The total variation of a color image $\mathbf{X}$ can be expressed as

$$TV(\mathbf{X}) = \sum_{i,j \in \mathcal{N}} \|\mathbf{x}_i - \mathbf{x}_j\|_p^q$$

where $\mathcal{N}$ defines the pixel neighborhood (usually the horizontal and vertical adjacent pixels) and $\|\cdot\|_p^q$ is the ℓ_p norm to the power of q.

- Classical ℓ_1 TV computed independently on each color component.

$$\|\mathbf{x}\|_1 = \sum_k \|\mathbf{x}_k\|_1 \quad (p = 1, q = 1)$$

- ℓ_2 TV computes the Euclidean norm of the vector.

$$\|\mathbf{x}\|_2 = \left(\sum_k x_k^2 \right)^{\frac{1}{2}} \quad (p = 2, q = 1)$$

- Squared ℓ_2 TV computes the squared Euclidean norm of the vector.

$$\|\mathbf{x}\|_2 = \sum_k x_k^2 \quad (p = 2, q = 2)$$