

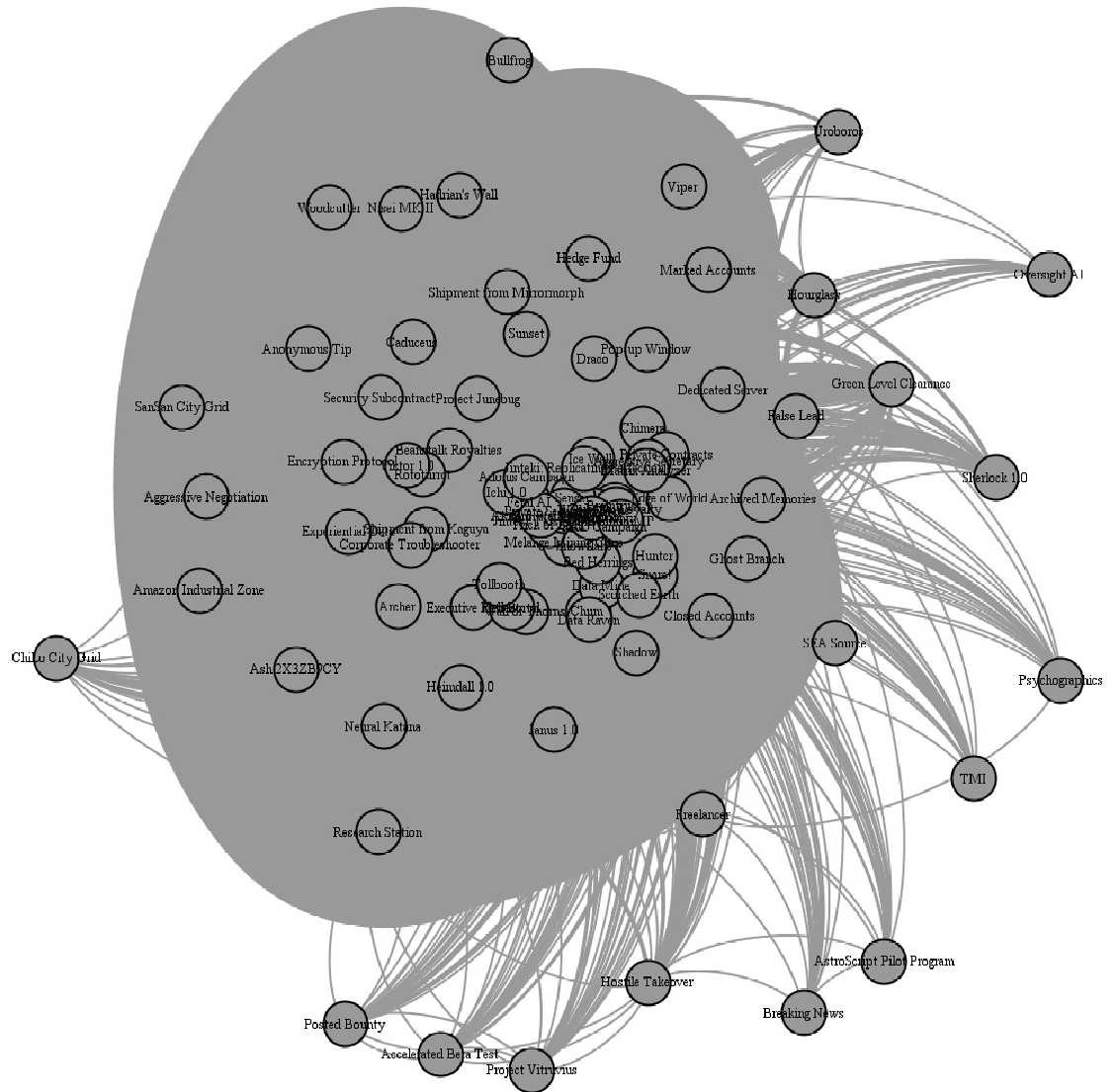
## **An Analysis of Deckbuilding in *Android: Netrunner***

by Scott D. Orr

*Android: Netrunner* is a card game that pits two opponents against one another in a cyberpunk setting that would be familiar to readers of William Gibson or Neal Stephenson, with one player in the role of a corporation (“corp”), and the other in the role of a “runner” attempting to penetrate the corp’s cybersecurity. A large part the game’s appeal lies in the ability of players to personalize their decks, selecting a number of cards (usually 40-49) from the dozens available. The purpose of this project is to determine if social network analysis can increase our understanding of the deckbuilding process, providing some insights into effective design, or at least giving players some idea of what to expect of their opponents.

Thankfully, a website, *CardGameDB* exists on which players can post their decks in a standard format, making analysis of those decks reasonably easy. In order to keep this project manageable, I selected one of the four available corps (“Jinteki”—the URL for the Jinteki decks is [http://www.cardgamedb.com/index.php/netrunner/android-netrunner-submitted-decks/\\_jinteki/](http://www.cardgamedb.com/index.php/netrunner/android-netrunner-submitted-decks/_jinteki/)), and saved the 228 decks submitted for that corp. Of those 228, 29 were eliminated for not being legal decks (one was part of a server test, one was incomplete, and the rest didn’t follow the game’s somewhat arcane deckbuilding rules), leaving 199 decks that formed part of the study. I then used an R program (see attached) to compose a master list of all cards used (the nodes for our analysis), and a list of the number of times each pair of cards appeared in the same deck (the edges—note that this means the edges are weighted).

The analysis possible for this sort of data is limited: because each card (node) has multiple links to other cards, the density of the network is far too high to allow a division into multiple communities, with even the least used card having a degree of 17 (compared with 88 for the most-used card). Instead, the best that can be done is to lay out the graph (using Force Atlas 2 in Gephi) with consideration of edge weights. This places cards that are used often together next to one another. Cards used frequently are in the center, and those used infrequently are seen on the edges. One limitation of the current analysis is that some cards were released after others, and therefore don’t appear as often as they otherwise might have simply because they weren’t available earlier; however, this analysis shows the potential of the method, and it would be relatively easy to redo the task with a subset of decks from a limited time period. It may also help to identify “combos”—cards that work well together and therefore often appear in the same deck.



## The Program in R

```
#Initialize variables, including output matrices for cards (nodes) and edges.
Cards <- rbind(c("ID", "Label"))
Edges <- rbind(c("Source", "Target", "Type", "Weight"))
MasterID <- 0
TruncPattern <- "\\(.*$"

#Read in next deck, after checking for existence of next deck in sequence.
for(DeckID in 1:277) {
  CurrentDeck <- paste0("Deck",DeckID,".txt")
  if(length(list.files(path="C:/text/data science/social network
analysis/project/Jinteki", pattern=CurrentDeck)) > 0) {
    print(CurrentDeck)
    CurrentDeckList <- readLines(con=paste0("C:/text/data
science/social network analysis/project/Jinteki/", CurrentDeck), -1)

    #Check to see if each line represents a card, extract card names, add cards to
    master list, and create a cleaned list for the current deck.
    CleanDeckList <- NULL
    line <- 1
    while (!grepl("Total Agenda", CurrentDeckList[line])) {
      if(grepl("Personal",
CurrentDeckList[line])|grepl("Replicating", CurrentDeckList[line])|grepl("#",
CurrentDeckList[line], fixed=TRUE)) {
        CardName <- sub(TruncPattern, "",
CurrentDeckList[line])

        if(CardName %in% Cards) {
          CardID <- (match(CardName, Cards) - nrow
(Cards) - 1)
        }
        else {
          MasterID <- MasterID + 1
          Cards <- rbind(Cards, c(MasterID,
CardName))

          CardID <- MasterID
        }
        CleanDeckList <- rbind(CleanDeckList,c(CardID,
CardName))
      }
      line <- line+1
    }

    #Extract new edges and add to weights of previous ones.
    NumCards <- nrow(CleanDeckList)
    for(Card1 in 1:(NumCards-1)) {
```

```

        for(Card2 in (Card1+1):NumCards) {
            if(as.integer(CleanDeckList[Card1, 1]) <
as.integer(CleanDeckList[Card2, 1])) {
                SourceID <- CleanDeckList[Card1, 1]
                TargetID <- CleanDeckList[Card2, 1]
            }
            else {
                SourceID <- CleanDeckList[Card2, 1]
                TargetID <- CleanDeckList[Card1, 1]
            }
            if(length(Edges[Edges[,1] == SourceID &
Edges[,2] == TargetID, 1:2]) == 0) {
                Edges <- rbind(Edges, c(SourceID,
TargetID, "Undirected", 1))
            }
            else {
                Edges[Edges[,1] == SourceID & Edges[,2]
== TargetID, 4] <- (as.integer(Edges[Edges[,1] == SourceID & Edges[,2] == TargetID,
4]) + 1)
            }
        }
    }
}

```

## Nodes

ID,Label

1,Jinteki: Personal Evolution

2,Executive Retreat

3,Braintrust

4,Fetal AI

5,Edge of World

6,Snare!

7,Project Junebug

8,Chum

9,Data Mine

10,Chimera

11,Ice Wall

12,Draco

13,Neural Katana

14,Wall of Static

15,Enigma

16,Shipment from Mirrormorph

17,Beanstalk Royalties

18,Green Level Clearance

19,Hedge Fund

20,Anonymous Tip

21,Nisei MK II

22,Priority Requisition

23,Melange Mining Corp

24,Zaibatsu Loyalty

25,Sensei

26,Woodcutter

27,Wall of Thorns

28,Shipment from Kaguya

29,Sunset

30,Trick of Light

31,Private Security Force

32,PAD Campaign

33,Private Contracts

34,Aggressive Secretary

35,Pop-up Window

36,Archived Memories

37,Red Herrings

38,Jinteki: Replicating Perfection

39,Snowflake

40,Rototurret

41,Matrix Analyzer

42,Viktor 1.0

43,Precognition

44,Security Subcontract  
45,Neural EMP  
46,Akitaro Watanabe  
47,Encryption Protocol  
48,Dedicated Server  
49,Ichi 1.0  
50,False Lead  
51,Janus 1.0  
52,Archer  
53,Ghost Branch  
54,Data Raven  
55,Hunter  
56,Closed Accounts  
57,Bullfrog  
58,Cell Portal  
59,Hourglass  
60,Adonis Campaign  
61,Viper  
62,Shadow  
63,Scorched Earth  
64,Marked Accounts  
65,Uroboros  
66,Aggressive Negotiation  
67,Tollbooth  
68,Caduceus  
69,Oversight AI  
70,SEA Source  
71,Sherlock 1.0  
72,Experiential Data  
73,Amazon Industrial Zone  
74,Corporate Troubleshooter  
75,Heimdall 1.0  
76,Ash 2X3ZB9CY  
77,Hadrian's Wall  
78,SanSan City Grid  
79,Psychographics  
80,Freelancer  
81,Hostile Takeover  
82,Accelerated Beta Test  
83,Posted Bounty  
84,Project Vitruvius  
85,Research Station  
86,Breaking News  
87,AstroScript Pilot Program  
88,TMI  
89,ChiLo City Grid

## Edges

Source,Target,Type,Weight

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1,3,Undirected,65  
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