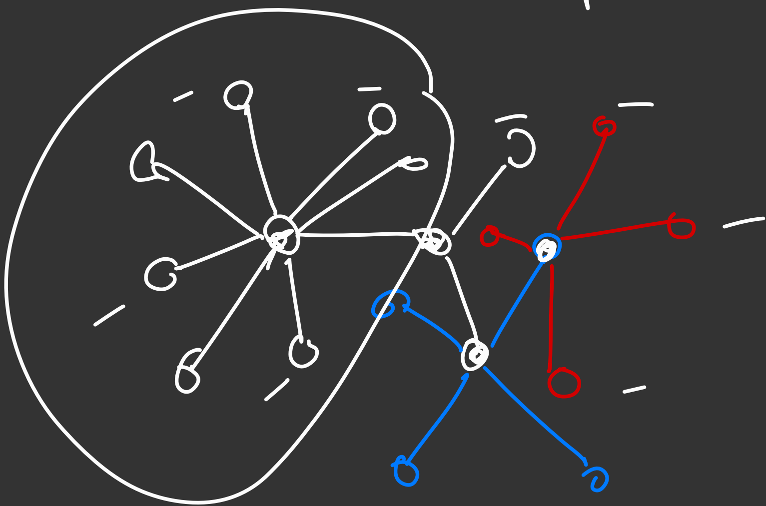
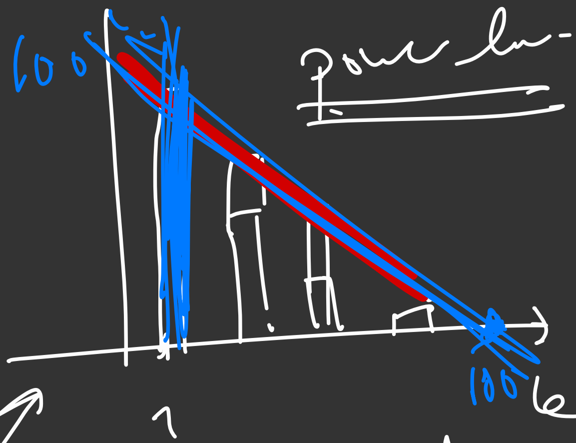
star graph



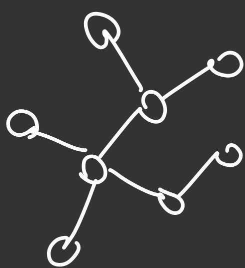


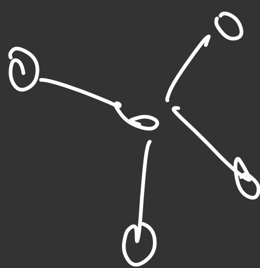
$k^{-\beta}$

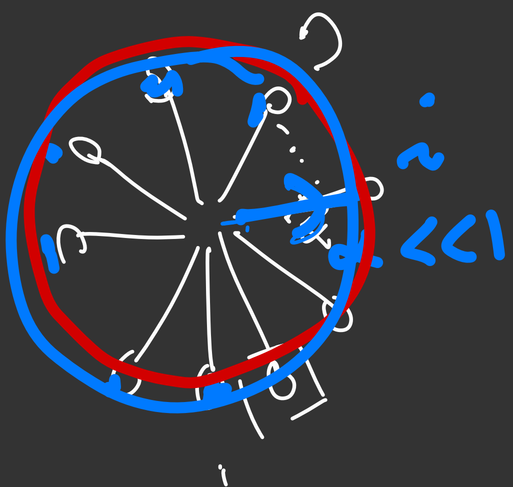
$\beta = 3$

Barabasi al

scale-free







$\alpha \ll 1$

$N+1$ node

N : low-degree

1 : hub

$$A = \begin{bmatrix} 0 & 1 & 1 & 1 & \cdots & 1 \\ 1 & & & & & \\ 1 & & & 0 & & \\ \vdots & & & & & \\ 1 & & & & & \end{bmatrix}$$

$$x_i(t+1) = f(x_i(t)) + \alpha \sum_j A_{ij} H(x_i^{(t)}, x_j^{(t)})$$

$+ \{$

α : weak.

in

1. RC

NN

ESN

1

low degre

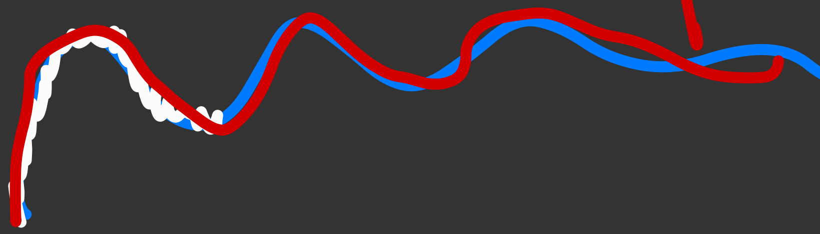
$\alpha A_{hi} H(x_i, x_j) \sim 0$

$\alpha \ll 1$

1

com

comp.



$$x_i(t+1) = RC(x_i(t)) + \text{Coupling}$$

$$x_i(t+1) - RC(x_i(t)) = \text{Coupl}$$

Coupling

hub

$$\sum_{i \neq j} A_{hj} H(x_i, x_j) =$$

prob

exp

$\Downarrow$

reduction

$$\int V(x_j)\,dx$$

N.h

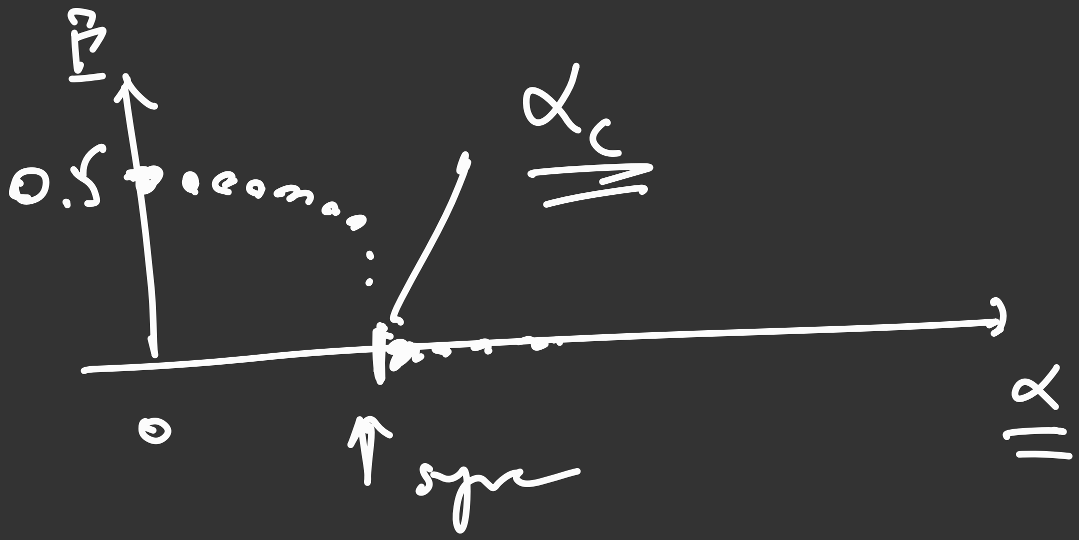
$$x_i(t+1) = RC_f(x_i(t)) + \alpha \int V \, d_\mu$$

$$RC_f$$

$$\boxed{x_i(t+1) = RC_f(x_i) + \beta \, RC_u(x_i)}$$

learn,

param = 1



Sync Error.

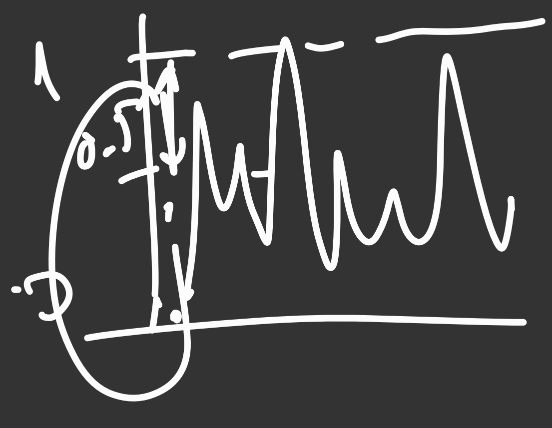
$$E = \frac{1}{N^2} \sum_i \sum_j (x_j - x_i)$$

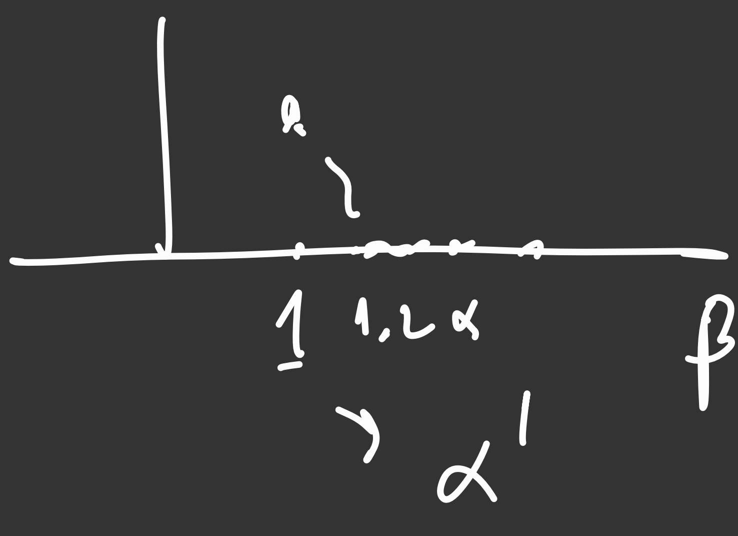
0.0000015

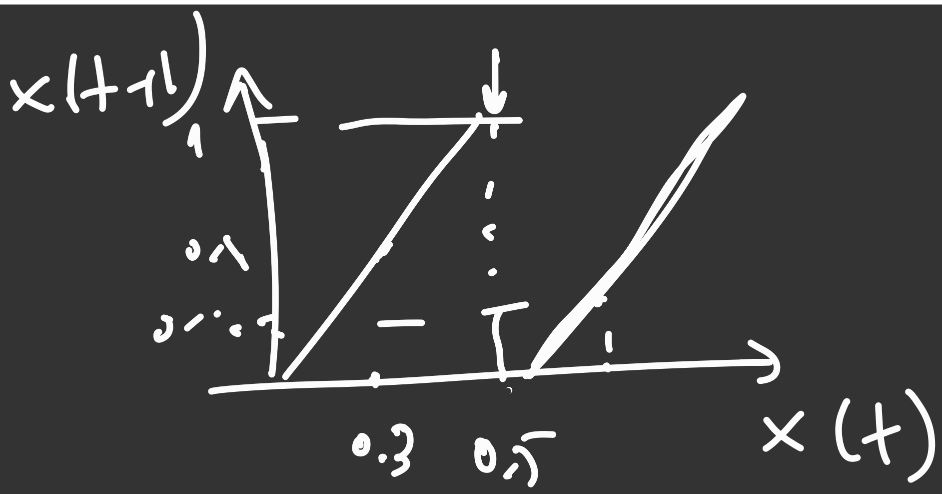
doubling

$$x(t+1) = 2x(t)\ r \bmod 1$$

$\lambda = 2$







expand.