CTF-DCT approach

- Let **I** be a digital image.
- Following the **JPEG pipeline**, **I** is divided into non-overlapping blocks of size **8x8**.
- The **Discrete Cosine Transform (DCT)** is then applied to each block, formally:

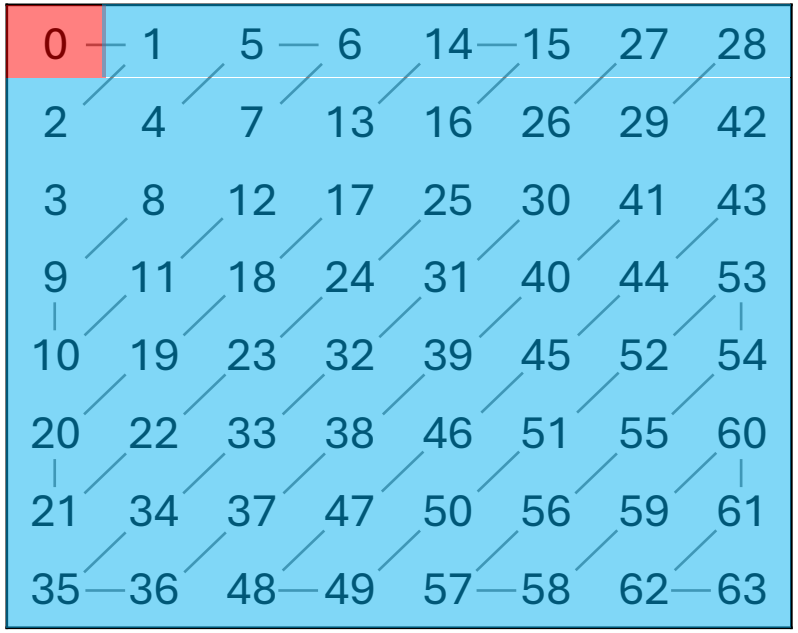
$$F[u,v] = \frac{1}{4} C(u) C(v) \left[\sum_{x=0}^{7} \sum_{y=0}^{7} I[x,y] \cos(a) \cos(b) \right]$$

where

$$a = \frac{(2x+1)u\pi}{16}, b = \frac{(2y+1)v\pi}{16}, C(u) = \begin{cases} \frac{1}{\sqrt{2}} & u = 0 \\ 1 & u > 0 \end{cases}, C(v) = \begin{cases} \frac{1}{\sqrt{2}} & v = 0 \\ 1 & v > 0 \end{cases}$$

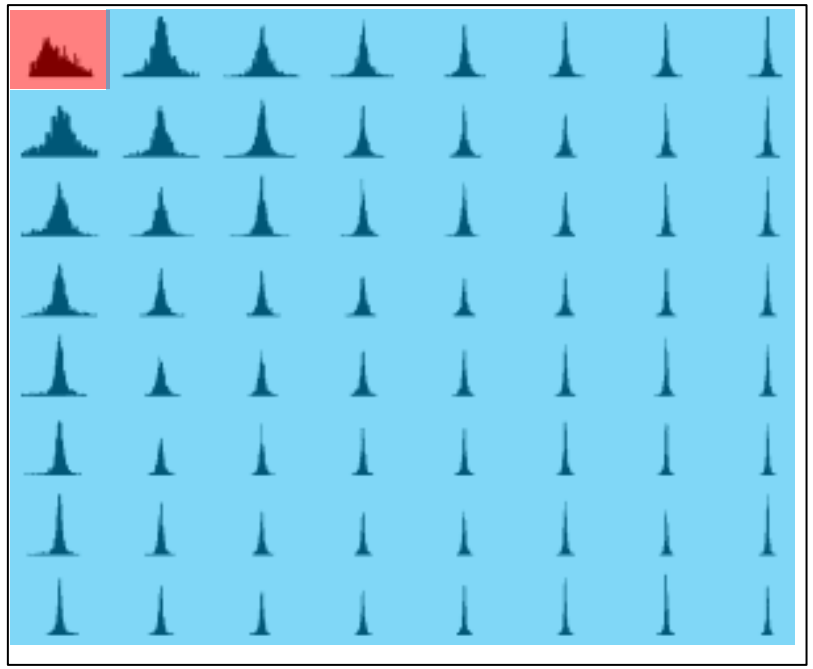
DCT

DC coefficient



AC coefficients

DC coefficient



AC coefficients

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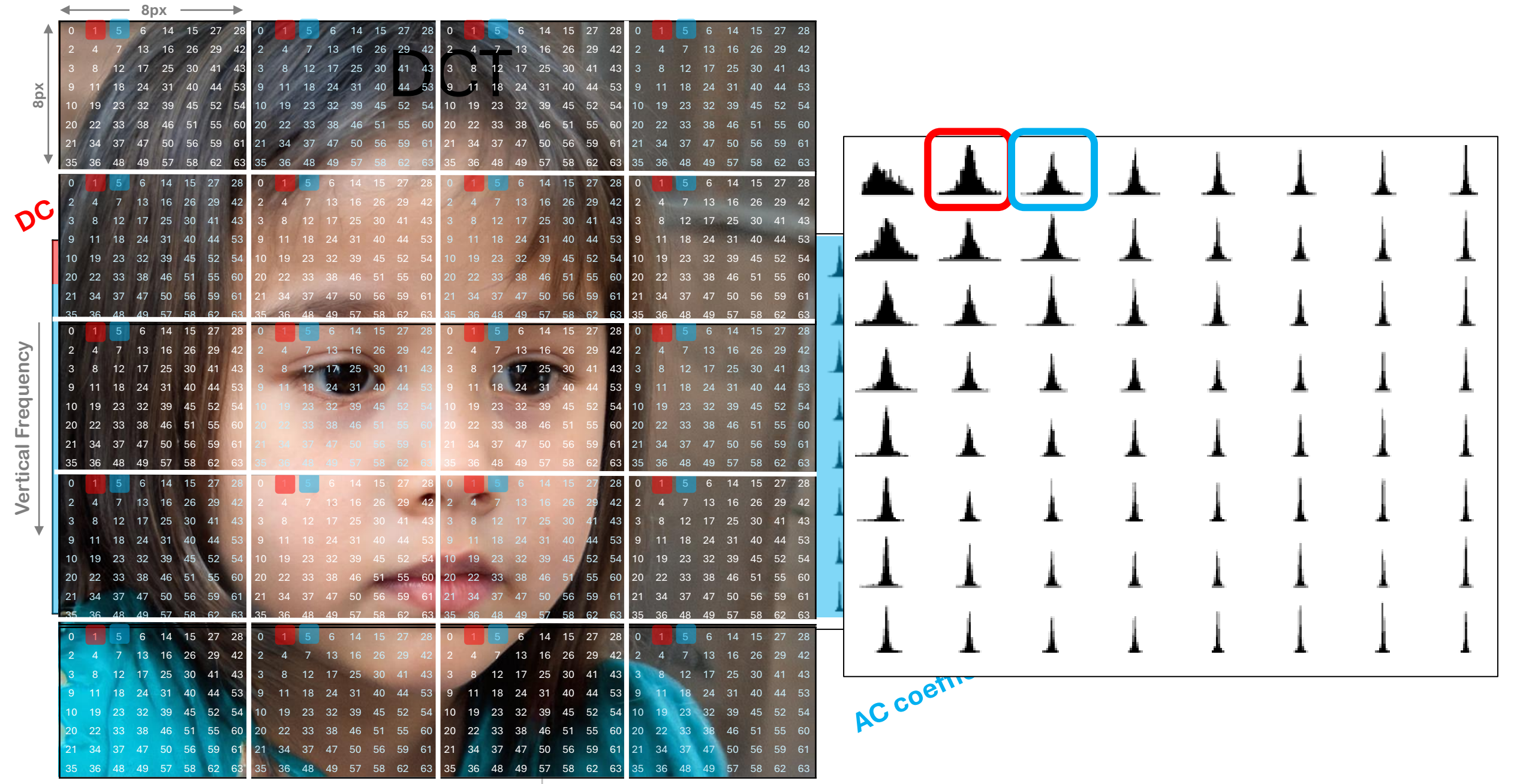

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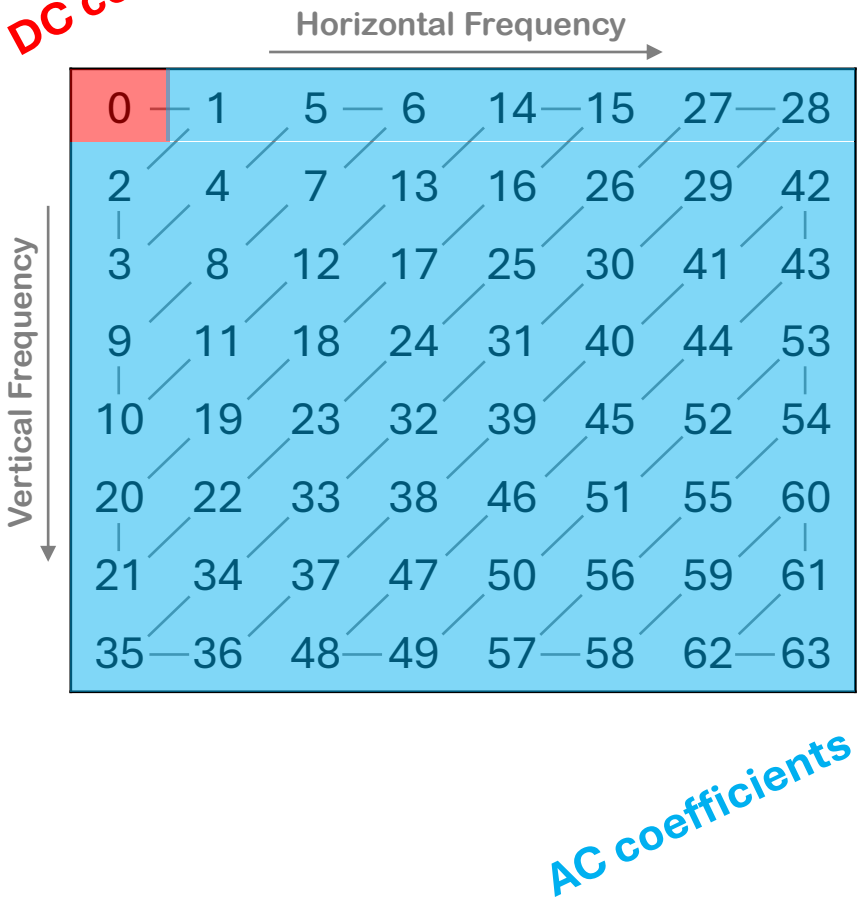
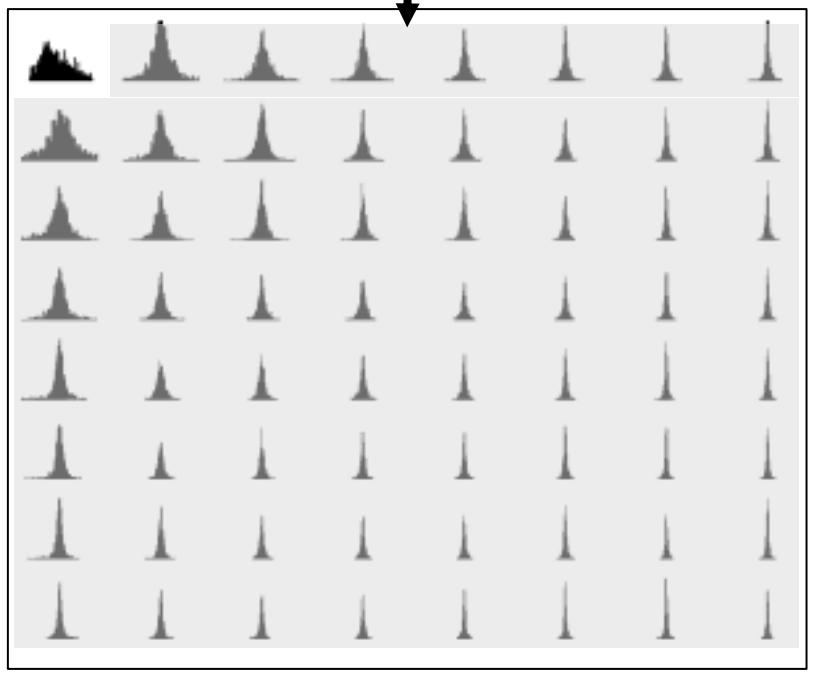
DCT

DC coefficient



AC coefficients

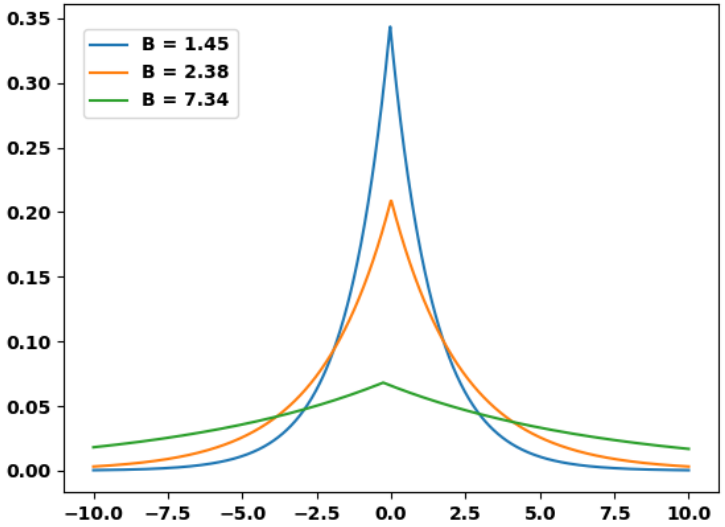


Lam, Edmund Y., and Joseph W. Goodman. "**A mathematical analysis of the DCT coefficient distributions for images**." *IEEE transactions on image processing* 9.10 (2000): 1661-1666.

Laplacian distribution

$$P(x) = \frac{1}{2\beta} exp\left(\frac{-|x-\mu|}{\beta}\right)$$

$$\beta = \frac{\sigma}{\sqrt{2}}$$



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