What makes a playlist succesful?

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Today's Discussion

Topic Outline

Survey Results

Strategy

Data Preparation

Exploratory Data Analysis & Visualization

Modeling

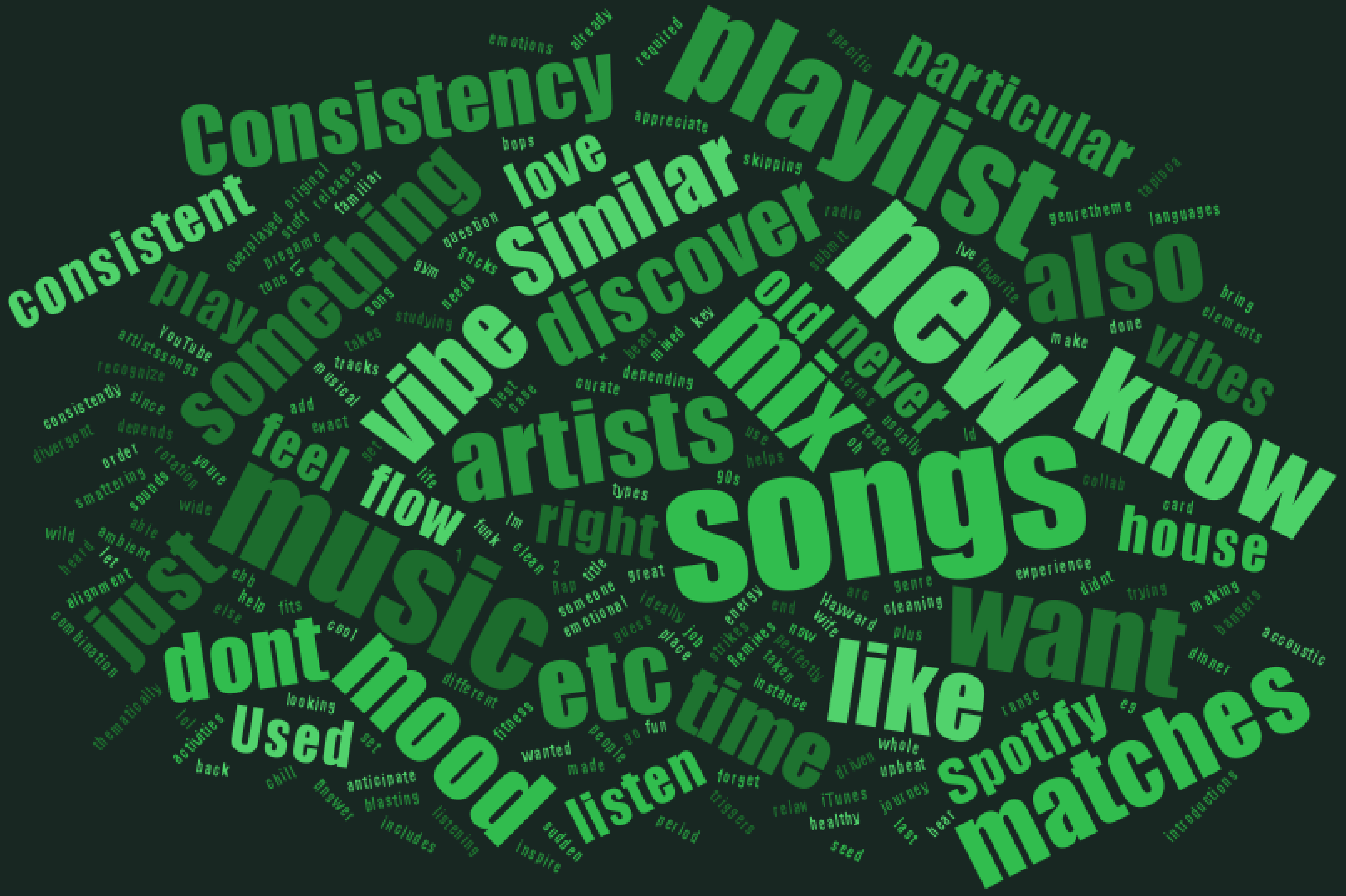
Conclusion

Next Steps

Thank You!

Spotify®

Survey Results


songs
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Consistency
mix
artists
vibe
something
discover
Similar
matches
want
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time
just
dont
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Spotify
Used
flow
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vibes
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emotions
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required
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appreciate
bops
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languages
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combination
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activities
back
chill
answer
anticipate
blasting
includes
listening
inspire
sudden
period
triggers
relax
iTunes
healthy
seed
last
hear
introductions
journey
upbeat
driven
whole
plus
cleaning
genre
Hayward
wife
experience
didnt
trying
making
bangers
accoustic
dinner
eg
range
collab
card
bring
elements
done
make
key
mixed
beats
depending
curate
tracks
musical
add
exact
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types
90s
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funk
clean
title
someone
emotional
great
Ideally
guess
energy
job
place
strikes
Remixes
taken
perfectly
instance
now
end
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fun
wanted
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people
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fitness
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Rap
Ive
favorite

WHAT MAKES A PLAYLIST GOOD?

Mary

"When it fits a mood; when I don't feel like skipping tracks; when it's a collab; when it has a mix of old and new songs of similar genre."

Ben

"It has some songs I know and love, but also helps me discover new songs. It matches my mood."

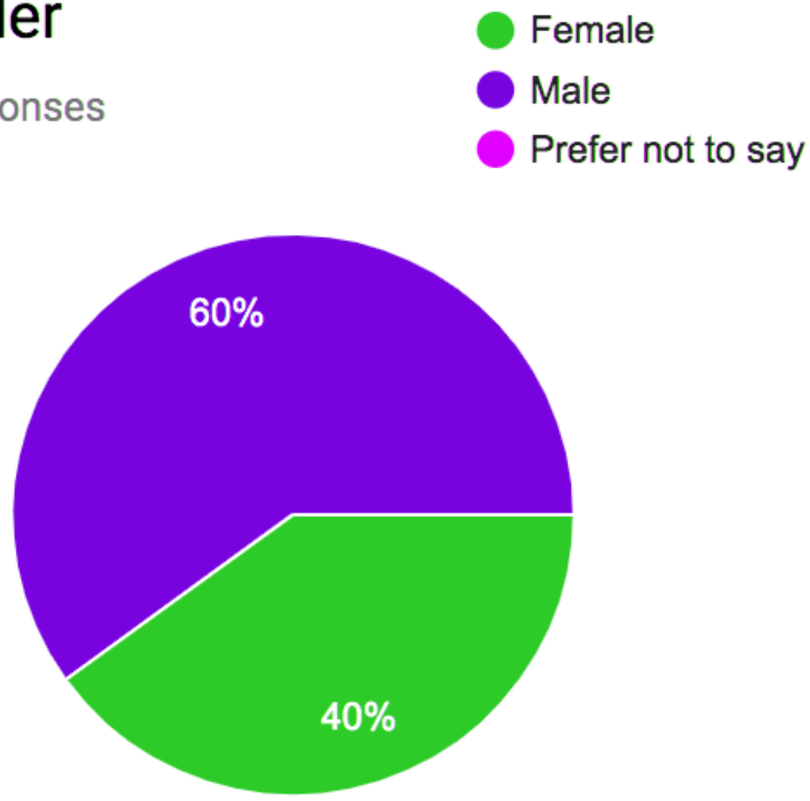
Ray

"When the whole playlist matches the exact vibe you're looking for perfectly (pre-game, 90s, gym flow, etc.), but also has a wide range of artists and song types."

SURVEY BREAKDOWN

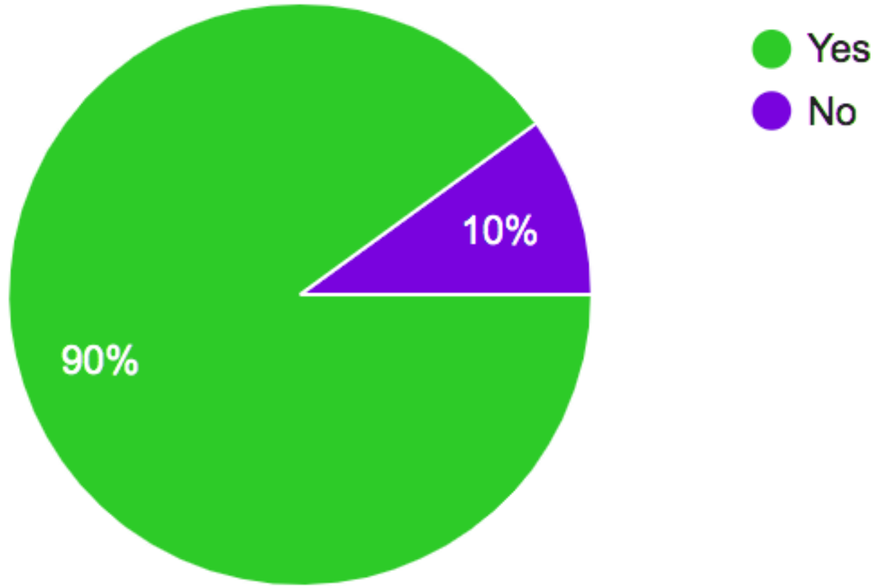
Gender

20 responses



Are you a Spotify Premium subscriber?

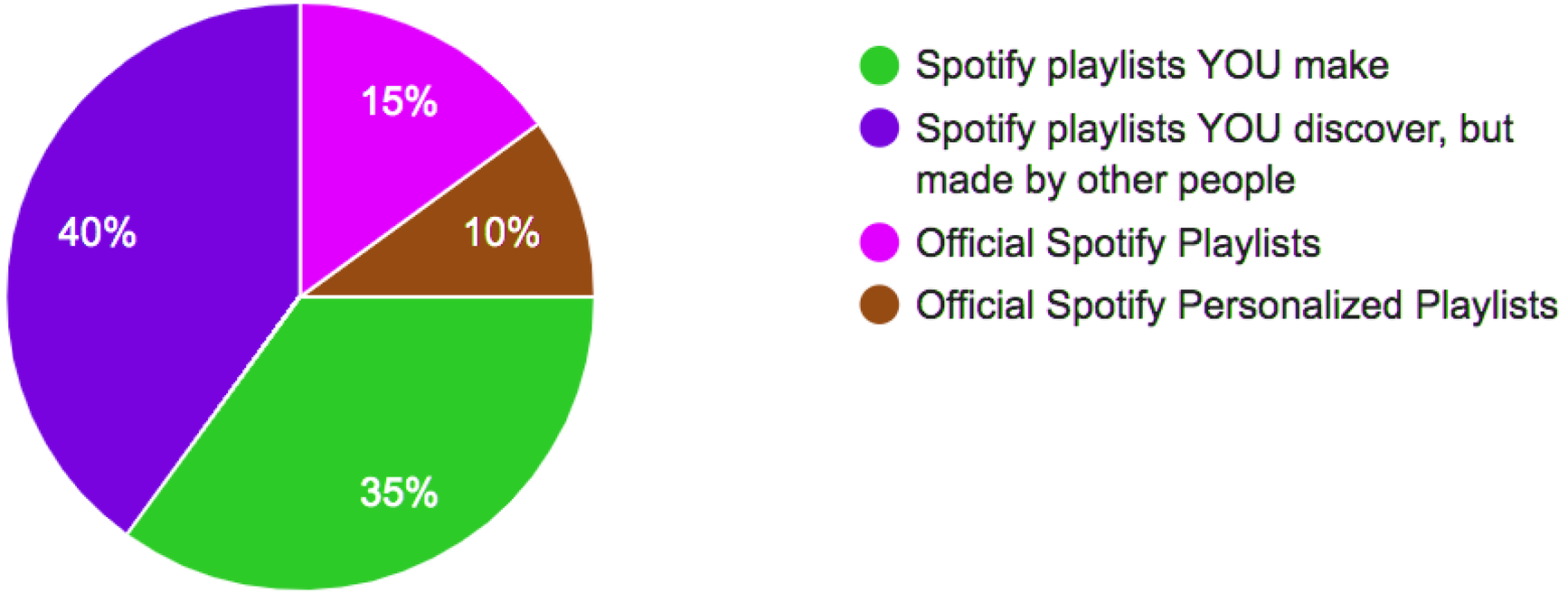
20 responses



YOUR FAVORITE PART OF SPOTIFY?

If you had to choose, which of these is most important to your Spotify experience?

20 responses



Strategy

Game Plan

Phase 1

Open the data.

Phase 2

Look at all the columns. Categorical? Continuous?

Phase 3

Decide the dependent variable. What does success mean? What is the success metric?

Phase 4

Engineer features; visualize data; look for relationships; model.

Phase 5

Insights.

403,366 playlists

403,366 playlists

403,366 playlists

403,366 playlists

LOTS OF NUMBERS TO CRUNCH

```
        1       US      455     2       341     381     332     321     ["slaylist", "looking"] Pop     Rap     R&B     Defiant Excited Energizing
spotify:user:35eb3d66eb58ae6e4fd35bab46e5542e:playlist:1vhA7OenKQTwZOPPTij1gX   35eb3d66eb58ae6e4fd35bab46e5542e        18      13      1       2       2       2       2       4
        0       US      444     0       93      114     129     110     ["christian", "best"]   Religious       Rock    Pop     Empowering      Upbeat  Brooding
spotify:user:2ac357e58edb6da0f92ff7f693680104:playlist:5ofVnH33nxzyTZ68WZ9nUU   2ac357e58edb6da0f92ff7f693680104        9       9       1       1       2       1       1       2
        0       US      1726    0       632     699     933     930     ["lista", "mami"]       Latin   Pop     Dance & House   Excited Romantic        Lively
spotify:user:7dcbc955cefb93e082bc3905cad5c8a1:playlist:65EFmOjcCYfyeca1H3sVUH   7dcbc955cefb93e082bc3905cad5c8a1        68      64      2       2       2       1       1       2
        0       US      154     0       75      75      328     99      ["new"] Dance & House   Electronica     Pop     Excited Sensual Energizing
spotify:user:2b4069fcfac91052eb60c8ed0eded2fd:playlist:4FnHzHjyONFkbg798UhKgp   2b4069fcfac91052eb60c8ed0eded2fd        0       0       0       1       2       1       1       2
        0       US      19      0       18      18      15      1       ["soda", "pop", "summer"]       Pop     Dance & House   Electronica     Defiant Excited Urgent
spotify:user:105fe547c61aa8f9d3831dbbf0103992:playlist:15s2Hjp1gGrWbQcmMRnZS5   105fe547c61aa8f9d3831dbbf0103992        0       0       0       1       3       2       1       9
        0       US      79      0       2       4       11      6       ["night", "sax", "music"]       Jazz    Rock    Traditional     Romantic        Empowering      Melancholy
spotify:user:29ee8e37b23c6209d07e4186f79e62f3:playlist:3RRpMk6upNjCyF7aGip8lT   29ee8e37b23c6209d07e4186f79e62f3        0       0       0       0       2       1       0       3
        0       US      268     0       7       11      16      0       ["ottmar", "liebert", "collection"]     Traditional     New Age -       Melancholy      Sensual Fiery
spotify:user:400e06c9a9898115013a895ab04f92ca:playlist:5fyuKwejya1d7xohj4hM2F   400e06c9a9898115013a895ab04f92ca        0       0       0       1       2       1       1       2
        0       US      128     0       46      46      235     234     ["music"]       Pop     Indie Rock      Rock    Gritty  Empowering      Melancholy
spotify:user:6d01fc6bf88c2a2854b59267c4f8f88d:playlist:4tt2LqgrKDzdj7KNqbLdqS   6d01fc6bf88c2a2854b59267c4f8f88d        0       0       0       1       2       2       2       2
        0       US      183     0       152     161     72      50      []      Electronica     Indie Rock      R&B     Excited Yearning        Defiant
spotify:user:b93fbd3c8c8dd61f6aee58db5ef6114d:playlist:5QnmGbt6bM50AWO97LQY57   b93fbd3c8c8dd61f6aee58db5ef6114d        8       4       1       2       5       4       3       5
        0       US      330     1       258     270     74      1       ["zoned"]       Latin   Dance & House   Pop     Excited Energizing      Lively
spotify:user:be98b3e1dc68d33b1d19f99b2c49d2c8:playlist:7mgw19ra8MT7ryUosbJOKx   be98b3e1dc68d33b1d19f99b2c49d2c8        5       5       1       2       4       5       1       12
        0       US      9       0       1       1       20      1       ["empire", "sun", "walking", "dream"]   Electronica     Alternative     -       Urgent  Excited Brooding
spotify:user:268f3524d209485667e3ab43ac27c29e:playlist:6jQYogkmD5VwE04fNM0W7w   268f3524d209485667e3ab43ac27c29e        0       0       0       1       2       1       1       2
        0       US      70      0       44      51      67      52      ["country", "music"]    Country & Folk  Pop     Spoken & Audio  Empowering      Upbeat  Yearning
spotify:user:63aaea00df3ca978e92761292a2eaa90:playlist:5XH0WG5KEOZxtATzewUaWg   63aaea00df3ca978e92761292a2eaa90        0       0       0       2       3       3       1       7
        0       US      66      0       1       5       78      1       ["steve", "pettit", "evangelistic", "team", "high", "price"]    Religious       -       -       Romantic
        Empowering      Sophisticated
spotify:user:4386d0317126baad62457b43bff3e500:playlist:3TR37MZYlGp7tp5aEiUH0h   4386d0317126baad62457b43bff3e500        15      3       1       2       2       1       1       2
        0       US      501     15      133     141     56      48      []      Indie Rock      Pop     Alternative     Yearning        Brooding        Empowering
spotify:user:64672b35946481aa3953fa492273718f:playlist:0KIQsi7z3Ghu1SAjPhJcvm   64672b35946481aa3953fa492273718f        1       1       1       2       4       4       2       7
        1       US      521     2       245     79      78      15      ["ragga", "jungle"]     Dance & House   Reggae  Electronica     Aggressive      Energizing      Excited
spotify:user:6234eea77f077d721bc8375bc2fe505e:playlist:4bPfPAonxfMaPBPRluDo4V   6234eea77f077d721bc8375bc2fe505e        0       0       0       2       5       3       1       7
        0       US      76      0       47      60      157     68      ["viejitas", "bonitas"] Latin   Jazz    Traditional     Sophisticated   Romantic        Tender
spotify:user:9f472ecbc51af7e92e3efd23ac1d11ce:playlist:6Pmu2P102HWmg8zCB1BPZ9   9f472ecbc51af7e92e3efd23ac1d11ce        0       0       0       1       2       1       1       2
        0       US      31      0       2       7       17      8       ["van", "halen"]        Rock    -       -       Defiant Rowdy   Excited
spotify:user:78a6655af797a286b32d6fb67584ba00:playlist:6DICLM6DYotMGeUmJqIulf   78a6655af797a286b32d6fb67584ba00        0       0       0       1       2       2       1       2
        0       US      503     7       353     386     20      1       ["top", "songs"]        Rap     R&B     Alternative     Cool    Sensual Defiant
spotify:user:631e3296e38597c66cdaeea6488becd7:playlist:1FQCFlBHSWPuYOCXdNKAoH   631e3296e38597c66cdaeea6488becd7        0       0       0       0       2       2       1       4
        0       US      78      0       59      67      25      11      ["abby"]        Indie Rock      Rock    Pop     Empowering      Yearning        Brooding
spotify:user:920995a70302b6ae67c65065cf855764:playlist:4J0FXDR0DXVujDQ3YakyJc   920995a70302b6ae67c65065cf855764        0       0       0       3       12      6       0       20
        0       US      14      0       1       1       208     68      ["miles", "davis", "sketches", "spain"] Jazz    -       -       Sentimental     Tender  Sophisticated
spotify:user:61b3c743795a4f3e0f6c8896b2cdaf55:playlist:14QOucvnz6BDLcT7WsvI77   61b3c743795a4f3e0f6c8896b2cdaf55        5       3       1       1       2       1       1       2
        0       US      387     3       86      101     181     165     ["mah", "faves"]        Indie Rock      Alternative     Pop     Yearning        Defiant Empowering
spotify:user:0c39bfe9cd637f54001b91455ddc9727:playlist:4KXYr7LK0eY6C4Pjz6h4pp   0c39bfe9cd637f54001b91455ddc9727        0       0       0       1       2       1       1       2
        0       US      58      0       23      39      126     109     ["jesus"]       Religious       Pop     Children's      Empowering      Upbeat  Yearning
spotify:user:4ed73df8f60ddf6f9fd3f7feb1c412d3:playlist:1QW8VQ49ibbdwBEKYQbnBp   4ed73df8f60ddf6f9fd3f7feb1c412d3        12      6       1       1       2       2       1       3
        0       US      73      0       59      68      80      4       ["classic", "rock"]     Rock    Alternative     Country & Folk  Upbeat  Empowering      Rowdy
spotify:user:43ec110e5340b84f51bfe1b1c6238dc9:playlist:5QdYjbky6Rclfn2ZDH1McJ   43ec110e5340b84f51bfe1b1c6238dc9        12      10      1       2       12      14      1       30
        1       US      14      0       1       1       212     19      ["danger", "doom", "mouse", "mask"]     Rap     -       -       Cool    Defiant Yearning
spotify:user:4caaecbffb7be674fa8446923b55c8a3:playlist:7LPYpGmu75IjW6cODgQ04g   4caaecbffb7be674fa8446923b55c8a3        0       0       0       1       5       8       4       10
        0       US      40      1       39      36      23      0       ["list"]        Dance & House   Electronica     Alternative     Excited Sensual Defiant
spotify:user:270ebca4873a87ddc99e7aeda8a47344:playlist:1YzPf50CqHSOBAL92EPC6c   270ebca4873a87ddc99e7aeda8a47344        0       0       0       0       2       1       0       2
        0       US      9       0       1       1       17      0       ["oliver", "swain", "big", "machine"]   Country & Folk  -       -       Serious Lively  Sophisticated
spotify:user:283fdcc361db98115ea4632404c1563a:playlist:2kJnXLwMu1OvmiKZSxeQdG   283fdcc361db98115ea4632404c1563a        0       0       0       0       2       2       1       4
        0       US      108     0       104     104     44      9       ["mix"] Dance & House   Latin   Pop     Excited Energizing      Lively
spotify:user:b50af0f4de752c5b0988829cd3a929b7:playlist:3WdZ8U6Tknr3rqfQncxQPN   b50af0f4de752c5b0988829cd3a929b7        3       1       1       1       2       1       1       3
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spotify:user:802a1822061867264338ccd41ff1879a:playlist:2DznPfLAiO1MoImUm2OD6K   802a1822061867264338ccd41ff1879a        0       0       0       0       2       1       1       2
        0       US      20      0       1       1       112     102     ["mats", "set"] Indie Rock      Alternative     Punk    Empowering      Brooding        Excited
spotify:user:e4c972e67463b71a1c652c59eb540175:playlist:23ddSW0maa3yssjfvO6ZXm   e4c972e67463b71a1c652c59eb540175        0       0       0       1       2       2       1       2
        0       US      99      5       77      78      83      3       ["ready", "store"]      Alternative     Pop     Indie Rock      Excited Yearning        Defiant
spotify:user:0f6cc1667441f36ca6865aef96dbd86d:playlist:4frAvwFh7REOHRcDgFfqcV   0f6cc1667441f36ca6865aef96dbd86d        1       1       1       1       2       2       1       2
        0       US      165     0       122     104     627     96      ["stoph"]       Dance & House   Electronica     Pop     Excited Energizing      Aggressive
spotify:user:dfc70a2ffa4bf21160c60325896cb6dd:playlist:0KZCgk60R0Mvb22yo2IPGa   dfc70a2ffa4bf21160c60325896cb6dd        80      30      1       2       2       1       1       2
        0       US      170     5       129     136     147     119     ["faves"]       Pop     Country & Folk  Indie Rock      Yearning        Empowering      Upbeat
spotify:user:609bd4fa14fdbcc70860f28fd5375503:playlist:5A5MCzO3ujH0WKIblHT39O   609bd4fa14fdbcc70860f28fd5375503        1       1       1       1       2       1       1       2
        0       US      52      1       24      37      67      46      ["worship"]     Religious       -       -       Upbeat  Yearning        Brooding
spotify:user:687f748f1ca42b1b17f7b3c957e0ee2b:playlist:72b6MFdqhvfMrB5N2oKpUM   687f748f1ca42b1b17f7b3c957e0ee2b        0       0       0       3       5       1       1       6
        0       US      145     0       80      110     36      26      ["put", "gun"]  Alternative     Metal   Rock    Urgent  Defiant Empowering
spotify:user:655b9f704eef3d04364a36f2ea753da4:playlist:4bl1Niom6mVdmiJeC5Cj6H   655b9f704eef3d04364a36f2ea753da4        9       7       1       1       2       2       1       3
        0       US      36      0       33      34      83      11      ["partyharty"]  Dance & House   Electronica     Pop     Excited Aggressive      Urgent
spotify:user:a3a064354f8d56f877c568c16790efa1:playlist:1zuOeDI8TPBbJERxPEYs3Z   a3a064354f8d56f877c568c16790efa1        2       2       1       1       2       0       0       2
        0       US      26      0       26      23      50      37      ["country"]     Country & Folk  Spoken & Audio  Pop     Upbeat  Yearning        Empowering
spotify:user:63cc244851c0ad1946bcf09afca5f04d:playlist:7up1zLfeQqVlsZmTDB7icb   63cc244851c0ad1946bcf09afca5f04d        0       0       0       1       2       2       2       2
        0       US      711     0       367     365     80      22      ["edm"] Dance & House   Electronica     Pop     Excited Aggressive      Energizing
spotify:user:5efff606ce5c339de913d708ee874ed1:playlist:75PB7rW1Er7mf3croqjO8T   5efff606ce5c339de913d708ee874ed1        9       6       1       1       2       2       1       5
        0       US      62      0       1       1       128     126     ["south"]       Rap     R&B     Pop     Defiant Cool    Energizing
spotify:user:09219433e162d6573d773b6113a09bc6:playlist:3CBjPICQKRNICpII8hhNIa   09219433e162d6573d773b6113a09bc6        0       0       0       2       3       1       1       3
        0       US      43      1       38      39      29      3       ["pizza", "party"]      Indie Rock      Dance & House   Electronica     Excited Yearning        Sensual
spotify:user:1a0fba3ec5c398bc526dd97425a770ee:playlist:4Tk2TLeNj82hkV8yhQ19do   1a0fba3ec5c398bc526dd97425a770ee        0       0       0       3       10      9       4       15
        0       US      39      0       1       1       336     71      ["uber", "boston", "september", "jams", "deux"] Rap     Indie Rock      Dance & House   Sensual Excited
Defiant
spotify:user:00aeb7fa582dbdc9664328fbb98be674:playlist:0grCzNDQyqdq0jcx08Tab4   00aeb7fa582dbdc9664328fbb98be674        0       0       0       1       3       1       1       3
        0       US      93      0       71      76      21      3       ["feeling", "nostalgic", "introspective"]       Indie Rock      Rock    Alternative     Yearning
Empowering      Upbeat
spotify:user:24df087b3597d6319837162564e03e92:playlist:1QbFZTay5sNWqNY1BerhE4   24df087b3597d6319837162564e03e92        65      55      1       1       4       2       1       11
        0       US      331     0       33      41      482     477     ["super", "mega", "puntastic", "mix", "heroicness"]     Soundtrack      Metal   Pop     Urgent  Defiant
Aggressive
spotify:user:5b8dd31ce1f4a04fc657155543e13931:playlist:1FDsNe4BTTmD0BNp2JbPe2   5b8dd31ce1f4a04fc657155543e13931        0       0       0       1       2       1       1       2
        0       US      17      0       16      17      25      0       ["neverback"]   Alternative     Metal   Punk    Defiant Urgent  Brooding
spotify:user:cbd243dc1e5c933313f3bbffdde3e77b:playlist:1cXT82UHuDoXbdrxfCg5pz   cbd243dc1e5c933313f3bbffdde3e77b        19      19      1       2       6       2       2       9
        0       US      110     0       1       11      74      51      ["oscar", "hijos"]      Latin   -       -       Lively  Fiery   Cool
spotify:user:020f8460253e2f04f9360bbb0f381c1e:playlist:3nXBOwbEjY6AaQhwwTBp7v   020f8460253e2f04f9360bbb0f381c1e        0       0       0       1       2       1       1       2
        0       US      122     1       81      90      67      63      ["sexy", "time"]        Alternative     Indie Rock      Rock    Defiant Empowering      Urgent
spotify:user:7b28826e7cdfcfd8daaef5399a344959:playlist:5QWYAANVqlQKd5Fva27Wkv   7b28826e7cdfcfd8daaef5399a344959        140     139     1       1       4       2       1       6
        0       US      4692    58      1274    337     3938    3919    ["jazz"]        Jazz    Easy Listening  Religious       Sophisticated   Sentimental     Romantic
spotify:user:7a3803aacfefd8d0800dfba2fde93c28:playlist:4xejf873EMKXyPpznIPvIx   7a3803aacfefd8d0800dfba2fde93c28        21      21      1       1       3       2       0       6
        0       US      54      1       2       6       23      0       ["sueno", "morfeo"]     Latin   -       -       Empowering      Yearning        Upbeat
spotify:user:f3b4bb4e8644cf237be5ad76e0f80f35:playlist:4DckmrBp93Y46ncWoUMG9Y   f3b4bb4e8644cf237be5ad76e0f80f35        165     132     10      72      242     90      15      384
        5       US      28      0       5       10      3372    382     ["ptx"] Pop     -       -       Defiant Excited Sensual
spotify:user:a7c1f9efe845053f0ec4a38e6c2f0a2b:playlist:4NGdNJUThL0rkfnaSxjAwz   a7c1f9efe845053f0ec4a38e6c2f0a2b        0       0       0       1       3       2       2       4
        0       US      25      1       6       12      60      33      ["taeyang", "rise"]     Pop     Rap     -       Sophisticated   Empowering      Romantic
spotify:user:c57fd0d8c32e980d13dbb45c2e78734c:playlist:5ZwkPLOAxYInzTqkQCGcBv   c57fd0d8c32e980d13dbb45c2e78734c        0       0       0       0       2       1       1       3
        0       US      33      3       25      28      11      4       ["dinner", "prty"]      Indie Rock      Rock    Alternative     Excited Yearning        Brooding
spotify:user:57549cd84362d16d228d20cd6bd13a98:playlist:6XErc7dzXqBnkgEujrxyOb   57549cd84362d16d228d20cd6bd13a98        3       3       1       2       3       2       2       3
        0       US      1207    1       212     312     508     119     []      Punk    Metal   Rock    Defiant Urgent  Aggressive
spotify:user:27ec4250b09ea3b86c033441a40d2cdf:playlist:1R0WFRUd3OHDMAtbvKhOBr   27ec4250b09ea3b86c033441a40d2cdf        2       2       1       1       2       1       1       2
        1       US      311     0       242     184     257     229     []      R&B     Rap     Pop     Sensual Defiant Energizing
spotify:user:33a6125a106ef18a4e68ab50aafcdc59:playlist:2N0NHyYFRkeWtZKNb3oLBK   33a6125a106ef18a4e68ab50aafcdc59        4       2       1       1       2       2       2       2
        0       US      79      0       74      77      76      54      ["reception", "mingle"] Pop     Rock    Indie Rock      Yearning        Easygoing       Gritty
spotify:user:dc479d9be932911f7cee318bfa18cdb2:playlist:6eHtLEtxAeXlTxueSancCT   dc479d9be932911f7cee318bfa18cdb2        0       0       0       1       2       2       1       3
        0       US      1091    0       783     828     438     415     ["morning", "playlist"] Pop     Dance & House   Alternative     Excited Energizing      Defiant
```

```
spotify:user:c04367d85e2d85003de9be2c1b5cf00b:playlist:3YwC4p5Ed528zy5PchBvlf   c04367d85e2d85003de9be2c1b5cf00b        0       0       0       1       2       1       1       2
        0       US      85      0       72      69      125     113     ["classical", "classics"]       Classical       Soundtrack      Pop     Tender  Peaceful        Stirring
spotify:user:63f30f0682a27dba7751c53c937caa90:playlist:5V0iulVs1nqhBXqkkcHKnP   63f30f0682a27dba7751c53c937caa90        1       0       0       3       3       2       2       3
        1       US      43      1       39      39      96      9       ["breakers"]    Indie Rock      Alternative     Rock    Yearning        Brooding        Melancholy
spotify:user:41069cc8999f842d4914757e9309ab03:playlist:2g3ZnnC4518wZirsbvjBI3   41069cc8999f842d4914757e9309ab03        3       3       1       4       13      13      3       27
        0       US      39      0       31      33      303     65      ["smooth", "sexy", "salsa"]     Latin   Pop     Jazz    Lively  Fiery   Romantic
spotify:user:d052537038ec6890906d2b011f38c4f5:playlist:5lJWE5aaydEr5tRgsqeZWc   d052537038ec6890906d2b011f38c4f5        13      11      1       1       2       2       1       3
        1       US      54      7       43      34      127     55      ["love", "keeps", "lifting"]    Rap     R&B     Indie Rock      Defiant Sensual Cool
spotify:user:a9af1290c53595cabba4d6713eea5df5:playlist:5dG7celtJOa9HVGpXMOZ81   a9af1290c53595cabba4d6713eea5df5        0       0       0       1       2       1       1       2
        0       US      84      0       9       13      68      45      ["folk"]        Rock    Country & Folk  -       Empowering      Gritty  Yearning
spotify:user:a3593d01625fed5ecfeeb42bd902688a:playlist:00CxDCtLKKH2XeafWNkMfI   a3593d01625fed5ecfeeb42bd902688a        0       0       0       1       2       1       1       2
        0       US      60      0       38      28      153     146     ["tigers", "norte"]     Latin   -       -       Lively  Cool    Romantic
spotify:user:260fa315fd42a5b4ea6c96a5e6ee4f21:playlist:0BYZbQB6sgVG7ZrUniY88D   260fa315fd42a5b4ea6c96a5e6ee4f21        0       0       0       1       2       0       0       2
        0       US      1800    0       128     199     93      87      ["study", "muzik", "haha"]      Indie Rock      Alternative     Rock    Brooding        Yearning
Melancholy
spotify:user:5757e5517ad867a31aac5b79d77bade1:playlist:1eJpIzrLUJthTHBoJvxjkm   5757e5517ad867a31aac5b79d77bade1        0       0       0       2       4       7       2       12
        0       US      208     0       122     120     46      33      ["country", "desert"]   Country & Folk  Rock    Pop     Upbeat  Yearning        Empowering
spotify:user:9488f2da65ae4194fb146a23ee9f9ad6:playlist:1YX2nOT6teAghj1I0mDA2J   9488f2da65ae4194fb146a23ee9f9ad6        5       2       1       2       2       2       1       3
        0       US      623     60      302     333     407     393     ["collection", "dope", "music"] Rap     Indie Rock      Alternative     Defiant Excited Cool
spotify:user:6d5a04eca32e0804f338627d09ddc027:playlist:46lBRWLJP0u4ZVHGC673Yp   6d5a04eca32e0804f338627d09ddc027        14      4       1       1       3       5       2       6
        0       US      242     1       160     180     89      63      ["summer", "forever"]   Alternative     Indie Rock      Electronica     Defiant Excited Urgent
spotify:user:ce72c4d76e5431d00a5113f68a69c4b2:playlist:5mXFvxGP8LFCspfnB2jedF   ce72c4d76e5431d00a5113f68a69c4b2        16      16      1       1       2       1       1       2
        0       US      14      0       14      14      65      39      []      Pop     Electronica     R&B     Brooding        Defiant Excited
spotify:user:bbe955cac1a86d81eb6290e85def7e3c:playlist:1XlJJah6ti5ifQaPgfo2jU   bbe955cac1a86d81eb6290e85def7e3c        0       0       0       0       2       1       1       2
        0       US      232     11      194     188     12      2       ["party"]       Dance & House   Electronica     Rap     Excited Aggressive      Energizing
spotify:user:45022317c2957f16e05228c15ca8e921:playlist:2Qnh29VuJ8r4oefNWCv9mo   45022317c2957f16e05228c15ca8e921        47      46      1       2       6       6       4       11
        1       US      90      0       71      77      1041    934     ["cry", "heart"]        Pop     Rock    Indie Rock      Yearning        Empowering      Sophisticated
spotify:user:f12d6f489c35c5510ed13dd0d4ca1540:playlist:2k3IZEO8sh50uaZ9yq0ui4   f12d6f489c35c5510ed13dd0d4ca1540        0       0       0       1       3       2       0       5
        0       US      47      0       45      44      30      0       ["twerk"]       Rap     Pop     Electronica     Defiant Energizing      Aggressive
spotify:user:ce53e4b60cce53320e37fa90177872d8:playlist:69VW6s7WEx4vwxiwpx4GMo   ce53e4b60cce53320e37fa90177872d8        4       4       1       1       2       0       0       2
        0       US      13      0       13      13      69      65      ["fall"]        Rock    Alternative     Country & Folk  Rowdy   Defiant Lively
spotify:user:2a5c0e4d31cbb88833eff22593cc3978:playlist:46lB52sNACmGjJUnYo3ZuG   2a5c0e4d31cbb88833eff22593cc3978        1       1       1       6       26      26      2       67
        1       US      37      0       28      29      231     0       ["young", "rich", "niggas"]     Rap     R&B     -       Defiant Cool    Sensual
spotify:user:c76a4b8b36a58dee5cb69bc75e8e03e4:playlist:7js1EPQLyFRWbBtXS2YQgf   c76a4b8b36a58dee5cb69bc75e8e03e4        0       0       0       0       2       2       1       3
        0       US      34      0       15      15      34      1       ["betta", "move"]       Electronica     Dance & House   Indie Rock      Excited Energizing      Aggressive
spotify:user:4328009308385bfc597106d1d4c32f31:playlist:1AMli4cjFOujs2tEGOlIo1   4328009308385bfc597106d1d4c32f31        0       0       0       1       2       1       1       2
        0       US      16      0       13      14      122     83      ["happy"]       Indie Rock      Alternative     Rock    Excited Yearning        Empowering
spotify:user:b5bd00f02b23cf2f02b3f893a168a2d0:playlist:3GJBTO1naXy4om2wJQesiM   b5bd00f02b23cf2f02b3f893a168a2d0        0       0       0       2       3       4       1       12
        0       US      153     0       96      117     226     217     ["birthday", "party"]   Rock    Metal   Alternative     Rowdy   Excited Urgent
spotify:user:28ddb607228dcb0e88eb33b5c145a709:playlist:66l4CeQpiKyrRXTBvC4Ev9   28ddb607228dcb0e88eb33b5c145a709        0       0       0       2       5       3       1       11
        0       US      14      0       13      13      47      22      ["new", "turkish"]      Pop     Rock    Traditional     Sophisticated   Brooding        Upbeat
spotify:user:2db8d7519f4c9a1b6b35f70ae70fe4fa:playlist:2BABAfZCTl2L1DxYRTDEng   2db8d7519f4c9a1b6b35f70ae70fe4fa        0       0       0       1       2       1       1       2
        0       US      15      0       15      15      32      27      ["yup"] Pop     Indie Rock      Rock    Empowering      Excited Easygoing
spotify:user:d5dcdbe3a4c0112e9dfe36ce2edf94f7:playlist:07YYyV2y31iIrxYx0DncLA   d5dcdbe3a4c0112e9dfe36ce2edf94f7        1       1       1       1       2       0       0       3
        0       US      28      0       28      28      7       4       ["bitch", "whiskey"]    Rap     Pop     Dance & House   Aggressive      Defiant Cool
spotify:user:2c8a1dce25265e13dedb901e3e74757e:playlist:2s5ciqyOS54YvlRhUtN6jE   2c8a1dce25265e13dedb901e3e74757e        15      7       1       1       2       2       1       6
        0       US      600     20      2       246     164     144     ["email", "music"]      Latin   Pop     Rap     Energizing      Defiant Excited
spotify:user:9eaf2af811849f4857817233af14ce6f:playlist:6VfGgG4sQ8wBNVJT6fng7W   9eaf2af811849f4857817233af14ce6f        1       1       1       2       4       5       1       9
        1       US      242     0       55      62      956     876     ["silent", "sleep"]     Alternative     Country & Folk  New Age Peaceful        Romantic        Somber
spotify:user:0e0cb01eb1fe758753fb966d5aaf8d7d:playlist:7KumgwGcvKv9pvJtc9deeN   0e0cb01eb1fe758753fb966d5aaf8d7d        2       1       1       2       5       4       1       14
        0       US      252     0       182     198     156     84      ["fairytale"]   Pop     Alternative     Rock    Yearning        Empowering      Upbeat
spotify:user:426e90e2bface02fc702036184afd3fa:playlist:0ECIakr8EittCMEjTSSK0A   426e90e2bface02fc702036184afd3fa        15      10      1       1       2       2       1       4
        0       US      339     0       92      85      224     221     ["girls", "songs"]      Pop     R&B     Children's      Empowering      Excited Yearning
spotify:user:bbc9b8176199e39f2b8fb72a36254a60:playlist:7173BpBFDZNbcBvf6ZtMls   bbc9b8176199e39f2b8fb72a36254a60        0       0       0       1       2       1       1       2
        0       US      100     0       20      20      65      3       ["ctf", "september"]    Indie Rock      Pop     New Age Urgent  Empowering      Energizing
```

Some Features in the Data

- **STREAMS, STREAM30S, MONTHLY OWNER STREAM30S**

  About user engagement within the playlist.

- **DAUS, WAUS, MAUS, USERS, SKIPPERS**

  About user engagement on the platform, and sometimes within the playlist.

- **TRACKS, LOCAL TRACKS*, ARTISTS, ALBUMS**

  Quantitative descriptions of the playlist. *Local Tracks indicate a known premium subscription.

- **MOODS, TOKENS, GENRES**

  Qualitative descriptions of the playlist. Tokens come from the user. Moods & Genres come from Spotify.

Possible Success Metrics

- **MONTHLY OWNER STREAM30S**

  Number of streams over 30 seconds by playlist owner this month

- **MONTHLY STREAM30S**

  Number of streams over 30 seconds this month

- **MAUS**

  Number of Monthly Active Users, i.e. users with a stream over 30 seconds from playlist in past month

- **STREAMS**

  Number of streams from playlist today

Success Metric for User Playlist

SUMMARY USER AND FINANCIAL METRICS

USERS (M)	Q1 2018	Q4 2018	Q1 2019	% Change Y/Y	% Change Q/Q
Total Monthly Active Users ("MAUs")	173	207	217	26%	5%
Premium Subscribers	75	96	100	32%	4%
Ad-Supported MAUs	102	116	123	21%	6%

What is success?

When a playlist gets used! The more, the better!

Considerations

There are two types of playlists in the dataset: user-created and Spotify official.

For this analysis, we'll focus on user-created playlists.

Success Metric

Number of streams over 30 seconds by playlist owner this month

Engineered Features

NATURAL LANGUAGE SENTIMENT SCORING

Token Sentiment Score, Mood Sentiment Score (all 3 moods averaged), Token Sentiment Absolute Value Score (intensity proxy)

PERSONAL AGGREGATIONS

Token count (effort proxy), Genre count (variation in playlist), Owner playlist count

RATIOS

Tracks per Artist (variation), Tracks per Album, Local-to-Total Tracks Ratio (discovery), Stream 30s-to-Streams (quality of time), Stream 30s-to-Monthly Streams (day-to-month ratio), Monthly Owner-to-Total Streams (intimacy)

BINARIES

Owner has multiple playlists, Owner known to be Premium subscriber

Data Preparation

GETTING THE DATA READY

Outliers

- Spotify official playlists must be taken out of the data. There are 399 of them.
- For linear regression, consider data within 3σ.

Dummy Variables

- Computers can't make sense of categorical variables, so they must be made binary.
- Avoid dummy variable trap.

Sentiment Analysis

- Python has very powerful natural language processing libraries, such as Vader Sentiment. It can score a word's positivity.

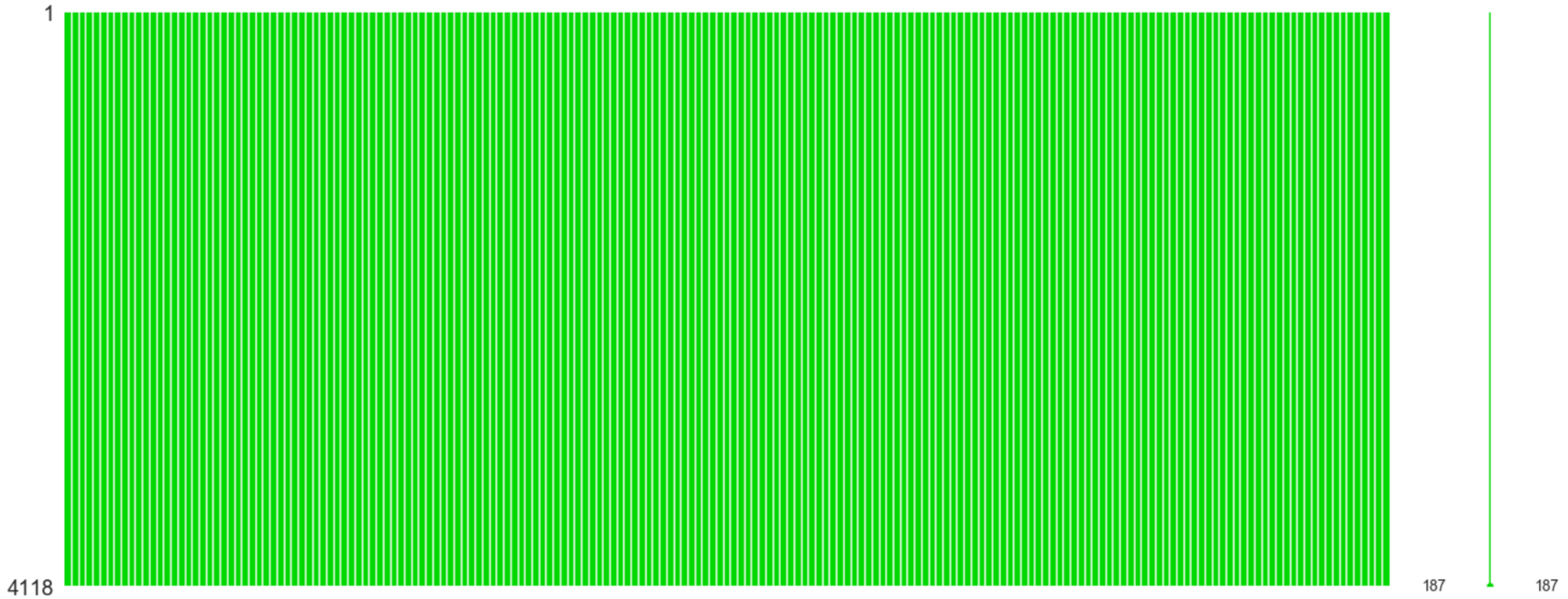
Look for Nulls

- Most data analysis does not do well with missing values. Consider eliminating the nulls, interpolating, or mean-fillling.

ABSOLUTELY NO NULLS!

In [ ]:
```
#checking for completenesss
msno.matrix(spotify_lite_numeric, color = (.0,.85,.0))
```

Out[ ]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x1a1adb7470>
```



WORD SENTIMENT ANALYSIS

	Lead Mood	Mood Sentiment Score
0	Aggressive	-0.1531
1	Brooding	0.0258
2	Cool	0.3182
3	Defiant	-0.2263
4	Easygoing	0.3182
5	Empowering	0.0000
6	Energizing	0.4588
7	Excited	0.3400
8	Fiery	-0.3400
9	Gritty	0.0000
10	Lively	0.4404

Reasonable minds can disagree on how the Vader Sentiment engine scores a given word, but, as we shall see, it becomes very powerful when analyzing word aggregations.

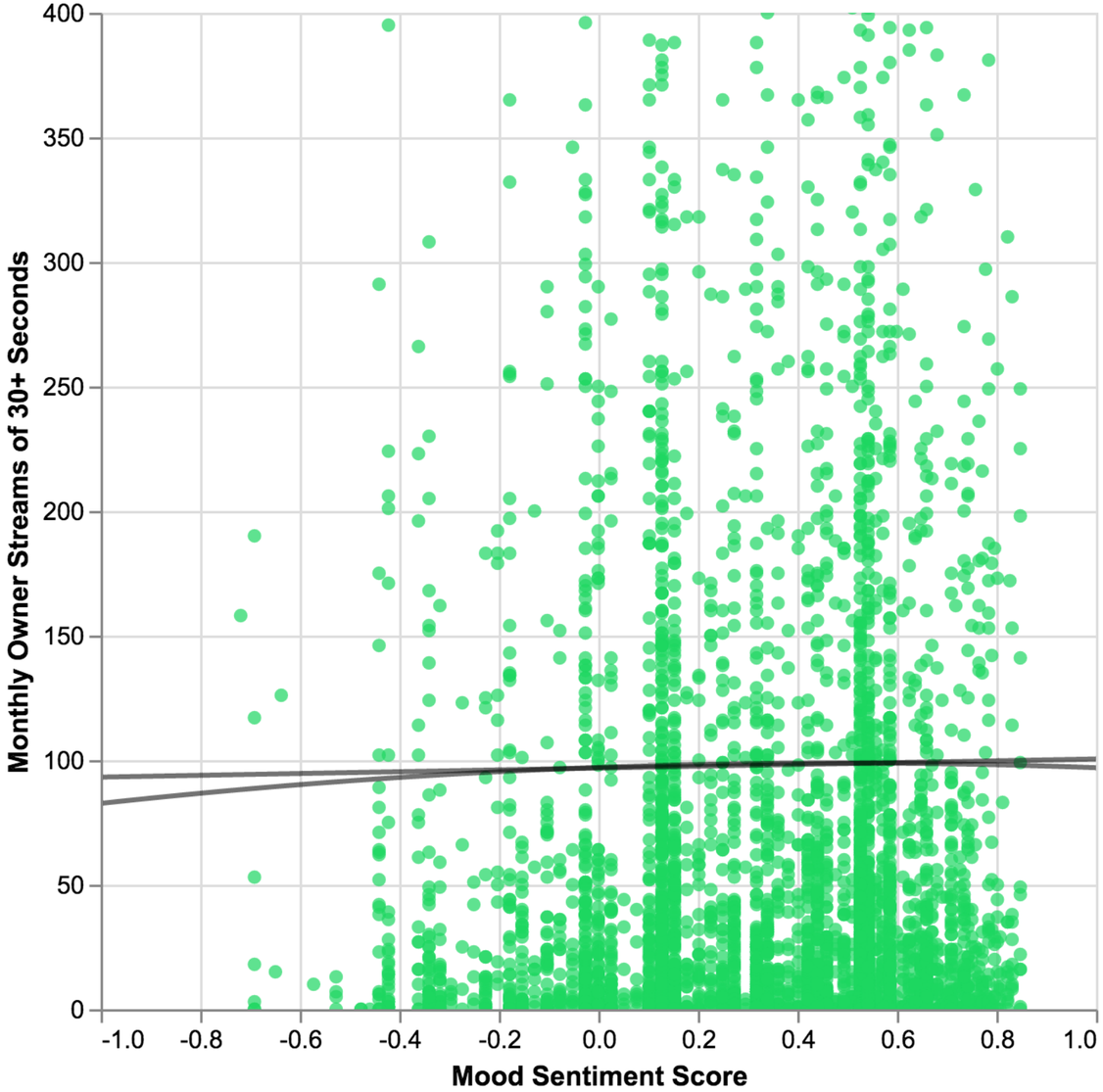
MOST NEGATIVE TOKEN COMBOS

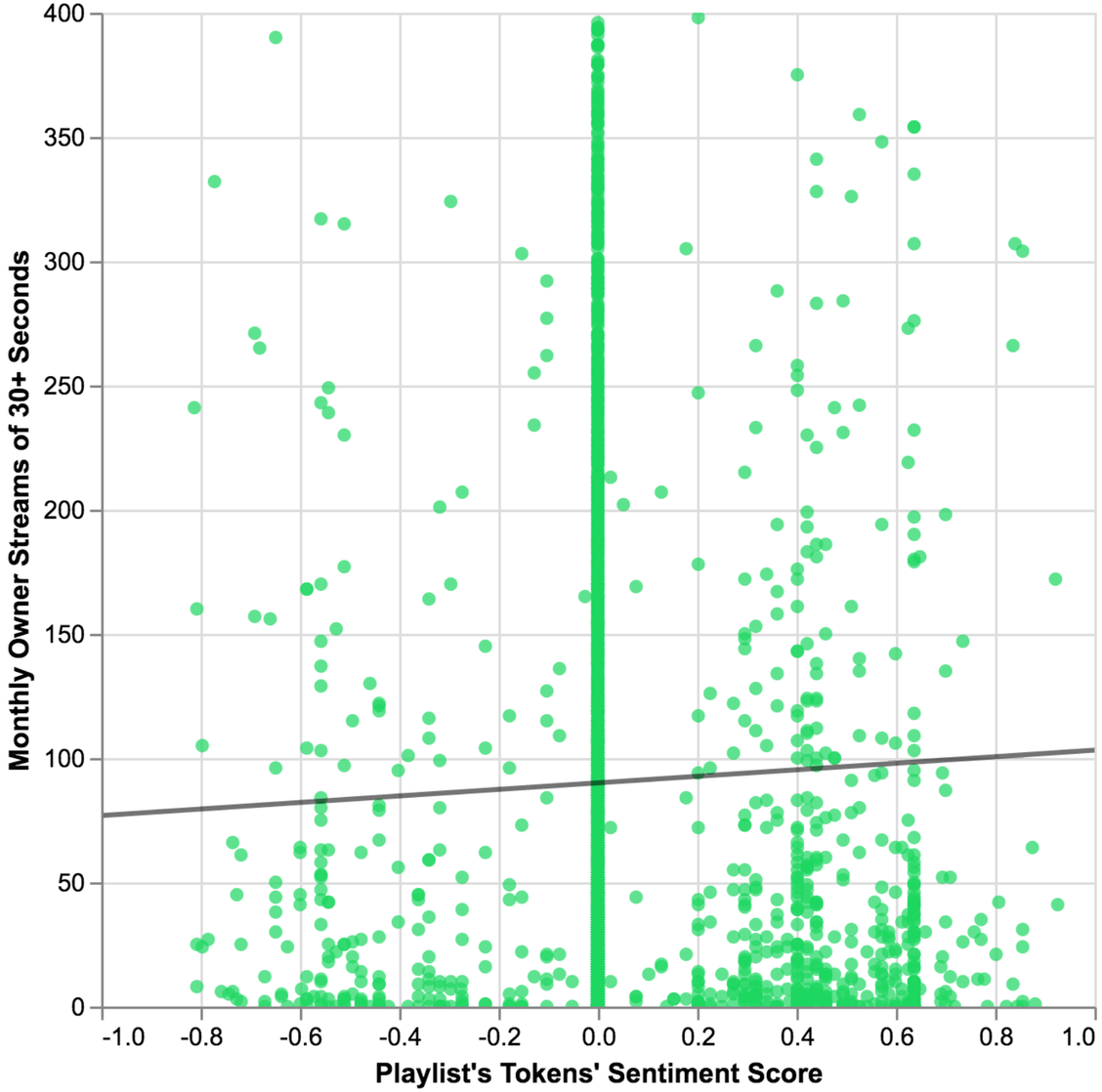
	Playlist ID	Tokens	Token Sentiment Score
0	1awu4P3xtUYkkpkTn2H6fl	["boss", "ass", "bitch", "bitch", "bitch", "bi...	-0.9623
1	1v8iwl5ehBWHgTfpJHYu9f	["killer", "killed", "killer", "killed"]	-0.9618
2	5rnoJcL2ssx56EgOHlKxEs	["killer", "killed", "killer", "killed"]	-0.9618
3	5uFFoFd935fHpsjNyS0gjo	["punk", "punk", "goes", "black", "death", "he...	-0.9413
4	3eZxZLBMuncTetclqdFu17	["yung", "based", "boy", "shit", "feel", "homi...	-0.9403
5	561AfqMPTVuCcBLHf7GqQB	["fuck", "bad", "bad", "bitch"]	-0.9360
6	3ABdz7AF9UGsf0p6Is0RTQ	["dope", "ass", "trick", "ass", "sucka", "ass"...	-0.9360
7	3XYRrF0FdmbNYJzVZlB9ml	["hell", "yeah", "bitch", "go", "hard", "hell"...	-0.9217
8	7eSo6eg25wtRnMQeYmuMWr	["depressing", "ass", "depressed", "shit"]	-0.9186
9	6eXrG7eVailErqsyWyY3rU	["shit", "kill", "shit"]	-0.9169
10	4jyKtjc4TUEoY9tjCCg6sD	["kill", "people", "burn", "shit", "fuck", "sc...	-0.9153

MOST POSITIVE TOKEN COMBOS

	Playlist ID	Tokens	Token Sentiment Score
0	5AWXjgKgf6dM5LB5xrmVxh	["relaxing", "piano", "greatest", "best", "lov...	0.9899
1	6NojvHGiwAWiKkXdLsENks	["relaxing", "piano", "greatest", "best", "lov...	0.9899
2	2nGaln1PPag20CxAlCeQ1G	["greatest", "best", "loved", "hymns", "spirit...	0.9856
3	1TpnPlLooYYP0Zl63yYHcG	["love", "songs", "love", "songs", "deep", "lo...	0.9803
4	2vklmB9cNciylP7aLv8fKr	["super", "happy", "funtime", "awesome", "nice...	0.9758
5	4M6n6PoCwhlG1mLMGBdHl3	["love", "songs", "piano", "songs", "romance",...	0.9682
6	7haamLtX1X711w2cc7kYt9	["hope", "anne", "muckley", "love", "like", "l...	0.9678
7	3pD9Sn1NOWHA7yYWHEDVCX	["edm", "rehab", "top", "electronic", "dance",...	0.9509
8	74WXhw6lAXJpC5SYHJqrAb	["great", "worship", "songs", "kids", "praise"...	0.9451
9	4lR6coi2zbiRrO51HRT19N	["great", "worship", "songs", "kids", "praise"...	0.9451
10	3PpbClzYP6w0xKY7qZ8lEl	["glee", "cast", "love", "like", "love", "song...	0.9442

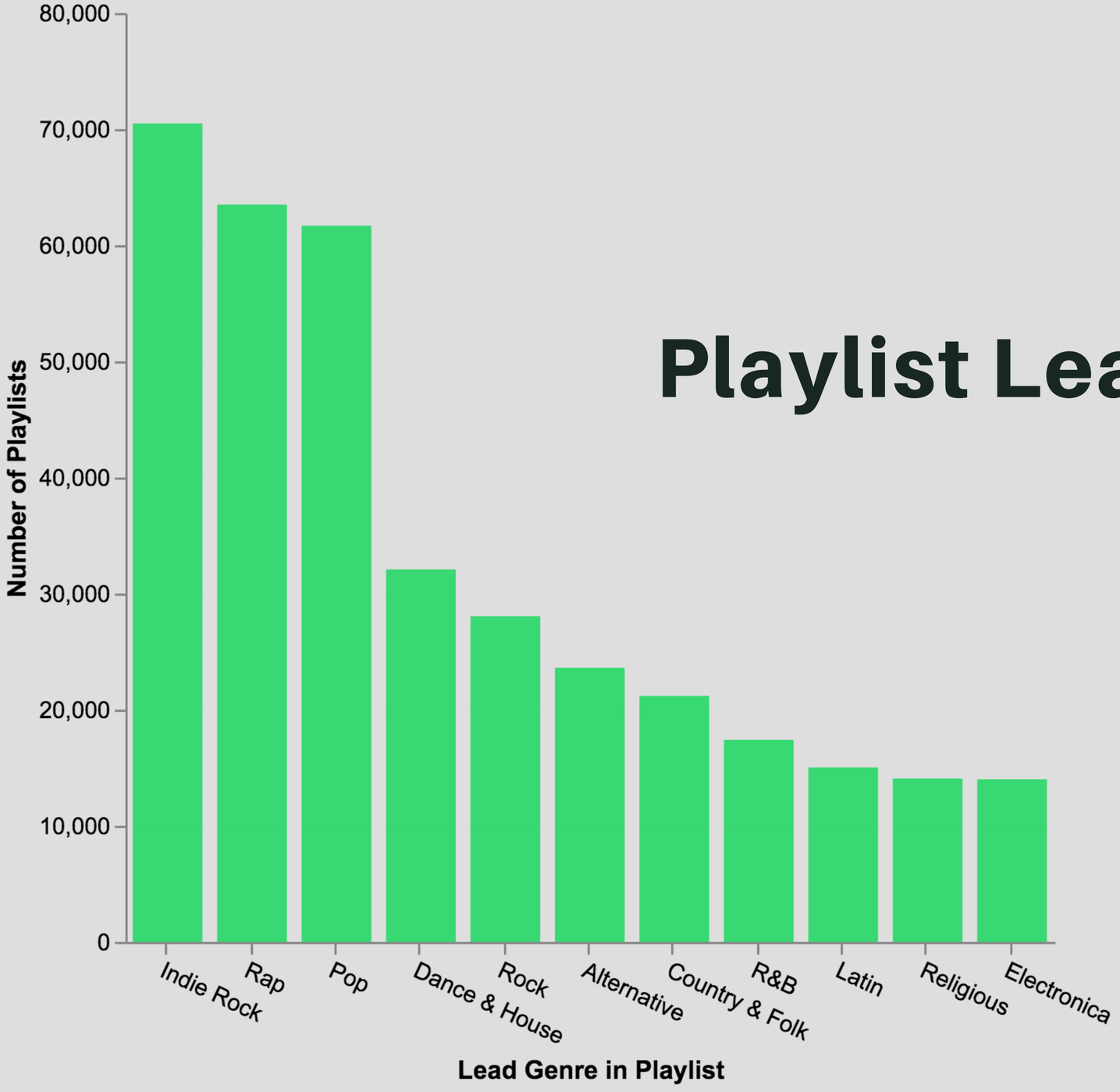
SCORES & STREAMS - NO CLEAR TREND



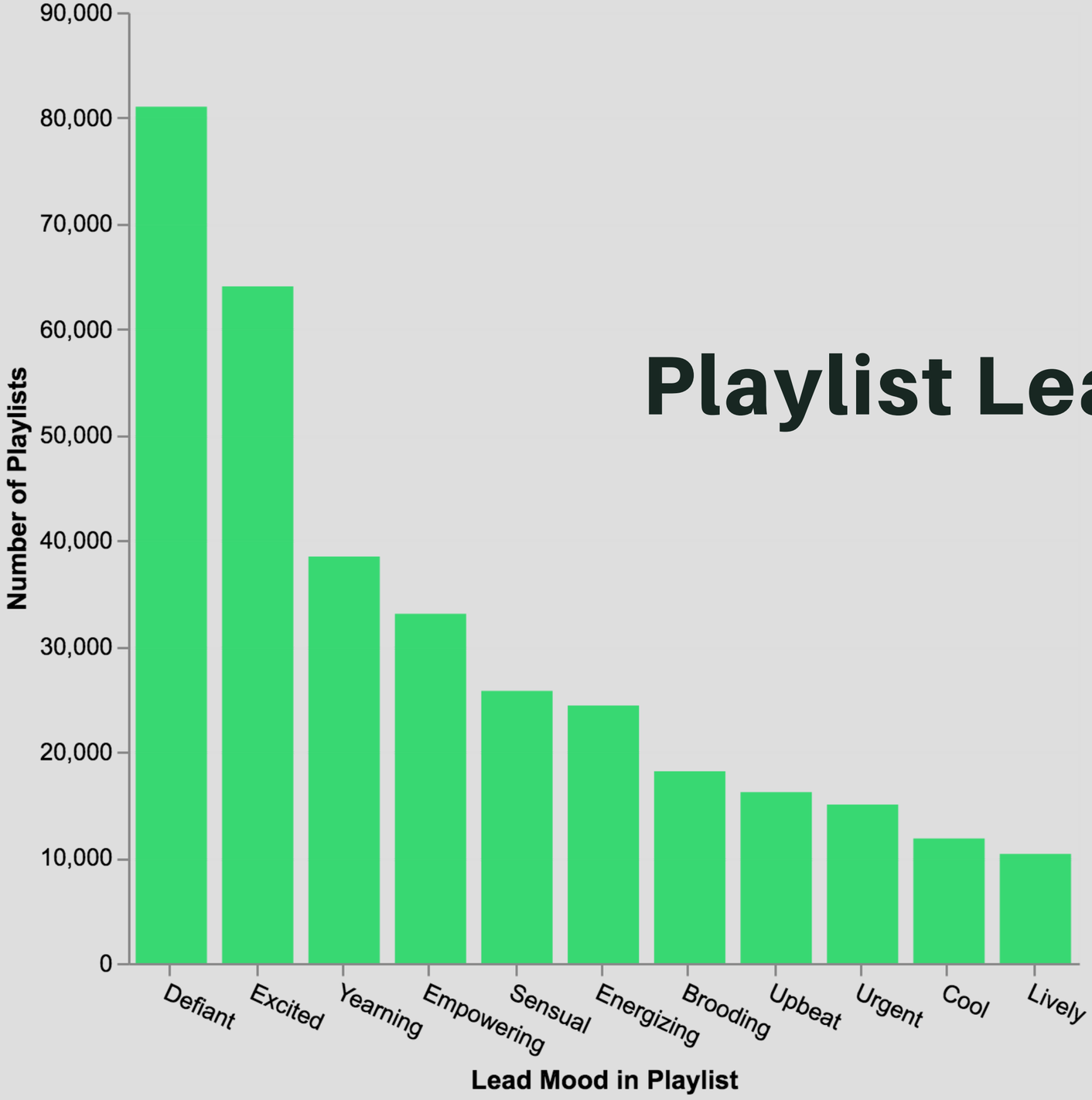


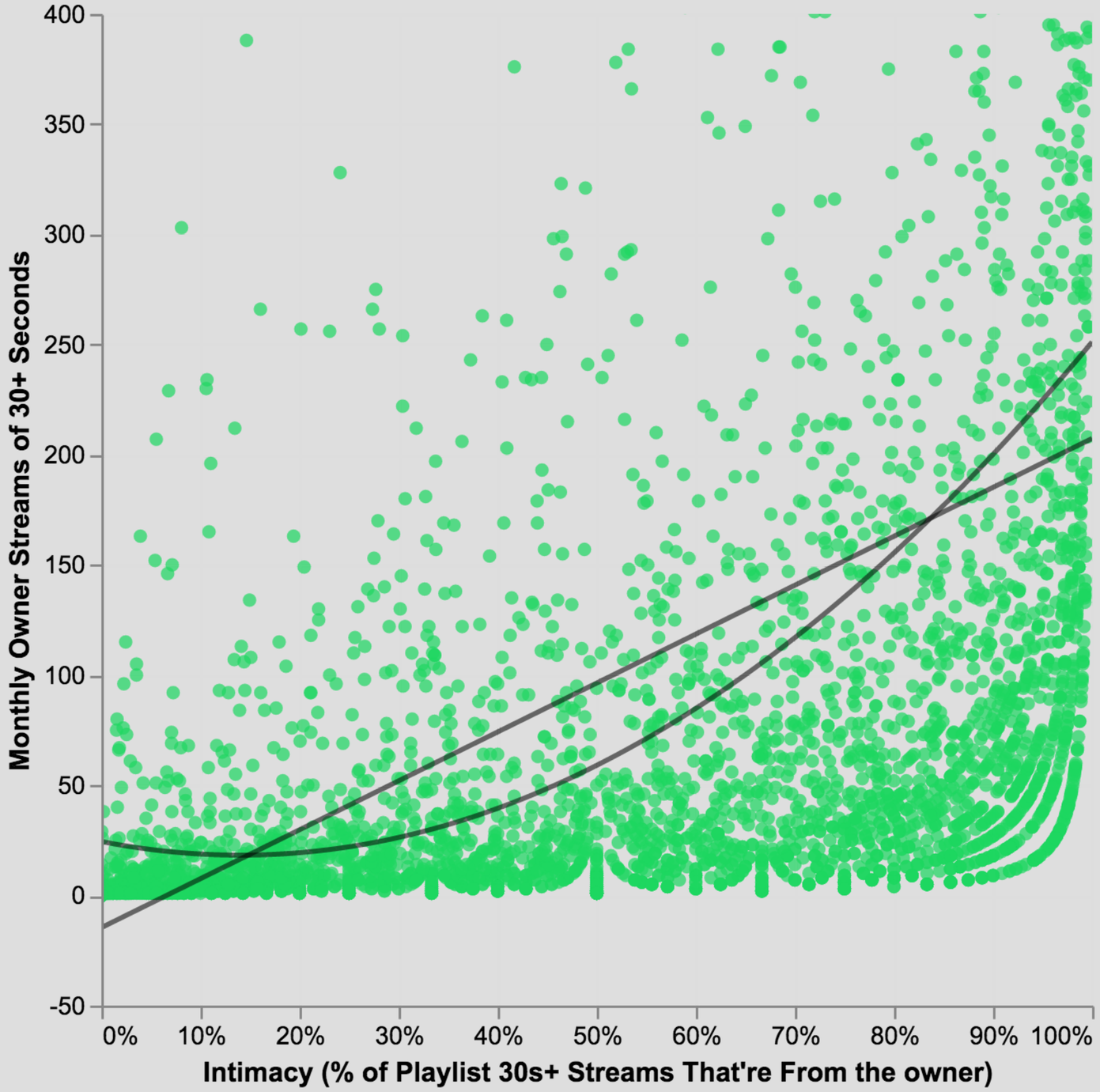
Exploratory Data Analysis & Visualization

Playlist Lead Genres



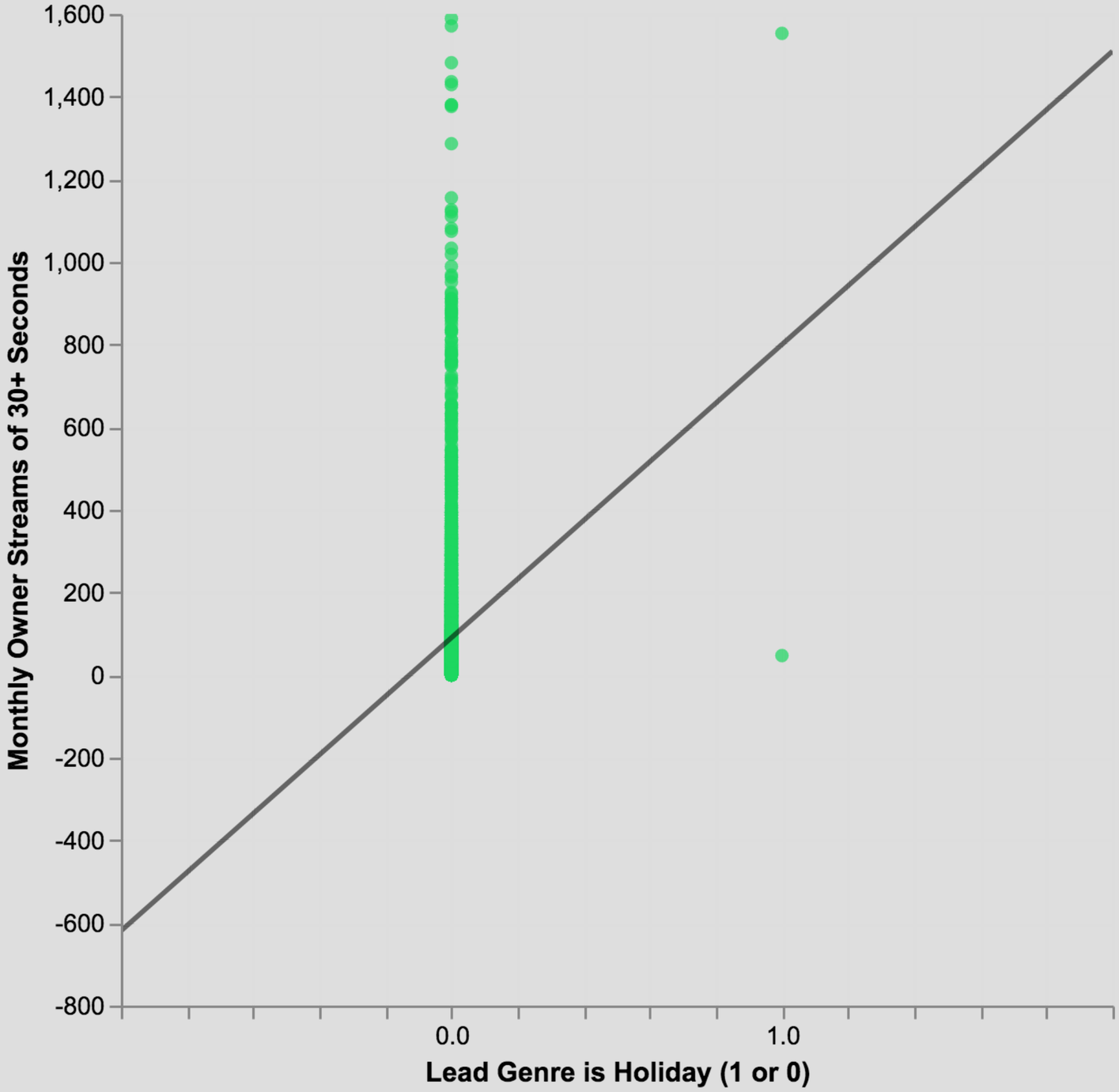
Playlist Lead Moods





Intimacy

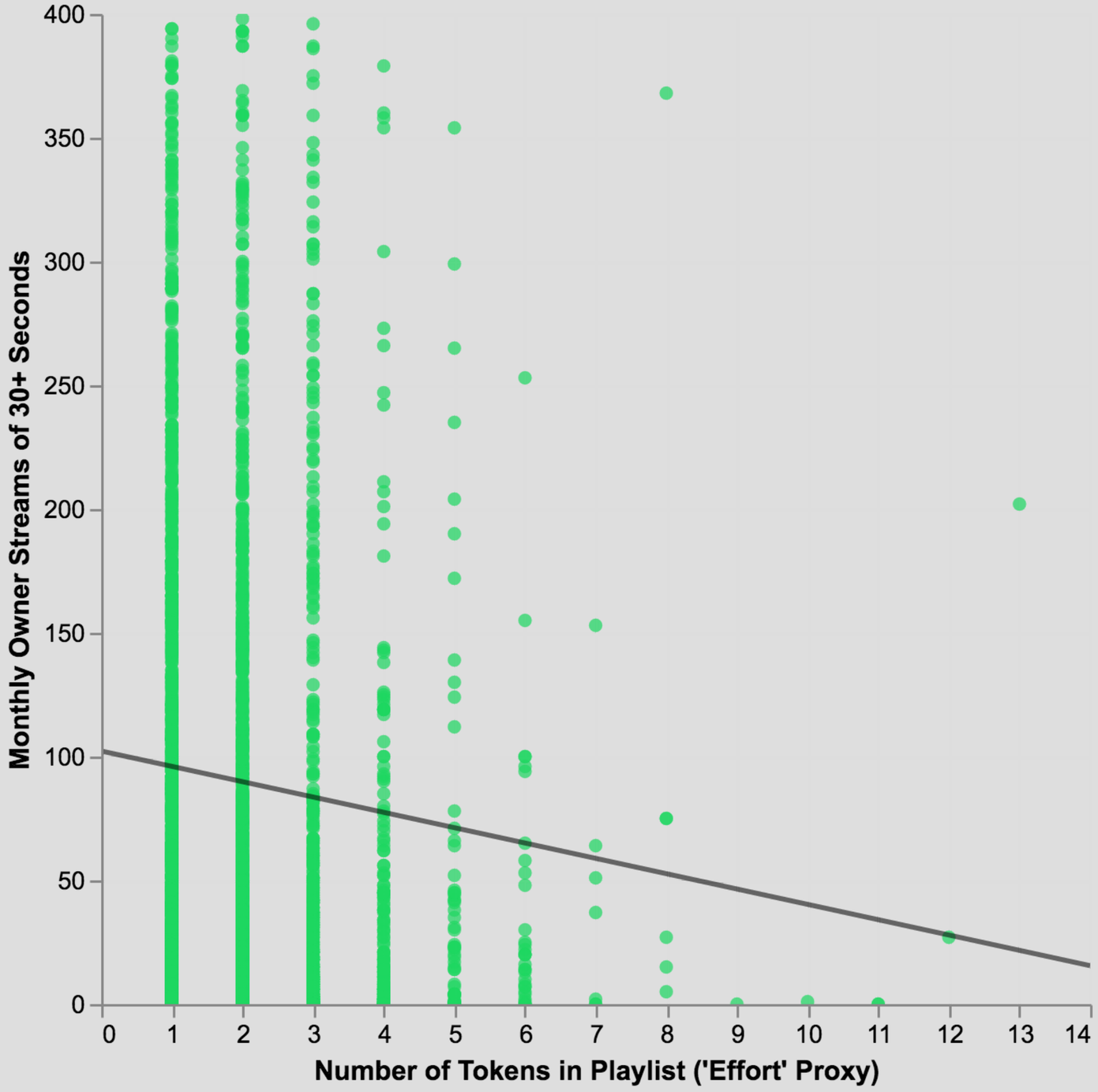
I contend that the proportion of a playlist's monthly 30+ second streams that come from YOU demonstrates the playlists's intimacy.



A Holiday Hunch...

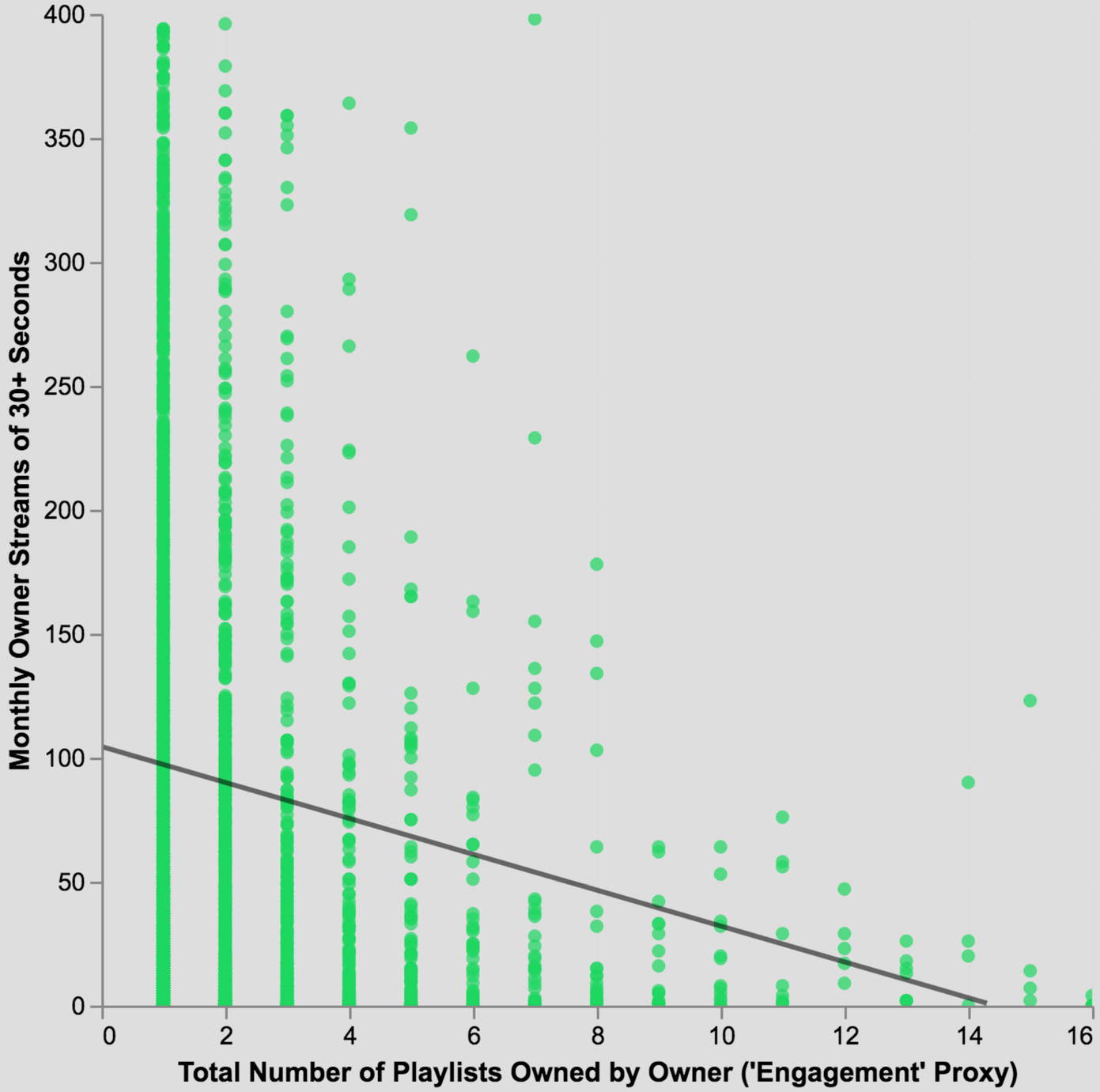
Playlists with 'Holiday' as the Lead Genre are pretty rare. 158 out of 402,967 user playlists (this excludes the 399 official Spotify playlists).

But it sure looks like holiday playlists get a LOT of streams. I'd need more data to properly analyze this.



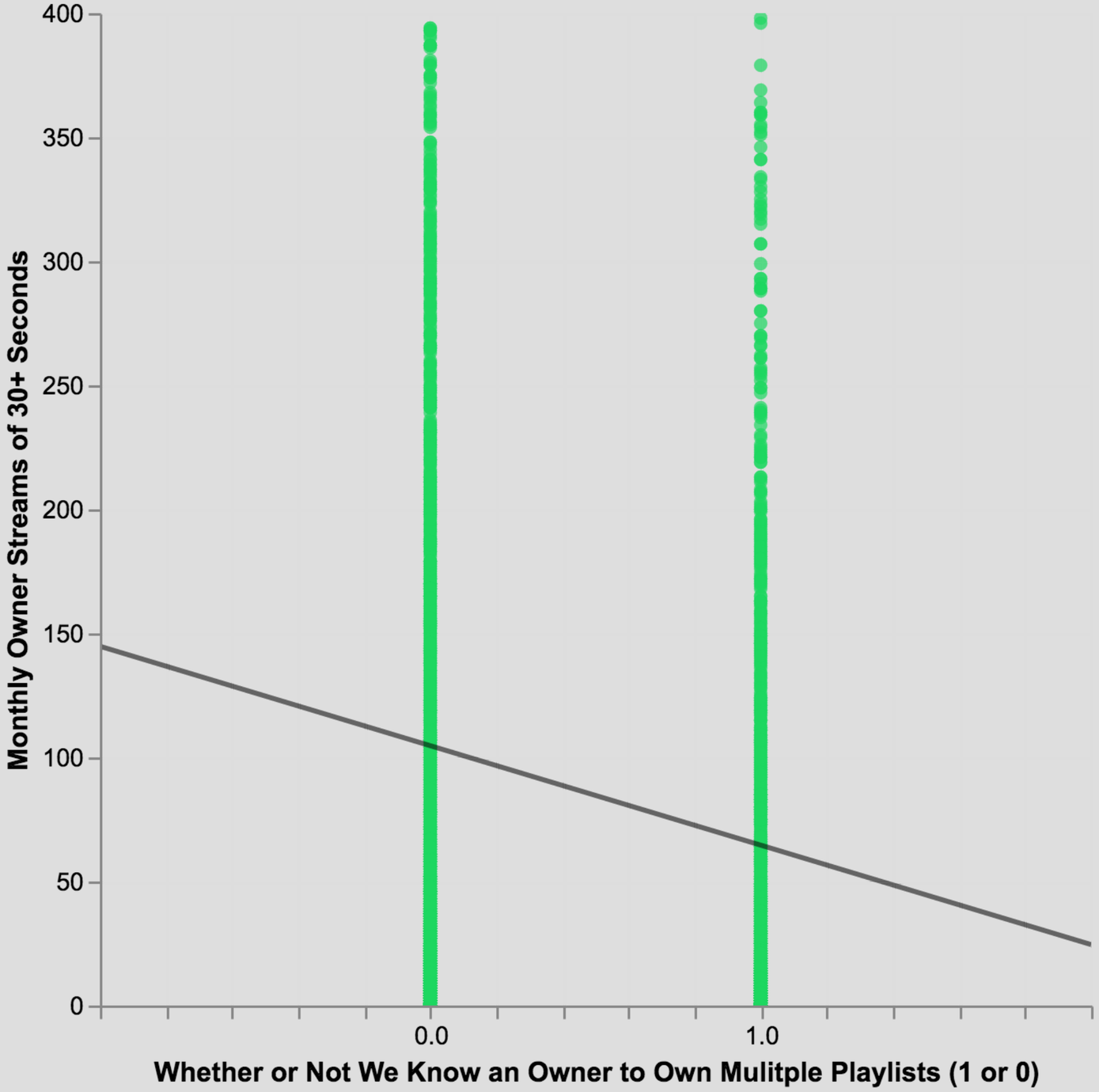
Sometimes the data surprises you

Unpacking the token data took a lot of work. But I figured it was worth it. Why? I thought the more 'effort' someone put into their playlist, maybe the longer its name would be, and then the more it'd get streamed. **Wrong**. The fewer the tokens, the more the streams!

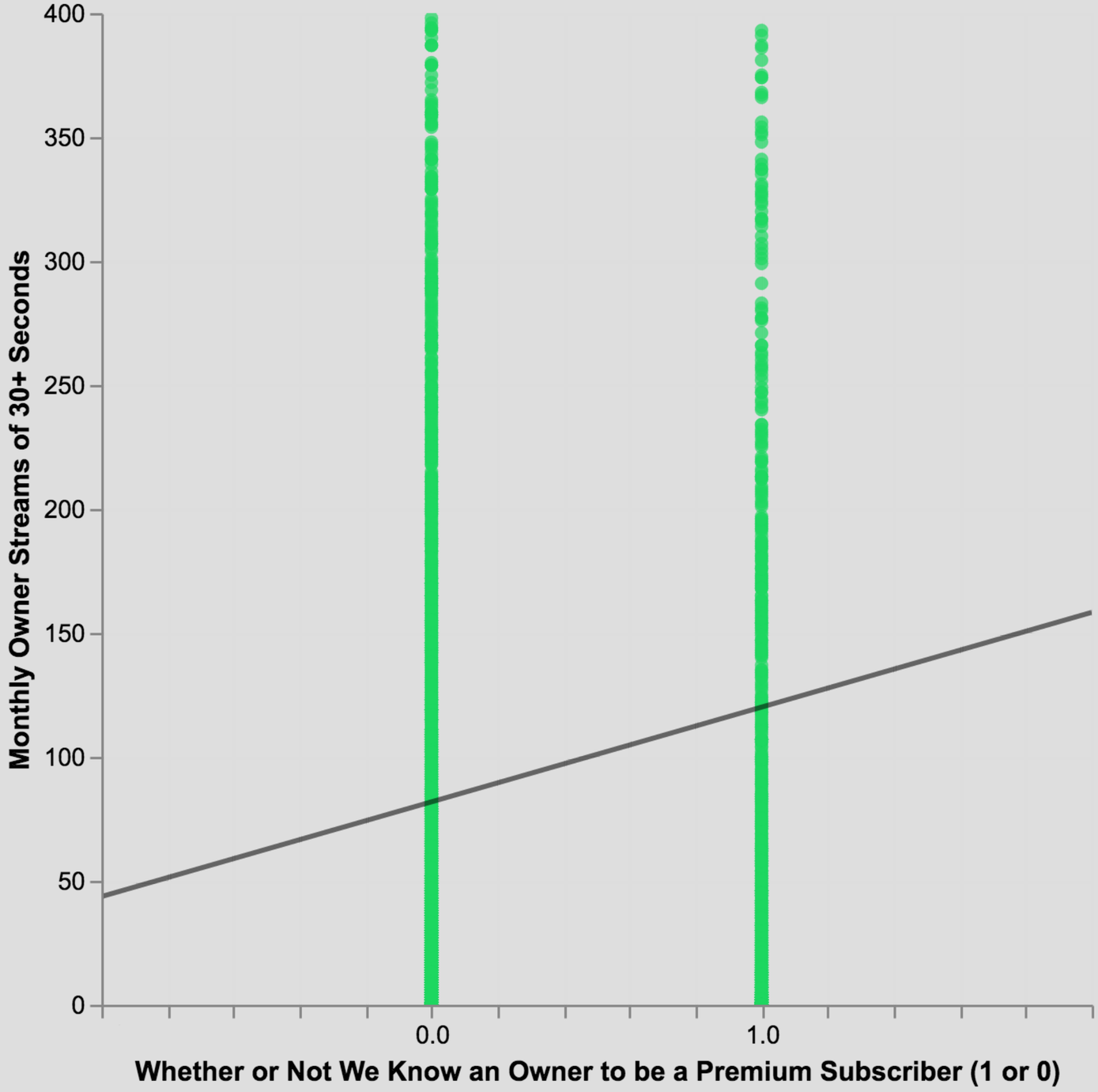


And still the data surprises you...

I thought the more playlists a user owned, the more engaged they would be on the platform, and the more times they would stream their playlists. **Wrong**. It looks like people who own just one or two playlists are more **focused** on them.



...Having more than one playlist was associated with fewer streams.



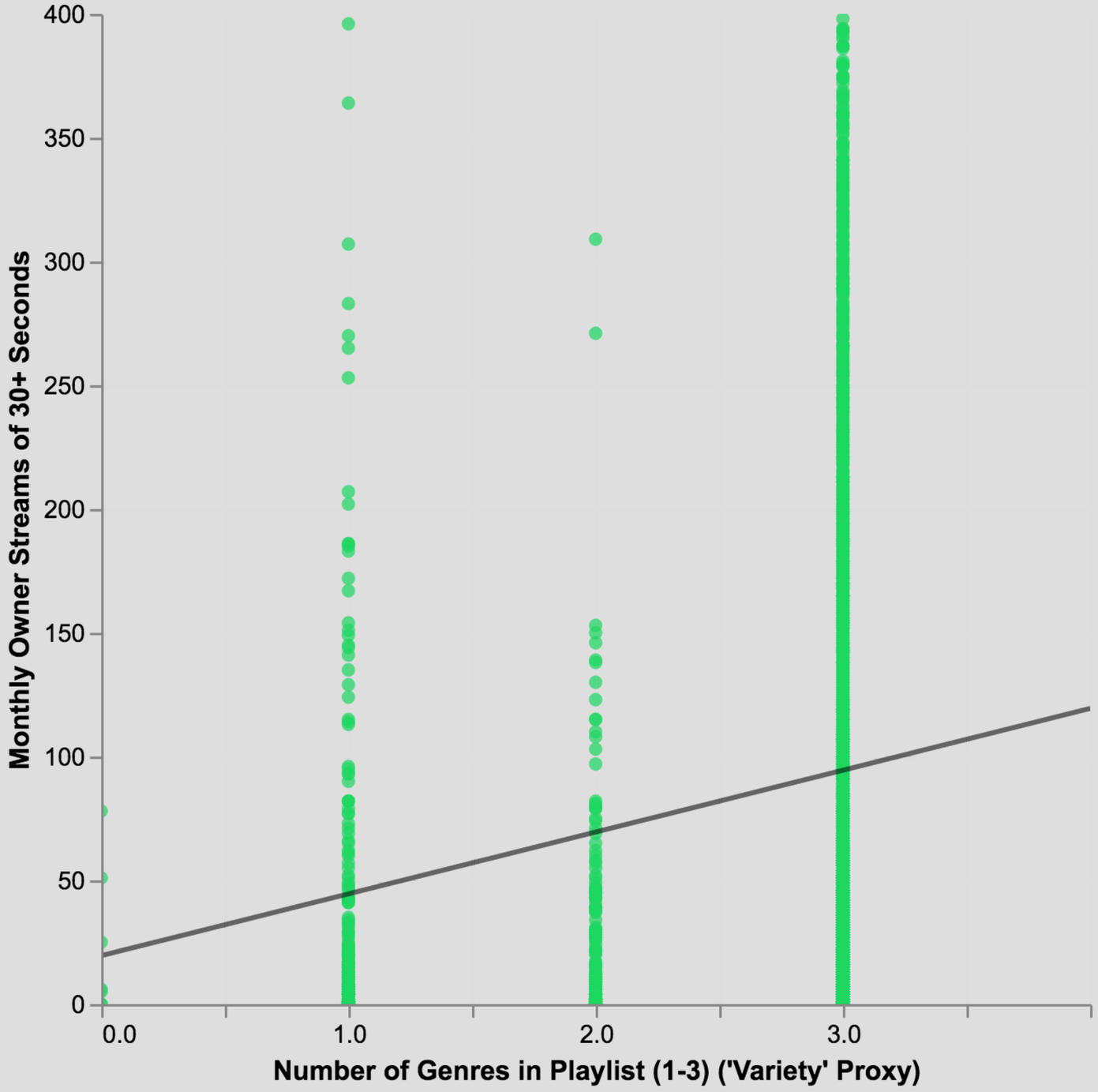
...But having Premium was associated with more streams.

According to Spotify's website, loading local tracks onto the platform is a Premium service. Thus, whenever a playlist had local tracks, I coded the owner as Premium. **Note**: a Premium user may also put zero local tracks in a playlist, so this list isn't exhaustive.

Idea 1: Intimacy. It's about you.

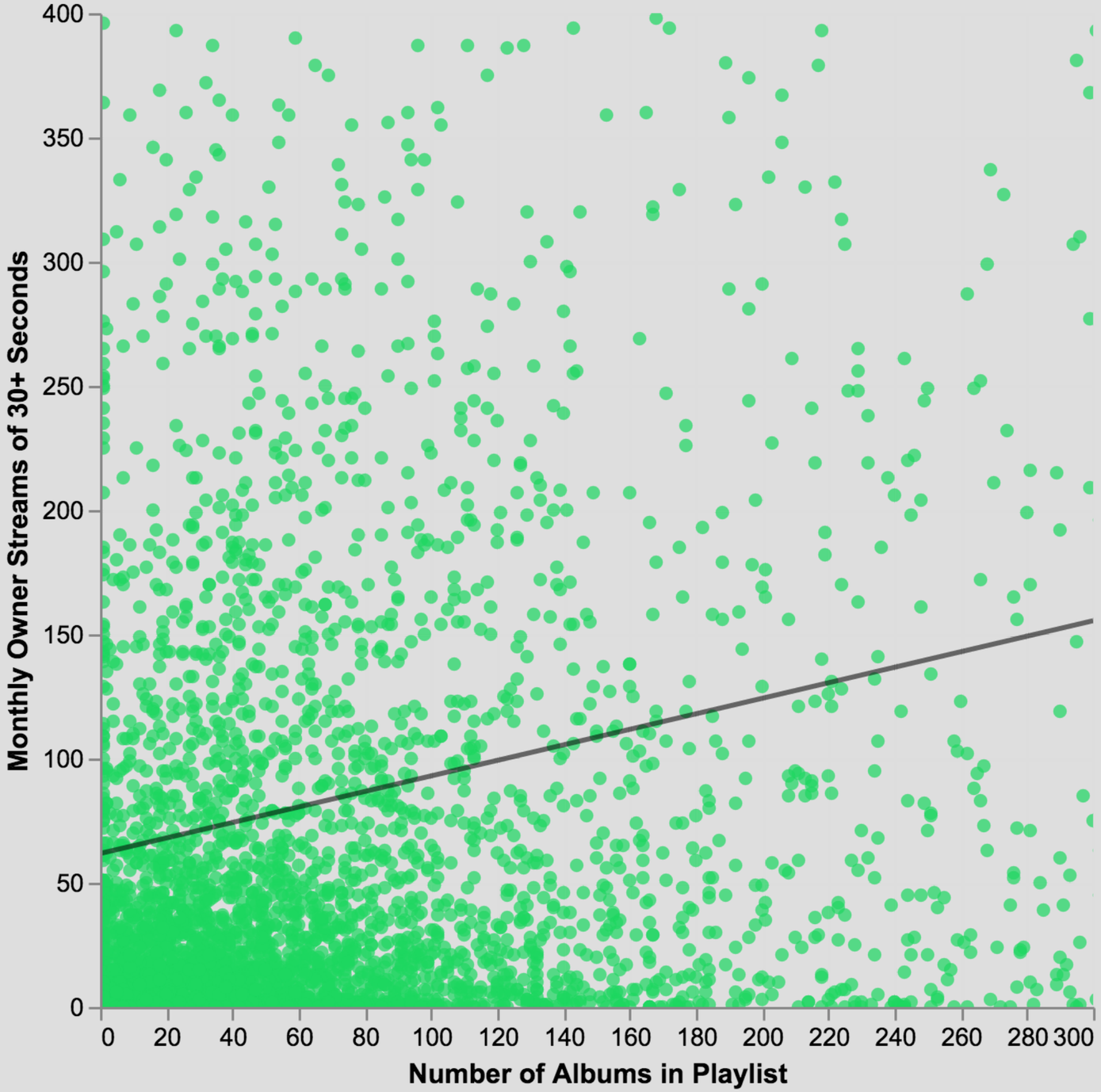
FOCUS, INTIMACY, AND PERSONALIZATION MAY BE KEYS TO HIGHLY-PLAYED USER-MADE PLAYLISTS.

THE MORE NARROWLY TAILORED THE PLAYLIST IS TO YOU, THE BETTER, EVEN IF THAT MEANS FEWER PEOPLE (OTHER THAN YOU) ARE STREAMING IT.



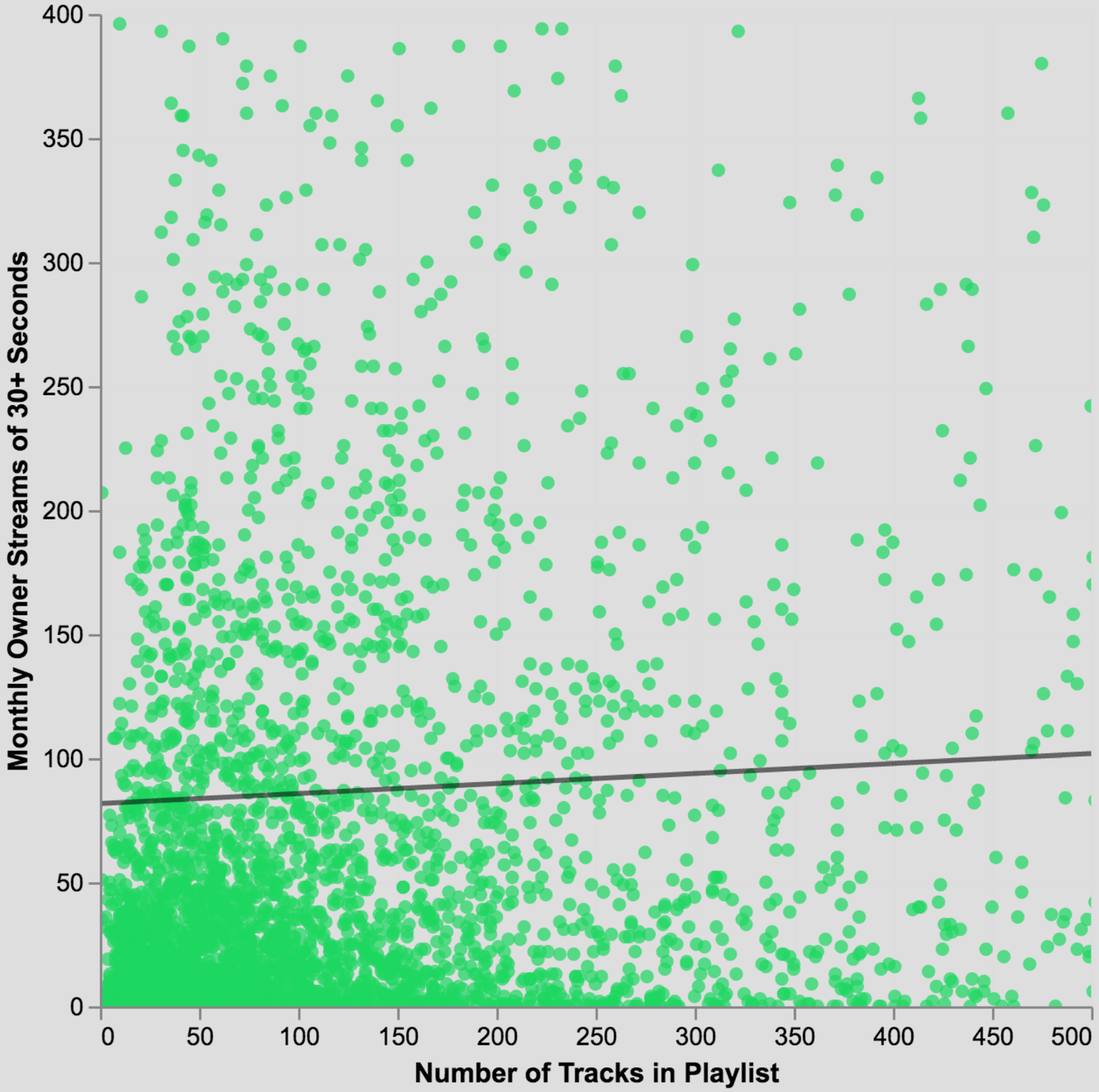
Variety is Important

Playlists with three different genres had more streams than playlists with just one.



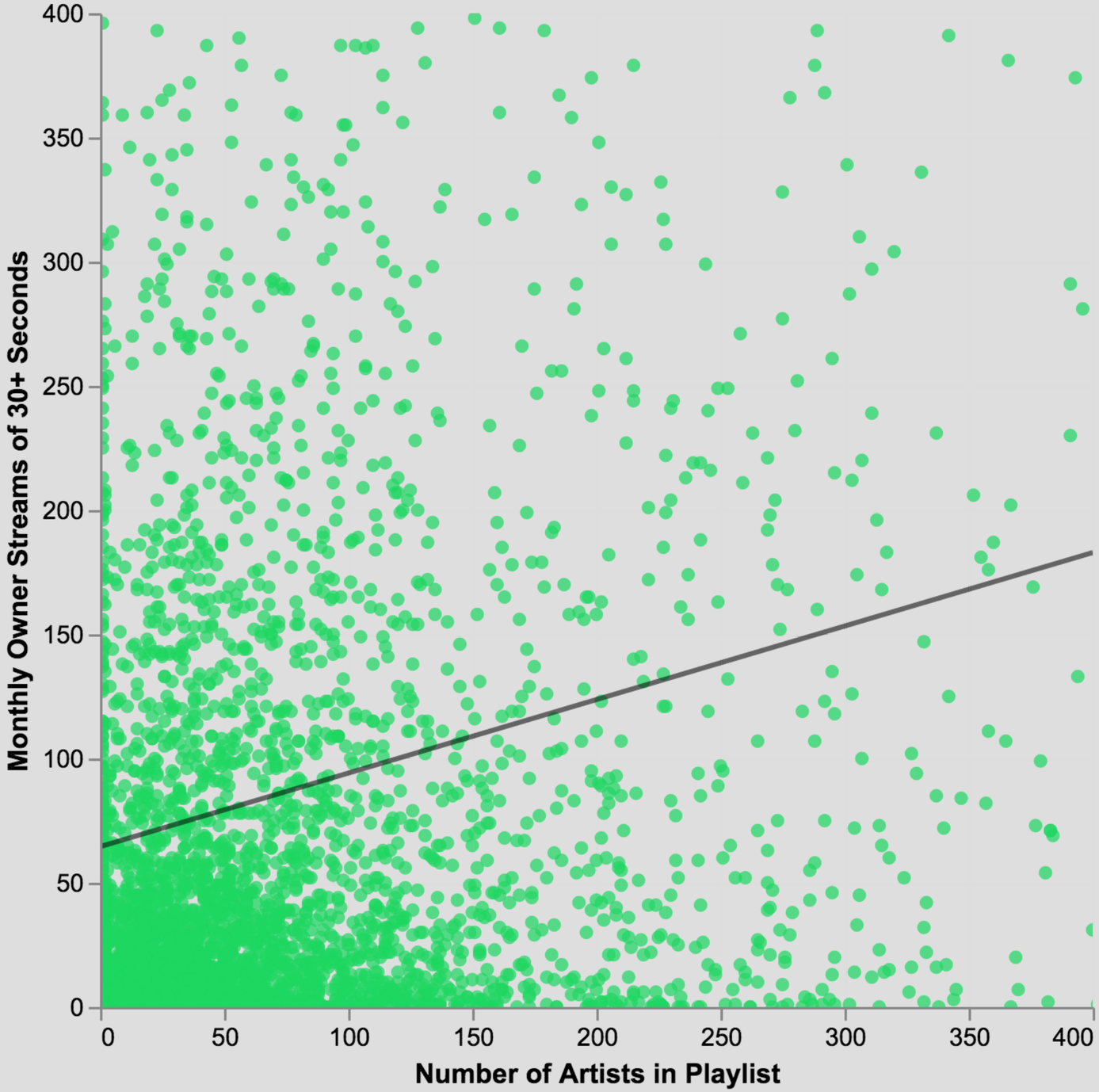
Variety is Important

The more albums in a playlist, the better.



...But number of tracks in a playlist does not seem to matter as much.

And this makes sense for our chosen dependent variable because each time a song is played for more than 30s it counts as a stream, even if it's the same song played on repeat.



It's variety that's key. The more artists, the better too.

Idea 2: Variety is key.

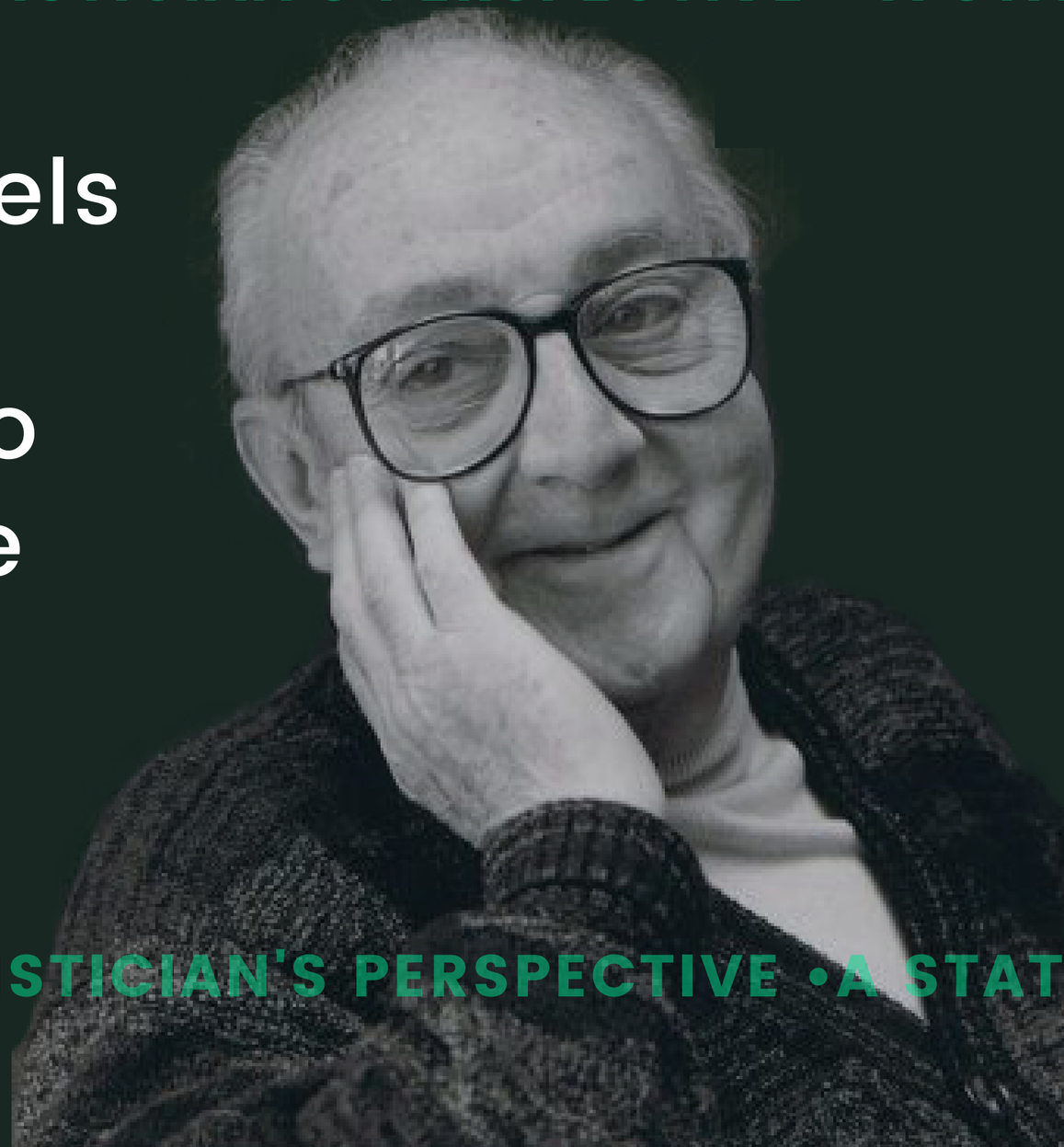
ALTHOUGH THEME AND GENRE ARE IMPORTANT, THIS MUST NOT COME AT THE EXPENSE OF PLAYLIST VARIETY. VARIETY BOLSTERS THE USER DISCOVERY PROCESS.

Modeling

A STATISTICIAN'S PERSPECTIVE • A STATISTICIAN'S PERSPECTIVE • A STA

"Remember that all models are wrong; the practical question is how wrong do they have to be to not be useful."

GEORGE E. P. BOX (1919-2013)



STATISTICIAN'S PERSPECTIVE • A STATISTICIAN'S PERSPECTIVE •A STAT

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        1       US      455     2       341     381     332     321     ["slaylist", "looking"] Pop     Rap     R&B     Defiant Excited Energizing
spotify:user:35eb3d66eb58ae6e4fd35bab46e5542e:playlist:1vhA7OenKQTwZOPPTij1gX   35eb3d66eb58ae6e4fd35bab46e5542e        18      13      1       2       2       2       2       4
        0       US      444     0       93      114     129     110     ["christian", "best"]   Religious       Rock    Pop     Empowering      Upbeat  Brooding
spotify:user:2ac357e58edb6da0f92ff7f693680104:playlist:5ofVnH33nxzyTZ68WZ9nUU   2ac357e58edb6da0f92ff7f693680104        9       9       1       1       2       1       1       2
        0       US      1726    0       632     699     933     930     ["lista", "mami"]       Latin   Pop     Dance & House   Excited Romantic        Lively
spotify:user:7dcbc955cefb93e082bc3905cad5c8a1:playlist:65EFmOjcCYfyeca1H3sVUH   7dcbc955cefb93e082bc3905cad5c8a1        68      64      2       2       2       1       1       2
        0       US      154     0       75      75      328     99      ["new"] Dance & House   Electronica     Pop     Excited Sensual Energizing
spotify:user:2b4069fcfac91052eb60c8ed0eded2fd:playlist:4FnHzHjyONFkbg798UhKgp   2b4069fcfac91052eb60c8ed0eded2fd        0       0       0       1       2       1       1       2
        0       US      19      0       18      18      15      1       ["soda", "pop", "summer"]       Pop     Dance & House   Electronica     Defiant Excited Urgent
spotify:user:105fe547c61aa8f9d3831dbbf0103992:playlist:15s2Hjp1gGrWbQcmMRnZS5   105fe547c61aa8f9d3831dbbf0103992        0       0       0       1       3       2       1       9
        0       US      79      0       2       4       11      6       ["night", "sax", "music"]       Jazz    Rock    Traditional     Romantic        Empowering      Melancholy
spotify:user:29ee8e37b23c6209d07e4186f79e62f3:playlist:3RRpMk6upNjCyF7aGip8lT   29ee8e37b23c6209d07e4186f79e62f3        0       0       0       0       2       1       0       3
        0       US      268     0       7       11      16      0       ["ottmar", "liebert", "collection"]     Traditional     New Age -       Melancholy      Sensual Fiery
spotify:user:400e06c9a9898115013a895ab04f92ca:playlist:5fyuKwejya1d7xohj4hM2F   400e06c9a9898115013a895ab04f92ca        0       0       0       1       2       1       1       2
        0       US      128     0       46      46      235     234     ["music"]       Pop     Indie Rock      Rock    Gritty  Empowering      Melancholy
spotify:user:6d01fc6bf88c2a2854b59267c4f8f88d:playlist:4tt2LqgrKDzdj7KNqbLdqS   6d01fc6bf88c2a2854b59267c4f8f88d        0       0       0       1       2       2       2       2
        0       US      183     0       152     161     72      50      []      Electronica     Indie Rock      R&B     Excited Yearning        Defiant
spotify:user:b93fbd3c8c8dd61f6aee58db5ef6114d:playlist:5QnmGbt6bM50AWO97LQY57   b93fbd3c8c8dd61f6aee58db5ef6114d        8       4       1       2       5       4       3       5
        0       US      330     1       258     270     74      1       ["zoned"]       Latin   Dance & House   Pop     Excited Energizing      Lively
spotify:user:be98b3e1dc68d33b1d19f99b2c49d2c8:playlist:7mgw19ra8MT7ryUosbJOKx   be98b3e1dc68d33b1d19f99b2c49d2c8        5       5       1       2       4       5       1       12
        0       US      9       0       1       1       20      1       ["empire", "sun", "walking", "dream"]   Electronica     Alternative     -       Urgent  Excited Brooding
spotify:user:268f3524d209485667e3ab43ac27c29e:playlist:6jQYogkmD5VwE04fNM0W7w   268f3524d209485667e3ab43ac27c29e        0       0       0       1       2       1       1       2
        0       US      70      0       44      51      67      52      ["country", "music"]    Country & Folk  Pop     Spoken & Audio  Empowering      Upbeat  Yearning
spotify:user:63aaea00df3ca978e92761292a2eaa90:playlist:5XH0WG5KEOZxtATzewUaWg   63aaea00df3ca978e92761292a2eaa90        0       0       0       2       3       3       1       7
        0       US      66      0       1       5       78      1       ["steve", "pettit", "evangelistic", "team", "high", "price"]    Religious       -       -       Romantic
        Empowering      Sophisticated
spotify:user:4386d0317126baad62457b43bff3e500:playlist:3TR37MZYlGp7tp5aEiUH0h   4386d0317126baad62457b43bff3e500        15      3       1       2       2       1       1       2
        0       US      501     15      133     141     56      48      []      Indie Rock      Pop     Alternative     Yearning        Brooding        Empowering
spotify:user:64672b35946481aa3953fa492273718f:playlist:0KIQsi7z3Ghu1SAjPhJcvm   64672b35946481aa3953fa492273718f        1       1       1       2       4       4       2       7
        1       US      521     2       245     79      78      15      ["ragga", "jungle"]     Dance & House   Reggae  Electronica     Aggressive      Energizing      Excited
spotify:user:6234eea77f077d721bc8375bc2fe505e:playlist:4bPfPAonxfMaPBPRluDo4V   6234eea77f077d721bc8375bc2fe505e        0       0       0       2       5       3       1       7
        0       US      76      0       47      60      157     68      ["viejitas", "bonitas"] Latin   Jazz    Traditional     Sophisticated   Romantic        Tender
spotify:user:9f472ecbc51af7e92e3efd23ac1d11ce:playlist:6Pmu2P102HWmg8zCB1BPZ9   9f472ecbc51af7e92e3efd23ac1d11ce        0       0       0       1       2       1       1       2
        0       US      31      0       2       7       17      8       ["van", "halen"]        Rock    -       -       Defiant Rowdy   Excited
spotify:user:78a6655af797a286b32d6fb67584ba00:playlist:6DICLM6DYotMGeUmJqIulf   78a6655af797a286b32d6fb67584ba00        0       0       0       1       2       2       1       2
        0       US      503     7       353     386     20      1       ["top", "songs"]        Rap     R&B     Alternative     Cool    Sensual Defiant
spotify:user:631e3296e38597c66cdaeea6488becd7:playlist:1FQCFlBHSWPuYOCXdNKAoH   631e3296e38597c66cdaeea6488becd7        0       0       0       0       2       2       1       4
        0       US      78      0       59      67      25      11      ["abby"]        Indie Rock      Rock    Pop     Empowering      Yearning        Brooding
spotify:user:920995a70302b6ae67c65065cf855764:playlist:4J0FXDR0DXVujDQ3YakyJc   920995a70302b6ae67c65065cf855764        0       0       0       3       12      6       0       20
        0       US      14      0       1       1       208     68      ["miles", "davis", "sketches", "spain"] Jazz    -       -       Sentimental     Tender  Sophisticated
spotify:user:61b3c743795a4f3e0f6c8896b2cdaf55:playlist:14QOucvnz6BDLcT7WsvI77   61b3c743795a4f3e0f6c8896b2cdaf55        5       3       1       1       2       1       1       2
        0       US      387     3       86      101     181     165     ["mah", "faves"]        Indie Rock      Alternative     Pop     Yearning        Defiant Empowering
spotify:user:0c39bfe9cd637f54001b91455ddc9727:playlist:4KXYr7LK0eY6C4Pjz6h4pp   0c39bfe9cd637f54001b91455ddc9727        0       0       0       1       2       1       1       2
        0       US      58      0       23      39      126     109     ["jesus"]       Religious       Pop     Children's      Empowering      Upbeat  Yearning
spotify:user:4ed73df8f60ddf6f9fd3f7feb1c412d3:playlist:1QW8VQ49ibbdwBEKYQbnBp   4ed73df8f60ddf6f9fd3f7feb1c412d3        12      6       1       1       2       2       1       3
        0       US      73      0       59      68      80      4       ["classic", "rock"]     Rock    Alternative     Country & Folk  Upbeat  Empowering      Rowdy
spotify:user:43ec110e5340b84f51bfe1b1c6238dc9:playlist:5QdYjbky6Rclfn2ZDH1McJ   43ec110e5340b84f51bfe1b1c6238dc9        12      10      1       2       12      14      1       30
        1       US      14      0       1       1       212     19      ["danger", "doom", "mouse", "mask"]     Rap     -       -       Cool    Defiant Yearning
spotify:user:4caaecbffb7be674fa8446923b55c8a3:playlist:7LPYpGmu75IjW6cODgQ04g   4caaecbffb7be674fa8446923b55c8a3        0       0       0       1       5       8       4       10
        0       US      40      1       39      36      23      0       ["list"]        Dance & House   Electronica     Alternative     Excited Sensual Defiant
spotify:user:270ebca4873a87ddc99e7aeda8a47344:playlist:1YzPf50CqHSOBAL92EPC6c   270ebca4873a87ddc99e7aeda8a47344        0       0       0       0       2       1       0       2
        0       US      9       0       1       1       17      0       ["oliver", "swain", "big", "machine"]   Country & Folk  -       -       Serious Lively  Sophisticated
spotify:user:283fdcc361db98115ea4632404c1563a:playlist:2kJnXLwMu1OvmiKZSxeQdG   283fdcc361db98115ea4632404c1563a        0       0       0       0       2       2       1       4
        0       US      108     0       104     104     44      9       ["mix"] Dance & House   Latin   Pop     Excited Energizing      Lively
spotify:user:b50af0f4de752c5b0988829cd3a929b7:playlist:3WdZ8U6Tknr3rqfQncxQPN   b50af0f4de752c5b0988829cd3a929b7        3       1       1       1       2       1       1       3
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spotify:user:802a1822061867264338ccd41ff1879a:playlist:2DznPfLAiO1MoImUm2OD6K   802a1822061867264338ccd41ff1879a        0       0       0       0       2       1       1       2
        0       US      20      0       1       1       112     102     ["mats", "set"] Indie Rock      Alternative     Punk    Empowering      Brooding        Excited
spotify:user:e4c972e67463b71a1c652c59eb540175:playlist:23ddSW0maa3yssjfvO6ZXm   e4c972e67463b71a1c652c59eb540175        0       0       0       1       2       2       1       2
        0       US      99      5       77      78      83      3       ["ready", "store"]      Alternative     Pop     Indie Rock      Excited Yearning        Defiant
spotify:user:0f6cc1667441f36ca6865aef96dbd86d:playlist:4frAvwFh7REOHRcDgFfqcV   0f6cc1667441f36ca6865aef96dbd86d        1       1       1       1       2       2       1       2
        0       US      165     0       122     104     627     96      ["stoph"]       Dance & House   Electronica     Pop     Excited Energizing      Aggressive
spotify:user:dfc70a2ffa4bf21160c60325896cb6dd:playlist:0KZCgk60R0Mvb22yo2IPGa   dfc70a2ffa4bf21160c60325896cb6dd        80      30      1       2       2       1       1       2
        0       US      170     5       129     136     147     119     ["faves"]       Pop     Country & Folk  Indie Rock      Yearning        Empowering      Upbeat
spotify:user:609bd4fa14fdbcc70860f28fd5375503:playlist:5A5MCzO3ujH0WKIblHT39O   609bd4fa14fdbcc70860f28fd5375503        1       1       1       1       2       1       1       2
        0       US      52      1       24      37      67      46      ["worship"]     Religious       -       -       Upbeat  Yearning        Brooding
spotify:user:687f748f1ca42b1b17f7b3c957e0ee2b:playlist:72b6MFdqhvfMrB5N2oKpUM   687f748f1ca42b1b17f7b3c957e0ee2b        0       0       0       3       5       1       1       6
        0       US      145     0       80      110     36      26      ["put", "gun"]  Alternative     Metal   Rock    Urgent  Defiant Empowering
spotify:user:655b9f704eef3d04364a36f2ea753da4:playlist:4bl1Niom6mVdmiJeC5Cj6H   655b9f704eef3d04364a36f2ea753da4        9       7       1       1       2       2       1       3
        0       US      36      0       33      34      83      11      ["partyharty"]  Dance & House   Electronica     Pop     Excited Aggressive      Urgent
spotify:user:a3a064354f8d56f877c568c16790efa1:playlist:1zuOeDI8TPBbJERxPEYs3Z   a3a064354f8d56f877c568c16790efa1        2       2       1       1       2       0       0       2
        0       US      26      0       26      23      50      37      ["country"]     Country & Folk  Spoken & Audio  Pop     Upbeat  Yearning        Empowering
spotify:user:63cc244851c0ad1946bcf09afca5f04d:playlist:7up1zLfeQqVlsZmTDB7icb   63cc244851c0ad1946bcf09afca5f04d        0       0       0       1       2       2       2       2
        0       US      711     0       367     365     80      22      ["edm"] Dance & House   Electronica     Pop     Excited Aggressive      Energizing
spotify:user:5efff606ce5c339de913d708ee874ed1:playlist:75PB7rW1Er7mf3croqjO8T   5efff606ce5c339de913d708ee874ed1        9       6       1       1       2       2       1       5
        0       US      62      0       1       1       128     126     ["south"]       Rap     R&B     Pop     Defiant Cool    Energizing
spotify:user:09219433e162d6573d773b6113a09bc6:playlist:3CBjPICQKRNICpII8hhNIa   09219433e162d6573d773b6113a09bc6        0       0       0       2       3       1       1       3
        0       US      43      1       38      39      29      3       ["pizza", "party"]      Indie Rock      Dance & House   Electronica     Excited Yearning        Sensual
spotify:user:1a0fba3ec5c398bc526dd97425a770ee:playlist:4Tk2TLeNj82hkV8yhQ19do   1a0fba3ec5c398bc526dd97425a770ee        0       0       0       3       10      9       4       15
        0       US      39      0       1       1       336     71      ["uber", "boston", "september", "jams", "deux"] Rap     Indie Rock      Dance & House   Sensual Excited
Defiant
spotify:user:00aeb7fa582dbdc9664328fbb98be674:playlist:0grCzNDQyqdq0jcx08Tab4   00aeb7fa582dbdc9664328fbb98be674        0       0       0       1       3       1       1       3
        0       US      93      0       71      76      21      3       ["feeling", "nostalgic", "introspective"]       Indie Rock      Rock    Alternative     Yearning
Empowering      Upbeat
spotify:user:24df087b3597d6319837162564e03e92:playlist:1QbFZTay5sNWqNY1BerhE4   24df087b3597d6319837162564e03e92        65      55      1       1       4       2       1       11
        0       US      331     0       33      41      482     477     ["super", "mega", "puntastic", "mix", "heroicness"]     Soundtrack      Metal   Pop     Urgent  Defiant
Aggressive
spotify:user:5b8dd31ce1f4a04fc657155543e13931:playlist:1FDsNe4BTTmD0BNp2JbPe2   5b8dd31ce1f4a04fc657155543e13931        0       0       0       1       2       1       1       2
        0       US      17      0       16      17      25      0       ["neverback"]   Alternative     Metal   Punk    Defiant Urgent  Brooding
spotify:user:cbd243dc1e5c933313f3bbffdde3e77b:playlist:1cXT82UHuDoXbdrxfCg5pz   cbd243dc1e5c933313f3bbffdde3e77b        19      19      1       2       6       2       2       9
        0       US      110     0       1       11      74      51      ["oscar", "hijos"]      Latin   -       -       Lively  Fiery   Cool
spotify:user:020f8460253e2f04f9360bbb0f381c1e:playlist:3nXBOwbEjY6AaQhwwTBp7v   020f8460253e2f04f9360bbb0f381c1e        0       0       0       1       2       1       1       2
        0       US      122     1       81      90      67      63      ["sexy", "time"]        Alternative     Indie Rock      Rock    Defiant Empowering      Urgent
spotify:user:7b28826e7cdfcfd8daaef5399a344959:playlist:5QWYAANVqlQKd5Fva27Wkv   7b28826e7cdfcfd8daaef5399a344959        140     139     1       1       4       2       1       6
        0       US      4692    58      1274    337     3938    3919    ["jazz"]        Jazz    Easy Listening  Religious       Sophisticated   Sentimental     Romantic
spotify:user:7a3803aacfefd8d0800dfba2fde93c28:playlist:4xejf873EMKXyPpznIPvIx   7a3803aacfefd8d0800dfba2fde93c28        21      21      1       1       3       2       0       6
        0       US      54      1       2       6       23      0       ["sueno", "morfeo"]     Latin   -       -       Empowering      Yearning        Upbeat
spotify:user:f3b4bb4e8644cf237be5ad76e0f80f35:playlist:4DckmrBp93Y46ncWoUMG9Y   f3b4bb4e8644cf237be5ad76e0f80f35        165     132     10      72      242     90      15      384
        5       US      28      0       5       10      3372    382     ["ptx"] Pop     -       -       Defiant Excited Sensual
spotify:user:a7c1f9efe845053f0ec4a38e6c2f0a2b:playlist:4NGdNJUThL0rkfnaSxjAwz   a7c1f9efe845053f0ec4a38e6c2f0a2b        0       0       0       1       3       2       2       4
        0       US      25      1       6       12      60      33      ["taeyang", "rise"]     Pop     Rap     -       Sophisticated   Empowering      Romantic
spotify:user:c57fd0d8c32e980d13dbb45c2e78734c:playlist:5ZwkPLOAxYInzTqkQCGcBv   c57fd0d8c32e980d13dbb45c2e78734c        0       0       0       0       2       1       1       3
        0       US      33      3       25      28      11      4       ["dinner", "prty"]      Indie Rock      Rock    Alternative     Excited Yearning        Brooding
spotify:user:57549cd84362d16d228d20cd6bd13a98:playlist:6XErc7dzXqBnkgEujrxyOb   57549cd84362d16d228d20cd6bd13a98        3       3       1       2       3       2       2       3
        0       US      1207    1       212     312     508     119     []      Punk    Metal   Rock    Defiant Urgent  Aggressive
spotify:user:27ec4250b09ea3b86c033441a40d2cdf:playlist:1R0WFRUd3OHDMAtbvKhOBr   27ec4250b09ea3b86c033441a40d2cdf        2       2       1       1       2       1       1       2
        1       US      311     0       242     184     257     229     []      R&B     Rap     Pop     Sensual Defiant Energizing
spotify:user:33a6125a106ef18a4e68ab50aafcdc59:playlist:2N0NHyYFRkeWtZKNb3oLBK   33a6125a106ef18a4e68ab50aafcdc59        4       2       1       1       2       2       2       2
        0       US      79      0       74      77      76      54      ["reception", "mingle"] Pop     Rock    Indie Rock      Yearning        Easygoing       Gritty
spotify:user:dc479d9be932911f7cee318bfa18cdb2:playlist:6eHtLEtxAeXlTxueSancCT   dc479d9be932911f7cee318bfa18cdb2        0       0       0       1       2       2       1       3
        0       US      1091    0       783     828     438     415     ["morning", "playlist"] Pop     Dance & House   Alternative     Excited Energizing      Defiant
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spotify:user:c04367d85e2d85003de9be2c1b5cf00b:playlist:3YwC4p5Ed528zy5PchBvlf   c04367d85e2d85003de9be2c1b5cf00b        0       0       0       1       2       1       1       2
        0       US      85      0       72      69      125     113     ["classical", "classics"]       Classical       Soundtrack      Pop     Tender  Peaceful        Stirring
spotify:user:63f30f0682a27dba7751c53c937caa90:playlist:5V0iulVs1nqhBXqkkcHKnP   63f30f0682a27dba7751c53c937caa90        1       0       0       3       3       2       2       3
        1       US      43      1       39      39      96      9       ["breakers"]    Indie Rock      Alternative     Rock    Yearning        Brooding        Melancholy
spotify:user:41069cc8999f842d4914757e9309ab03:playlist:2g3ZnnC4518wZirsbvjBI3   41069cc8999f842d4914757e9309ab03        3       3       1       4       13      13      3       27
        0       US      39      0       31      33      303     65      ["smooth", "sexy", "salsa"]     Latin   Pop     Jazz    Lively  Fiery   Romantic
spotify:user:d052537038ec6890906d2b011f38c4f5:playlist:5lJWE5aaydEr5tRgsqeZWc   d052537038ec6890906d2b011f38c4f5        13      11      1       1       2       2       1       3
        1       US      54      7       43      34      127     55      ["love", "keeps", "lifting"]    Rap     R&B     Indie Rock      Defiant Sensual Cool
spotify:user:a9af1290c53595cabba4d6713eea5df5:playlist:5dG7celtJOa9HVGpXMOZ81   a9af1290c53595cabba4d6713eea5df5        0       0       0       1       2       1       1       2
        0       US      84      0       9       13      68      45      ["folk"]        Rock    Country & Folk  -       Empowering      Gritty  Yearning
spotify:user:a3593d01625fed5ecfeeb42bd902688a:playlist:00CxDCtLKKH2XeafWNkMfI   a3593d01625fed5ecfeeb42bd902688a        0       0       0       1       2       1       1       2
        0       US      60      0       38      28      153     146     ["tigers", "norte"]     Latin   -       -       Lively  Cool    Romantic
spotify:user:260fa315fd42a5b4ea6c96a5e6ee4f21:playlist:0BYZbQB6sgVG7ZrUniY88D   260fa315fd42a5b4ea6c96a5e6ee4f21        0       0       0       1       2       0       0       2
        0       US      1800    0       128     199     93      87      ["study", "muzik", "haha"]      Indie Rock      Alternative     Rock    Brooding        Yearning
Melancholy
spotify:user:5757e5517ad867a31aac5b79d77bade1:playlist:1eJpIzrLUJthTHBoJvxjkm   5757e5517ad867a31aac5b79d77bade1        0       0       0       2       4       7       2       12
        0       US      208     0       122     120     46      33      ["country", "desert"]   Country & Folk  Rock    Pop     Upbeat  Yearning        Empowering
spotify:user:9488f2da65ae4194fb146a23ee9f9ad6:playlist:1YX2nOT6teAghj1I0mDA2J   9488f2da65ae4194fb146a23ee9f9ad6        5       2       1       2       2       2       1       3
        0       US      623     60      302     333     407     393     ["collection", "dope", "music"] Rap     Indie Rock      Alternative     Defiant Excited Cool
spotify:user:6d5a04eca32e0804f338627d09ddc027:playlist:46lBRWLJP0u4ZVHGC673Yp   6d5a04eca32e0804f338627d09ddc027        14      4       1       1       3       5       2       6
        0       US      242     1       160     180     89      63      ["summer", "forever"]   Alternative     Indie Rock      Electronica     Defiant Excited Urgent
spotify:user:ce72c4d76e5431d00a5113f68a69c4b2:playlist:5mXFvxGP8LFCspfnB2jedF   ce72c4d76e5431d00a5113f68a69c4b2        16      16      1       1       2       1       1       2
        0       US      14      0       14      14      65      39      []      Pop     Electronica     R&B     Brooding        Defiant Excited
spotify:user:bbe955cac1a86d81eb6290e85def7e3c:playlist:1XlJJah6ti5ifQaPgfo2jU   bbe955cac1a86d81eb6290e85def7e3c        0       0       0       0       2       1       1       2
        0       US      232     11      194     188     12      2       ["party"]       Dance & House   Electronica     Rap     Excited Aggressive      Energizing
spotify:user:45022317c2957f16e05228c15ca8e921:playlist:2Qnh29VuJ8r4oefNWCv9mo   45022317c2957f16e05228c15ca8e921        47      46      1       2       6       6       4       11
        1       US      90      0       71      77      1041    934     ["cry", "heart"]        Pop     Rock    Indie Rock      Yearning        Empowering      Sophisticated
spotify:user:f12d6f489c35c5510ed13dd0d4ca1540:playlist:2k3IZEO8sh50uaZ9yq0ui4   f12d6f489c35c5510ed13dd0d4ca1540        0       0       0       1       3       2       0       5
        0       US      47      0       45      44      30      0       ["twerk"]       Rap     Pop     Electronica     Defiant Energizing      Aggressive
spotify:user:ce53e4b60cce53320e37fa90177872d8:playlist:69VW6s7WEx4vwxiwpx4GMo   ce53e4b60cce53320e37fa90177872d8        4       4       1       1       2       0       0       2
        0       US      13      0       13      13      69      65      ["fall"]        Rock    Alternative     Country & Folk  Rowdy   Defiant Lively
spotify:user:2a5c0e4d31cbb88833eff22593cc3978:playlist:46lB52sNACmGjJUnYo3ZuG   2a5c0e4d31cbb88833eff22593cc3978        1       1       1       6       26      26      2       67
        1       US      37      0       28      29      231     0       ["young", "rich", "niggas"]     Rap     R&B     -       Defiant Cool    Sensual
spotify:user:c76a4b8b36a58dee5cb69bc75e8e03e4:playlist:7js1EPQLyFRWbBtXS2YQgf   c76a4b8b36a58dee5cb69bc75e8e03e4        0       0       0       0       2       2       1       3
        0       US      34      0       15      15      34      1       ["betta", "move"]       Electronica     Dance & House   Indie Rock      Excited Energizing      Aggressive
spotify:user:4328009308385bfc597106d1d4c32f31:playlist:1AMli4cjFOujs2tEGOlIo1   4328009308385bfc597106d1d4c32f31        0       0       0       1       2       1       1       2
        0       US      16      0       13      14      122     83      ["happy"]       Indie Rock      Alternative     Rock    Excited Yearning        Empowering
spotify:user:b5bd00f02b23cf2f02b3f893a168a2d0:playlist:3GJBTO1naXy4om2wJQesiM   b5bd00f02b23cf2f02b3f893a168a2d0        0       0       0       2       3       4       1       12
        0       US      153     0       96      117     226     217     ["birthday", "party"]   Rock    Metal   Alternative     Rowdy   Excited Urgent
spotify:user:28ddb607228dcb0e88eb33b5c145a709:playlist:66l4CeQpiKyrRXTBvC4Ev9   28ddb607228dcb0e88eb33b5c145a709        0       0       0       2       5       3       1       11
        0       US      14      0       13      13      47      22      ["new", "turkish"]      Pop     Rock    Traditional     Sophisticated   Brooding        Upbeat
spotify:user:2db8d7519f4c9a1b6b35f70ae70fe4fa:playlist:2BABAfZCTl2L1DxYRTDEng   2db8d7519f4c9a1b6b35f70ae70fe4fa        0       0       0       1       2       1       1       2
        0       US      15      0       15      15      32      27      ["yup"] Pop     Indie Rock      Rock    Empowering      Excited Easygoing
spotify:user:d5dcdbe3a4c0112e9dfe36ce2edf94f7:playlist:07YYyV2y31iIrxYx0DncLA   d5dcdbe3a4c0112e9dfe36ce2edf94f7        1       1       1       1       2       0       0       3
        0       US      28      0       28      28      7       4       ["bitch", "whiskey"]    Rap     Pop     Dance & House   Aggressive      Defiant Cool
spotify:user:2c8a1dce25265e13dedb901e3e74757e:playlist:2s5ciqyOS54YvlRhUtN6jE   2c8a1dce25265e13dedb901e3e74757e        15      7       1       1       2       2       1       6
        0       US      600     20      2       246     164     144     ["email", "music"]      Latin   Pop     Rap     Energizing      Defiant Excited
spotify:user:9eaf2af811849f4857817233af14ce6f:playlist:6VfGgG4sQ8wBNVJT6fng7W   9eaf2af811849f4857817233af14ce6f        1       1       1       2       4       5       1       9
        1       US      242     0       55      62      956     876     ["silent", "sleep"]     Alternative     Country & Folk  New Age Peaceful        Romantic        Somber
spotify:user:0e0cb01eb1fe758753fb966d5aaf8d7d:playlist:7KumgwGcvKv9pvJtc9deeN   0e0cb01eb1fe758753fb966d5aaf8d7d        2       1       1       2       5       4       1       14
        0       US      252     0       182     198     156     84      ["fairytale"]   Pop     Alternative     Rock    Yearning        Empowering      Upbeat
spotify:user:426e90e2bface02fc702036184afd3fa:playlist:0ECIakr8EittCMEjTSSK0A   426e90e2bface02fc702036184afd3fa        15      10      1       1       2       2       1       4
        0       US      339     0       92      85      224     221     ["girls", "songs"]      Pop     R&B     Children's      Empowering      Excited Yearning
spotify:user:bbc9b8176199e39f2b8fb72a36254a60:playlist:7173BpBFDZNbcBvf6ZtMls   bbc9b8176199e39f2b8fb72a36254a60        0       0       0       1       2       1       1       2
        0       US      100     0       20      20      65      3       ["ctf", "september"]    Indie Rock      Pop     New Age Urgent  Empowering      Energizing
```

1. READ IN THE DATA

In [ ]:
```
import pandas as pd
import numpy as np
```

In [ ]:
```
spotify = pd.read_csv("playlist_summary_external.txt", delimiter='\t')
```

In [ ]:
```
spotify.shape
```

Out[ ]:
```
(403366, 25)
```

In [ ]:
```
pd.set_option('display.max_columns', None)
spotify.head(9)
```

Out[ ]:

country	n_tracks	n_local_tracks	n_artists	n_albums	monthly_stream30s	monthly_owner_stream30s	tokens	genre_1	genre_2	genre_3	mood_1
US	52	0	4	7	30	27	["ambient", "music", "therapy", "binaural", "b...	Dance & House	New Age	Country & Folk	Peaceful
US	131	0	112	113	112	94	["good", "living"]	Pop	Indie Rock	Alternative	Excited
US	43	0	35	36	63	0	["norte\u00f1a"]	Latin	-	-	Lively
US	27	1	27	26	154	108	[]	Dance & House	Electronica	Pop	Excited
US	52	0	47	51	230	0	["cheesy", "pants"]	Indie Rock	Alternative	Electronica	Excited
US	8	1	7	7	73	44	["aids", "walk"]	Indie Rock	Alternative	Pop	Brooding
US	8	0	7	6	9	8	["classy"]	Classical	Soundtrack	Alternative	Tender
US	33	0	5	24	256	53	["iranian", "rap"]	Rap	Soundtrack	Rock	Excited

2. TOKEN COUNT (EFFORT PROXY)

FEATURE ENGINEERING EXAMPLE

In [ ]:
```
#length of tokens
token_count = []
for i in range(len(spotify.tokens)):
    length = len(spotify.tokens[i].split(","))
    token_count.append(length)
#this gives us a count of how many words (tokens) there are in a set with 1 being the lowest
#even an empyt list will be a 1
```

In [ ]:
```
token_count[:10]
```

Out[ ]:
```
[9, 2, 1, 1, 2, 2, 1, 2, 1, 2]
```

In [ ]:
```
spotify['token_count'] = token_count
```

3. GENRE COUNT (VARIETY PROXY)

FEATURE ENGINEERING EXAMPLE

In [ ]:
```
#now I am trying to count how many genres are listed in one playlist
genre_count = []
for i in range(len(spotify.genre_1)):
    row_genre_count = 3
    if spotify.genre_1[i] == '-':
        row_genre_count += -1
    if spotify.genre_2[i] == '-':
        row_genre_count += -1
    if spotify.genre_3[i] == '-':
        row_genre_count += -1
    genre_count.append(row_genre_count)
```

In [ ]:
```
genre_count[:11]
```

Out[ ]:
```
[3, 3, 1, 3, 3, 3, 3, 3, 3, 3, 1]
```

In [ ]:
```
spotify['genre_count'] = genre_count
```

4. OWNER PLAYLIST COUNT (ENGAGEMENT)

FEATURE ENGINEERING EXAMPLE

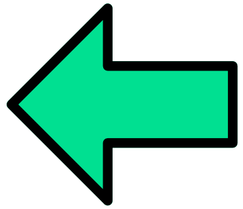
In [ ]:
```
owner_frequency = spotify['owner'].value_counts().to_dict()
```

In [ ]:
```
owner_frequency['47f677584fac29bc905cb4fe70c22c88'] #incredible!!!
#this is one of the times i've really seen pandas roar
```

Out[ ]:
```
3
```

In [ ]:
```
owner_frequency
```

Out[ ]:
```
{'spotify': 399,
 '6987037f34b5cee787a1a5e8de9b2689': 48,
 'a5add6d0d5fbebb01abb2fbe7e47208d': 47,
 'f54f32d1c706754a70f8392aa1dbad46': 44,
 '4a03268bef1505a49f8b3eced879f311': 43,
 '9ff1b837bb1262d44f2194549748385a': 40,
 '17d6159195b25d619e0eff98f809c90e': 40,
```



number of playlists owned by given user

In [ ]:
```
owner_playlist_count = []
for i in range(len(spotify.owner)):
    needed_string = spotify.owner[i]
    owner_playlist_count.append(owner_frequency[needed_string])
```

In [ ]:
```
owner_playlist_count[:20]
```

Out[ ]:
```
[2, 1, 2, 3, 1, 1, 3, 1, 1, 1, 1, 1, 4, 4, 2, 3, 1, 2, 1, 1]
```

In [ ]:
```
spotify['owner_playlist_count'] = owner_playlist_count
```

5. % OWNER STREAMS (INTIMACY PROXY)

FEATURE ENGINEERING EXAMPLE

In [ ]:
```
#monthly_owner_stream30s_to_monthly_stream30s_ratio
monthly_owner_stream30s_to_monthly_stream30s_ratio = []
for i in range(len(spotify.playlist_uri)):
    numerator = spotify.monthly_owner_stream30s[i]
    denominator = spotify.monthly_stream30s[i]
    ratio = numerator / denominator
    monthly_owner_stream30s_to_monthly_stream30s_ratio.append(ratio)
```

In [ ]:
```
spotify['monthly_owner_stream30s_to_monthly_stream30s_ratio'] =\
monthly_owner_stream30s_to_monthly_stream30s_ratio
```

6. SEPARATING USER-MADE FROM OFFICIAL SPOTIFY-MADE PLAYLISTS

In [ ]:
```
spotify_user_playlists = spotify[spotify.owner != 'spotify']
```

In [ ]:
```
spotify_official_playlists = spotify[spotify.owner == 'spotify']
```

In [ ]:
```
spotify_user_playlists.shape
```

Out[ ]:
```
(402967, 199)
```

In [ ]:
```
spotify_official_playlists.shape
```

Out[ ]:
```
(399, 199)
```

In [ ]:
```
spotify_user_playlists.to_csv("spotify_user_playlists.csv", index = False)
```

In [ ]:
```
spotify_official_playlists.to_csv("spotify_official_playlists.csv", index=False)
```

7. SENDING THEM TO SQL :)

```
In [ ]: spotify_official_playlists.to_sql(name='spotify_official_playlists', con=engine,\
                                        if_exists = 'replace', index=False)
```

```
In [ ]: #and now....the big one
```

```
In [ ]: spotify_user_playlists.to_sql(name='spotify_user_playlists', con=engine,\
                                        if_exists = 'replace', index=False, chunksize = 25000)
```

8. THIS IS HOW I READ SQL IN PYTHON!

In [ ]:
```
#this is where we are getting some info from the data set
df = pd.read_sql("""
select
playlist_sole_id as 'Playlist ID',
tokens as 'Tokens',
round(token_sentiment_score, 4) as 'Token Sentiment Score'
from sys.spotify_user_playlists2
order by 3 asc
limit 11;
""", con=db)
```

In [ ]:
```
df
```

Out[ ]:

	Playlist ID	Tokens	Token Sentiment Score
0	1awu4P3xtUYkkpkTn2H6fl	["boss", "ass", "bitch", "bitch", "bitch", "bi...	-0.9623
1	1v8iwl5ehBWHgTfpJHYu9f	["killer", "killed", "killer", "killed"]	-0.9618
2	5rnoJcL2ssx56EgOHlKxEs	["killer", "killed", "killer", "killed"]	-0.9618
3	5uFFoFd935fHpsjNyS0gjo	["punk", "punk", "goes", "black", "death", "he...	-0.9413
4	3eZxZLBMuncTetclqdFu17	["yung", "based", "boy", "shit", "feel", "homi...	-0.9403
5	561AfqMPTVuCcBLHf7GqQB	["fuck", "bad", "bad", "bitch"]	-0.9360
6	3ABdz7AF9UGsf0p6Is0RTQ	["dope", "ass", "trick", "ass", "sucka", "ass"...	-0.9360
7	3XYRrF0FdmbNYJzVZlB9ml	["hell", "yeah", "bitch", "go", "hard", "hell"...	-0.9217
8	7eSo6eg25wtRnMQeYmuMWr	["depressing", "ass", "depressed", "shit"]	-0.9186
9	6eXrG7eVailErqsyWyY3rU	["shit", "kill", "shit"]	-0.9169
10	4jyKtjc4TUEoY9tjCCg6sD	["kill", "people", "burn", "shit", "fuck", "sc...	-0.9153

9. SET UP THE DUMMY VARIABLES

SK-LEARN AUTOMAGICALLY HANDLES THE DUMMY VARIABLE TRAP

In [ ]:
```
spotify_dummies = pd.get_dummies(spotify[['genre_1', 'genre_2', 'genre_3', 'mood_1','mood_2','mood_3']])
```

In [ ]:
```
spotify_dummies.sample(4)
```

Out[ ]:

	genre_1_-	genre_1_Alternative	genre_1_Blues	genre_1_Children's	genre_1_Classical	genre_1_Country & Folk	genre_1_Dance & House	genre_1_Easy Listening	genre_1_Electroni
61563	0	0	0	0	0	0	0	0	
331772	0	0	0	0	0	1	0	0	
101341	0	1	0	0	0	0	0	0	
167513	0	0	0	0	0	0	0	0	

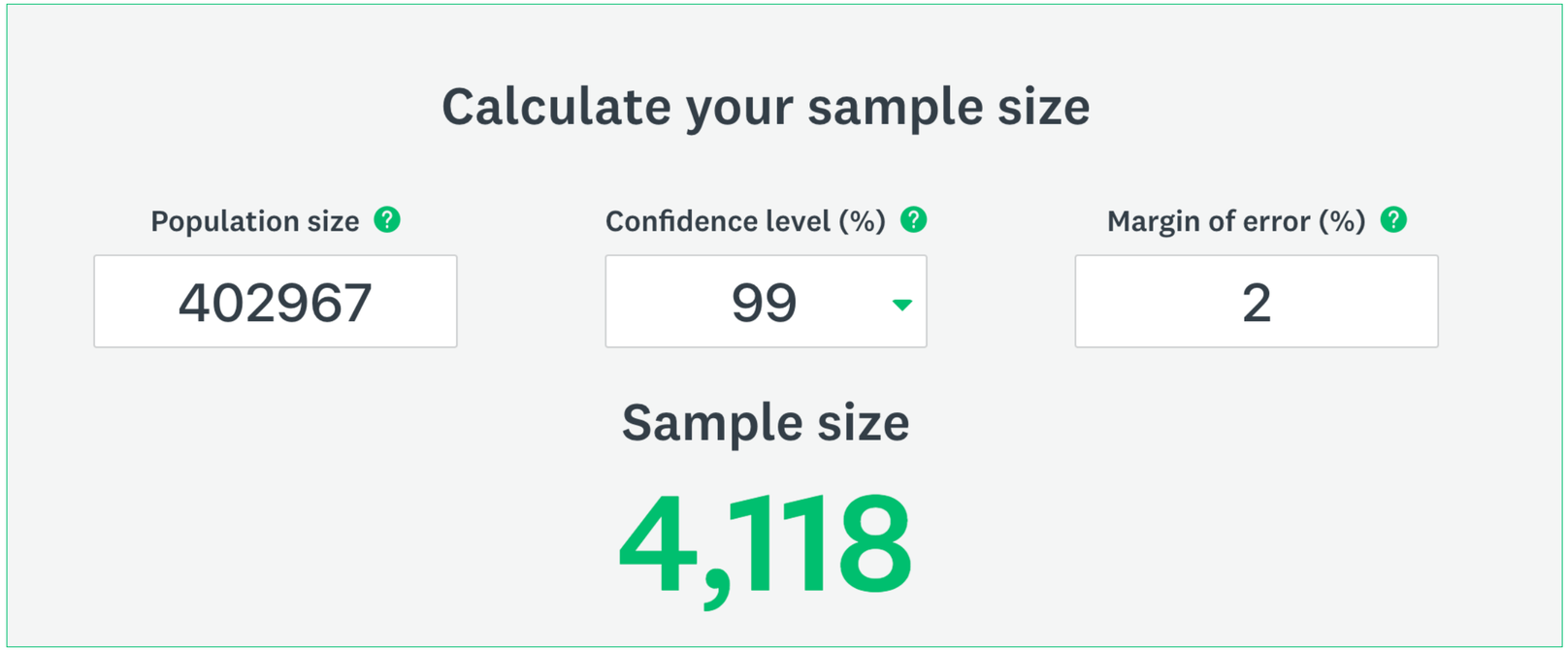
In [ ]:
```
#"Combine DataFrame objects horizontally along the x axis by passing in axis=1."
spotify = pd.concat([spotify,spotify_dummies], axis = 1)
```

In [ ]:
```
spotify.shape
```

Out[ ]:
```
(403366, 193)
```

10. SET UP POPULATION SAMPLE

WWW.SURVEYMONKEY.COM/MP/SAMPLE-SIZE-CALCULATOR/




```
In [ ]: spotify_lite = spotify.sample(4118).reset_index()

In [ ]: spotify_lite.shape

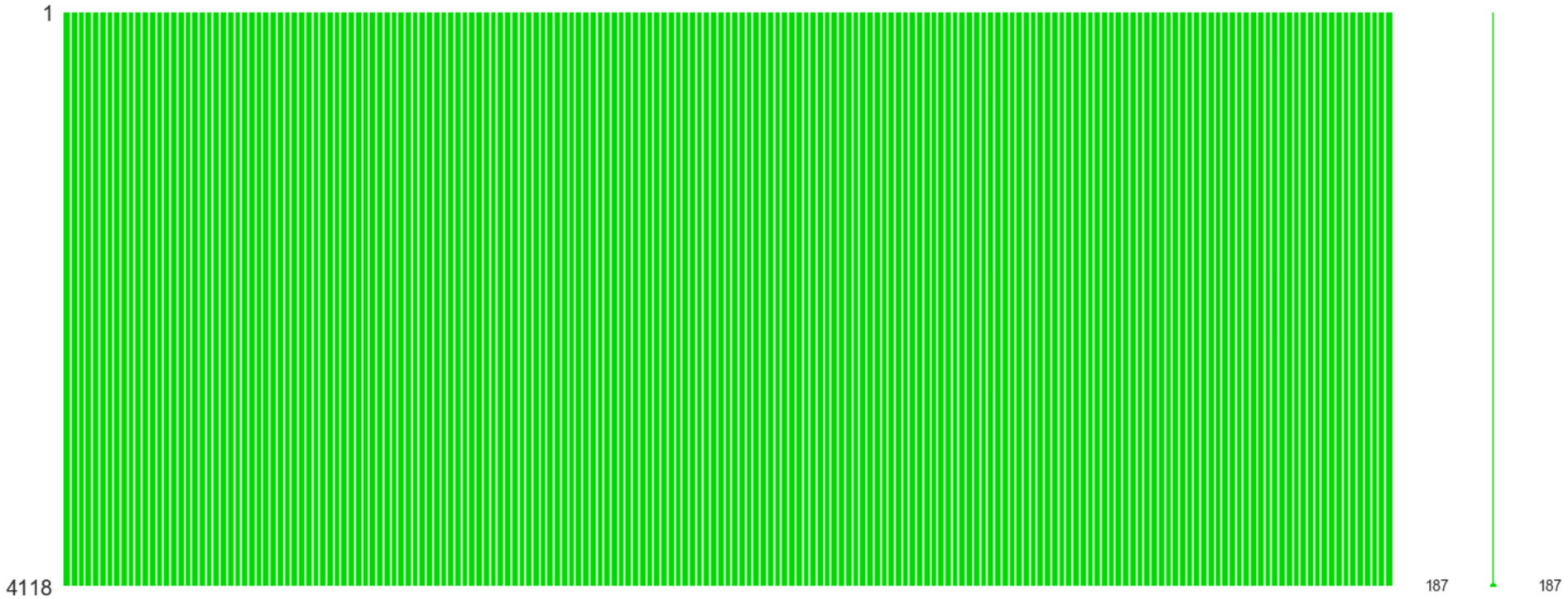
Out[ ]: (4118, 200)
```

11. CHECK SAMPLE FOR NULLS

In [ ]:
```
spotify_lite_numeric = spotify_lite.drop(columns = ['index','playlist_uri','owner',\
    'owner_country','tokens','genre_1','genre_2','genre_3','mood_1','mood_2',\
                            'mood_3','playlist_sole_id','stream30s_to_streams_ratio'])
#we need to also drop stream30s_to_streams_ratio b/c it has NaN's in it...
```

In [ ]:
```
#checking for completenesss
msno.matrix(spotify_lite_numeric, color = (.0,.85,.0))
```

Out[ ]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x1a1adb7470>
```



12. REMOVE OUTLIERS

In [ ]:
```
outlier_watch_cols = ['streams', 'stream30s','dau','wau','mau','mau_previous_month',\
                      'mau_both_months','users','skippers','n_tracks','n_local_tracks',\
                      'n_artists','n_albums','monthly_stream30s','monthly_owner_stream30s']
#the other columns are basically metrics based on these or things where it only goes from
#say 1 to 3 (as in the genre count one)
for i in range(len(outlier_watch_cols)):
    spotify_lite_numeric_no_outliers =\
    spotify_lite_numeric[np.abs(spotify_lite_numeric\
                                            [outlier_watch_cols[i]]-\
                    spotify_lite_numeric[outlier_watch_cols[i]].mean())\
       <= (2.17*spotify_lite_numeric[outlier_watch_cols[i]].std())]
    #2.17 covers basially 98.5% of all data under a normal distribution curve
    #just to 'feel out' the data, I want to take out the top 1.5# of numbers
```

In [ ]:
```
spotify_lite_numeric_no_outliers.shape
```

Out[ ]:
```
(4014, 187)
```

In [ ]:
```
#just a little intermediary check for completeness
temp_spotify_lite_numeric_no_outliers_no_na = spotify_lite_numeric_no_outliers.dropna()
temp_spotify_lite_numeric_no_outliers_no_na.shape
```

Out[ ]:
```
(4014, 187)
```

13. SPLIT FEATURES & INDEPENDENT VAR.

THIS IS FOR INITIAL EXPLORATION BEFORE TRAIN/TEST SPLIT

In [ ]:
```
#the independent variables (features):
features = spotify_lite_numeric_no_outliers.drop(columns = ['monthly_owner_stream30s'])
#the dependent variable (y):
y = spotify_lite_numeric_no_outliers.monthly_owner_stream30s
```

```
Now we begin the process.
```

14. ANY STATISTICAL SIGNIFICANCE?

```
In [   ]: regressor_OLS.summary()
```

Out[ ]:

OLS Regression Results

Dep. Variable:	monthly_owner_stream30s	**R-squared:**	0.412
Model:	OLS	**Adj. R-squared:**	0.385
Method:	Least Squares	**F-statistic:**	15.02
Date:	Wed, 31 Jul 2019	**Prob (F-statistic):**	5.85e-321
Time:	13:01:06	**Log-Likelihood:**	-22940.
No. Observations:	4014	**AIC:**	4.624e+04
Df Residuals:	3834	**BIC:**	4.737e+04
Df Model:	179		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	3.2421	8.627	0.376	0.707	-13.671	20.157

15. FEATURE SELECTION

```
This begins the sklearn portion of the show.
```

In [ ]:
```
most_relevant_features = ['stream30s', 'dau', 'wau',\
                          'mau', 'mau_both_months', 'users',\
                          'n_artists', 'monthly_stream30s',\
                          'token_sentiment_score',\
                          'owner_has_multiple_playlists',\
                          'genre_count', 'genre_1_children_s',\
                          'genre_1_country_and_folk',\
                          'genre_1_electronica', 'genre_1_punk',\
                          'genre_2_electronica', 'genre_3_none',\
                          'mood_1_defiant', 'mood_1_excited',\
                          'mood_1_other', 'mood_2_sophisticated',\
                          'mood_3_cool', 'mood_3_lively',\
                          'mood_3_rowdy', 'tracks_per_album',\
                          'stream30s_to_monthly_stream30s_ratio',\
                'monthly_owner_stream30s_to_monthly_stream30s_ratio']
```

In [ ]:
```
most_relevant_features2 = ['streams', 'dau', 'wau',\
                          'mau', 'mau_both_months', 'users',\
                          'n_artists', 'monthly_stream30s',\
                          'owner_has_multiple_playlists',\
                          'stream30s_to_monthly_stream30s_ratio',\
                'monthly_owner_stream30s_to_monthly_stream30s_ratio']
```

16. FEATURE PRUNING

In [ ]:
```
most_relevant_features3 = ['n_artists', 'n_albums','genre_count',\
                'monthly_owner_stream30s_to_monthly_stream30s_ratio',\
                'token_count','owner_playlist_count',\
                'owner_known_to_be_premium']
```

In [ ]:
```
most_relevant_features4 = ['n_albums','genre_count',\
                'monthly_owner_stream30s_to_monthly_stream30s_ratio',\
                'owner_playlist_count']
```

17. THE CHOSEN ONES

In [ ]:
```
regressor_OLS = sm.OLS(endog = y, exog = chosen_features).fit()
regressor_OLS.summary()
```

Out[ ]:

OLS Regression Results

Dep. Variable:	monthly_owner_stream30s	**R-squared:**	0.533
Model:	OLS	**Adj. R-squared:**	0.533
Method:	Least Squares	**F-statistic:**	1146.
Date:	Wed, 31 Jul 2019	**Prob (F-statistic):**	0.00
Time:	15:50:31	**Log-Likelihood:**	-23282.
No. Observations:	4014	**AIC:**	4.657e+04
Df Residuals:	4010	**BIC:**	4.660e+04
Df Model:	4		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
n_albums	0.1879	0.012	16.029	0.000	0.165	0.211
genre_count	-3.5340	0.955	-3.702	0.000	-5.406	-1.662
monthly_owner_stream30s_to_monthly_stream30s_ratio	132.3355	3.735	35.427	0.000	125.012	139.659
owner_playlist_count	-2.2438	0.593	-3.782	0.000	-3.407	-1.081

18. TRAIN/TEST SPLIT

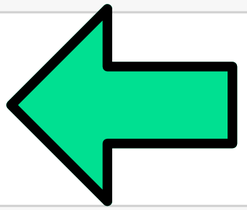
In [ ]:
```
X_train, X_test, y_train, y_test = train_test_split\
(chosen_features, y, test_size = 0.2, random_state = 1)
```

In [ ]:
```
model = LinearRegression()
model.fit(X_train,y_train)
```

Out[ ]:
```
LinearRegression(copy_X=True, fit_intercept=True, n_jobs=None,
         normalize=False)
```

In [ ]:
```
sorted(list(zip(most_relevant_features4,model.coef_))\
       ,key = lambda x: abs(x[1]),reverse=True)
```

Out[ ]:
```
[('monthly_owner_stream30s_to_monthly_stream30s_ratio', 135.33557249728625),
 ('genre_count', 2.874949752342296),
 ('owner_playlist_count', -2.050225875348983),
 ('n_albums', 0.15740051956660164)]
```



sk-learn coefficients

In [ ]:
```
y_predicted = model.predict(X_test)
```

In [ ]:
```
#I want to get a dataframe ready for alttari
model_scoring = pd.DataFrame(\
             {'y_test': y_test, 'y_predicted': y_predicted, 'residual':\
              (y_predicted-y_test)},\
        columns=['y_test', 'y_predicted','residual']).reset_index()
```

19. MODEL SCORING & CROSS-VALIDATION

In [ ]:
```
r2_score(model_scoring.y_test, model_scoring.y_predicted)
```

Out[ ]:
```
0.3297546526887427
```

In [ ]:
```
mean_absolute_error(y_test, y_predicted)
```

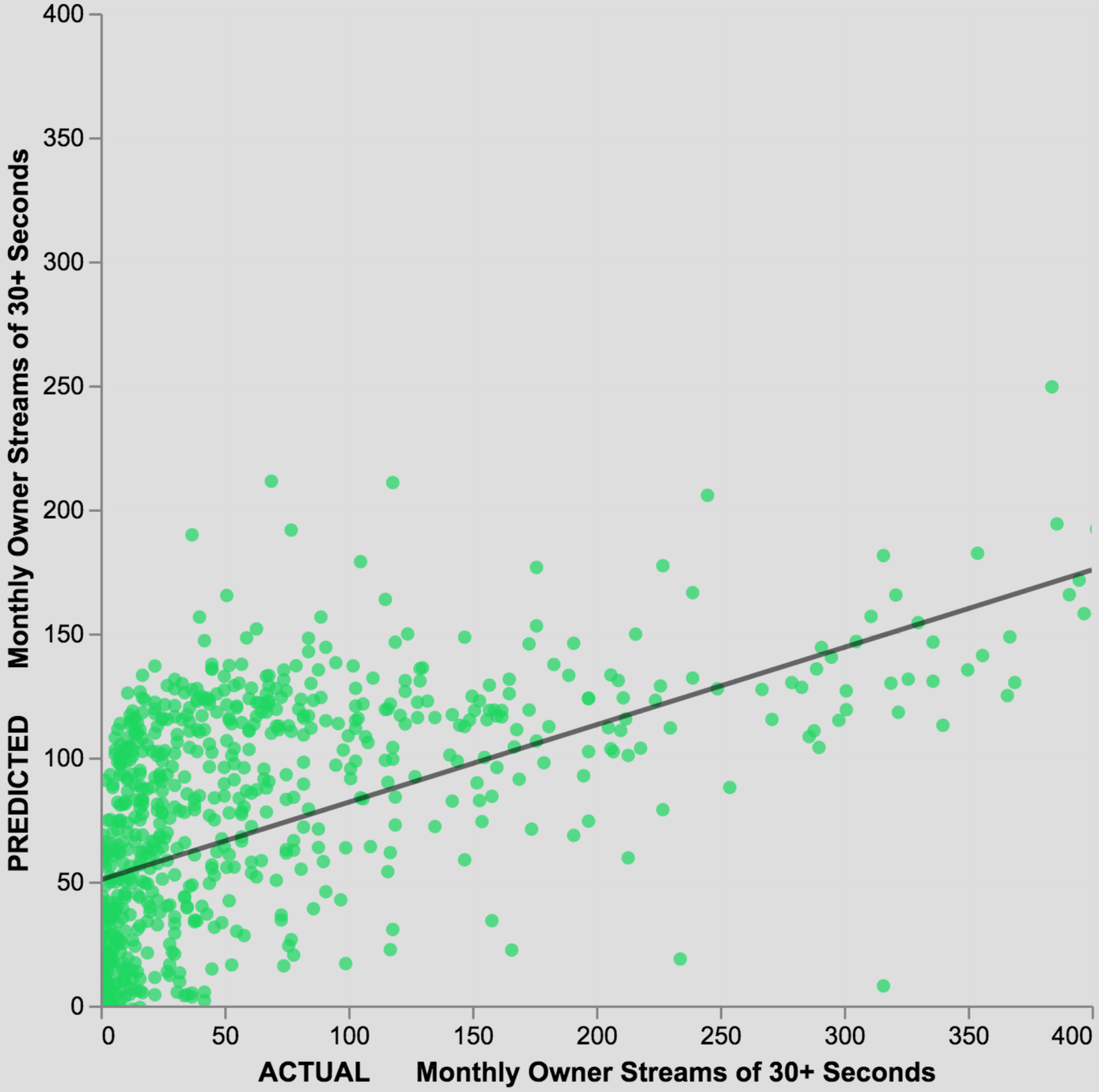
Out[ ]:
```
54.1607115248918
```

In [ ]:
```
median_absolute_error(y_test, y_predicted)
```

Out[ ]:
```
39.92515627211054
```

In [ ]:
```
#last let's look at the cross validation
print("Cross-Validation Scoring")
print('Mean Absolute Error: {}'.format(-1*round(cross_val_score(LinearRegression(),\
                    chosen_features, y, cv=10, scoring='neg_mean_absolute_error').mean(),2)))
#no option for RMSE in cross val score, so looking at mean absolute error
#multiply by -1 to get a positve value to take a look at it
print('R^2: {}'.format(round(cross_val_score(LinearRegression(),\
                                        chosen_features, y, cv=10, scoring='r2').mean(),2)))
```

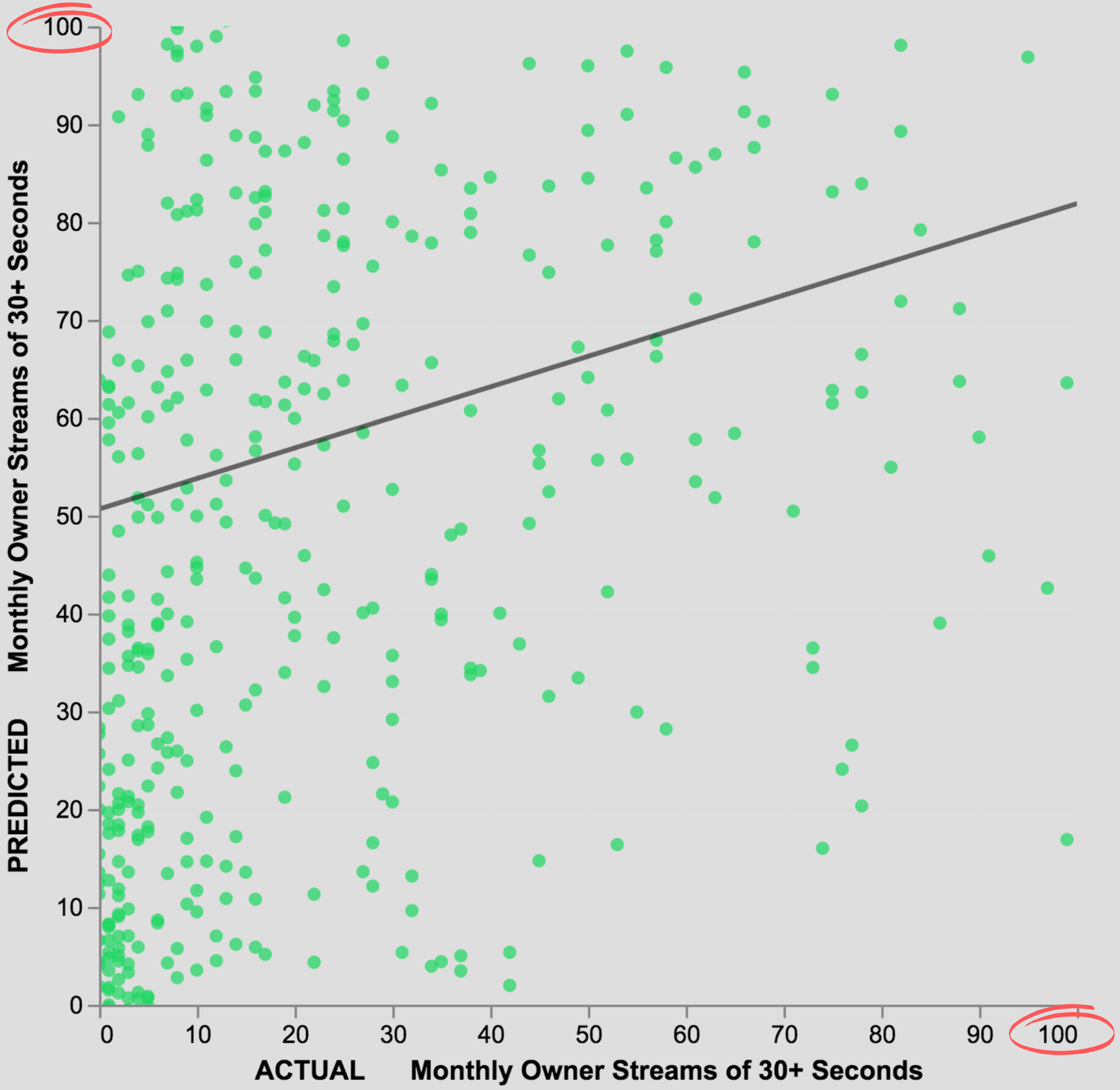
```
Cross-Validation Scoring
Mean Absolute Error: 52.23
R^2: 0.3
```



Actual (x axis) vs. Predicted (y axis)

Not bad, but gets worse as the cases get more extreme. This makes sense because I eliminated the highest values from the training set.

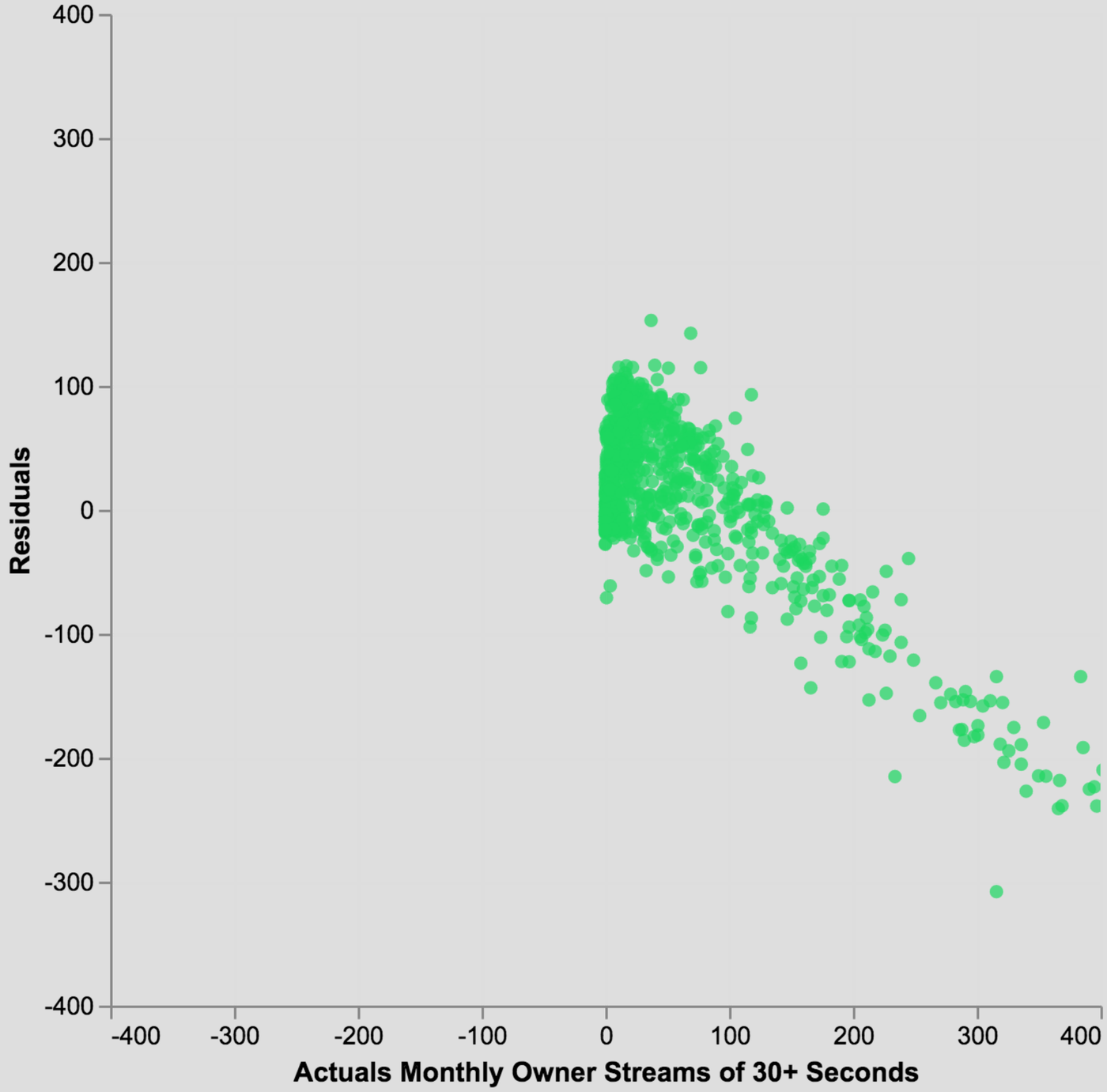
We may consider focusing the model on the more common lower-frequency users.



100-stream level:

Actual (x axis) vs. Predicted (y axis)

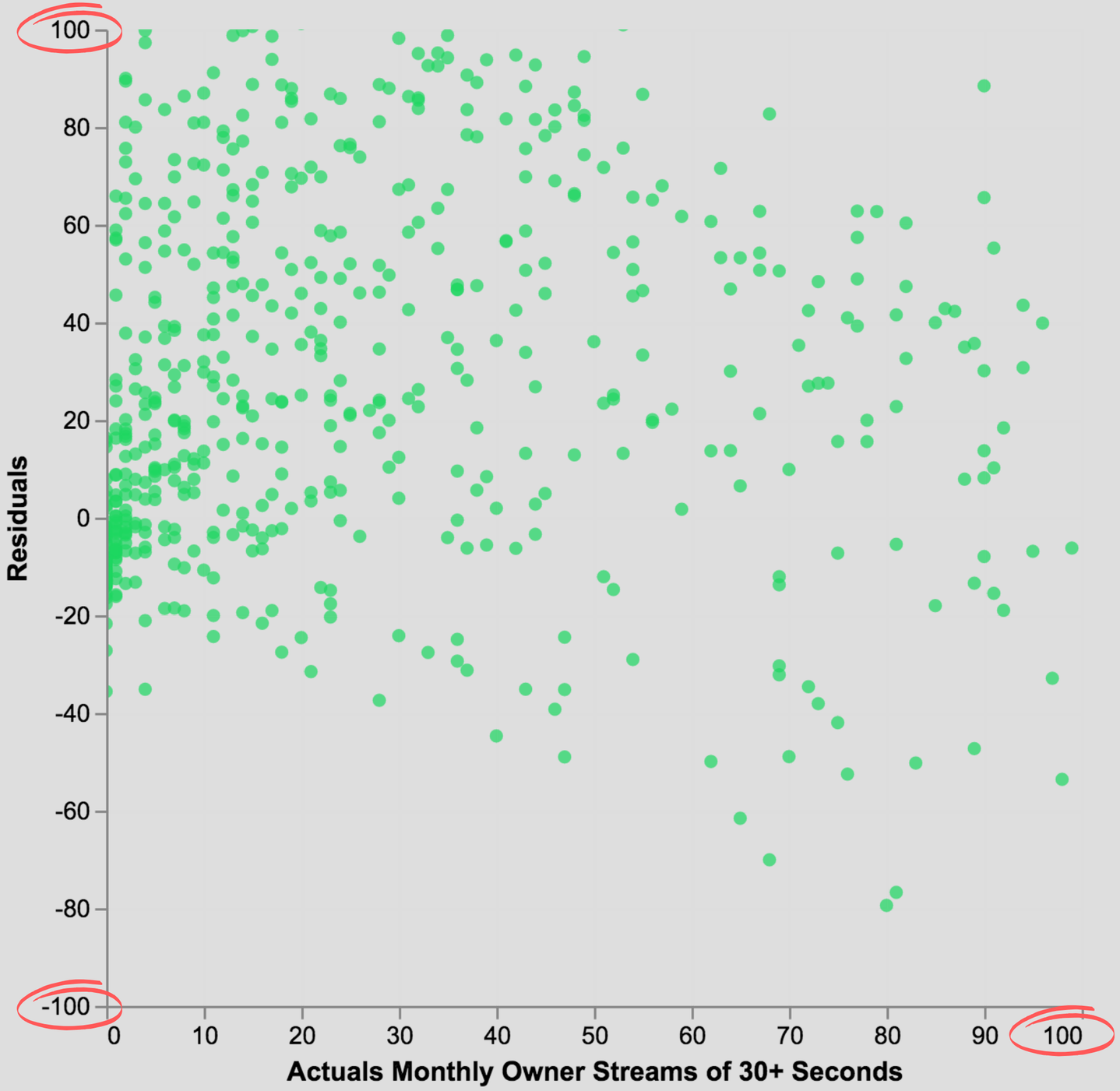
This looks better to me, but there's always room for improvement.



Plotting the residuals.

Again, not bad at first, but gets worse as the cases get more extreme. This makes sense because I eliminated the highest values from the training set.

Just as before, we may consider focusing the model on the more common lower-frequency users.



100-stream level:

Plotting the residuals.

This looks better to me, but there's always room for improvement. I also restricted this to positives because there can't be a negative stream count.

So. . .
what makes a playlist successful?

INTIMACY, FOCUS

Pos Corr: Owner's Proportion of Monthly Streams

Neg Corr: Number of Playlists User Owns

VARIETY WITHIN THEME

Pos Corr: Number of Genres (up to 3)

Pos Corr: Number of Albums

Next Steps

Next steps...

Ideas

Bring In Other Types of Machine Learning Models

Get More Spotify Data

Do New Analysis Focusing Only on Spotify-Official Playlists

Spotify®

Thank you!

George John Jordan Thomas Aquinas Hayward, Optimist