DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

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Multimedia Fingerprinting & Traitor Tracing

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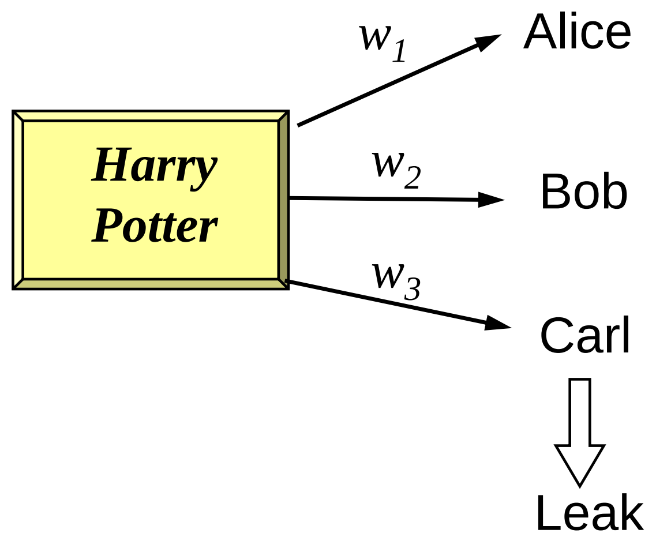
Media And Security Team

Digital Fingerprinting

Leak of information poses serious threats to government operations and commercial markets

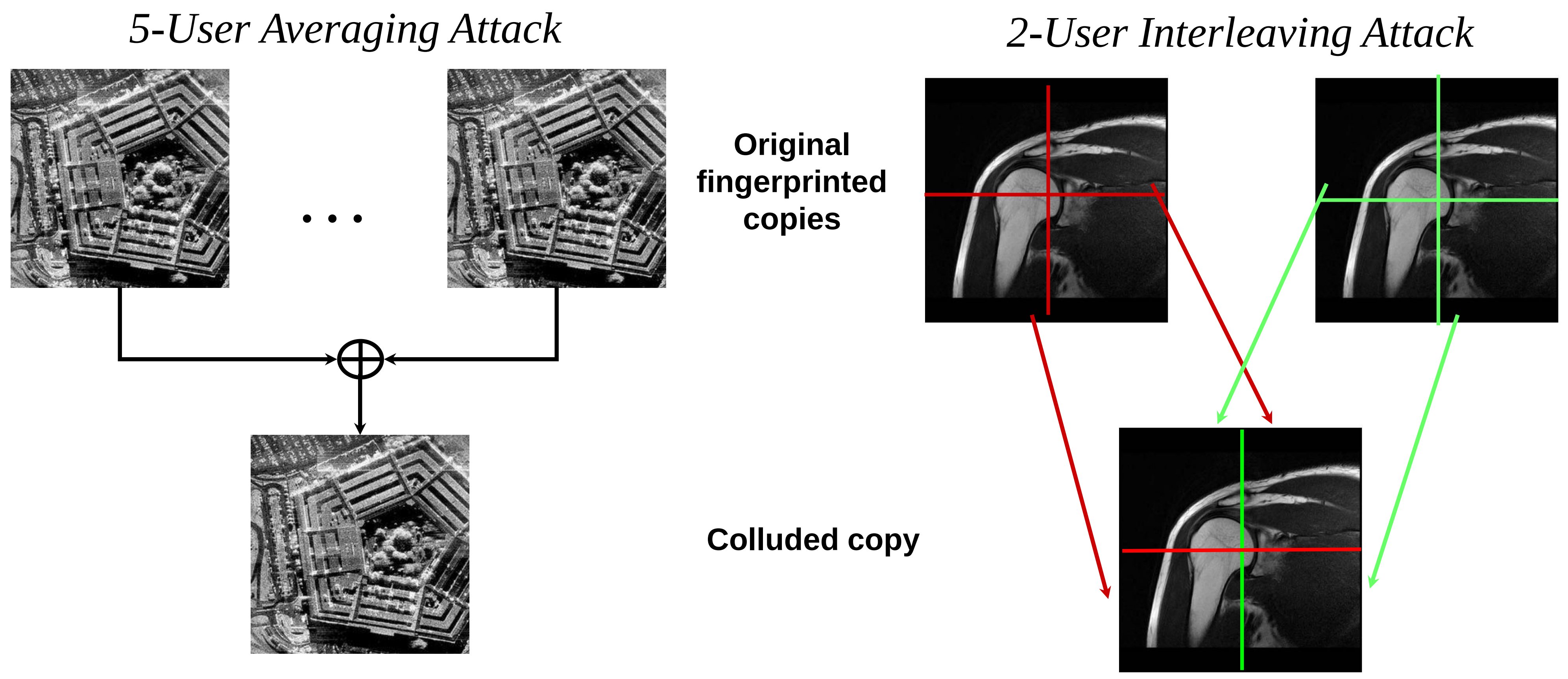
⇨ Promising countermeasure: Digital Fingerprints

- Insert special signals (called "fingerprints") to identify recipients
- Purpose: Deter information leakage
- Challenges: fidelity, robustness, tracing capability



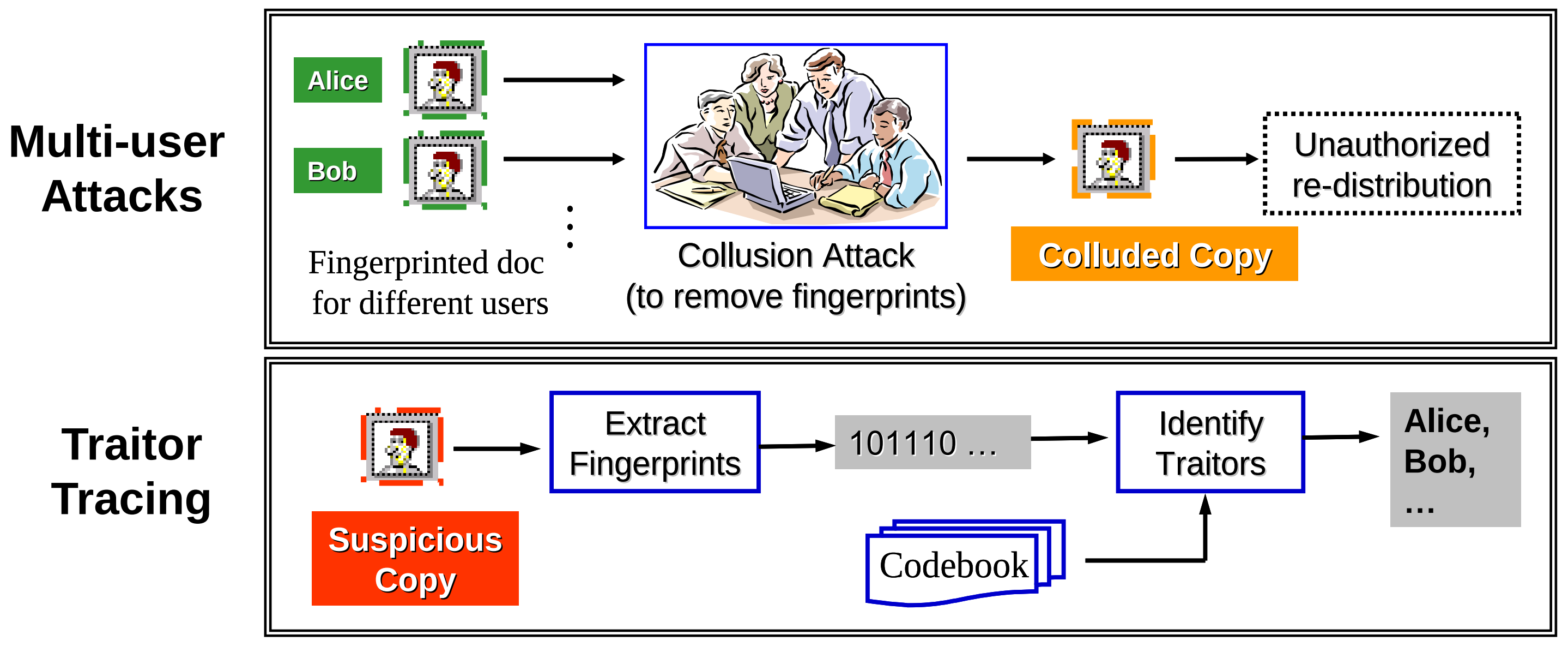
Collusion Attacks

Group of malicious users combine their copies to create a version that cannot be traced back to any of them



Collusion-Resistant Fingerprinting

- Goal: Identify malicious users involved in multi-user collusion attack
- Tailor embedding domain to multimedia characteristics and application requirements



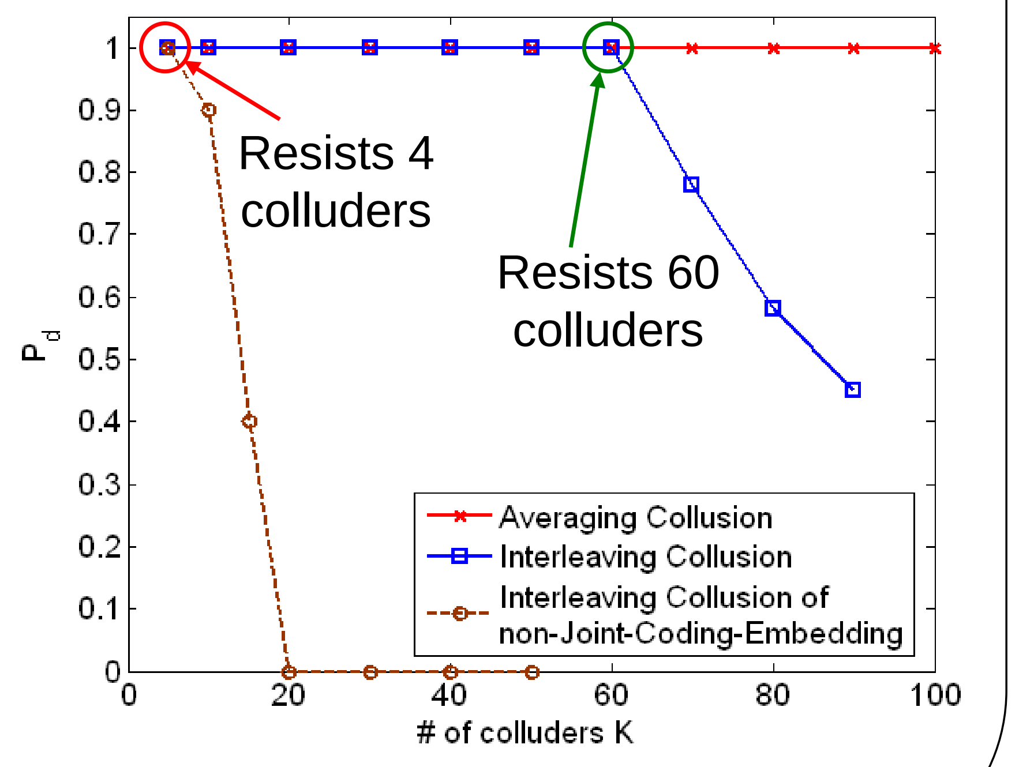
Joint Coding and Embedding Framework

Limited collusion-resistance using conventional Error Correcting Code-based fingerprints

⇨ Multimedia embedding layer: improve the robustness

- Permuted Subsegment Embedding: improve resistance
- Group based fingerprints: exploit attacker behavior
- Efficient Detection: accommodate a million users and tolerate hundreds of colluders

P_d vs. K under Collusion and 3Mbps MPEG compression



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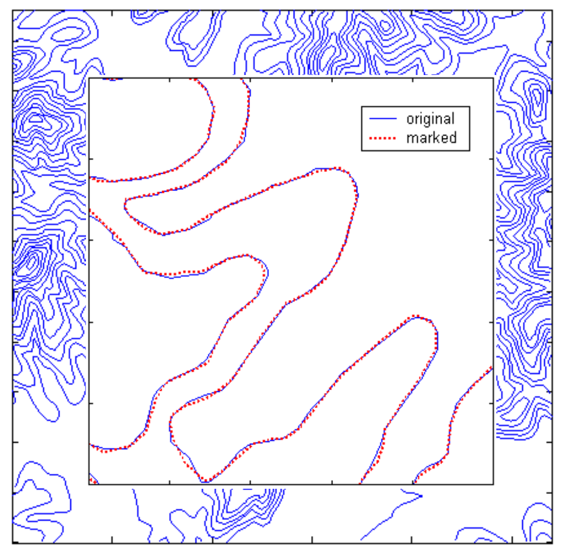
Fingerprinting Curves and Graphics

Traditional protection: intentionally alter geospatial content

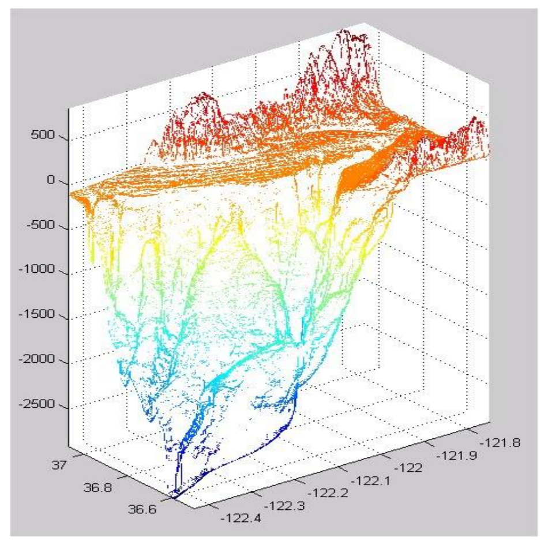
Less intrusive solution: minor changes to the shape of curves to embed fingerprints

Can survive combined attacks of collusion + print + scan

2-D Maps

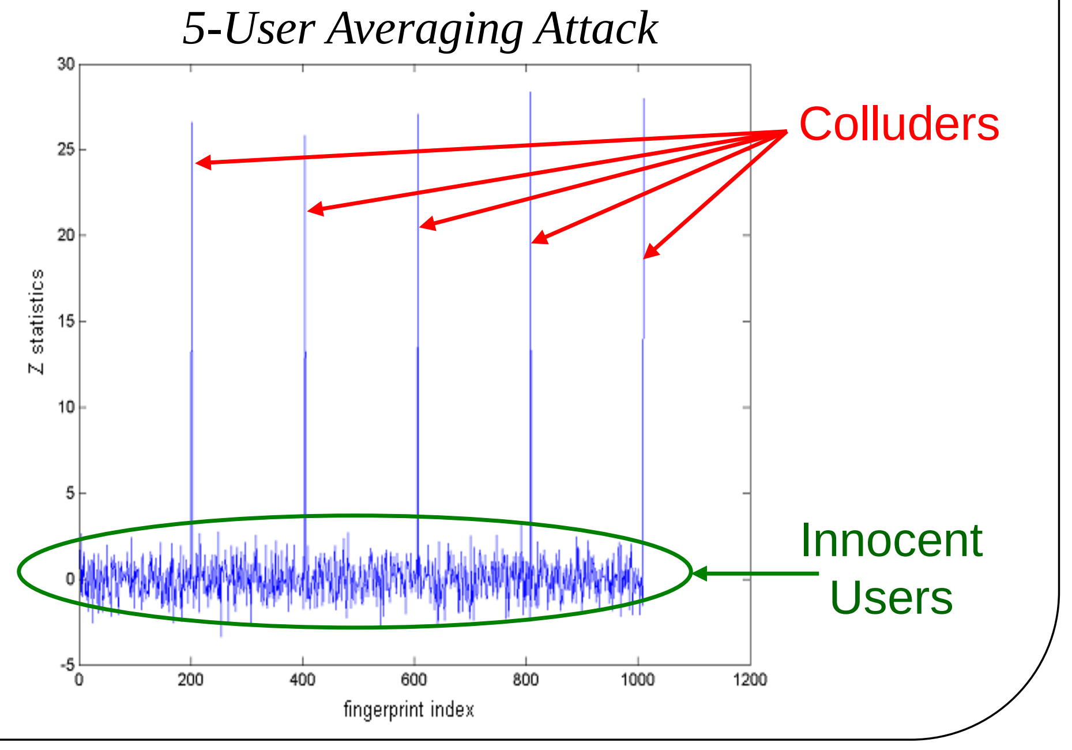


3-D Digital Elevation Maps



Detection Results

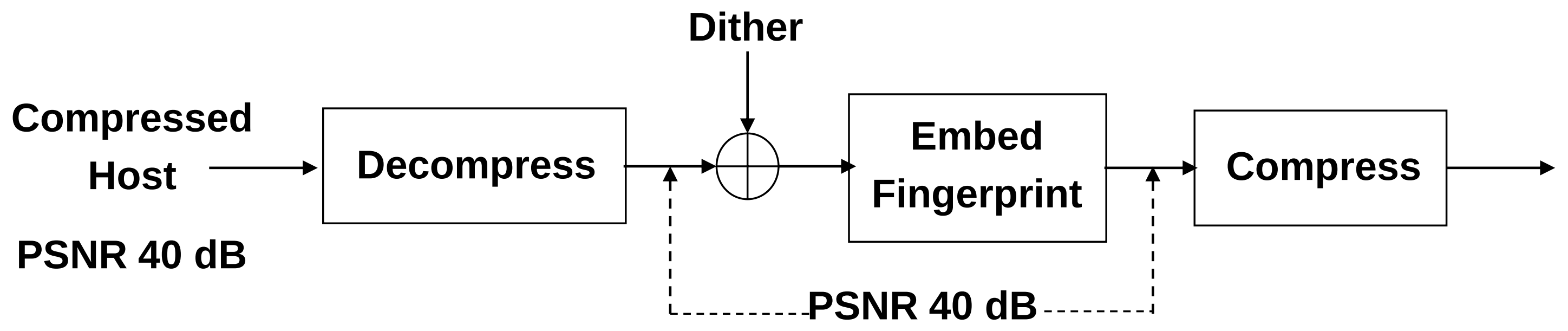
5-User Averaging Attack



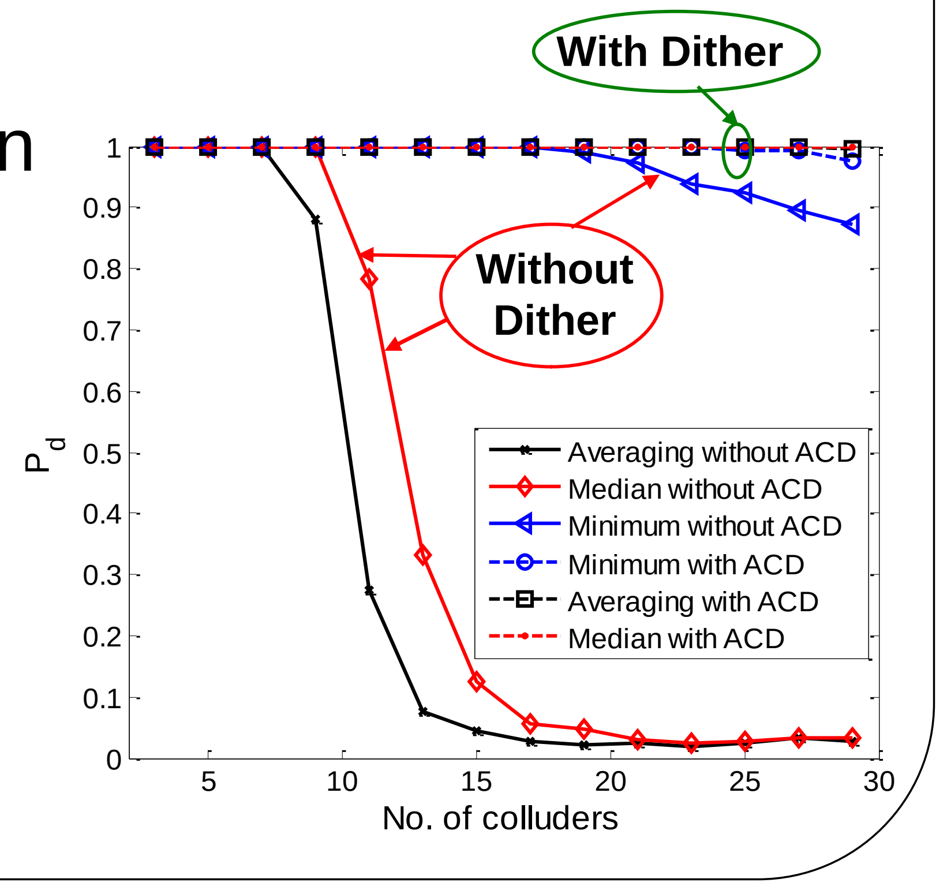
Fingerprinting Compressed Multimedia

Discrete nature of fingerprints embedded in previously compressed multimedia → vulnerable to multi-user collusion

⇨ Use random signal (dither) to simulate "continuous host"



Improve collusion resistance without increasing bitrate or reducing fidelity


With Dither
Without Dither
P_d
No. of colluders
Averaging without ACD
Median without ACD
Minimum without ACD
Minimum with ACD
Averaging with ACD
Median with ACD