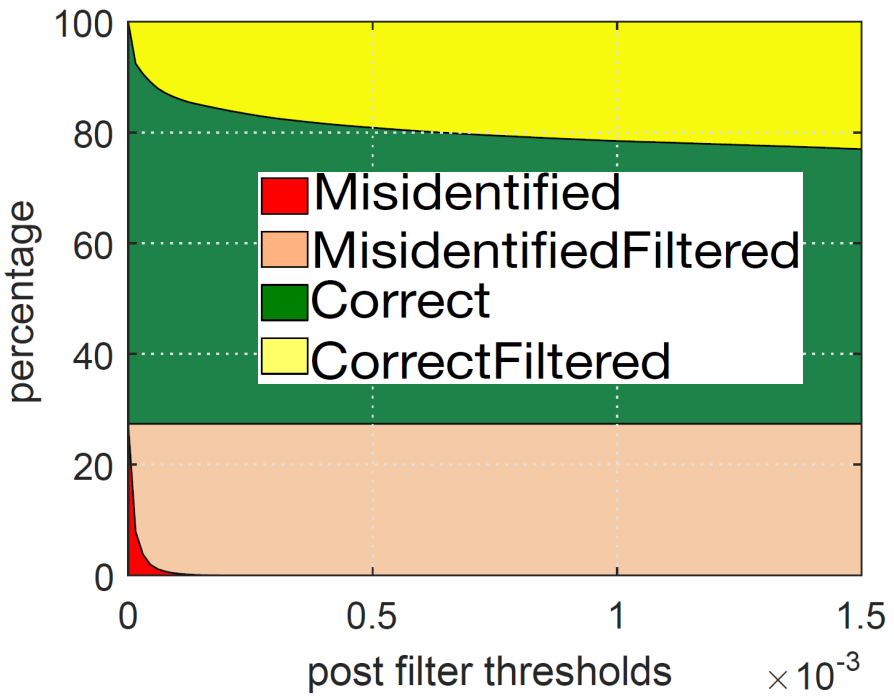
Fig. 3 (a) correctly identified, no filter (b) ac, ΔE

The 30-bus system

Results

Identification results versus the filter threshold





- Threshold ↑
  Misidentified ↓↓
  Correct ↓
- More PMUs
  Correct ↑
  Correct Filtered ↓

Fig. 5 (a) 26 PMUs (c) 868 PMUs (220 kV+)

The Ontario system (3488 buses)

Conclusions/Recommendations

- Ac model necessary for higher accuracy
- Rejection filter to overcome misidentification due to measurement uncertainties
- Significant benefits of having a higher PMU coverage