Almustaqbal University
Engineering And Technical Engineering
Computer Techniques Engineering Department

Information Theory Laboratory

Class :- 4^{th}

Lectuer 1

Self Information

By

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Experiment No. 1 "Self Information "

The experiment discusses the concept known as **"Self Information"**, which is a mathematical measure that expresses the **amount of information or surprise** obtained when a particular **event occurs**.

$$\mathbf{I}(x_i) = -\log(P_{xi})$$

where:-

- $\mathbf{I}(x_i)$: represents the self-information of the event x_i.
- P_{xi} : is the probability of that event.
- The **negative sign** ensures that the result is always **positive** since $\log(P_{xi})$ is **negative** for probabilities **less than 1.**

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Procedure:

- Input the following non-equiprobability vector. **P=[0.04, 0.01, 0.10, 0.15, 0.05, 0.07, 0.08, 0.11, 0.09, 0.27, 0.03]**
- Arrange the probability vector upward by using the **code Sort**. " **px = sort(px);** "
- Create an empty vector: Initialize an empty vector **m** to store the calculated self-information values. " **m = [ ];** "
- Find the length of the probability vector:Determine how many probability values are in the vector. **n = length(px);**
- Calculate the self-information for each event using a loop: **I(x_i)= - log(P_{xi})**

```
for i = 1:n
  Ix = -log(px(i));
   m(i) = Ix;
end
```

- Display the result:Print the calculated self-information values. **" m "**
- Plot the relationship between probability and self-information:

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- Plot the relationship between probability and self-information:

```
plot(px, m);
xlabel('P');
ylabel('I(x)');
title('Relationship between Probability and Self-Information');
grid on;
```

MATLAB code

```
clc;
clear all;
px=[0.04 0.01 0.1 0.15 0.05 0.07 0.08 0.11 0.09 0.27 0.03];
px=sort(px);
m=[];
n=length(px);
for i = 1:n
Ix = -log(px(i));
m(i) = Ix;
end
m
plot(px, m)
xlabel('Probability');
ylabel('Self information');
grid on
```

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Result

m = 4.6052 3.5066 3.2189 2.9957 2.6593 2.5257 2.4079 2.3026 2.2073 1.8971 1.3093