EXP5- Entropy

```
k = 10;
n = 100;
x = ceil(k*rand(1,n));
y = ceil(k*rand(1,n));

function z = entropy(x)
n = numel(x);
[u,~,x] = unique(x);
k = numel(u);
idx = 1:n;
Mx = sparse(idx,x,1,n,k,n);
Px = nonzeros(mean(Mx,1));
Hx = -dot(Px,log2(Px));
z = max(0,Hx);
end
Hx = entropy(x)
Hy = entropy(y)
```

JOINT ENTROPY

```
function z = jointEntropy(x, y)
assert(numel(x) == numel(y));
n = numel(x);
x = reshape(x,1,n);
y = reshape(y,1,n);
l = min(min(x),min(y));
x = x-l+1;
y = y-l+1;
k = max(max(x),max(y));
idx = 1:n;
p = nonzeros(sparse(idx,x,1,n,k,n)'*sparse(idx,y,1,n,k,n)/n);
z = -dot(p,log2(p));
z = max(0,z);
end
Hxy = jointEntropy(x,y)
```

CONDITIONAL ENTROPY

```
function z = condEntropy(x, y)
assert(numel(x) == numel(y));
n = numel(x);
x = reshape(x,1,n);
y = reshape(y,1,n);
l = min(min(x),min(y));
x = x-l+1;
y = y-l+1;
k = max(max(x),max(y));
idx = 1:n;
Mx = sparse(idx,x,1,n,k,n);
My = sparse(idx,y,1,n,k,n);
Pxy = nonzeros(Mx'*My/n);
Hxy = -dot(Pxy,log2(Pxy));
Py = nonzeros(mean(My,1));
Hy = -dot(Py,log2(Py));
z = Hxy-Hy;
z = max(0,z);
end
Hx_y = condEntropy(x,y)
```

MUTUAL INFORMATION

```
function z = mutInfo(x, y)
assert(numel(x) == numel(y));
n = numel(x);
x = reshape(x,1,n);
y = reshape(y,1,n);
l = min(min(x),min(y));
x = x-l+1;
y = y-l+1;
k = max(max(x),max(y));
idx = 1:n;
Mx = sparse(idx,x,1,n,k,n);
My = sparse(idx,y,1,n,k,n);
Pxy = nonzeros(Mx'*My/n);
Hxy = -dot(Pxy,log2(Pxy));
Px = nonzeros(mean(Mx,1));
Py = nonzeros(mean(My,1));
```

```
Hx = -dot(Px,log2(Px));
Hy = -dot(Py,log2(Py));
z = Hx+Hy-Hxy;
z = max(0,z);
end
Ixy = mutInfo(x,y)
```