ECE 4110/5110 Monday, 10/02/23

Lecture 12: Branching Processes

Dr. Kevin Tang Handout 13

Related Reading

Grimmett and Stirzaker Section 5.4

Let X_n be the number of members of the nth generation, and $G_{X_n}(s)$ be its moment generating function.

Distribution of X_n

$$G_{X_n}(s) = G_{X_1}(G_{X_{n-1}}(s)) = G_{X_1}(G_{X_1}(\dots G_{X_1}(s)\dots)) \tag{1}$$

With $G_{X_n}(s)$, we in principle knows everything about X_n and can certainly compute its moments.

Extinction Probability

$$\pi_0 = \lim_{n\to\infty} P(X_n = 0|X_0 = 1) \tag{2}$$

π_0 is the smallest nonnegative solution to the following equation

$$\pi_0 = \sum_{k=0}^{\infty} \pi_0^k P(X_1 = k) \tag{3}$$