

A review of data processing modules in digital image forensics methods using deep learning

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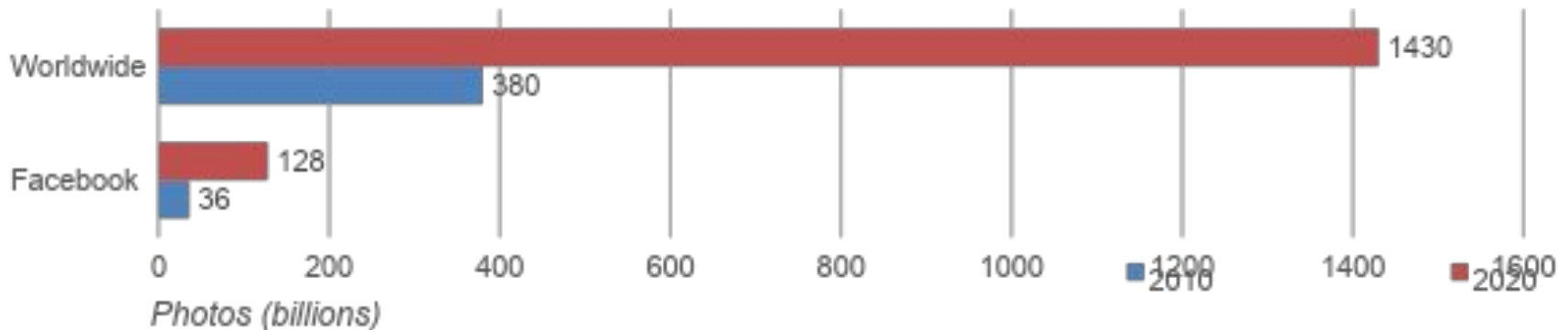
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Digital Image Forensics

- A new way of communication

Photos statistics in the last decade¹



- Potential malicious modifications that affect several aspects linked to images

POLITIC

SOCIAL

LEGAL

ECONOMIC

- DIF provides solution to authenticate images

¹Numbers taking from Facebook, TechToday and Fstoppers

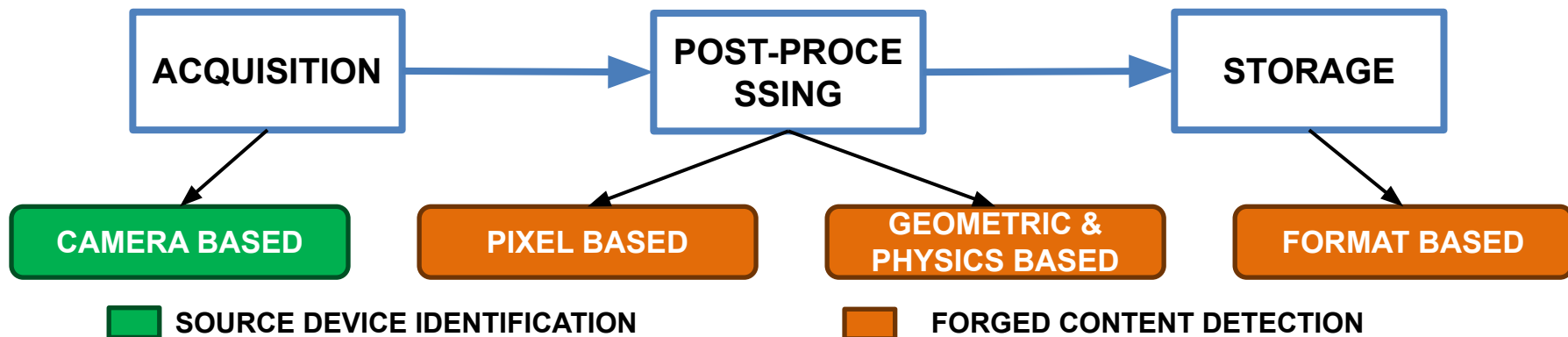
Main forgeries



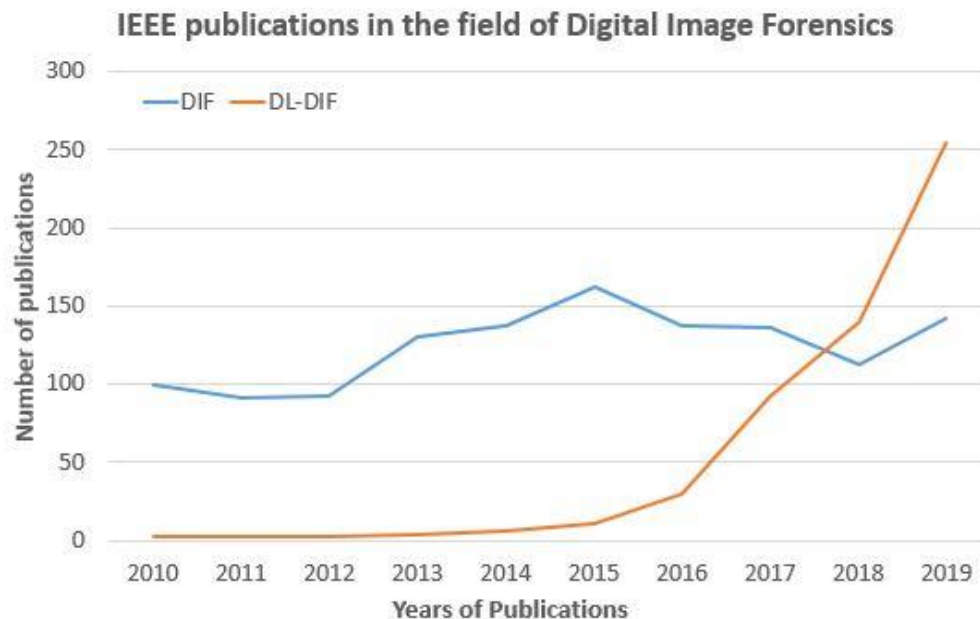
Original images

Forged images

Type of artefacts



- **Classical DIF techniques based on artefacts**
- **Deep learning DIF methods overcame since 2017**



Pre-processing modules

HAND-CRAFTED ARTEFACTS

DCT¹
Histogram

MFR (Median
Filtering
Residual)

Denoising Filter

High-pass filter

SELF-LEARNED ARTEFACTS

Weight
initialization
with SRM²

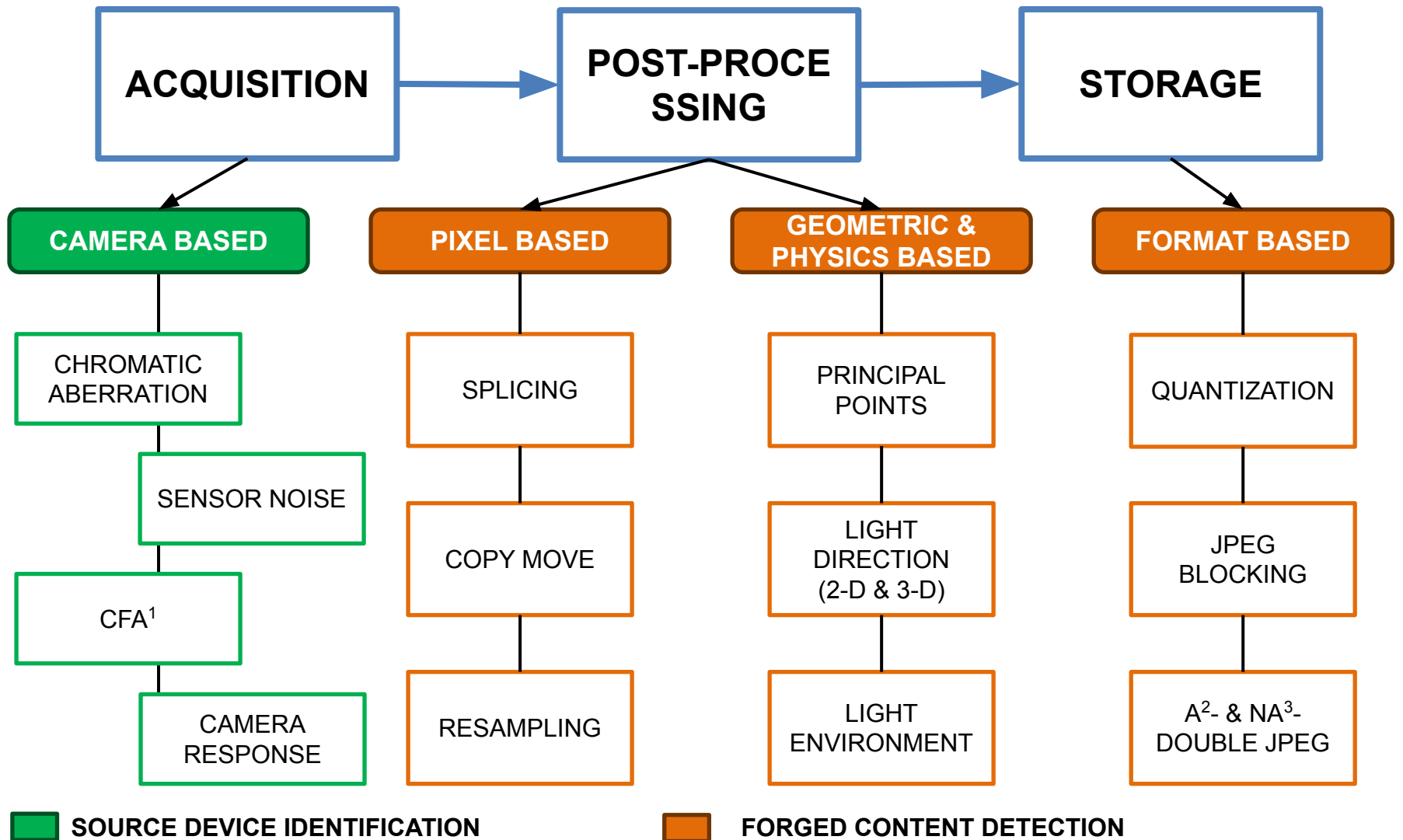
Constrained
convolutional
layer

¹ Discrete Cosine Transform

² Spatial Rich Model

**THANK YOU ALL
FOR LISTENING**

Type of artefacts



¹ Color Filter Array

² Aligned ³ Non Aligned

Handcrafted pre-processing

- DCT coefficients' Histograms : re-compression affects their distribution

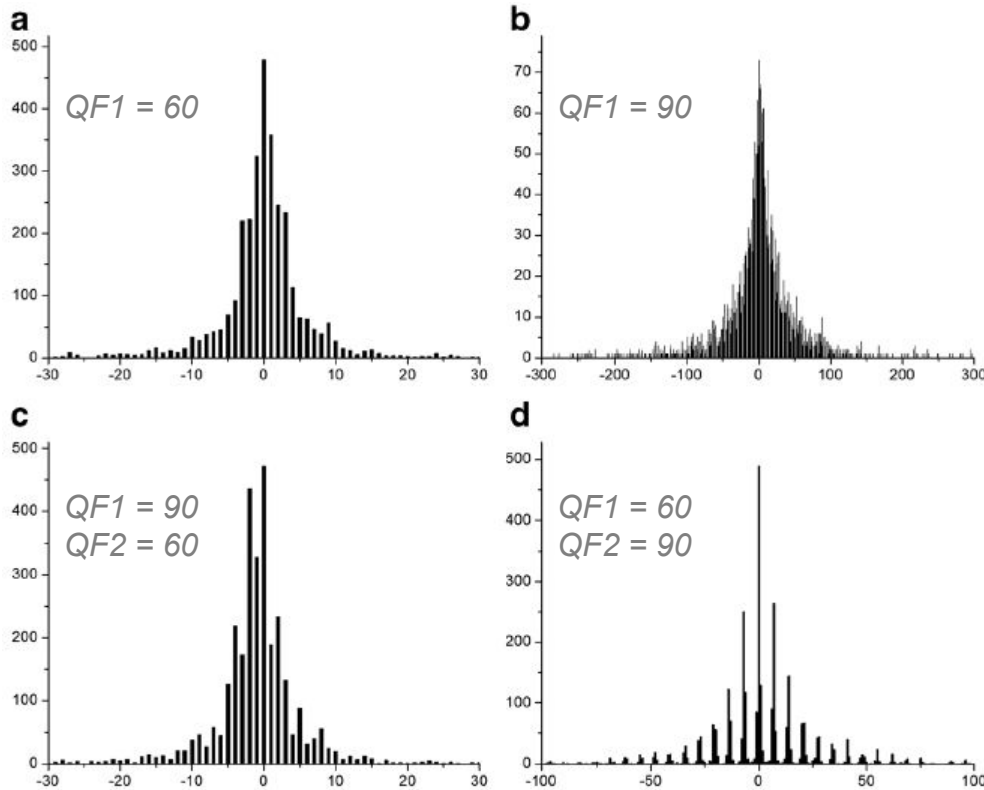
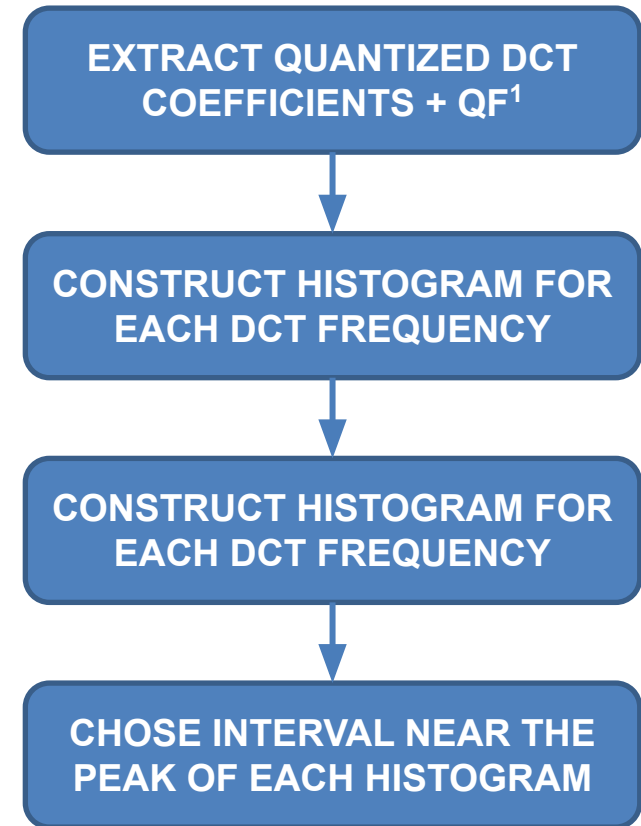


Fig. 1 : Comparison of DCT coefficient histograms with different quality factors [1]

[1] Wang, Qing & Zhang, Rong. (2016). Double JPEG compression forensics based on a convolutional neural network. EURASIP Journal on Information Security. 2016. 10.1186/s13635-016-0047-y.



DNN pre-processing

- Constrained convolutional layer : suppress image content

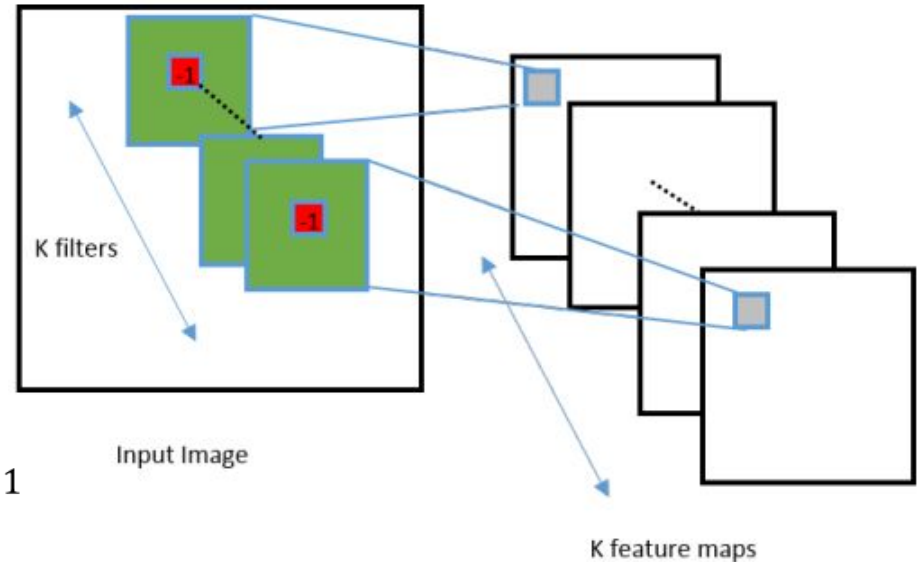
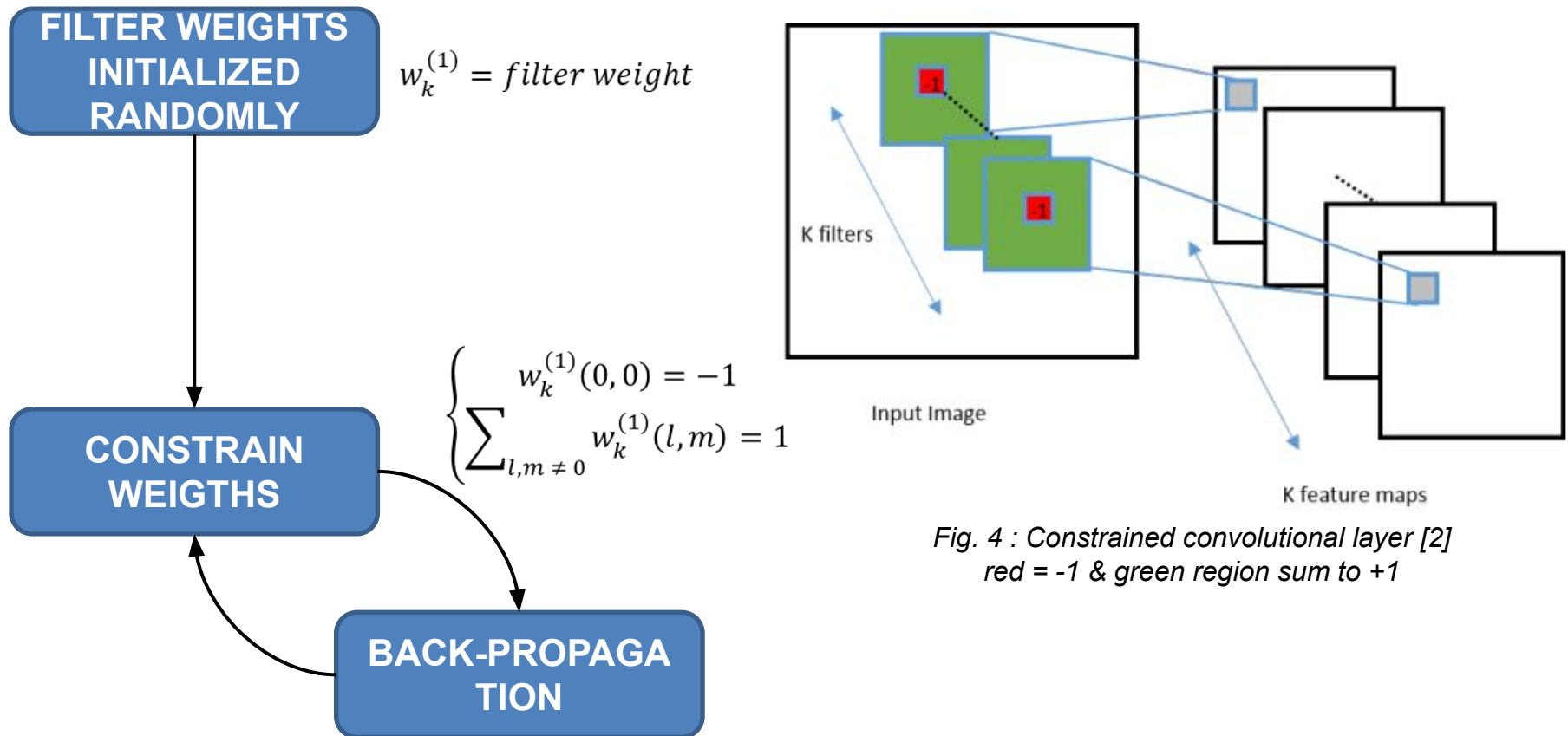


Fig. 4 : Constrained convolutional layer [2]
red = -1 & green region sum to +1

[2] Bayar, Belhassen & Stamm, Matthew. (2016). A Deep Learning Approach to Universal Image Manipulation Detection Using a New Convolutional Layer. 5-10. 10.1145/2909827.2930786.