

# Multimedia Content Identification

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## Content Identification

- Enormous volume of multimedia content generated  
⇒ Need better techniques for multimedia management  
**Can we enable automatic identification of multimedia?**



- Internet opens up new ways for sharing multimedia  
⇒ Concerns about copyright infringement:

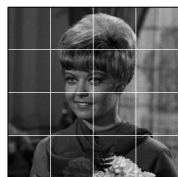


**How to help online multimedia communities flourish legally?**

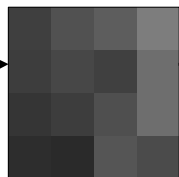


**Content Fingerprints:** a compact, robust, and unique representation of multimedia data

## Example of Fingerprint Generation



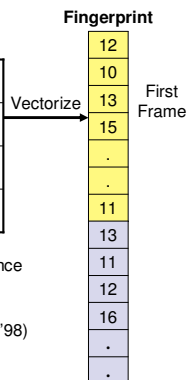
Divide into blocks



Find average luminance of each block

12	7	5	1
10	8	14	3
13	9	6	2
15	16	4	11

Rank average luminance from high to low



Ref: Mohan (ICASSP '98)

## Focus of Our Research

Analyze the mapping from video to features to bits: how is processing on video translated to changes in hash bits?

Model performance at bit string level

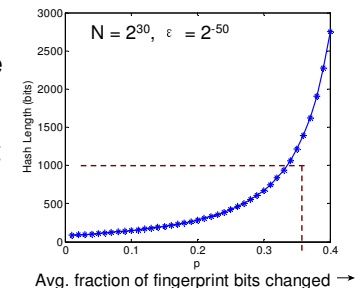


- Gain a more solid understanding of current schemes and devise guidelines for designing new schemes
- Complement experimental evaluations to predict how performance scales
- Examine possible attacks and devise counter-attack strategies

## How long should a fingerprint be?

Idealizing assumptions:

- Fingerprint bits are independent and equiprobable
- Each bit is independently flipped with probability  $p$
- Higher robustness / fewer errors / larger no. of distinct fingerprints ⇒ need longer fingerprint
- Derived lower bound on hash length to achieve desired performance

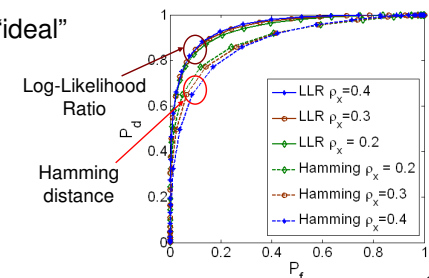
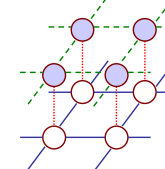


## Modeling using Markov Random Fields

Fingerprints generated by practical schemes not "ideal"

⇒ Capture correlations using Markov Random Field model

Statistical physics inspired approach to characterize the influence of correlation



## Analysis of Ordinal Ranking

Analyze change in ranks of features due to local variations

⇒ Masking technique to reduce sensitivity

