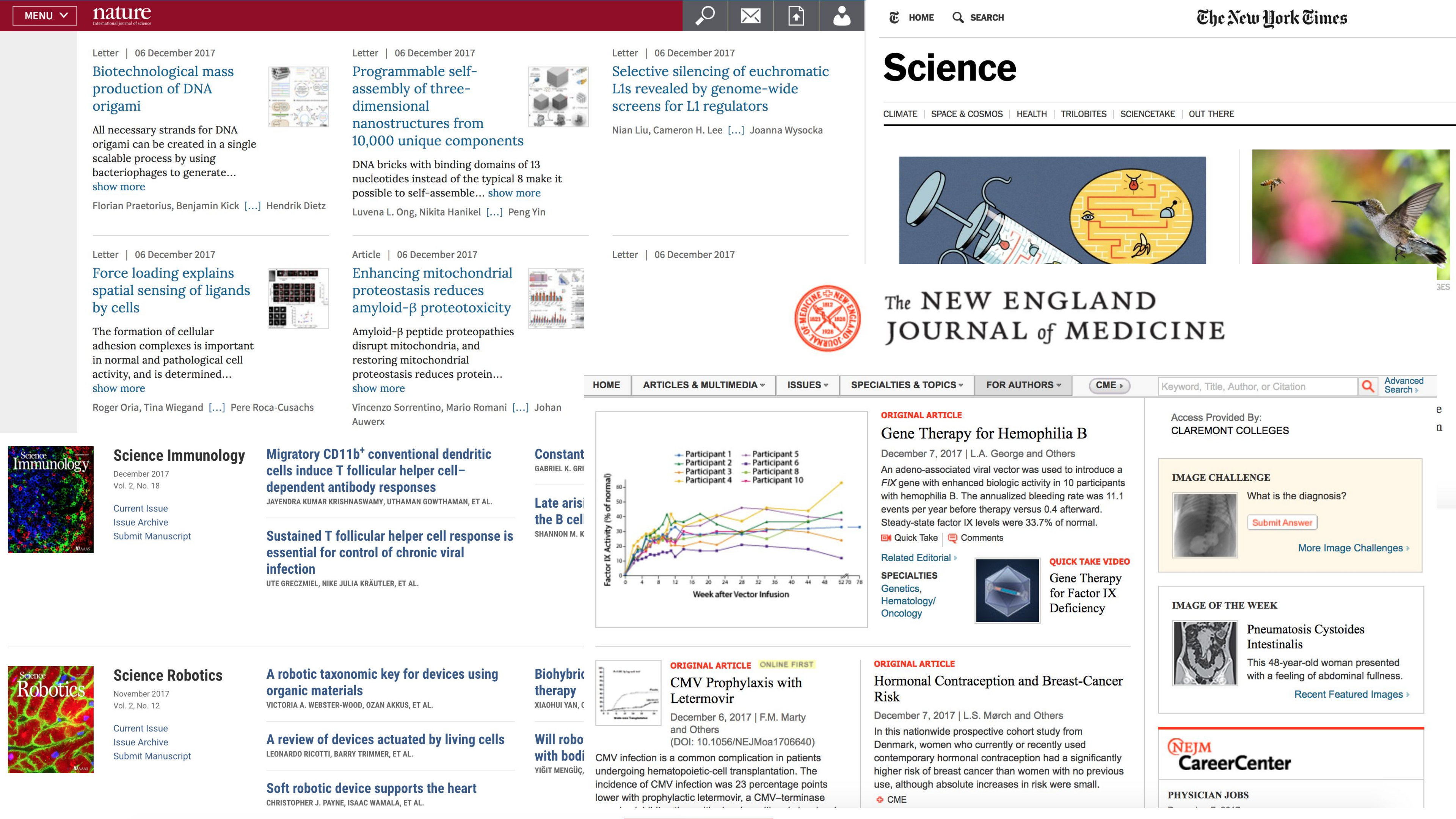
What makes a science article popular?

Sal Fu, Jerry Xuan, Brian Lorenz



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ORIGINAL ARTICLE

Gene Therapy for Hemophilia B

December 7, 2017 | L.A. George and Others

An adeno-associated viral vector was used to introduce a *FIX* gene with enhanced biologic activity in 10 participants with hemophilia B. The annualized bleeding rate was 11.1 events per year before therapy versus 0.4 afterward. Steady-state factor IX levels were 33.7% of normal.

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Gene Therapy for Factor IX Deficiency

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IMAGE CHALLENGE

What is the diagnosis?

Submit Answer

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IMAGE OF THE WEEK

Pneumatosis Cystoides Intestinalis

This 48-year-old woman presented with a feeling of abdominal fullness.

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ORIGINAL ARTICLE ONLINE FIRST

CMV Prophylaxis with Letermovir

December 6, 2017 | F.M. Marty and Others
(DOI: 10.1056/NEJMoa1706640)

CMV infection is a common complication in patients undergoing hematopoietic-cell transplantation. The incidence of CMV infection was 23 percentage points lower with prophylactic letermovir, a CMV–terminase

ORIGINAL ARTICLE

Hormonal Contraception and Breast-Cancer Risk

December 7, 2017 | L.S. Mørch and Others

In this nationwide prospective cohort study from Denmark, women who currently or recently used contemporary hormonal contraception had a significantly higher risk of breast cancer than women with no previous use, although absolute increases in risk were small.

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Science Immunology

December 2017
Vol. 2, No. 18

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Sustained T follicular helper cell response is essential for control of chronic viral infection

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Soft robotic device supports the heart

CHRISTOPHER J. PAYNE, ISAAC WAMALA, ET AL.

Biohybric therapy

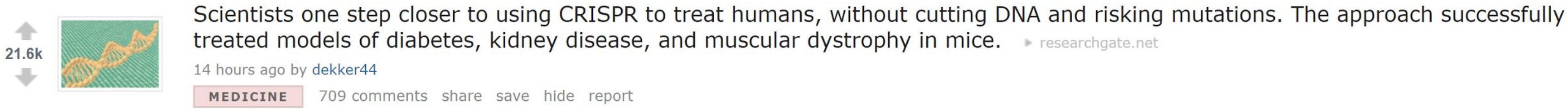
XIAOHUI YAN, C

Will robo with bodi

YIĞIT MENGÜÇ,

Consider Reddit

- Over 500 million users - 8th most visited website worldwide
- Subreddits: specific forums for topic areas
- Upvote system:
    - Users can post content and “upvote” ones they like
    - High upvotes makes an articles more visible (by appearing on the front page)
- Our work is restricted to /r/science
    - Only links to science articles are allowed



21.6k

Scientists one step closer to using CRISPR to treat humans, without cutting DNA and risking mutations. The approach successfully treated models of diabetes, kidney disease, and muscular dystrophy in mice. ▸ researchgate.net

14 hours ago by dekker44

MEDICINE 709 comments share save hide report

Project Overview

Question: What makes a science post popular on Reddit?

Possible explanatory variables: Scientific field of post, time post was created, content of the title, author of the post, etc...

Response variable: Number of upvotes

Method: build random forests!

- Also returns variable importance

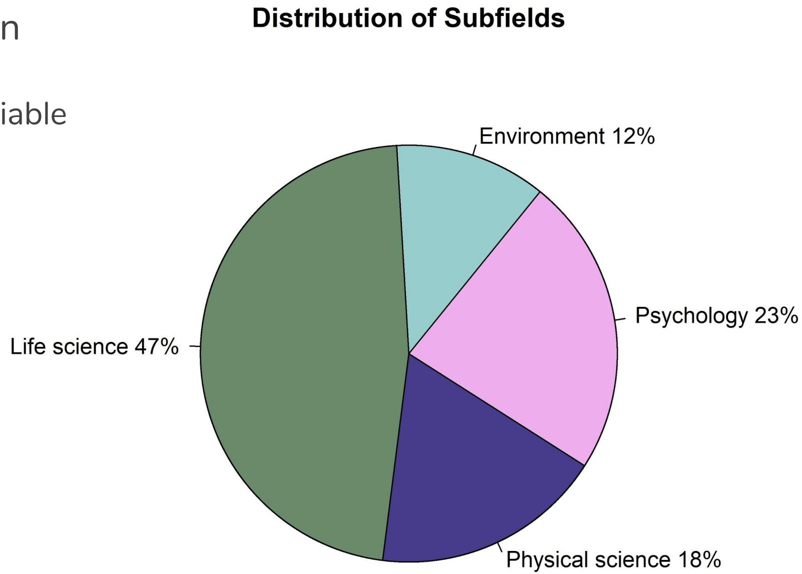
Data Acquisition: PRAW

praw-dev / praw

- "Python Reddit API Wrapper"
- Created Reddit account, authenticated, and connected to Reddit API with PRAW
- Data from November 2015 - November 2017
- 21,921 total posts to /r/science in that time

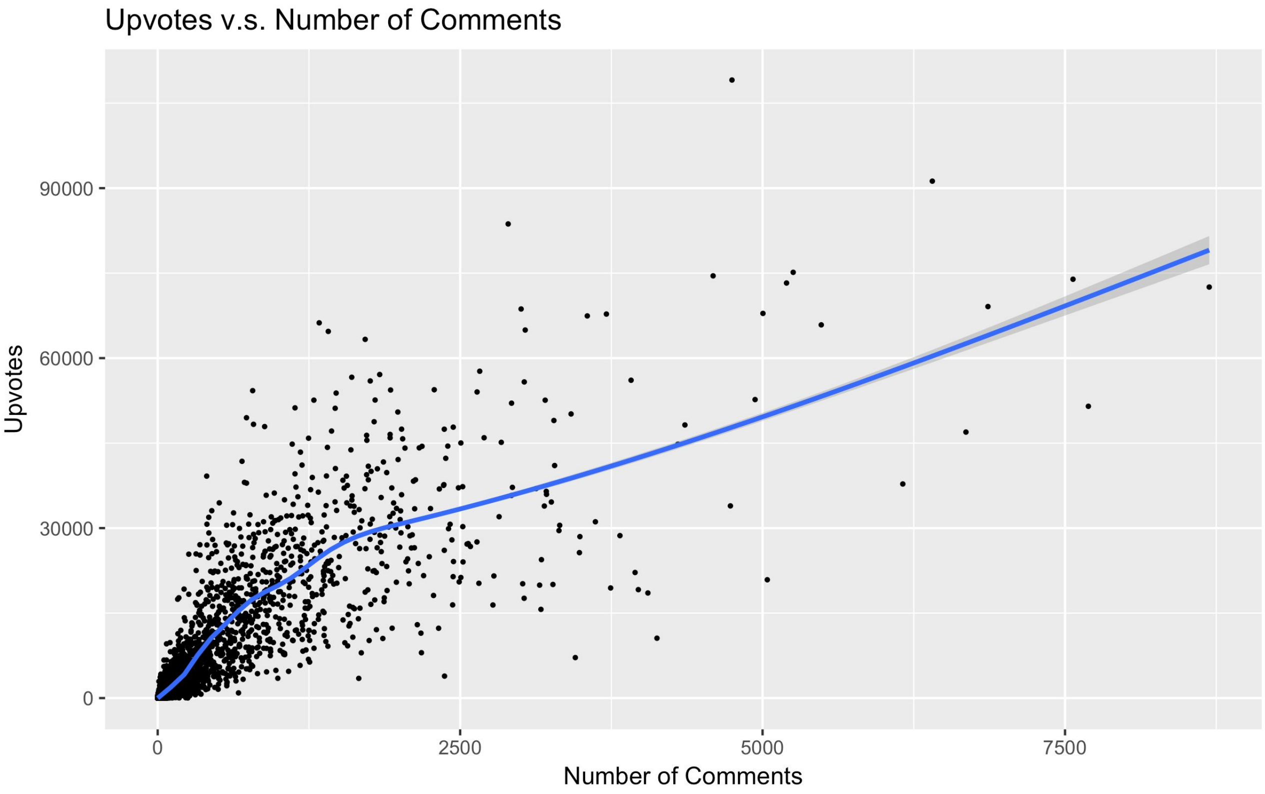
Data Characteristics

- Basic columns: post title, upvotes, time posted, subfield...
- Wrangled explanatory variables to extract information
  - Consolidated subfields, turned time into categorical variable
- Added journal *h*-index (impact factor)
  - Low: Journal *h* index: below 500 (SJR)[1]

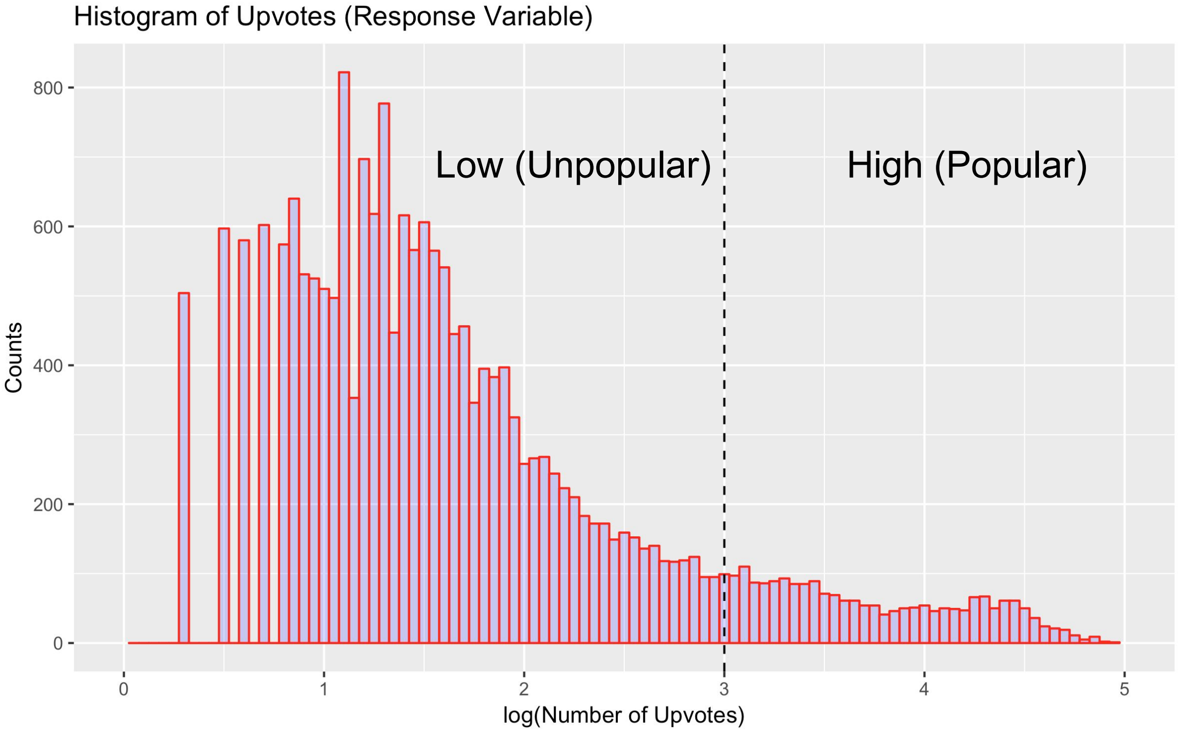


[1] *Scimago Journal & Country Rank*

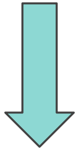
- Removed variables that are closely coupled with response
    - Author’s link karma, post’s number of comments



Response: Upvotes



Continuous Response



Binary Response

Title Analysis

- Computed mean and max word length
- Title Sentiment - SentiWordNet
  - Each word is given a score from 0 to 1 for “Positive” and “Negative”
  - Removed common “stopwords” (e.g. “which,” “the,” “and”)
  - Scaled to length of title

Highly Positive:

Highly Negative:

Title Analysis

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<u>Highly Positive:</u>

Reasonable?
“Babies know when they don’t know something”

<u>Highly Negative:</u>

Reasonable?
“Induced Earthquakes”

Title Analysis

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<u>Highly Positive:</u>

Reasonable?
“Babies know when they don’t know something”

Umm….
“Happiness doesn’t bring good health, study finds”

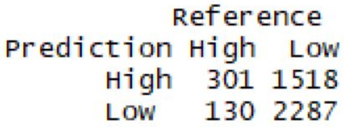
<u>Highly Negative:</u>

Reasonable?
“Induced Earthquakes”

Umm…
“Cats protect newborns against asthma”

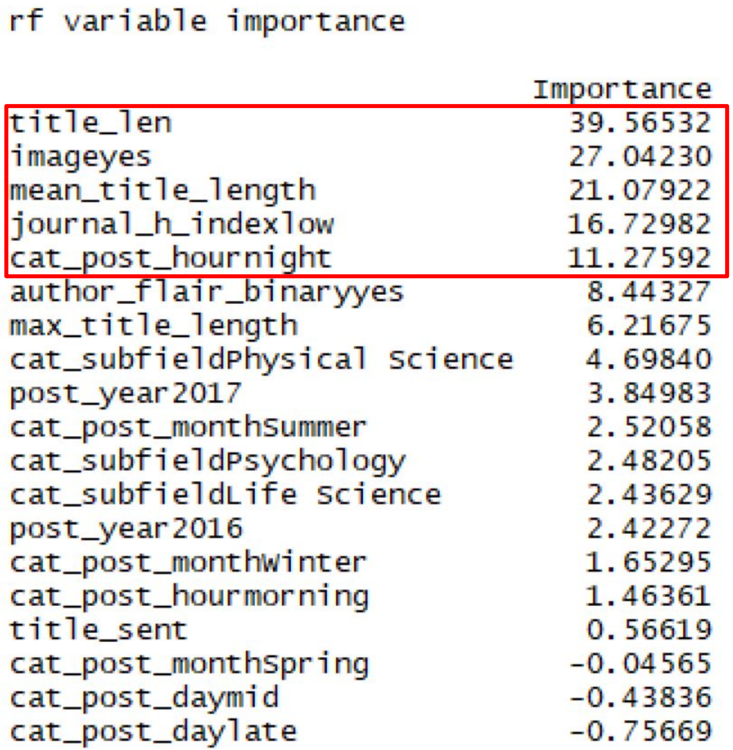
Building the Random Forest...

- Set aside test data (20%)
- Create training data with equal numbers of high/low response
  - Biased training set - vast majority are low upvotes
- Random forest with 1000 trees, tuning mtry
  - mtry = 3
  - OOB error rate: 35%
  - Test error rate: 39%
  - 95% CI for accuracy: 59.6%-62.6%



```
          Reference
Prediction High  Low
      High  301 1518
      Low   130 2287
```

Variable Importance Analysis



```
rf variable importance

                               Importance
title_len                        39.56532
imageyes                         27.04230
mean_title_length                21.07922
journal_h_indexlow               16.72982
cat_post_hournight               11.27592
author_flair_binaryyes            8.44327
max_title_length                  6.21675
cat_subfieldPhysical Science      4.69840
post_year2017                     3.84983
cat_post_monthSummer              2.52058
cat_subfieldPsychology            2.48205
cat_subfieldLife Science          2.43629
post_year2016                     2.42272
cat_post_monthWinter              1.65295
cat_post_hourmorning              1.46361
title_sent                        0.56619
cat_post_monthSpring             -0.04565
cat_post_daymid                  -0.43836
cat_post_daylate                 -0.75669
```

Most important variables!

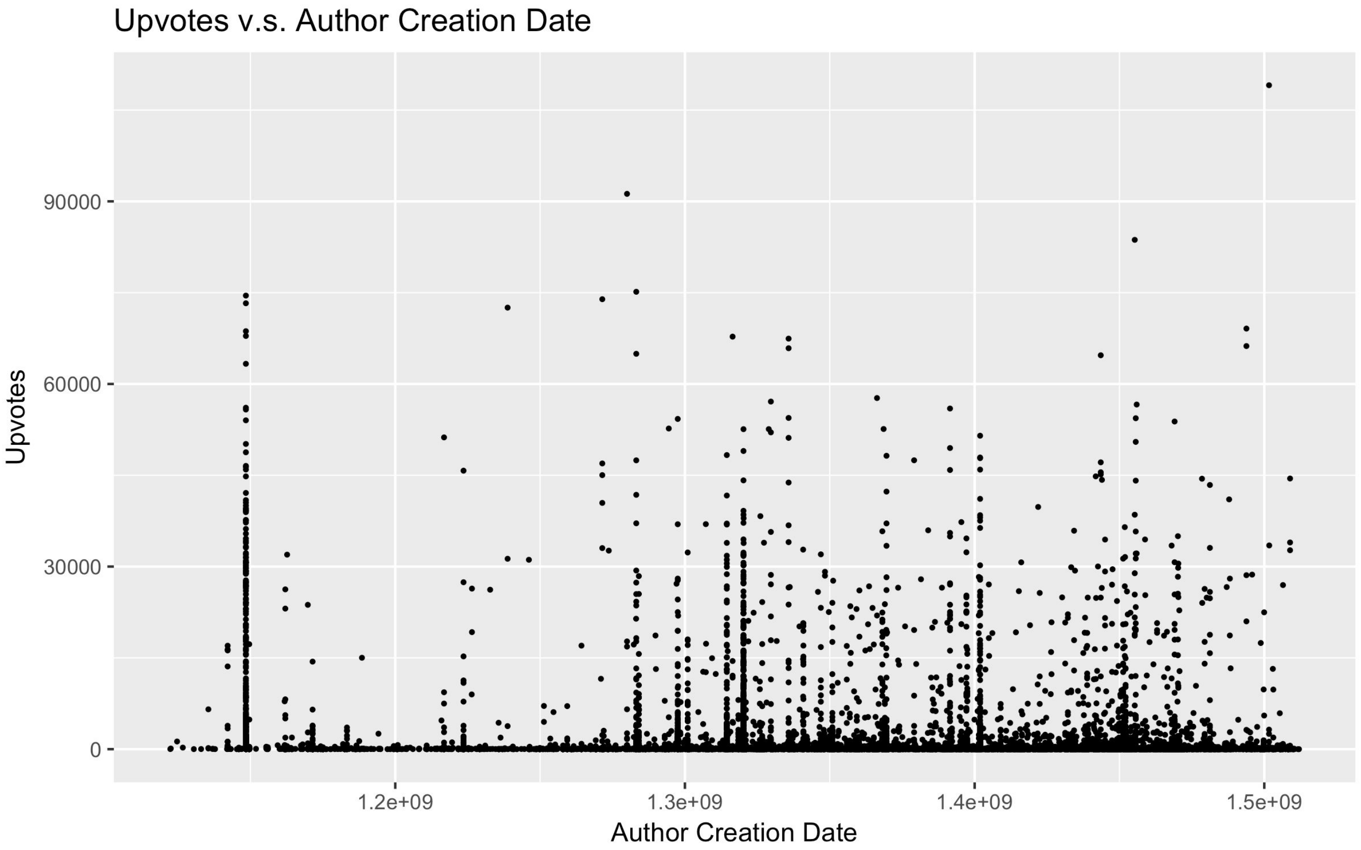
- Mean_title_length = mean length of words in title
- Nighttime defined as: 6PM-3AM PST

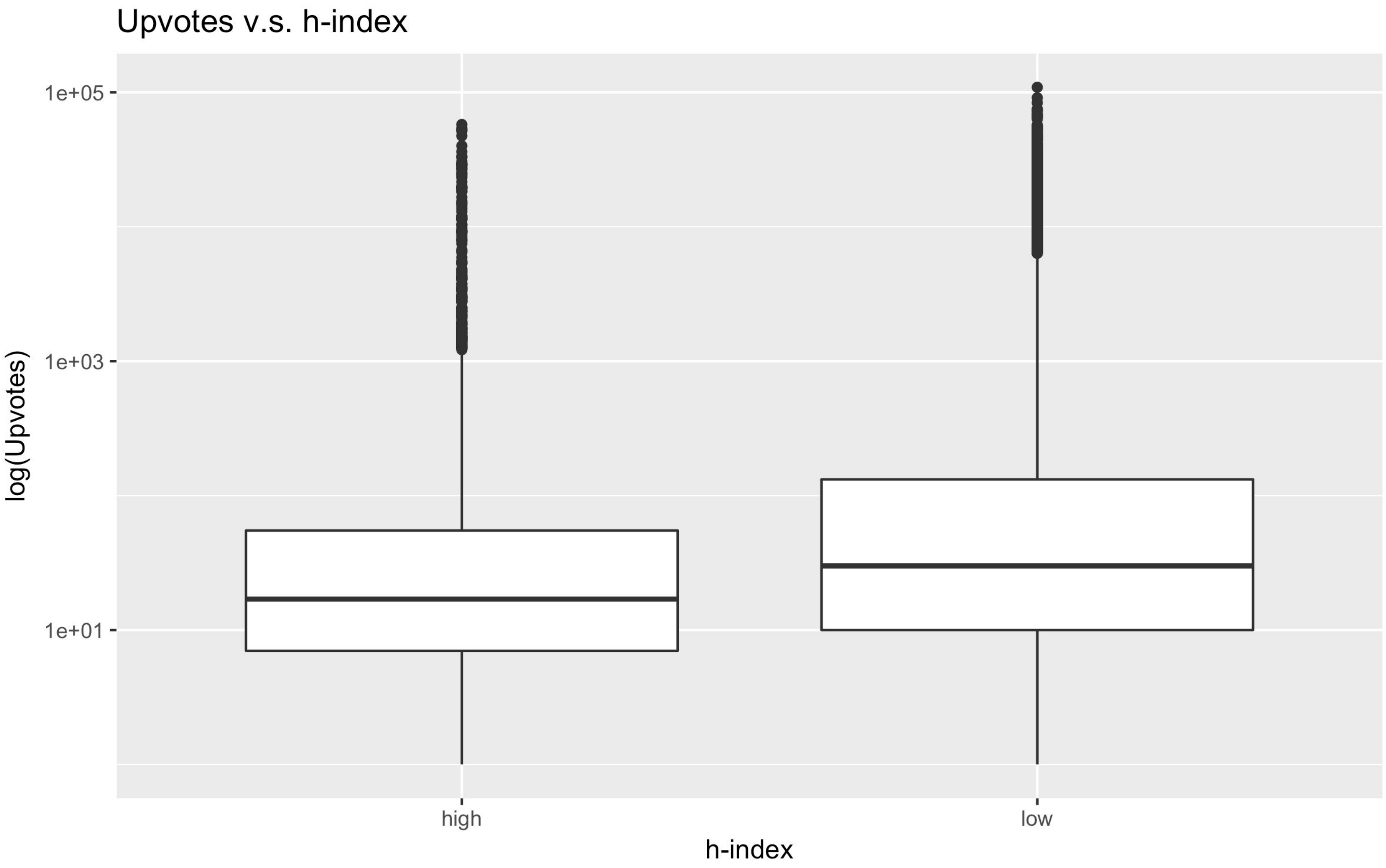
Conclusions

- Data represents those on Reddit who are interested in science
  - Demographic: primarily ages 18-25, primarily male[1]
  - NOT representative sample of overall population
- “Fast-food” Science Media Consumption
  - Popularity likely related to long post titles and low journal *h* index
- Effective (?) science communication: keep things colloquial!

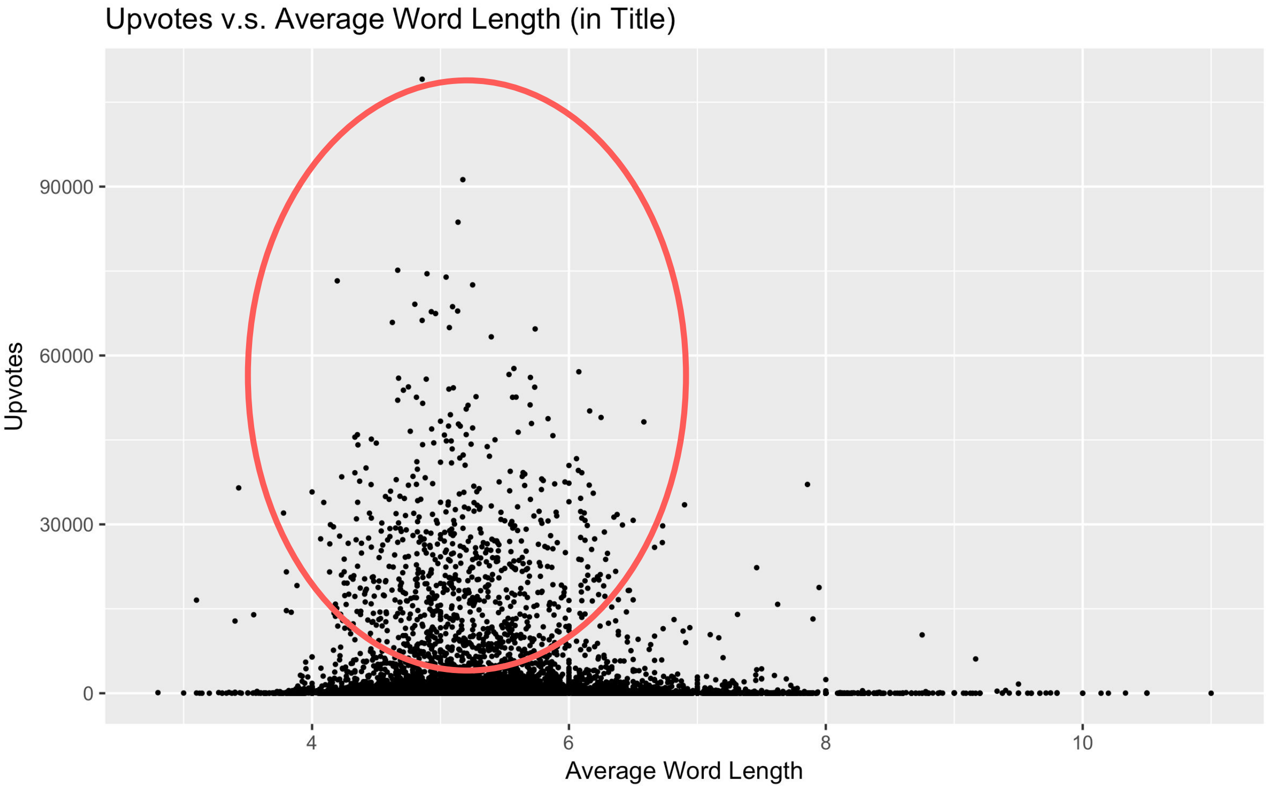
[1] *https://www.reddit.com/r/dataisbeautiful/comments/5700sj/octhe_results_of_the_reddit_demographics_survey/*

Extras


Upvotes v.s. Author Creation Date
Upvotes
90000
60000
30000
0
1.2e+09
1.3e+09
1.4e+09
1.5e+09
Author Creation Date


Upvotes v.s. h-index
1e+05
1e+03
1e+01
log(Upvotes)
high
low
h-index

The Unexpected Effect of Word Length


Upvotes v.s. Average Word Length (in Title)
Upvotes
Average Word Length