Reliability Map Estimation For CNN-Based Camera Model Attribution

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Introduction

• **Camera model attribution**: detect which camera model has been used to acquire an image by only exploiting pixel information
• CNNs have enabled camera model attribution methods to work well even on small image patches
• Some patches of an image may not contain enough information related to the camera model (e.g., saturated patches)

Our Contribution: Reliability Map Estimation (RME)

• CNN-based solution to estimate the camera model attribution reliability of a given image patch
• RME indicates which portions of the image contain reliable camera traces
• RME can drive tampering localization methods

Proposed Approach

- **Transfer learning** enables to preserve part of the CNN estimation by a series of fully connected layers for patch reliability architecture proposed in [1]
- **Localization methods** given image patch estimate the camera model

Experimental Validation

- The proposed approach leverages CNN feature learning capabilities and transfer learning training strategies
  - Specifically, we make use of a CNN composed by the architecture proposed in [1] as feature extractor, followed by a series of fully connected layers for patch reliability estimation
  - Transfer learning enables to preserve part of the CNN weights of [1], and train the whole architecture end-to-end with a reduced number of image patches
- Our strategy is validated on the Dresden Image Database [2]
  - We first validate the proposed architecture and training strategy
  - Then, we compare the proposed solution against a set of baseline methodologies based on classic supervised machine learning techniques
  - Finally, we show that it is possible to increase camera model attribution accuracy by more than 8% with respect to [1] using our proposed approach

Results

- **Qualitative**
  - By using our proposed approach, we achieve a significant improvement in the camera model attribution accuracy

- **Quantitative**
  - The proposed approach outperforms baseline methodologies in terms of accuracy

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