

# TRENDING VIDEOS

An Analysis of the Factors That Play a Role in YouTube's Trending List

# Opportunity

- Identify relevant videos that will have lasting impact
- Predict how many days a video will trend
- Provide solution for effective advertising on YouTube

## THE GOAL



Create a model to predict  
the number of days a YouTube  
will remain trending

# INDEPENDENT VARIABLES



Number of  
Likes



Number of  
Views



Number of  
Comments



Number of  
Dislikes

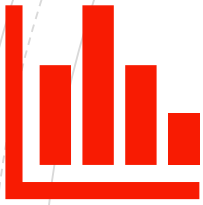


Weekday vs  
weekend

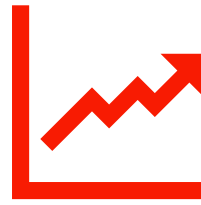


Video Category

# METHODOLOGY



Clean Data in R and  
Excel



Regression Analysis



Parsimony

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	
video_id	trending_title	channel_title	category	publish_time	tags	views	likes	dislikes	comment	thumbnail	comment_ratings	di	video_err	description			
2lv4d6u0h17.14.11	WE WANT Cawehlester	22	2017-11-13T07:59	Music	martin	748374	57527	2966	15954	https://v	FALSE	FALSE	FALSE	SHANTELL'S CHANNEL -	https://www.youtube.com/channel/UCwrti0t		
12APheU17.14.11	The Trumps LastWeekTo	24	2017-11-13T07:18	last week tonight trump		2418781	97185	6146	12703	https://v	FALSE	FALSE	FALSE	One year after the presidential election, John Oliver discusses what w			
5eq93Dg17.14.11	Racial Sup Rudy Mancu	23	2017-11-12T15:34	racist superman	"rudy" i	3191434	146033	5339	8181	https://v	FALSE	FALSE	FALSE	WATCH MY PREVIOUS VIDEO &#x26	https://www.y		
pus9W1E17.14.11	Nickelback Good Mythic	24	2017-11-13T11:46	and i&quot	"gem"	348158	10172	666	2146	https://v	FALSE	FALSE	FALSE	Today we find out if Link is a Nickelback member or a secret Nickelba			
4380moC17.14.11	Dare You nigella	24	2017-11-12T15:34	Erynni "Higa"	"Higuer"	2059731	132235	1989	17518	https://v	FALSE	FALSE	FALSE	I know it's been a while since we did this show, but we're back with a			
g1Q2Gou17.14.11	2 Weeks Vilustine	28	2017-11-13T15:09	ine	week with iPho	115180	9763	511	1434	https://v	FALSE	FALSE	FALSE	Using the iPhone for the past two weeks - here's my thoughts!&quot	r		
39u4yP17.14.11	Roy Moor Saturday Nig	24	2017-11-12T05:04	"Saturday Night Live	2104417	15993	2445	1970	https://v	FALSE	FALSE	FALSE	FALSE	Embattled Alabama Senate candidate Roy Moore (Miley Day) meets			
nc8fuc017.14.11	5 ice Cream CrazySurpr	28	2017-11-12T21:15	ice Cream Gadgets"	"ice	813732	23663	778	3432	https://v	FALSE	FALSE	FALSE	Ice Cream First Combination Lock - http://amzn.to/2ACp0e1&quot	ice		
9y90KwC17.14.11	The Great 20th Centur	1	2017-11-13T14:34	Trailer	"Hugh Jackman"	826059	3543	119	340	https://v	FALSE	FALSE	FALSE	Inspired by the imagination of P.T. Barnum, The Greatest Showman is			
1Tumygc17.14.11	Why the r Vios	25	2017-11-13T13:00	com	"we"	256426	12654	1363	2368	https://v	FALSE	FALSE	FALSE	For now, at least, we have better things to worry about.&quot	hly/yfdu&quot		
7wQdGPN17.14.11	Dion Lowi NFL	17	2017-11-13T02:04	"Football"	"offense"	81377	655	25	177	https://v	FALSE	FALSE	FALSE	New England Patriots returner Dion Lewis blasts off for an amazing ki			
VfQd8EA17.14.11	15POLERS AMC	24	2017-11-13T03:18	The Walking Dead"	"show"	104578	1576	303	1279	https://v	FALSE	FALSE	FALSE	Shiva arrives just in time as King Ezekiel attempts to take out an army			
5E4Z85w17.14.11	Marshmello marshmello	10	2017-11-13T17:17	marshmello's	"blocks"	1'm	687582	114188	1333	8371	https://v	FALSE	FALSE	FALSE	WATCH SILENCE MUSIC VIDEO &#x26	https://youtu.be/Tx1sqfC3q&quot;v&quot	
Gp9m6517.14.11	Which Car NewThs Wo	25	2017-11-12T14:06	newth's	"world"	544770	7848	1171	3982	https://v	FALSE	FALSE	FALSE	The world at large is improving, but some countries and their govern			
TaTeoKc17.14.11	SHOPPINGThe King of	15	2017-11-12T15:08	shopping for new fish"	"in	207532	7473	246	2120	https://v	FALSE	FALSE	FALSE	Today we go shopping for new fish for some of the aquariums. I want			
lgo045y17.14.11	The New BostonDyna	28	2017-11-13T20:03	Robots"	Boston Dynamic	79752	9419	52	1230	https://v	FALSE	FALSE	FALSE	For more information . . . stay tuned.			
2AGz-v017.14.11	One Chan Crieded	23	2017-11-12T17:34	pacific rim	"rim"	295639	8011	638	1256	https://v	FALSE	FALSE	FALSE	Pacific Rim was so good, we can&quot	believe they didn&quot		
VYyHf6m17.14.11	How does TED Ed	27	2017-11-13T16:10	"TED Ed"	"TED Ed"	78044	5398	53	385	https://v	FALSE	FALSE	FALSE	Check out our Patreon page: https://www.patreon.com/hedded/v&quot	u/v&quot		
en50Mqet17.14.11	HomeMac PeterSripol	28	2017-11-13T15:09	airplane"	"The	97007	11963	36	2211	https://v	FALSE	FALSE	FALSE	aaaaaand now to fly out of ground effect! The homemade airplane d			
85u4MRAN17.14.11	Founding SciShow	27	2017-11-12T22:36	show	"science"	"hand	222871	8421	191	1214	https://v	FALSE	FALSE	FALSE	Thanks to 23&quot	Me for supporting SciShow. These kits make great gif	
u14L8Yh17.14.11	How Can I Life Reggin	27	2017-11-13T14:06	reggin"	"Life reggin y"	115791	9586	75	2800	https://v	FALSE	FALSE	FALSE	What if there was a way to control your dreams? Let's discuss lucid d			
6Vhu_14417.14.11	The Makin Teased	28	2017-11-12T15:09	teased"	"testadom"	"de	224019	3585	138	208	https://v	FALSE	FALSE	FALSE	At this year's DesignerCon, we meet up with Ironhead Studio, the cos		
-e0Hwbb17.14.11	h R Dengi Tom Scott	27	2017-11-13T16:00	scott	"TomScott"	"b	144418	11758	89	1014	https://v	FALSE	FALSE	FALSE	I'm visiting the University of Iowa's National Advanced Driving Simula		
hRTZ2Zu17.14.11	What S4J Refney919	26	2017-11-13T16:00	refney919"	"refney919"	149921	1707	578	613	https://v	FALSE	FALSE	FALSE	On this episode of Sweet D&quot	igs, we tour Social Media Editor, Ally Hicks		
U68ZJ_017.14.11	Using Oth Gus Johnson	23	2017-11-13T14:06	using other peoples sho		33980	4884	52	234	https://v	FALSE	FALSE	FALSE	Why is it so hard to figure out other people's showers?&quot	Please subs		
qPpZNY17.14.11	SPAGETTHealthyLunk	24	2017-11-12T14:06	spaghetti burrito"	"div bu	228077	8676	193	1392	https://v	FALSE	FALSE	FALSE	Visit http://www.Bongolov&quot	brand.com/yand get 20% using the coupon		
6v9pN817.14.11	78557 an Numberphili	28	2017-11-13T12:00	numberphili	"prime num	80705	4687	41	437	https://v	FALSE	FALSE	FALSE	James Grime is back and talking prime numbers!&quot	Check out Brilliant.		
qWVqZ17.14.11	A Smart... JerryRigEver	26	2017-11-13T15:09	smart mag"	"Heated the	120727	9033	224	1346	https://v	FALSE	FALSE	FALSE	YouTubes new channel! https://www.youtube.com/unsub&quot	for the		
ixj3N3_17.14.11	LeBron Ja Cleveland Ca	25	2017-11-13T15:09	lebron-jordan-auth		27943	156	36	83	https://v	FALSE	FALSE	FALSE	LeBron James gave another all-time press conference in New York			
n8505Cw17.14.11	Nick And&quotPaerynCove	1	2013-09-29T13:00	theats and geeks"	"jason i	50943	715	238	246	https://v	FALSE	FALSE	FALSE	The opening of Freaks and Geeks episode 6, I'm With The Band			
U0AGQ17.14.11	TODK Thig overlad	2	2017-11-13T05:04	com&quot	"ben&quotberghin mi	98378	4035	495	486	https://v	FALSE	FALSE	FALSE	Finally took the Mura to Carmax! Hope you enjoyed!&quot	Yehdale sure to		
CRV8G_17.14.11	Amazon CAmazon.co.u	24	2017-11-06T17:00	Amazon	Christo	26000	119	69	0	https://v	TRUE	FALSE	FALSE	Shhhh. See how Amazon helps Dad create a magical Christmas to			
r1WqP17.14.11	Eminem - EminemVEV	10	2017-11-10T13:00	eminem"	"Walk"	"On"	1,76,407	787419	43420	15982	https://v	FALSE	FALSE	FALSE	Eminem's new track Walk on Water ft. Beyonc&quot	is available everyw	
h7u4lq17.14.11	What's in office401	24	2017-11-12T12:00	detective"	"office"	"I"	67661	3781	84	626	https://v	FALSE	FALSE	FALSE	Intro Song: Dion Timmer - Lost in the End Song: Skip & Slur - Old D&quot	ivide	
p2huy17.14.11	New Emir Emirates	19	2017-11-12T15:09	Emirates"	"First Class"	141148	1661	70	236	https://v	FALSE	FALSE	FALSE	We are changing the game in First Class travel. Inspired by @Mr			
0mN2vU17.14.11	Me O Cas Nobrand	22	2017-04-21T06:00	"cas"	"that"	"hgg	98966	2486	184	532	https://v	FALSE	FALSE	FALSE	Kittens come out of the eggs in a Thai commercial&quot	ly/yfhe&quot;lad&quot	
Om_06N17.14.11	TLDW - E Screen Junki	1	2017-11-13T16:00	screen junk		288922	7515	792	211	https://v	FALSE	FALSE	FALSE	With Justice League approaching fast we watched all four movies in			
u_7m1n17.14.11	Hunter H Hunter Hays	10	2017-11-13T15:09	"Hays"	"You sh	13917	1318	24	76	https://v	FALSE	FALSE	FALSE	You Should Be Loved (feat. The Shadow&quot	Boxers) Available Now!&quot		
06u&quot;17.14.11	06u&quot;17.14.11	06u&quot;17.14.11	06u&quot;17.14.11	06u&quot;17.14.11	06u&quot;17.14.11	06u&quot;17.14.11	06u&quot;17.14.11	06u&quot;17.14.11	06u&quot;17.14.11	06u&quot;17.14.11	06u&quot;17.14.11	06u&quot;17.14.11	06u&quot;17.14.11	06u&quot;17.14.11	06u&quot;17.14.11	06u&quot;17.14.11	

## Original Data

```
dftmp <- df
dftmp <- group_by(dftmp, title, channel_title, category_id, publish_date)
dftmp <- summarize(dftmp,
  total_trend_time = max(trending_date) - min(trending_date) + 1,
  time_to_trend = min(min(trending_date) - min(publish_date)),
  days_spent_trending = n(),
  views_fd = min(views),
  likes_fd = min(likes),
  dislikes_fd = min(dislikes),
  comment_count_fd = min(comment_count))
```

## Cleaning in R

	A	B	C	D	E	F	G	H
1	category_	days_sper	views_fd	likes_fd	dislikes_fc	comment_	weekday_	weekend
2	22	13	661775	0	0	0	0	
3	26	11	745936	0	0	0	0	
4	22	10	2.1E+07	0	0	0	1	
5	24	9	1687984	0	0	0	0	
6	28	9	593426	0	0	0	1	
7	10	8	867588	0	0	0	0	
8	1	7	15058	0	0	0	0	
9	17	6	19333	0	0	0	0	
10	24	6	281860	0	0	0	1	
11	28	6	269906	0	0	0	0	
12	17	6	110404	0	0	0	0	
13	22	5	14376	0	0	0	0	
14	1	4	82977	0	0	0	0	
15	24	4	3560	0	0	0	0	
16	29	4	1456	0	0	0	0	
17	10	3	3598220	0	0	0	0	
18	17	2	2197	0	2	0	1	
19	22	1	2259	0	0	0	0	
20	24	1	59606	0	0	0	1	
21	25	1	22690	0	0	0	0	
22	17	1	139068	0	0	0	0	

## Final Model

$$\text{Days Trending} = 5.98 + 2.72\text{E-}07(\text{First Day Views}) + 3.80\text{E-}06(\text{First Day Likes}) - 1.11\text{E-}05(\text{First Day Dislikes})$$

- + 10,000,000 views predicts 2.72 more days trending
- + 1,000,000 likes predicts 3.80 more days trending
- + 100,000 dislikes predicts 1.11 less days trending

# Evaluating the Fit



**Coefficients  
significantly  
different than 0**



**Logical coefficients  
and intercept**



**Randomly dispersed  
residuals per  
variable**



**Residuals not  
normally distributed**



**Standard error >10%  
average days  
trending**



**Low adjusted R  
squared value .035**



Regression  
Model with Video  
Category

$$\begin{aligned}\text{Days Trending} = & 5.91 + 1.30(\text{Category 10}) \\ & + 8.35\text{E-}01(\text{Category 26}) \\ & + 1.79\text{E-}07(\text{First Day Views}) \\ & + 5.03\text{E-}06(\text{First Day Likes}) \\ & - 1.62\text{E-}05(\text{First Day Comments})\end{aligned}$$

# Optimization

- Application for Tippie Ads Agency

Tippie Ads,  
a Youtube advertising  
agency, is deciding how  
many ads to place in some  
categories of YouTube.  
The goal is to maximize  
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## ■ Constraints

	Entertainment	Music	Comedy	Sports
Expected Exposure	500,000	420,000	170,000	120,000
Cost/Ads	\$8,000	\$7,000	\$3,000	\$2,000

- At least 8 ads should be placed in Entertainment.
- No more than 5 ads should be placed in Comedy.
- The number of ads in Entertainment and Comedy should be less than that of Music and Sports
- A total of at most 80 ads can be placed.
- Tippie Ads budgeted a maximum of \$500,000 for the ads.

Make a Decision



# Optimization Example



Optimization Example

## Tippie Ads Agency Ltd. Advertising Plan

	Entertain.	Music	Comedy	Sports	Limits
Entertain. Ads	1	0	0	0	8
Sports Ads	0	0	0	1	5
Ads Balance	1	-1	1	-1	0
Total Ads	1	1	1	1	80
Costs(\$1,000s)	8	7	3	2	500
Exposures (1,000s)	500	420	170	120	

Ads to Place



### Constraints

	LHS	Sign	RHS
Entertain. Ads	0	$\geq$	8
Sports Ads	0	$\leq$	5
Ads Balance	0	$\leq$	0
Total Ads	0	$\leq$	80
Costs(\$1,000s)	0	$\leq$	500

### Objective

Total Exposures  
Maximize



# Optimization Result

## Tippie Ads Agency Ltd. Advertising Plan

	Entertain.	Music	Comedy	Sports	Limits
Entertain. Ads	1	0	0	0	8
Sports Ads	0	0	0	1	5
Ads Balance	1	-1	1	-1	0
Total Ads	1	1	1	1	80
Costs(\$1,000s)	8	7	3	2	500
Exposures (1,000s)	500	420	170	120	

Ads to Place

35	30	0	5
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### Constraints

	LHS	Sign	RHS
Entertain. Ads	35	>=	8
Sports Ads	5	<=	5
Ads Balance	0	<=	0
Total Ads	70	<=	80
Costs(\$1,000s)	500	<=	500

### Objective

Total Exposures  
Maximize

30,700
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# Simulation

- Application for Tippie Ads Agency

[illegible]

- Since clients want to pay for truly viewed Ads, the time for watched is main concern for Tippie Ads Agency.
- According to Tippie's experience, customers can be classified into two different groups, with-in 10 seconds view (Group1) and more than 10 seconds delay (Group2).
- Tippie knows the probability of any new customer belonging to Group1 is 70% and belonging to Group2 is 30%. The average view time of Group1 customers is normally distributed with a mean of 5 seconds and a standard deviation of 3 seconds. The average view time of Group2 customers is normally distributed with a mean of 25 seconds and a standard deviation of 8 seconds.
- There would be 1,000 new customers this month and Tippie will estimate the overall average view time for these 1,000 customers.



# Simulation Example



Simulation Example

## Tippie Ads Agency Ltd. Advertised time

### Historical Data

Group1

Average view time:	5
Stdev of view time:	3
Probability	70%

Group2

Average view time:	25
Stdev of view time:	8
Probability	30%

### Simulation

Average View Time 11.36

Customer	Random Number	Group ID	Predicted Delay Time
1	0.851872553	2	25
2	0.300075196	1	5
3	0.382456465	1	5
999	0.271293846	1	5
1000	0.680417508	1	5

# Recommendations

- For effective YouTube advertising, examine:
  - Likes
  - Views
  - Dislikes
  - Video category

# Limitations and Future Considerations

## Limitations

- Low standard error
- Low adjusted R square
- Excel processing power: Video category

## Future analysis

- Additional variables: Duration of video, text analysis (title, description, tags), channel history (Performance, subscriber count)