

**Definition 10.27** Let

The mutual information between  $X$  and  $Y$  given  $T$  is defined as

$$I(X; Y|T) = \int_{\mathcal{S}_T} I(X; Y|T = t) dF(t) = E \log \frac{f(Y|X, T)}{f(Y|T)}$$

where

$$I(X; Y|T = t) = \int_{\mathcal{S}_X(t)} \int_{\mathcal{S}_Y(x, t)} f(y|x, t) \log \frac{f(y|x, t)}{f(y|t)} dy dF(x|t).$$