EM_Algorithm

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6.6.4

Intital theta

Part A

```
X <- rep(0,4)
X[1] = 125
X[2] = 18
X[3] = 20
X[4] = 34

n = sum(X)
# theta_0 = (x1-x2-x3+x4)/n
theta_0 = (X[1] - X[2] -X[3] +X[4])/n

cat("Initial estimate:", theta_0)
```

```
## Initial estimate: 0.6142132
```

Part B

```
theta <- rep(0,5)

theta[1] <- theta_0

for (i in 1:4){
  theta[i+1] = (X[1]*theta[i] + 2*X[4] + X[4]*theta[i])/
    (n*theta[i] + 2*(X[2]+X[3]+X[4]))
}

theta
```

```
## [1] 0.6142132 0.6251317 0.6265968 0.6267917 0.6268175
```

```
cat("Here we can see sequence of estimates theta is getting converge")
```

```
## Here we can see sequence of estimates theta is getting converge
```

Part C

```
## MLE = (x1+x2+x3+x4)*theta^2 - (x1-2x2-2x3-x4)*theta - 2x4


quad <- function(a, b, c)
{
  a <- as.complex(a)
  answer <- c((-b + sqrt(b^2 - 4 * a * c)) / (2 * a),
              (-b - sqrt(b^2 - 4 * a * c)) / (2 * a))
  if(all(Im(answer) == 0)) answer <- Re(answer)
  if(answer[1] == answer[2]) return(answer[1])
  answer
}


root <- quad(a = 197, b= -15, c = -68)
cat("Positive root:", root[1])
```

```
## Positive root: 0.6268215
```

```
cat(" \n We can see the positive root of this quadratic equation is same with roundoff error to
 MLE (theta)")
```

```
##
##  We can see the positive root of this quadratic equation is same with roundoff error to MLE
(theta)
```