EXPERIMENT: Introducing peers with varying top-k strategies into an existing rational network  
  
DESCRIPTION: Given a network that has been established, see how various top-k strategies perform when added at different “ages” of the network. Ages refers to how old the network is (how many ticks has it been established for). The networks will initially be populated with peers using a random top-k strategy and a random top-m strategy. This experiment will be simplistic, documents and peers will have only one of two possible tags; this will limit the usefulness of some top-k strategies which try to find documents that are more likable than others (with each document having one of 2 tags, they should all have 50%).

The top-k strategies being tested:

* document popularity
* peer popularity
* peer distance
* peer similarity
* follow similarity

The different of the ages of the network that will be tested are:

* Starting Network: the network is brand new (ticks = 0)
* Morning Network: the network has had few turns (ticks = 10)
* Noon Network: most peers have had a turn (ticks = 40)
* Evening Network: almost all peers are connected (ticks = 160)
* Complete Network: the network should be fully established (ticks = 2000)

Network Info:

* All peers:
  + Will have 1 of 2 tags.
  + The top-k will be of size 5, and will exclude files that have been in the top-k before.
  + A like strategy where, if the file shares at least one taste in common with the peer (and has not been liked before), it will be liked.
  + The top-m will be of size 3, and will randomly select peers that liked documents from the top-k.
  + A follow strategy that follows everyone who appeared in the top-m.
  + A payoff function which will increment the score of the user by one for every document in the top-k that shares at least one tag in common with the user, and has not been seen by the user before.
* The network will start with 20 peers who are using the random top-k strategy, and 50 documents. Exactly half of the starting peers and documents will have one tag, the other half will have the other tag.
* Only one peer will be added to each network for testing, it will have one of the 2 tag values

What will be measured and how?

* The new peers will be looped through 10 ticks each in random order (the original 20 peers will not have turns), after 5 turns they will be stopped and their utility analyzed.
* After each tick, the new peers will have their utility analyzed
* After each tick, trending documents and peers will be recorded (trendiness = how many likes the document or follows a peer has received / ticks)
* Results will be the average of 1000 simulations

HYPOTHESIS:

The peer and document popularity strategies should be successful in the first turn, as they are not required to be connected to the existing network.

The peer distance, peer similarity, and follow similarity strategies should quickly take the lead after a turn or two, as they will isolate peers with the same tags as them.

RESULTS:

1. STARTING NETWORK:
   1. STRATEGY: Document Popularity

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 1 |
| 2 | 4 |
| 3 | 7 |
| 4 | 9 |
| 5 | 11 |
| 6 | 14 |
| 7 | 18 |
| 8 | 22 |
| 9 | 24 |
| 10 | 25 |

* 1. STRATEGY: Peer Popularity

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 5 |
| 2 | 7 |
| 3 | 9 |
| 4 | 11 |
| 5 | 13 |
| 6 | 15 |
| 7 | 17 |
| 8 | 21 |
| 9 | 24 |
| 10 | 25 |

* 1. STRATEGY: Peer Distance

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 4 |
| 2 | 6 |
| 3 | 9 |
| 4 | 13 |
| 5 | 15 |
| 6 | 16 |
| 7 | 20 |
| 8 | 20 |
| 9 | 22 |
| 10 | 25 |

* 1. STRATEGY: Peer Similarity

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 3 |
| 2 | 6 |
| 3 | 9 |
| 4 | 11 |
| 5 | 13 |
| 6 | 15 |
| 7 | 19 |
| 8 | 21 |
| 9 | 23 |
| 10 | 25 |

* 1. STRATEGY: Follow Similarity

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 2 |
| 2 | 3 |
| 3 | 4 |
| 4 | 7 |
| 5 | 12 |
| 6 | 17 |
| 7 | 18 |
| 8 | 20 |
| 9 | 22 |
| 10 | 25 |

1. EARLY NETWORK:
   1. STRATEGY: Document Popularity

|  |  |
| --- | --- |
| **Ticks** | **Average of Score** |
| 0 | 0 |
| 1 | 2.551 |
| 2 | 5.104 |
| 3 | 7.61 |
| 4 | 10.131 |
| 5 | 12.6 |
| 6 | 15.054 |
| 7 | 17.543 |
| 8 | 20.061 |
| 9 | 22.524 |
| 10 | 25 |
| **Grand Total** | **12.56163636** |

* 1. STRATEGY: Peer Popularity

|  |  |
| --- | --- |
| **Row Labels** | **Average of sum [score] of profiles3** |
| 0 | 0 |
| 1 | 2.44 |
| 2 | 5.36 |
| 3 | 8.333 |
| 4 | 10.956 |
| 5 | 13.485 |
| 6 | 15.924 |
| 7 | 18.286 |
| 8 | 20.582 |
| 9 | 22.825 |
| 10 | 25 |
| **Grand Total** | **13.01736364** |

* 1. STRATEGY: Peer Distance

|  |  |
| --- | --- |
| **Row Labels** | **Average of sum [score] of profiles4** |
| 0 | 0 |
| 1 | 2.523 |
| 2 | 6.1 |
| 3 | 9.676 |
| 4 | 12.605 |
| 5 | 15.01 |
| 6 | 17.19 |
| 7 | 19.258 |
| 8 | 21.207 |
| 9 | 23.137 |
| 10 | 25 |
| **Grand Total** | **13.79145455** |

* 1. STRATEGY: Peer Similarity

|  |  |
| --- | --- |
| **Row Labels** | **Average of sum [score] of profiles5** |
| 0 | 0 |
| 1 | 2.478 |
| 2 | 6.187 |
| 3 | 9.867 |
| 4 | 12.82 |
| 5 | 15.153 |
| 6 | 17.285 |
| 7 | 19.234 |
| 8 | 21.192 |
| 9 | 23.093 |
| 10 | 25 |
| **Grand Total** | **13.84627273** |

* 1. STRATEGY: Follow Similarity

|  |  |
| --- | --- |
| **Row Labels** | **Average of sum [score] of profiles6** |
| 0 | 0 |
| 1 | 2.491 |
| 2 | 5.012 |
| 3 | 7.535 |
| 4 | 9.98 |
| 5 | 12.487 |
| 6 | 15.027 |
| 7 | 17.494 |
| 8 | 20.006 |
| 9 | 22.504 |
| 10 | 25 |
| **Grand Total** | **12.50327273** |

1. NOON NETWORK:
   1. STRATEGY: Document Popularity

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 1 |
| 2 | 4 |
| 3 | 7 |
| 4 | 9 |
| 5 | 11 |
| 6 | 14 |
| 7 | 18 |
| 8 | 22 |
| 9 | 24 |
| 10 | 25 |

* 1. STRATEGY: Peer Popularity

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 5 |
| 2 | 7 |
| 3 | 9 |
| 4 | 11 |
| 5 | 13 |
| 6 | 15 |
| 7 | 17 |
| 8 | 21 |
| 9 | 24 |
| 10 | 25 |

* 1. STRATEGY: Peer Distance

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 4 |
| 2 | 6 |
| 3 | 9 |
| 4 | 13 |
| 5 | 15 |
| 6 | 16 |
| 7 | 20 |
| 8 | 20 |
| 9 | 22 |
| 10 | 25 |

* 1. STRATEGY: Peer Similarity

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 3 |
| 2 | 6 |
| 3 | 9 |
| 4 | 11 |
| 5 | 13 |
| 6 | 15 |
| 7 | 19 |
| 8 | 21 |
| 9 | 23 |
| 10 | 25 |

* 1. STRATEGY: Follow Similarity

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 2 |
| 2 | 3 |
| 3 | 4 |
| 4 | 7 |
| 5 | 12 |
| 6 | 17 |
| 7 | 18 |
| 8 | 20 |
| 9 | 22 |
| 10 | 25 |

1. EVENING NETWORK:
   1. STRATEGY: Document Popularity

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 1 |
| 2 | 4 |
| 3 | 7 |
| 4 | 9 |
| 5 | 11 |
| 6 | 14 |
| 7 | 18 |
| 8 | 22 |
| 9 | 24 |
| 10 | 25 |

* 1. STRATEGY: Peer Popularity

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 5 |
| 2 | 7 |
| 3 | 9 |
| 4 | 11 |
| 5 | 13 |
| 6 | 15 |
| 7 | 17 |
| 8 | 21 |
| 9 | 24 |
| 10 | 25 |

* 1. STRATEGY: Peer Distance

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 4 |
| 2 | 6 |
| 3 | 9 |
| 4 | 13 |
| 5 | 15 |
| 6 | 16 |
| 7 | 20 |
| 8 | 20 |
| 9 | 22 |
| 10 | 25 |

* 1. STRATEGY: Peer Similarity

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 3 |
| 2 | 6 |
| 3 | 9 |
| 4 | 11 |
| 5 | 13 |
| 6 | 15 |
| 7 | 19 |
| 8 | 21 |
| 9 | 23 |
| 10 | 25 |

* 1. STRATEGY: Follow Similarity

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 2 |
| 2 | 3 |
| 3 | 4 |
| 4 | 7 |
| 5 | 12 |
| 6 | 17 |
| 7 | 18 |
| 8 | 20 |
| 9 | 22 |
| 10 | 25 |

1. COMPLETE NETWORK:
   1. STRATEGY: Document Popularity

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 1 |
| 2 | 4 |
| 3 | 7 |
| 4 | 9 |
| 5 | 11 |
| 6 | 14 |
| 7 | 18 |
| 8 | 22 |
| 9 | 24 |
| 10 | 25 |

* 1. STRATEGY: Peer Popularity

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 5 |
| 2 | 7 |
| 3 | 9 |
| 4 | 11 |
| 5 | 13 |
| 6 | 15 |
| 7 | 17 |
| 8 | 21 |
| 9 | 24 |
| 10 | 25 |

* 1. STRATEGY: Peer Distance

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 4 |
| 2 | 6 |
| 3 | 9 |
| 4 | 13 |
| 5 | 15 |
| 6 | 16 |
| 7 | 20 |
| 8 | 20 |
| 9 | 22 |
| 10 | 25 |

* 1. STRATEGY: Peer Similarity

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 3 |
| 2 | 6 |
| 3 | 9 |
| 4 | 11 |
| 5 | 13 |
| 6 | 15 |
| 7 | 19 |
| 8 | 21 |
| 9 | 23 |
| 10 | 25 |

* 1. STRATEGY: Follow Similarity

|  |  |
| --- | --- |
| Ticks | Score |
| 1 | 2 |
| 2 | 3 |
| 3 | 4 |
| 4 | 7 |
| 5 | 12 |
| 6 | 17 |
| 7 | 18 |
| 8 | 20 |
| 9 | 22 |
| 10 | 25 |