Likelihood under JC69 model

The probability of substitution for each pair under JC69 model is 1/4

We assume branch length is =μt

The substitution is Poisson distribution, when there is no substitution, we have probability:

*P* (x=0) =

So, the probability of at least one substitution is

*P* (at least one substitution) =

The probability of nucleotide end in different stat at time t is:

*P* (substitution in different stats) =

For each specific different stat, like A mutate to G, the probability is:

*P* (substitution in one different stats) =

The probability of no substitution or with substitution to same stat at time t:

*P* (same stat) =

Thus, the probability matrix will be like the following:

*P*(t)=