AI-in-SF-Analysis

July 19, 2019

1 The Portrayal of Artificial Intelligence in Science Fiction Literature

1.1 Analysis

```
In [1]: import numpy as np
        import pandas as pd
        import seaborn as sns
        import matplotlib.pyplot as plt
        from adjustText import adjust_text
        from sklearn.metrics import r2_score
        from scipy.stats import pearsonr
```

```
In [2]: data = pd.read_csv("dataset_final.csv", delimiter=";")
        data = data.replace("nA", np.nan)
```

```
In [3]: data.head()
```

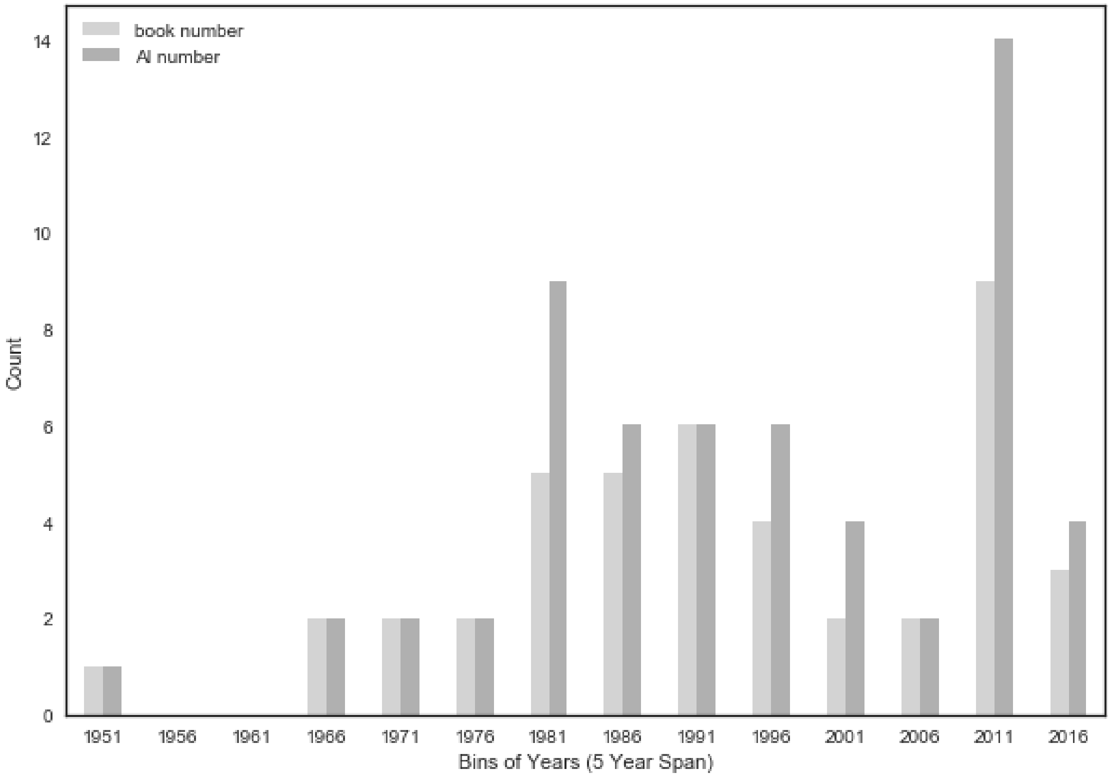
```
Out[3]:    year                                             title  \
        0  1954  They'd Rather Be Rightă(akaăThe Forever Machine)
        1  1966                      The Moon Is a Harsh Mistress
        2  1968                                 Stand on Zanzibar
        3  1973                              Rendezvous with Rama
        4  1975                                    The Female Man

                                name short name gender (5)  \
        0  Bossy, the synthetic brain      Bossy        4.0
        1             HOLMES IV, Mike       Mike        2.0
        2                 Shalmaneser       Shal        2.0
        3                       Biots      Biots        3.0
        4                        Davy       Davy        1.5

                                               manifestation  physical (5)  \
        0                           "her rejuvenation power"           1.0
        1                      male name, referenced as "he"           1.0
        2  "This was the one he - I mean it - rated highest"           1.0
        3                                               none           1.0
        4                          male, in name and in body           4.0
```

```
                                          difference  technical (3)  \
0                              computer with display            1.0
1                                          black box            1.0
2                         white metal, 18 to 11 inch            1.0
3  crablike, starfish, shark, spider, metallic su...            1.0
4                                ? Controlled mind?             1.0

   consciousness (5)            ...              quantity (3)  warrior  \
0                1.0            ...                       1.0      0.0
1                3.0            ...                       1.0      0.0
2                1.0            ...                       1.0      0.0
3                1.0            ...                       3.0      1.0
4                2.0            ...                       1.0      0.0

   rebellious  harmed humans  harms creator more control world domination  \
0         0.0            0.0                0.0           0.0              0.0
1         1.0            0.0                0.0           0.0              0.0
2         0.0            0.0                0.0           0.0              0.0
3         0.0            1.0                0.0           0.0              0.0
4         0.0            0.0                0.0           0.0              0.0

  alien technology author gender  explicit mention of gender
0              0.0           0.0                         0.0
1              0.0           0.0                         0.0
2              0.0           0.0                         0.5
3              1.0           0.0                         0.0
4              0.0           1.0                         1.0

[5 rows x 34 columns]
```

1.2 Count of Books and AIs over Years

```
In [4]: yearbins = ["1951", "1956", "1961", "1966", "1971", "1976", "1981",
                     "1986", "1991", "1996", "2001", "2006", "2011", "2016"]

In [5]: book_num = [1,0,0,2,2,2,5,5,6,4,2,2,9,3]

In [6]: ai_num = [1,0,0,2,2,2,9,6,6,6,4,2,14,4]

In [7]: df = [yearbins, book_num, ai_num]

In [8]: df = pd.DataFrame()

In [9]: df['years'] = pd.Series(yearbins)
        df['book number'] = pd.Series(book_num)
        df['AI number'] = pd.Series(ai_num)

In [10]: df = df.set_index('years')
         #df
```

```
In [11]: sns.set(style="white", palette=sns.dark_palette("lightgrey", reverse=True))
         test = df.plot(kind= 'bar', secondary_y= 'ai_number', rot= 0, figsize=(10,7))
         plt.ylabel("Count")
         plt.xlabel("Bins of Years (5 Year Span)")
         plt.show()
```



2 hypothesis 1.1 - male/female

The AI is rather presented as a male than as a female.

```
In [12]: gender_cat = pd.Categorical(data["gender (5)"], categories=["1", "1.5", "2", "2.5", "

In [13]: gender = data["gender (5)"].replace(["1.0", "1.5", "2.0"], "male").replace(["4.0", "4

In [14]: gender.value_counts()

Out[14]: male       23
         neutral    19
         female     11
         other       6
         Name: gender (5), dtype: int64
```

```
In [15]: #sns.set(style = "white", palette = sns.dark_palette("black"))
         #sns.distplot(data["gender (5)"].astype(str), bins=9, kde=False, rug=True)
         #plt.ylabel("count")
         #plt.xlabel("gender (male - female)")
```

3 hypothesis 1.2 - mentioning of gender and gender correlation

(a) When the topic of the gender of an AI is explicitly mentioned, it is more probably female than male. (b) When gender is only mentioned and not discussed more deeply, it is more probably male than female.

```
In [16]: mentioned = data["explicit mention of gender"]
```

```
In [17]: df = pd.crosstab(gender, mentioned)
         df.loc["Total"] = df.loc["female"] + df.loc["male"] + df.loc["neutral"] + df.loc["othe
         df
```

```
Out[17]: explicit mention of gender  0.0  0.5  1.0
         gender (5)
         female                        7    1    3
         male                         18    3    2
         neutral                      17    1    1
         other                         4    1    0
         Total                        46    6    6
```

```
In [18]: df = pd.crosstab(gender, mentioned, normalize="index")
         df
```

```
Out[18]: explicit mention of gender       0.0       0.5       1.0
         gender (5)
         female                      0.636364  0.090909  0.272727
         male                        0.782609  0.130435  0.086957
         neutral                     0.894737  0.052632  0.052632
         other                       0.800000  0.200000  0.000000
```

```
In [19]: df = pd.crosstab(gender, mentioned, normalize="columns")
         df
```

```
Out[19]: explicit mention of gender       0.0       0.5       1.0
         gender (5)
         female                      0.152174  0.166667  0.500000
         male                        0.391304  0.500000  0.333333
         neutral                     0.369565  0.166667  0.166667
         other                       0.086957  0.166667  0.000000
```

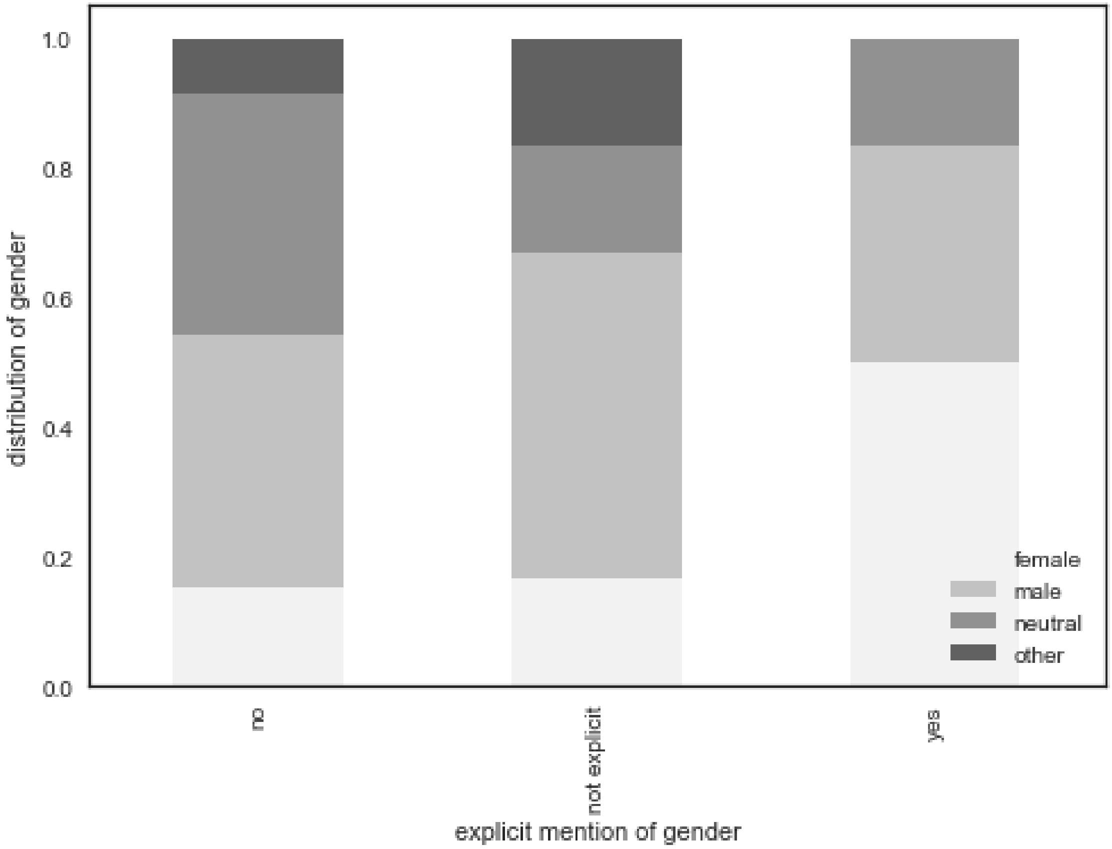
```
In [20]: data["name"][mentioned == 1]
```

```
Out[20]: 4                                      Davy
         22                                      Yod
```

```
43                         Anaander Mianaai
44    Breq from the Gerenade, Breq Mianaani
46                                  Rupetta
55                                Murderbot
Name: name, dtype: object
```

```
In [21]: df = df.transpose()
```

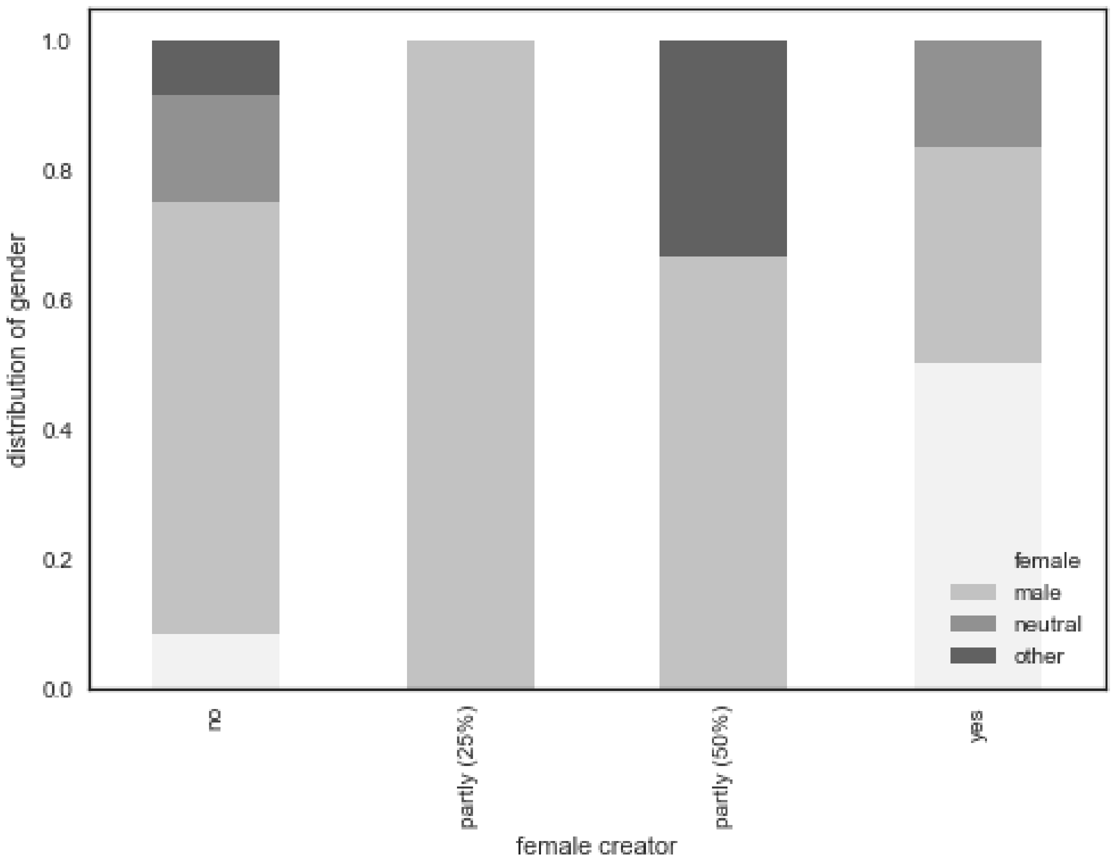
```
In [22]: sns.set(style = "white", palette = sns.light_palette("black"))
         df.plot.bar(stacked=True)
         #labels = ["servant", "changing", "no servant"]
         plt.legend()
         plt.ylabel("distribution of gender")
         bars = ("no", "not explicit", "yes")
         y_pos = np.arange(len(bars))
         plt.xticks(y_pos, bars)
         plt.show()
```



4 hypothesis 1.3 - creator/creation

When the creator is male, the created AI is more probably female than male.

```
In [23]: female_creator = data["female creator"]

In [24]: df = pd.crosstab(gender, female_creator)
         df.loc["Total"] = df.loc["female"] + df.loc["male"] + df.loc["neutral"] + df.loc["othe
         df

Out[24]: female creator   0  0.25  0.5  1
         gender (5)
         female           1     0    0  3
         male             8     2    2  2
         neutral          2     0    0  1
         other            1     0    1  0
         Total           12     2    3  6

In [25]: df = pd.crosstab(gender, female_creator, normalize="index")
         df

Out[25]: female creator         0      0.25       0.5         1
         gender (5)
         female          0.250000  0.000000  0.000000  0.750000
         male            0.571429  0.142857  0.142857  0.142857
         neutral         0.666667  0.000000  0.000000  0.333333
         other           0.500000  0.000000  0.500000  0.000000

In [26]: df = pd.crosstab(gender, female_creator, normalize="columns")
         df

Out[26]: female creator         0  0.25       0.5         1
         gender (5)
         female          0.083333   0.0  0.000000  0.500000
         male            0.666667   1.0  0.666667  0.333333
         neutral         0.166667   0.0  0.000000  0.166667
         other           0.083333   0.0  0.333333  0.000000

In [27]: df = df.transpose()
         sns.set(style = "white", palette = sns.light_palette("black"))
         df.plot.bar(stacked=True)
         plt.ylabel("distribution of gender")
         plt.legend(title = "")
         bars = ("no", "partly (25%)", "partly (50%)", "yes")
         y_pos = np.arange(len(bars))
         plt.xticks(y_pos, bars)
         plt.show()
```



```
In [28]: data["name"][(female_creator == "0") & (gender == "female")]

Out[28]: 0    Bossy, the synthetic brain
         Name: name, dtype: object

In [29]: data["name"][(female_creator == "1") & (gender == "male")]

Out[29]: 4           Davy
         12    Wintermute
         Name: name, dtype: object
```

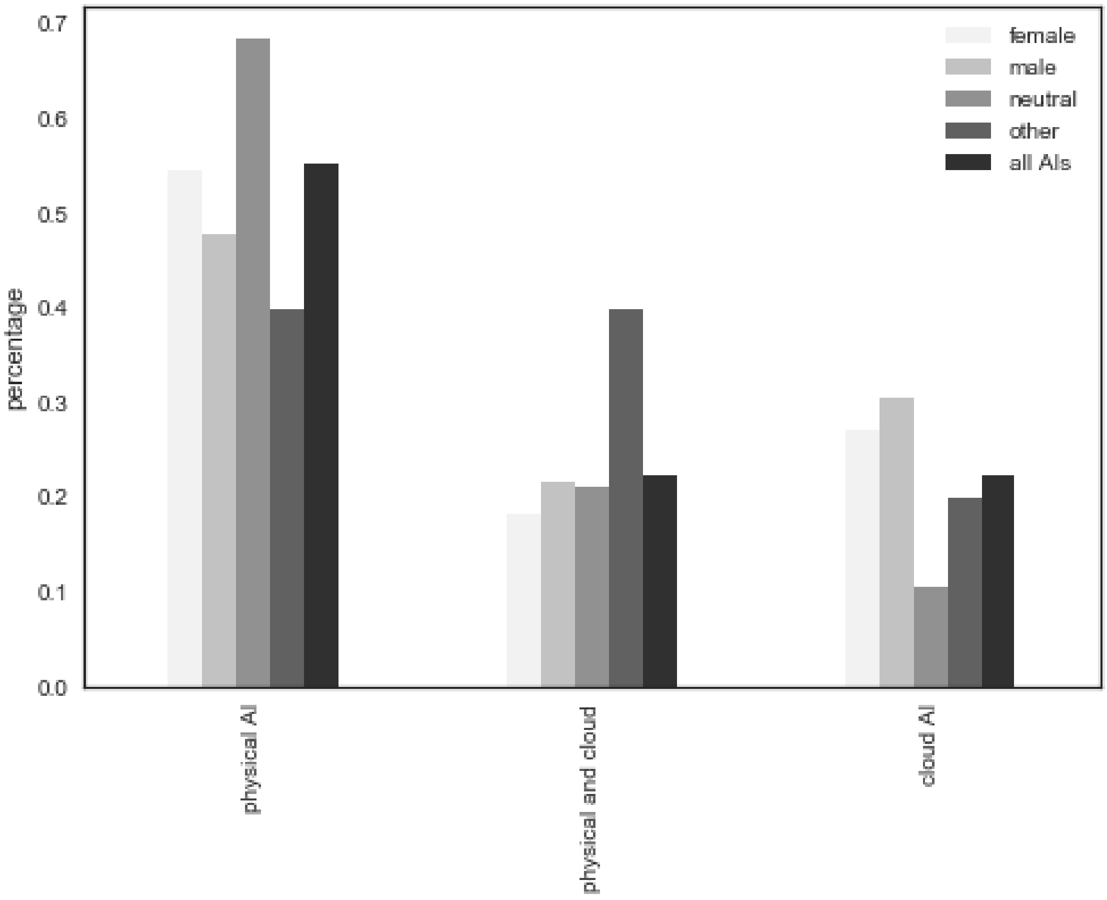
5 hypothesis 1.4 - technical form and gender correlation

(a) Female AIs tend to be more in cloud form, (b) male AIs tend to be more in physical form.

```
In [30]: form = data["technical (3)"]

In [31]: df = pd.crosstab(gender, form)
         df.loc["Total"] = df.loc["female"] + df.loc["male"] + df.loc["neutral"] + df.loc["othe
         df
```

```
Out[31]: technical (3)  1.0  2.0  3.0
         gender (5)
         female           6    2    3
         male            11    5    7
         neutral         13    4    2
         other            2    2    1
         Total           32   13   13
```

```
In [32]: df = pd.crosstab(gender, form, normalize="index")
         df.loc["all AIs"] = [0.552, 0.224, 0.224]
         df = df.transpose()
         sns.set(style = "white", palette = sns.light_palette("black"))
         df.plot.bar()
         plt.ylabel("percentage")
         plt.xlabel("")
         plt.legend(title = "")
         bars = ("physical AI", "physical and cloud", "cloud AI")
         y_pos = np.arange(len(bars))
         plt.xticks(y_pos, bars)
         plt.show()
```



```
In [33]: df = pd.crosstab(gender, form, normalize="index")
         df
```

```
Out[33]: technical (3)       1.0       2.0       3.0
         gender (5)
         female         0.545455  0.181818  0.272727
         male           0.478261  0.217391  0.304348
         neutral        0.684211  0.210526  0.105263
         other          0.400000  0.400000  0.200000
```

```
In [34]: df = pd.crosstab(gender, form, normalize="columns")
         df
```

```
Out[34]: technical (3)      1.0       2.0       3.0
         gender (5)
         female         0.18750  0.153846  0.230769
         male           0.34375  0.384615  0.538462
         neutral        0.40625  0.307692  0.153846
         other          0.06250  0.153846  0.076923
```

```
In [35]: data["name"][((gender == "female") | (gender == "male")) & (form == 3)]
```

```
Out[35]: 11          Dixie
         12     Wintermute
         13    Neuromancer
         16           Jane
         23       Art Fish
         25          Alice
         26    Paul Durham
         38         Rabbit
         42        Pauline
         52     Supervisor
         Name: name, dtype: object
```

```
In [36]: data["name"][((gender == "other") | (gender == "neutral")) & (form == 3)]
```

```
Out[36]: 20         TechnoCore
         32             Ganesh
         35    Lobster colony
         Name: name, dtype: object
```

```
In [37]: data["name"][(gender == "male") & (form == 1)]
```

```
Out[37]: 1         HOLMES IV, Mike
         2            Shalmaneser
         4                   Davy
         5                Hangman
         6     Sigfrid von Shrink
         7          Ralph Numbers
```

```
9          Cobb Anderson
10               Tik-Tok
15               Cyclops
22                   Yod
56            John of Us
Name: name, dtype: object
```

6 hypothesis 2.1 - servant

The AI appears as a servant for human beings.

```
In [38]: servant = data["servant (3)"].dropna()
```

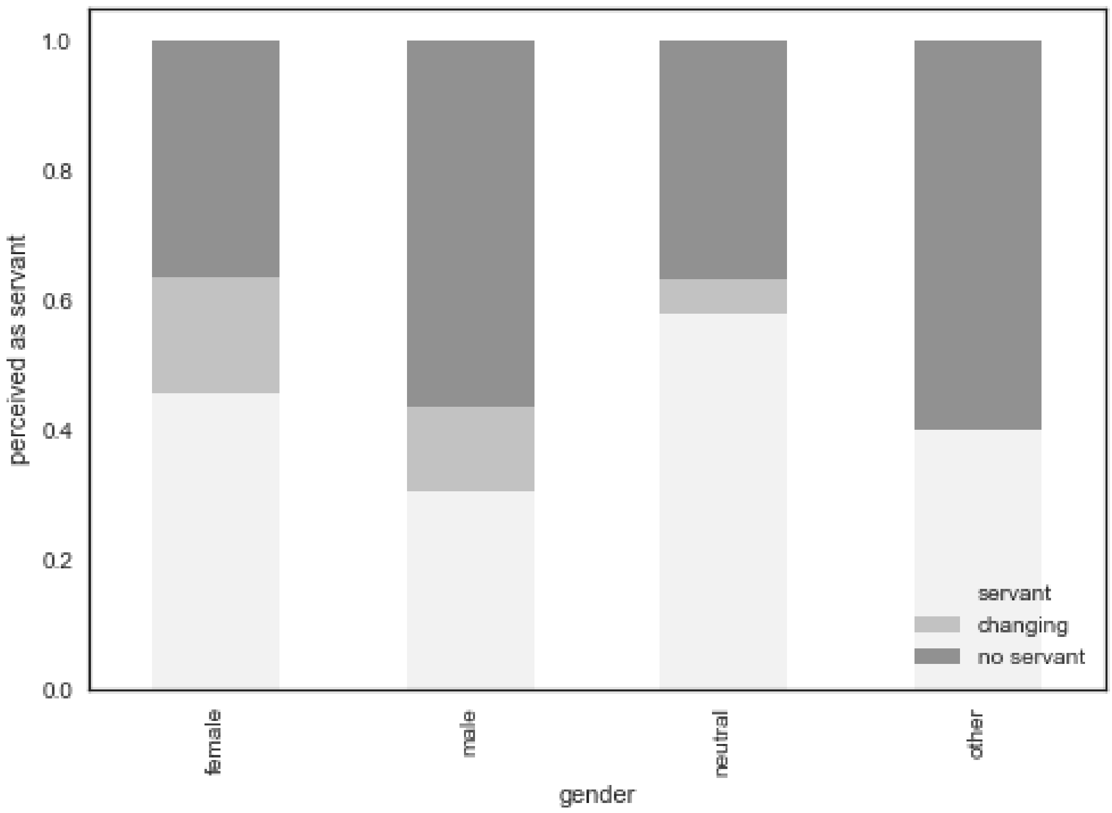
```
In [39]: df = pd.crosstab(gender, servant, rownames=["gender"], colnames=["servant"])
         df.loc["total"] = df.loc["female"] + df.loc["male"] + df.loc["neutral"] + df.loc["othe
         df
```

```
Out[39]: servant  1.0  2.0  3.0
         gender
         female     5    2    4
         male       7    3   13
         neutral   11    1    7
         other      2    0    3
         total     25    6   27
```

```
In [40]: df = pd.crosstab(gender, servant, rownames=["gender"], colnames=["servant"], normalize
         df
```

```
Out[40]: servant       1.0       2.0       3.0
         gender
         female   0.454545  0.181818  0.363636
         male     0.304348  0.130435  0.565217
         neutral  0.578947  0.052632  0.368421
         other    0.400000  0.000000  0.600000
```

```
In [41]: sns.set(style = "white", palette = sns.light_palette("black"))
         df.plot.bar(stacked=True)
         labels = ["servant", "changing", "no servant"]
         plt.legend(labels, loc="lower right")
         plt.ylabel("perceived as servant")
         plt.show()
```



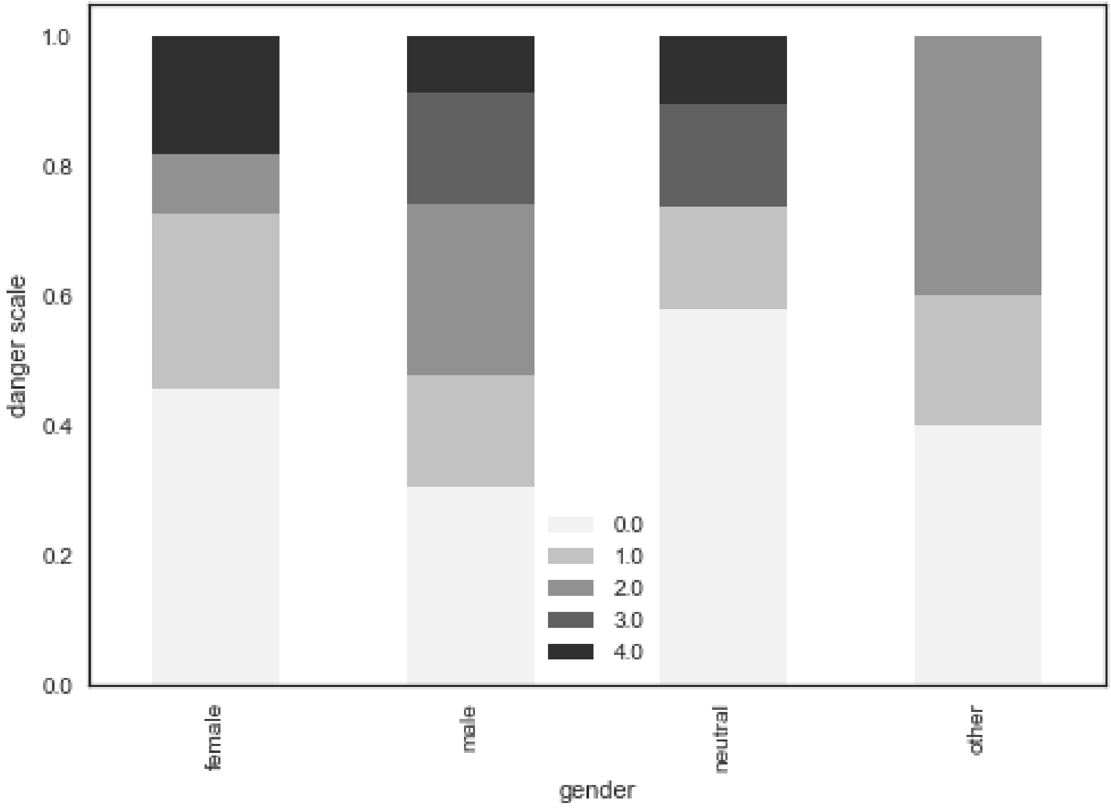
```
In [42]: data["name"][(data["servant (3)"] == 3) & ((data["gender (5)"] == 4) | (data["gender

Out[42]: Series([], Name: name, dtype: object)
```

7 hypothesis 2.2.1 - danger (general)

The AI is dangerous for (a) human beings in general.

```
In [43]: data["danger"] = pd.to_numeric(data["rebellious"]) + pd.to_numeric(data["harmed humans

In [44]: danger = data["danger"]

In [45]: df = pd.crosstab(gender, danger, rownames=["gender"], colnames=["danger"])
         df.loc["total"] = df.loc["female"] + df.loc["male"] + df.loc["neutral"] + df.loc["othe
         df

Out[45]: danger   0.0  1.0  2.0  3.0  4.0
         gender
         female     5    3    1    0    2
         male       7    4    6    4    2
         neutral   11    3    0    3    2
         other      2    1    2    0    0
         total     25   11    9    7    6
```

```
In [46]: df = pd.crosstab(gender, danger, rownames=["gender"], colnames=["danger"], normalize=
         df

Out[46]: danger        0.0       1.0       2.0       3.0       4.0
         gender
         female   0.454545  0.272727  0.090909  0.000000  0.181818
         male     0.304348  0.173913  0.260870  0.173913  0.086957
         neutral  0.578947  0.157895  0.000000  0.157895  0.105263
         other    0.400000  0.200000  0.400000  0.000000  0.000000

In [47]: sns.set(style = "white", palette = sns.light_palette("black"))
         df.plot.bar(stacked=True)
         #labels = ["servant", "changing", "no servant"]
         plt.legend()
         plt.ylabel("danger scale")
         plt.show()
```



```
In [48]: data["name"][(danger == 4.0)]

Out[48]: 8      Big 12 (GAX, TEX, BEX, MEX, Mr Frosti)
         12                                 Wintermute
         24                                 the Blight
         43                              Anaander Mianaai
         49                                  Su-Yong Shu
         53                                 Bartholomäus
         Name: name, dtype: object
```

8 hypothesis 2.2.2 - danger (creator)

The AI is dangerous for (b) its owner/creator.

```
In [49]: harms_creator = data["harms creator"]
```

```
In [50]: df = pd.crosstab(gender, harms_creator, rownames=["gender"], colnames=["harms creator
         df.loc["total"] = df.loc["female"] + df.loc["male"] + df.loc["neutral"] + df.loc["othe
         df
```

```
Out[50]: harms creator  0.0  1.0
         gender
         female          10    1
         male            20    3
         neutral         18    1
         other            5    0
         total           53    5
```

```
In [51]: df = pd.crosstab(gender, harms_creator, rownames=["gender"], colnames=["harms creator
         df
```

```
Out[51]: harms creator       0.0       1.0
         gender
         female         0.909091  0.090909
         male           0.869565  0.130435
         neutral        0.947368  0.052632
         other          1.000000  0.000000
```

```
In [52]: data["name"][data["harms creator"] == 1]
```

```
Out[52]: 5                                        Hangman
         7                                  Ralph Numbers
         8      Big 12 (GAX, TEX, BEX, MEX, Mr Frosti)
         36                               Aineko, AI Neko
         44      Breq from the Gerenade, Breq Mianaani
         Name: name, dtype: object
```

9 hypothesis 2.2.3 - danger (humanity)

The AI is dangerous for (c) humanity in total.

```
In [53]: world = data["world domination"]
In [54]: df = pd.crosstab(gender, world, rownames=["gender"], colnames=["world domination"])
         df.loc["total"] = df.loc["female"] + df.loc["male"] + df.loc["neutral"] + df.loc["othe
         df
```

```
Out[54]: world domination  0.0  1.0
         gender
         female              9    2
         male               20    3
         neutral            15    4
         other               5    0
         total              49    9
```

```
In [55]: df = pd.crosstab(gender, world, rownames=["gender"], colnames=["world domination"], no
         df
```

```
Out[55]: world domination       0.0       1.0
         gender
         female            0.818182  0.181818
         male              0.869565  0.130435
         neutral           0.789474  0.210526
         other             1.000000  0.000000
```

```
In [56]: data["name"][data["world domination"] == 1]
```

```
Out[56]: 8     Big 12 (GAX, TEX, BEX, MEX, Mr Frosti)
         12                                Wintermute
         20                                TechnoCore
         24                                the Blight
         43                           Anaander Mianaai
         49                              Su-Yong Shu
         50                                The Sophon
         52                                Supervisor
         53                              Bartholomäus
         Name: name, dtype: object
```

10 hypothesis 2.3 - warrior

The AI is produced and used as a warrior.

```
In [57]: warrior = data["warrior"]
```

```
In [58]: df = pd.crosstab(gender, warrior, rownames=["gender"], colnames=["warrior"])
         df.loc["total"] = df.loc["female"] + df.loc["male"] + df.loc["neutral"] + df.loc["othe
         df
```

```
Out[58]: warrior  0.0  1.0
         gender
         female     9    2
         male      21    2
         neutral   10    9
         other      5    0
         total     45   13
```

```
In [59]: df = pd.crosstab(gender, warrior, rownames=["gender"], colnames=["warrior"], normalize
         df

Out[59]: warrior       0.0       1.0
         gender
         female   0.818182  0.181818
         male     0.913043  0.086957
         neutral  0.526316  0.473684
         other    1.000000  0.000000

In [60]: data["name"][data["warrior"] == 1]

Out[60]: 3                                      Biots
         5                                    Hangman
         21                          Skaffen-Amtiskaw
         22                                       Yod
         28                                Churt Lyne
         29                          Sisela Ytheleus
         31                         Rhadamanth Nemes
         40                                  Nanobots
         44    Breq from the Gerenade, Breq Mianaani
         45         Justice of Toren One Esk Nineteen
         48                                      Ship
         50                                The Sophon
         55                                 Murderbot
         Name: name, dtype: object
```

11 hypothesis 2.4 - body vs hyper

The AI is either presented as body AI or as hyper AI.

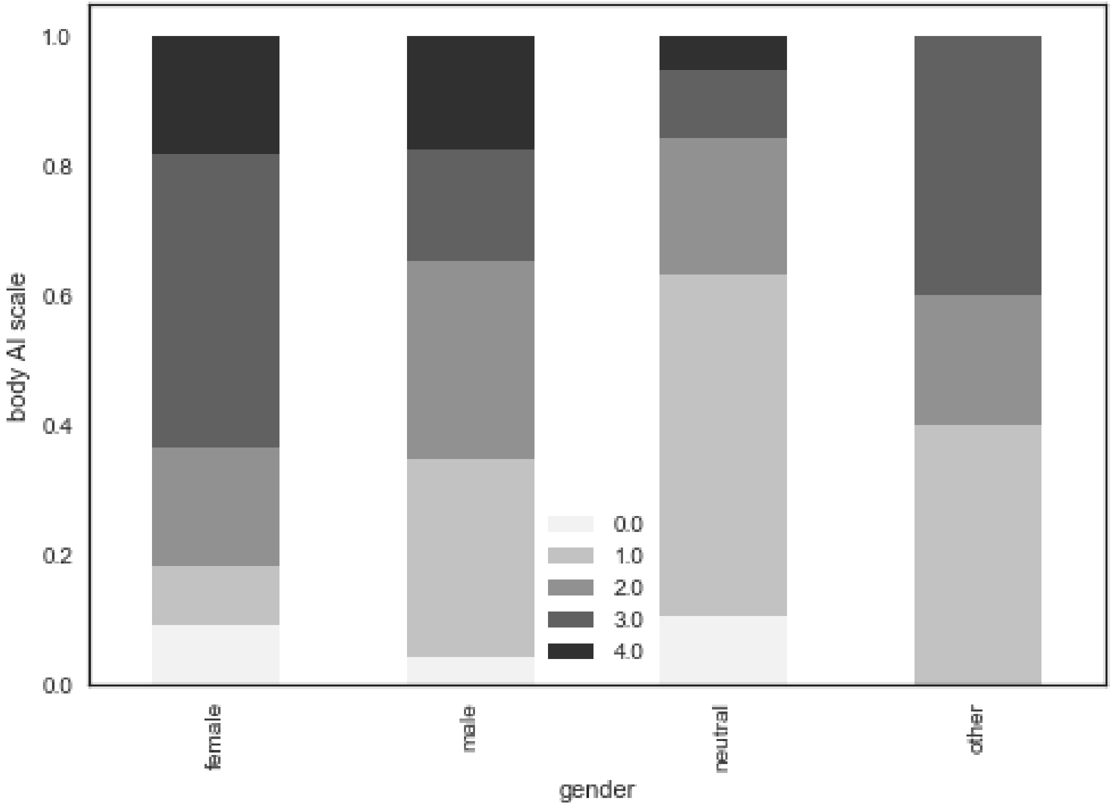
```
In [61]: # is body ai: physical or both, intimacy friendship or love, regarded as subject or c
         # is hyper ai: cloud or both, wants control, world domination

In [62]: body1 = data["technical (3)"].replace([1, 2], 1).replace(3, 0)
         body2 = data["intimacy (4)"].replace([1, 2], 0).replace([3, 4], 1)
         body3 = data["subject (3)"].replace([1, 2], 1).replace(3, 0)
         body4 = data["physical (5)"].replace([3, 2, 1], 0).replace([4, 5], 1)
         body = body1 + body2 + body3 + body4

In [63]: df = pd.crosstab(gender, body, colnames=["body-scale"])
         df.loc["Total"] = df.loc["female"] + df.loc["male"] + df.loc["neutral"] + df.loc["othe
         df
```

```
Out[63]: body-scale  0.0  1.0  2.0  3.0  4.0
         gender (5)
         female        1    1    2    5    2
         male          1    7    7    4    4
         neutral       2   10    4    2    1
         other         0    2    1    2    0
         Total         4   20   14   13    7
```

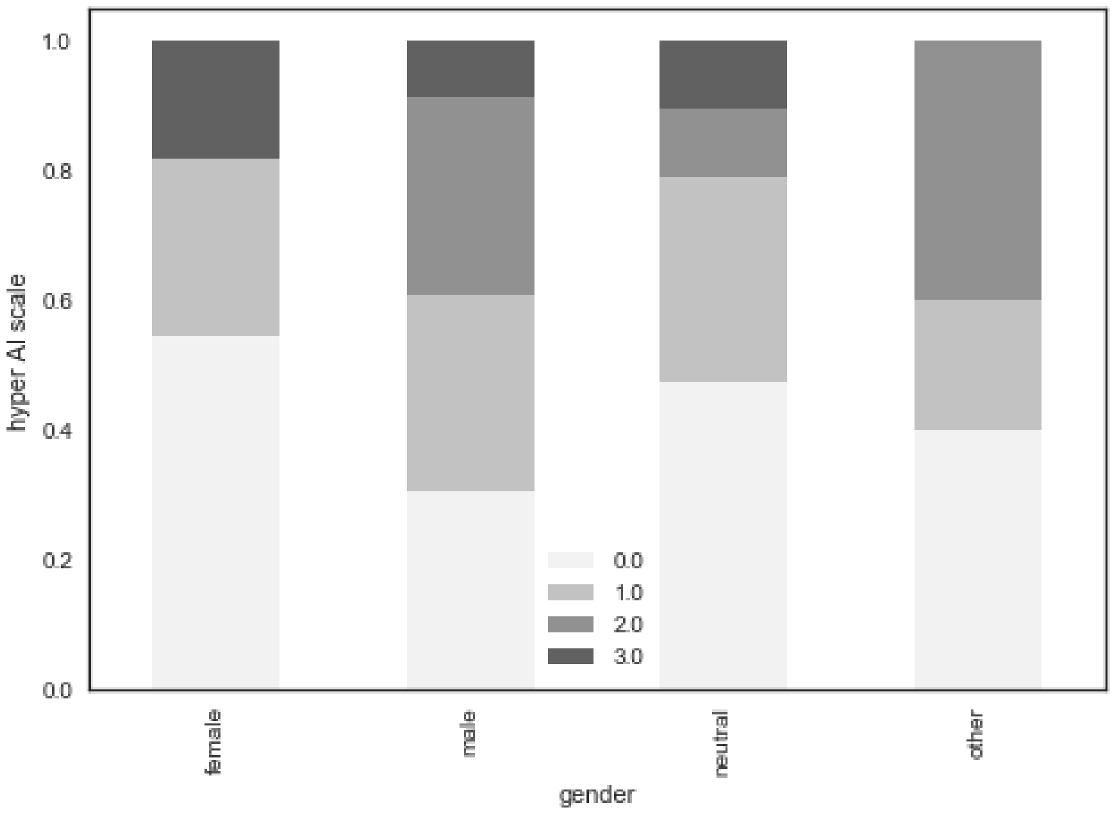
```
In [64]: df = pd.crosstab(gender, body, colnames=["body-scale"], normalize="index")
         df
```

```
Out[64]: body-scale       0.0       1.0       2.0       3.0       4.0
         gender (5)
         female      0.090909  0.090909  0.181818  0.454545  0.181818
         male        0.043478  0.304348  0.304348  0.173913  0.173913
         neutral     0.105263  0.526316  0.210526  0.105263  0.052632
         other       0.000000  0.400000  0.200000  0.400000  0.000000
```

```
In [65]: sns.set(style = "white", palette = sns.light_palette("black"))
         df.plot.bar(stacked=True)
         #labels = ["servant", "changing", "no servant"]
         plt.legend()
         plt.ylabel("body AI scale")
         plt.xlabel("gender")
         plt.show()
```



```
In [66]: data["name"][body == 4]

Out[66]: 9                              Cobb Anderson
         17                       Johnny (John Keats)
         19                             Joseph Severn
         22                                       Yod
         44    Breq from the Gerenade, Breq Mianaani
         46                                   Rupetta
         55                                 Murderbot
         Name: name, dtype: object

In [67]: hyper1 = data["technical (3)"].replace(1, 0).replace([2, 3], 1)
         hyper2 = data["more control"].replace(1, 1).replace(0, 0)
         hyper3 = data["world domination"].replace("1", 1).replace(["0", "0.5"], 0)
         hyper = hyper1 + hyper2 + hyper3

In [68]: df = pd.crosstab(gender, hyper, colnames=["hyper-scale"])
         df.loc["Total"] = df.loc["female"] + df.loc["male"] + df.loc["neutral"] + df.loc["othe
         df

Out[68]: hyper-scale  0.0  1.0  2.0  3.0
         gender (5)
         female         6    3    0    2
         male           7    7    7    2
         neutral        9    6    2    2
         other          2    1    2    0
         Total         24   17   11    6

In [69]: df = pd.crosstab(gender, hyper, colnames=["hyper-scale"], normalize="index")
         df

Out[69]: hyper-scale       0.0       1.0       2.0       3.0
         gender (5)
         female       0.545455  0.272727  0.000000  0.181818
         male         0.304348  0.304348  0.304348  0.086957
         neutral      0.473684  0.315789  0.105263  0.105263
         other        0.400000  0.200000  0.400000  0.000000

In [70]: sns.set(style = "white", palette = sns.light_palette("black"))
         df.plot.bar(stacked=True)
         #labels = ["servant", "changing", "no servant"]
         plt.legend()
         plt.ylabel("hyper AI scale")
         plt.xlabel("gender")
         plt.show()
```



```
In [71]: data["name"][hyper == 3]

Out[71]: 8      Big 12 (GAX, TEX, BEX, MEX, Mr Frosti)
         12                                 Wintermute
         20                                 TechnoCore
         43                             Anaander Mianaai
         49                                Su-Yong Shu
         53                               Bartholomäus
         Name: name, dtype: object
```

12 hypothesis 3 - variation over time

The younger the story (a) the more android the AI is presented, (b) the more the AI is seen as a subject, (c) the less the AI is seen as a servant, (d) the less threatening the AI is presented, (e) the more affection appears toward the AI.

```
In [72]: def best_fit(X, Y):
             X = X.astype(int)
             Y = Y.astype(int)

             xbar = sum(X)/len(X)
```

```
    ybar = sum(Y)/len(Y)
    n = len(X) # or len(Y)

    numer = sum([xi*yi for xi,yi in zip(X, Y)]) - n * xbar * ybar
    denum = sum([xi**2 for xi in X]) - n * xbar**2

    b = numer / denum
    a = ybar - b * xbar

    r2 = r2_score(Y, [a + b * xi for xi in X])
    pcc = pearsonr(X, Y)

    print('best fit line:\ny = {:.2f} + {:.2f}x'.format(a, b))
    print('Rš = ', r2)
    print("Spearmans Correlation Coefficient = ", X.corr(Y, method="spearman"))

    return a, b, r2
```

```
In [73]: def scatter_line_text(X, Y, T, title):
             sns.set(style="white", palette=sns.dark_palette("black"))
             fig = plt.figure(figsize=(15,10))
             ax = fig.add_subplot(111)
             plt.scatter(X, Y)
             a, b, r2 = best_fit(X, Y)
             yfit = [a + b * xi for xi in X]
             plt.plot(X, yfit)

             texts = []
             for x, y, s in zip(X, Y, T):
                 texts.append(plt.text(x, y, s))

             plt.xlabel(title[0])
             plt.ylabel(title[1])
             plt.title(title[2])
             adjust_text(texts, arrowprops=dict(arrowstyle="->", color='black', lw=0.5))

             plt.grid()
             plt.show()
```

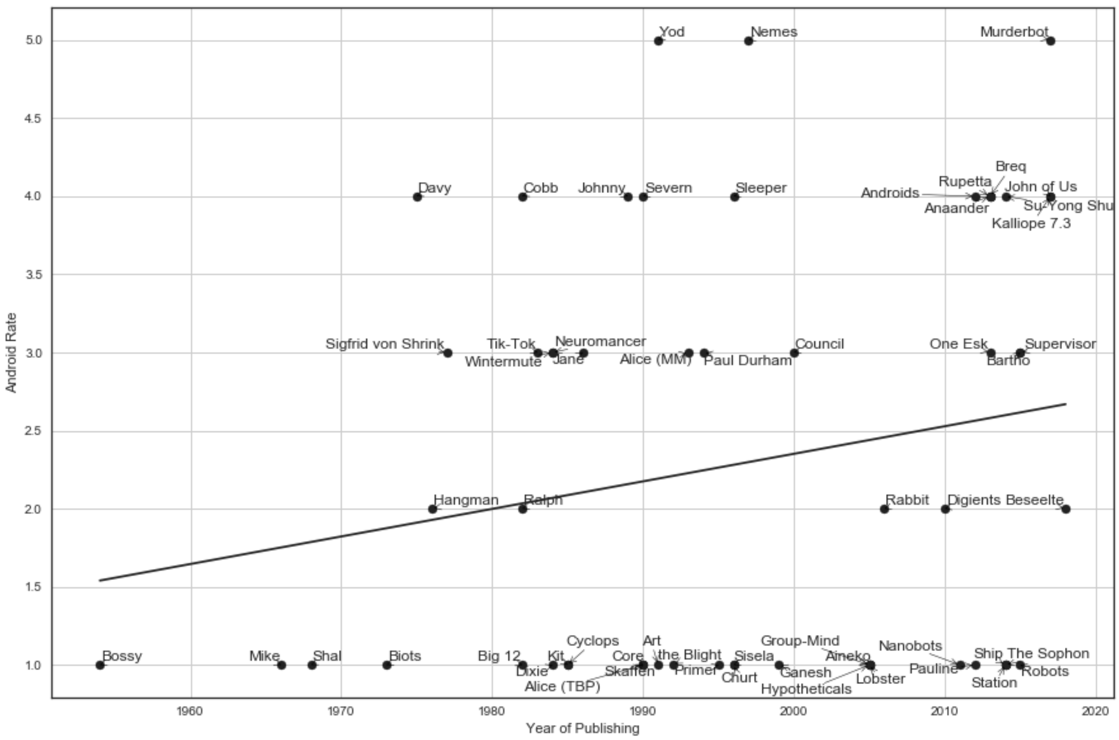
```
In [74]: year = data["year"]
```

```
In [75]: android = data["physical (5)"]
```

```
In [76]: scatter_line_text(year[android.dropna().index],
                           pd.to_numeric(android.dropna()),
                           data["short name"][android.dropna().index],
                           ["Year of Publishing", "Android Rate", ""])
```

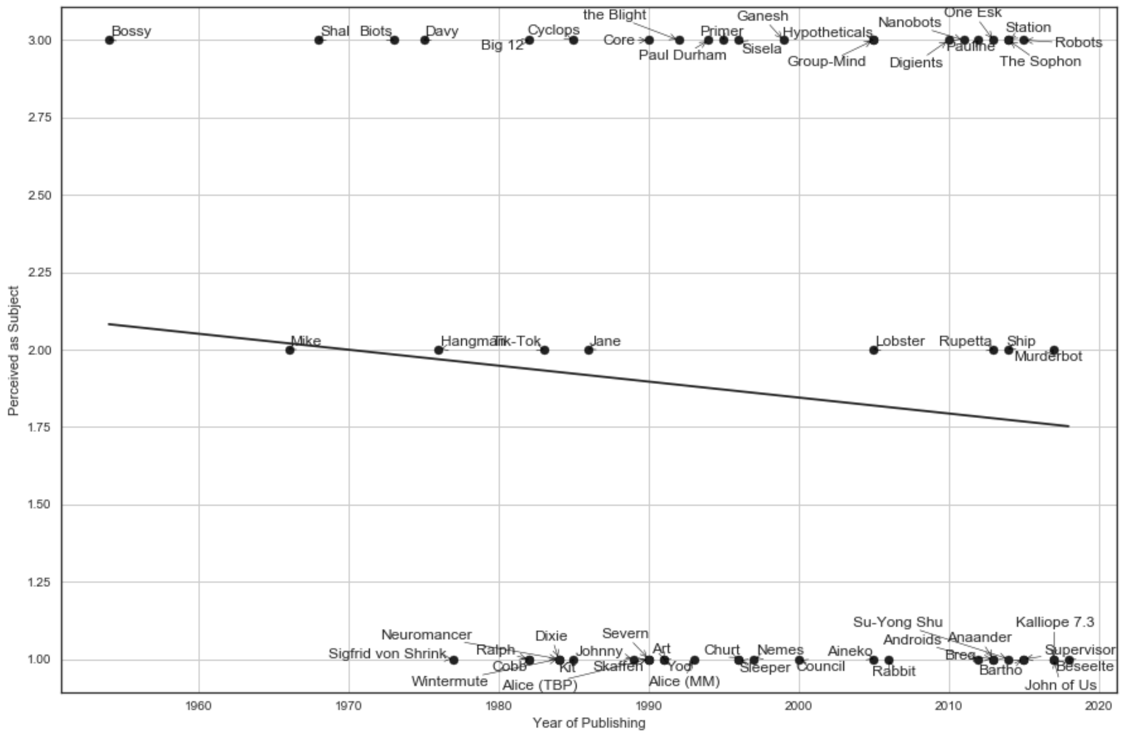
```
best fit line:
y = -32.92 + 0.02x
```

```
Rš =  0.039394485830319126
Spearmans Correlation Coefficient =  0.1907450919041437
```

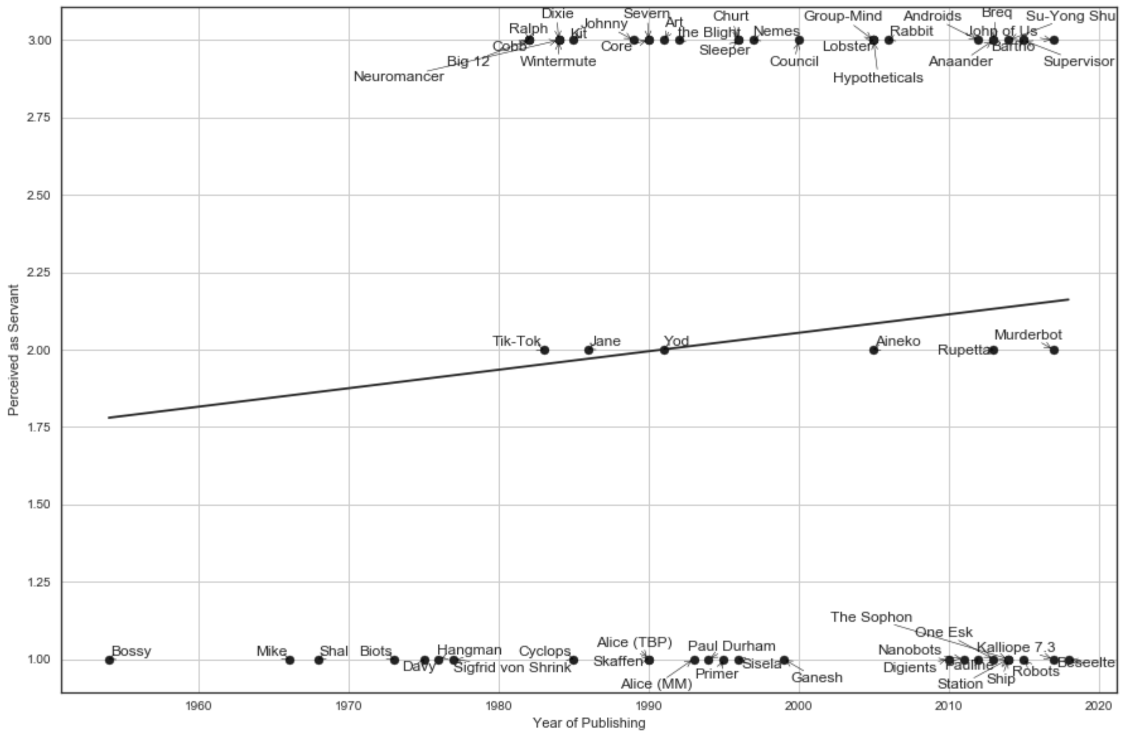


```
In [77]: subject = data["subject (3)"]

In [78]: scatter_line_text(year[subject.dropna().index],
                           pd.to_numeric(subject.dropna()),
                           data["short name"][subject.dropna().index],
                           ["Year of Publishing", "Perceived as Subject", ""])
```

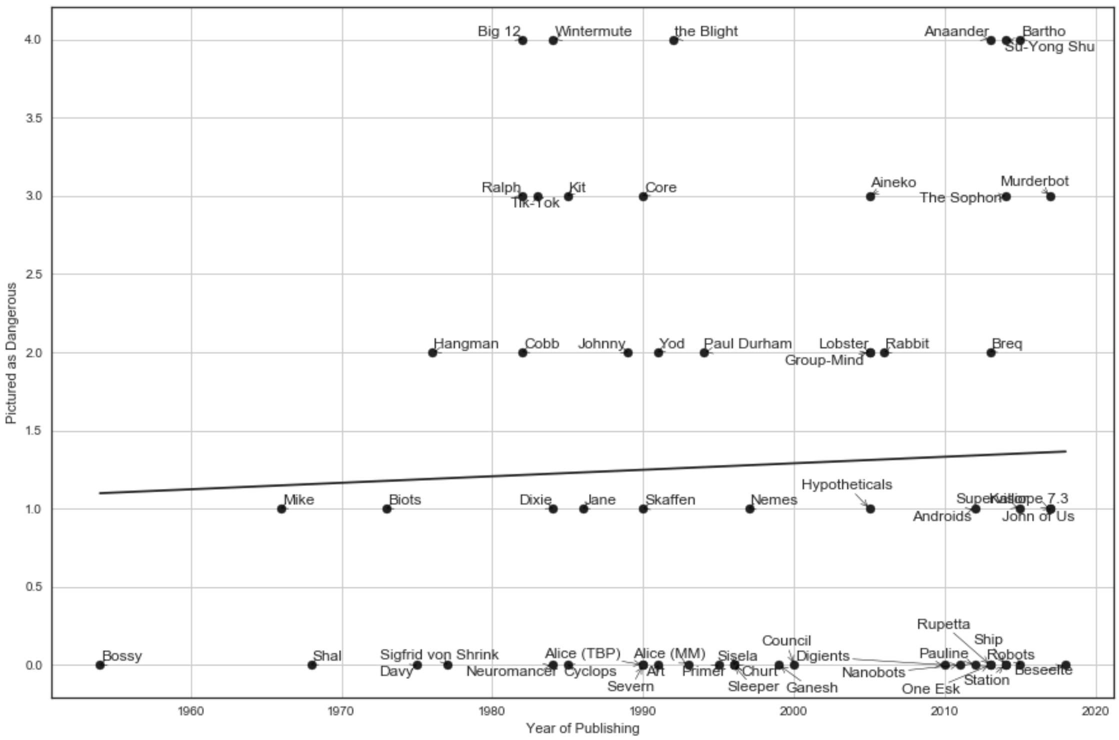
```
best fit line:
y = 12.15 + -0.01x
Rš =  0.007426570710348357
Spearmans Correlation Coefficient =  -0.07048691081839746
```



```
In [79]: servant = data["servant (3)"]

In [80]: scatter_line_text(year[servant.dropna().index],
                           pd.to_numeric(servant.dropna()),
                           data["short name"][servant.dropna().index],
                           ["Year of Publishing", "Perceived as Servant", ""])

best fit line:
y = -9.88 + 0.01x
Rš =  0.009377224473751444
Spearmans Correlation Coefficient =  0.0393337068809139
```



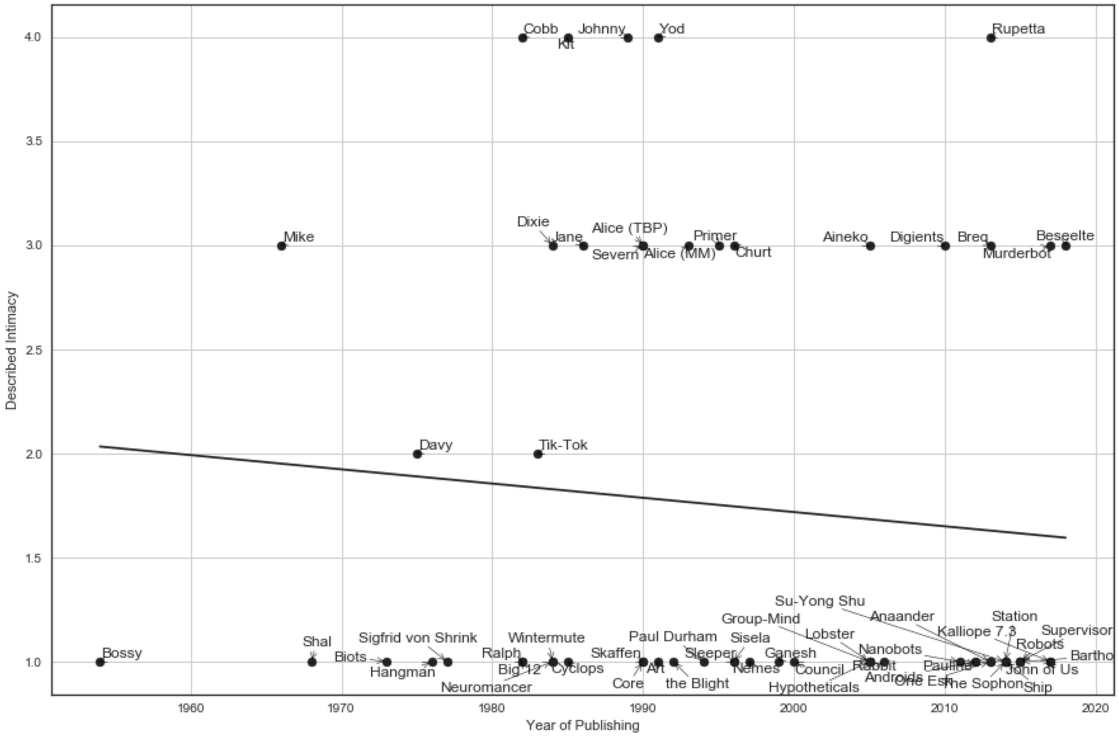
```
In [81]: pd.crosstab(servant, subject)

Out[81]: subject (3)  1.0  2.0  3.0
         servant (3)
         1.0            6    3   16
         2.0            2    4    0
         3.0           21    1    5

In [82]: print("Spearmans Correlation Coefficient: ", servant.corr(subject, method="spearman"))

Spearmans Correlation Coefficient:  -0.5134538986270615


In [83]: scatter_line_text(year[danger.dropna().index],
                           pd.to_numeric(danger.dropna()),
                           data["short name"][danger.dropna().index],
                           ["Year of Publishing", "Pictured as Dangerous", ""])

best fit line:
y = -7.04 + 0.00x
Rš =  0.002125760541498267
Spearmans Correlation Coefficient =  -0.0053675796644054715
```



```
In [84]: intimacy = data["intimacy (4)"]
```

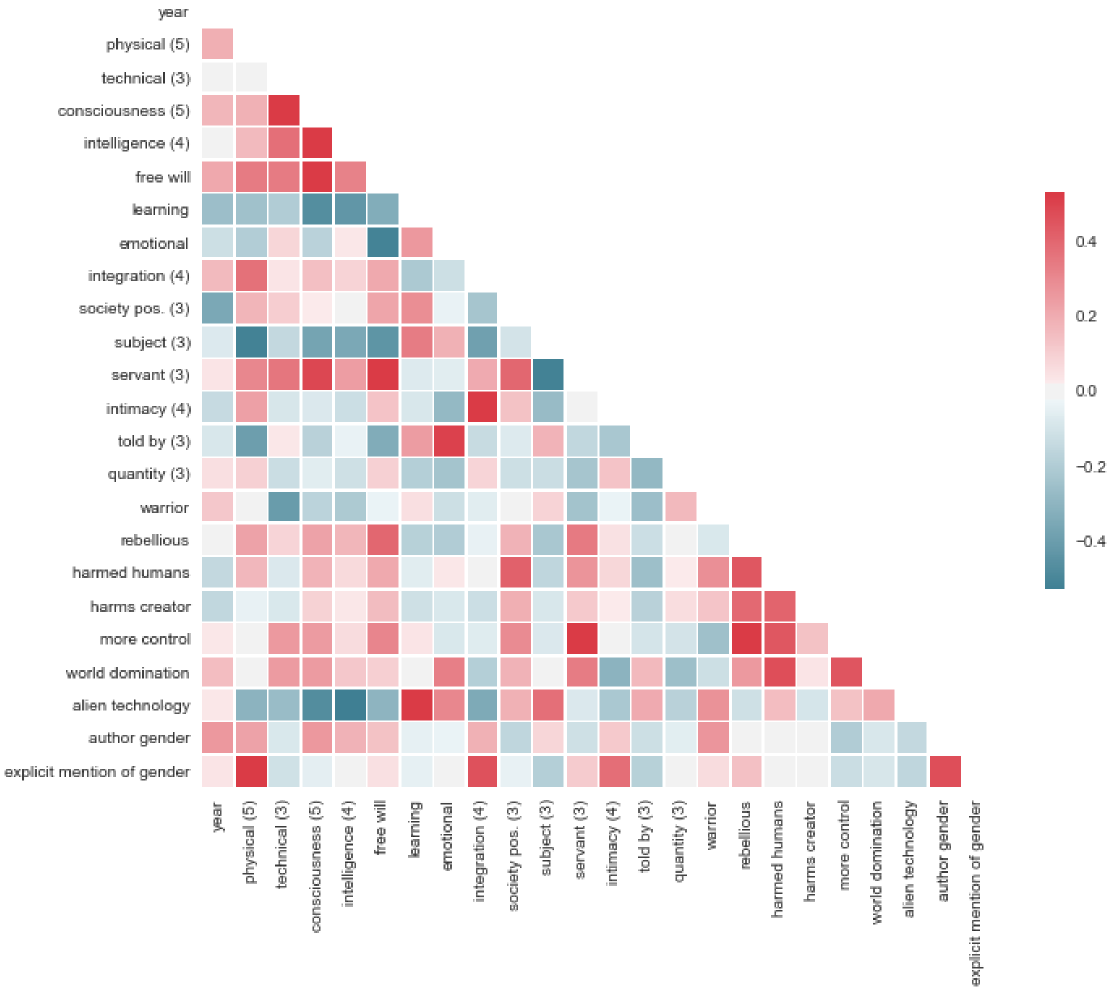
```
In [85]: scatter_line_text(year[intimacy.dropna().index],
                           pd.to_numeric(intimacy.dropna()),
                           data["short name"][intimacy.dropna().index],
                           ["Year of Publishing", "Described Intimacy", ""])
```

```
best fit line:
y = 15.41 + -0.01x
Rš =  0.00955229863743301
Spearmans Correlation Coefficient =  -0.1400829794732072
```



12.1 Additional Findings

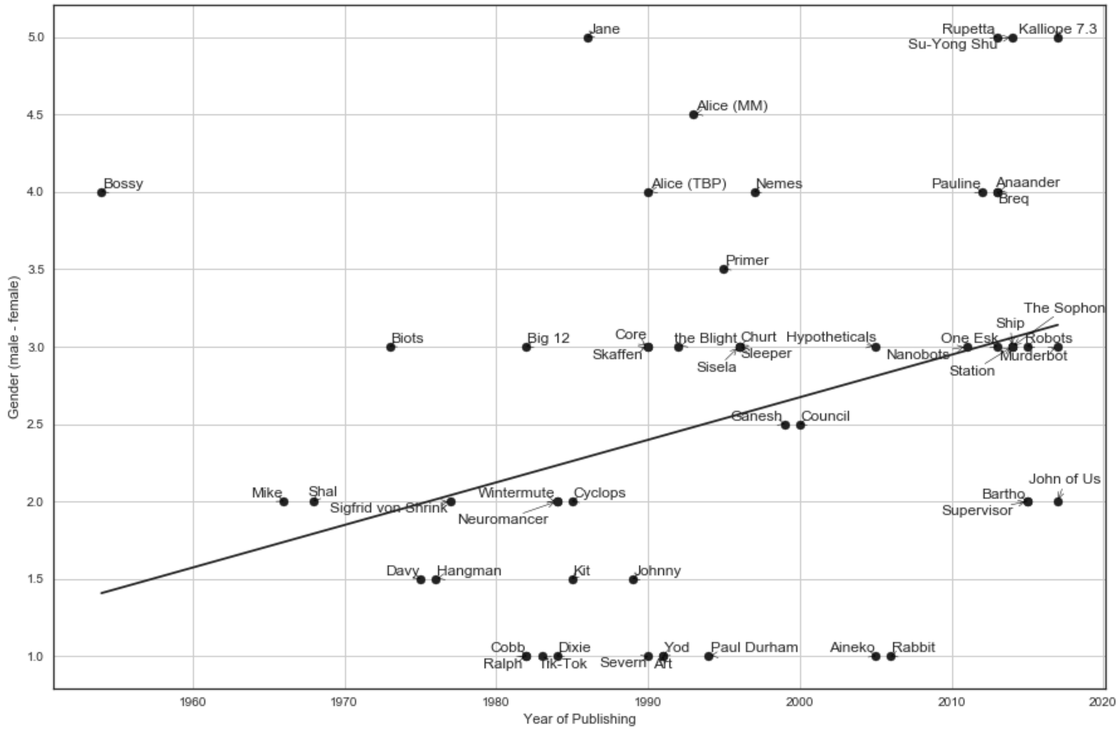
```
In [86]: import seaborn as sns

         sns.set(style="white")

         # Compute the correlation matrix
         data2 = data.iloc[:,:-1]
         corr = data2.corr(method="spearman")

         # Generate a mask for the upper triangle
         mask = np.zeros_like(corr, dtype=np.bool)
         mask[np.triu_indices_from(mask)] = True

         # Set up the matplotlib figure
         f, ax = plt.subplots(figsize=(11, 9))

         # Generate a custom diverging colormap
         cmap = sns.diverging_palette(220, 10, as_cmap=True)

         # Draw the heatmap with the mask and correct aspect ratio
         sns.heatmap(corr, mask=mask, cmap=cmap, vmax=.3, center=0, square=True, linewidths=.5

Out[86]: <matplotlib.axes._subplots.AxesSubplot at 0x199cb87c3c8>
```



```
In [87]: print("Spearmans Correlation Coefficient: ", data["author gender"].corr(data["gender

Spearmans Correlation Coefficient:  0.08541444449766288


C:\Users\laris\Anaconda3\lib\site-packages\scipy\stats\stats.py:250: RuntimeWarning: The input
  "values. nan values will be ignored.", RuntimeWarning)
```

```
In [88]: scatter_line_text(year[data["gender (5)"].dropna().index],
                           pd.to_numeric(data["gender (5)"].dropna()),
                           data["short name"][data["gender (5)"].dropna().index],
                           ["Year of Publishing", "Gender (male - female)", ""])

best fit line:
y = -52.34 + 0.03x
Rš =  0.12042348849623097
```

```
Spearmans Correlation Coefficient =  0.38856115185962115
```



12.2 Google Trends Figure

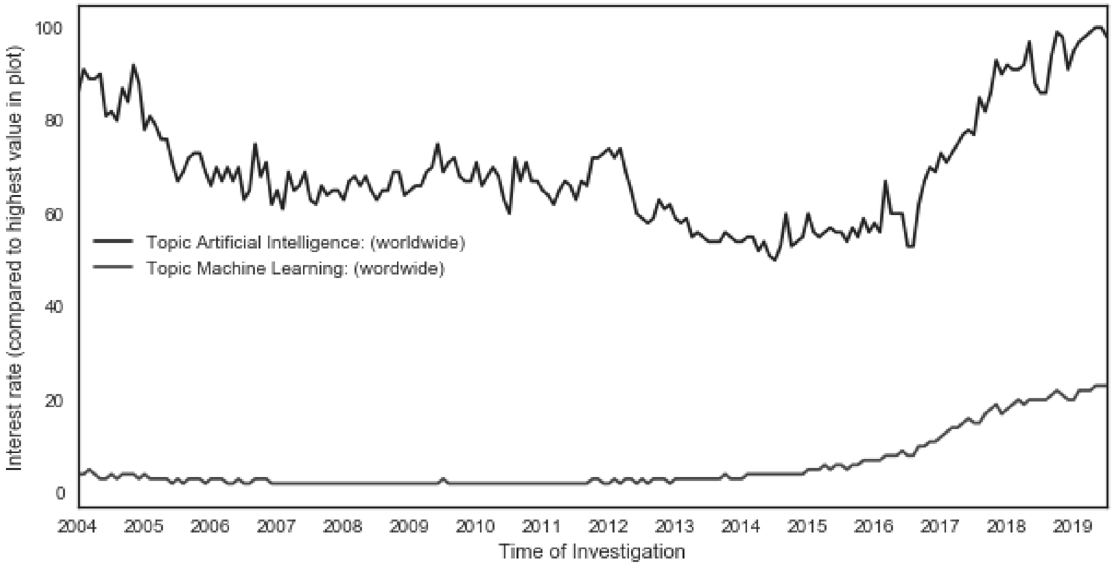
```
In [89]: trends = pd.read_csv("google-trends.csv", delimiter=",")
```

```
In [90]: trends.head()
```

```
Out[90]:       Month  Topic Artificial Intelligence: (worldwide)  \
         0  2004-01                                           86
         1  2004-02                                           91
         2  2004-03                                           89
         3  2004-04                                           89
         4  2004-05                                           90

            Topic Machine Learning: (wordwide)
         0                                  4
         1                                  4
         2                                  5
         3                                  4
         4                                  3
```

```
In [91]: sns.set(style="white", palette=sns.dark_palette("lightgrey"))
         test = trends.plot(kind= 'line', secondary_y= 'ai_number', rot= 0, figsize=(10,5))
```

```
plt.ylabel("Interest rate (compared to highest value in plot)")
plt.xlabel("Time of Investigation")
my_xticks = ['2004','','','','','','','','','','','','2005','','','','','','','','','
plt.xticks(range(0, 186), my_xticks)
plt.show()
```


Interest rate (compared to highest value in plot)
Topic Artificial Intelligence: (worldwide)
Topic Machine Learning: (wordwide)
Time of Investigation