Solution 1:

As x_{status} is a categorical feature, the gower distance is suited as a distance measure:

$$d_{gower}(\mathbf{x}, \tilde{\mathbf{x}}) = \frac{\sum\limits_{j=1}^{p} \delta_{x_j, \tilde{x}_j} \cdot d_{gower}(x_j, \tilde{x}_j)}{\sum\limits_{j=1}^{p} \delta_{x_j, \tilde{x}_j}}$$

Gower distance for $\mathbf{x}^*$ and $\mathbf{x}^{(1)} = (-2,\ -1,\ married)$:

$$d_{gower}(\mathbf{x}^*, \mathbf{x}^{(1)}) = \frac{1 \cdot \frac{|-2-0|}{|-2-2|} + 1 \cdot \frac{|-1-0|}{|-1-2|} + 1 \cdot 1}{1+1+1} = \frac{\frac{2}{4} + \frac{1}{3} + 1}{3} = 0.611$$

Gower distance for $\mathbf{x}^*$ and $\mathbf{x}^{(2)} = (1,\ 0,\ divorced)$:

$$d_{gower}(\mathbf{x}^*, \mathbf{x}^{(2)}) = \frac{1 \cdot \frac{|1-0|}{|-2-2|} + 1 \cdot \frac{|0-0|}{|-1-2|} + 1 \cdot 1}{1+1+1} = \frac{\frac{1}{4} + \frac{0}{3} + 1}{3} = 0.417$$

Gower distance for $\mathbf{x}^*$ and $\mathbf{x}^{(3)} = (2,\ 2,\ single)$:

$$d_{gower}(\mathbf{x}^*, \mathbf{x}^{(3)}) = \frac{1 \cdot \frac{|2-0|}{|-2-2|} + 1 \cdot \frac{|2-0|}{|-1-2|} + 1 \cdot 0}{1+1+1} = \frac{\frac{2}{4} + \frac{2}{3} + 0}{3} = 0.389$$

Therefore, the 1-neighborhood $N_1(\mathbf{x}^*)$ of the red point $\mathbf{x}^*$ is the point $\mathbf{x}^{(3)}$, which is the observation with the lowest gower distance.