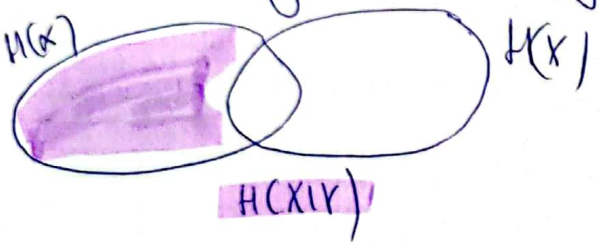
Q4 Explain the properties of entropy on the examples of conditional entropy $H(X|Y)$ and joint entropy $H(X,Y)$. Use venne diagrams.

- Entropy $H(X) = -\sum_{x \in X} p(x) \log p(x)$
- CE $H(X|Y) = \sum_{y \in Y} p(y) H(X|Y=y)$

$$= -\sum_{y \in Y} \sum_{x \in X} p(x,y) \log p(x|y)$$

Conditioning means adding some known information ⇒ reduce entropy

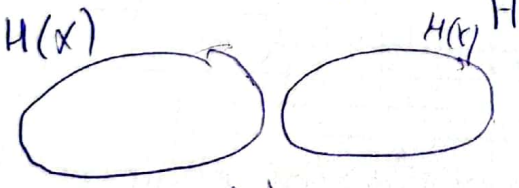


Not symetric
$H(X|Y) \neq H(Y|X)$

- JE : $H(X,Y) = -\sum_{x \in X} \sum_{y \in Y} p(x,y) \log_2 (p(x,y)) = -E[\log(p(x,y))]$

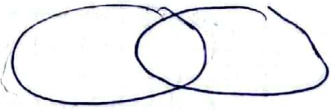
Increase of entropy by adding randomness.

symetrice



best case

$H(X,Y) \leq H(X,Y,Z)$



check QLETI if needed