$$E[N_t] = N_o e^{(b-d)t}$$

$$\Pr[(k,n-k)] = \begin{cases} \dfrac{2}{n-1} & k \neq n-k \\[2ex] \dfrac{1}{n-1} & k = n-k \end{cases}$$

$$I_c = \frac{\sum_{\text{(all interior nodes)}} |\, T_R - T_L \,|}{\boxed{\dfrac{(n-1)(n-2)}{2}}},$$

likelihood = P[tree | λ] = $e^{-n\lambda x_n} \prod_{i=2}^{n-1} i\lambda e^{-i\lambda x_i} = (n-1)!\,\lambda^{n-2} e^{-\lambda s}$

$$s = \sum_{i=2}^{n-1} i x_i$$

AIC = 2 k - 2 ln L $\quad AICc = AIC + \dfrac{2k(k+1)}{n-k-1}.$

$$\gamma = \frac{\left(\frac{1}{n-2}\sum_{i=2}^{n-1}\left(\sum_{k=2}^{i} k g_k\right)\right) - \left(\frac{T}{2}\right)}{T\sqrt{\frac{1}{12(n-2)}}},\ T = \left(\sum_{j=2}^{n} j g_j\right).$$

$$W(t) \sim N(W(0), \sigma^2 t)$$

var(i) = $\sigma^2(d_i)$; d_i =distance from root to tip i

cov(i,j) = $\sigma^2(c_{i,j})$; $c_{i,j}$ =shared path of tip i and j

$$\hat{\sigma}^2 = \frac{(\mathbf{x} - \hat{a}\mathbf{1})'\mathbf{C}^{-1}(\mathbf{x} - \hat{a}\mathbf{1})}{n}$$

$$\hat{\mathbf{a}} = [(\mathbf{1}'\mathbf{C}^{-1}\mathbf{1})^{-1}(\mathbf{1}'\mathbf{C}^{-1}\mathbf{X})]'$$

$$V = R \otimes C$$

$$Q = \alpha \begin{bmatrix} 1-k & 1 & \dots & 1 \\ 1 & 1-k & \dots & 1 \\ \vdots & \vdots & \ddots & \vdots \\ 1 & 1 & \dots & 1-k \end{bmatrix}$$

$$L_{(\tau)} = \sum_{r=1}^{k^{n-1}} \Pr(R_r | \tau)$$

$$\Pr[y = x] = \frac{1}{\sigma\sqrt{2\pi t}} \exp\left(-\frac{(x-\theta)^2}{2\sigma^2 t}\right)$$