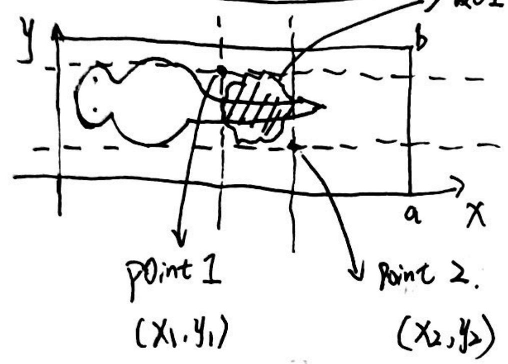
~~How to quantificatio~~

Step ① $\boxed{\text{Collecting data}}$

Grad-CAM heligt space.

→ ROI (Reijon of interested)



In the task of objection Detection, we can use a vector $\vec{p} = \begin{bmatrix} x_1 \\ y_1 \\ x_2 \\ y_2 \end{bmatrix}$ to represent the information of RoI. In this task, we can also use it.

$$E(\vec{p}) = \vec{\mu}, \quad Var(\vec{p}) = \Sigma, \quad \vec{p} \sim f(\vec{\mu}, \Sigma)$$

we dont know the distribution of $\vec{p}$ but we can say it is not normal distribution. This is because: $x \sim uniform(0, a)$, $y \sim uniform(0, b)$, $x \perp\!\!\!\perp y$. So, the combination of x, y can't be multivariate normal distribution, so, we can't use Hotelling's T^2 testing

our final sample matrix

correct classified

$$\begin{bmatrix} x_{11} & y_{11} & x_{21} & y_{21} \\ x_{12} & y_{12} & x_{22} & y_{22} \\ \vdots & & \ddots & \vdots \\ x_{1n} & y_{1n} & x_{2n} & y_{2n} \end{bmatrix} n \times 4 \text{ matrix}$$

incorrect classified.

$$\begin{bmatrix} x_{11} & y_{11} & x_{21} & y_{21} \\ \vdots & \vdots & \vdots & \vdots \\ x_{1m} & y_{1m} & x_{2m} & y_{2m} \end{bmatrix} m \times 4 \text{ matrix.}$$

Step ② Statistical testing:

a. Hotelling's T^2 testing ⊗, Not normal distribution

b. MANOVA ⊗, Not normal distribution and it is not suit for dependent variable.

c. Kruskal-Wallis test ✓, but it can only be used on one dimension variable.

we can't use KW test on one dimension of sample matrix directly, this is because one dimension of original sample matrix only represent partial information of ROI, it does't contain any information of other part of ROI. So, only testing on one dimension is useless. But we can test on the linear combination of x_1, y_1, x_2, y_2.

$$\cancel{Y = \mu_1 \cdot x_1 + \mu_2 \cdot y_1 + \mu_3 \cdot x_2 +}$$

$$Y = z_1 \cdot x_1 + z_2 \cdot y_1 + z_3 \cdot x_2 + z_4 \cdot y_2 = \vec{z}^T \cdot \vec{p}$$

So, How to find the linear combination is the key. PCA can help us.

$$\begin{bmatrix} x_{11} & y_{11} & x_{21} & y_{21} \\ \vdots & \vdots & \vdots & \vdots \\ x_{1n} & y_{1n} & x_{2n} & y_{2n} \end{bmatrix} \xrightarrow{PCA} \begin{bmatrix} Y_{11} & Y_{12} & Y_{13} & Y_{14} \\ \vdots & \vdots & \vdots & \vdots \\ Y_{n1} & Y_{n2} & Y_{n3} & Y_{n4} \end{bmatrix}$$

KW test$_1$ KW test$_2$ KW test$_3$ KW test$_4$

→ P-value: P_1, P_2, P_3, P_4.

Use weighted Bonferroni procedure to control the FDR.

$P_{min} = \min\{P_1, P_2, P_3, P_4\}$ if $P_{min} <$ Thresholded we can conclude that it is different.

Scanned with CamScanner