

Format of Nanoscopy Data for Training of Neural Network

1. Nanoscopy data frame

A nanoscopy data frame consists of $K_r \times K_c$ pixels each of size $D \times D$ nm². Then a nanoscopy data frame represents the region of interest with size $(DK_r) \times (DK_c)$ nm². A pixel located at the i th row and j th column is denoted by (i, j) and its intensity is denoted by $I(i, j)$.

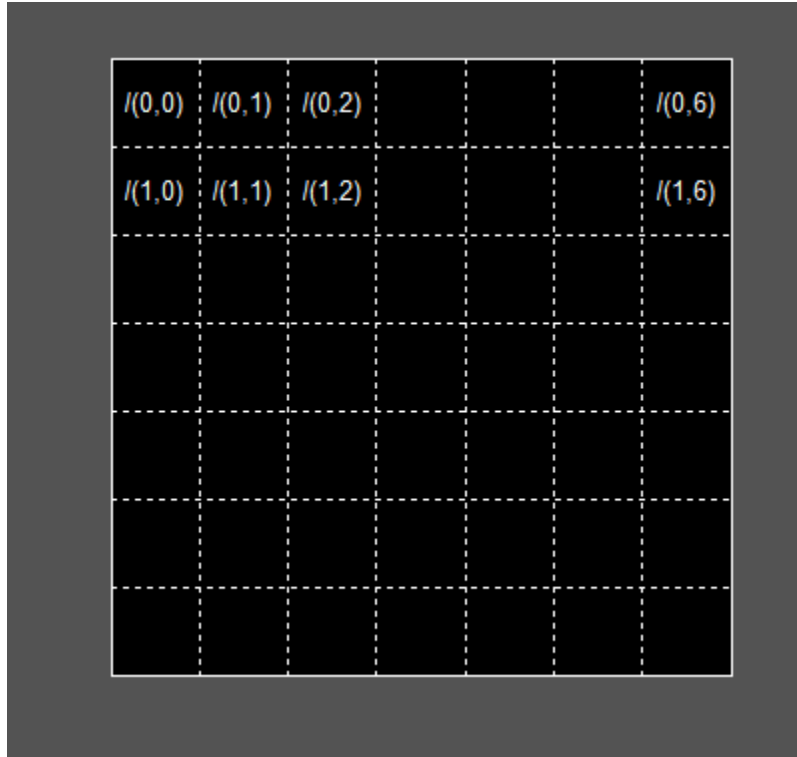


Figure 1 A bank data frame consists of $K_r \times K_c = 7 \times 7$ pixels of size $D = 100$ nm. The pixel indices (i, j) and pixel intensities $I(i, j)$ are indicated.

2. Fluorophore location

It is known that a single fluorophore is located in the central pixel of data frame. The pixel is partitioned into subpixels of size $R \times R$ where $h = D/R > 1$ is an integer. Hence, the pixel consists of $h \times h$ subpixels. R in nm is the desired spatial resolution in fluorophore localization. Let (i, j) denote the subpixel in the i th row and j th column $i, j = 0, 1, \dots, h - 1$.

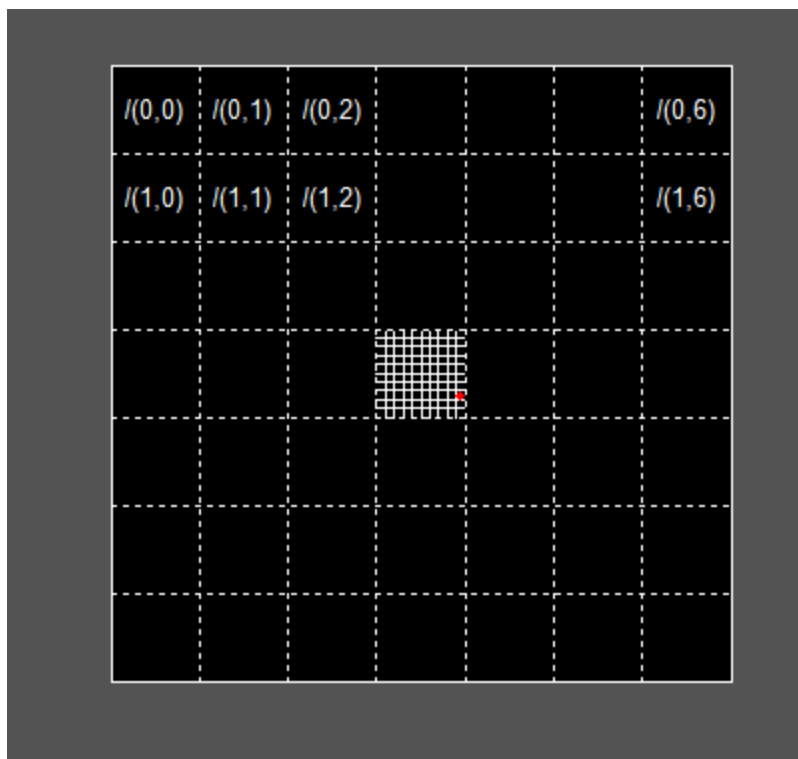


Figure 2 A fluorophore is located in the central pixel that consists of $h \times h = 10 \times 10$ subpixels of size $R \times R = 10 \times 10 \text{ nm}^2$.

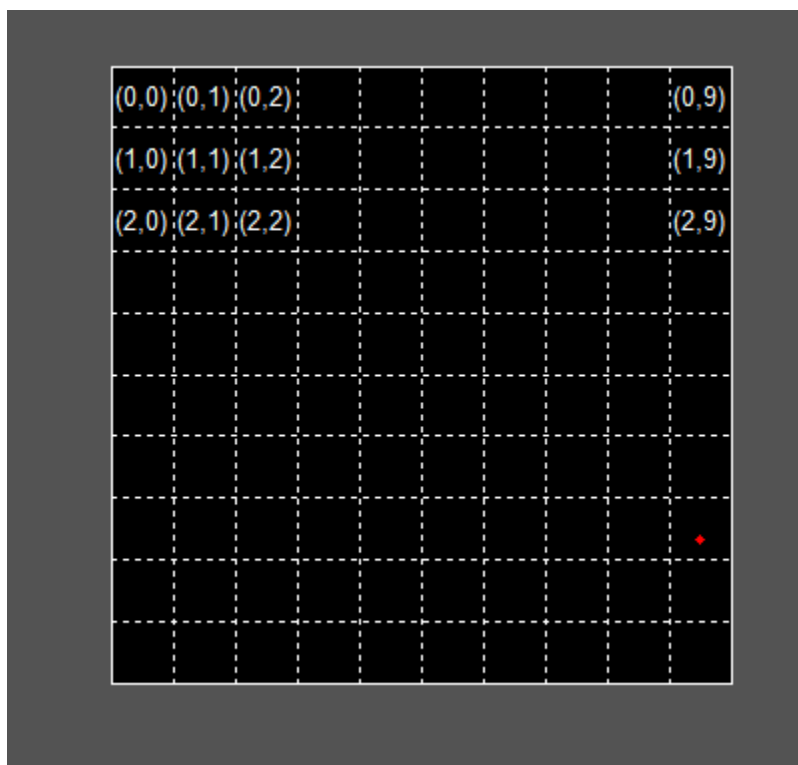


Figure 3 The central pixel of Fig. 2. The indices of subpixels are indicated. The fluorophore is located in the $(i, j) = (8, 10)$ th subpixel.

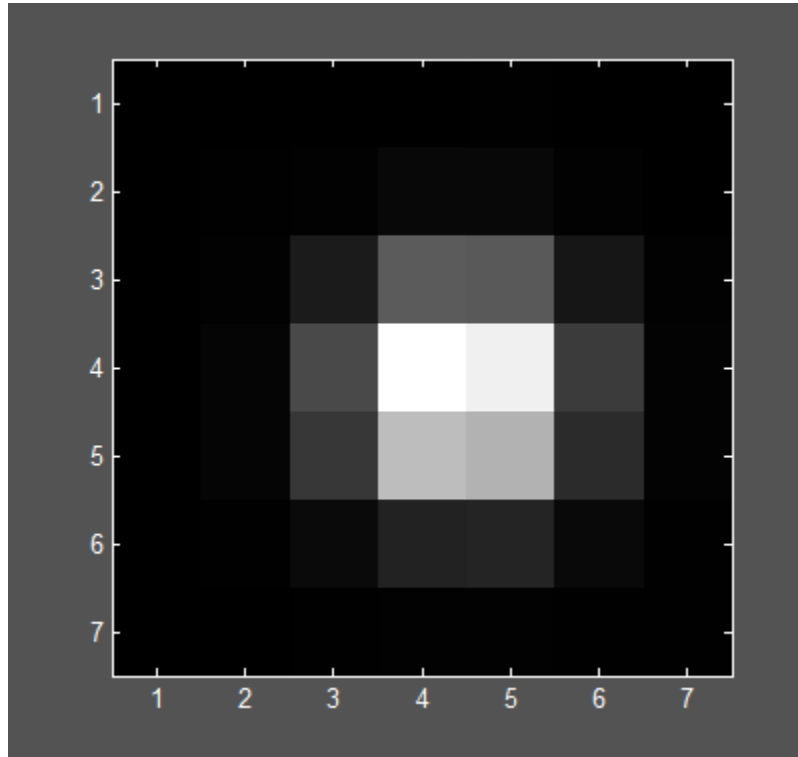


Figure 4 The noiseless data frame produced by the fluorophore in Fig. 2.

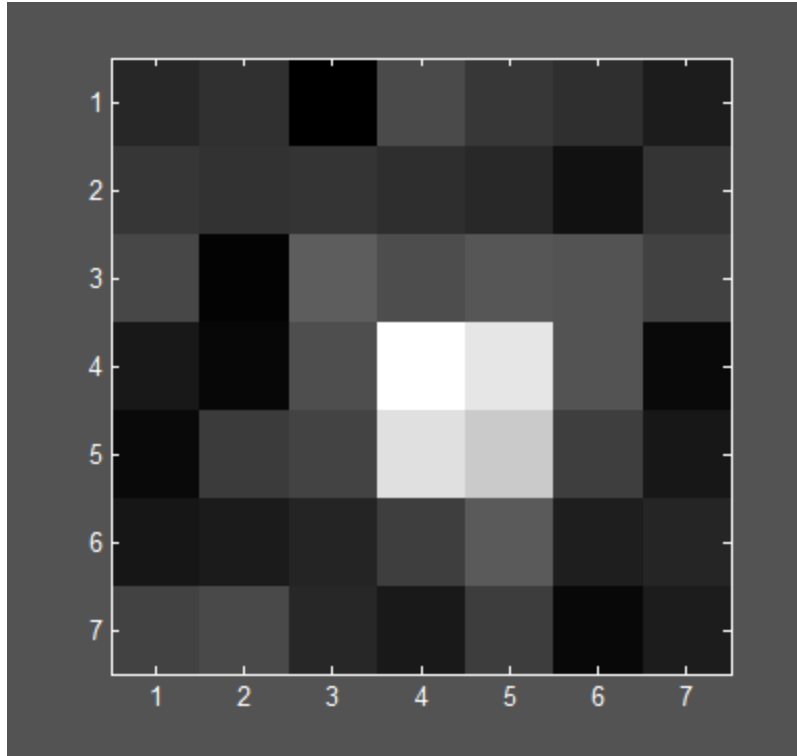


Figure 5 A noisy data frame produced by the fluorophore in Fig. 2.

3. Objective

It is known a priori that the fluorophore is located in the central pixel of a data frame but it is unknown in which subpixel the fluorophore is located. Given a noisy data frame like Fig. 5, the objective of fluorophore localization is to determine the subpixel where the fluorophore is located, see Fig. 3.

4. Format of training data

The training data will be written in a file of plain text. Each row gives information of one frame that includes the following numbers one by one separated by a space:

Fluorophore location		Pixel intensity of a data frame			
Row	Column	1st row	2nd row	Last row
i	j	$I(0,0) \dots I(0,6)$	$I(1,0) \dots I(1,6)$	$I(6,0) \dots I(6,6)$