# Towards the Automated Restoration of Old Photographic Prints: A Survey - F. Stanco', G. Ramponi', and A. de Polo"

* With classical, physical restoration, the images are dusted and cleaned, the gaps are filled up, the emulsion is consolidated, the gelatin is fixed, and some parts are repainted by hand. This pipeline produces cleaner images, but is extremely expensive, and often the damage is still visible.
* The photographic print is what is usually called positive of the image. It is a sheet of paper with a mix of gelatin and nitrate of silver on the surface. The image is created by the sensitivity of the nitrate of silver to the light. The main cause of the imperfection in old prints is a careless conservation of the positive.
* Types of damage:
  + Mechanical damage:
    - Cracks severely deteriorate the aspect of a picture, because they can be very large.
    - Old photos are often plagued with numerous scratches. They are thin straight lines without a preferential direction
    - Folds or tears, where pieces of image are missing
    - Human retouches like stamps, holes or text
  + Chemical Damage:

Semi-transparent blotches, often originated by water or humidity

* + Deposited matter, covering original image
* Only semi-transparent blotches preserve part of original information. Rest all damages result in complete loss of info.

# Learning Deep CNN Denoiser Prior for Image Restoration - Kai Zhang1,2, Wangmeng Zuo, Shuhang Gu, Lei Zhang

Code: <https://github.com/cszn/ircnn>

y = Hx + v

where:

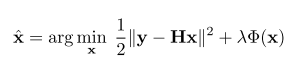
x: clean image

y: degraded image

H is a degradation matrix; v is additive white Gaussian noise of standard deviation σ

Types of H:

* H: identity matrix – image denoising
* H: blurring operator – image deblurring
* H: composite operator of blurring and down-sampling – super-resolution

From a Bayesian perspective, the solution x can be obtained by solving a Maximum A Posteriori (MAP) problem