

# Good, Great, Excellent Quality Reviews of Amazon Electronics

*J. Garrecht Metzger*

(Metis Winter Cohort 2021)

# Inspiration for study?

- Amazon organizes its own categories of Electronics

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- Amazon organizes its own categories of Electronics
  - What might unsupervised Natural Language Processing tell us about how reviews *discuss* actual electronics products Amazon sells?

# Inspiration for study?

- Amazon organizes its own categories of Electronics
  - What might unsupervised Natural Language Processing tell us about how reviews *discuss* actual electronics products Amazon sells?
- Can this help the User Experience?

## Wi-Fi 6 is here

All-new  
eero 6



Hi, John

Customer since 2006

Your recent order



[See your orders](#)

### Recently viewed



Today

[Edit your browsing history](#)

### Celebrate Black History Makers



Buy Black



TV & Film



Books



Music

[See more](#)

Video: Recommended for you ON ORIGINAL

Tom Clancy's Jack Ryan - Season 1

Chrome

File

Edit

View

History

JupyterLab

amazon.com/ref=nav\_logo

Apps

Gmail

Calander

GH/OnL\_C

amazon prime

Deliver to John

Petaluma 94954

All

Buy Again

Prime Video

Prime

Appliances

Apps & Games

Arts, Crafts & Sewing

Automotive Parts & Accessories

Baby

Beauty & Personal Care

Books

CDs & Vinyl

Cell Phones & Accessories

Clothing, Shoes & Jewelry

Women

Men

Girls

Boys

Baby

Under \$10

Amazon Explore

Collectibles & Fine Art

Computers

Courses

Credit and Payment Cards

Digital Educational Resources

Digital Music

Electronics

Garden & Outdoor

Gift Cards

Grocery & Gourmet Food

Handmade

Health, Household & Baby Care

Home & Business Services

Home & Kitchen

Industrial & Scientific

Just for Prime

Kindle Store

Luggage & Travel Gear

Magazine Subscriptions

Movies & TV

Musical Instruments

Office Products

Pet Supplies

Premium Beauty

Hi, John

Customer since 2006

Your recent order

Sharpie

12

See your orders

Video: Recommended for

Tom Clancy's Jack Ryan - Season 1

Help

Create a Column Based on a C

Amazon.com: Online Shopping

heatSheet

Treehouse

Python - ATBS

Codewars

Canvas

Exp Arduino

Other Bookmarks

Update

Search

Hello, John

Account & Lists

Returns & Orders

Cart

on.com

Browsing History

Gift Cards

Best Sellers

Today's Deals

Whole Foods

Find a Gift

Florida Georgia Line Live

Thurs, Feb 25 5 PM PT

amazon music

viewed

Today

ing history

AL

Celebrate Black History Makers

Buy Black

TV & Film

Books

Music

See more

# Apple Watch Series 6

The future of health is on your wrist.

SHOP NOW ►

Categories!!



## Department

### Electronics

- Accessories & Supplies
- Camera & Photo
- Car & Vehicle Electronics
- Cell Phones & Accessories
- Computers & Accessories
- Electronics Warranties
- GPS, Finders & Accessories
- Headphones
- Home Audio
- Office Electronics
- Portable Audio & Video
- Security & Surveillance
- Service Plans

## Shop by Category



Computers  
& Accessories



TV & Video



Cell Phones  
& Accessories



Photography  
& Videography



Home Audio



Amazon Devices



1

# Apple Watch Series 6

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- Security & Surveillance
- Service Plans
- Television & Video
- Video Game Consoles & Accessories
- Video Projectors
- Wearable Technology
- eBook Readers & Accessories
- Household Batteries, Chargers & Accessories
- Power Accessories

Amazon Prime

## Shop by Category



Computers & Accessories



TV & Video



Cell Phones & Accessories



Photography & Videography



Home Audio



Amazon Devices



Headphones



Office Electronics



Office Supplies



Smart Home



Musical Instruments



Video Games

## Noise cancelling earbuds

The world fades. Your music shines.



1



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## Categories!

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- Accessories & Supplies
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- Security & Surveillance
- Service Plans
- Television & Video
- Video Game Consoles & Accessories
- Video Projectors
- Wearable Technology
- eBook Readers & Accessories
- Household Batteries, Chargers & Accessories
- Power Accessories

Amazon Prime

### Shop by Category



Computers & Accessories



TV & Video



Cell Phones & Accessories



Photography & Videography



Home Audio



Amazon Devices



Headphones



Office Electronics



Office Supplies



Smart Home



Musical Instruments



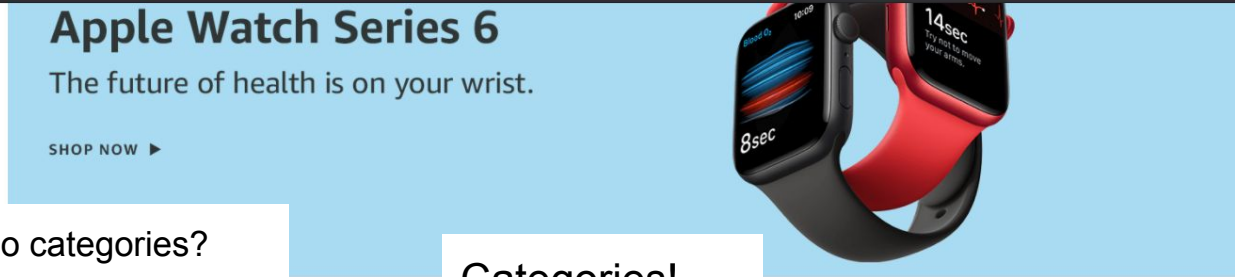
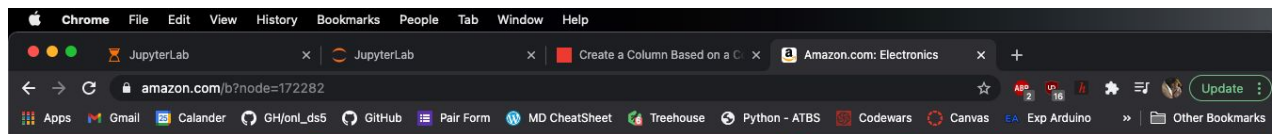
Video Games

## Noise cancelling earbuds

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1



Also categories?

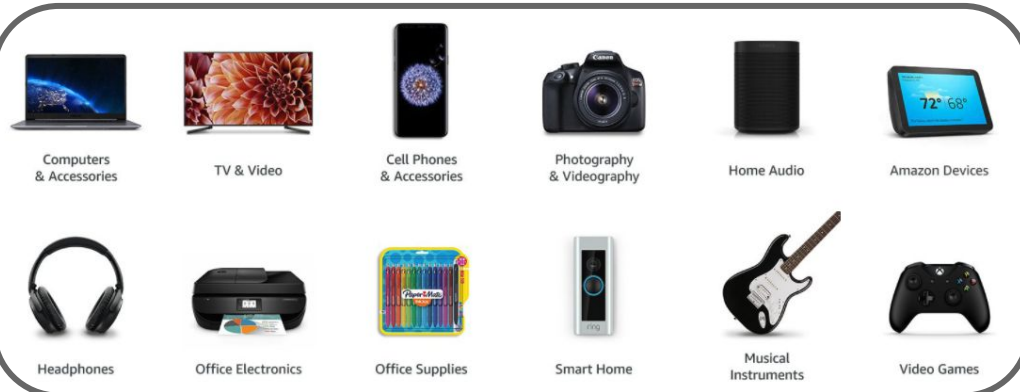
Categories!

#### Department

##### Electronics

- Accessories & Supplies
- Camera & Photo
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- Computers & Accessories
- Electronics Warranties
- GPS, Finders & Accessories
- Headphones
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- Television & Video
- Video Game Consoles & Accessories
- Video Projectors
- Wearable Technology
- eBook Readers & Accessories
- Household Batteries, Chargers & Accessories
- Power Accessories

#### Shop by Category



Noise cancelling  
earbuds

The world fades. Your music shines.



# Stats

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- Power Accessories

Amazon Prime

## Shop by Category



Computers & Accessories



TV & Video



Cell Phones & Accessories



Photography & Videography



Home Audio



Amazon Devices



Headphones



Office Electronics



Office Supplies



Smart Home



Musical Instruments



Video Games

## Noise cancelling earbuds

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# Stats

- 20,004,353 Reviews

## Department

### Electronics

Accessories & Supplies  
Camera & Photo  
Car & Vehicle Electronics  
Cell Phones & Accessories  
Computers & Accessories  
Electronics Warranties  
GPS, Finders & Accessories  
Headphones  
Home Audio  
Office Electronics  
Portable Audio & Video  
Security & Surveillance  
Service Plans  
Television & Video  
Video Game Consoles & Accessories  
Video Projectors  
Wearable Technology  
eBook Readers & Accessories  
Household Batteries, Chargers & Accessories  
Power Accessories

Amazon Prime

## Shop by Category



Computers & Accessories



TV & Video



Cell Phones & Accessories



Photography & Videography



Home Audio



Amazon Devices



Headphones



Office Electronics



Office Supplies



Smart Home



Musical Instruments



Video Games

## Noise cancelling earbuds

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# Stats

- 20,004,353 Reviews
- 786,868 Products

## Department

### Electronics

Accessories & Supplies  
Camera & Photo  
Car & Vehicle Electronics  
Cell Phones & Accessories  
Computers & Accessories  
Electronics Warranties  
GPS, Finders & Accessories  
Headphones  
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## Shop by Category



Computers & Accessories



TV & Video



Cell Phones & Accessories



Photography & Videography



Home Audio



Amazon Devices



Headphones



Office Electronics



Office Supplies



Smart Home



Musical Instruments



Video Games

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# Stats

- 20,004,353 Reviews
- 786,868 Products
- May 1996-Oct 2018

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## Shop by Category



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TV & Video



Cell Phones & Accessories



Photography & Videography



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Amazon Devices



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Office Electronics



Office Supplies



Smart Home



Musical Instruments



Video Games

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# Stats

- 20,004,353 Reviews
- 786,868 Products
- May 1996-Oct 2018
- *Subsample*
  - 67,396 Reviews

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Computers & Accessories  
Electronics Warranties  
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Home Audio



Amazon Devices



Headphones



Office Electronics



Office Supplies



Smart Home



Musical Instruments



Video Games

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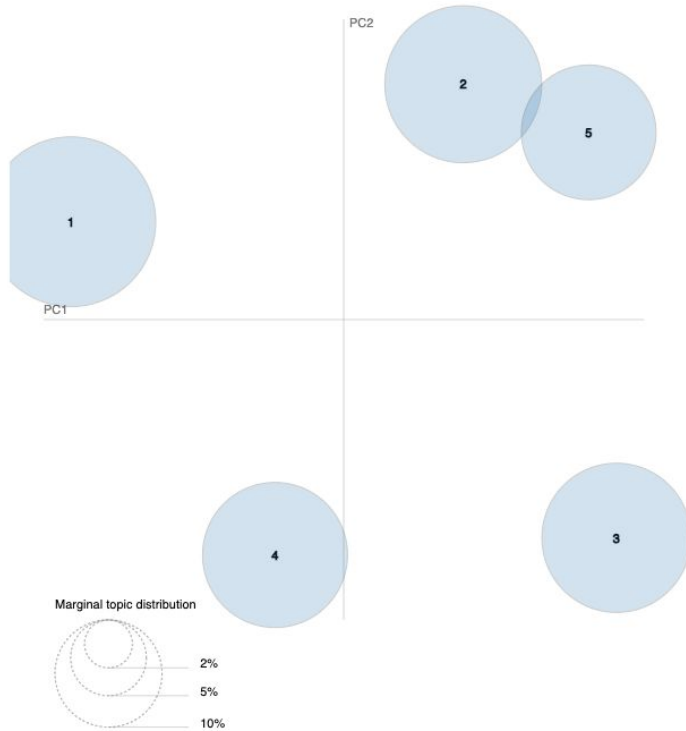
# Topic Modeling Time



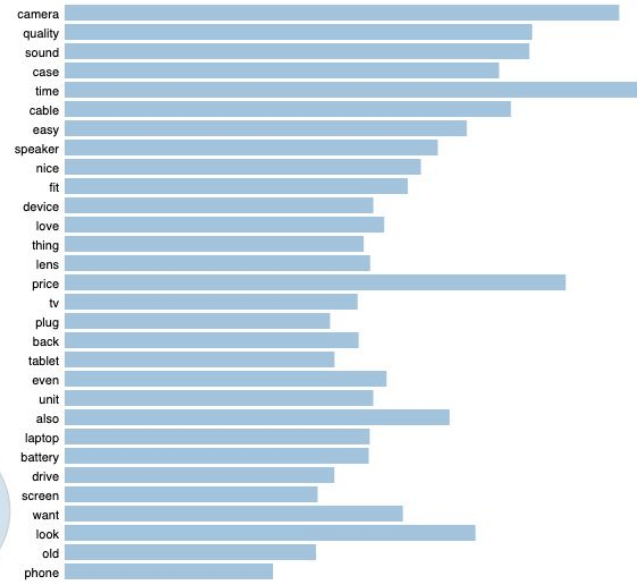
# Topic Modeling Time

*Latent Dirichlet Analysis (LDA)*

Intertopic Distance Map (via multidimensional scaling)



Top-30 Most Salient Terms<sup>1</sup>



Overall term frequency

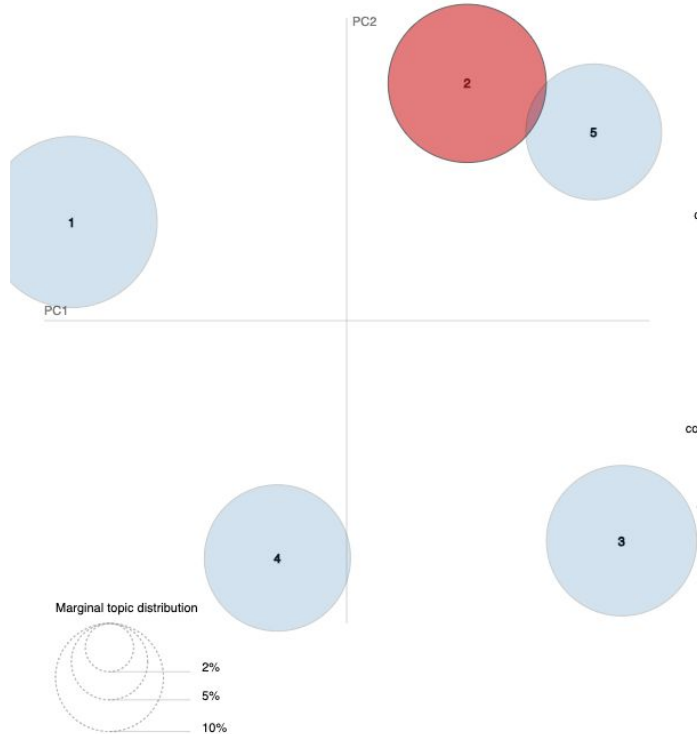
Estimated term frequency within the selected topic

1.  $saliency(term\ w) = frequency(w) * [\sum_t p(t|w) * \log(p(t|w)/p(t))]$  for topics  $t$ ; see Chuang et. al (2012)

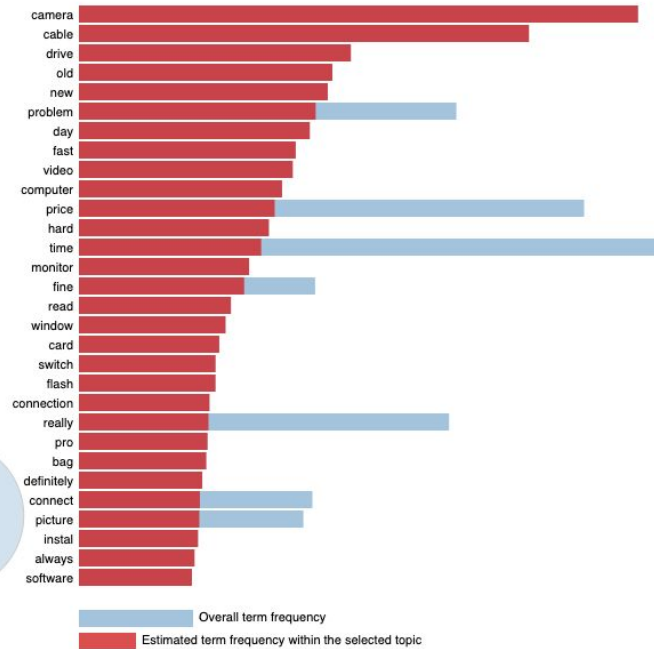
2.  $relevance(term\ w\ | \ topic\ t) = \lambda * p(w|t) + (1 - \lambda) * p(w|t)/p(w)$ ; see Sievert & Shirley (2014)

# Camera

Intertopic Distance Map (via multidimensional scaling)



Top-30 Most Relevant Terms for Topic 2 (21.4% of tokens)

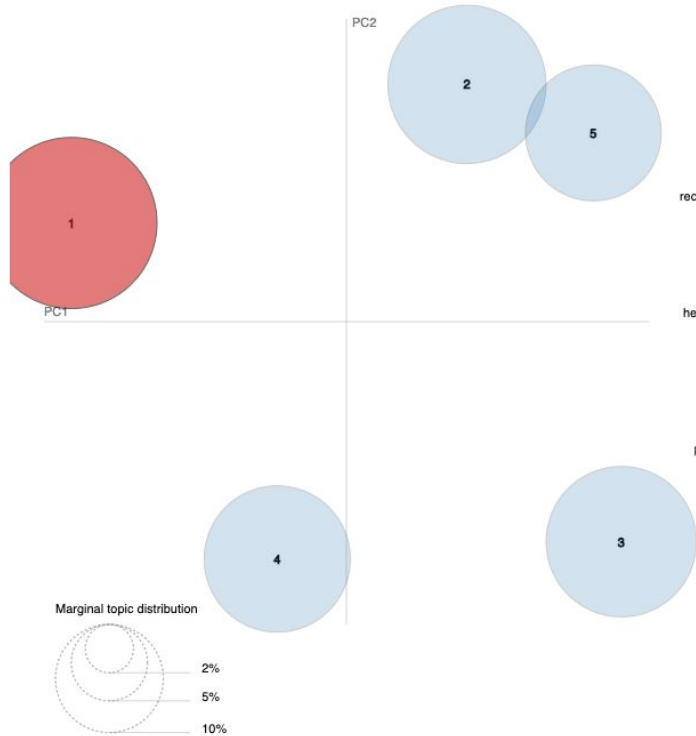


1. saliency(term  $w$ ) = frequency( $w$ ) \*  $\sum_t p(t | w) * \log(p(t | w)/p(t))$  for topics  $t$ ; see Chuang et. al (2012)

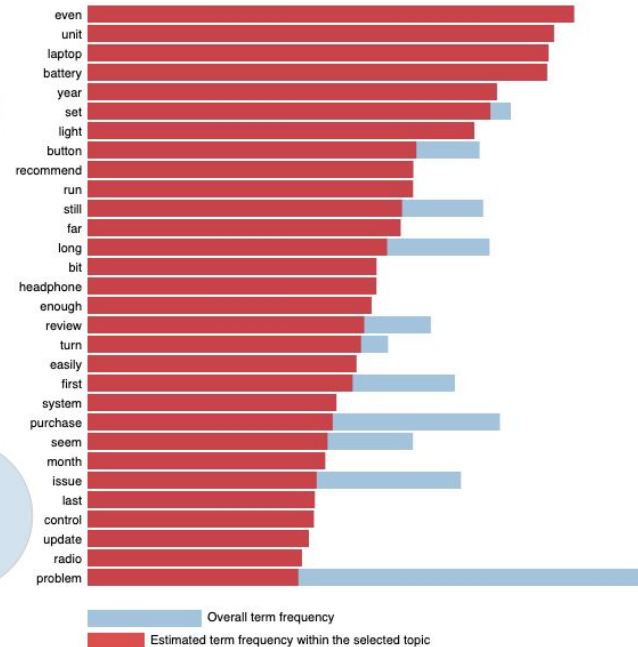
2. relevance(term  $w$  | topic  $t$ ) =  $\lambda * p(w | t) + (1 - \lambda) * p(w | t)/p(w)$ ; see Sievert & Shirley (2014)

# Laptop

Intertopic Distance Map (via multidimensional scaling)



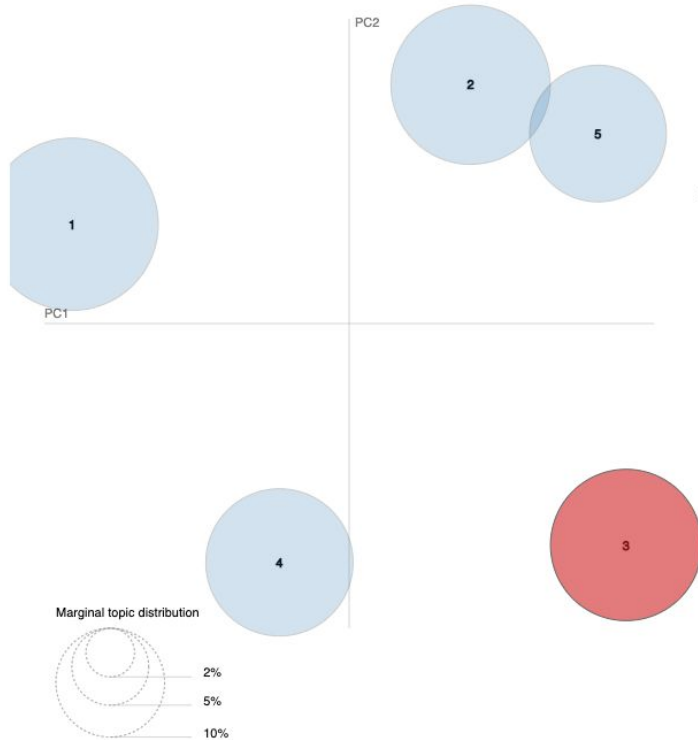
Top-30 Most Relevant Terms for Topic 1 (25.1% of tokens)



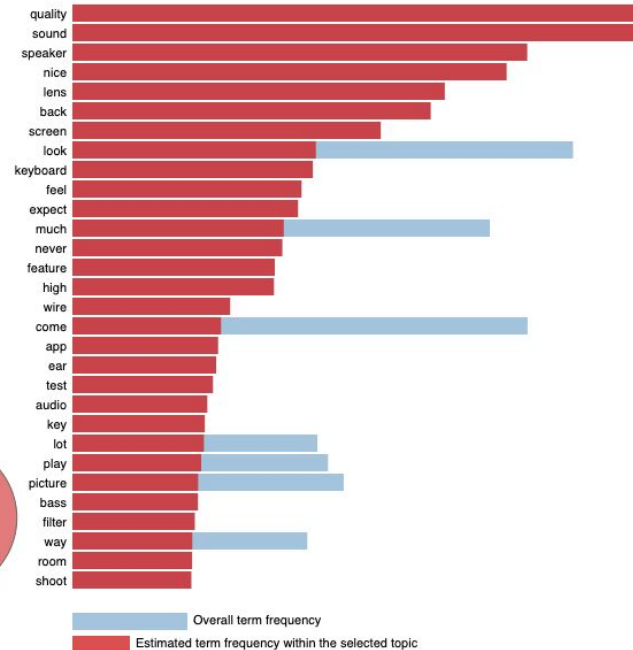
1.  $\text{saliency}(\text{term } w) = \text{frequency}(w) * [\sum_t p(t | w) * \log(p(t | w)/p(t))]$  for topics  $t$ ; see Chuang et. al (2012)
2.  $\text{relevance}(\text{term } w | \text{topic } t) = \lambda * p(w | t) + (1 - \lambda) * p(w | t)/p(w)$ ; see Sievert & Shirley (2014)

# Sound

Intertopic Distance Map (via multidimensional scaling)



Top-30 Most Relevant Terms for Topic 3 (19.4% of tokens)

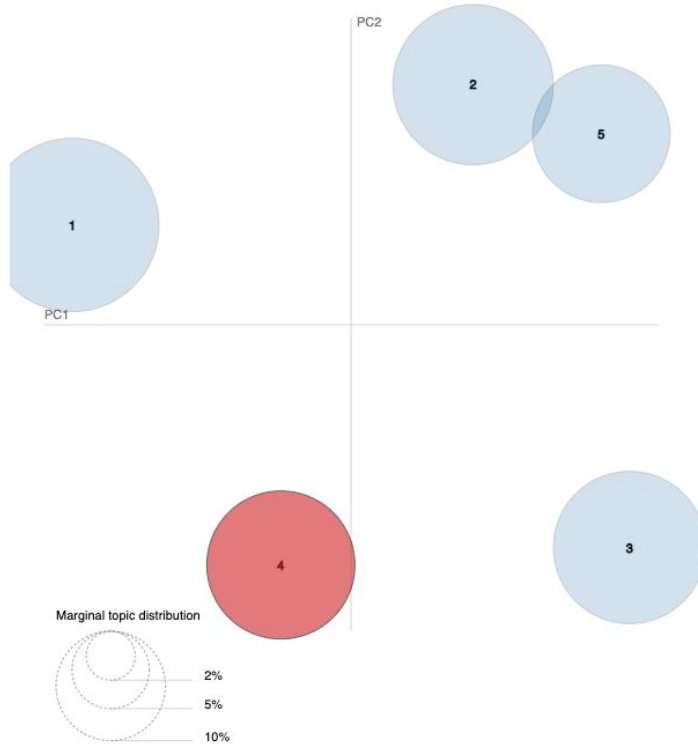


1.  $\text{saliency}(\text{term } w) = \text{frequency}(w) * [\sum_t p(t | w) * \log(p(t | w)/p(t))]$  for topics  $t$ ; see Chuang et. al (2012)

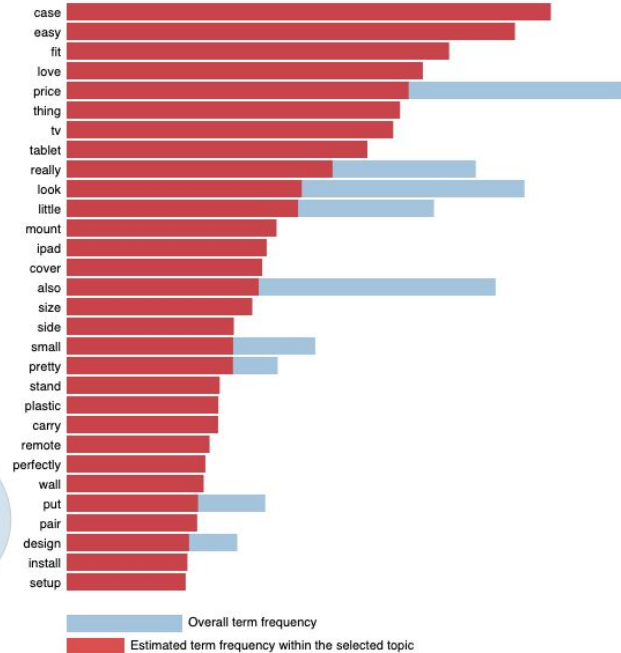
2.  $\text{relevance}(\text{term } w | \text{topic } t) = \lambda * p(w | t) + (1 - \lambda) * p(w | t)/p(w)$ ; see Sievert & Shirley (2014)

# Tablet

Intertopic Distance Map (via multidimensional scaling)



Top-30 Most Relevant Terms for Topic 4 (18.3% of tokens)



1.  $\text{saliency}(\text{term } w) = \text{frequency}(w) * [\sum_t p(t | w) * \log(p(t | w)/p(t))]$  for topics  $t$ ; see Chuang et. al (2012)

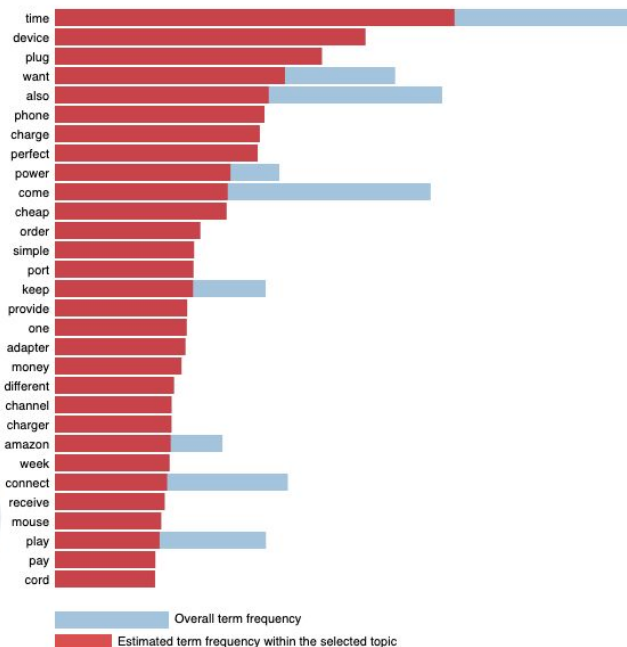
2.  $\text{relevance}(\text{term } w | \text{topic } t) = \lambda * p(w | t) + (1 - \lambda) * p(w | t)/p(w)$ ; see Sievert & Shirley (2014)

# Miscellaneous Hardware

Intertopic Distance Map (via multidimensional scaling)

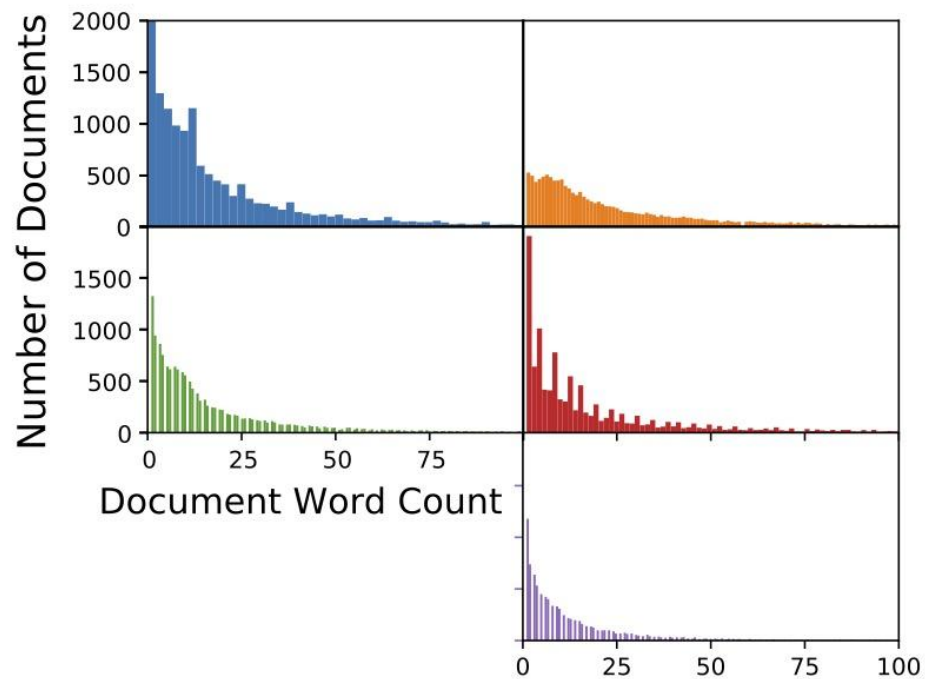


Top-30 Most Relevant Terms for Topic 5 (15.8% of tokens)



1.  $\text{saliency}(\text{term } w) = \text{frequency}(w) * [\sum_t p(t | w) * \log(p(t | w)/p(t))]$  for topics  $t$ ; see Chuang et. al (2012)
2.  $\text{relevance}(\text{term } w | \text{topic } t) = \lambda * p(w | t) + (1 - \lambda) * p(w | t)/p(w)$ ; see Sievert & Shirley (2014)

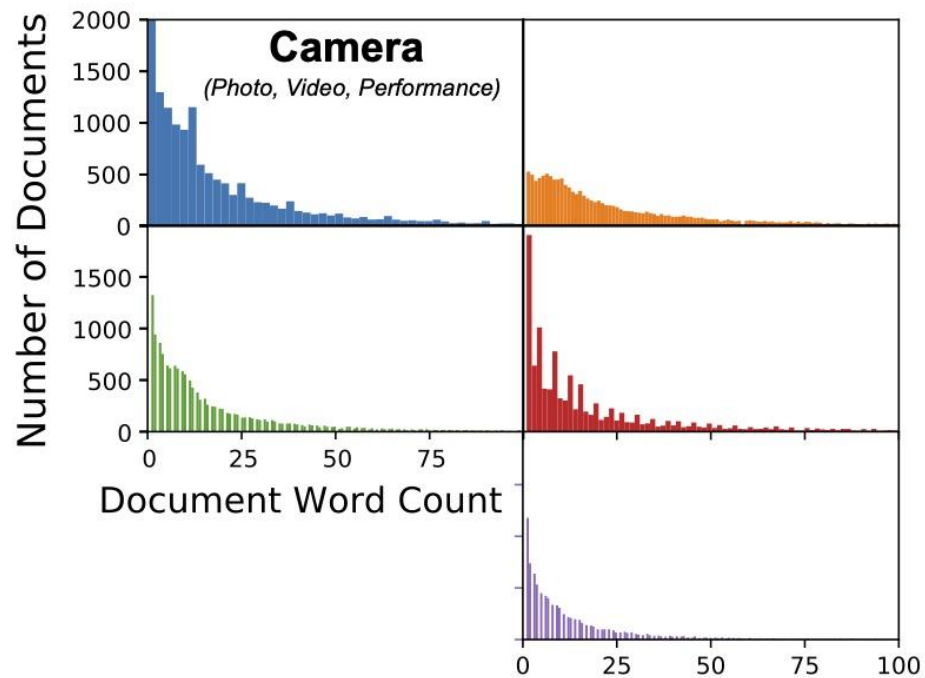
# Topics





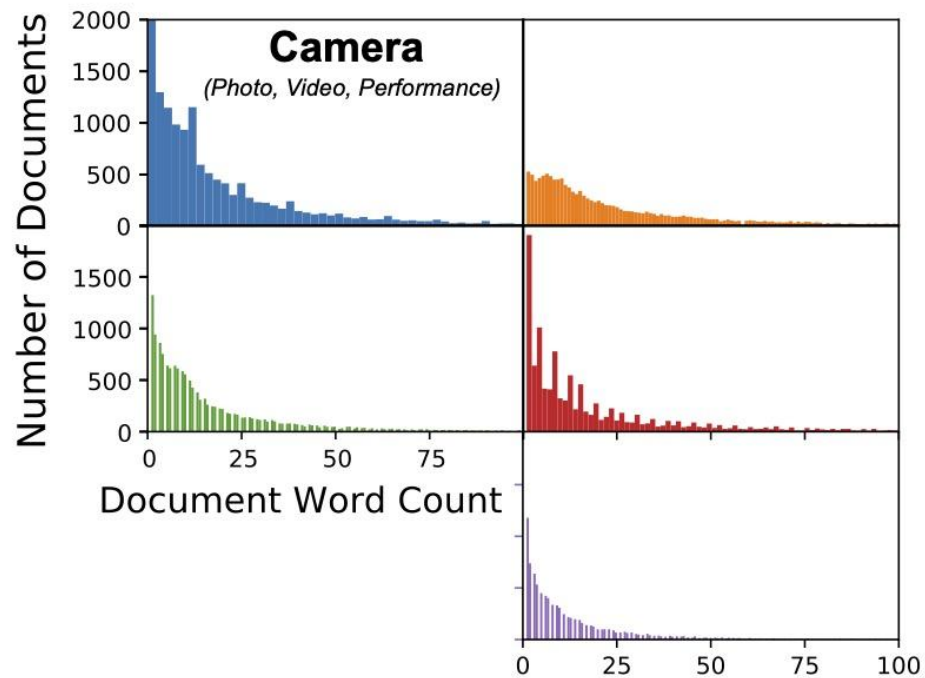
# Topics

## 1. Camera



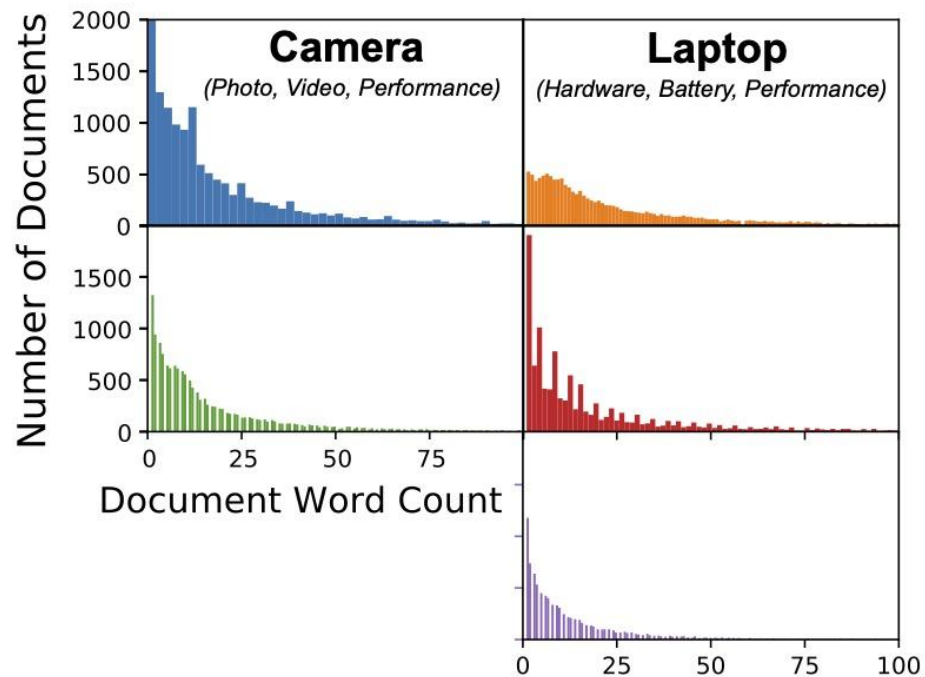
# Topics

1. Camera
  - a. Performance
  - b. Hardware
  - c. Connectivity



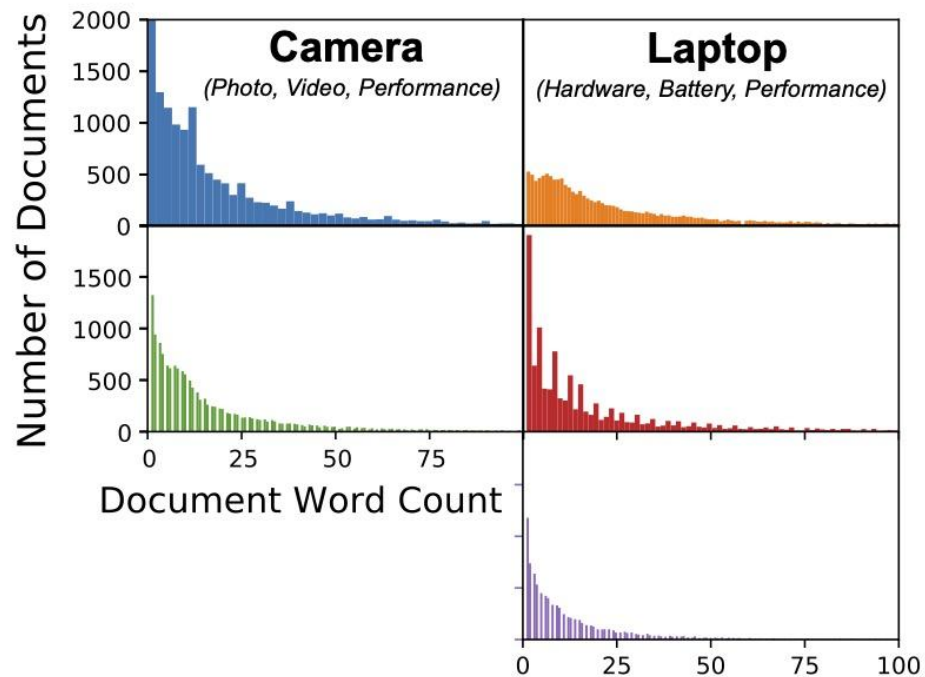
# Topics

1. Camera
  - a. Performance
  - b. Hardware
  - c. Connectivity
2. Laptop



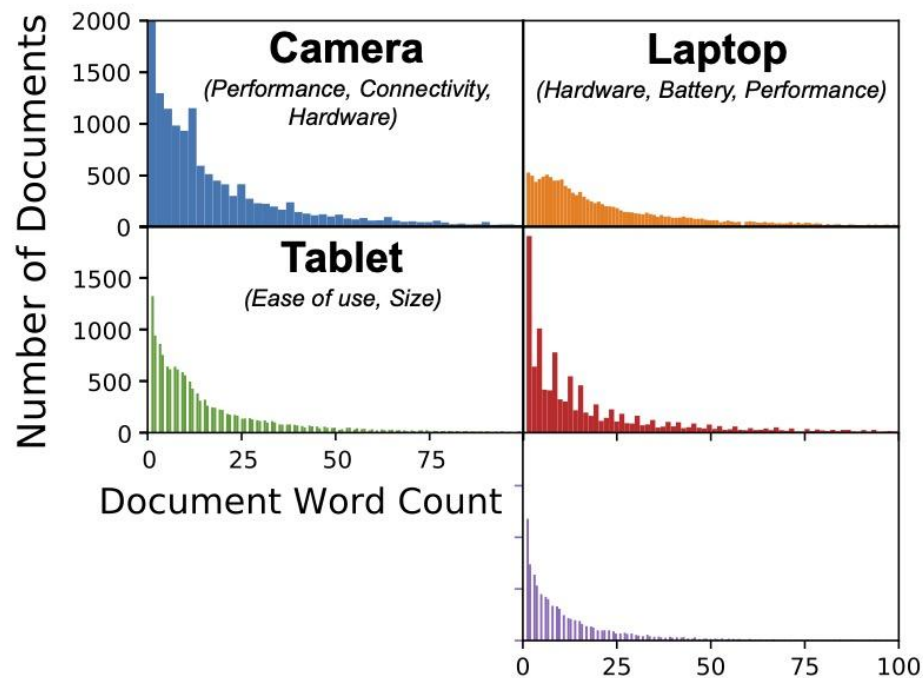
# Topics

1. Camera
  - a. Performance
  - b. Hardware
  - c. Connectivity
2. Laptop
  - a. Hardware
  - b. Battery
  - c. Performance



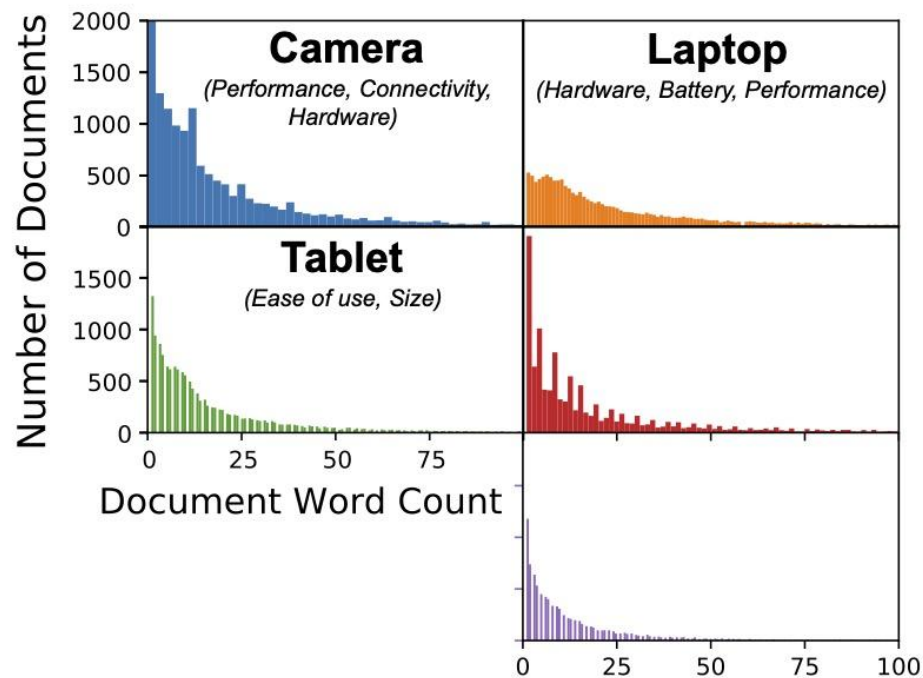
# Topics

1. Camera
  - a. Performance
  - b. Hardware
  - c. Connectivity
2. Laptop
  - a. Hardware
  - b. Battery
  - c. Performance
3. Tablet



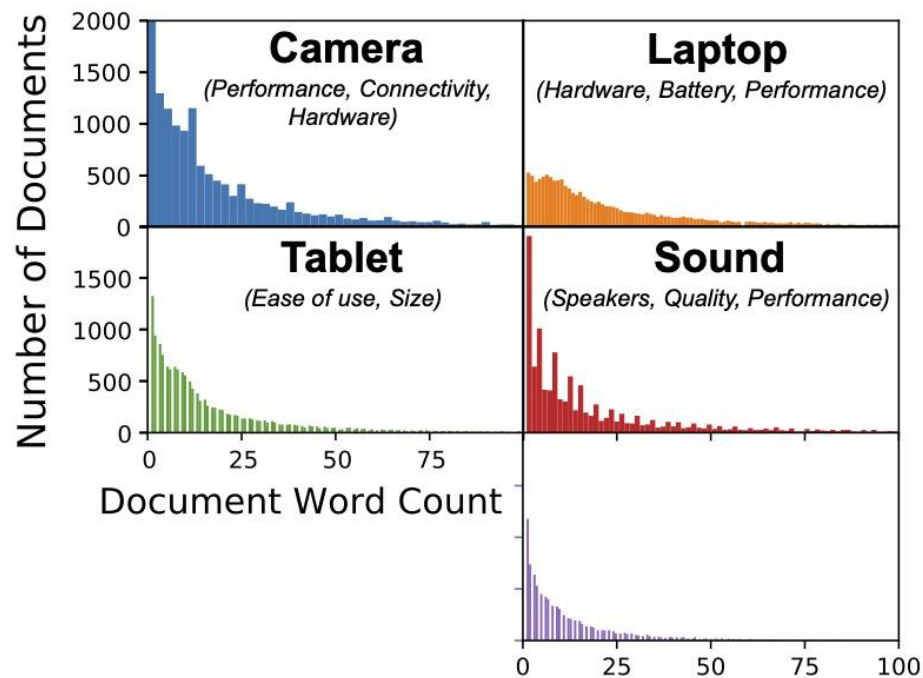
# Topics

1. Camera
  - a. Performance
  - b. Hardware
  - c. Connectivity
2. Laptop
  - a. Hardware
  - b. Battery
  - c. Performance
3. Tablet
  - a. Ease of Use
  - b. Size



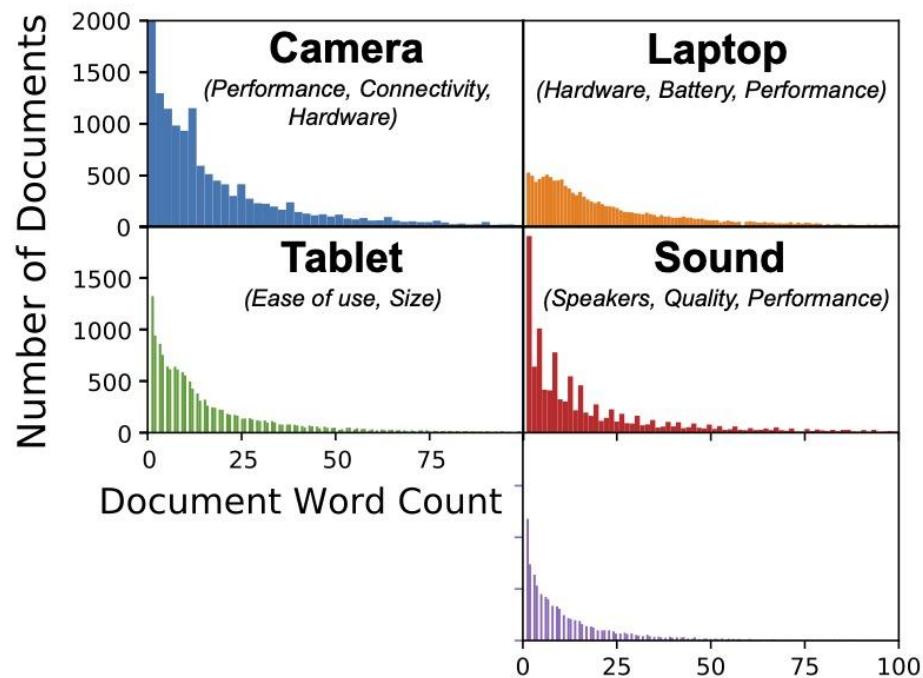
# Topics

1. Camera
  - a. Performance
  - b. Hardware
  - c. Connectivity
2. Laptop
  - a. Hardware
  - b. Battery
  - c. Performance
3. Tablet
  - a. Ease of Use
  - b. Size
4. Sound (Earbuds, headphones, Speakers)



# Topics

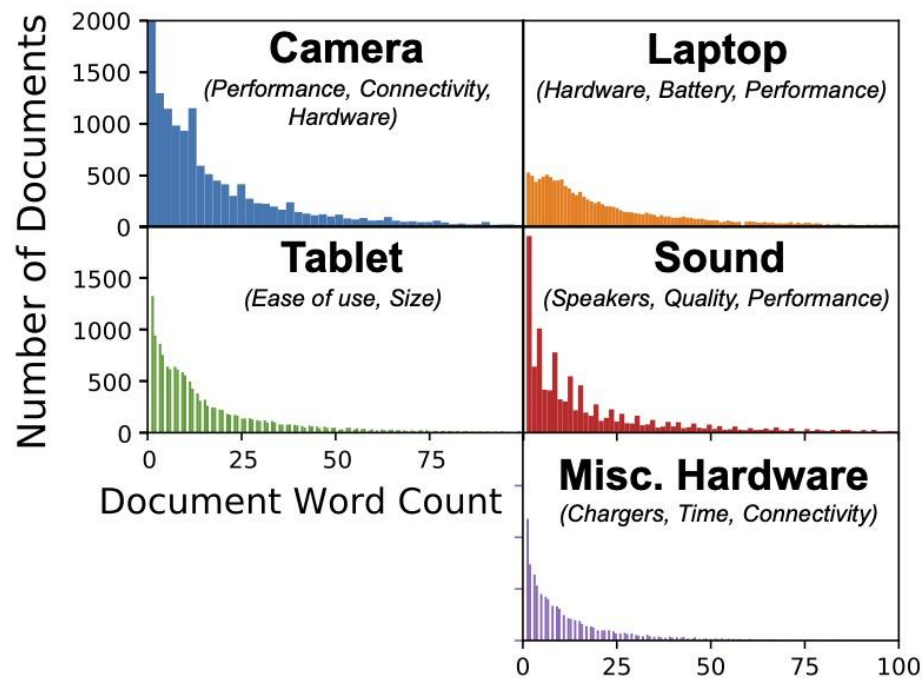
1. Camera
  - a. Performance
  - b. Hardware
  - c. Connectivity
2. Laptop
  - a. Hardware
  - b. Battery
  - c. Performance
3. Tablet
  - a. Ease of Use
  - b. Size
4. Sound (Earbuds, headphones, Speakers)
  - a. Speakers
  - b. Quality
  - c. Performance





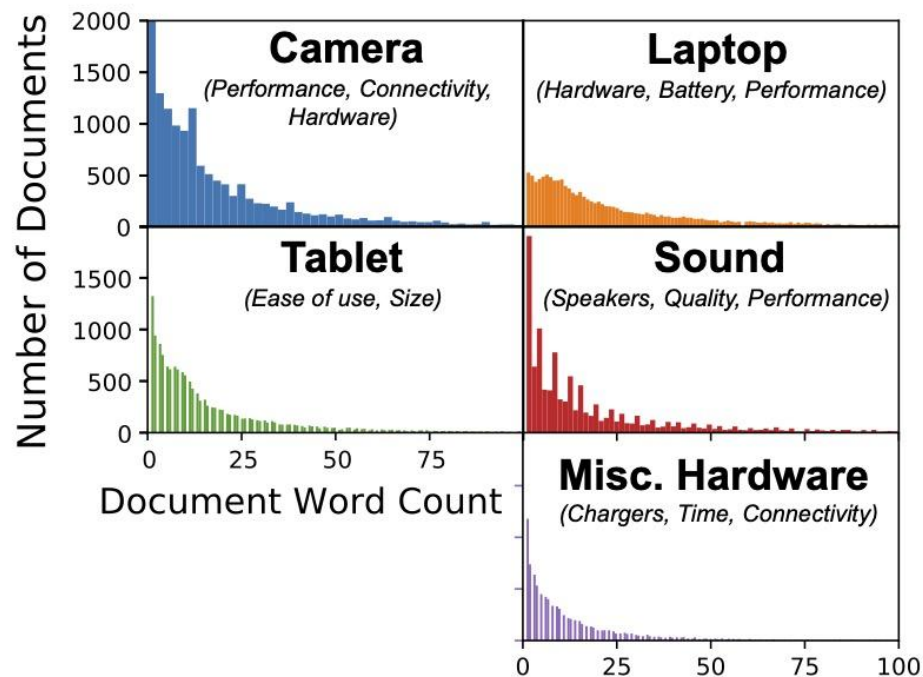
# Topics

1. Camera
  - a. Performance
  - b. Hardware
  - c. Connectivity
2. Laptop
  - a. Hardware
  - b. Battery
  - c. Performance
3. Tablet
  - a. Ease of Use
  - b. Size
4. Sound (Earbuds, headphones, Speakers)
  - a. Speakers
  - b. Quality
  - c. Performance
5. Miscellaneous Hardware



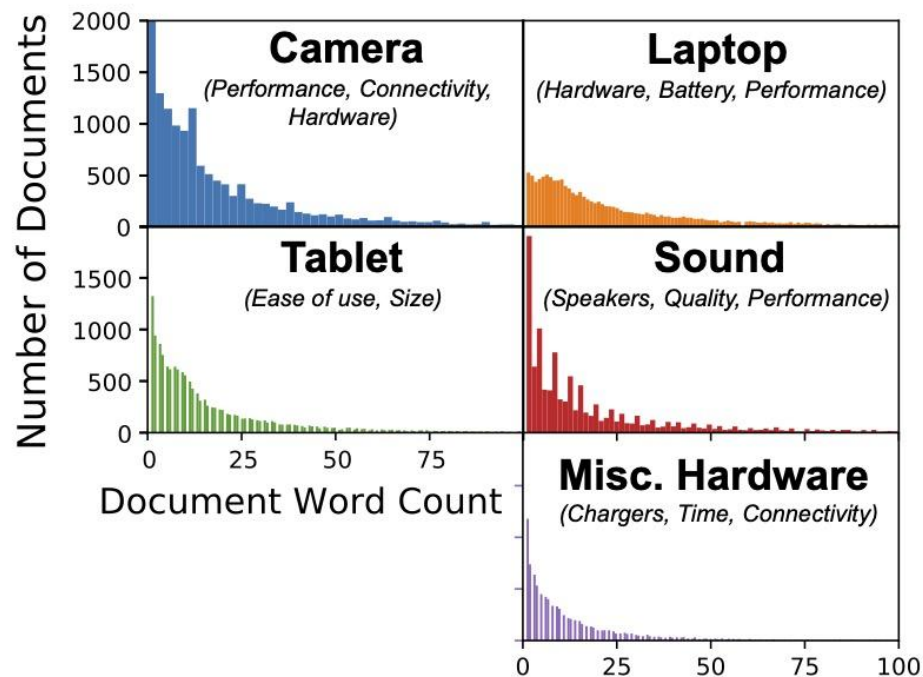
# Topics

1. Camera
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  - b. Hardware
  - c. Connectivity
2. Laptop
  - a. Hardware
  - b. Battery
  - c. Performance
3. Tablet
  - a. Ease of Use
  - b. Size
4. Sound (Earbuds, headphones, Speakers)
  - a. Speakers
  - b. Quality
  - c. Performance
5. Miscellaneous Hardware
  - a. Chargers
  - b. Time
  - c. Connectivity



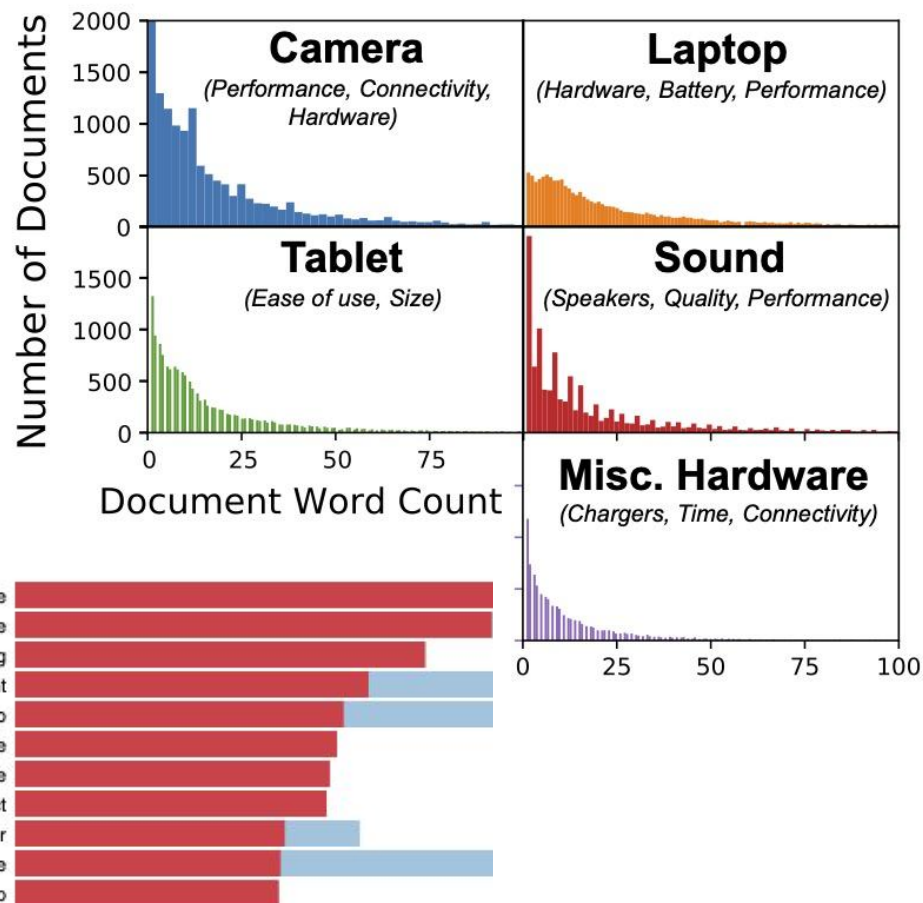
# Topics

1. Camera
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  - c. Performance
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  - c. Performance
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  - a. Chargers
  - b. Time
  - c. Connectivity



# Topics

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# Observations

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- Cameras come up no matter which model I was doing

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- Cameras come up no matter which model I was doing.
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  - People give very specific reviews about the camera equipment?
  - Does this community leave similar reviews on other sites?

# Observations

- Cameras come up no matter which model I was doing.
- Proper nouns showed up in Cameras and Misc. Hardware
  - People give very specific reviews about the camera equipment?
  - Does this community leave similar reviews on other sites?

How Does this compare to Amazon's  
Categories?

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- Power Accessories

## Shop by Category



Computers  
& Accessories



TV & Video



Cell Phones  
& Accessories



Photography  
& Videography



Home Audio



Amazon Devices



Headphones



Office Electronics



Office Supplies



Smart Home



Musical  
Instruments



Video Games

# Noise cancelling earbuds

## Department

### Electronics

Accessories & Supplies

Camera & Photo

Car & Vehicle Electronics

Cell Phones & Accessories

Computers & Accessories

Electronics Warranties

GPS, Finders & Accessories

Headphones

Home Audio

Office Electronics

Portable Audio & Video

Security & Surveillance

Service Plans

Television & Video

Video Game Consoles & Accessories

Video Projectors

Wearable Technology

eBook Readers & Accessories

Household Batteries, Chargers & Accessories

Power Accessories

## Shop by Category



Computers  
& Accessories



TV & Video



Cell Phones  
& Accessories



Photography  
& Videography



Home Audio



Amazon Devices



Headphones



Office Electronics



Office Supplies



Smart Home



Musical  
Instruments



Video Games

## Camera

Noise cancelling  
earbuds

1

## Department

### Electronics

Accessories & Supplies

Camera & Photo

Car & Vehicle Electronics

Cell Phones & Accessories

Computers & Accessories

Electronics Warranties

GPS, Finders & Accessories

Headphones

Home Audio

Office Electronics

Portable Audio & Video

Security & Surveillance

Service Plans

Television & Video

Video Game Consoles &  
Accessories

Video Projectors

Wearable Technology

eBook Readers &  
Accessories

Household Batteries,  
Chargers & Accessories

Power Accessories

## Laptop

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## Noise cancelling earbuds

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#### Department

##### Electronics

Accessories & Supplies  
Camera & Photo  
Car & Vehicle Electronics  
Cell Phones & Accessories  
Computers & Accessories  
Electronics Warranties  
GPS, Finders & Accessories  
Headphones  
Home Audio  
Office Electronics  
Portable Audio & Video  
Security & Surveillance  
Service Plans  
Television & Video  
Video Game Consoles & Accessories  
Video Projectors  
Wearable Technology  
eBook Readers & Accessories  
Household Batteries, Chargers & Accessories  
Power Accessories

Tablet

?

## Laptop

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Department

Electronics

- Accessories & Supplies
- Camera & Photo
- Car & Vehicle Electronics
- Cell Phones & Accessories
- Computers & Accessories
- Electronics Warranties
- GPS, Finders & Accessories
- Headphones
- Home Audio
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- Portable Audio & Video
- Security & Surveillance
- Service Plans
- Television & Video
- Video Game Consoles & Accessories
- Video Projectors
- Wearable Technology
- eBook Readers & Accessories
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- Power Accessories

Tablet



## Laptop

### Shop by Category



Computers & Accessories



TV & Video



Cell Phones & Accessories



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Home Audio



Amazon Devices



Headphones



Office Electronics



Office Supplies



Smart Home



Musical Instruments



Video Games

Noise cancelling  
earbuds





Misc.  
Hardware

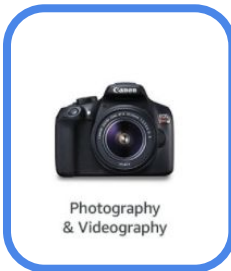
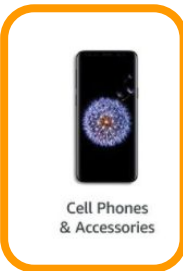
etc.

Tablet

- Department
- Electronics
    - Accessories & Supplies
    - Camera & Photo
    - Car & Vehicle Electronics
    - Cell Phones & Accessories
    - Computers & Accessories
    - Electronics Warranties
    - GPS, Finders & Accessories
    - Headphones
    - Home Audio
    - Office Electronics
    - Portable Audio & Video
    - Security & Surveillance
    - Service Plans
    - Television & Video
    - Video Game Consoles & Accessories
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    - eBook Readers & Accessories
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    - Power Accessories

## Laptop

Shop by Category



What do we do with this information?

# What do we do with this information?

- *Help Amazon organize their Electronic Categories suggestion algorithms*

Me: \*says anything\*

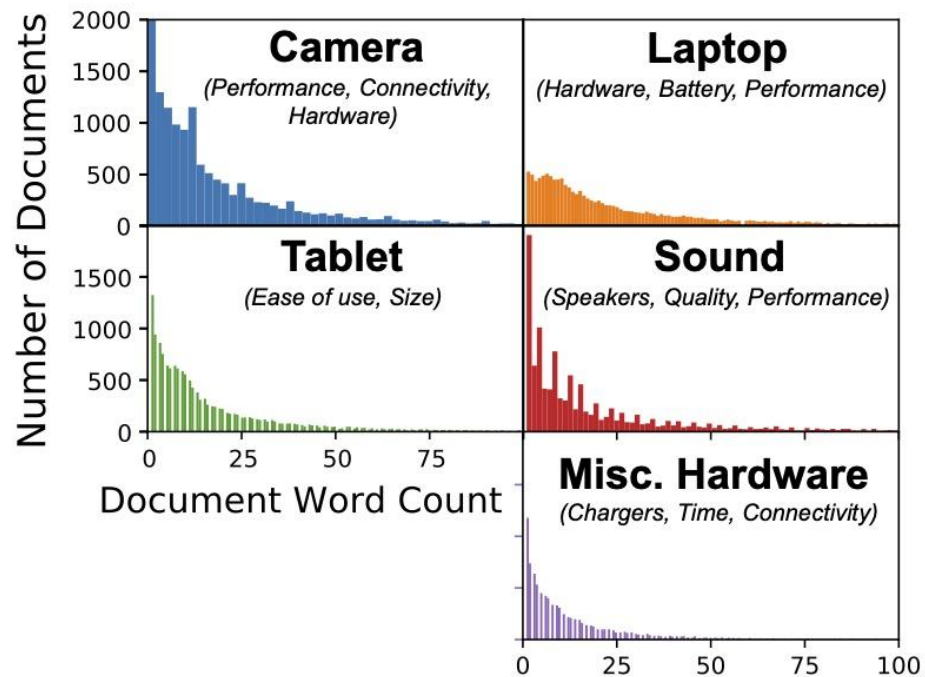
~~Internet:~~

Amazon Reviewers:



'actuality',  
'actualizazione',  
'actually',  
'actuallyl',  
'actuallyright',  
'actuallytruly',  
'actuallywell',  
'actualy',  
'actuate',  
'actuation',  
'actuator',  
'actuially',  
'actullay',  
'actully',  
'acually',  
'acuity',  
'acura',  
'acurate',  
'acurite',  
'acusb',  
'acutally',

But has this been noticed?



Misc.  
Hardware

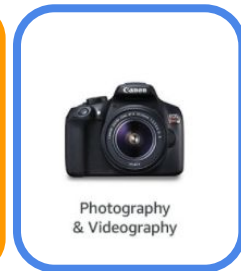
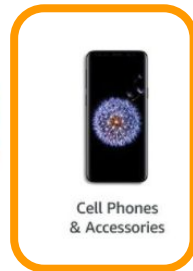
etc.

Tablet

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## Laptop

Shop by Category



# Future Work

# Future Work

- Different Models and Libraries



# Future Work

- Different Models and Libraries
  - E.g., spaCy

# Future Work

- Different Models and Libraries
  - E.g., spaCy
- Control for language

# Future Work

- Different Models and Libraries
  - E.g., spaCy
- Control for language
- Compare with other Departments

# Future Work

- Different Models and Libraries
  - E.g., spaCy
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## Department

### Pet Supplies

Dogs

Cats

Fish & Aquatic Pets

Birds

Horses

Reptiles & Amphibians

Small Animals

# Thank You!

## Sources

<https://nijianmo.github.io/amazon/index.html>

<https://www.howtogeek.com/401209/how-to-safely-buy-photography-gear-online/>

## Tools Used



pandas  
 $y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$

