

Comparison Top100 ranks from various service provider

The Spotify logo is centered in the image. It features the word "Spotify" in a sans-serif font, with the "S" in blue and the rest in green. To the right of the text is a large green circle containing three horizontal black wavy lines, representing the Spotify icon. The background of the slide is a blurred image of a person's face and hands holding a smartphone.

Donghyun Kang

2018.02.13

Data Scientist Fellow

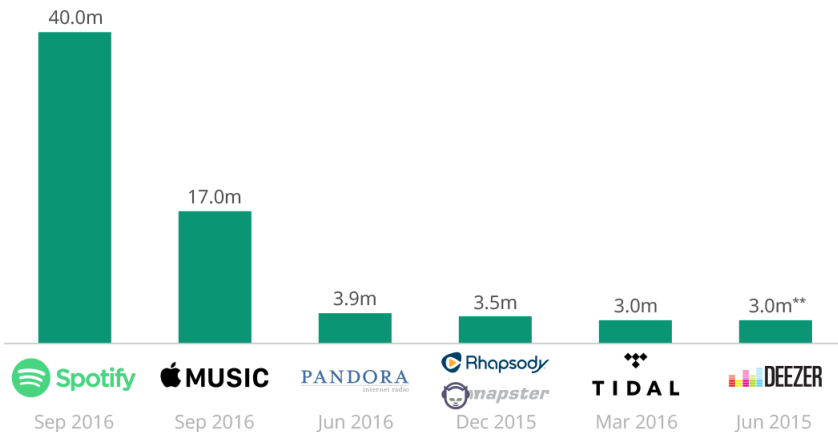
NYC Data Science Academy

Motivation

Tech  Chart of the Day

The State of Music Streaming

Worldwide paid subscribers of music streaming services (as of September 2016)*



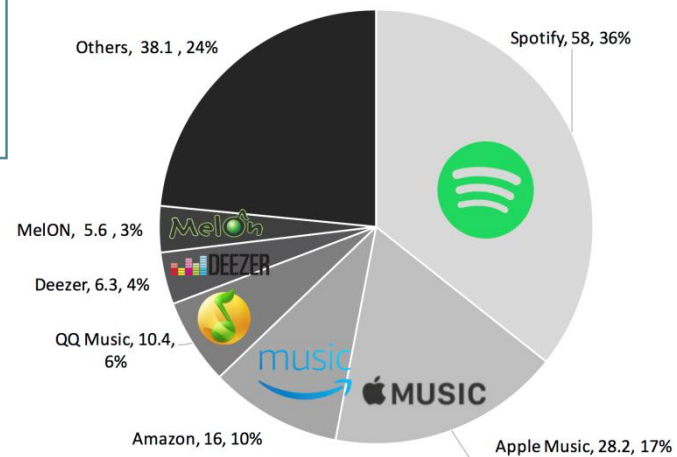
* most recent available information; Google and Amazon do not disclose subscriber numbers for their music streaming services
 ** excluding inactive bundle subscribers

BUSINESS INSIDER

Source: Company announcements  statista 

Amazon Has Fast Become The 3rd Largest Music Subscription Service Globally

Global Streaming Music Subscribers, June 2017



162.6 million subscribers globally

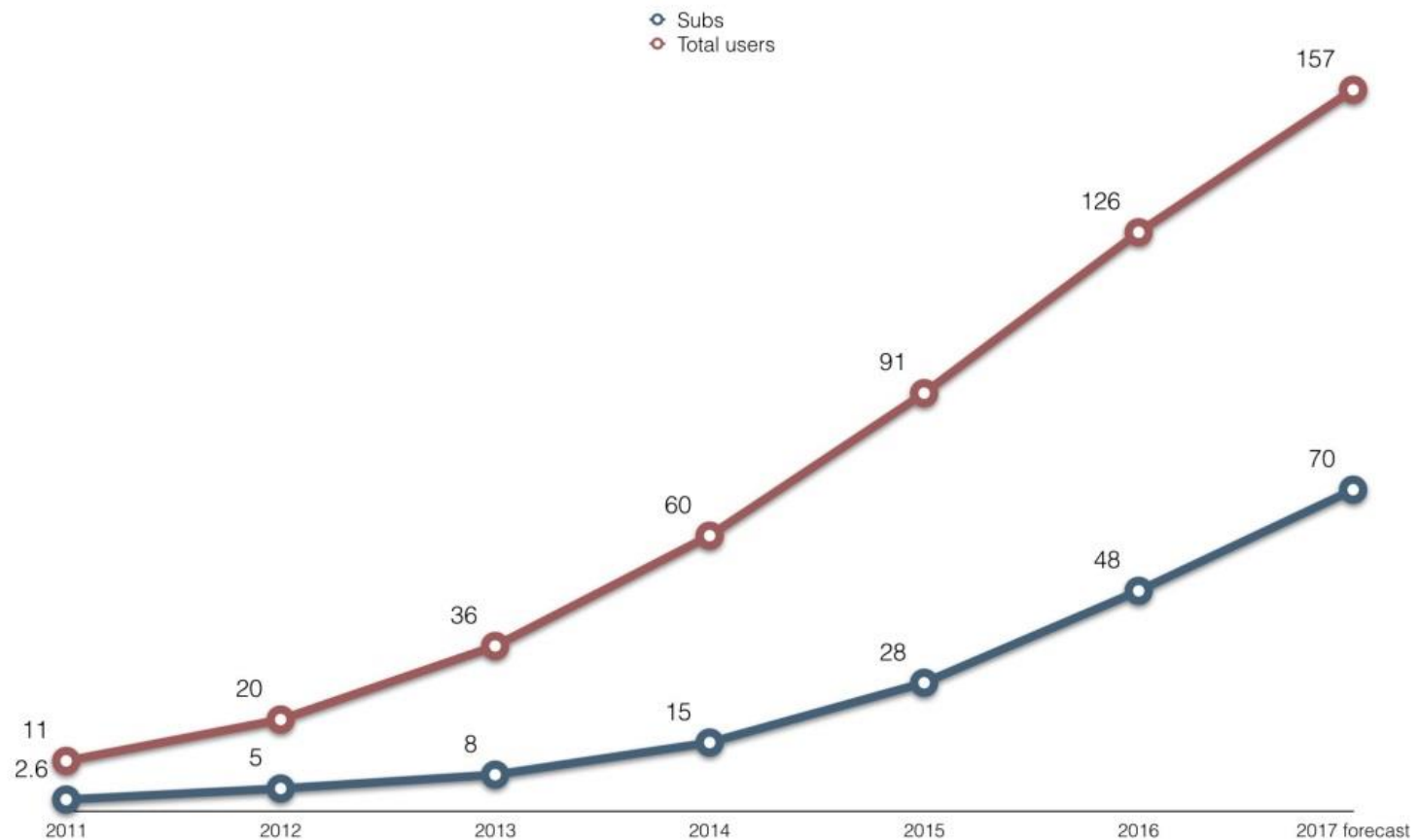
35% of Prime subscribers are Prime Music users

Note: Figures are in millions and refer to commercially active subscriptions
 Source: MIDIA Research and company reports

MIDIA 

Motivation

Spotify end-of-year paying subs and total active users (m)



Source: Company accounts. 2014/2015 restated in 2016 accounts. 2017 is MBW's forecast.

Motivation

- Spotify is really making a music trend?
- Why many people uses Spotify's data?
- Are these reliable?

Analysis points

- Spotify is really making a music trend?
 - Compare with others' list
- Why many people uses Spotify's data?
 - Web scraping and using it
- Are these reliable?
 - ...

exploratory candidates

Top Tier



Second Tier



Data Sets by Web-scraping

- Spotify Weekly Top 100

(<https://spotifycharts.com/regional/us/daily/latest>)

- YouTube Music Chart Top 100

(<https://artists.youtube.com/charts/tracks>)

- Billboard the hot 100

(<https://www.billboard.com/charts/hot-100>)

iTunes
– for Genre

Spotify scraping

Scrapy

Secure | <https://spotifycharts.com/regional/us/daily/latest/>

Apps BmarkTop A.Useful B.Kids C.US D.Sci D.Work E.ROK CMP Cloud Gmail GDrive Competitions canslove.tistory X-Speed Fin Forum Paper Uni Dc DEE W

Spotify | Charts

DOWNLOAD TO CSV

TOP 200 VIRAL 50 Filter by UNITED STATES DAILY 02/08/2018

TRACK STREAMS

1	God's Plan by Drake	3,348,966
2	Stir Fry by Migos	1,306,069
3	Mine by Bazzi	1,231,098

Elements Console Sources Network Performance Memory

```
<div class="responsive-select" data-type="country">...</div>
<div class="responsive-select" data-type="recurrence">...</div>
<div class="responsive-select" data-type="date">
  <div class="responsive-select-value">...</div> == $0
  <ul>
    <li data-value="2018-02-08" class="selected">02/08/2018</li>
    <li data-value="2018-02-07" class>02/07/2018</li>
    <li data-value="2018-02-06" class>02/06/2018</li>
    <li data-value="2018-02-05" class>02/05/2018</li>
    <li data-value="2018-02-04" class>02/04/2018</li>
    <li data-value="2018-02-03" class>02/03/2018</li>
    <li data-value="2018-02-02" class>02/02/2018</li>
    <li data-value="2018-02-01" class>02/01/2018</li>
    <li data-value="2018-01-31" class>01/31/2018</li>
    <li data-value="2018-01-30" class>01/30/2018</li>
    <li data-value="2018-01-29" class>01/29/2018</li>
    <li data-value="2018-01-28" class>01/28/2018</li>
    <li data-value="2018-01-27" class>01/27/2018</li>
    <li data-value="2018-01-26" class>01/26/2018</li>
    <li data-value="2018-01-25" class>01/25/2018</li>
    <li data-value="2018-01-24" class>01/24/2018</li>
  </ul>

```

html body #content div div div span div div div div div div div responsive-select-value

Secure | <https://spotifycharts.com/regional/us/daily/2018-02-08>

Apps BmarkTop A.Useful B.Kids C.US D.Sci D.Work E.ROK CMP Cloud Gmail GDrive Competitions canslove.tistory X-Speed Fin Forum Paper Uni Dc DEE W E

Spotify | Charts

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Elements Console Sources Network Performance Memory Application

```
</div>
</div>
<div class="loader hide"></div>
<table class="chart-table" style="display: table;" == $0
  <thead>...</thead>
  <tbody>
    <tr>
      <td class="chart-table-image">...</td>
      <td class="chart-table-position">1</td>
      <td class="chart-table-trend">...</td>
      <td class="chart-table-track">
        <strong>God's Plan</strong>
        <span>by Drake</span>
      </td>
      <td class="chart-table-streams">3,348,966</td>
    </tr>
    <tr>...</tr>
    <tr>...</tr>
    <tr>...</tr>
    <tr>...</tr>
  </tbody>

```

html body #content div div.wrapper div.container span table.chart-table tbody tr td.chart-table-track

Selenium

The screenshot shows a web browser window displaying the YouTube for Artists charts page. The page features a navigation bar with links to CHARTS, MUSIC INSIGHTS, ARTIST RESOURCES, and BLOG. The main content area shows the 'US Top 100' chart, which includes a table of songs, their view counts, and their position on the chart. The browser's developer tools are open, showing the 'Elements' panel with the HTML structure of the chart, the 'Styles' panel with the CSS for the 'paper-listbox' element, and the 'Console' panel with the 'Highlights from the Chrome 64 update' message.

US Top 100

How is this calculated?

VIRAL VIDEOS **ALL VIDEOS**

TITLE	VIEW COUNT	CHANGE	ON CHART
Bodak Yellow Cardi B	21.9M	0.8%	15 wks
Despacito (feat. Daddy Yankee) Luis Fonsi	14.7M	20%	39 wks
Look What You Made Me Do Taylor Swift	13.9M	20.7%	7 wks
I-800-273-8255 (feat. Alessia Cara & Khalid) Logic	13.1M	13.9%	8 wks
Rake It Up (feat. Nicki Minaj)	11.5M	11.7%	15 wks

Elements

```

<iron-dropdown id="dropdown" class="style-scope paper-menu-button" aria-disabled="false" horizontal-align="right" vertical-align="top" style="outline: none; position: fixed; left: 10.625px; top: 160px; z-index: 103; ">
  <div id="contentWrapper" class="style-scope iron-dropdown">
    <div class="dropdown-content" style-scope paper-menu-button" slot="dropdown-content" style="box-sizing: border-box; max-width: 225.078px; max-height: 588px;">
      <paper-listbox class="dropdown-content" style-scope ytma-charts x-scope paper-listbox-0" slot="dropdown-content" role="listbox" aria-expanded="true" tabindex="0">
        <paper-item class="style-scope ytma-charts x-scope paper-item-0" role="option" tabindex="-1" aria-disabled="false">Jan 26 - Feb 1, 2018</paper-item>
        <paper-item class="style-scope ytma-charts x-scope paper-item-0" role="option" tabindex="-1" aria-disabled="false">Jan 19 - Jan 25, 2018</paper-item>
        <paper-item class="style-scope ytma-charts x-scope paper-item-0" role="option" tabindex="-1" aria-disabled="false">Jan 12 - Jan 18, 2018</paper-item>
        <paper-item class="style-scope ytma-charts x-scope paper-item-0" role="option" tabindex="-1" aria-disabled="false">Jan 5 - Jan 11, 2018</paper-item>
        <paper-item class="style-scope ytma-charts x-scope paper-item-0" role="option" tabindex="-1" aria-disabled="false">Dec 29, 2017 - Jan 4, 2018</paper-item>
        <paper-item class="style-scope ytma-charts x-scope paper-item-0" role="option" tabindex="-1" aria-disabled="false">Dec 22 - Dec 28, 2017</paper-item>
        <paper-item class="style-scope ytma-charts x-scope paper-item-0" role="option" tabindex="-1" aria-disabled="false">Dec 15 - Dec 21, 2017</paper-item>
        <paper-item class="style-scope ytma-charts x-scope paper-item-0" role="option" tabindex="-1" aria-disabled="false">Dec 8 - Dec 14, 2017</paper-item>
        <paper-item class="style-scope ytma-charts x-scope paper-item-0" role="option" tabindex="-1" aria-disabled="false">Dec 1 - Dec 7, 2017</paper-item>
        <paper-item class="style-scope ytma-charts x-scope paper-item-0" role="option" tabindex="-1" aria-disabled="false">Nov 24 - Nov 30, 2017</paper-item>
      </paper-listbox>
    </div>
  </div>
</iron-dropdown>

```

Styles

```

element.style {
  display: block;
  padding: 8px 0;
  background-color: #ffffff;
  color: #212121;
}

```

Console

Highlights from the Chrome 64 update

Billboard scraping

Scrapy

Secure | <https://www.billboard.com/charts/hot-100/2018-02-10>

Apps BmarkTop A.Useful B.Kids C.US D.Sci D.Work E.ROK CMP Cloud Gmail GDrive Competitions canslove.tistory X-Speed Fin Forum Paper Uni Dc DEE W E

billboard

div.chart-row_main-display | 870 x 113

- Perfect
Ed Sheeran
- Finesse
Bruno Mars & Cardi B
- Havana
Camila Cabello Featuring Young Thug
- Rockstar
Post Malone Featuring 21 Savage

Elements Console Sources Network Performance Memory

```
<div class="chart-rail_module-video-wrapper">...</div>
<aside class="chart-sidebar-unit info-module highlights-module" data-trackaction="
Highlights">...</aside>
<div class="chart-ad-ic">...</div>
<article class="chart-row chart-row--2 js-chart-row" data-hovertracklabel="Song
Hover-" data-songtitle">
  <div class="chart-row_primary">
    <div class="chart-row__history chart-row__history--steady">...</div>
    <div class="chart-row_main-display">...</div>
    <div class="chart-row__rank">
      <span class="chart-row__current-week">2</span>
      <span class="chart-row__last-week">Last Week: 2</span>
    </div>
    <div class="chart-row_image" style="background-image: url(https://charts-
static.billboard.com/img/2017/03/ed-sheeran-3vg.jpg)">
    </div>
  <div class="chart-row_container">...</div>
</article>
```

html body #main div div div article div.chart-row_primary div.chart-row_main-display

Styles Event Listeners DOM Breakpoints Properties Accessibility

Filter :hov .cls +

```
element.style {
}
.chart-row_main-display {
  overflow: hidden;
}
```

html, body, div, span, applet, charts.css?d399_480b714b7133:1
object, iframe, h1, h2, h3, h4, h5, h6, p, blockquote, pre, a,
abbr, acronym, address, big, cite, code, del, dfn, img, ins,

Console What's New

margin -
border -
padding -
870 x 113

Why Spotify's dataset ?

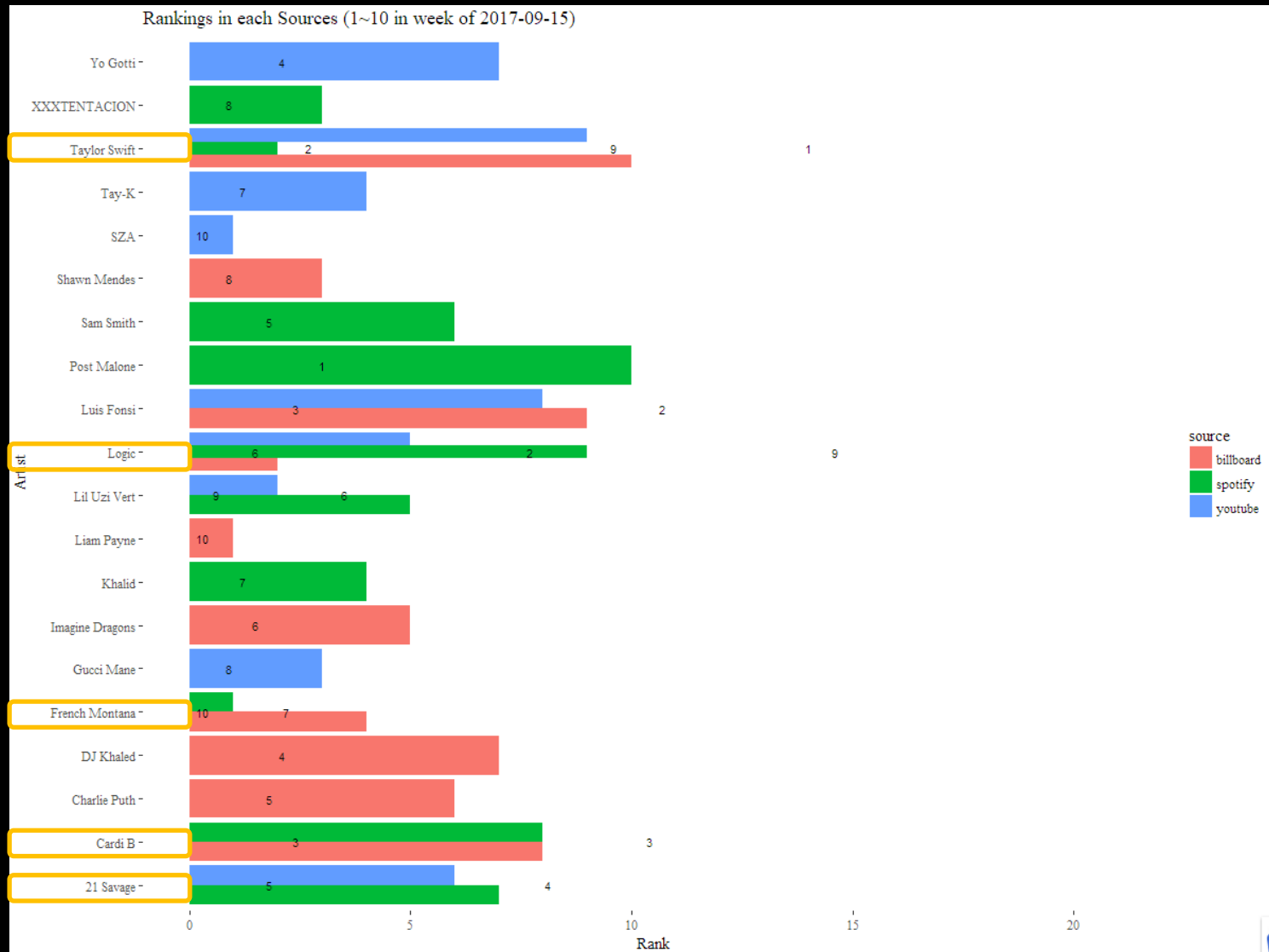
- Easy to web-scrape
- Easy to get (without web-scrape)
- Provide various data set
 - Regional, Daily, Weekly
- Long term monitored data
 - Every year
- Quick update

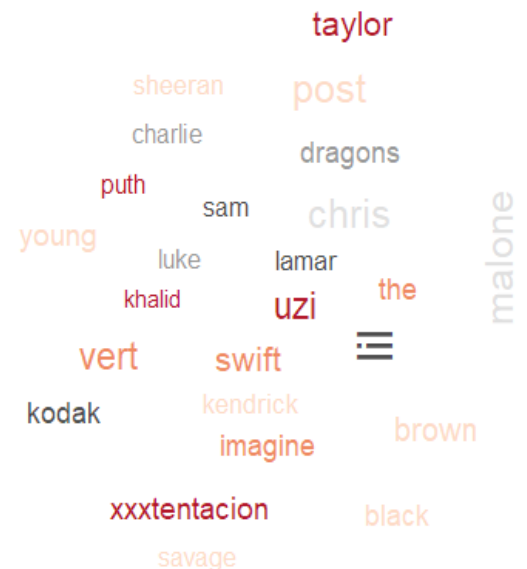
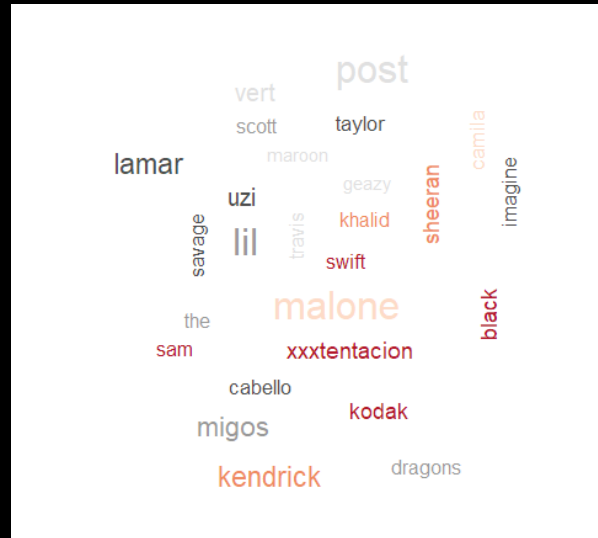
Rank Top10 Comparison

Rankings in each Sources (1~10 in week of 2017-09-15)



Rank Top10 Comparison





Significant factor selection

Artist who is registered in Top100 more than 30 times

Spotify	freq	Youtube	freq	Billboard	freq
Post Malone	110	lil ...	111	lil ...	97
lil ...	103	Kodak Black	57	Post Malone	70
Kendrick lamar	67	Brown	53	Chris	68
Migos	63	Chris	46	Uzi Vert	60
Uzi Vert	57	Post Malone	44	Taylor Swift	51
Kodak Black	47	Broke again	41	Brown	49
Ed Sheeran	45	Never youngboy	41	Young	44
Cabello Camila	42	Imagine Dragon	39	Kodak Black	42
Taylor Swift	41	Ed Sheeran	39	Imagine Dragons	40
Sam	39	Taylor Swift	38	Ed Sheeran	37
Imagine Dragon	38	Uzi Vert	37		

(2017-09-15 ~ 2018-01-26)

'Post Malone' : c("rockstar","congratulations","go flex","candy paint", "i fall apart", "white iverson")

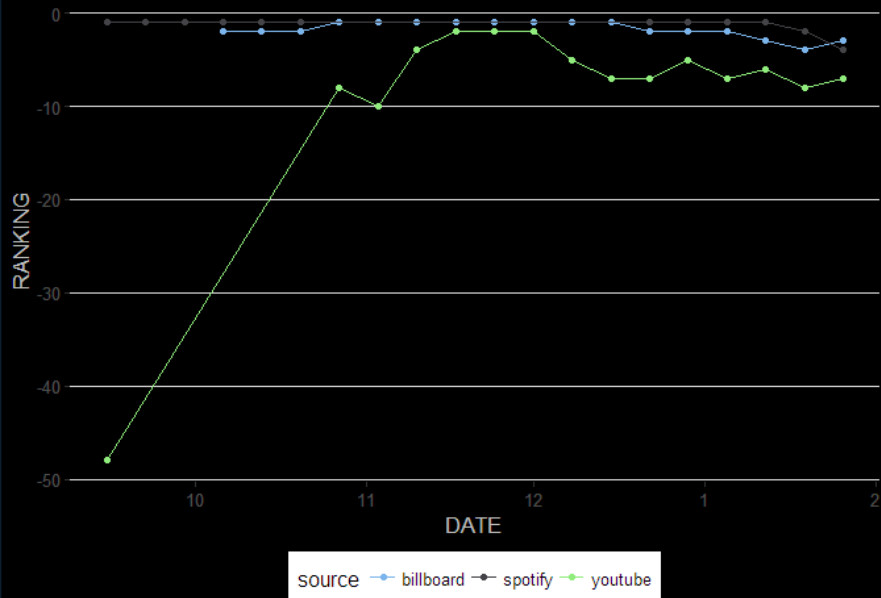
'Kodak Black' : c("roll in peace", "transportin", "tunnel vision", "codeine dreaming", "no flockin", "patty cake","halloween", "patty cake", "too much money", "roll in peace"))

'Taylor swift' : c("Look What You Made Me Do", "...ready for it?", "gorgeous", "call it what you want", "end game", "i did something bad", "delicate")

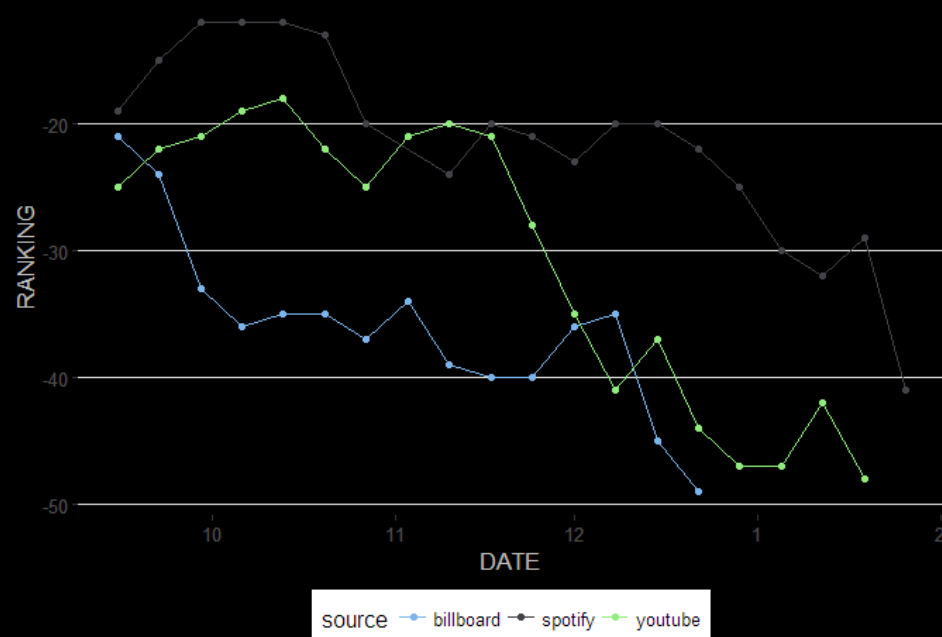
'Ed Sheeran' : c("shape of you", "perfect", "thinking out loud") # derivative should be merged again

'Imagine Dragons' : c("thunder", "believer")

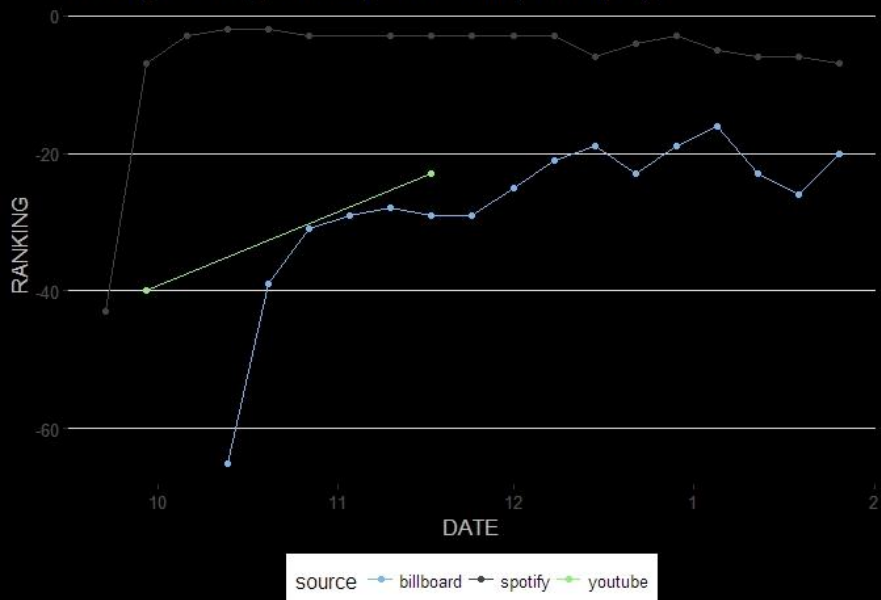
Weekly Ranking Trend - post malone(rockstar)



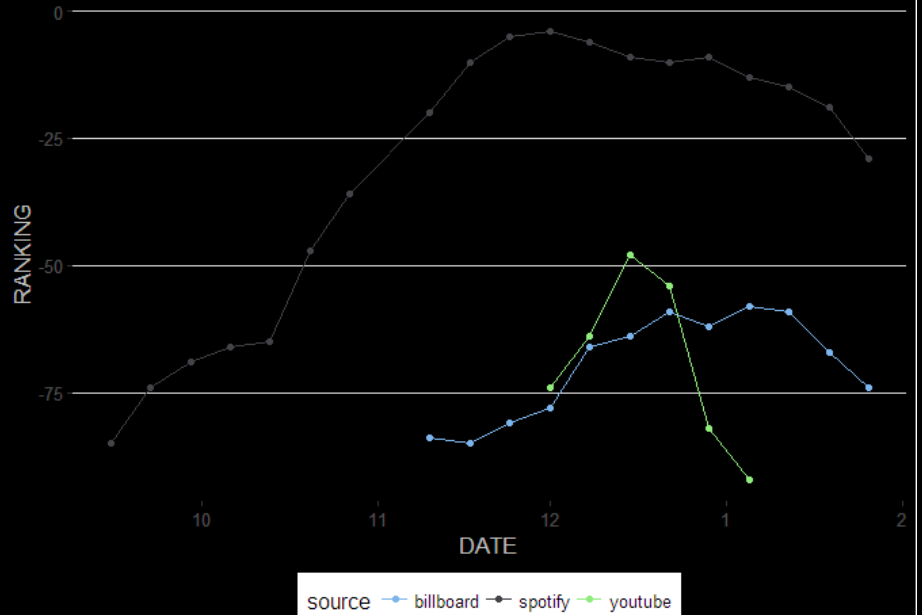
Weekly Ranking Trend - post malone(congratulations)



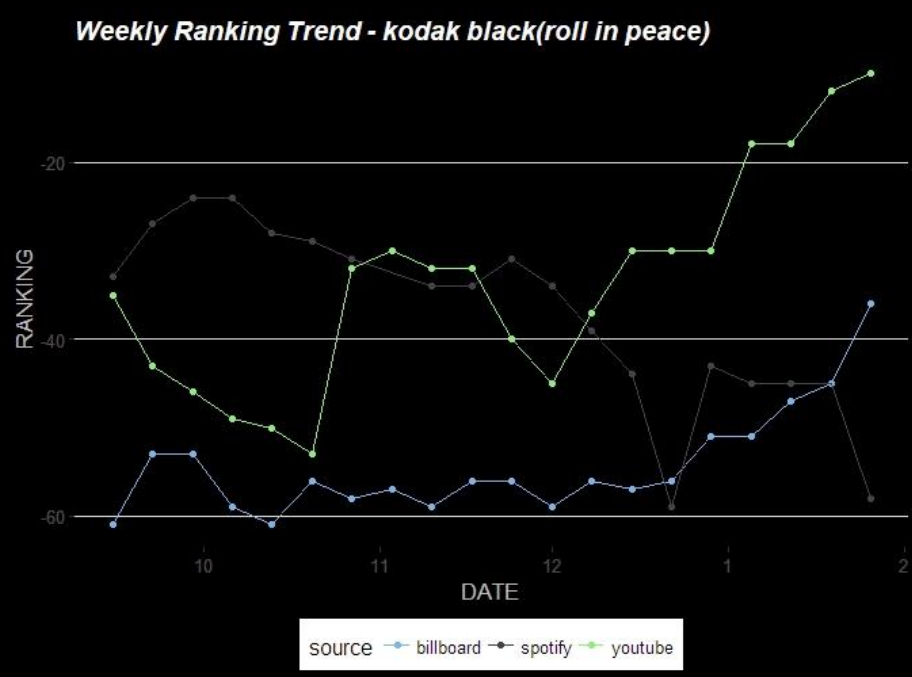
Weekly Ranking Trend - post malone(i fall apart)



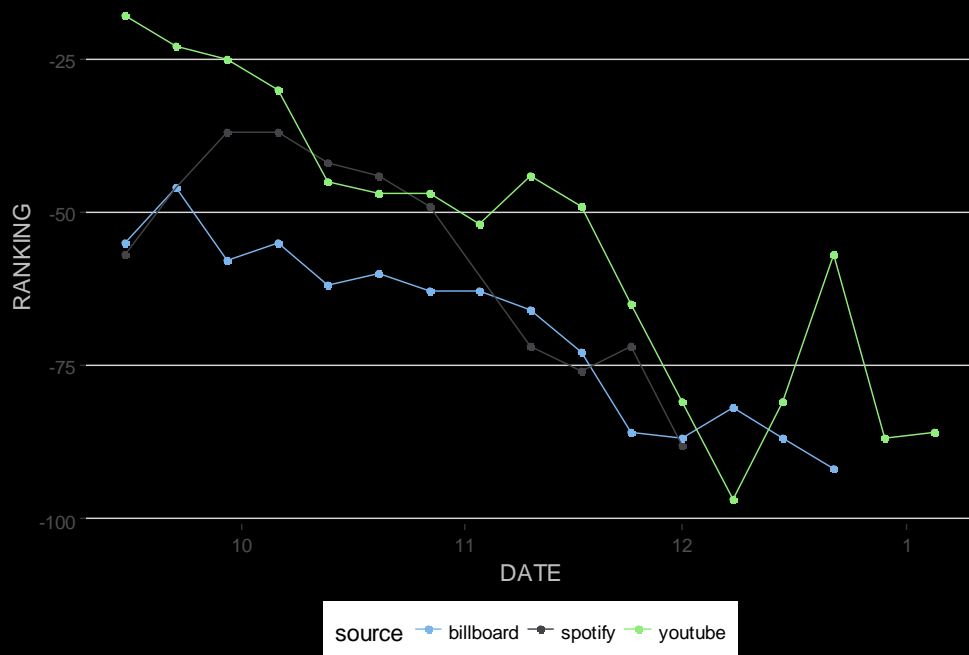
Weekly Ranking Trend - post malone(candy paint)



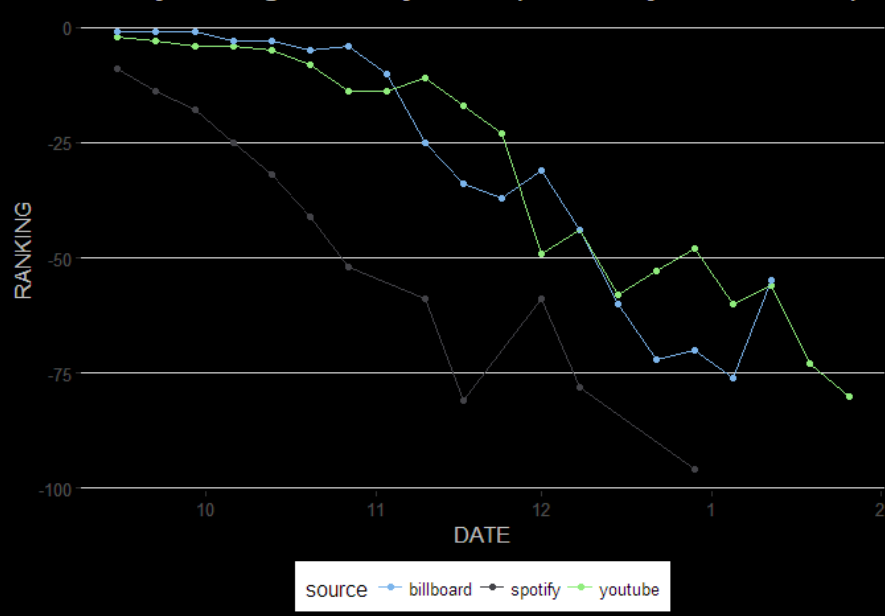
Weekly Ranking Trend - kodak black(roll in peace)



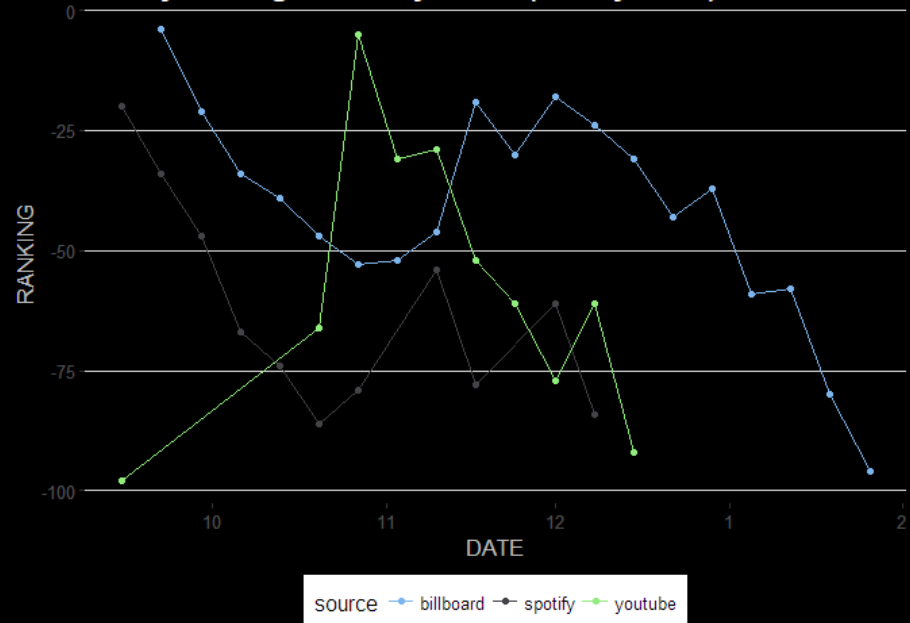
Weekly Ranking Trend - kodak black(transportin')



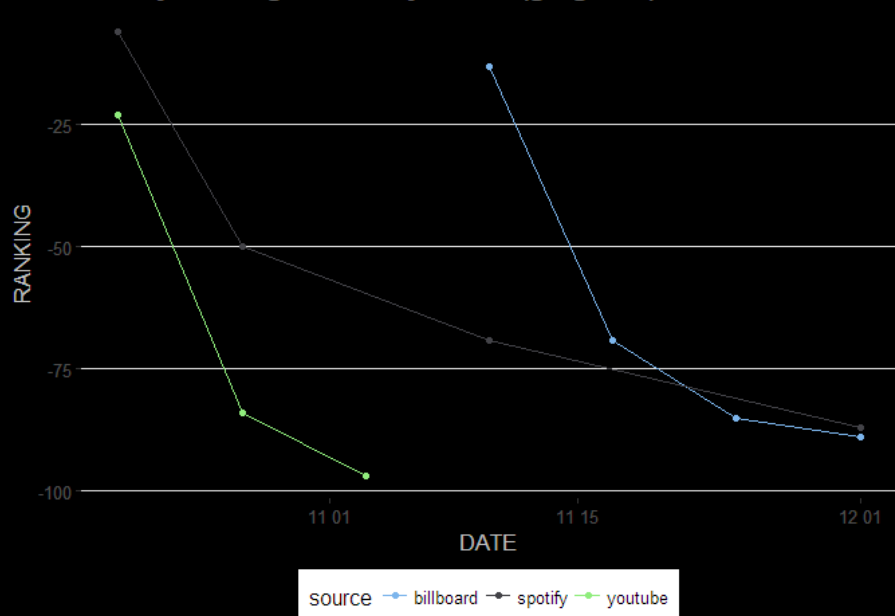
Weekly Ranking Trend - taylor swift(look what you made me do)



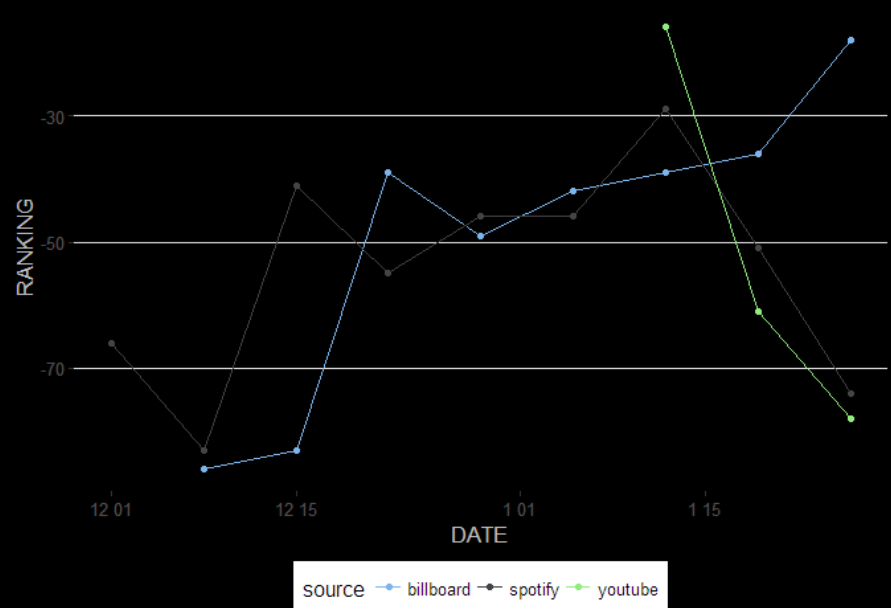
Weekly Ranking Trend - taylor swift(...ready for it?)



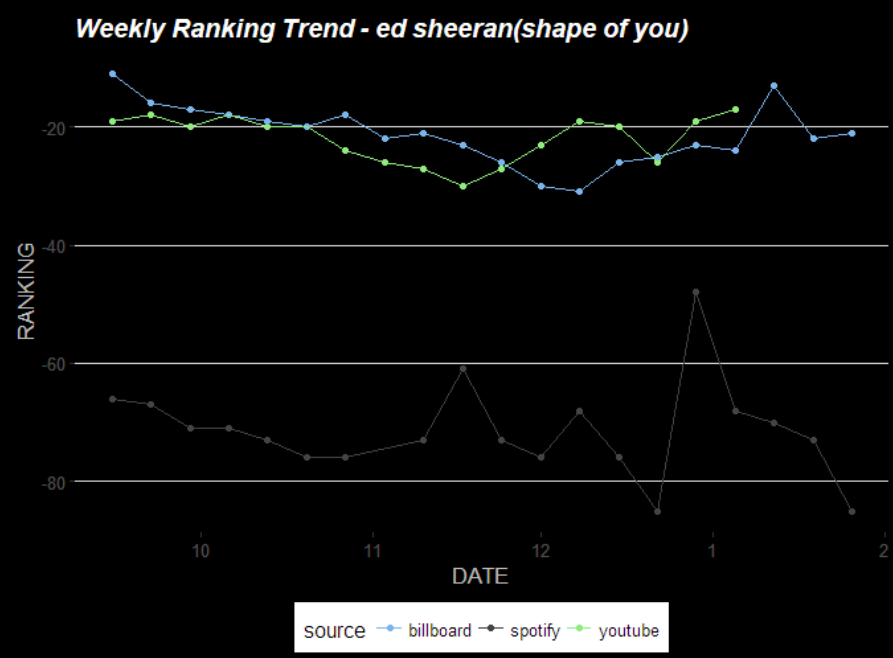
Weekly Ranking Trend - taylor swift(gorgeous)



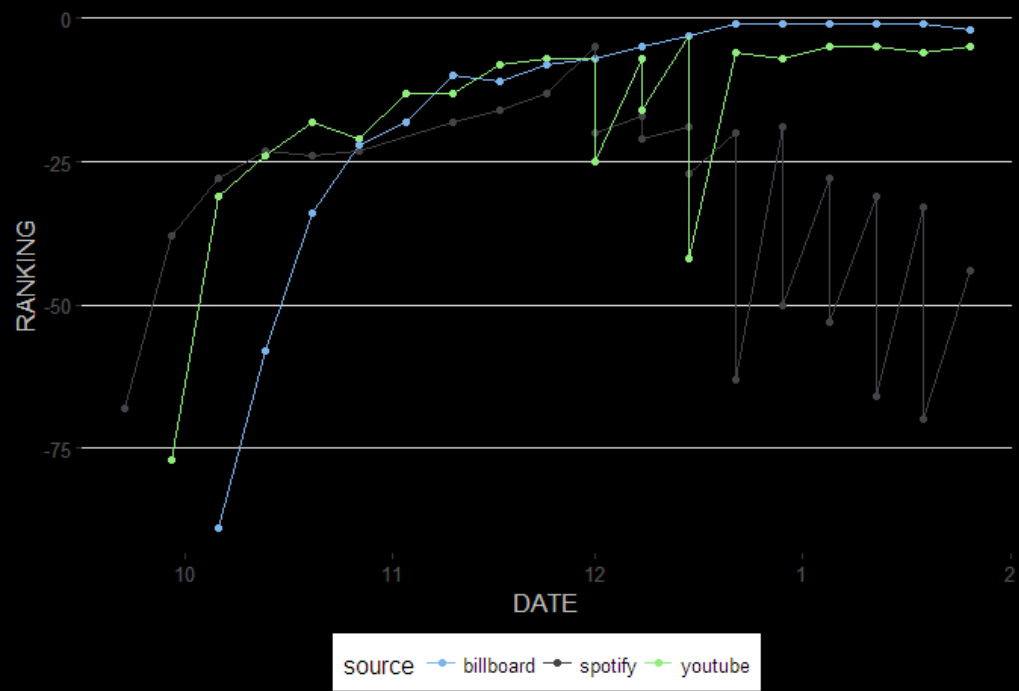
Weekly Ranking Trend - taylor swift(end game)



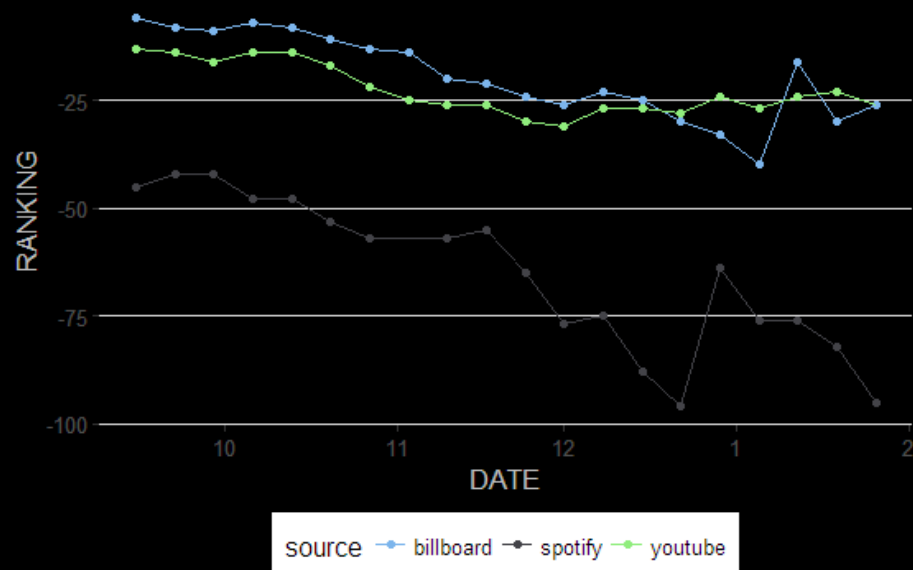
Weekly Ranking Trend - ed sheeran(shape of you)



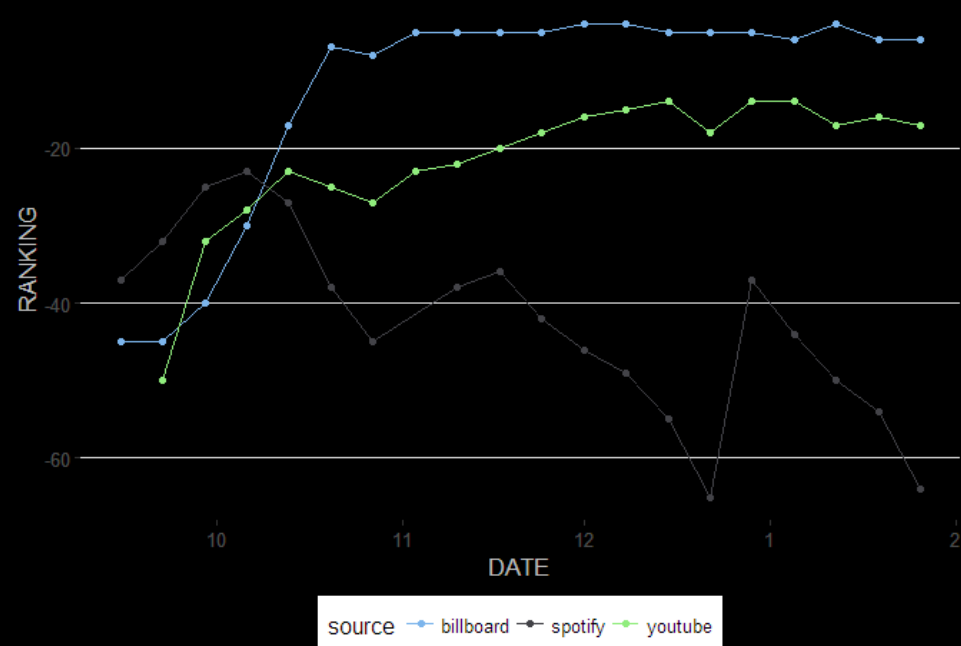
Weekly Ranking Trend - ed sheeran(perfect)



Weekly Ranking Trend - imagine dragons(believer)



Weekly Ranking Trend - imagine dragons(thunder)



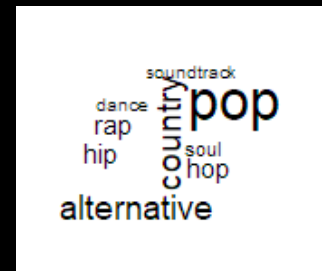
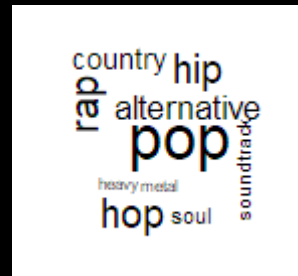
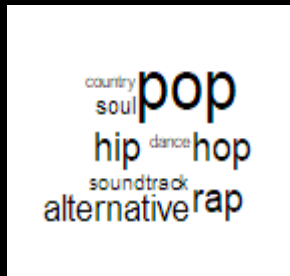
Observation

- Spotify's ranking line is on the left-side than YouTube music and Billboard's
- Spotify provide first viral hit and followed by YouTube music and Billboard's

→ But,

long-term data comparison is needed

Genre positioning in Top100



Genre frequency in Week Top100 (2017-09-15 ~ 2018-01-26)

Spotify		Youtube		Billboard	
pop	49.6%	pop	44.0%	pop	40.5%
hip hop/ rap	21.2%	hip hop/rap	21.4%	country	18.6%
alternative	18.7%	alternative	15.7%	alternative	18.3%
R&B/Soul	5.7%	country	11.1%	hip hop/rap	11.9%
Soundtrack	4.2%	R&B/Soul	4.7%	R&B/Soul	4.5%
Country	0.2%	Soundtrack	2.9%	Soundtrack	3.6%
Dance	0.2%	Heavy metal	0.2%	Dance	2.7%

How to Rank



Total number of
downloaded stream



Simple,
but
Fast, and effective !



Total number of
viewed music on
YouTube by video,
artist, track, and
viral score



Radio airplay
audience
impressions as
measured by
Nielsen Music,
sales data as
compiled by
Nielsen Music and
streaming activity
data provided by
online music
sources

Future Work

- Data Survey
 - Regional subscriber distribution
 - Weather, Airplay data
- Analysis
 - Free vs. charged subscriber
 - By age, gender, occupation
 - By weather, date
- Visualization

**Thank you
for
attention !**