



Introduction to the Lander-Green Algorithm

Biostatistics 666



Overall Pedigree Likelihood

$$L = \sum_{G_1} \dots \sum_{G_n} \prod_i P(X_i | G_i) \prod_{founder} P(G_{founder}) \prod_{\{o, f, m\}} P(G_o | G_f, G_m)$$

- Computation rises exponentially with #people
- Computation rises exponentially with #markers
 - G – genotypes, X – Phenotypes
 - Iterations are over everyone (*i*), founders (*founder*), or offspring, father, mother trios $\{o, f, m\}$



Elston-Stewart Algorithm

- Calculate conditional probability for sections of pedigree:

$$H_{connector}(G_{connector}) = \sum_{G_{spouse}} P(X_{spouse} | G_{spouse}) P(G_{spouse}) \prod_o \sum_{G_o} P(X_o | G_o) P(G_o | G_{connector}, G_{spouse}) H_o(G_o)$$

- For persons with no descendants, or leafs:

$$H_{leaf}(G_{leaf}) = 1$$