# Idea 1: Varying $\theta_{Frogs}$

Frogs

November 13, 2024

## 1 Modelling and Data

### 1.1 Modelling

- $\theta_{Frogs}^{(0)} \sim \text{Po}(\lambda)$: initial number of frogs

- $\theta_{Frogs}^{(t)} = \theta_{Frogs}^{(t-1)} + R^{(t)}$: number of frogs at time $t$, $R^{(t)} \sim F_r$ is a random variable, can be Geometric, Possion, etc, with parameter $r$

- $\theta_{Love} \sim \text{Geo}(p)$: true love (0 means don't want love, 1 means congwen, rest means frog number $\theta_{Love}$)

- $\theta_p = \theta_3 \sim \text{U}(0,1)$: $\Pr(\text{reply}|\text{is true love})$

- Each Frogs have probability $p_{send}$ to send letter, and they will only send one letter

- Congwen will send a letter in sats and suns

### 1.2 Data

- $t = 0, \ldots, T$: time $t$

- $m_t \geq 0$: number of letters from congwen at time $t$

- $n_t \geq 0$: number of letters from other frogs at time $t$

- $Z_1, Z_2, \ldots, Z_{m_t} \in \{0,1\}$: whether the congwen's letter is replied

- $X_1, X_2, \ldots, X_{n_t} \in \{0,1\}$: whether the other frog's letter is replied