1. Suppose we have taken an image I using a camera with the intrinsic matrix K.

$$K = \begin{bmatrix} f_u & s & u \\ 0 & f_v & v \\ 0 & 0 & 1 \end{bmatrix}$$

We assume the pixel coordinate are defined in the row-column system, i.e., a pixel (u, v) is located at the u-th row and the v-th column of I.
Let's crop a rectangle region J in the image I, where the left-upper corner of J is at $\begin{Bmatrix} u_1 \\ v_1 \end{Bmatrix}$ and the lower-right corner of J is at $\begin{Bmatrix} u_2 \\ v_2 \end{Bmatrix}$. We can treat J as an image. Then, what is the (equivalent) intrinsic matrix of J?

2. SuperPoint is a deep learning approach that finds keypoints (interesting points) in an image. It uses a tensor of downsized map (W/8 and H/8) with 65 channels to encode the keypoints, instead of using deconvolution layers and a binary mask of the original image size to represent the keypoints.
    Question: Explain the advantage of such a design.