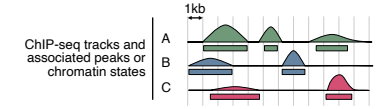
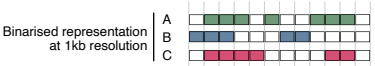
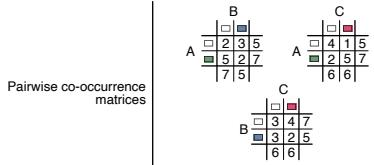






Marginal and joint entropies (H)

$H(...) = -\sum p \log(p)$

$H(A) = -\left(\frac{5}{12}\log\frac{5}{12} + \frac{7}{12}\log\frac{7}{12}\right) \approx 0.68$

$H(B) = -\left(\frac{7}{12}\log\frac{7}{12} + \frac{5}{12}\log\frac{5}{12}\right) \approx 0.68$

$H(C) = -\left(\frac{6}{12}\log\frac{6}{12} + \frac{6}{12}\log\frac{6}{12}\right) \approx 0.69$

$H(A,B) = -\left(\frac{2}{12}\log\frac{2}{12} + \frac{3}{12}\log\frac{3}{12} + \frac{5}{12}\log\frac{5}{12} + \frac{2}{12}\log\frac{2}{12}\right)$

≈ 1.31

$H(A,C) \approx 1.24$

$H(B,C) \approx 1.36$

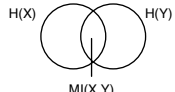
Mutual Information (MI)

$MI(X,Y) = H(X) + H(Y) - H(X,Y)$

$MI(A,B) \approx 0.68 + 0.68 - 1.31 = 0.05$

$MI(A,C) \approx 0.68 + 0.69 - 1.24 = 0.13$

$MI(B,C) \approx 0.68 + 0.69 - 1.36 = 0.01$



Uncertainty Coefficient (U), Normalised MI

$U(X,Y) = MI(X,Y)/H(X)$

$U(A,B) = 0.05/0.68 = 0.074$ $\quad U(B,A) = 0.05/0.68 = 0.074$

$U(A,C) = 0.13/0.68 = 0.191$ $\quad U(C,A) = 0.13/0.69 = 0.188$

$U(B,C) = 0.01/0.68 = 0.015$ $\quad U(C,B) = 0.01/0.69 = 0.014$

Convention:
fraction of entropy of protein ChIP-seq explained by chromatin feature

$$U(\text{protein,feature}) = \frac{MI(\text{protein, feature})}{H(\text{protein})}$$