

# Verification of Zipf's Law in Lady Gaga Lyrics

**Team Pirates of the Caribbean**

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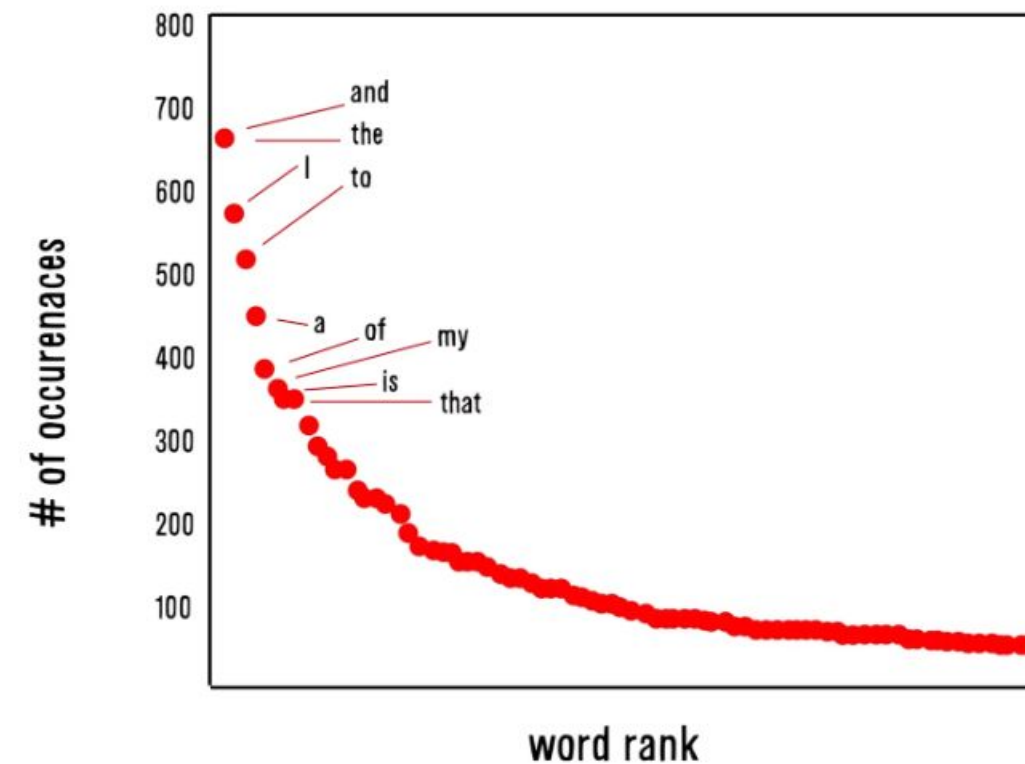
# What is Zipf's Law?

Word frequency  $\sim 1/\text{rank}$

Frequency inversely related to rank

Zipf's Law models natural language word use

word frequency and rank in *Romeo and Juliet* (linear-linear)



# Why Lady Gaga?

## Unique lyric diversity

## Massive pop culture impact

## Rich dataset for analysis





# Data Source & Methodology

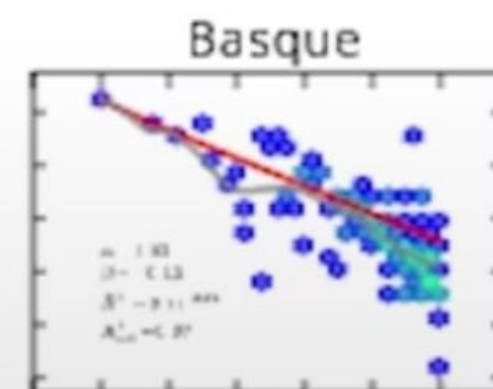
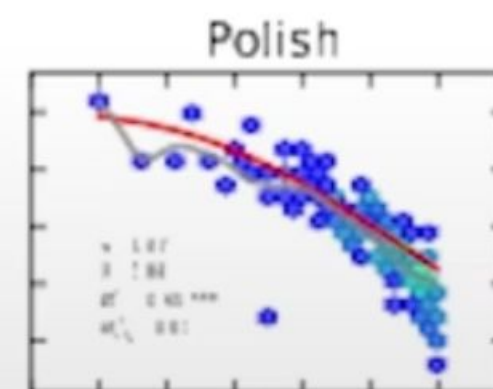
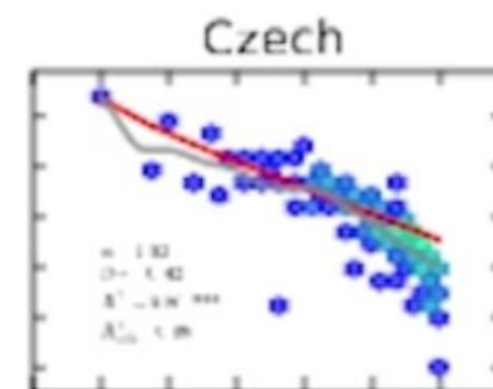
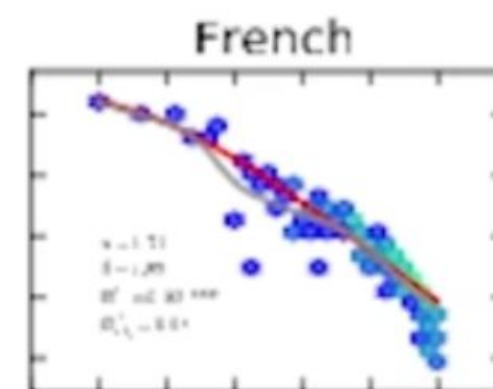
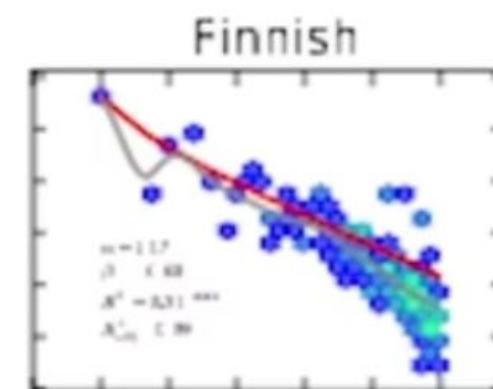
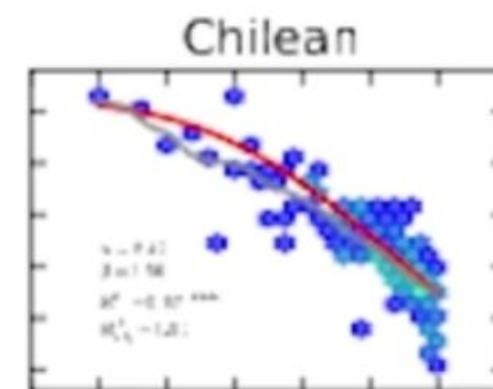
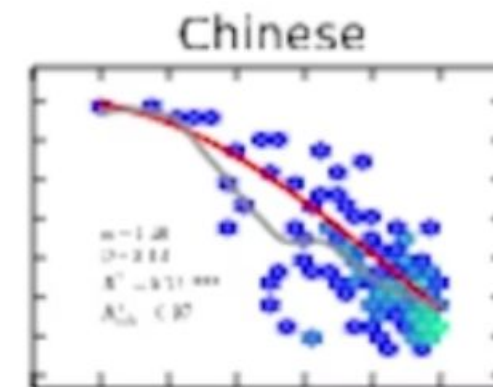
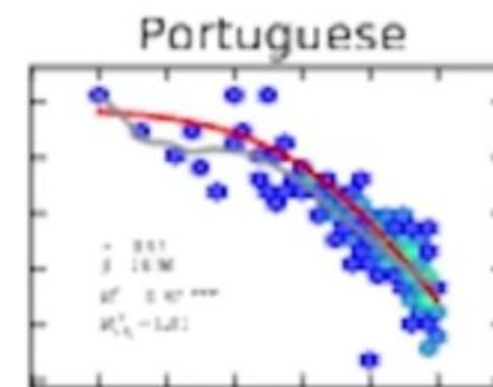
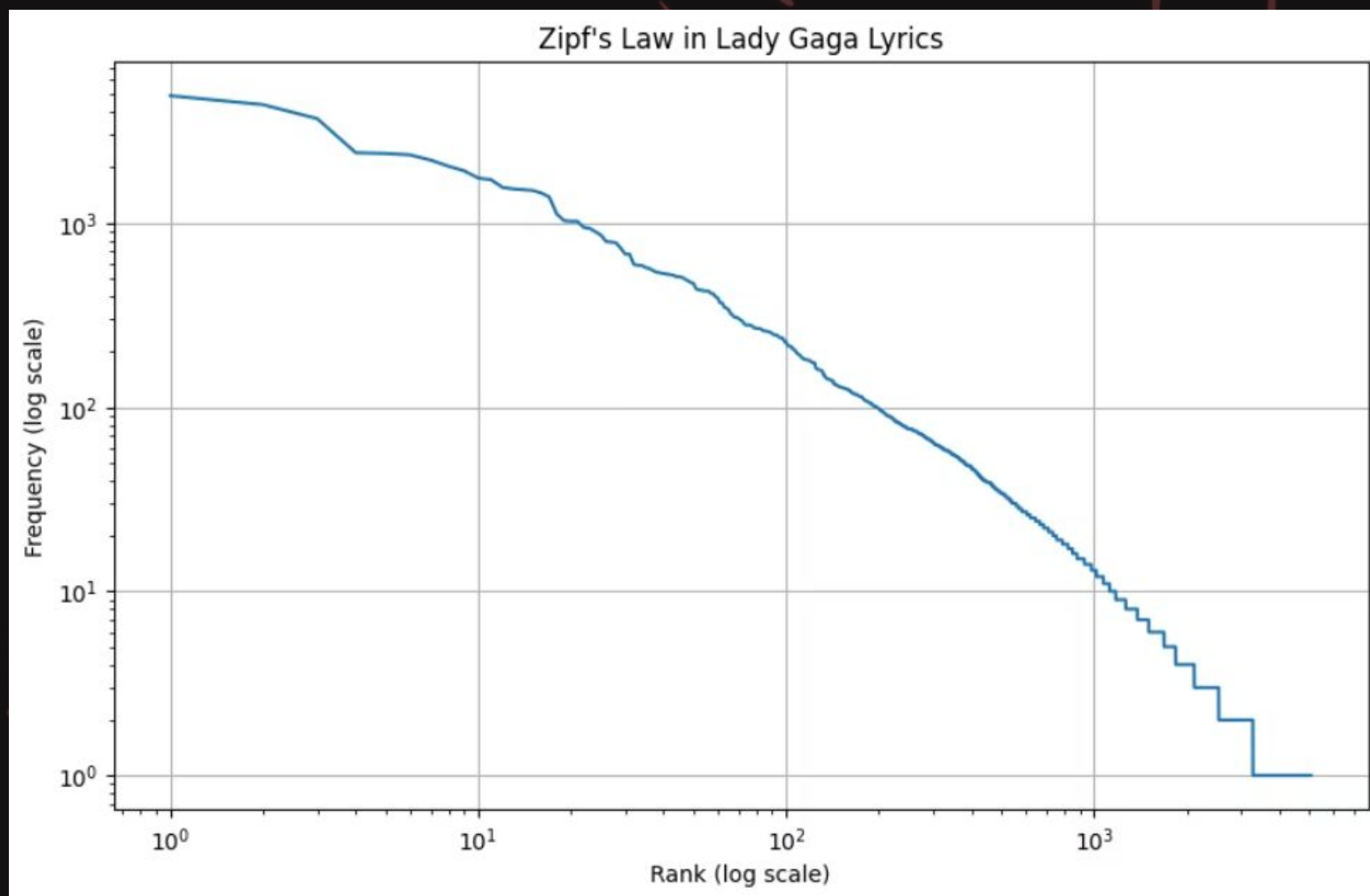
- 20 songs from 2008–2020
- Steps: Scrape → Clean → Analyze
- Python scripting for data cleaning

	B	C	D	E	F	G	H	I	J
	Artist	Title	Album	Year	Date	Lyric			
0	Lady Gaga	Do What U Want	ARTPOP	2013	2013-10-21	lady gaga r kelly yeah oh turn the mic up yeah yeah eh eh eh eh eh e			
1	Lady Gaga	Always Rememt	A Star is Boi	2018	2018-10-05	that arizona sky burnin' in your eyes you look at me and babe i wanna			
2	Lady Gaga	Bad Romance	The Fame M	2009	2009-10-23	ohohohohoh ohohohoh ohohoh caught in a bad romance ohohohohoh			
3	Lady Gaga	Sexxx Dreams	ARTPOP	2013	2013-11-06	last night our lovers' quarrel i was thinking about you hurts more than i			
4	Lady Gaga	I'll Never Love A	A Star is Boi	2018	2018-10-05	wish i could i could've said goodbye i would've said what i wanted to m			
5	Lady Gaga	Poker Face	The Fame	2008	2008-09-26	mum mum mum mah mum mum mum mah mum mum mum mah mur			
6	Lady Gaga	Million Reasons	Joanne	2016	2016-10-05	you're giving me a million reasons to let you go you're giving me a mill			
7	Lady Gaga	G.U.Y.	ARTPOP	2014	2014-03-28	by lady gaga greetings himeros god of sexual desire son of aphrodite			
8	Lady Gaga	911	Chromatica	2020	2020-05-29	turnin' up emotional faders keep repeating selfhating phrases i have h			
9	Lady Gaga	The Cure	Now That's '	2017	2017-04-16	i'll undress you 'cause you're tired cover you as you desire when you f			
10	Lady Gaga	Born This Way	Born This W	2011	2011-02-11	it doesn't matter if you love him or capital him m m m just put your paw			
11	Lady Gaga	Applause	ARTPOP	2013	2013-08-12	i stand here waiting for you to bang the gong to crash the critic saying			
12	Lady Gaga	Venus	ARTPOP	2013	2013-10-27	rocket number nine take off to the planet to the planet venus aphrodite			
13	Lady Gaga	Perfect Illusion	Joanne	2016	2016-09-09	tryin' to get control pressure's takin' its toll stuck in the middle zone i ju			
14	Lady Gaga	Donatella	ARTPOP	2013	2013-11-06	i am so fab check out i'm blonde i'm skinny i'm rich and i'm a little bit o			
15	Lady Gaga	Telephone	The Fame M	2010	2010-01-26	lady gaga hello hello baby you called i can't hear a thing i have got no			
16	Lady Gaga	Aura	ARTPOP	2013	2013-11-06	i killed my former and left her in the trunk on highway 0 put the knife u			
17	Lady Gaga	Babylon	Chromatica	2020	2020-05-29	we only have the weekend you can serve it to me ancientcity style we			
18	Lady Gaga	Gypsy	ARTPOP	2013	2013-11-06	sometimes a story has no end sometimes i think that we could just be			
19	Lady Gaga	Paparazzi	The Fame	2009	2009-07-06	we are the crowd we're ccomin' out got my flash on it's true need that			
20	Lady Gaga	Alice	Chromatica	2020	2020-05-29	my name isn't alice but i'll keep looking i'll keep looking for wonderland			
21	Lady Gaga	Alejandro	The Fame M	2010	2010-04-20	i know that we are young and i know that you may love me but i just ca			
22	Lady Gaga	Stupid Love	Chromatica	2020	2020-02-28	you're the one that i've been waiting for gotta quit this cryin' nobody's g			
23	Lady Gaga	Judas	Born This W	2011	2011-04-15	whoawhoawhoawhoawhoa im in love with judaas judaas whoawhoawh			
24	Lady Gaga	John Wayne	Joanne	2016	2016-10-21	spoken it's like i just love a cowboy you know i'm just like i just i know i			
25	Lady Gaga	Just Dance	The Fame	2008	2008-04-08	lady gaga akon truth redone konvict gaga ohoh eh lady gaga akon i			

# Key Graph: Zipf's Plot

Plot of  $\log(\text{rank})$  against  $\log(\text{frequency})$

Linear trend indicates Zipf's Law



# Thank You!

We appreciate your time and attention. Looking forward to sharing more exciting insights with you.