

# **The Science of One-Hit Wonders**

**Eric Larson**



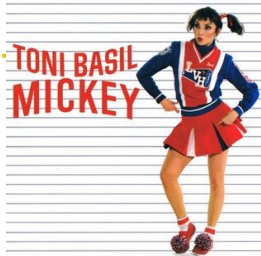
# What's a One-Hit Wonder?



- An artist **known for one song**
  - Technically defined as an artist with only one Billboard top 40 hit song
  - Examples:
    - Come On Eileen by Dexys Midnight Runners (1983)
    - Mambo No. 5 by Lou Bega (1999)
    - Harlem Shake by Baauer (2012)
- Can we predict if a song and artist will be a one-hit wonder?

FOR WEEK ENDING APRIL 23, 1983

Billboard				HOT 100			
<small>Copyright 1983 Billboard Publications, Inc. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher.</small>							
WEEK	LAST	WEEKS ON CHART	TITLE—Artist (Producer) Writer, Label & Number (Distributing Label)	WEEK	LAST	WEEKS ON CHART	TITLE—Artist (Producer) Writer, Label & Number (Distributing Label)
★	2	14	COME ON EILEEN—Dexys Midnight Runners (Cave, Leiper, Alan Winstanley, R. Howard, J. Patterson, & Martin Murray) 14189 (Polygram)	★	38	4	FLASHDANCE... WHAT A FEELING—Mani Mani (George Moroder, J. Farley, I. Carr; Capablanca 811440-7) (Polygram)
★	5	9	BEAT IT—Michael Jackson (Quincy Jones); W. Jackson; Epic 34-03759	★	39	7	STRAIGHT FROM THE HEART—Bryan Adams (Bryan Adams, Bob Clearmountain); Adams, Rogers; A&M 3206
★	3	11	MR. ROBOT—Jay-Z (Roc-A-Fella)	★	35	12	I LIKE IT—Dobrynya (J. Gentry, L. DeGeorge, R. DeGeorge; Gentry 1545) (Motown)



# The Data

## Music Charts

- Weekly and year-end charts from **Billboard**
- An artist's first song to reach the weekly top 40 chart is eligible
- Only looking at songs from 1980 to 2016

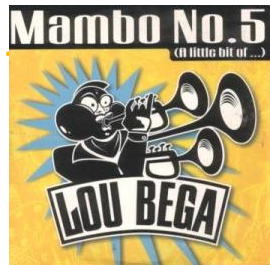
## Song Attributes

- Used **Spotify** API to get calculated song attributes and artists' genres
  - Time signature, danceability, tempo, etc
  - Dance pop, rap, indie rock, etc

## Lyrics & More

- Used **Genius** API to get lyrics and the songs' producers and writers

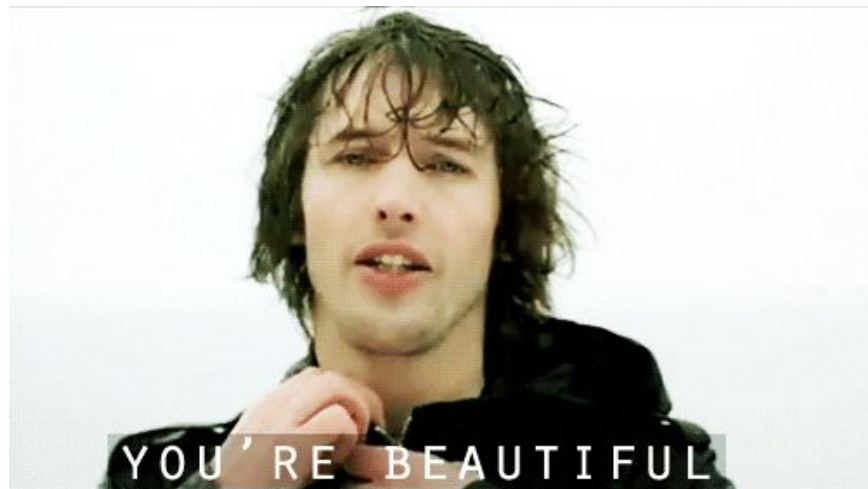
1500 songs, **48%** are one-hit wonders



# Modeling

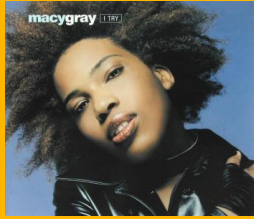
Optimizing F-score, a **neural network** works best followed closely by linear SVM and logistic regression

<b>F-score</b>	<b>0.71</b>
Recall	0.88
Precision	0.60
AUC	0.73
Accuracy	0.66



**Great! So what makes a one-hit wonder a one-hit wonder?**

**Let's find out!**



# Top Predictors

## More likely to be one-hit wonder:

- Another artist is featured

## One-hit wonders:

- American Boy by Estelle ft. Kanye West (2009)
- Latch by Disclosure ft. Sam Smith (2014)





# Top Predictors

## More likely to be one-hit wonder:

- Relatively low peak chart position
- Low score on chart success as defined by:

$$\frac{\text{Weeks on Chart}}{\text{Peak Position}}$$

- **Not a one-hit wonder** (unfortunately)- How You Remind Me by Nickelback (2001)
  - Peaked at number 1, was on chart for 49 weeks
- **One-hit wonder**- C'est La Vie by B\*Witched (1999)
  - Peaked at number 9, was on chart for 15 weeks



# Top Predictors

## More likely to be one-hit wonder:

- Lyrics are more similar to other popular songs at time of release
- **One-hit wonder:** What Is Love, Haddaway (1993)

No, I don't know why you're not there  
I give you my love but you don't care  
So what is right and what is wrong?  
Give me a sign

What is love?  
Oh, baby, don't hurt me  
Don't hurt me no more  
What is love?  
Oh, baby, don't hurt me  
Don't hurt me no more

Whoa, whoa, whoa, whoa, whoa, whoa, uh, uh  
Whoa, whoa, whoa, whoa, whoa, whoa, uh, uh





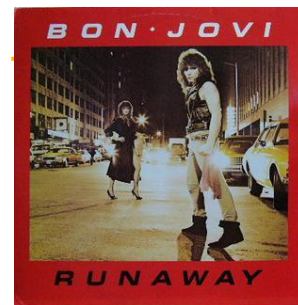
# Top Predictors

- Song with unique lyrics are **less likely** to be a one-hit wonder
- **Not a one-hit wonder:** Runaway, Bon Jovi (1984)

On the street where you live girls talk about their social lives  
They're made of lipstick, plastic and paint, a touch of sable in their eyes  
(All your life) all your life all you've asked when's your daddy gonna talk to you  
But you were living in another world trying to get your message through

No one heard a single word you said  
They should have seen it in your eyes  
What was going around your head

Ooh, she's a little runaway  
Daddy's girl learned fast  
All those things she couldn't say  
Ooh, she's a little runaway



# Top Predictors Summary

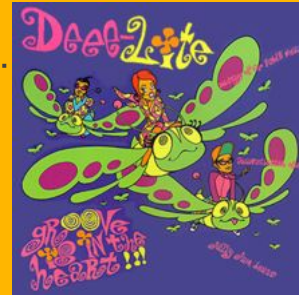


## More likely to be one-hit wonder:

- Another artist is featured
- Worse (relative) performance on chart
- Lyrics are very similar to popular songs at time of release
- Genre is not popular at time of release
- Released in 10s
- Song categorized as R&B
  - Opposite effect for country, hip-hop, and dance



# Thanks for watching!

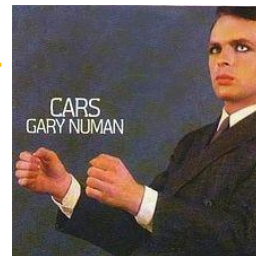


(Eric's favorite one-hit wonder, Groove is in the Heart!)

## Eric Larson

- [elarson649@gmail.com](mailto:elarson649@gmail.com)
- [www.linkedin.com/in/elarson649/](https://www.linkedin.com/in/elarson649/)
- [www.github.com/elarson649](https://www.github.com/elarson649)



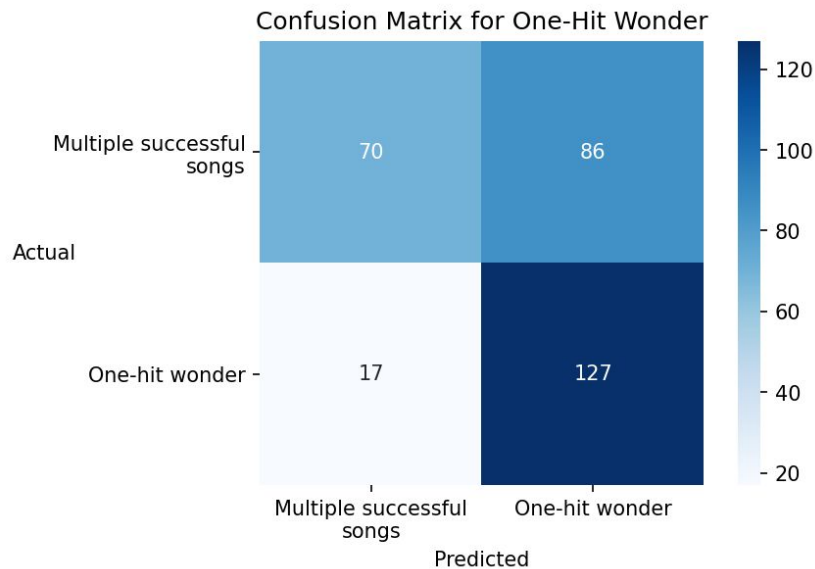


# Appendix: Models

Model	F-Score	AUC
Dummy	0.50	0.00
Baseline Linear Regression	0.65	0.71
Linear Regression (Lasso/Ridge)	0.65	0.73
SVM (Linear)	0.66	0.73
KNN	0.64	0.69
Random Forests	0.64	0.72
XGBoost	0.64	0.72
<b>Neural Net (2 Hidden Layers)</b>	<b>0.66</b>	<b>0.74</b>

\*Metrics from predictions on validation set before threshold tuning

# Appendix: Confusion Matrix



\*From test data on neural network



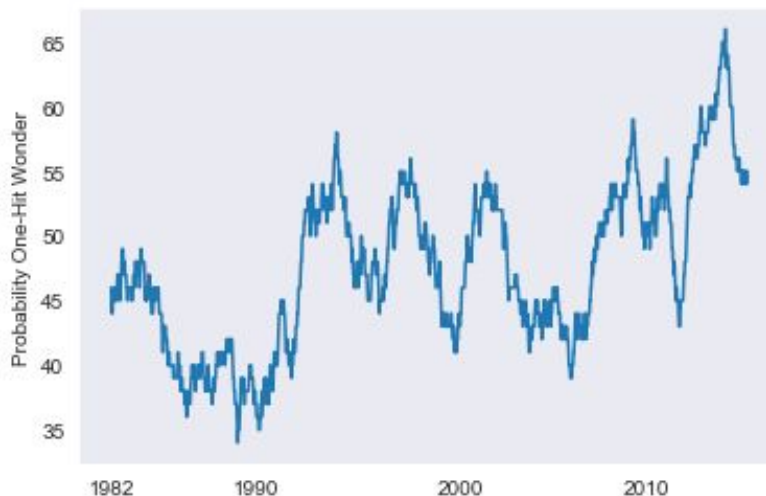
# Appendix: Year as Predictor

**More likely to be one-hit wonder:**

- Released in 10s

**Less likely to be one-hit wonder:**

- Released in 80s





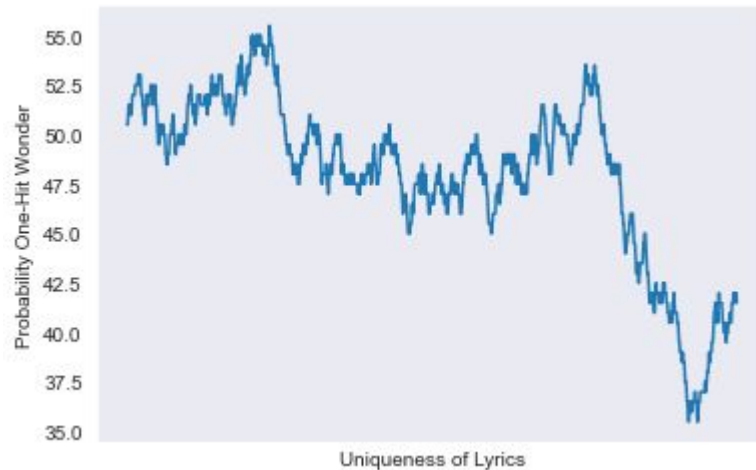
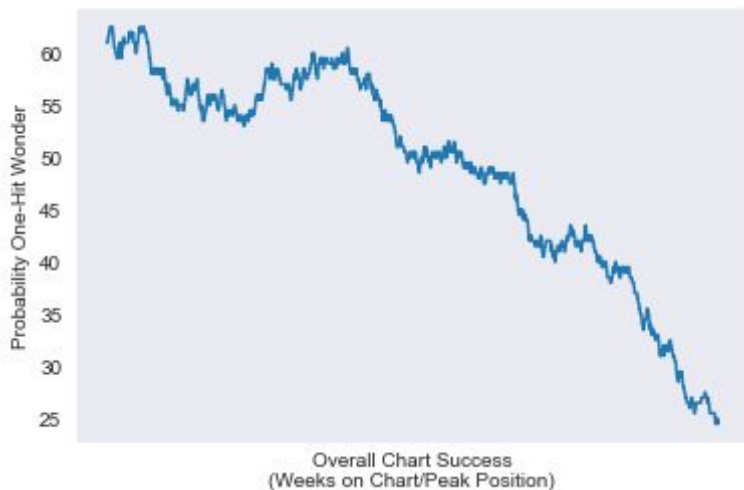
# Appendix: Genre as Predictor

## Less likely to be one-hit wonder:

- Genre is popular at time of release
  - Top songs from the prior year had the same genre
- **One-hit wonder**- Ho Hey, The Lumineers (2012)
  - Folk, Rock. 2 songs in the top 100 from 2011 had similar genres
- **Not a one hit wonder**- Wake Me Up, Avicii (2013)
  - EDM, Pop. 67 songs in the top 100 from 2012 had similar genres



# Appendix: Graphs for Predictors







# Appendix: Future Work

- Include information or build separate model about follow-up single
- Include demographic information (age of artist, nationality, gender, etc)
- Include information about the artist's career prior to the top 40 single
- Get more accurate information from APIs
  - Had to exclude 300+ songs due to mismatches from Genius and/or Spotify API
- Get track specific genres (vs artist)

# Appendix: Data Sources

- Year-end charts via Kaylin Pavlik
- Billboard top 100 charts via Sean Miller

