

Supplementary material

1 Top recognized songs’ long lists for Sweden and USA

In Table 1 and Table 2 we present the 100 most recognized songs (according to T-REC) in Sweden and USA respectively. Also, in Table 3 and Table 4 the corresponding most recognized artists, in terms of maximum entries and maximum score, are illustrated. Especially for the case of Sweden the “Top-100 songs” list is overwhelmed by non-Swedish artists and songs (mainly American and English), which is partially explained by the fact that our dataset contains only 1,082 Swedish songs out of a total of 39,466 songs. Additionally, the Top-1 recognized artist in Sweden, according to Table 3, is “Avicii”, a Swedish artist with international impact.

Table 1: The Top-100 recognized songs in Sweden according to T-REC.

song	artist	T-REC
1. More Than You Know	Axwell \wedge Ingrosso	84.4
2. rockstar	Post Malone	84.2
3. Never Be Like You (feat. Kai)	Flume	83.4
4. Havana	Camila Cabello	83.3
5. Despacito (Featuring Daddy Yankee)	Daddy Yankee	82.9
6. Despacito - Remix	Daddy Yankee	82.7
7. Thunder	Imagine Dragons	82.5
8. Mambo No. 5 (A Little Bit of...)	Lou Bega	82.4
9. Last Christmas	Various Artists	81.9
10. Shape of You	Ed Sheeran	81.4
11. Stay With Me	Sam Smith	81.3
12. Hot N Cold	Katy Perry	81.2
13. Poker Face	Lady Gaga	81.1
14. All I Want for Christmas Is You	Mariah Carey	81.0
15. Hymn For The Weekend	Coldplay	80.9
16. Perfect	Ed Sheeran	80.9
17. Dancing On My Own	Calum Scott	80.8
18. All of Me	John Legend	80.8
19. Un-Break My Heart	Toni Braxton	80.7
20. Bad Romance	Lady Gaga	80.6
21. Lean On	Major Lazer	80.6
22. Cheerleader - Felix Jaehn Remix Radio Edit	OMI	80.5
23. Titanium (feat. Sia)	David Guetta	80.3
24. Something Just Like This	The Chainsmokers	80.2
25. Timber	Pitbull	80.0
26. El Perdón	Nicky Jam	79.9

27. Someone Like You	Adele	79.8
28. When Love Takes Over (feat. Kelly Rowland)	David Guetta	79.7
29. Thinking Out Loud	Ed Sheeran	79.6
30. Grenade	Bruno Mars	79.6
31. Rather Be (feat. Jess Glynne)	Jess Glynne	79.6
32. Attention	Charlie Puth	79.5
33. Symphony (feat. Zara Larsson)	Clean Bandit	79.4
34. I'm Yours	Jason Mraz	79.3
35. I Gotta Feeling	The Black Eyed Peas	79.3
36. Human	The Killers	79.2
37. New Rules	Dua Lipa	79.2
38. TiK ToK	Kesha	79.0
39. I Love It (feat. Charli XCX)	Icona Pop	79.0
40. My Heart Will Go On	Cline Dion	78.9
41. Waiting For Love	Avicii	78.9
42. Closer	The Chainsmokers	78.9
43. 1-800-273-8255	Logic	78.8
44. Meant to Be (feat. Florida Georgia Line)	Bebe Rexha	78.7
45. The Ocean	Mike Perry	78.7
46. Give Me Everything	Pitbull	78.6
47. Cheap Thrills	Sia	78.5
48. Unforgettable	French Montana	78.5
49. Say You Won't Let Go	James Arthur	78.5
50. Coco Jambo	Mr. President	78.5
51. We Found Love	Rihanna	78.4
52. Faded	Alan Walker	78.4
53. Let It Go	James Bay	78.4
54. What Lovers Do (feat. SZA)	Maroon 5	78.4
55. Mercy	Duffy	78.2
56. Bailando	Paradisio	78.1
57. Congratulations	Post Malone	78.1
58. I Need Your Love	Calvin Harris	78.1
59. Hymn For The Weekend - Seeb Remix	Coldplay	78.1
60. Do They Know It's Christmas? - 1984 Version	Band Aid 20	78.0
61. Don't Let Me Down	The Chainsmokers	77.9
62. Believer	Imagine Dragons	77.9
63. What Do You Mean?	Justin Bieber	77.9
64. Just Dance	Lady Gaga	77.8
65. Children	Robert Miles	77.8
66. Lush Life	Zara Larsson	77.8
67. This Is The Life	Amy Macdonald	77.8
68. You're My Heart You're My Soul	Modern Talking	77.8
69. I Kissed a Girl	Katy Perry	77.7
70. Whenever Wherever	Shakira	77.7
71. Sorry	Justin Bieber	77.7
72. Swalla (feat. Nicki Minaj & Ty Dolla \$ign)	Nicki Minaj	77.7
73. SUBEME LA RADIO	Enrique Iglesias	77.6
74. The Nights	Avicii	77.6
75. Sunset Lover	Petit Biscuit	77.5
76. Hey Brother	Avicii	77.5
77. Cold Water	Major Lazer	77.5
78. Rockabye (feat. Sean Paul & Anne-Marie)	Clean Bandit	77.4
79. Too Good At Goodbyes	Sam Smith	77.3
80. CAN'T STOP THE FEELING!	Various Artists	77.3
81. Levels - Radio Edit	Avicii	77.3
82. I'm the One	DJ Khaled	77.3
83. Frn och med Du	Oskar Linnros	77.3

84. It Feels So Good	Sonique	77.2
85. Dilemma	Nelly	77.1
86. Mama	Jonas Blue	77.1
87. I'll Be Missing You (feat. 112)	Various Artists	77.1
88. Fireflies	Owl City	77.1
89. I Don't Feel Like Dancin'	Scissor Sisters	77.1
90. Can't Feel My Face	The Weeknd	77.0
91. Umbrella	Rihanna	77.0
92. Ain't Nobody (Loves Me Better)	Felix Jaehn	77.0
93. How Far I'll Go - From "Moana"	Alessia Cara	77.0
94. Boom Boom Boom Boom!!	Vengaboys	76.9
95. Perfect Strangers	Jonas Blue	76.9
96. See You Again (feat. Charlie Puth)	Charlie Puth	76.9
97. Truly Madly Deeply	Savage Garden	76.8
98. Halo	Beyonc	76.8
99. Cotton Eye Joe	Rednex	76.8
100. If I Were a Boy	Beyonc	76.8

Table 2: The Top-100 recognized songs in USA according to T-REC.

song	artist	T-REC
1. Escpate Conmigo	Wisin	86.1
2. Ginza	J Balvin	86.1
3. I Knew I Loved You	Various Artists	86.0
4. Thunder	Imagine Dragons	86.0
5. Believer	Imagine Dragons	85.9
6. Whatever It Takes	Imagine Dragons	85.8
7. I Get The Bag (feat. Migos)	Gucci Mane	85.5
8. Stay With Me	Sam Smith	85.5
9. No Roots	Alice Merton	85.3
10. Stayin' Alive	Bee Gees	84.9
11. Look What You Made Me Do	Taylor Swift	84.9
12. Baby Come Back	Player	84.8
13. rockstar	Post Malone	84.8
14. Glad You Came	The Wanted	84.8
15. Havana	Camila Cabello	84.7
16. Leave Get Out	JoJo	84.7
17. Never Be Like You (feat. Kai)	Flume	84.6
18. Hold Me (feat. Tobymac)	Jamie Grace	84.4
19. Felices los 4	Maluma	84.4
20. Baby Come Back	Player	84.3
21. Attention	Charlie Puth	84.3
22. You And Me	Lifehouse	84.3
23. Bottoms Up	Brantley Gilbert	84.3
24. It Won't Stop (feat. Chris Brown)	Sevyn Streeter	84.3
25. Greatest Love Story	LANCO	84.3
26. Dancing On My Own	Calum Scott	84.1
27. Genie in a Bottle	Christina Aguilera	84.1
28. Dilemma	Nelly	84.1
29. MotorSport	Cardi B	84.0
30. Permission	Ro James	84.0
31. Try Again	Aaliyah	83.8
32. Beautiful Day	Jamie Grace	83.8
33. Vacaciones	Wisin	83.8
34. My Story	Big Daddy Weave	83.8
35. Say It	Tory Lanez	83.6

36. ...Ready For It?	Taylor Swift	83.5
37. Rather Be (feat. Jess Glynne)	Jess Glynne	83.4
38. Home	Phillip Phillips	83.2
39. Whatever She's Got	David Nail	83.1
40. Waiting for a Star to Fall	Boy Meets Girl	83.1
41. Firework	Katy Perry	83.1
42. Party Rock Anthem	LMFAO	83.0
43. Despacito (Featuring Daddy Yankee)	Daddy Yankee	82.9
44. My Way (feat. Monty)	Monty	82.9
45. Say It (feat. Tove Lo)	Flume	82.9
46. All About That Bass	Meghan Trainor	82.9
47. Come on over Baby (All I Want Is You)	Christina Aguilera	82.8
48. Hey Mama	David Guetta	82.8
49. Tell Your Heart to Beat Again	Danny Gokey	82.8
50. Mambo No. 5 (A Little Bit of...)	Lou Bega	82.8
51. Shake It Off	Taylor Swift	82.8
52. It's Not Over Yet	for KING & COUNTRY	82.7
53. Girls Just Want to Have Fun	Various Artists	82.7
54. Despacito - Remix	Daddy Yankee	82.7
55. Body Party	Ciara	82.7
56. We Don't Talk Anymore (feat. Selena Gomez)	Charlie Puth	82.6
57. Lean On	Major Lazer	82.5
58. Wishing Well	Terence Trent D'Arby	82.5
59. The Power	SNAP!	82.5
60. Ay Mi Dios	IAmChino	82.4
61. Ex-Factor	Ms. Lauryn Hill	82.4
62. The House of the Rising Sun	The Animals	82.4
63. All Night Long (All Night) - Single Version	Various Artists	82.3
64. Dangerous Woman	Ariana Grande	82.3
65. Wonderwall	Oasis	82.3
66. All On Me	Devin Dawson	82.3
67. Bad Romance	Lady Gaga	82.3
68. 679 (feat. Remy Boyz)	Fetty Wap	82.3
69. Rolling in the Deep	Adele	82.3
70. TiK ToK	Kesha	82.2
71. El Mismo Sol	Alvaro Soler	82.2
72. Cheerleader - Felix Jaehn Remix Radio Edit	OMI	82.2
73. What a Girl Wants	Christina Aguilera	82.2
74. No Sleep (feat. J. Cole)	Janet Jackson	82.2
75. The Ketchup Song (Asereje) - Spanish Version	Las Ketchup	82.2
76. Mi Gente	J Balvin	82.2
77. We Are Never Ever Getting Back Together	Taylor Swift	82.2
78. Hey DJ	CNCO	82.2
79. Hope in Front of Me	Danny Gokey	82.1
80. Single Ladies (Put a Ring on It)	Beyonc	82.1
81. OOOUUU	Young M.A	82.1
82. Loco	Enrique Iglesias	82.1
83. I Love It (feat. Charli XCX)	Icona Pop	82.0
84. See You Again (feat. Charlie Puth)	Charlie Puth	82.0
85. Hasta el Amanecer	Nicky Jam	82.0
86. Sin Contrato	Maluma	82.0
87. El Perdedor	Maluma	82.0
88. She Drives Me Crazy	Fine Young Cannibals	82.0
89. Say Something	A Great Big World	82.0
90. Cheap Thrills	Sia	81.9
91. Thriller	Michael Jackson	81.9
92. La Bicicleta	Shakira	81.9

93. Total Eclipse of the Heart	Various Artists	81.9
94. Titanium (feat. Sia)	David Guetta	81.8
95. Shape of You	Ed Sheeran	81.8
96. Dile Que Tu Me Quieres	Ozuna	81.8
97. E.T.	Katy Perry	81.8
98. 6 AM	J Balvin	81.8
99. Shaky Shaky	Daddy Yankee	81.8
100. Don't Speak	No Doubt	81.8

artist	max. entries	artist	max. score
1. Avicii	4	1. Axwell \wedge Ingrosso	84.4
2. The Chainsmokers	3	2. Post Malone	84.2
3. Lady Gaga	3	3. Flume	83.4
4. Ed Sheeran	3	4. Camila Cabello	83.3
5. Katy Perry	2	5. Daddy Yankee	82.7
6. Post Malone	2	6. Imagine Dragons	82.5
7. Jonas Blue	2	7. Lou Bega	82.4
8. Justin Bieber	2	8. Ed Sheeran	81.4
9. Imagine Dragons	2	9. Sam Smith	81.3
10. Major Lazer	2	10. Katy Perry	81.2

Table 3: Top-10 artists in terms of maximum entries (left) and maximum score (right) in the list of Top-100 recognized songs in Sweden.

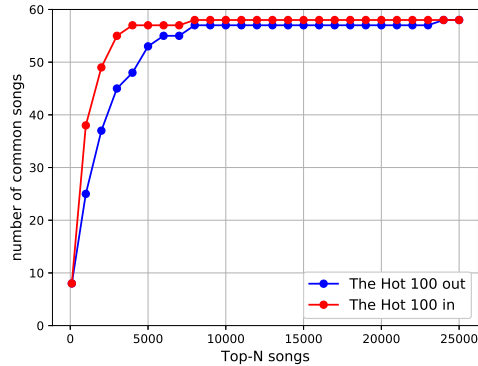
artist	max. entries	artist	max. score
1. Taylor Swift	4	1. Wisin	86.1
2. Charlie Puth	3	2. J Balvin	86.1
3. J Balvin	3	3. Imagine Dragons	86.0
4. Imagine Dragons	3	4. Gucci Mane	85.5
5. Maluma	3	5. Sam Smith	85.5
6. Daddy Yankee	3	6. Alice Merton	85.3
7. Christina Aguilera	3	7. Bee Gees	84.9
8. Player	2	8. Taylor Swift	84.9
9. Flume	2	9. Player	84.8
10. David Guetta	2	10. Post Malone	84.8

Table 4: Top-10 artists in terms of maximum entries (left) and maximum score (right) in the list of Top-100 recognized songs in USA.

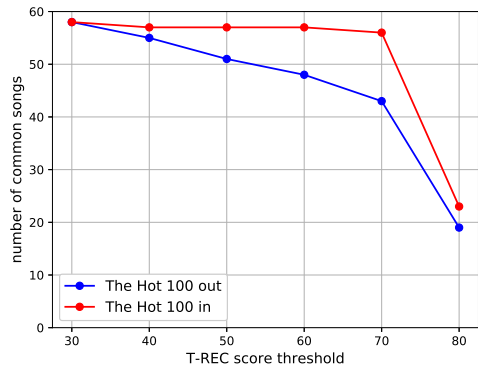
For comparison purposes we use Billboard’s “The Hot 100’s All-Time Top 100 Songs” list¹ where the Top-100 songs of all time, according to Billboard’s “The hot 100” chart, are illustrated. Many of these songs are not included in our songs dataset, thus we compare T-REC’s Top- N list (for $N=100, 1000, 2000, \dots$)

¹<https://www.billboard.com/articles/news/hot-100-turns-60/8468142/hot-100-all-time-biggest-hits-songs-list>

for USA, with the intersection of Billboard’s list and our songs dataset, namely 58 common songs.



(a)



(b)

Figure 1: Number of common songs in T-REC’s Top-N lists for USA and Billboard’s “The Hot 100” Top-100 songs of all time. In (a) the number of listed songs N is specified by the x coordinate, while in (b) the number of listed songs N is the number of songs with T-REC greater than a threshold specified by the x coordinate.

In Figure 1a we present the number of top Billboard songs included in T-REC’s Top-N lists for USA, while in Figure 1b we present the number of top Billboard songs included in T-REC’s Top-N lists for USA, where N is the number of songs with T-REC score greater than a threshold specified by the x coordinate. At this point we should mention that for this specific experiment and the corresponding T-REC computations we also present results where chart data from “The Hot 100” are discarded during computation for comparison legitimacy.

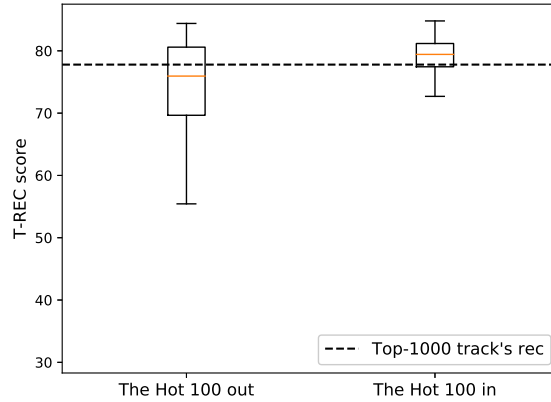


Figure 2: Distribution of T-REC’s scores for Billboard’s top songs with chart data from “The Hot 100” not included (left boxplot) and included (right boxplot) in the computation. The dashed line indicates the T-REC level of the Top-1000 song when “The Hot 100” is not included in the computation.

As expected, T-REC’s values are significantly higher and more concentrated when “The Hot 100” is included in the computations (see Figure 2 for more details). This fact indicates that the criteria for song ranking may vary a lot among different charts. Also, it is remarkable that half of Billboard’s top songs are ranked by T-REC² lower than the 1450th position, which occurs primarily due to lack of “The Hot 100” information and secondarily due to ISRC annotation mismatches in our database.³

²In this calculation we excluded Billboard’s “The Hot 100” chart.

³The main factor for these mismatches is that the same song may have multiple ISRCs, as it can be included in different releases and different countries. In cases that we fail to merge these ISRCs, the estimated T-REC of a song is much lower than the actual, as it does not include all the chart appearances of the song in the calculation.