



How can we create a model which:

- Is informed by theory, and
- Results in polarization under intuitive conditions.

Biased Assimilation

Lord *et al.* (1979):

“

[People] are apt to accept “confirming” evidence at face value while subjecting “disconfirming” evidence to critical evaluation, and as a result to draw undue support for their initial positions from mixed or random empirical findings.

”

A well-known phenomenon in social psychology.

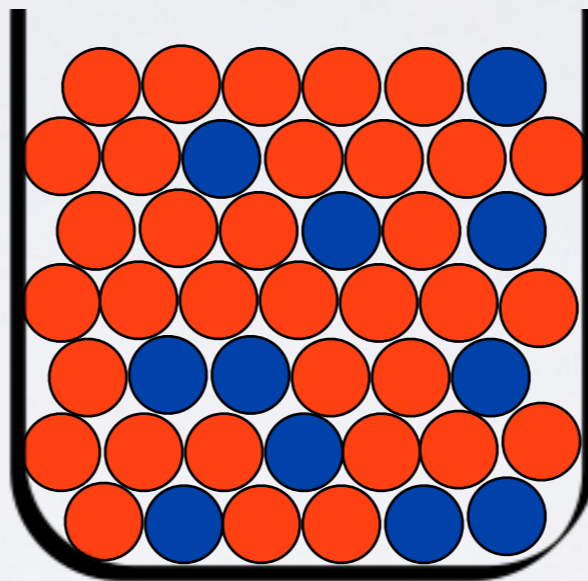
Intuition via Urn Dynamics



$x_i(t)$: degree of support for **RED** view.

$1-x_i(t)$: degree of support for **BLUE** view.

Intuition via Urn Dynamics

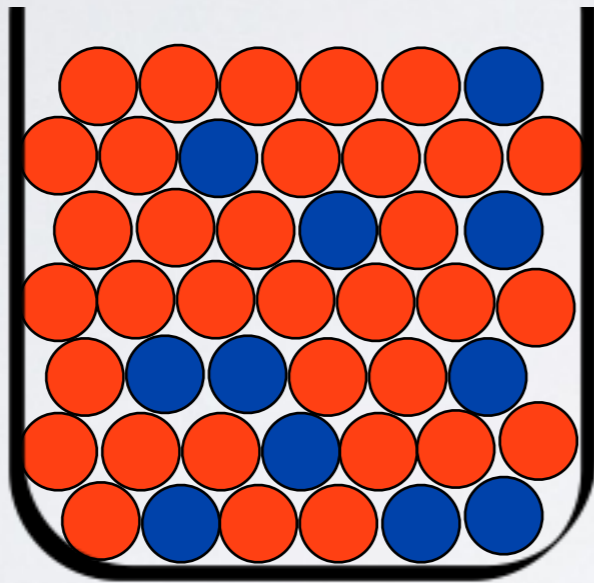


i

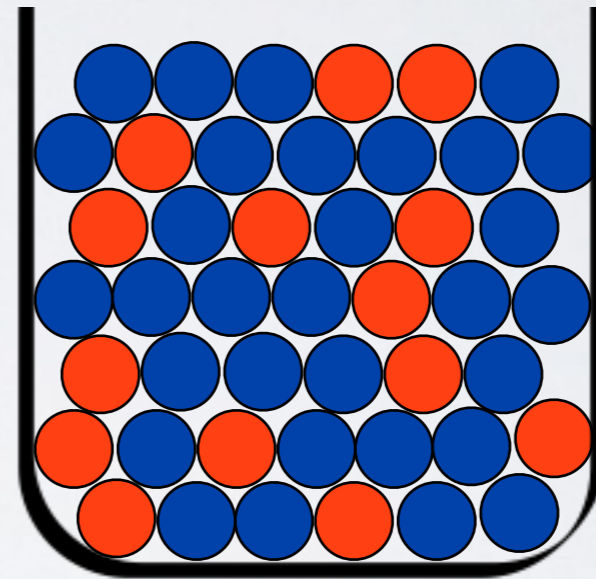
$x_i(t)$: fraction of **RED** balls in *i*'s urn.

$1-x_i(t)$: fraction of **BLUE** balls in *i*'s urn.

Urn Dynamic: DeGroot



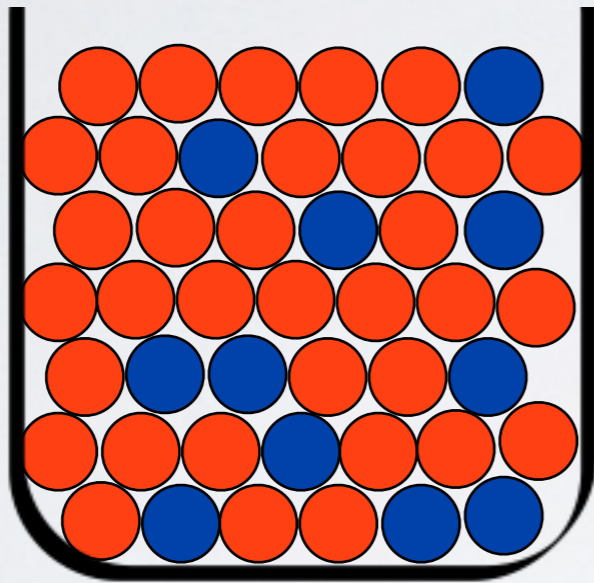
i



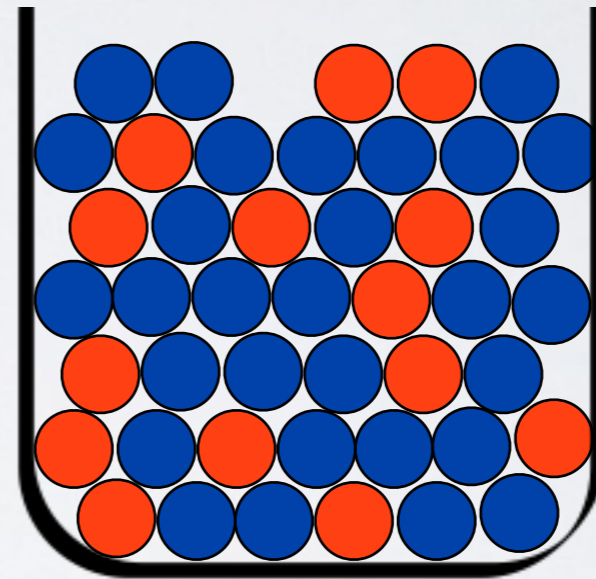
j

$$\frac{x_j(t)}{1 - x_j(t)}$$

Urn Dynamic: DeGroot



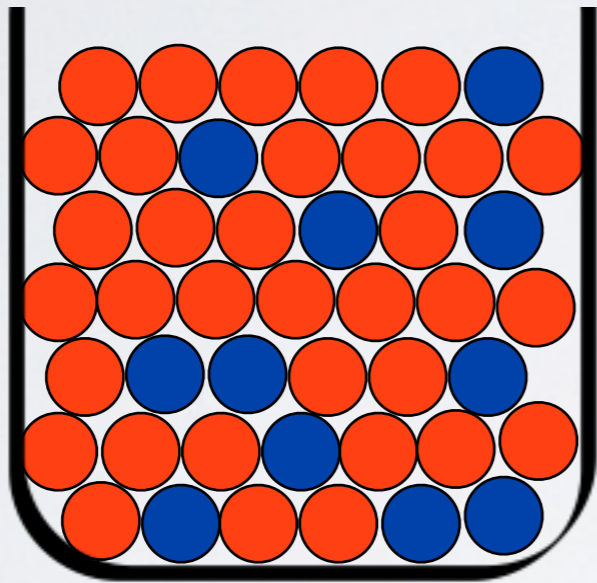
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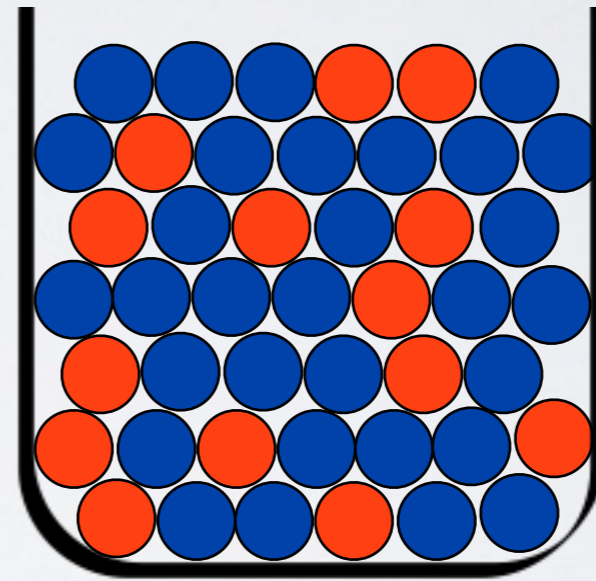
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Urn Dynamic: DeGroot



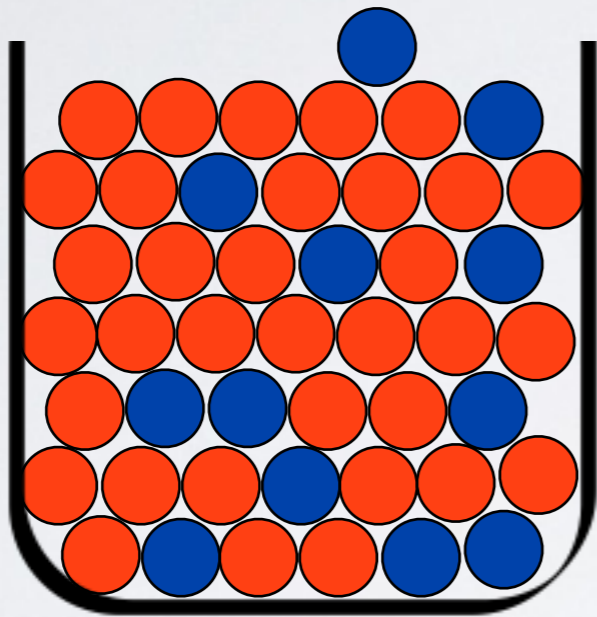
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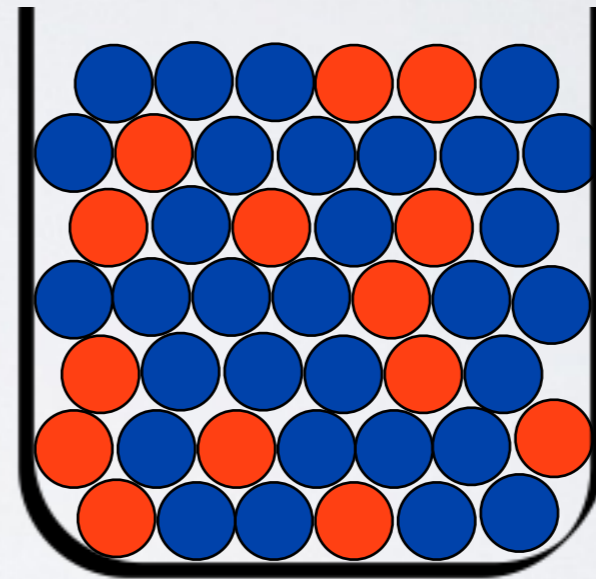
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Urn Dynamic: DeGroot



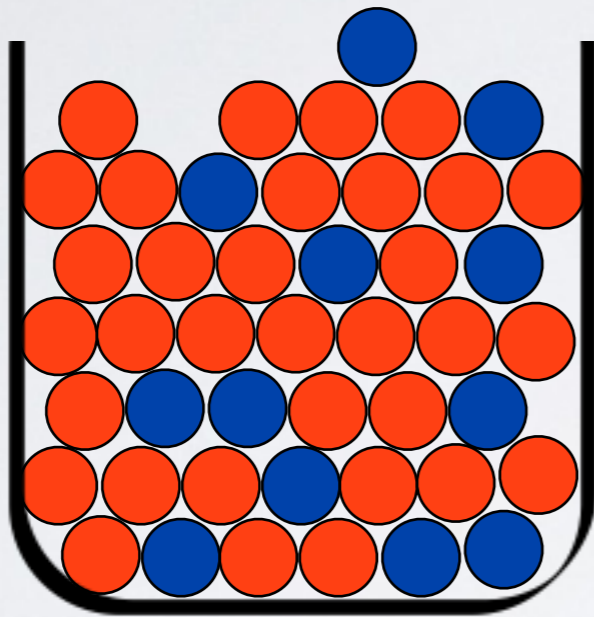
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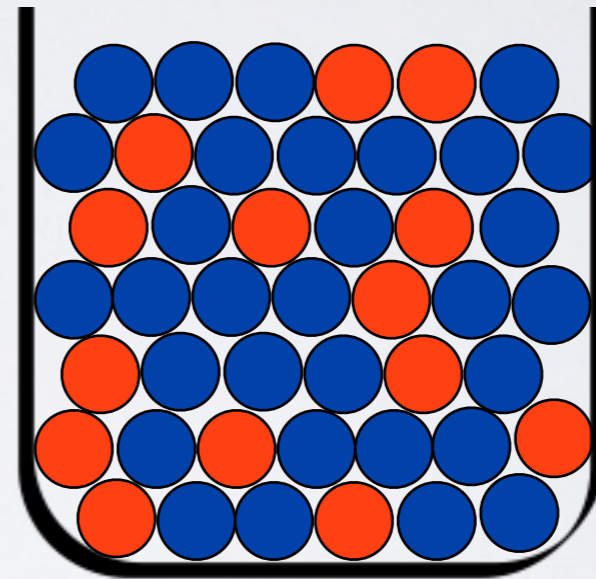
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Urn Dynamic: DeGroot



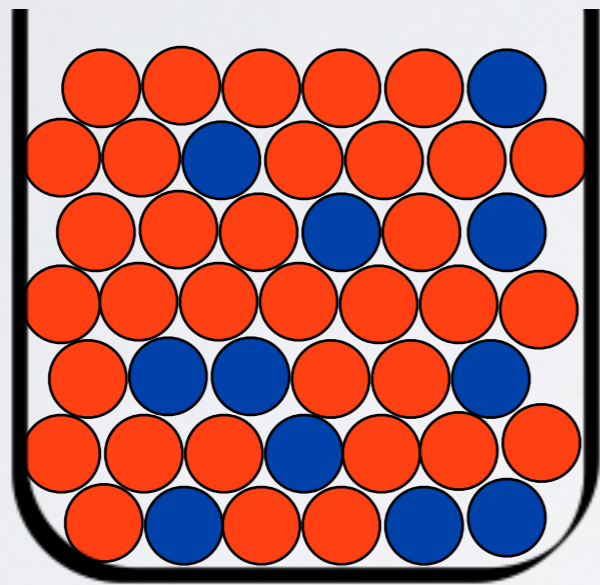
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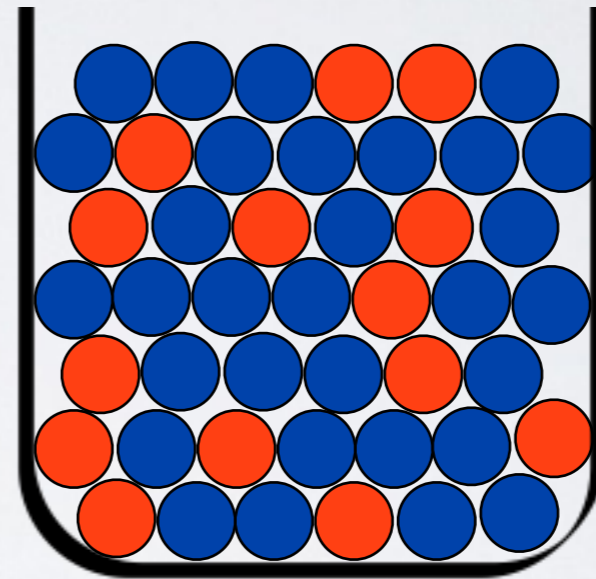
j

$$\frac{x_j(t)}{1 - x_j(t)}$$

Urn Dynamic: Biased Assimilation



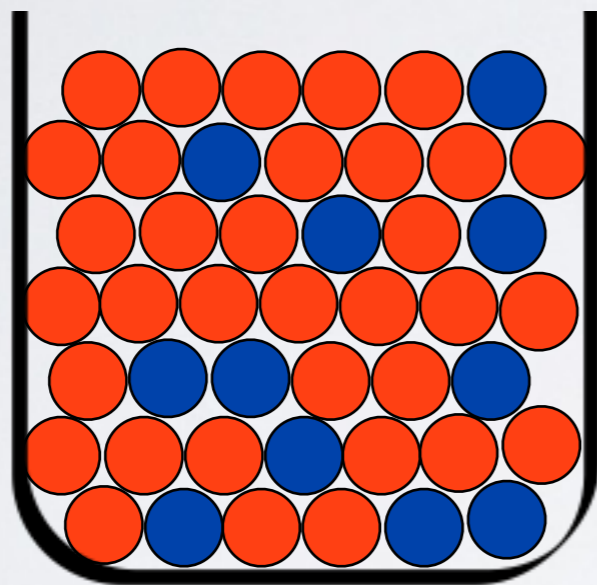
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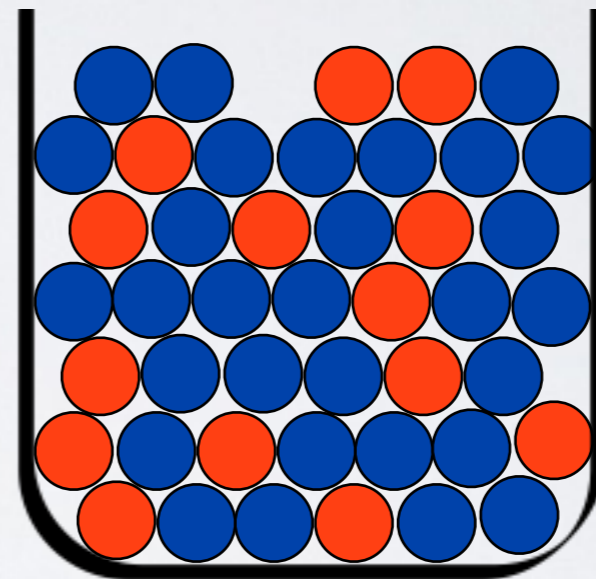
j

$$\frac{x_i(t)x_j(t)}{(1-x_i(t))(1-x_j(t))}$$

Urn Dynamic: Biased Assimilation



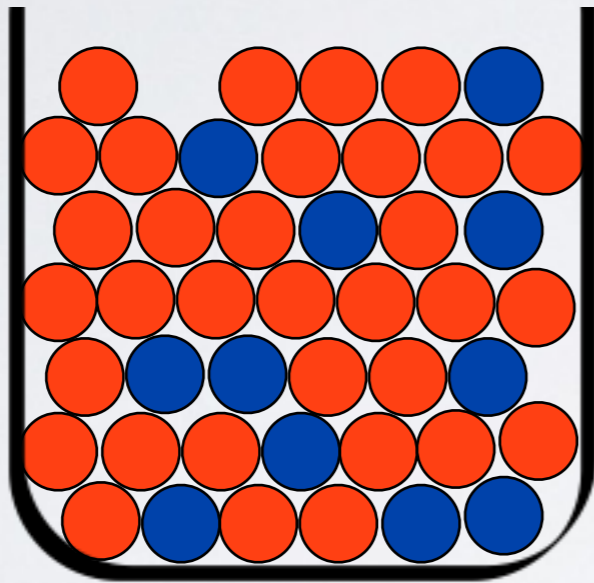
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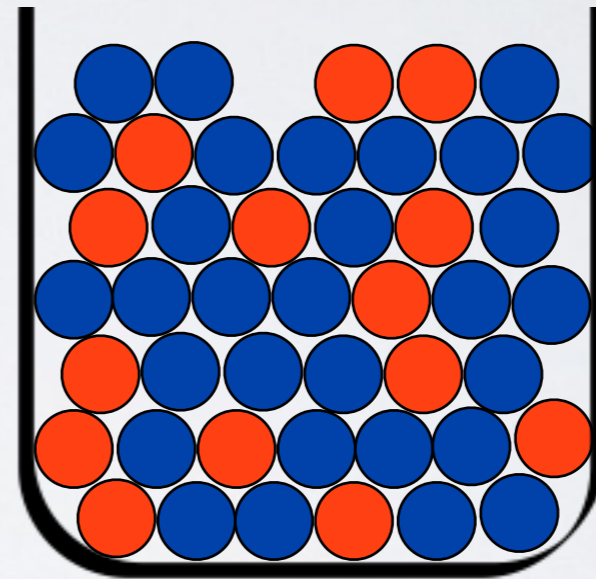
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Urn Dynamic: Biased Assimilation



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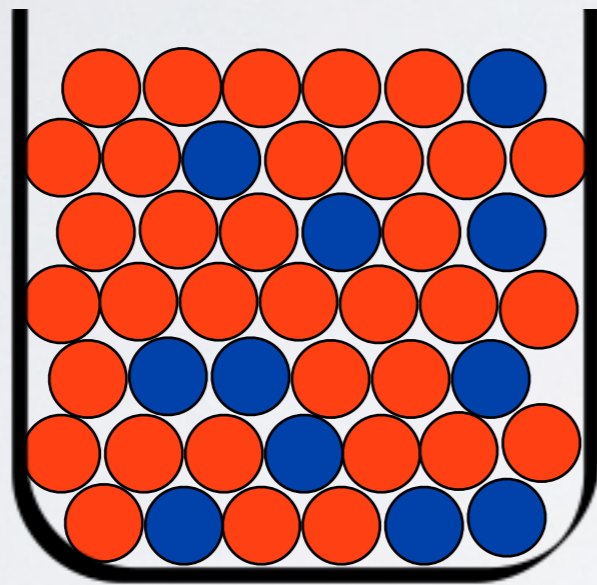


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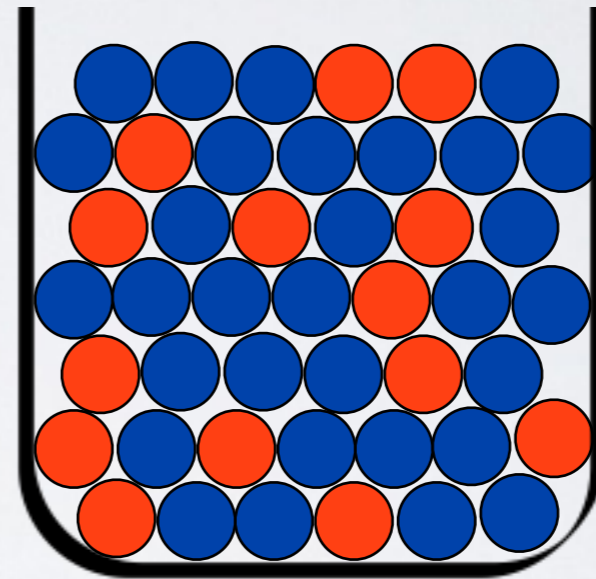
$$x_i(t)x_j(t)$$

$$(1 - x_i(t))(1 - x_j(t))$$

Urn Dynamic: Biased Assimilation



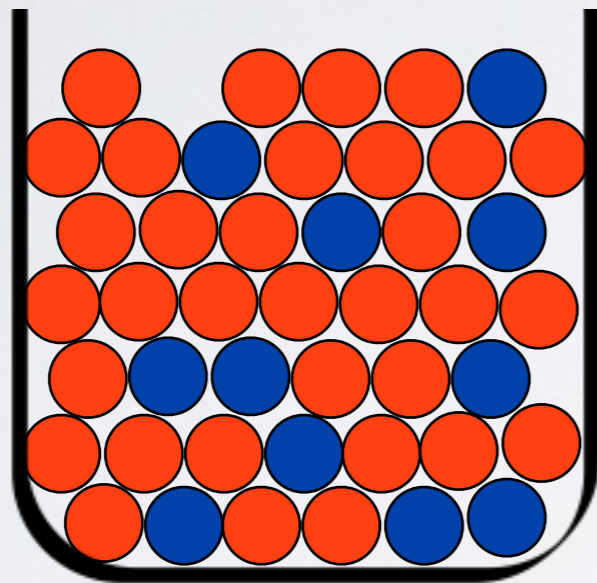
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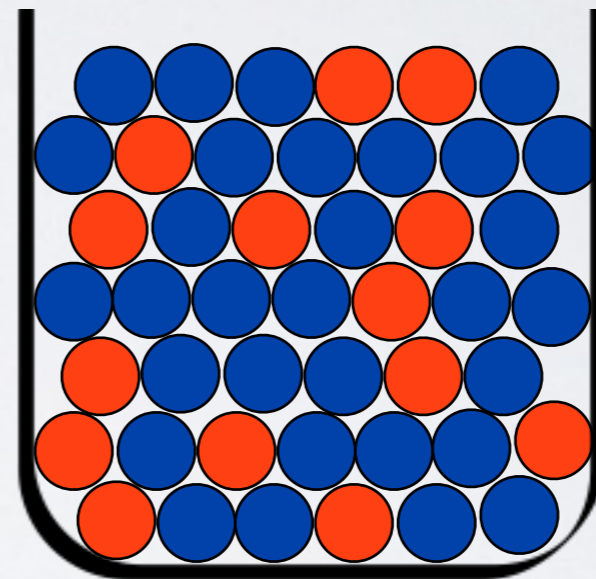
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Urn Dynamic: Biased Assimilation



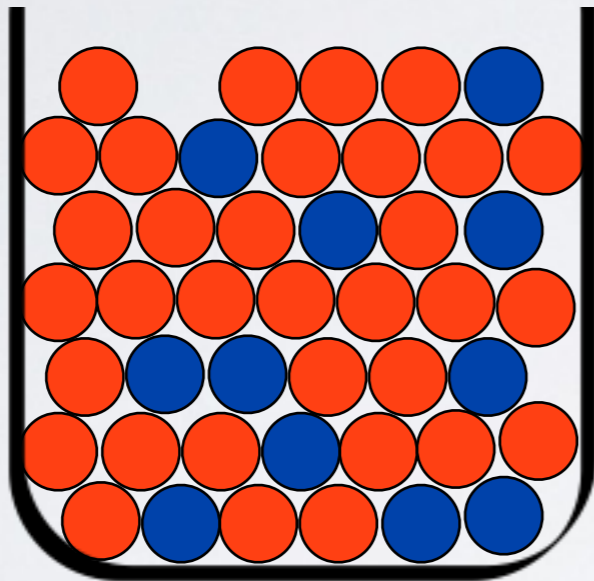
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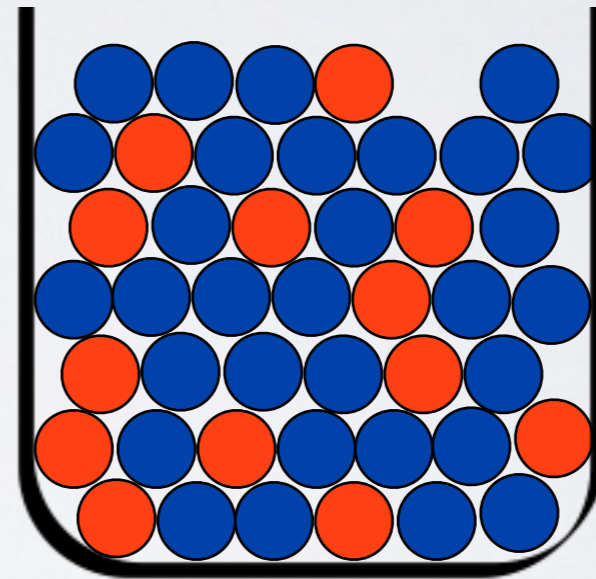
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Urn Dynamic: Biased Assimilation



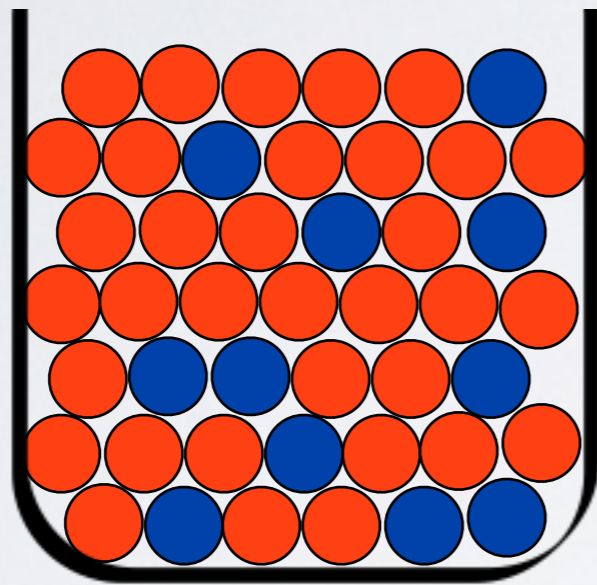
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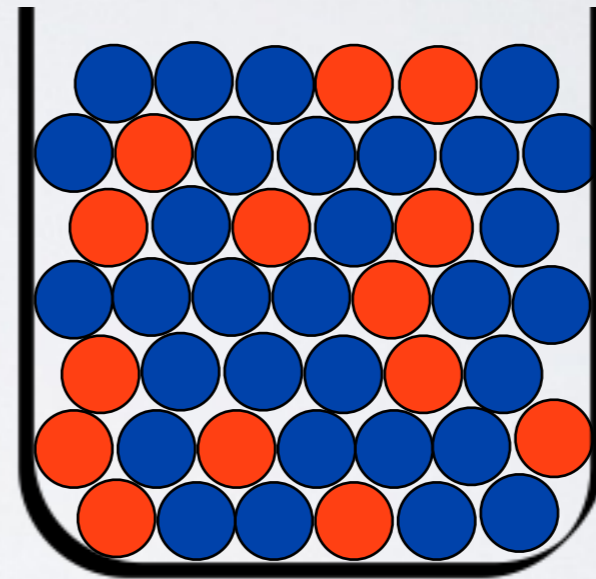
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Urn Dynamic: Biased Assimilation



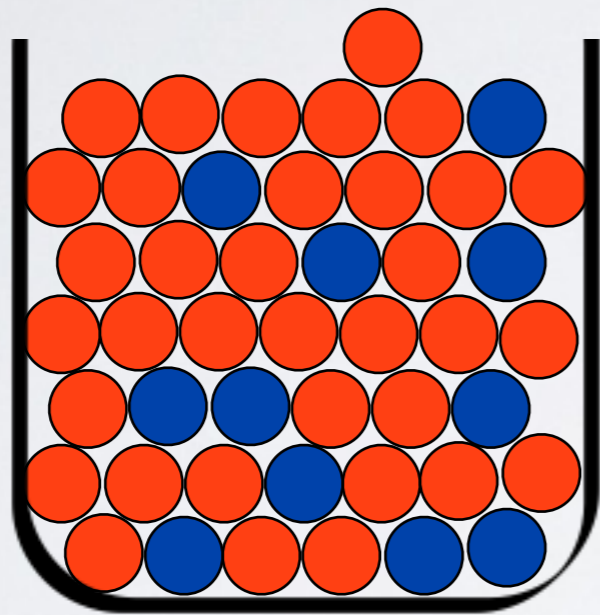
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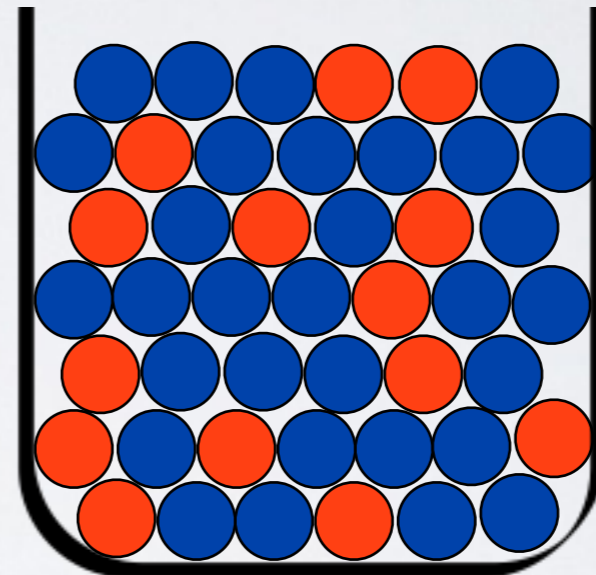
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Urn Dynamic: Biased Assimilation



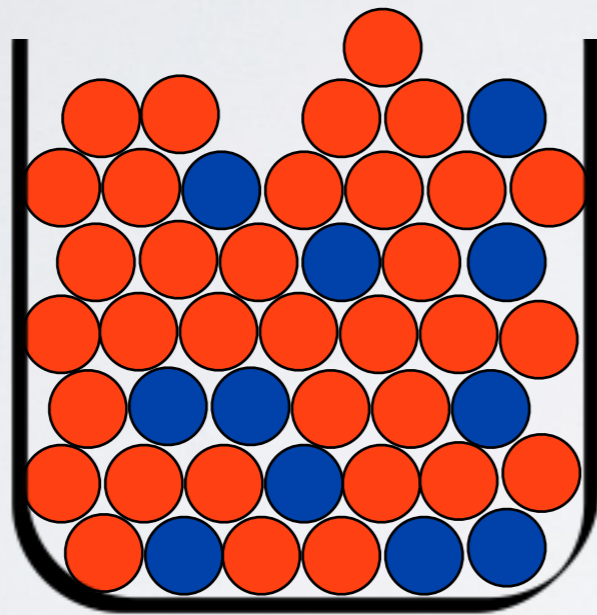
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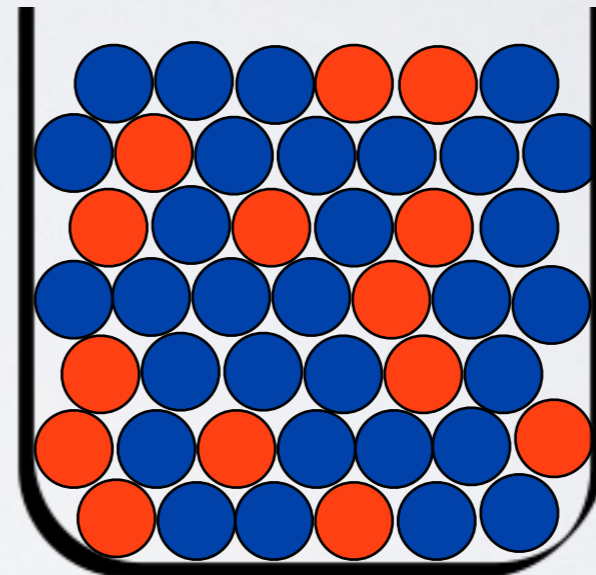
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Urn Dynamic: Biased Assimilation



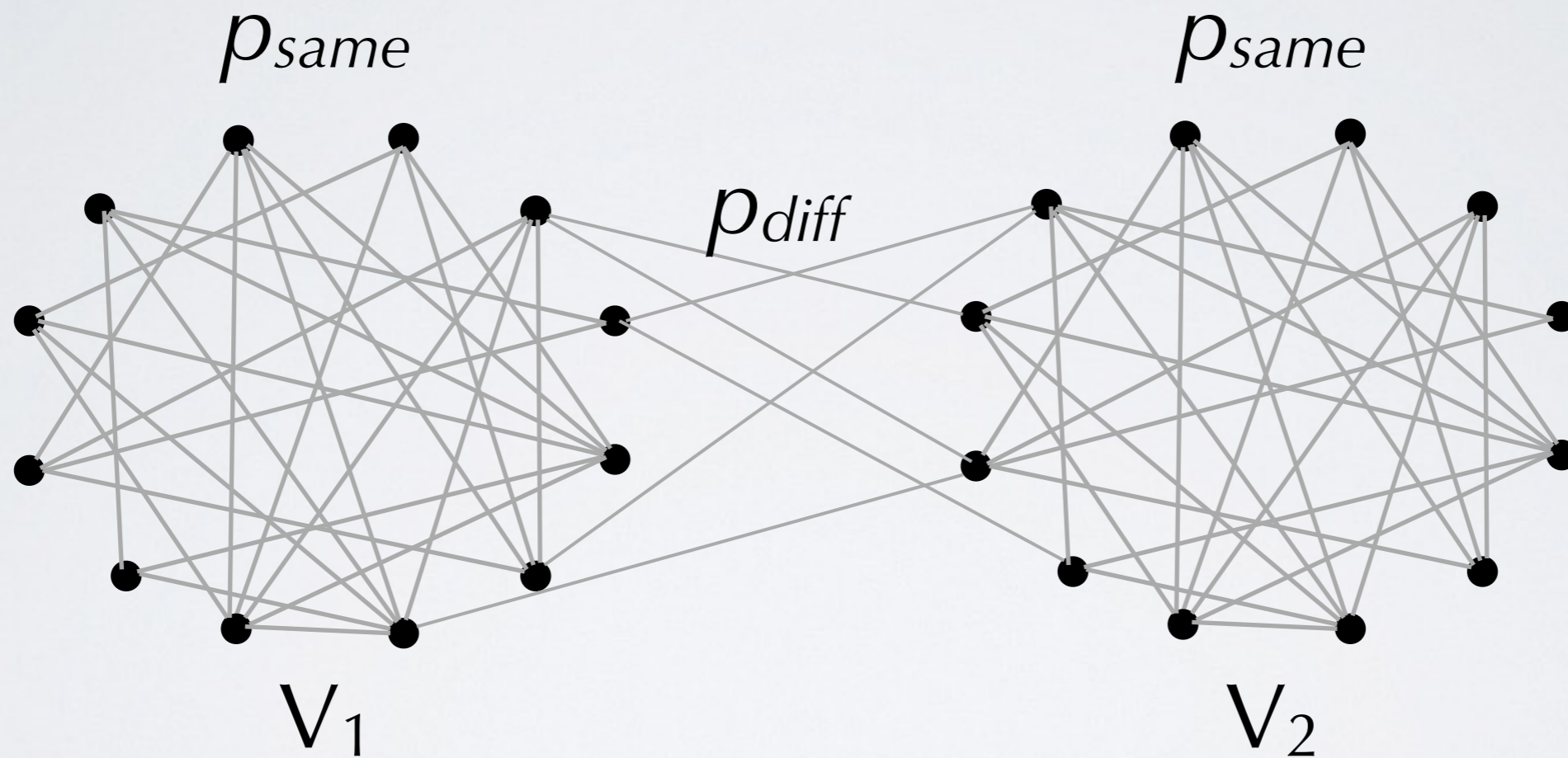
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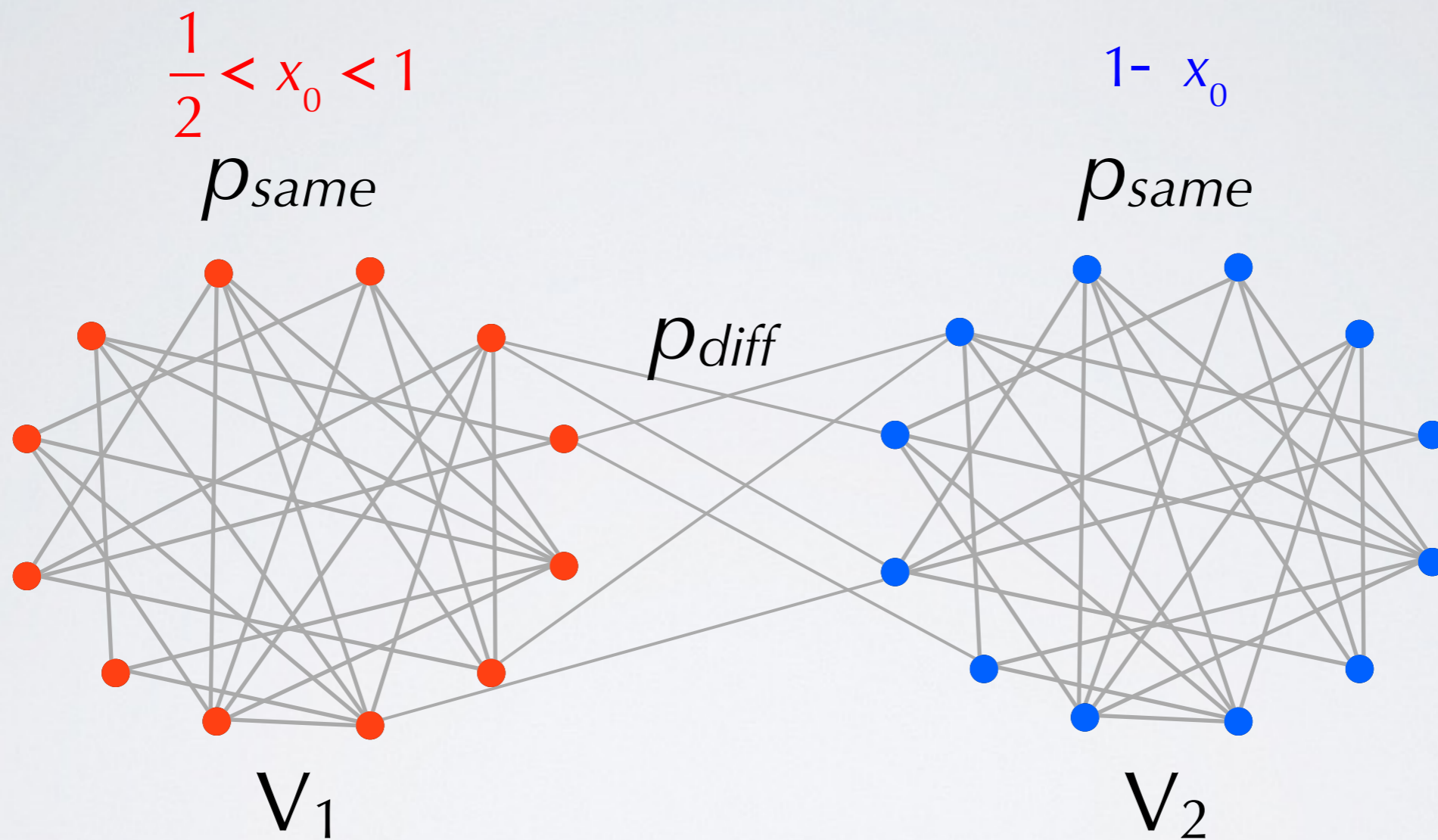
$$\frac{x_i(t)x_j(t)}{(1-x_i(t))(1-x_j(t))}$$

Two-island Network



$$h = \rho_{same} / \rho_{diff}$$

Two-island Network



$$h = p_{same} / p_{diff}$$

Biased Assimilation & Polarization

Bias b : How strongly do we need someone to agree with us before we adopt their opinion

DeGroot: $b = 0$

Biased Assimilation as in the Urn dynamic: $b = 1$

Biased Assimilation & Polarization

(Polarization)

If $b \geq 1$,

$$i \in V_1 : x_i(t) \rightarrow 1,$$

$$i \in V_2 : x_i(t) \rightarrow 0.$$

.....

(Persistent Disagreement)

If $1 > b \geq \frac{2}{h+1}$,

$$i \in V_1 : x_i(t) \rightarrow \hat{x},$$

$$i \in V_2 : x_i(t) \rightarrow 1 - \hat{x}.$$

.....

(Consensus)

If $b < \frac{2}{h+1}$,

$$i \in V : x_i(t) \rightarrow \frac{1}{2}.$$

Homophily, without biased assimilation,
is not sufficient to polarize society.

Surprising Connection to Recommender Systems

The image shows a screenshot of a Twitter profile page for Pankaj Gupta (@pankaj). The profile header includes a profile picture, a cover photo of the Golden Gate Bridge, and the name 'Pankaj Gupta' with the handle '@pankaj'. Below this, statistics are shown: 5,520 tweets, 949 following, and 9,329 followers. A 'Compose new Tweet...' button is visible. The 'Who to follow' section lists three accounts: Safeway (@Safeway), Discovery News (@DNews), and Micheal (@micheal). The main content area shows a list of tweets under the heading 'Tweets' with '3 new Tweets' indicated. The tweets are from Aapo Kyrola (@kyrpov), Rohit (@rohit_x_), D-Lab @ MIT (@dlab_mit), and Mark McBride (@mccv).

Home Notifications Discover Me Search

Pankaj Gupta
@pankaj

TWEETS 5,520 FOLLOWING 949 FOLLOWERS 9,329

Compose new Tweet...

Who to follow · Refresh · View all

- Safeway** @Safeway
Followed by Mazen Rawashd...
Follow Promoted
- Discovery News** @DNews
Follow
- Micheal** @micheal
Followed by Vinod Kone an...
Follow

Popular accounts · Find friends

Tweets

3 new Tweets

- Aapo Kyrola** @kyrpov · 1m
GraphChi used for computational biology: homes.di.unimi.it/valentini/pape...
Results: As fast as in-memory computation, way faster than Neo4j.
Expand Reply Retweet Favorite Pocket
- Rohit** @rohit_x_ · 1m
This is big. theguardian.com/science/2014/m... Primordial Gravitational waves
'seen' in polarization of early light. #Einstein
View summary Reply Retweet Favorite Pocket
- D-Lab @ MIT** @dlab_mit · 2m
March 26: Follow-up @harvest_fuel webinar to March 5th "Charcoal Briquette
Enterprise Development" @dlab_mit @harvest_fuel...
Expand Reply Retweet Favorite
- Mark McBride** @mccv · 7m
today I'm responding to all iMessages with "congratulations!".
Expand Reply Retweet Favorite
- 1 more reply
- Mark McBride** @mccv · 4m
@matasar you know that's like me clowning you for the links in DMs debacle
Expand Reply Retweet Favorite

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The 'Who to follow' section, highlighted with a blue border, lists three accounts:

- Safeway** (@Safeway) - Verified account, followed by Mazen Rawashd... Includes a 'Follow' button and a 'Promoted' tag.
- Discovery News** (@DNews) - Includes a 'Follow' button.
- Micheal** (@micheal) - Followed by Vinod Kone an... Includes a 'Follow' button.

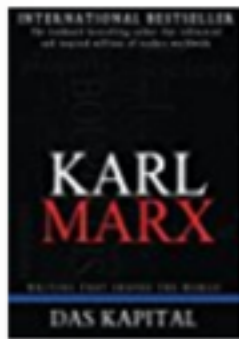
At the bottom of the 'Who to follow' section, there are links for 'Popular accounts' and 'Find friends'.

The 'Tweets' section on the right shows three tweets:

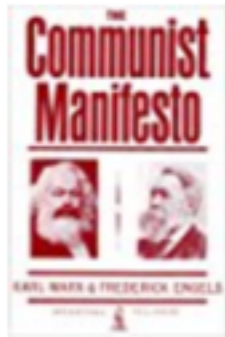
- Aapo Kyrola** (@kyrpov) - 1m followers. Tweet: GraphChi used for computational biology: homes.di.unimi.it/valentini/pape... Results: As fast as in-memory computation, way faster than Neo4j. Includes 'Expand', 'Reply', 'Retweet', 'Favorite', and 'Pocket' options.
- Rohit** (@rohit_x_) - 1m followers. Tweet: This is big. theguardian.com/science/2014/m... Primordial Gravitational waves 'seen' in polarization of early light. #Einstein. Includes 'View summary', 'Reply', 'Retweet', 'Favorite', and 'Pocket' options.
- D-Lab @ MIT** (@dlab_mit) - 2m followers. Tweet: March 26: Follow-up @harvest_fuel webinar to March 5th "Charcoal Briquette Enterprise Development" @dlab_mit @harvest_fuel... Includes 'Expand', 'Reply', 'Retweet', 'Favorite', and 'Pocket' options.

Below the D-Lab tweet, there is a reply from **Mark McBride** (@mccv) - 7m followers: today I'm responding to all iMessages with "congratulations!". This tweet has 'Expand', 'Reply', 'Retweet', 'Favorite', and 'Pocket' options. Below it, another tweet from **Mark McBride** (@mccv) - 4m followers: @matasar you know that's like me clowning you for the links in DMs debacle. This tweet also has 'Expand', 'Reply', 'Retweet', 'Favorite', and 'Pocket' options.

Surprising Connection to Recommender Systems



+



Total price: **\$12.95**

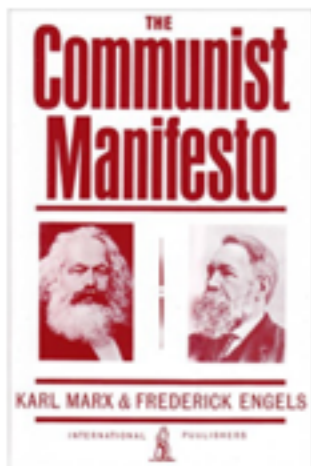
Add both to Cart

Add both to List

✓ **This item:** Das Kapital: A Critique of Political Economy by Karl Marx Paperback **\$9.95**

✓ **The Communist Manifesto** by Karl Marx Paperback **\$3.00**

Customers who bought this item also bought



The Communist Manifesto

› Karl Marx

★★★★☆ 1,489

#1 Best Seller in

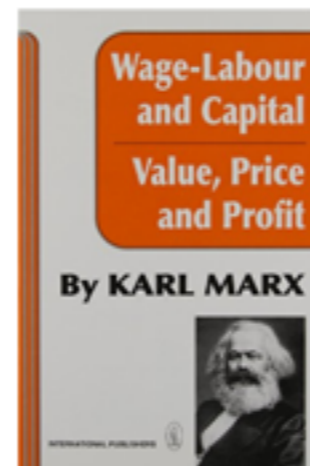


State and Revolution

Vladimir Ilich Lenin

★★★★☆ 45

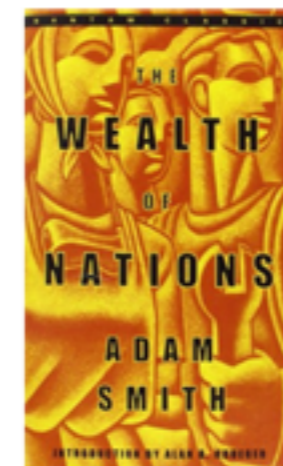
Paperback



**Wage-Labour and Capital
and Value, Price, and Profit**

› Karl Marx

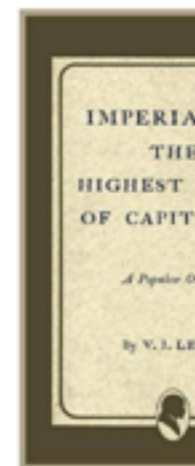
★★★★☆ 18



**The Wealth of Nations
(Bantam Classics)**

› Adam Smith

★★★★☆ 762



**Imperialism
Stage of Capitalism**

Vladimir Ilich Lenin

★★★★☆

Surprising Connection to Recommender Systems

Two kinds of recommender systems

1. Best result: Look at all the books I have bought, or all the people I follow, and recommend to me the one that is the most similar to this set (eg. the Twitter example)
2. Most similar to one item: Look at a random book I bought, or a random person I followed, and recommend one that is most similar to this one person/book

Surprising Connection to Recommender Systems

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Polarizes our reading choices, like biased assimilation

2. Most similar to one item: Look at a random book I bought, or a random person I followed, and recommend one that is most similar to this one person/book

Similar to persistent disagreement — does not polarize