Almustaqbal University
Engineering And Technical Engineering
Computer Techniques Engineering Department

Information Theory Laboratory

Class :- 4^{th}

Lectuer 5

Marginal and Joint entropies

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Experiment No. 1 “Marginal and Joint entropies”

This experiment aims to understand how to calculate the amount of information when we have **two random variables** that occur together **(X and Y)**.

We use a **joint probability matrix** to determine the probability of each pair **(Xi , Yj),** and from this matrix we extract:

- **Marginal probabilities** for each variable independently **(p(X)** and **p(Y))** by summing the rows and columns.
- **Marginal entropies** for each variable, which represent the amount of information in **X** alone and in **Y** alone.
- **Joint entropy H(X,Y),** which represents the total amount of information contained in the two variables when they occur together.

Experiment No. 1 “Marginal and Joint entropies”

Objective :-

This experiment aims to calculate the joint entropy and the marginal entropies of two random variables using their joint probability matrix, in order to understand the amount of information in each variable individually and in both variables together, as well as to determine how their relationship affects the overall uncertainty in the system.

Experiment No. 1 “Marginal and Joint entropies”

MATLAB Code

```
pxy=[0.1 0.15 0.05 ;0.2 0.07 0.08 ;0.01 0.04 0.3];
py=sum(pxy);
hy=0;
for i=1:3
hy=hy+(-py(i)*log2(py(i)));
end
hy
px=sum(pxy,2);
hx=0;
for i=1:3
hx=hx+(-px(i)*log2(px(i)));
end
hx
hxy=0;
for i=1:3
for j=1:3
hxy=hxy+(-pxy(i,j)*log2(pxy(i,j)));
end
end
hxy
```

Result

hy = 1.5526

hx = 1.5813

hxy = 2.7566