

URM-NSF Comp. Bio.

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Fall 2014

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NSF for funding this research*

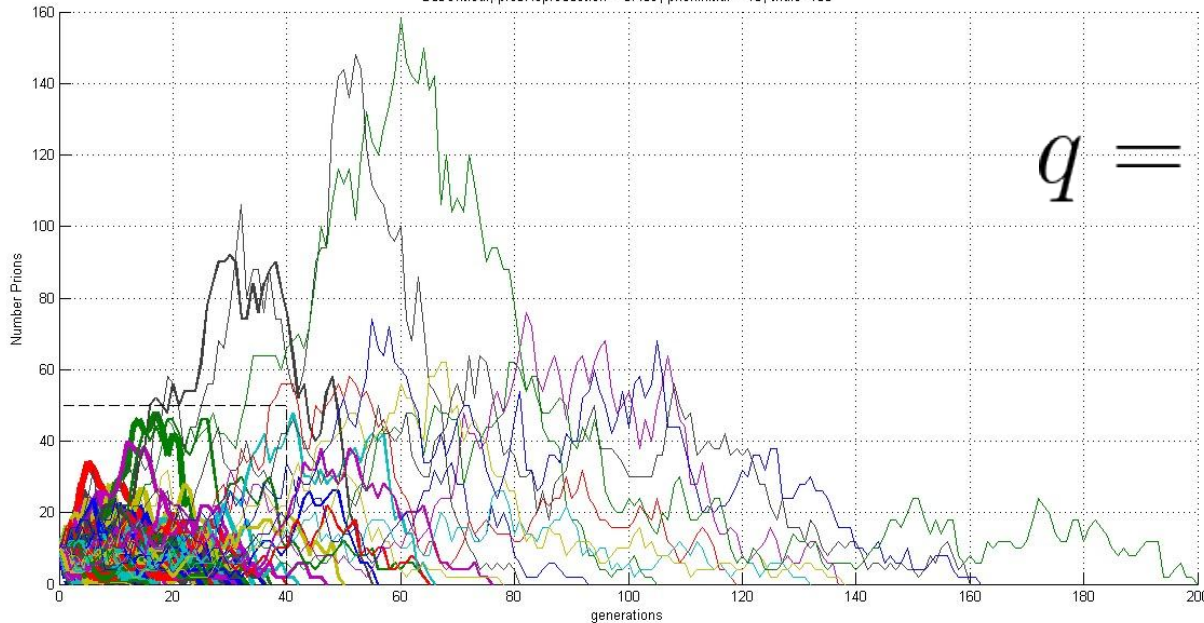
Corollary 4.1 Branching Process | 0.449, 0.437

$$m = f'(t) = d/dt \sum a_n t^n$$

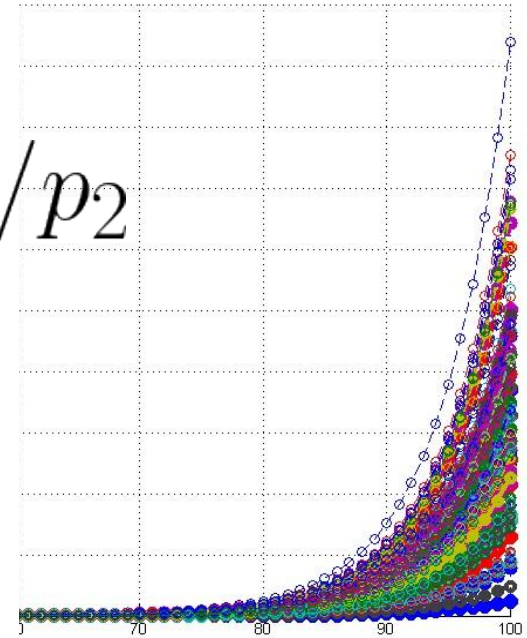
$\times 10^9$

Super Critical, probReproduction = 0.6, prionInitial = 10, trials=100

SubCritical, probReproduction = 0.489, prionInitial = 10, trials=100

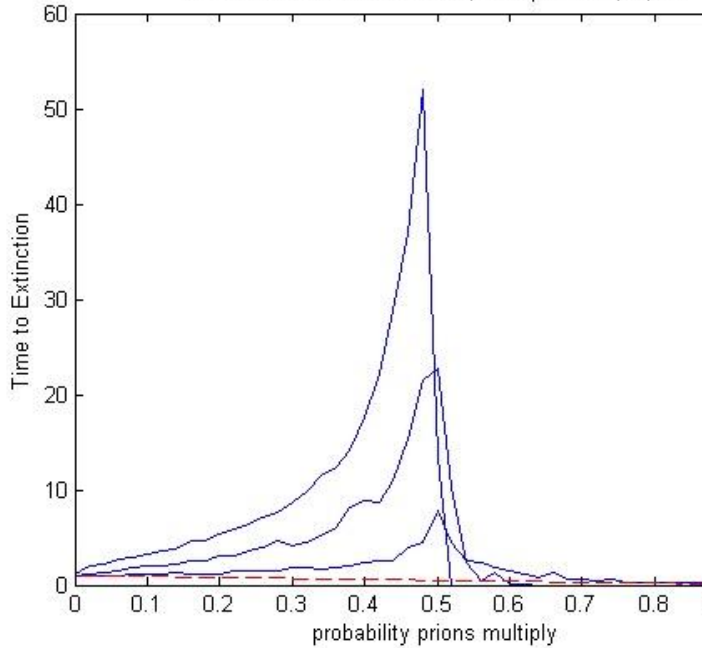


$$q = p_0 / p_2$$

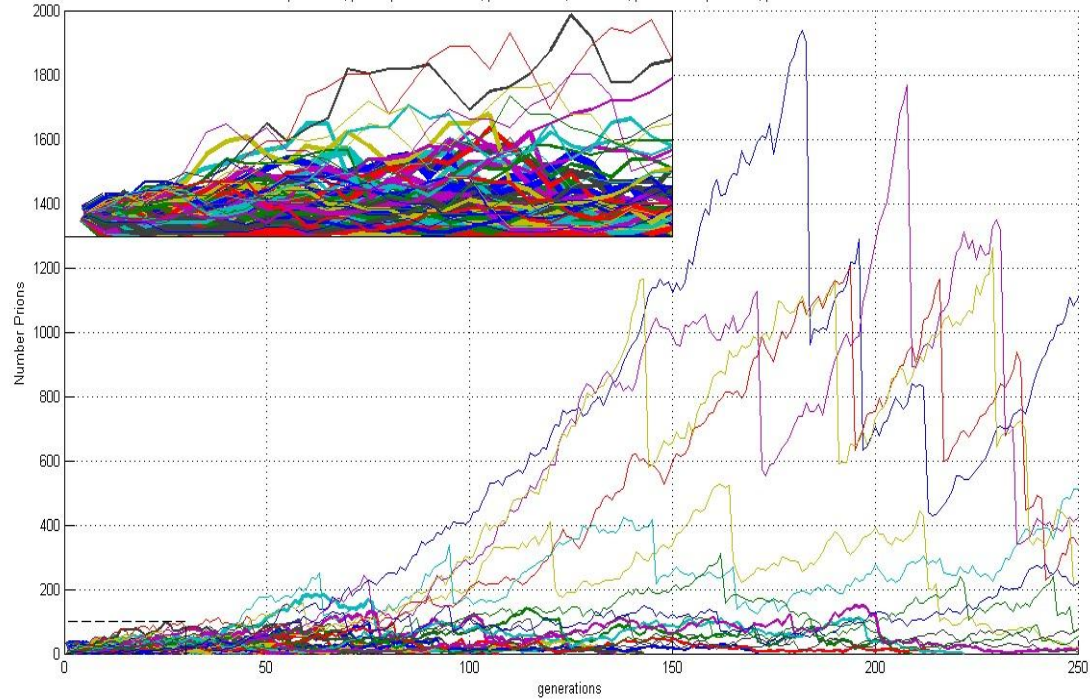


Catastrophic Branching & Extinction Time

Simulation of Extinction Time, Initialprions=1,10,100



SuperCritical, probReproduction=0.51, prionInitial=10, trials=100, probCatastrophe=0.03, probRetention=0.5

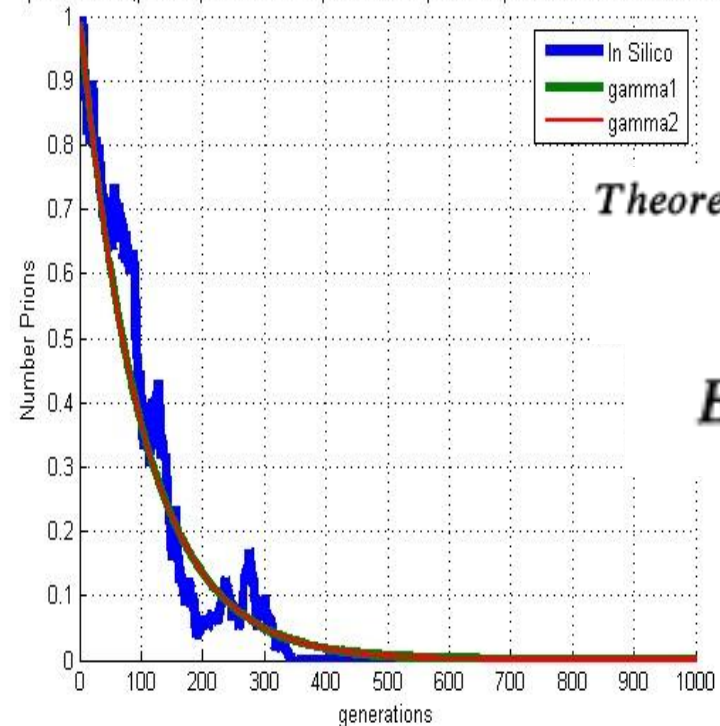


Branching Limit Theorems

A BRANCHING PROCESS WITH DISASTERS

prionInitial=1, prionReproduction=0.5, probCatastrophe=0.02, probRetention=0.5, trials=1000

prionInitial=1, prionReproduction=0, probCatastrophe=0.02, probRetention=0.5, trials=1000



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Theorem 2.1.

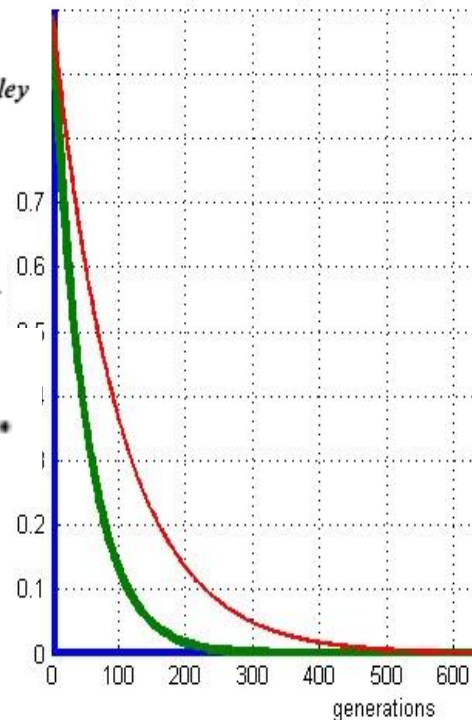
$$E\{Z(t) | F\} = p^{N(t)} E\{X(t)\}$$

$$E\{Z(t)\} \sim e^{\gamma_1 t}, \quad \gamma_1 = \alpha - \beta.$$

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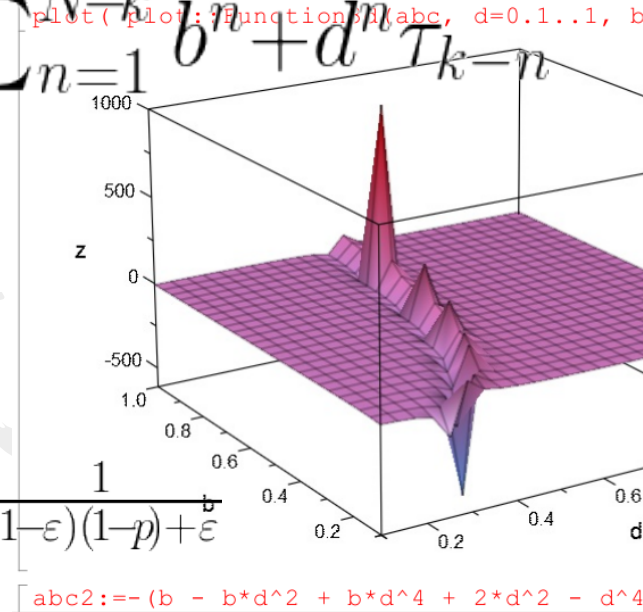
Derived Discrete Model | $k=1:N/2, k=N/2+1:N$

$$-1 = \sum_{n=1}^k b^n t_{n+k} - \sum_{n=1}^k (b^n + d^n) \tau_k + \sum_{n=1}^k d^n \tau_{k-n}$$

$$-1 = \sum_{n=1}^{N-k} b^n t_{n+k} - \sum_{n=1}^k d^n \tau_{k-n} - \sum_{n=1}^{N-k} (b^n + d^n) \tau_{k-n}$$

$$\begin{pmatrix} 1 & 0 \\ d & -d \end{pmatrix} \begin{pmatrix} \tau_0 \\ \tau_1 \end{pmatrix} = \begin{pmatrix} 0 \\ -1 \end{pmatrix}, \tau = \frac{1}{1-p}$$

$$\begin{pmatrix} 1 & 0 \\ (1-\varepsilon)d & d(\varepsilon-1) - \varepsilon \end{pmatrix} \begin{pmatrix} \tau_0 \\ \tau_1 \end{pmatrix} = \begin{pmatrix} 0 \\ (\varepsilon-1) - \varepsilon \end{pmatrix}, \tau = \frac{1}{(1-\varepsilon)(1-p) + \varepsilon}$$

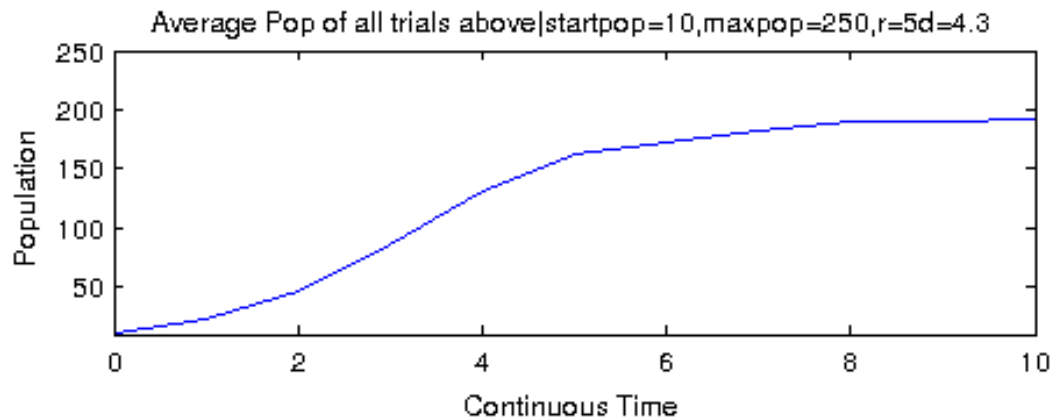
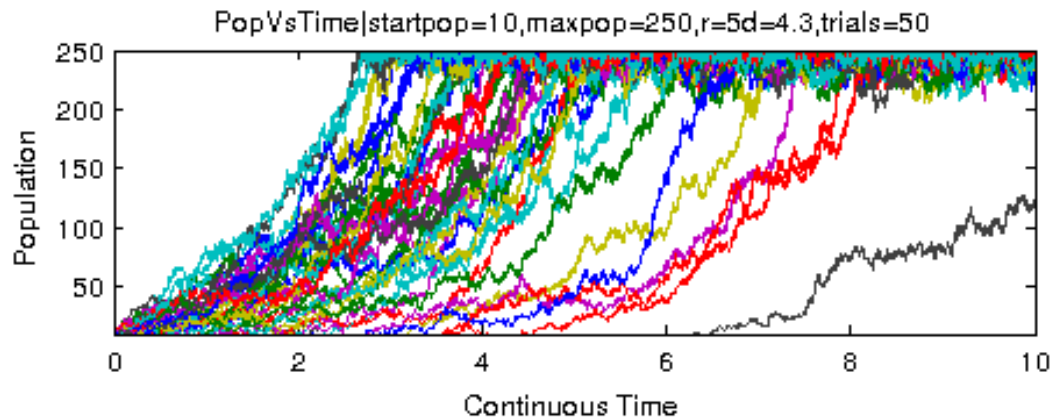


Gillespie

Possibly
incorporate

$$\delta(t) = \begin{cases} 0 & t \neq 0 \\ \infty & t = 0 \end{cases}$$

$$\int_{t_1}^{t_2} dt \delta(t) = 1$$



IAS-PCMI 2014 | Young's Tacking Problem



$$E(u) = \int_0^1 u(x)^2 dx + \int_0^1 (u'(x)^2 - 1) dx$$

