

## Stat 342 Example 13

Suppose  $X_1, X_2, \dots, X_n$  are iid Bernoulli ( $p$ ). The mgf of any one of these is

$$E \exp(tX_1) = p \exp(t) + (1-p)$$

Then  $Y = X_1 + X_2 + \dots + X_n$  is Binomial ( $n, p$ ). So the Binomial ( $n, p$ ) mgf is

$$\begin{aligned} E \exp(tY) &= E \exp(tX_1) \exp(tX_2) \dots \exp(tX_n) \\ \text{independence} &\Rightarrow E \exp(tX_1) E \exp(tX_2) \dots E \exp(tX_n) \\ &= (p \exp(t) + (1-p)) (p \exp(t) + (1-p)) \dots \\ &\quad (p \exp(t) + (1-p)) \\ &= (p \exp(t) + (1-p))^n \end{aligned}$$