

La recherche en traitement d'images contre le trucage de photos

Tina Nikoukhah



école _____
normale _____
supérieure _____
paris – saclay _____



IMAGES TRUQUÉES ET FAKE NEWS



14:33 • DIRECT
AVENUE DES CHAMPS-ÉLYSÉES (PARIS)

FAKE NEWS ?

GILETS JAUNES: 123 MORTS LÉGERS ET 2300 BLESSÉS GRAVES

ALERTE INFO Blocages : les forces de l'ordre ont fait usage de gaz lacrymogènes à l'entrée du tunnel du Mont-Blanc (cellule de crise).

GILETS JAUNES LA TENSION



IMAGES TRUQUÉES ET FAKE NEWS



Yvan Hostettler

13 juin, 09:33 · 🌐

La 5G détruit les arbres! Une antenne 5G active à été posée sur le haut d'un sapin dans le Jura afin de tester l'effet de ses ondes: après quelques semaines, le résultat est catastrophique... Balance ton smartphone.

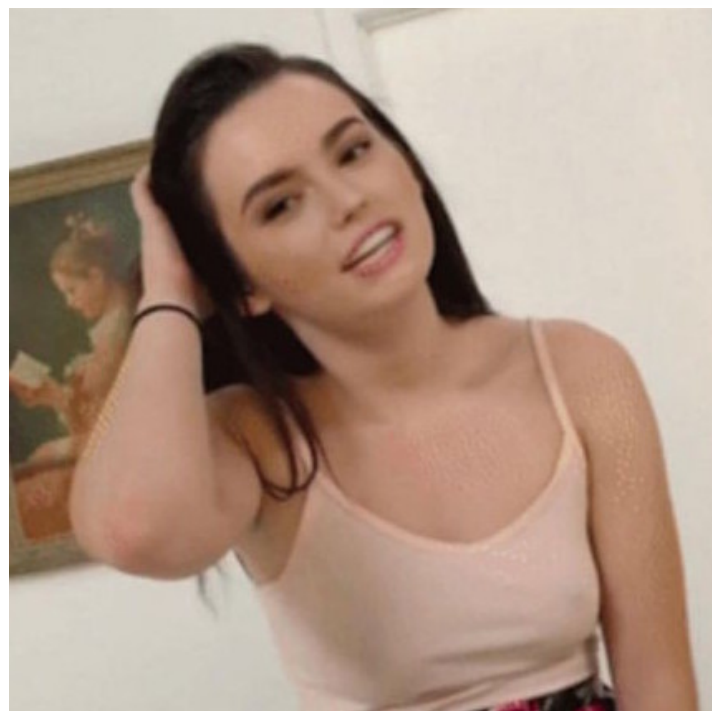
**Une antenne 5G
qui “détruit les arbres” ?**

FAUX

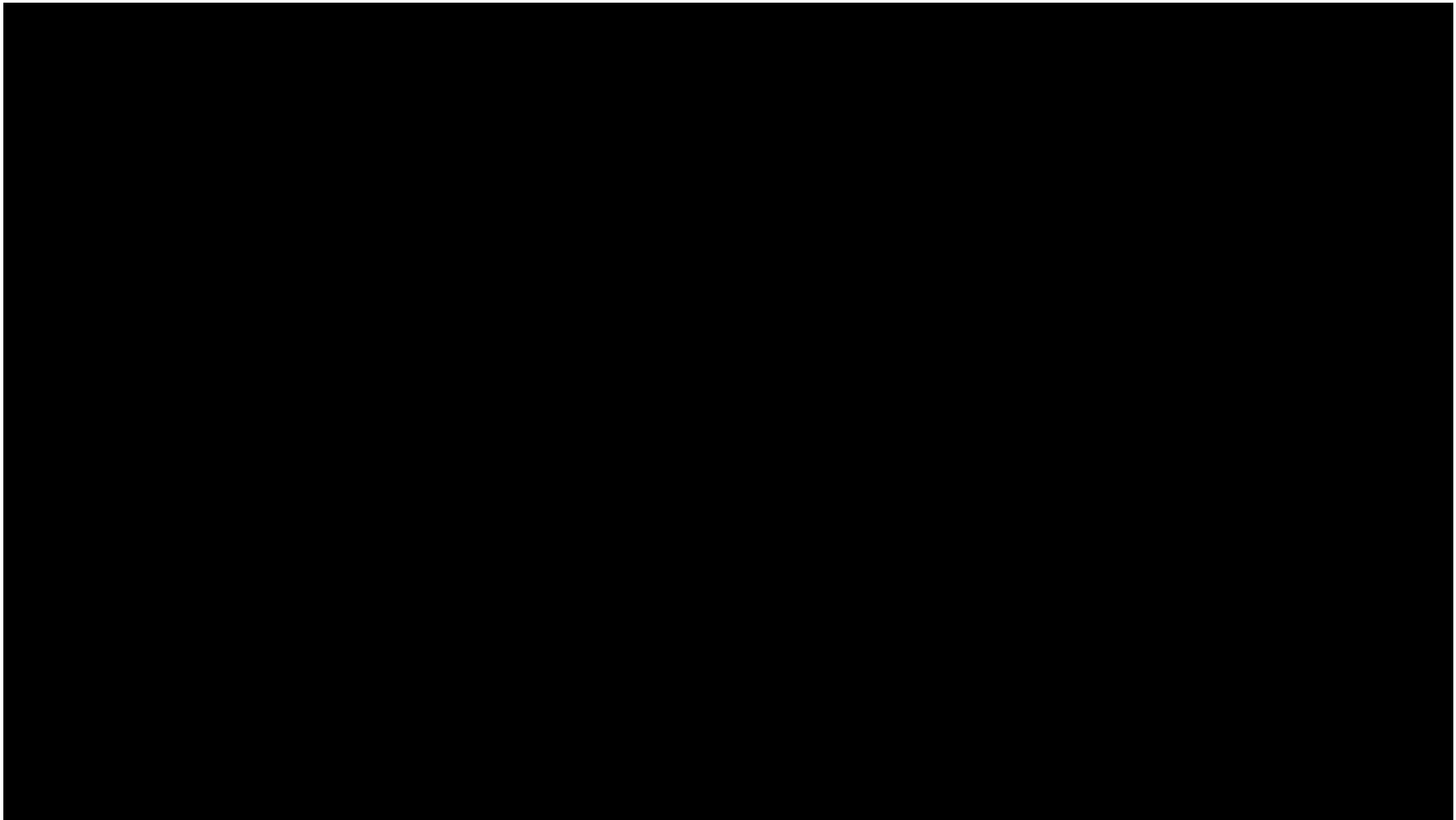
Pourquoi truquer des images ?



 YouTube



DeepFake



d é s i n f o x

C O R O N A V I R U S



L'HISTORIQUE D'UNE IMAGE NUMÉRIQUE



“D’où vient cette photo ?”



“Qu’a subi cette photo ?”



7360 x 4912 (5,9 MB)		No Location data	Date Taken	01-10-2019 07:00:24 PM
f/1.6	1/125 seconds	ISO 160	Edited Date	
50 mm		NIKON D800	Speed	GPS Data not available
Aperture (F-number)	f/1.6		Altitude	GPS Data not available
ISO Sensitivity	ISO 160		FlashpixVersion	1.0
Focal Length	50 mm		Digital Zoom Ratio	1.000000
Focal Length in 35 mm	50 mm		Exposure Bias Value	0.00
Star Rating				
Flash	Flash did not fire, compulsory flash mode			
Aperture Max	1,4 (APEX = 1)			
			Exposure Mode	Auto Exposure
			Exposure Program	Aperture priority
			Exposure Time	0.008000 - (1/125 seconds)
			White Balance	Auto White Balance

L'HISTORIQUE D'UNE IMAGE NUMÉRIQUE



“D’où vient cette photo ?”



“Qu’a subi cette photo ?”



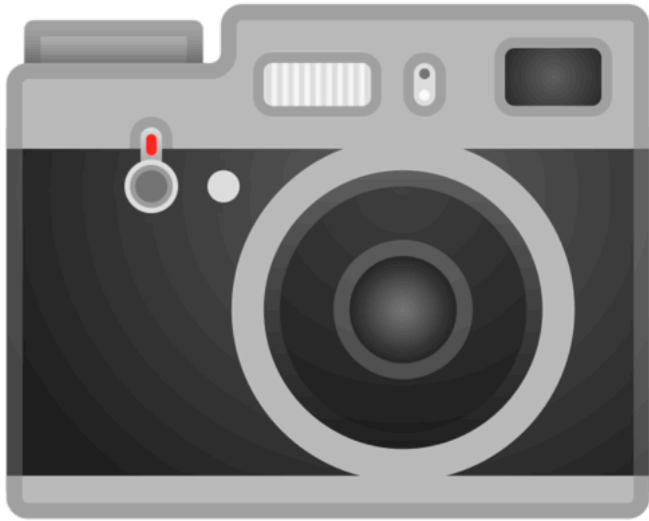
7360 x 4912 (5,9 MB)		No Location data
f/1.6	1/125 seconds	ISO 160
50 mm		NIKON D800
Aperture (F-number)	f/1.6	
ISO Sensitivity	ISO 160	
Focal Length	50 mm	
Focal Length in 35 mm	50 mm	
Star Rating		
Flash	Flash did not fire, compulsory flash mode	
Aperture Max	1,4 (APEX = 1)	

Date Taken	01-10-2019 07:00:24 PM
Edited Date	
Speed	GPS Data not available
Altitude	GPS Data not available
FlashpixVersion	1.0
Digital Zoom Ratio	1.000000
Exposure Bias Value	0.00
Exposure Mode	Auto Exposure
Exposure Program	Aperture priority
Exposure Time	0.008000 - (1/125 seconds)
White Balance	Auto White Balance

MATHÉMATIQUES

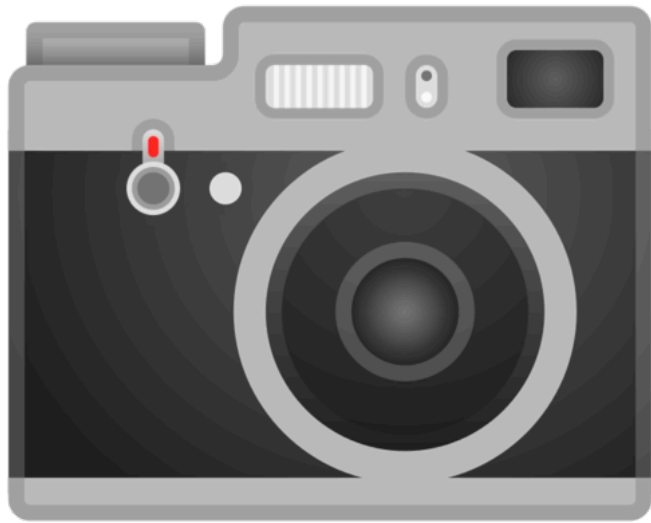
INFORMATIQUE

L'HISTOIRE D'UNE IMAGE NUMÉRIQUE



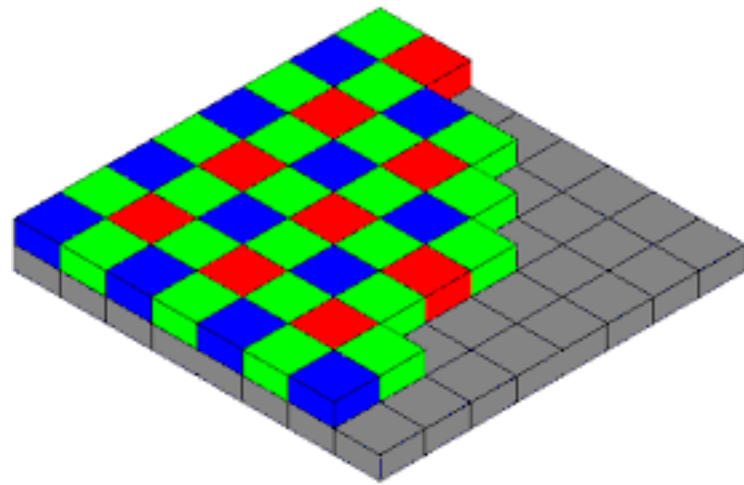
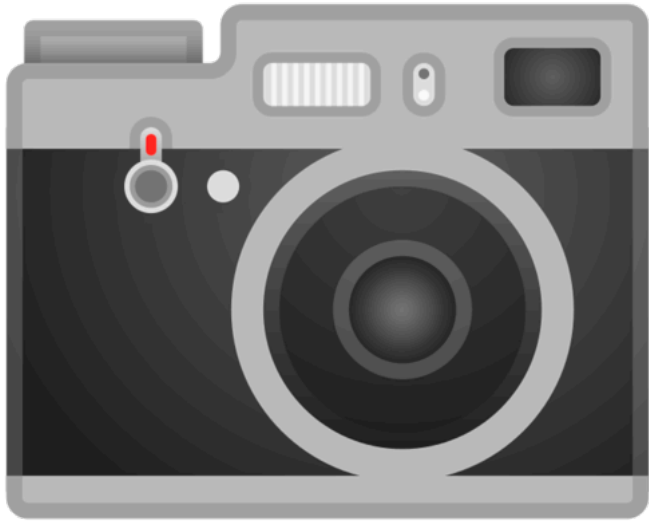
- dématriçage
- balance des blancs
- correction des distorsions optiques
- débruitage
- rehaussement de contraste
- compression
- ...

L'HISTOIRE D'UNE IMAGE NUMÉRIQUE



L'HISTOIRE D'UNE IMAGE NUMÉRIQUE

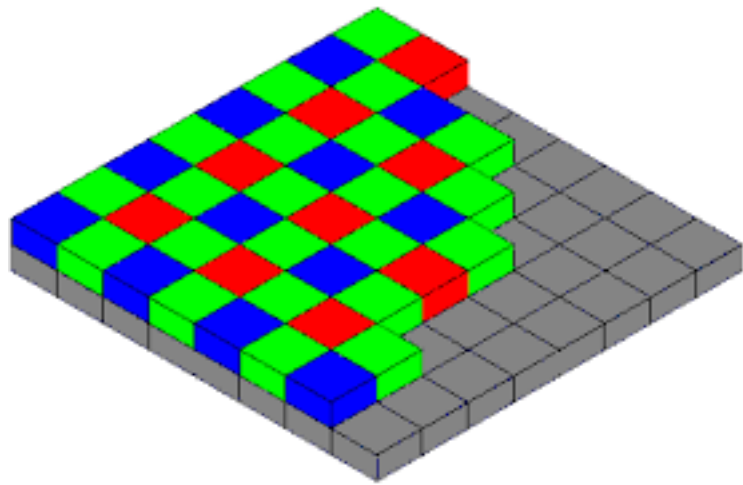
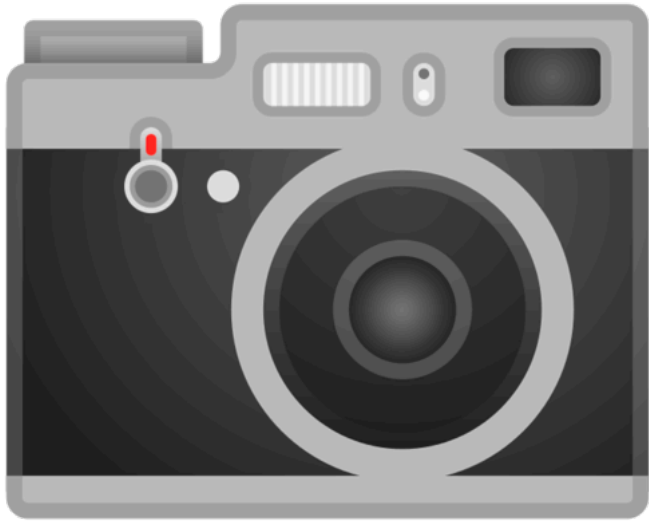
Sortie du capteur



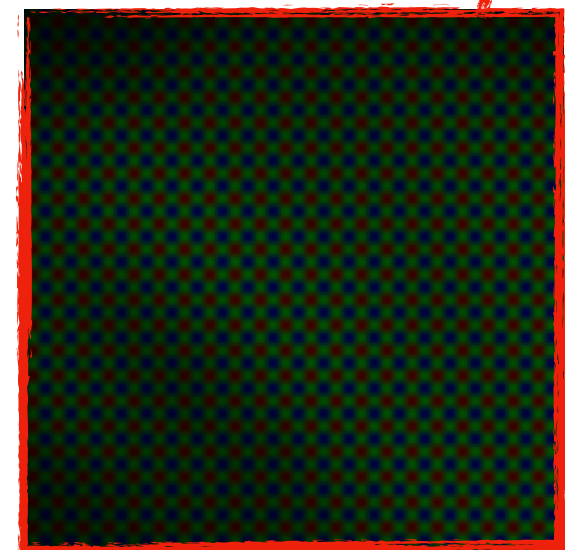
Capteur photosensible
recouvert d'une grille de Bayer

L'HISTOIRE D'UNE IMAGE NUMÉRIQUE

Sortie du capteur



Capteur photosensible
recouvert d'une grille de Bayer



Zoom x1000

L'HISTOIRE D'UNE IMAGE NUMÉRIQUE



L'HISTOIRE D'UNE IMAGE NUMÉRIQUE



Dématriçage : avant



Dématriçage : après



Balance des blancs



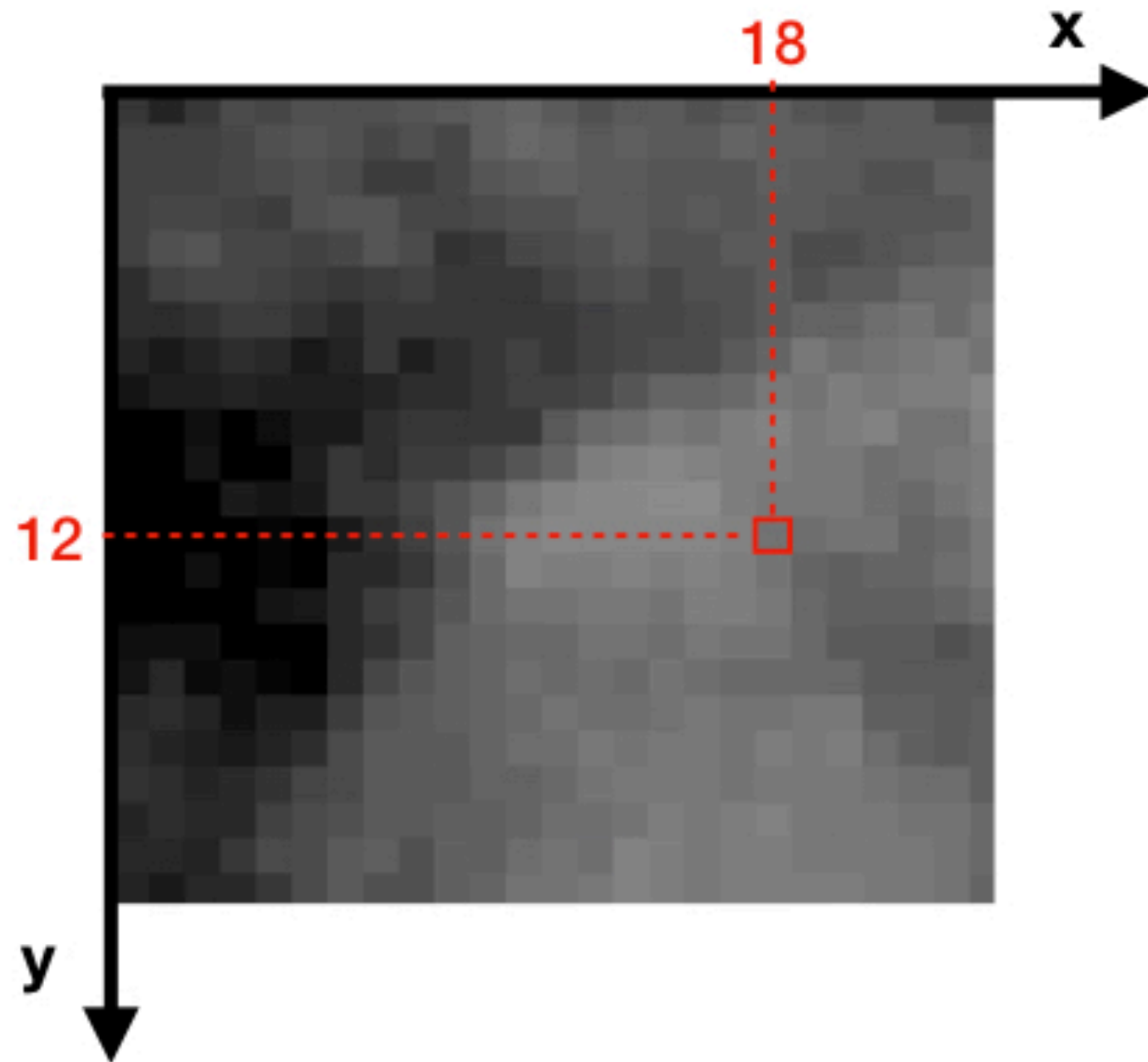
Correction des distorsions optiques



Autres améliorations



L'HISTOIRE D'UNE IMAGE NUMÉRIQUE



Compression



Image non-compressée
Poids : 75 Mo



Image compressée
Poids : 5 Mo

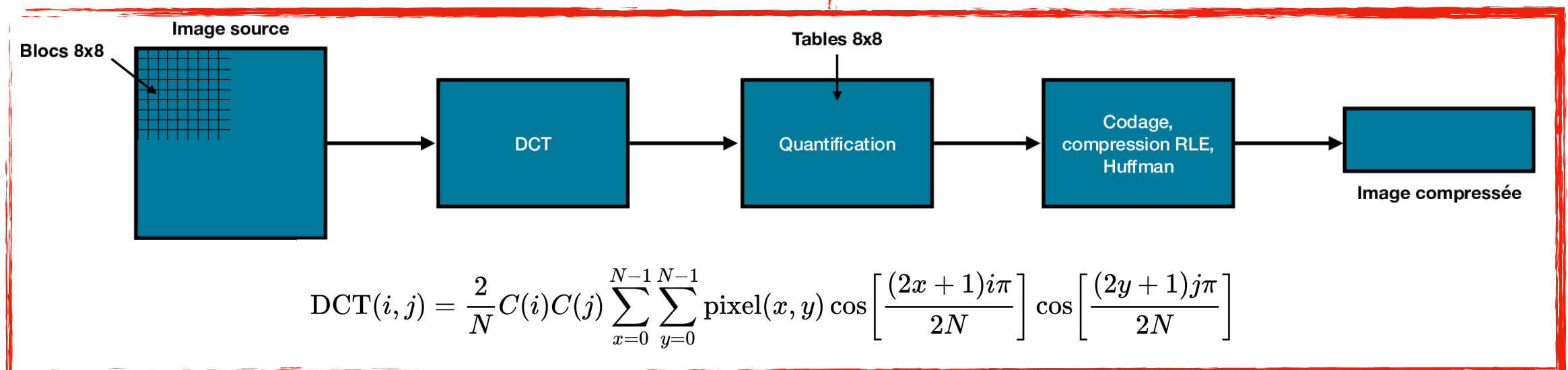
Compression



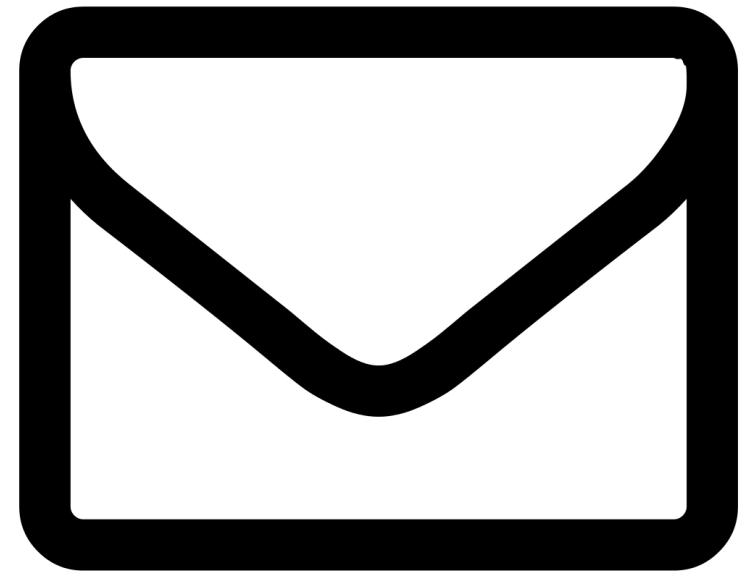
Image non-compressée
Poids : 75 Mo



Image compressée
Poids : 5 Mo



Compression



LA COMPRESSION JPEG



Image non-compressée



Image ayant subi une compression



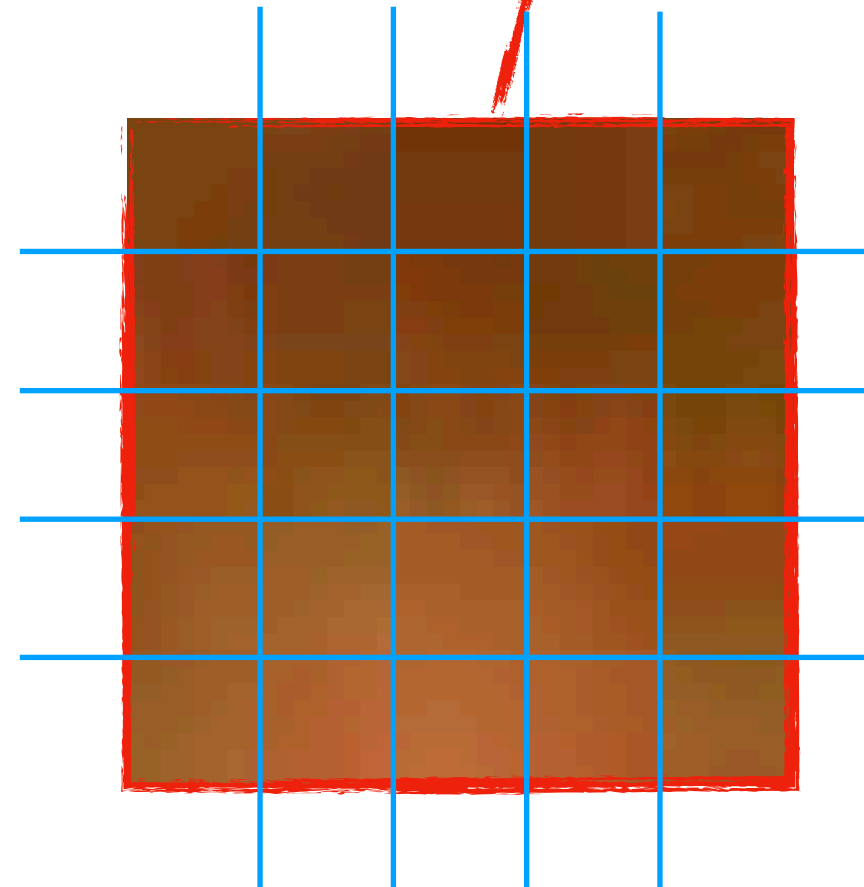
LA COMPRESSION JPEG



Image non-compressée



Image ayant subi une compression



Size: 1080x1080x3

Range: 0..255

Zoom: 79%

Displayed: 0..255

Shader: default

Pixel: (-21474836



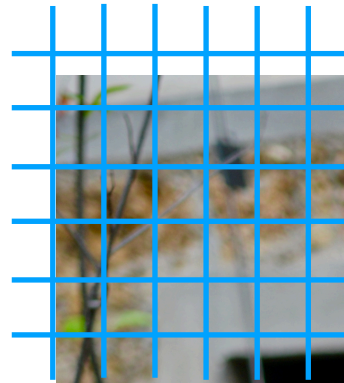
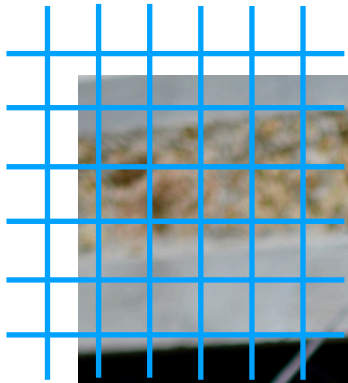
Filtre laplacien



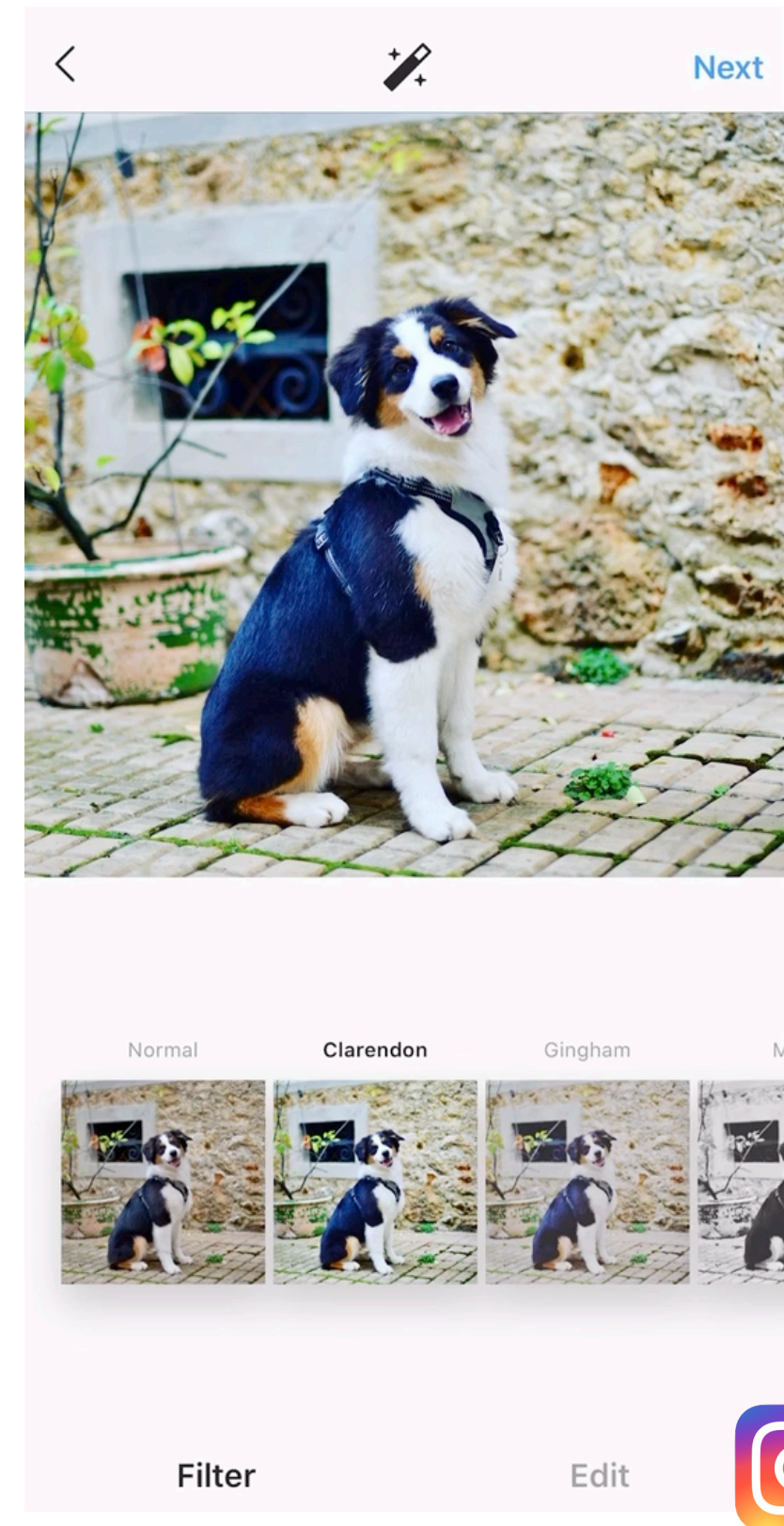
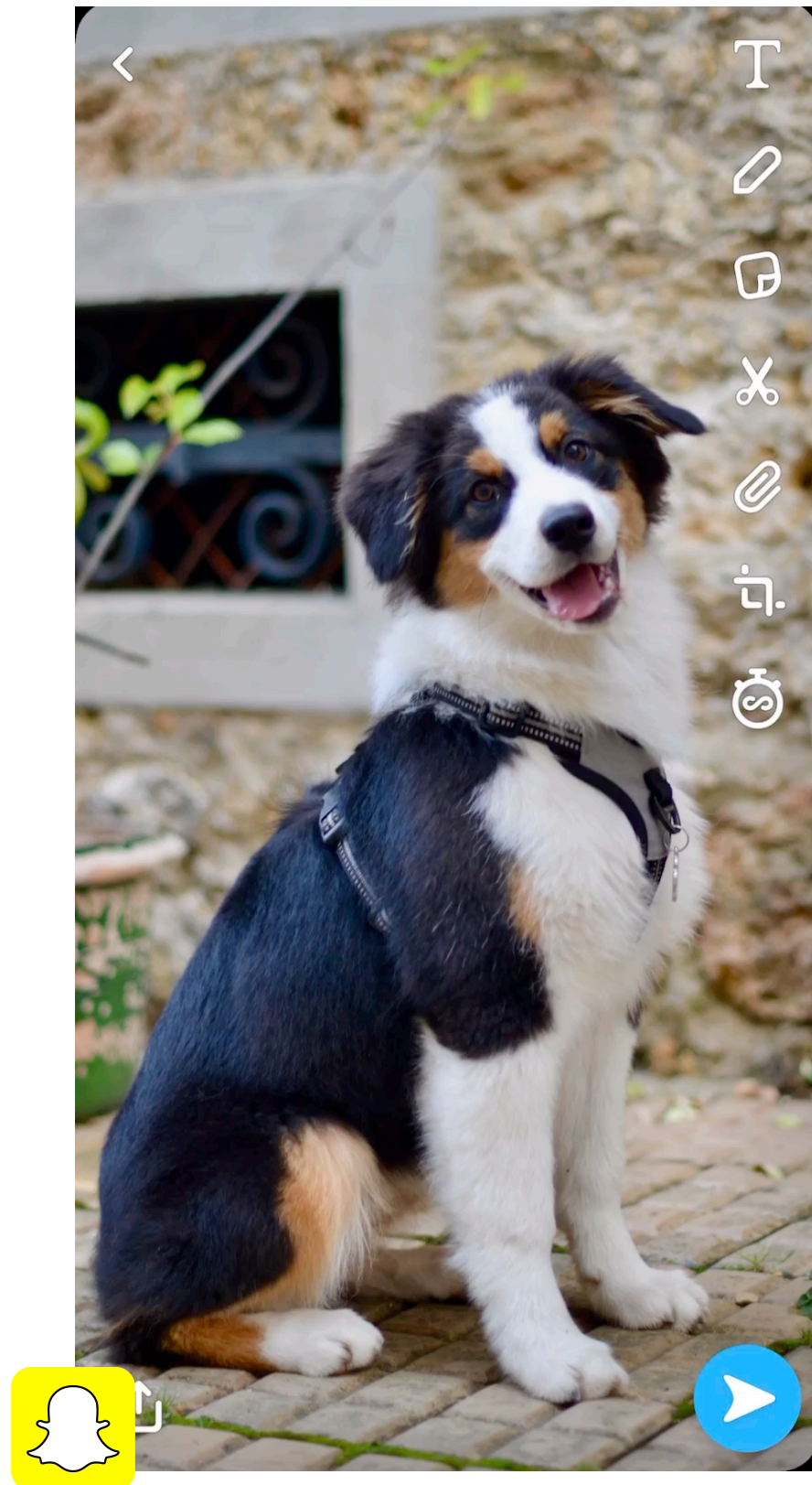
Comment détecter un recadrage ?



Comment détecter un recadrage ?



Autres traitements



UNE IMAGE TRUQUÉE



Image compressée
Poids : 180 Ko



Image ayant subi une
compression

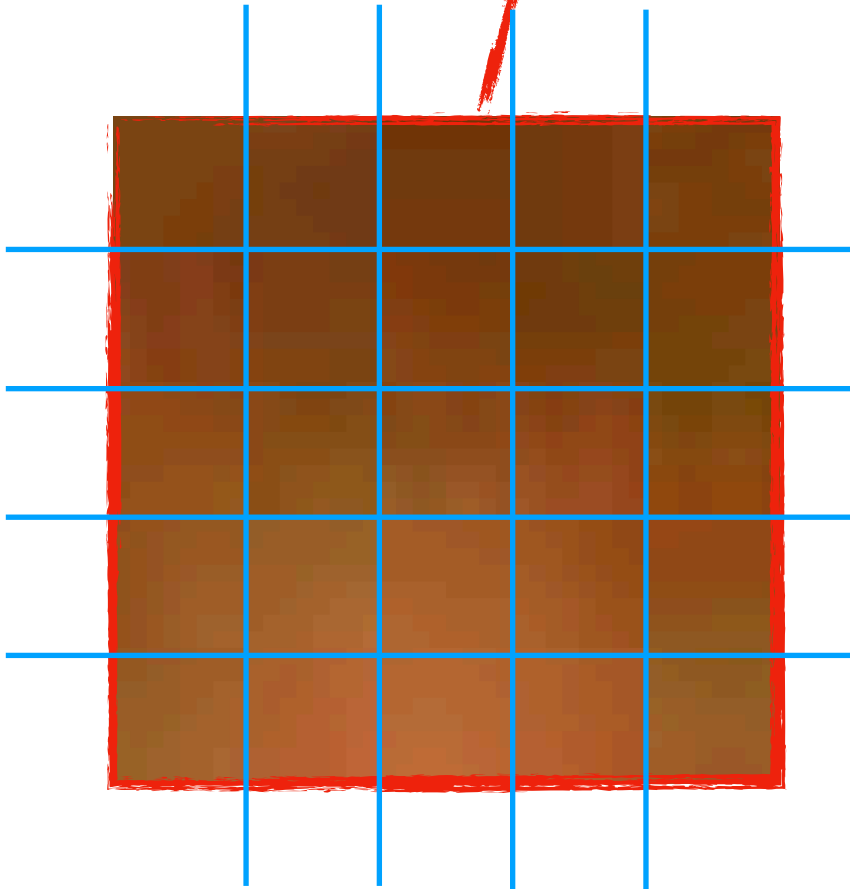
UNE IMAGE TRUQUÉE



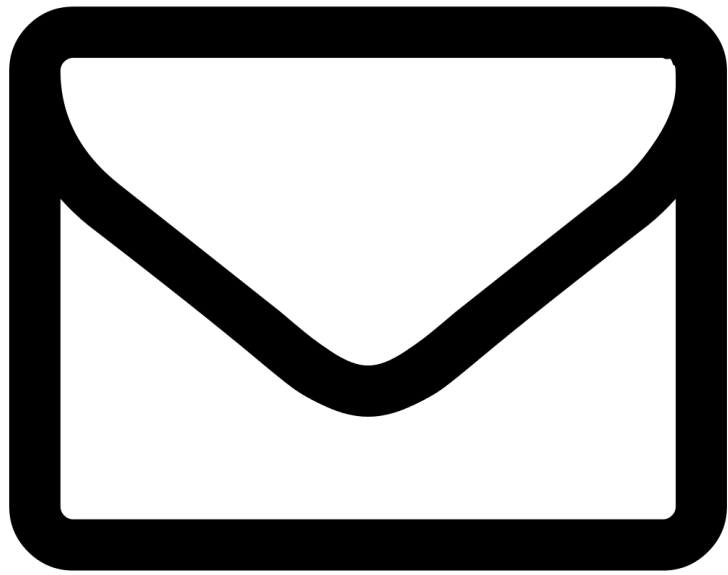
Image compressée
Poids : 180 Ko



Image ayant subi une
compression



UNE IMAGE TRUQUÉE



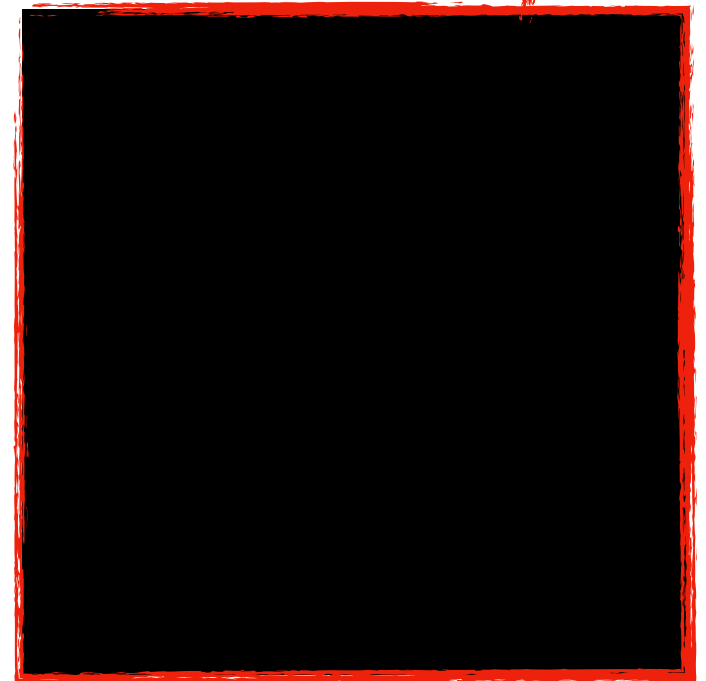
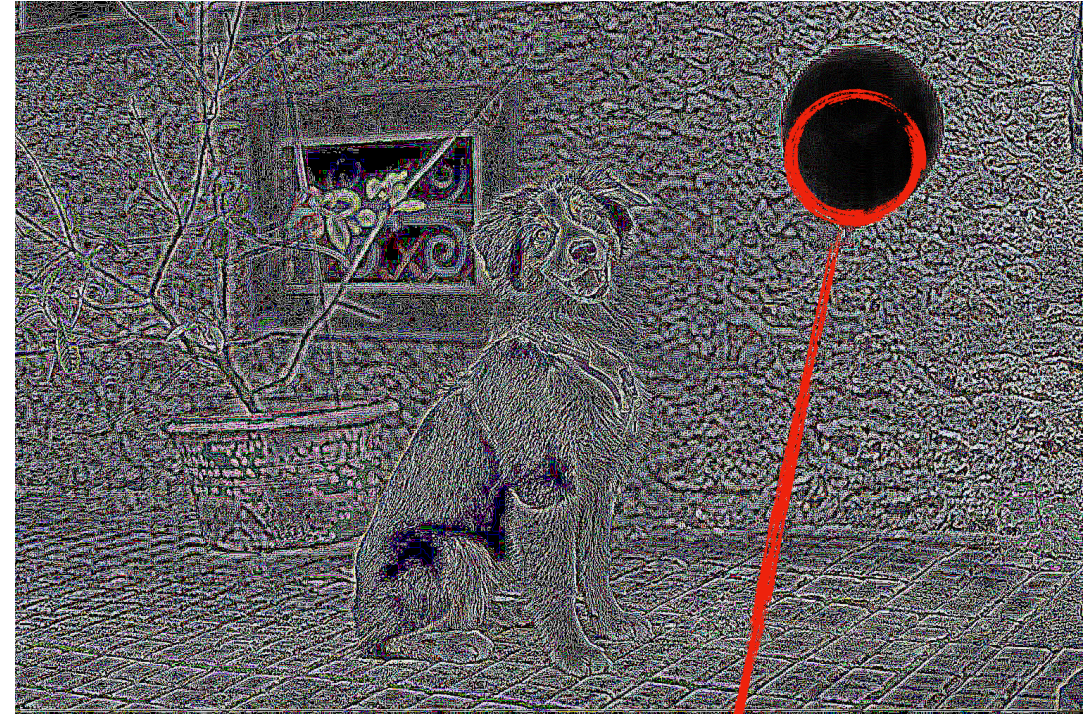
UNE IMAGE TRUQUÉE



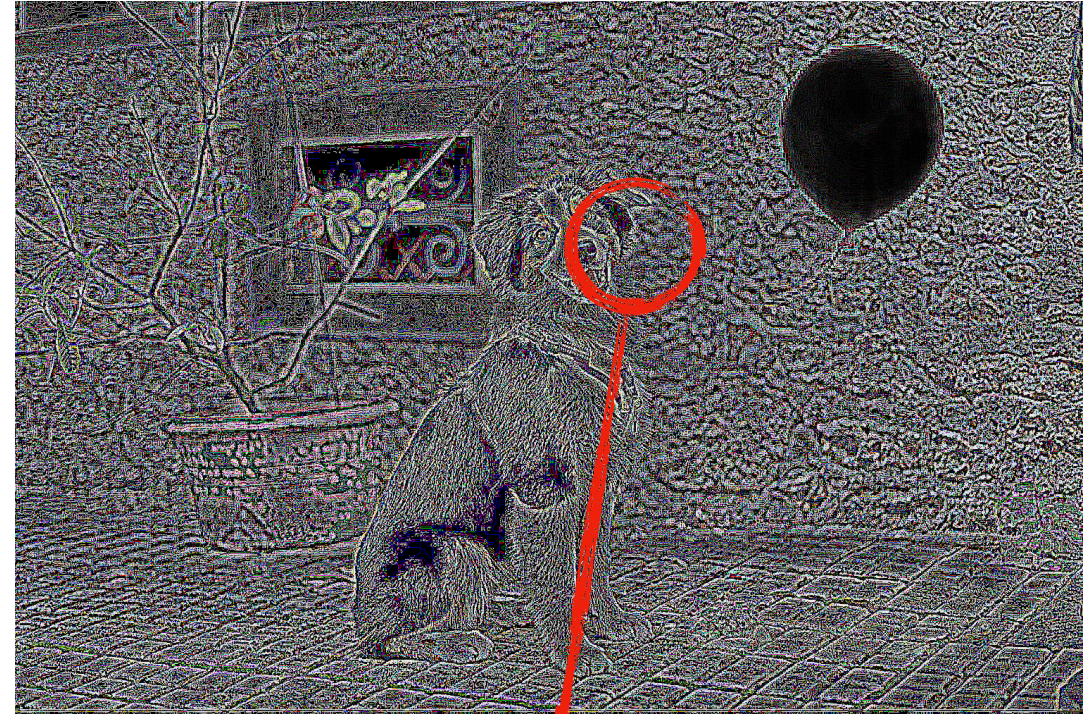
UNE IMAGE TRUQUÉE



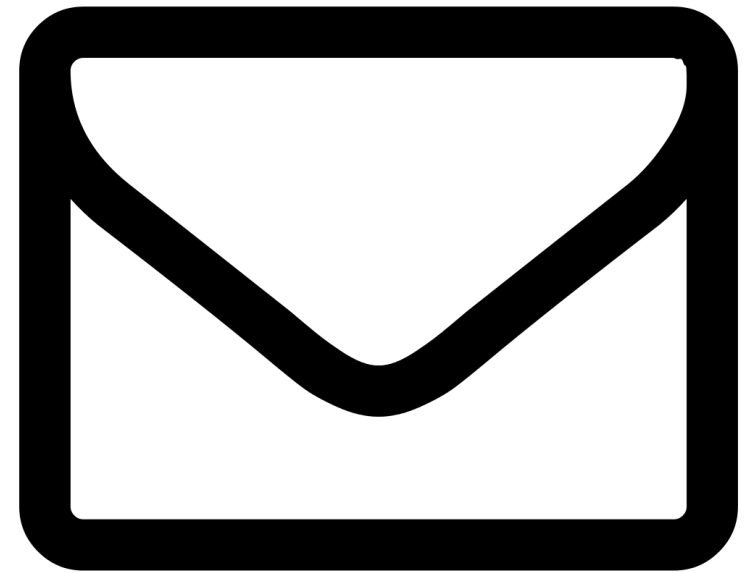
Filtre laplacien



Filtre laplacien



Compression



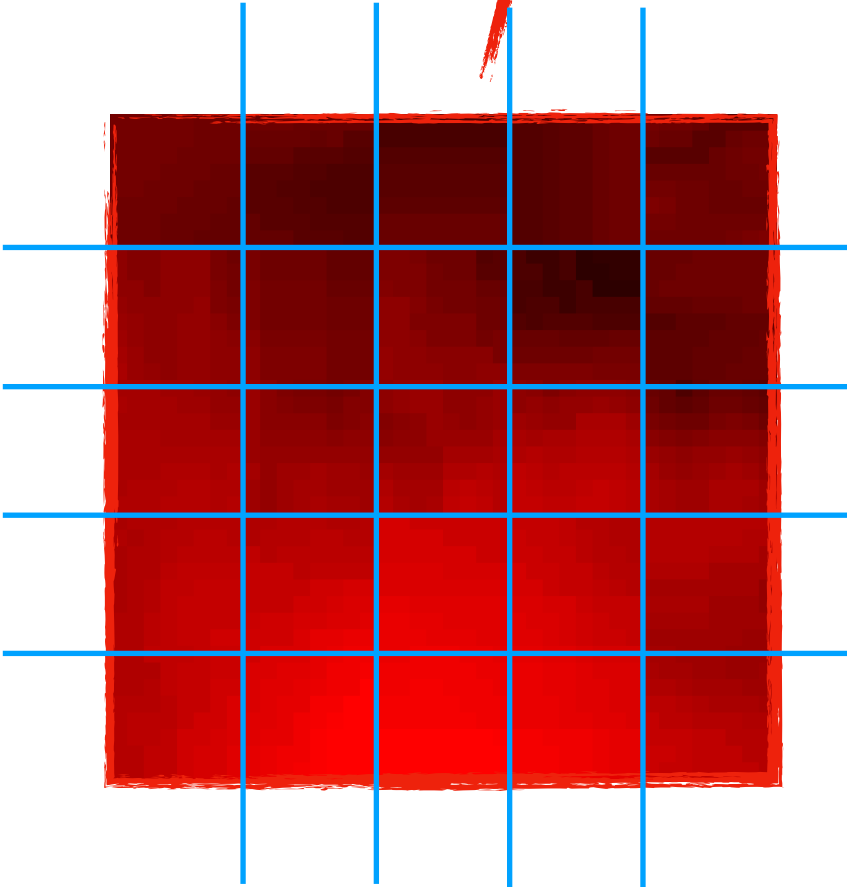
UNE IMAGE TRUQUÉE



Image compressée
Poids : 180 Ko



Image ayant subi une
compression



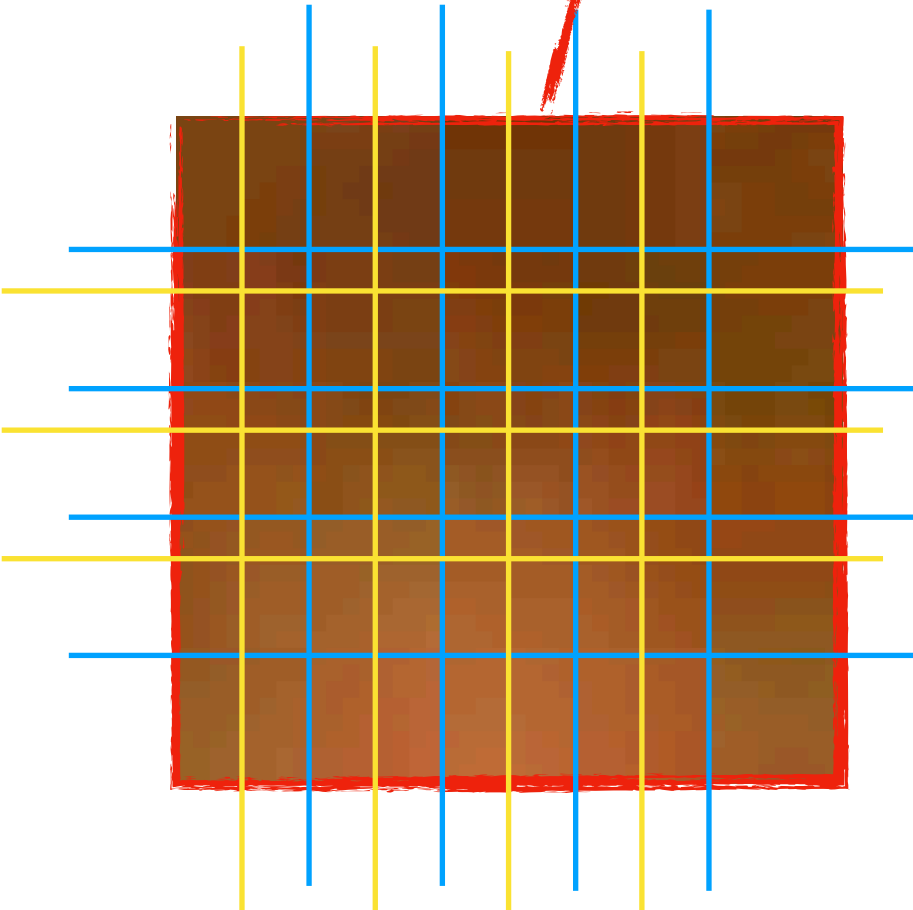
UNE IMAGE TRUQUÉE



Image compressée
Poids : 180 Ko



Image ayant subi une
compression



OUTILS POUR DÉTECTER UNE IMAGE TRUQUÉE

- **Improvements of the Inverse Compositional Algorithm for Parametric Motion Estimation**
2018-12-18 · Thibaud Briand, Gabriele Facciolo, Javier Sánchez
 - **An Analysis and Implementation of the Shape Preserving Local Histogram Modification Algorithm**
2018-12-07 · Jose-Luis Lisani
 - **Study of the Principal Component Analysis Method for the Correction of Images Degraded by Turbulence**
2018-11-23 · Tristan Dagobert, Yohann Tendere, Stéphane Landeau
- **An Implementation of the Exposure Fusion Algorithm**
2018-11-17 · Charles Hessel
 - **Structural Similarity Metrics for Quality Image Fusion Assessment: Algorithms**
2018-10-26 · Silvina Pistonesi, Jorge Martinez, Silvia Maria Ojeda, Ronny Vallejos
 - **Interpolation of Missing Samples in Sound Signals Based on Autoregressive Modeling**
2018-10-17 · Laurent Oudre

Series and Special Issues

- Special Issue on Discrete Geometry (DGC 2011)
- SIIMS Companion Papers

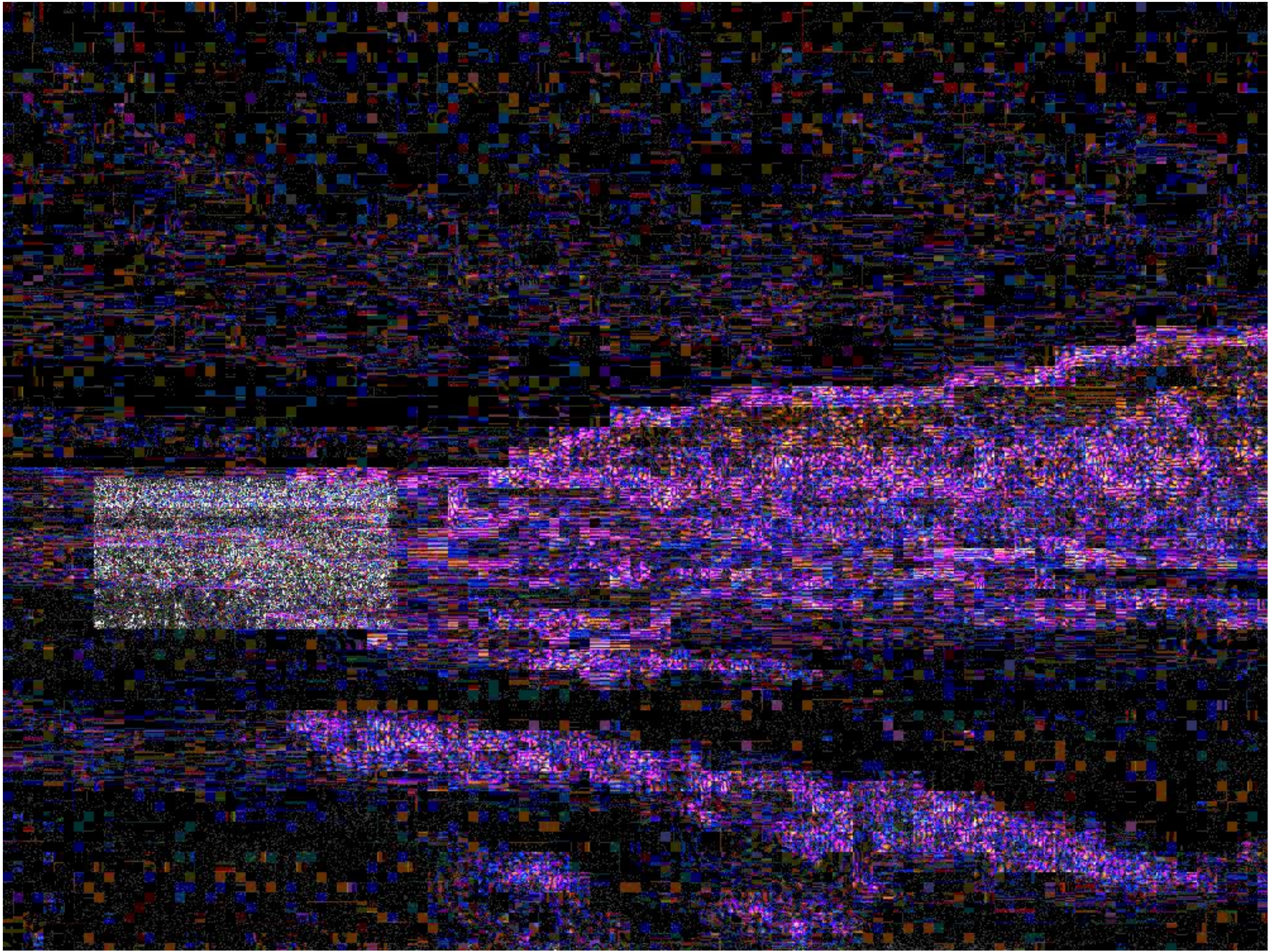
Topics

- 3D
 - Blur
 - Calibration
 - Color and Contrast
 - Computational Photography
 - Demosaicking
 - Denoising
 - Geometry
 - Infrared
 - Learning and Detection
 - Inpainting
- Interpolation
 - Image Comparison
 - Optical Flow
 - PDE
 - Segmentation and Edges
 - Stereovision
 - Texture
 - Vision Through Turbulence
 - Computer Graphics
 - Satellite Imaging
 - Sound

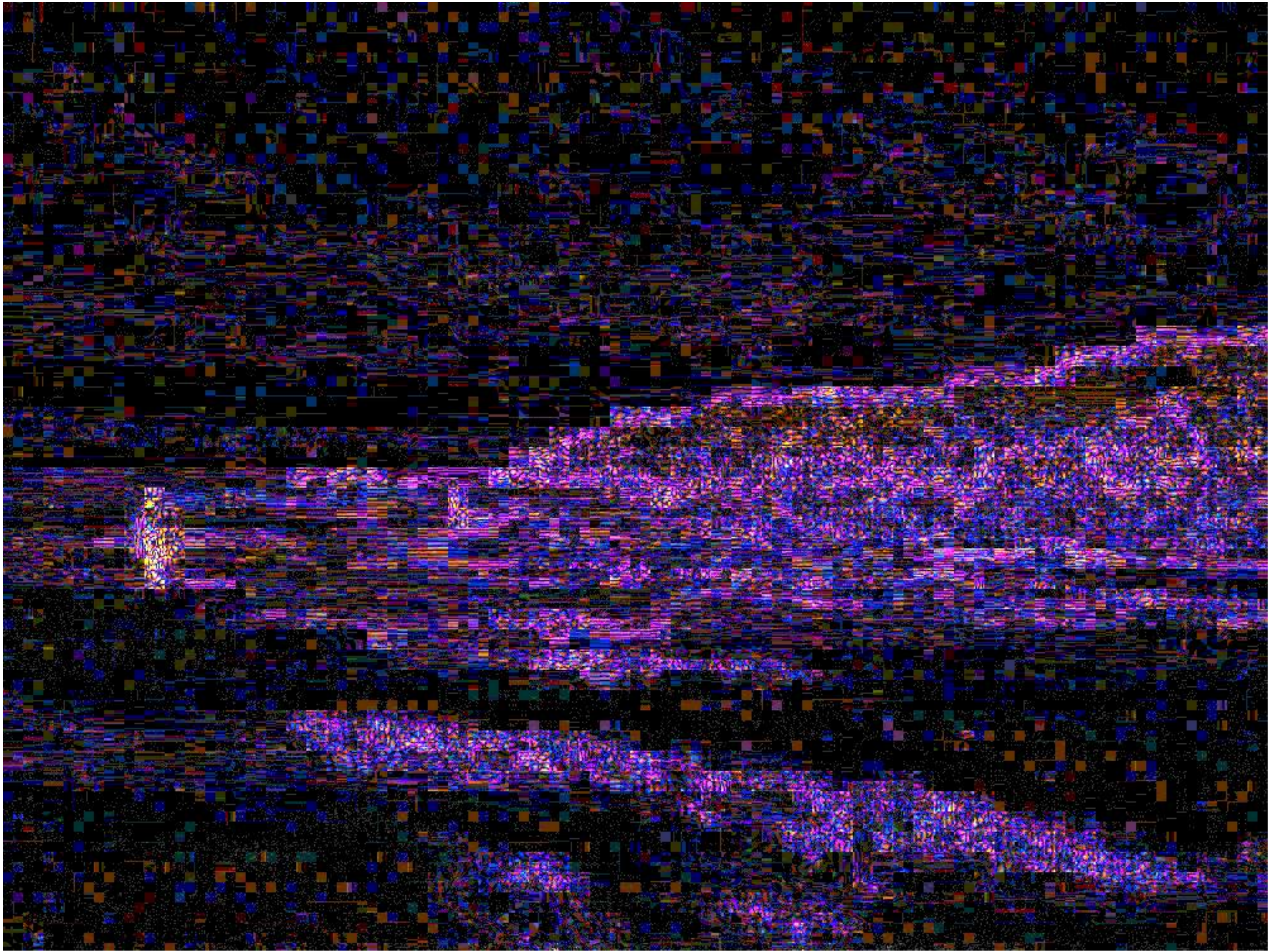
Latest News

- **Software Guidelines 1.04**
2018-04-14
 - **IPOL will be indexed in SCOPUS**
2017-03-08
 - **IPOL indexation in DOAJ**
2017-01-02
- **IPOL will be at the Workshop on Reproducible Research on Pattern Recognition**
2016-09-05
 - **IPOL at the RCBR Workshop of NTMS 2015**
2015-07-29
 - **IPOL is now indexed by DBLP**
2015-06-20









Input

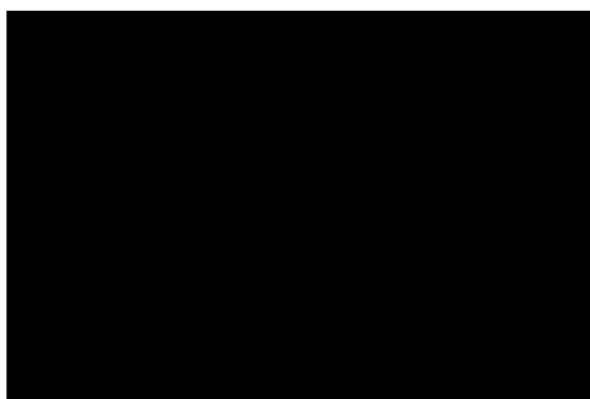
Forgery



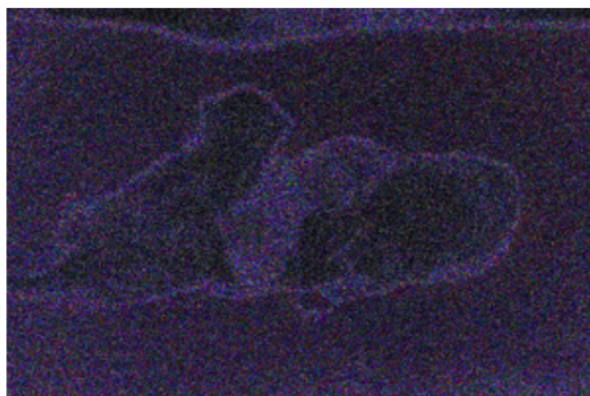
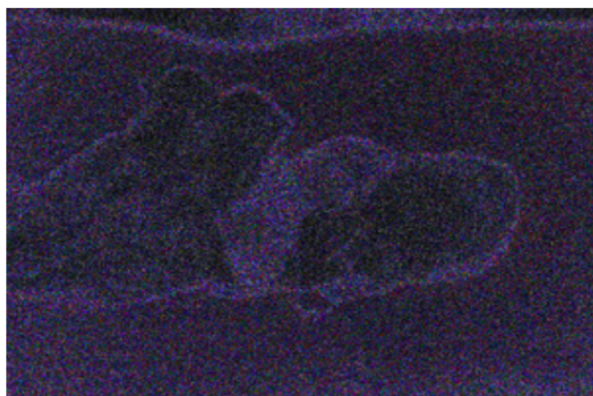
Original



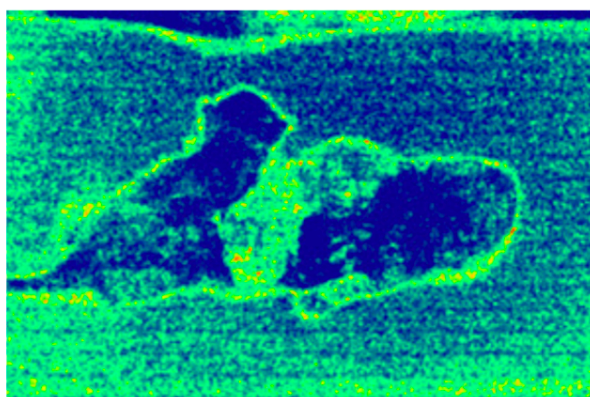
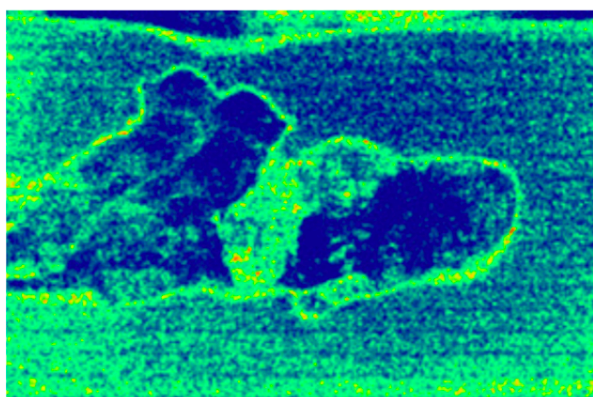
ZERO



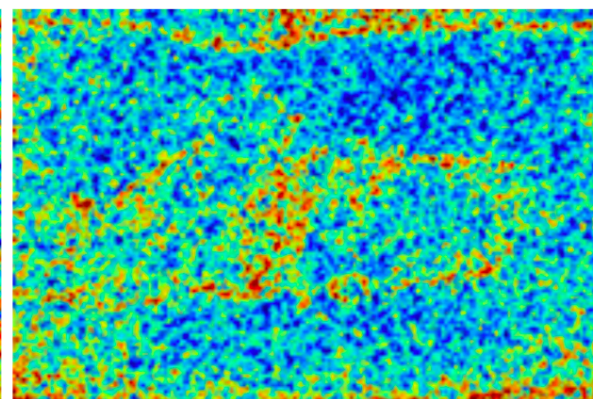
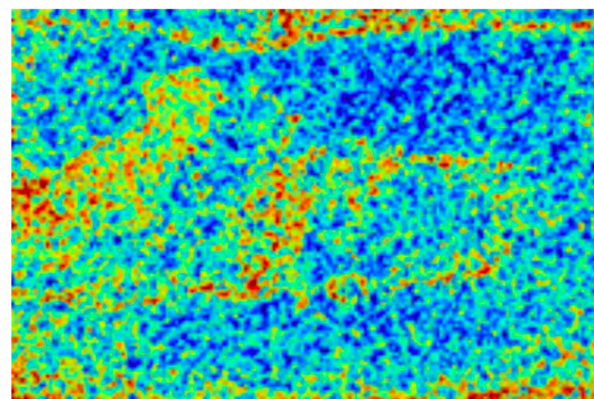
ELA [18]



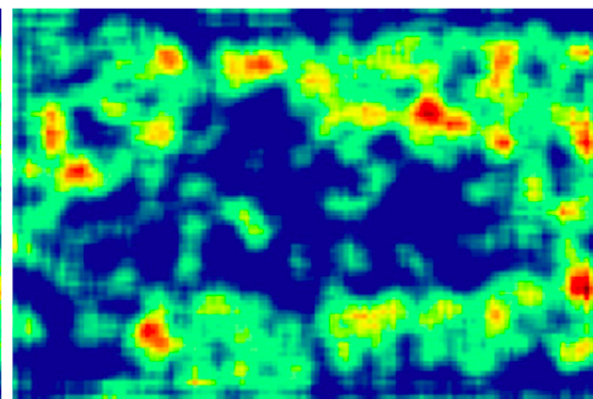
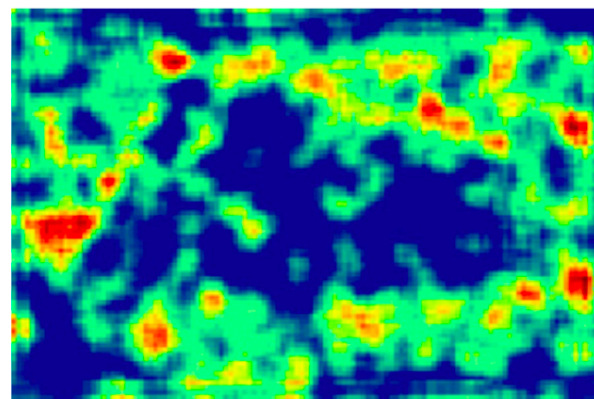
GHOST [11]



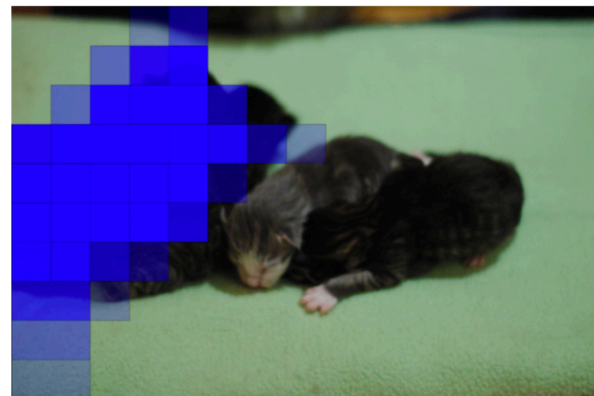
BLK [20]



CAGI [15]



GOD [23]



CMFD [6]

