

LA_RubanrajRavichandran_180417_02_Exercise3_MaxL

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GIVEN: Samples 0,1,0,0,1,0 from a binomial distribution which has the form: $P(x=0)=(1-\mu)$, $P(x=1)=\mu$

REQUESTED: What is the maximum likelihood estimate of μ Hint: you can use SymPy to compute the derivatives symbolically

```
In [2]: import sympy as sp
        sp.init_printing("use=latex")

In [3]: # initializing symbols
        x,p,n = sp.symbols("x,p,n")

In [4]: #likelihood function
        log_likelihood = (x*sp.log(p)) + ((n-x)*sp.log(1-p))
        log_likelihood
```

Out[4]:

$$x \log(p) + (n - x) \log(-p + 1)$$

```
In [4]: # likelihood diff
        diff_logL = log_likelihood.diff(p)
        diff_logL
```

Out[4]:

$$-\frac{n - x}{-p + 1} + \frac{x}{p}$$

```
In [9]: mu = sp.solve(diff_logL,p)
        mu = mu[0]
        mu
```

Out [9] :

$$\frac{x}{n}$$

```
In [11]: #P(x=0)
mu.subs([(x,4),(n,6)])
```

Out [11] :

$$\frac{2}{3}$$

$$P(x=0) = 1 - \mu = 1 - (4/6) = 2/3$$

```
In [13]: #P(x=1)
mu.subs([(x,2),(n,6)])
```

Out [13] :

$$\frac{1}{3}$$

$$P(x=1) = \mu = 2/6 = 1/3$$