

# Modern Metrics

~~2020~~ ~~2021~~ 2022

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# Modern Metrics

(2020)

~~COVID~~

What's new in Web Performance?

Core Web Vitals

- Largest Contentful Paint (LCP)
- Cumulative Layout Shift (CLS)
- First Input Delay (FID)

*performance*.**now()**

# Modern Metrics

(2021)

What's new in Web Performance?

• Core Web Vitals affecting SEO

*performance* • **now()**

# Modern Metrics

... 2022?

## What's new in Web Performance?

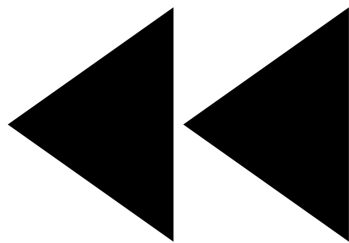
- A survey of "modern" metrics
- Evaluating metrics
  - Pros
  - Cons
- What's the latest and why should you care?
- Taking a look yourself!

*performance*.**now()**

# "Modern" Metrics (2022)

What is a "modern" metric?





REWIND!

# "Modern" Metrics (2020)

CWV

FID

LCP

CLS



## "Modern" Metrics (2018)

TTFI

LT

FCP

TTI

FMP



Velocity

"Modern" Metrics (2016)

SPA

PLT

SPDY

CSS

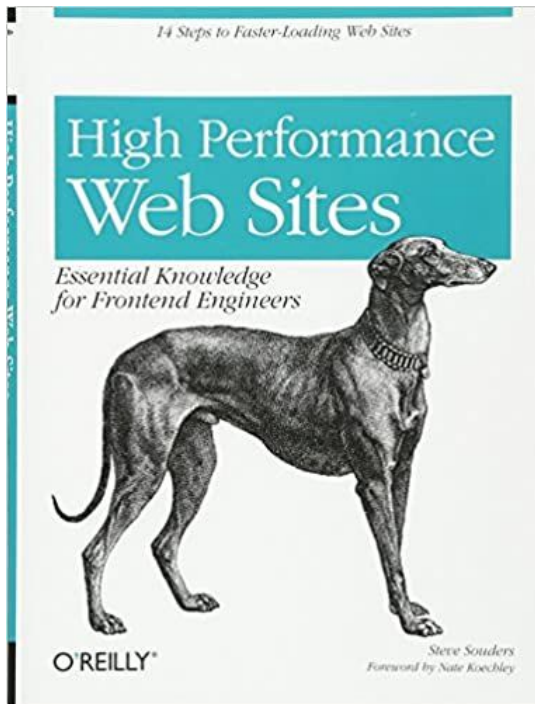
CDN



## "Modern" Metrics (2008)

TCP

DNS



RUM

XHR

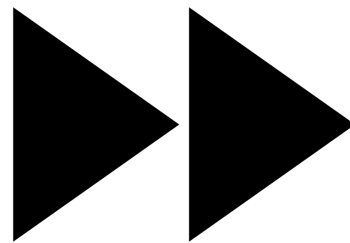
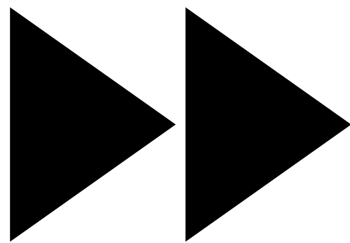
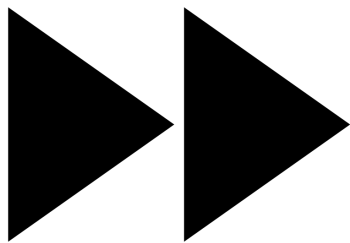


## "Modern" Metrics (2000s)

RTT

KB

PING



BACK TO THE FUTURE!

# How to mint a "Modern" Metric

Every year the MMC (Metric Minting Committee) gets together to create a new metric.

Their process:

- Step 1: Pick a cool sounding TLA
- Step 2: ???
- Step 3: Profit!



# "Modern" Metrics (2030)



TLA

TLA

TLA

# "Modern" Metrics (2022)



- Network Focused
  - DNS, TCP, SSL, RTT, TTFB
- Browser Focused
  - PLT, TBT
- Visual
  - FP, FCP, FMP, LCP, TTFR, SI
- User Experience
  - TTFI, TTI, CLS, FID, INP, Rage Clicks

# "Modern" Metrics (2022)



- Why do we have so many?
- Which of those matter?
- Who's in charge of minting these new metrics?
- Why should I care?



# "Modern" Metrics (2022)

- Lean in! Here's the secret

[redacted from slides, only available to live audience]



# "Modern" Metrics (2022)

- Seriously, lean in!

[redacted from slides, only available to live audience]



# "Modern" Metrics (2022)



- Measure the things that sound right to you, and see how they compare to the other metrics you care most about

Is that?

- Website traffic
- Business Metrics
- Conversion metrics
- Retention metrics
- Ads Served

# "Modern" Metrics (2022)



- What's the latest shiny thing?
- The world evolves
- Metrics evolve
- We should too!
- Let's evaluate how metrics behave in the Real World(tm)

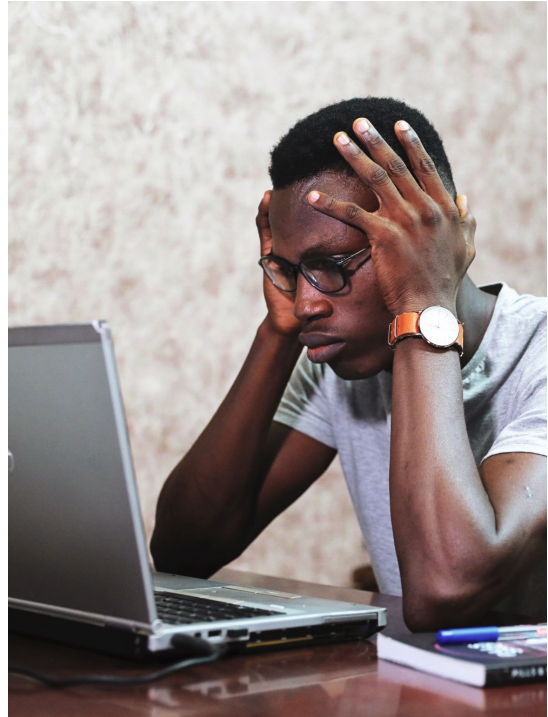
Core. Web. Vitals.

# Core? Web? Vitals?

There are many ways to interpret and present data that may affect how people react to it.

How can data have **bias**? In our industry:

- RUM vs. Synthetic
- Measurement techniques
- Dimensions
- MPA vs. SPA
- Time
- Human interpretation



# Bias: RUM vs. Synthetic

- Synthetic
  - Stable environment
  - Access to more + raw data
- **RUM**
  - Reflection of the real world
  - Only access to what browsers allow
  - Beacon time matters

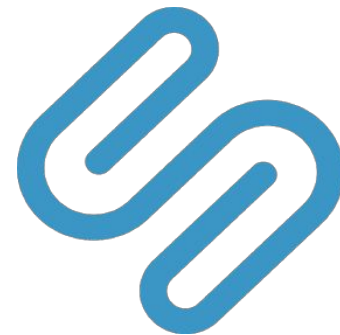
# Bias: Measurement Technique

- Library

- web-vitals.js
- **boomerang.js**
- lux.js
- perfume.js
- ga

- Time of the beacon

- **Load**
- Unload / Hidden
- (multiple)





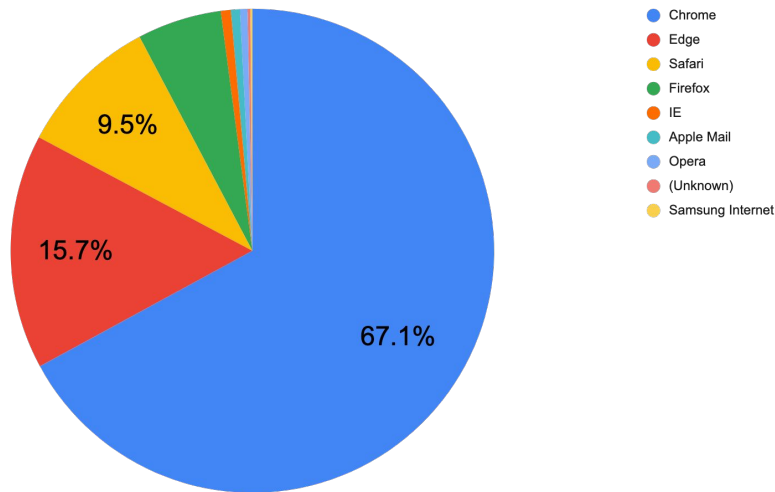
# Bias: Dimensions

- Device Type (Desktop vs. Mobile)
- Browser
  - Marketshare
  - Browser supported APIs
- Geolocation
- The actual websites being measured
- etc

# Bias: Dimensions: Browser

- Marketshare
- Browser supported APIs

Desktop Browser Marketshare (mPulse 2022-09)



## LargestContentfulPaint API

Current aligned Usage relative Date relative Filtered All

Chrome	Edge *	Safari	Firefox	Opera
103				
104	104		104	
105	105	15.6	105	90
106	106	16.0	106	91
107		16.1	107	
108		TP	108	
109				

## PerformanceEventTiming API

Current aligned Usage relative Date relative Filtered All

Chrome	Edge *	Safari	Firefox	Opera
103				
104	104		104	
105	105	15.6	105	90
106	106	16.0	106	91
107		16.1	107	
108		TP	108	
109				

## LayoutShift API

Current aligned Usage relative Date relative Filtered All

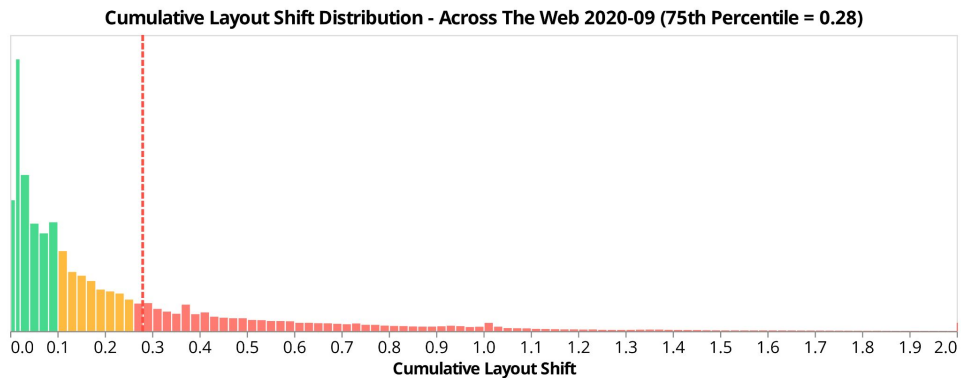
Chrome	Edge *	Safari	Firefox	Opera
103				
104	104		104	
105	105	15.6	105	90
106	106	16.0	106	91
107		16.1	107	
108		TP	108	
109				

# Bias: MPA vs. SPA

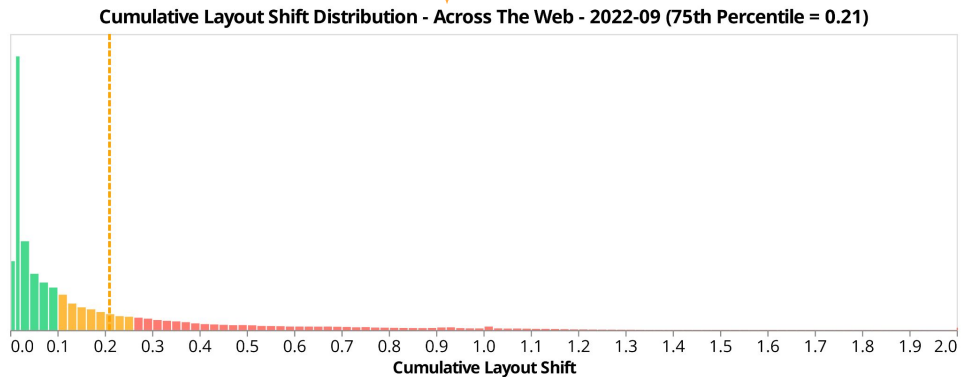
- Synthetic
  - Often biased towards MPAs (or the Hard navigation of a SPA)
  - Tools are being updated to support Soft navigations
- RUM
  - Can "split" measurements by soft navigation

# Bias: Time

- Time changes all things
- Time of Day
- Day of Week

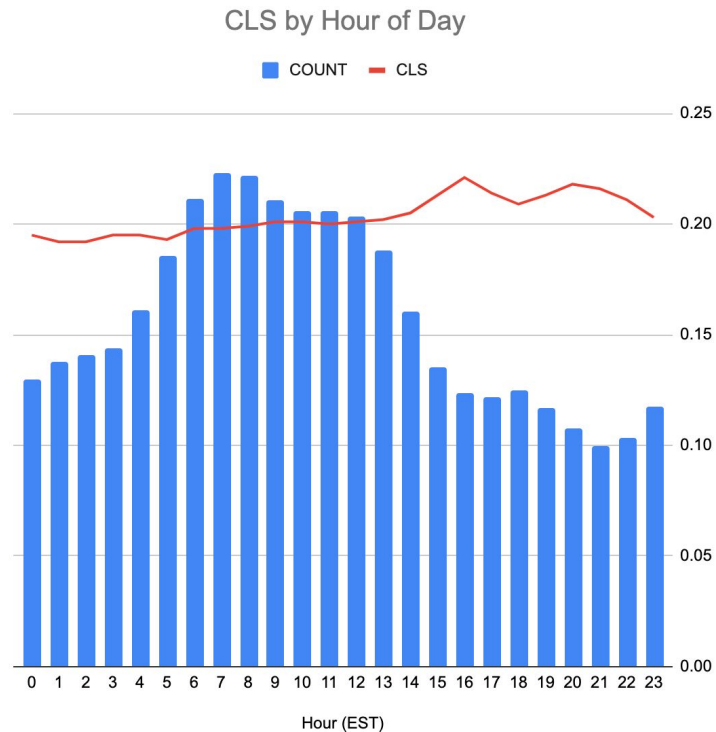


+2 years



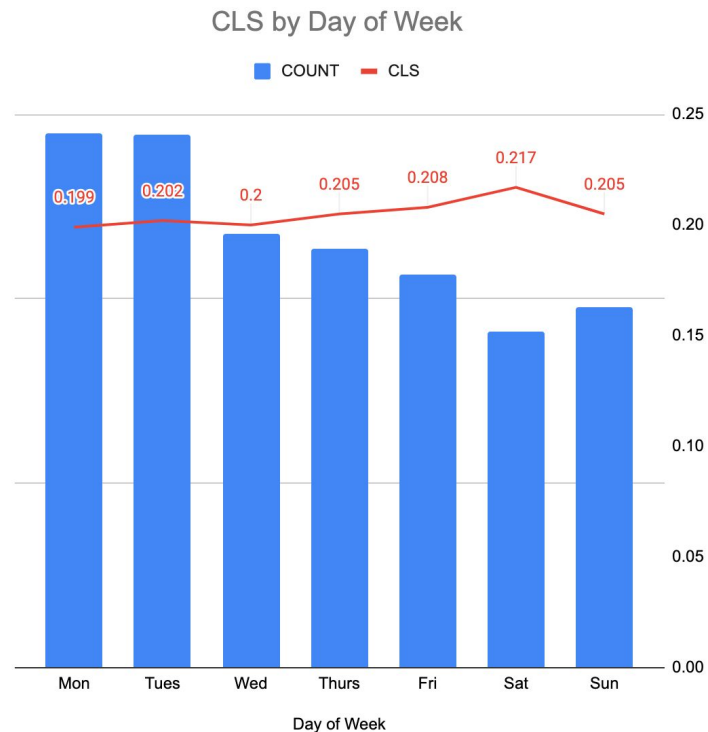
# Bias: Time

- Time changes all things
- **Time of Day**
- Day of Week



# Bias: Time

- Time changes all things
- Time of Day
- **Day of Week**



# Bias: Human Interpretation

- Data is in the eye of the beholder (presenter)
- Who is this Nic guy anyway?
  - BSE, CompSci
  - !Data Scientist



Core! Web! Vitals!



# WARNING

chart-intensive slides ahead

# WARNING

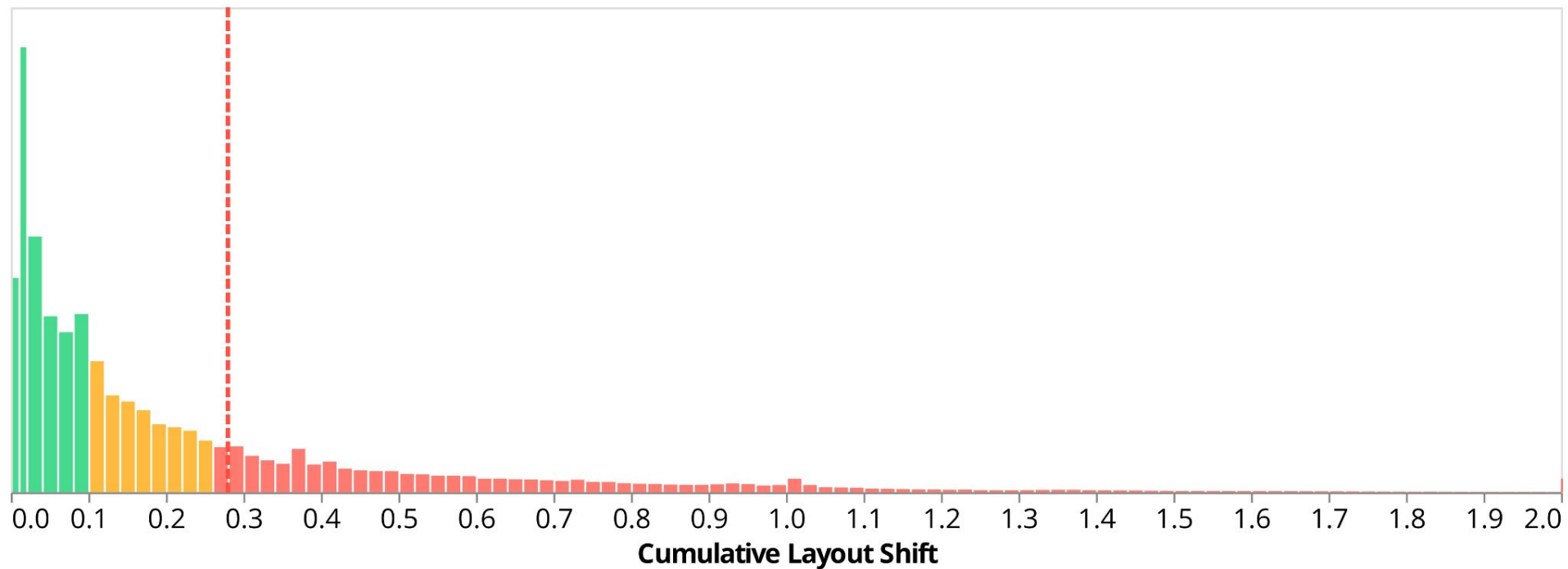
i don't know what I'm saying

# CLS

Cumulative Layout Shift

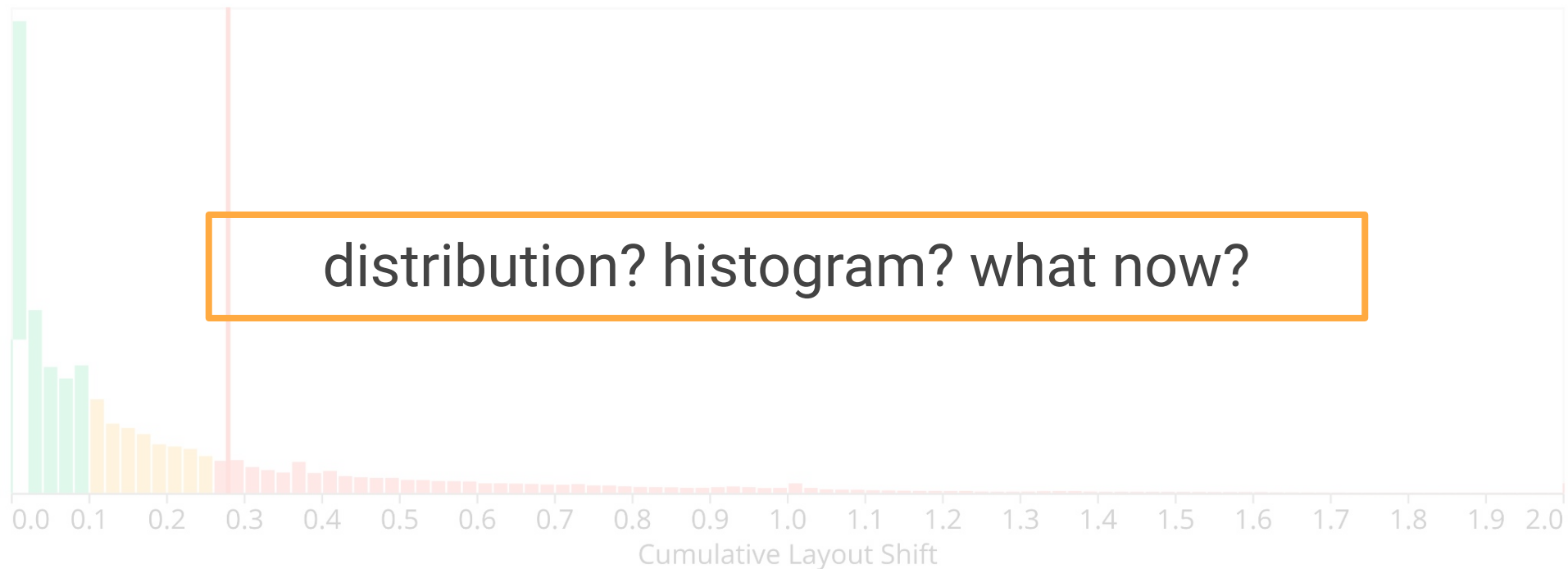


## Cumulative Layout Shift Distribution - Across The Web 2020-09 (75th Percentile = 0.28)



\* RUM, mPulse, boomerang.js (MPA+SPA), 2020-09 1w, all browsers that support CLS, 0.02 bucket, n = ~2b, n,nnn sites, Nic

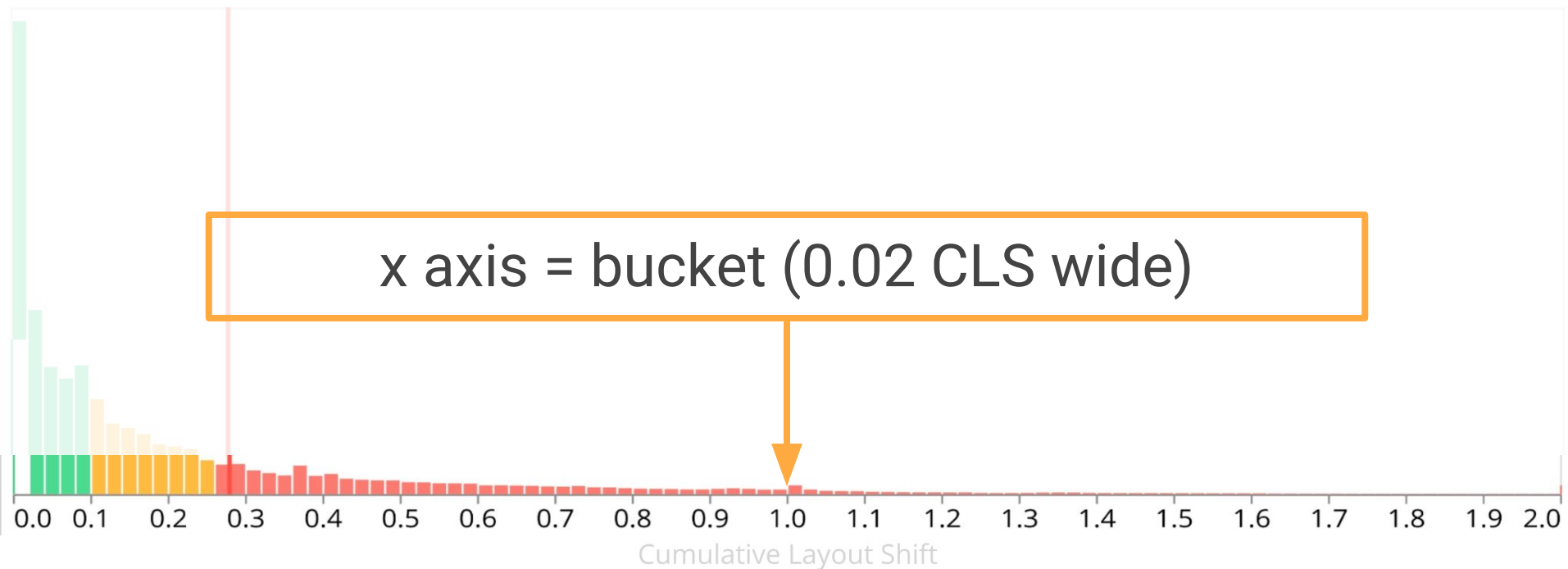
Cumulative Layout Shift Distribution - Across The Web 2020-09 (75th Percentile = 0.28)



distribution? histogram? what now?

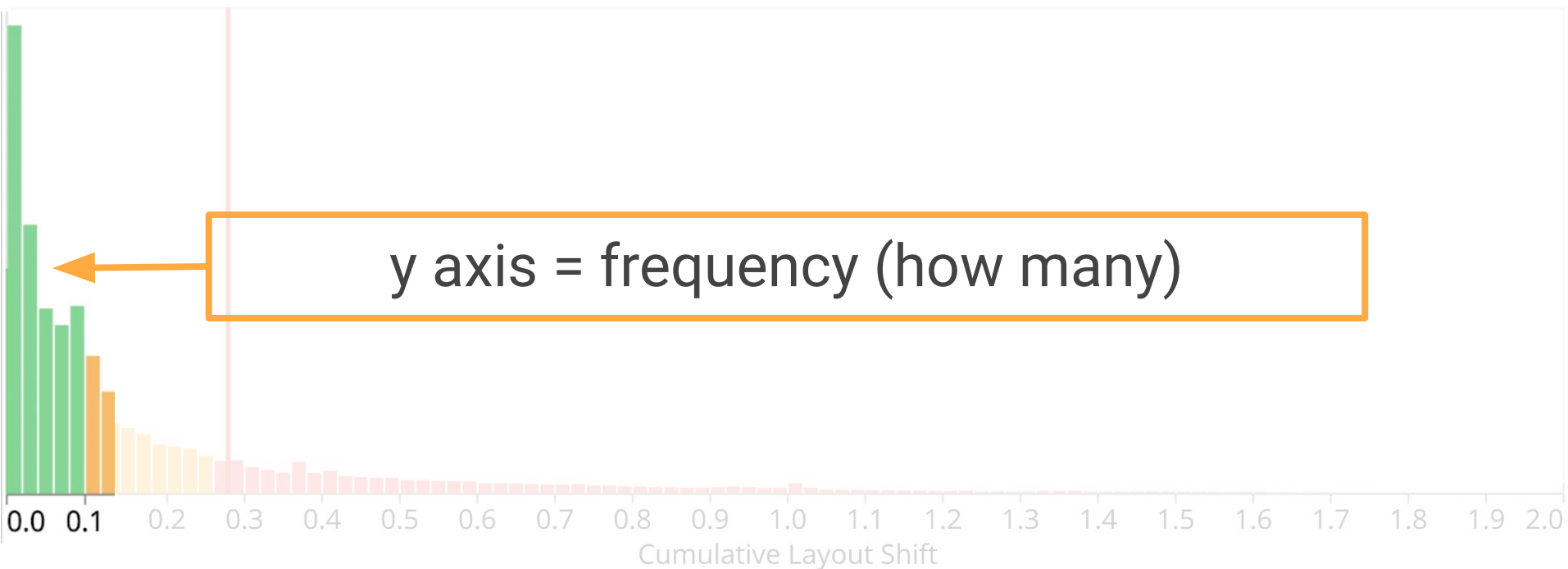
\* RUM, mPulse, boomerang.js (MPA+SPA), 2020-09 1w, all browsers that support CLS, 0.02 bucket, n = ~2b, n,nnn sites, Nic

Cumulative Layout Shift Distribution - Across The Web 2020-09 (75th Percentile = 0.28)



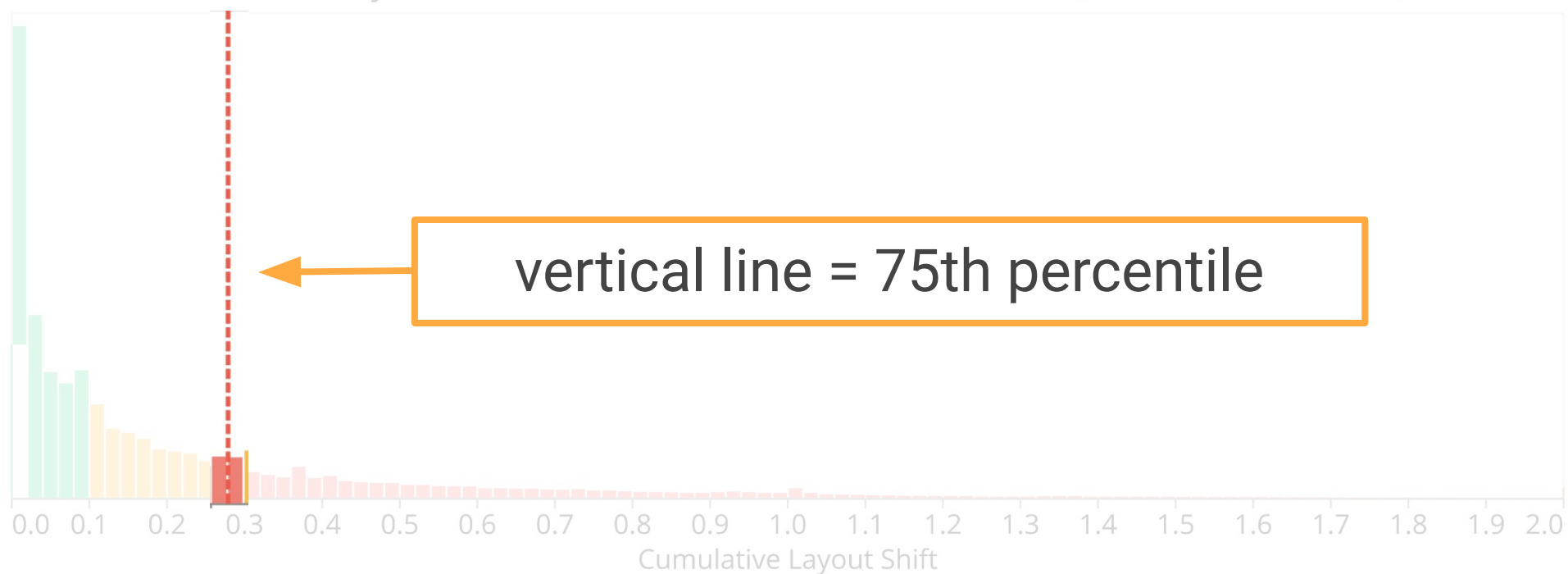
\* RUM, mPulse, boomerang.js (MPA+SPA), 2020-09 1w, all browsers that support CLS, 0.02 bucket, n = ~2b, n,nnn sites, Nic

Cumulative Layout Shift Distribution - Across The Web 2020-09 (75th Percentile = 0.28)



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Cumulative Layout Shift Distribution - Across The Web 2020-09 (75th Percentile = 0.28)



vertical line = 75th percentile

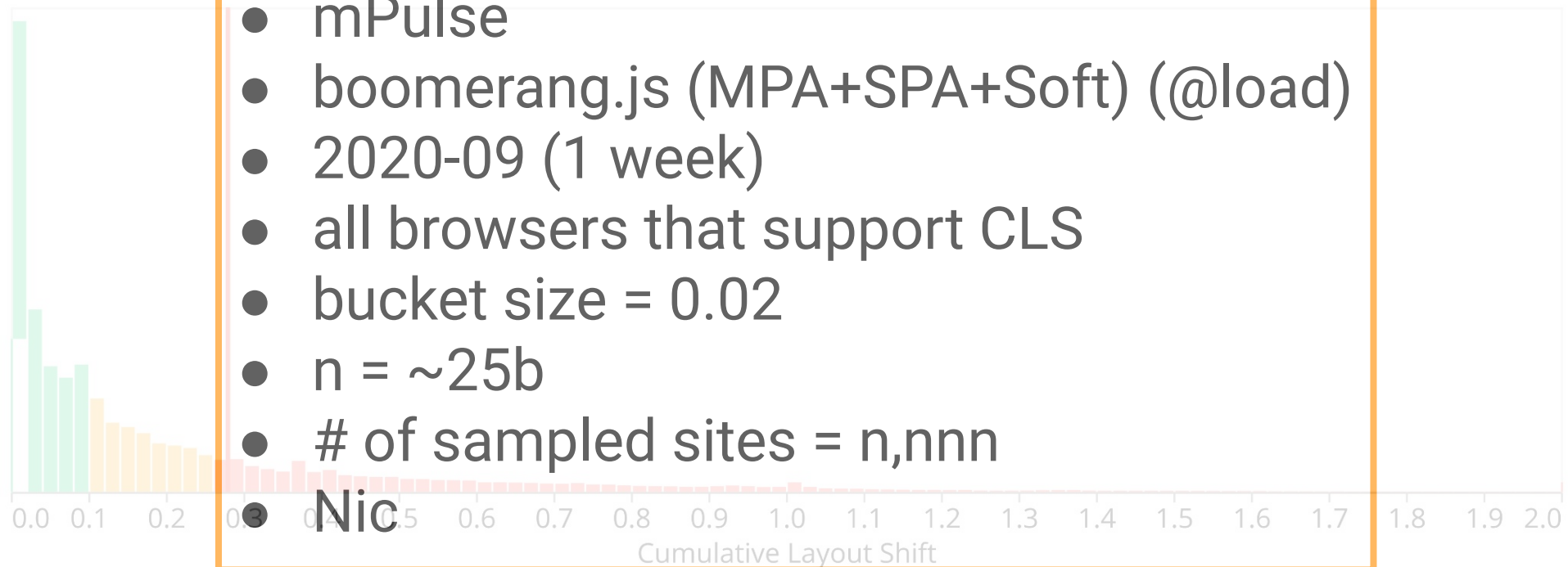
\* RUM, mPulse, boomerang.js (MPA+SPA), 2020-09 1w, all browsers that support CLS, 0.02 bucket, n = ~2b, n,nnn sites, Nic



## the fine print:

- RUM
- mPulse
- boomerang.js (MPA+SPA+Soft) (@load)
- 2020-09 (1 week)
- all browsers that support CLS
- bucket size = 0.02
- $n = \sim 25b$
- # of sampled sites = n,nnn
- Nic

Cumulative Layout Shift Distribution - Across The Web 2020-09 (75th Percentile = 0.28)



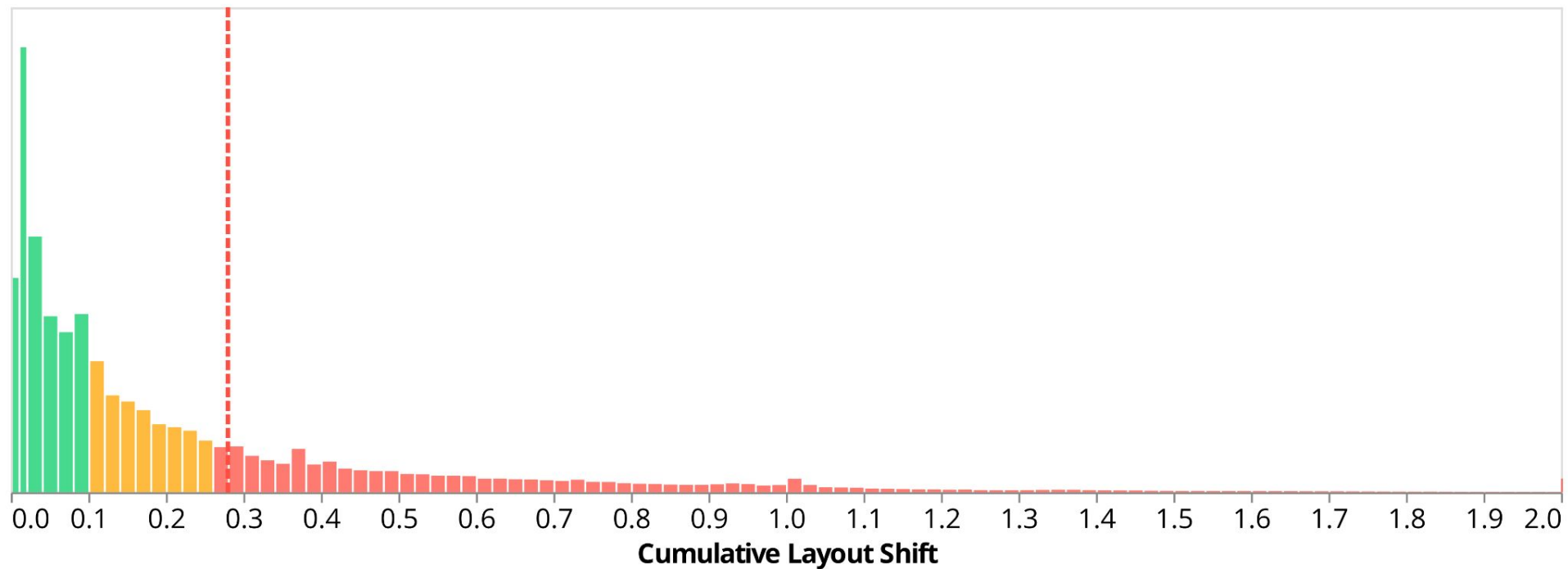
\* RUM, mPulse, boomerang.js (MPA+SPA), 2020-09 1w, all browsers that support CLS, 0.02 bucket,  $n = \sim 2b$ , n,nnn sites, Nic

Cumulative Layout Shift Distribution - Across The Web 2020-09 (75th Percentile = 0.28)



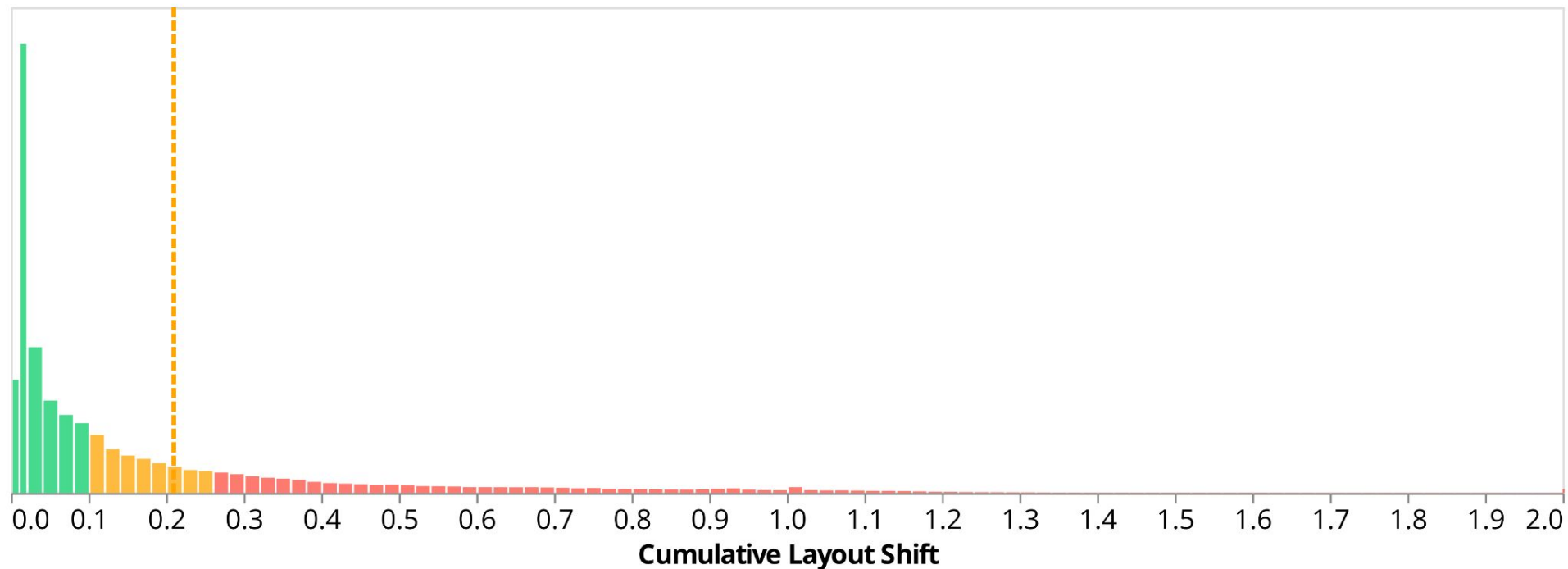
\* RUM, mPulse, boomerang.js (MPA+SPA), 2020-09 1w, all browsers that support CLS, 0.02 bucket, n = ~2b, n,nnn sites, Nic

## Cumulative Layout Shift Distribution - Across The Web 2020-09 (75th Percentile = 0.28)



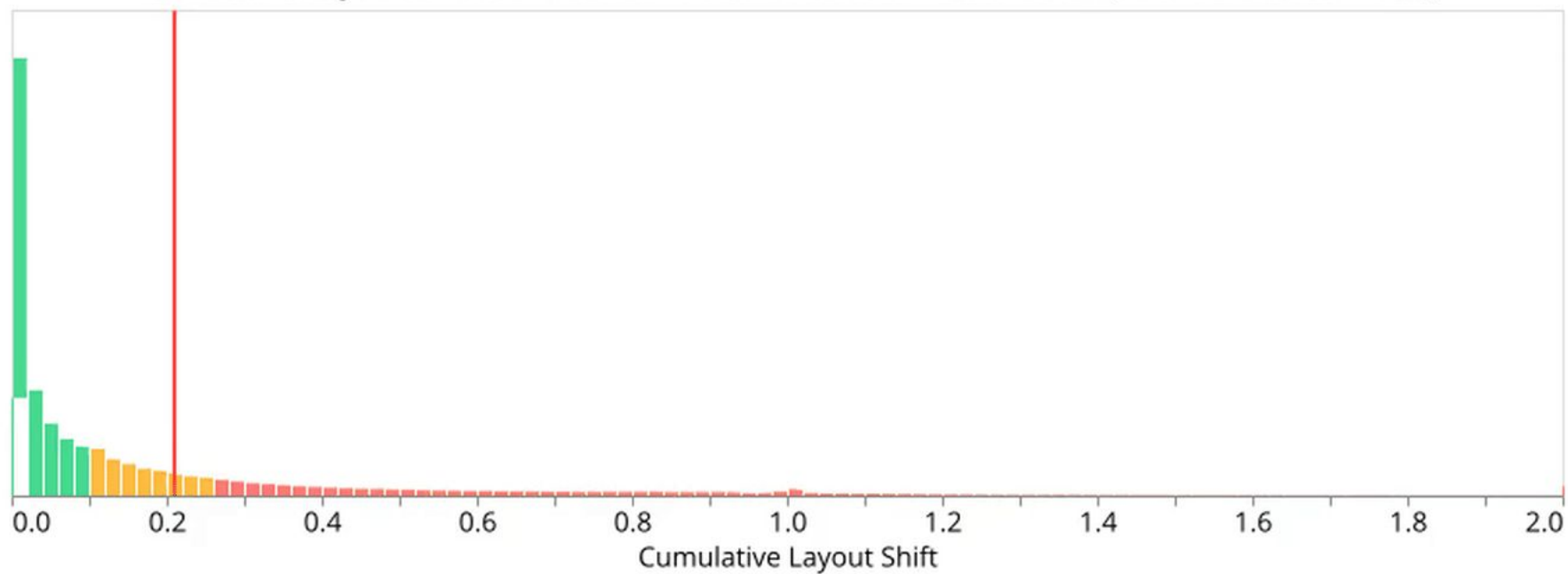
\* RUM, mPulse, boomerang.js (MPA+SPA), 2020-09 1w, all browsers that support CLS, 0.02 bucket, n = ~2b, n,nnn sites, Nic

# Cumulative Layout Shift Distribution - Across The Web - 2022-09 (75th Percentile = 0.21)

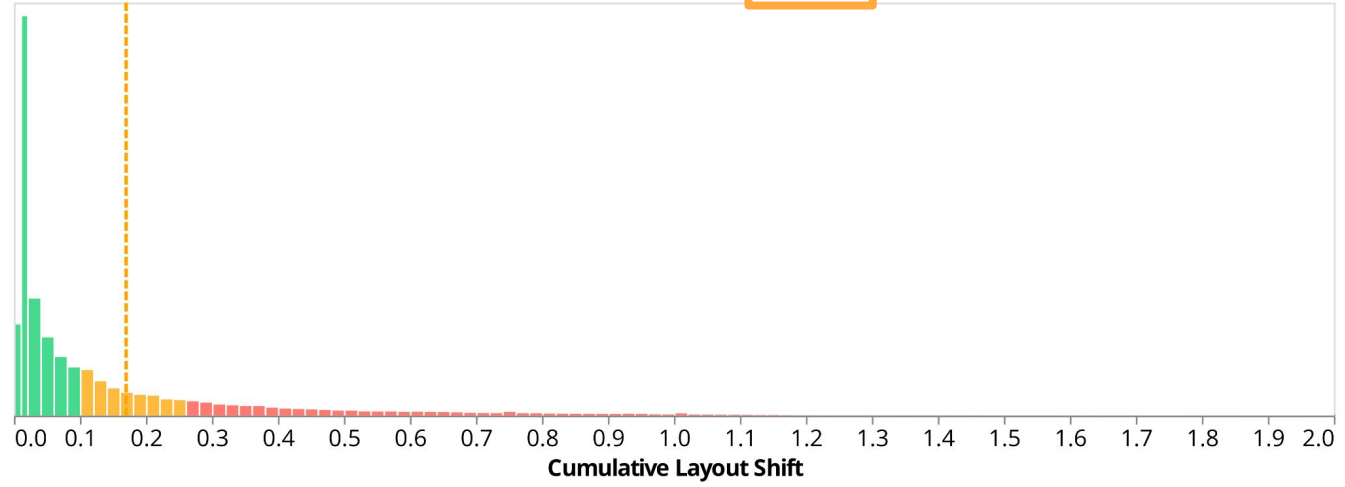


\* RUM, mPulse, boomerang.js (MPA+SPA), 2022-09 1w, all browsers that support CLS, 0.02 bucket, n = ~2b, n,nnn sites, Nic

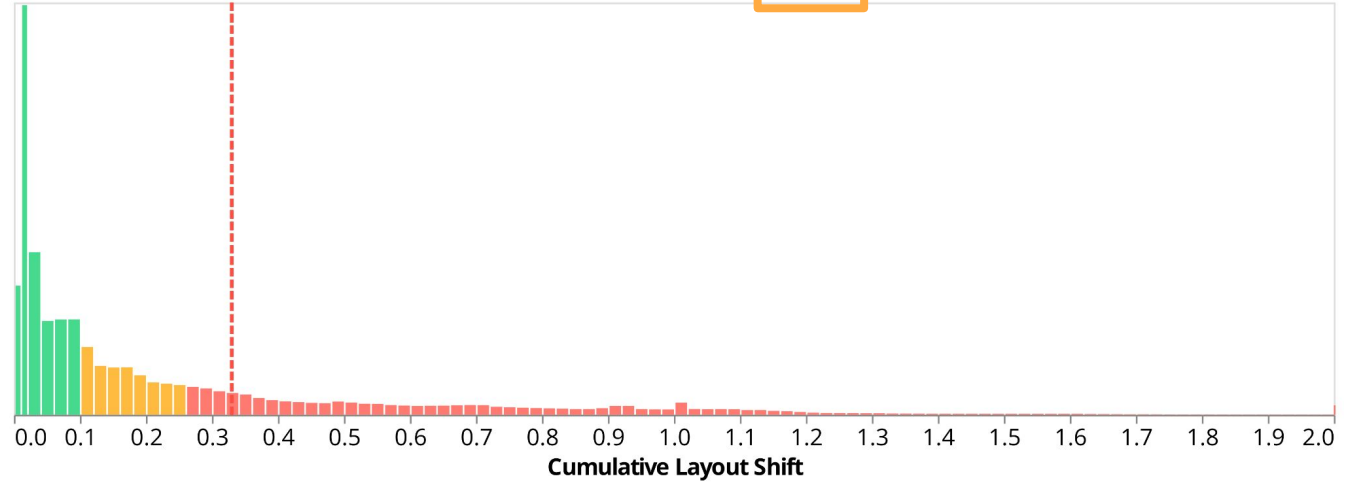
Cumulative Layout Shift Distribution - Across The Web - 2021-08-07 (75th Percentile = 0.21)



Cumulative Layout Shift Distribution - Across The Web **Desktop** 2022-09 (75th Percentile = 0.17)



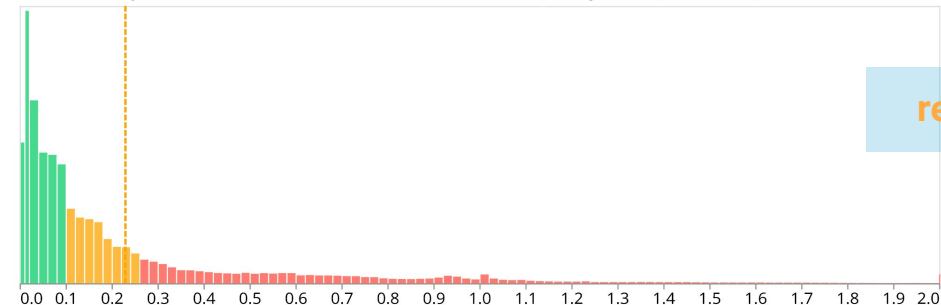
Cumulative Layout Shift Distribution - Across The Web **Mobile** 2022-09 (75th Percentile = 0.33)



2020-09

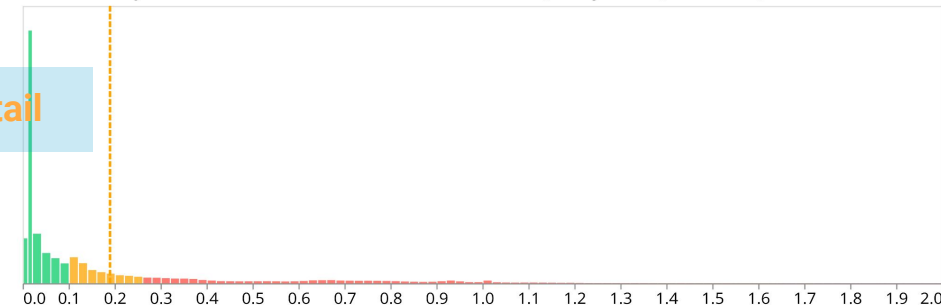
2022-09

Cumulative Layout Shift Distribution - Across The Web - Retail (multiple sites) - 2020-09 (75th Percentile = 0.23)

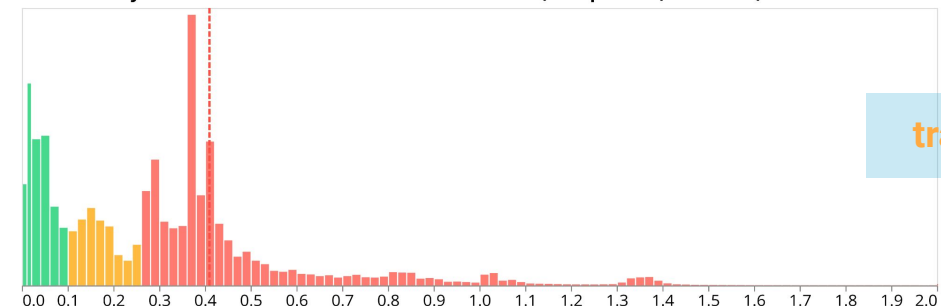


retail

Cumulative Layout Shift Distribution - Across The Web - Retail (multiple sites) - 2022-09 (75th Percentile = 0.19)

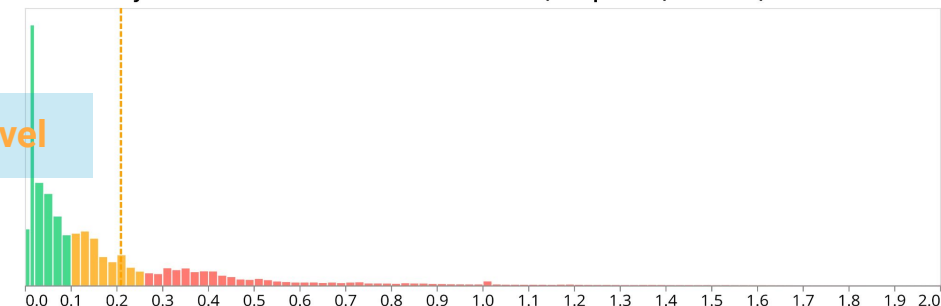


Cumulative Layout Shift Distribution - Across The Web - Travel (multiple sites) - 2020-09 (75th Percentile = 0.41)

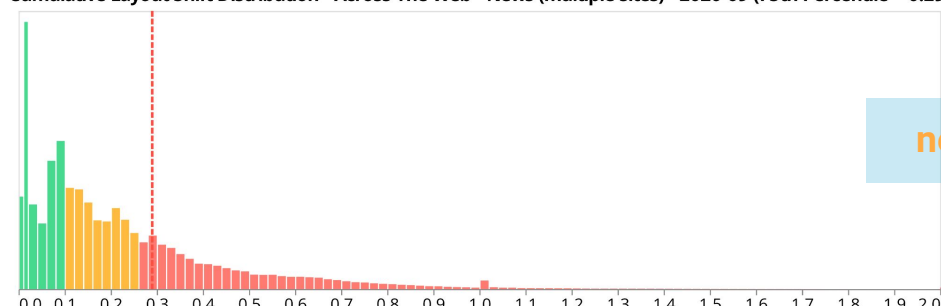


travel

Cumulative Layout Shift Distribution - Across The Web - Travel (multiple sites) - 2022-09 (75th Percentile = 0.21)

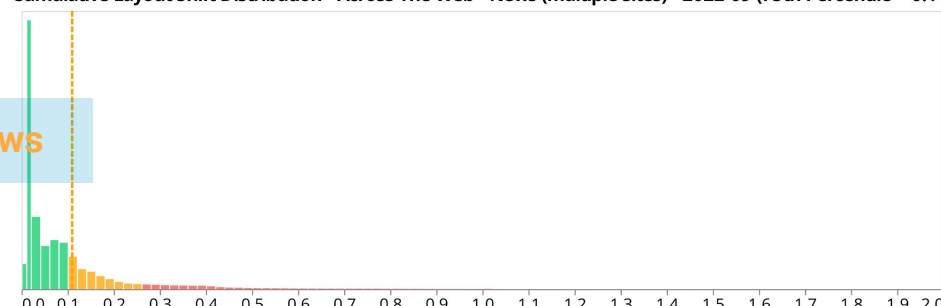


Cumulative Layout Shift Distribution - Across The Web - News (multiple sites) - 2020-09 (75th Percentile = 0.29)



news

Cumulative Layout Shift Distribution - Across The Web - News (multiple sites) - 2022-09 (75th Percentile = 0.11)

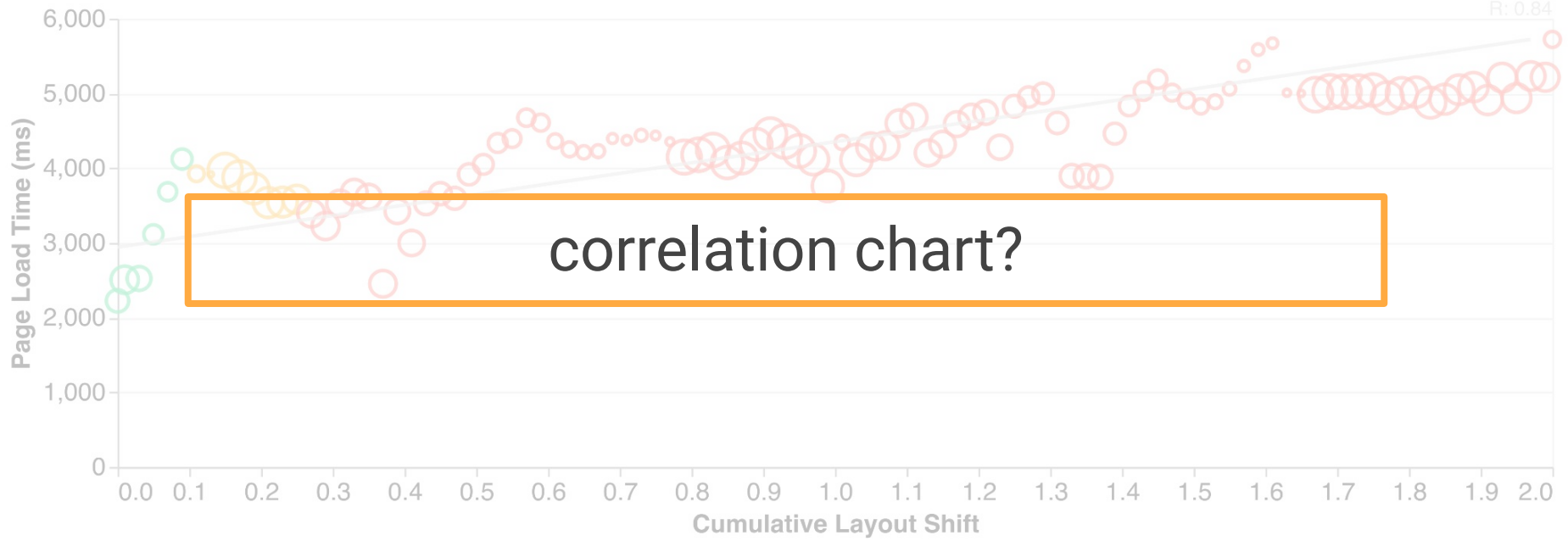


### Cumulative Layout Shift vs. Median Page Load Time - Across the Web

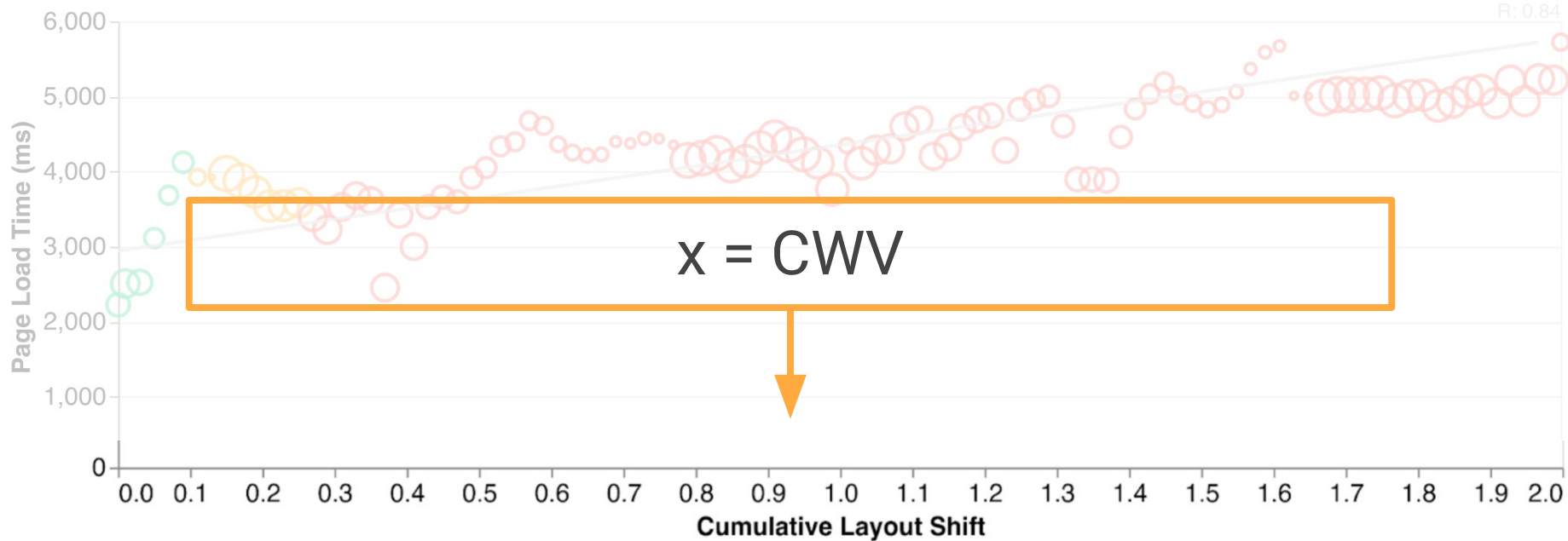




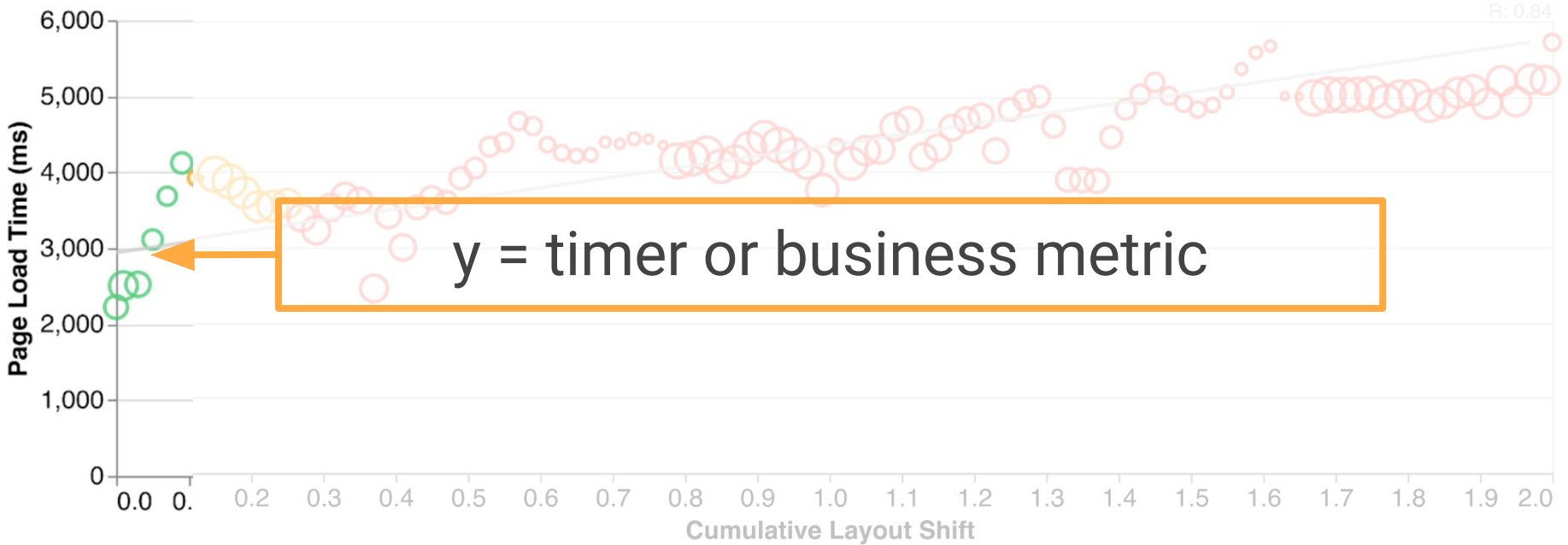
Cumulative Layout Shift vs. Median Page Load Time - Across the Web



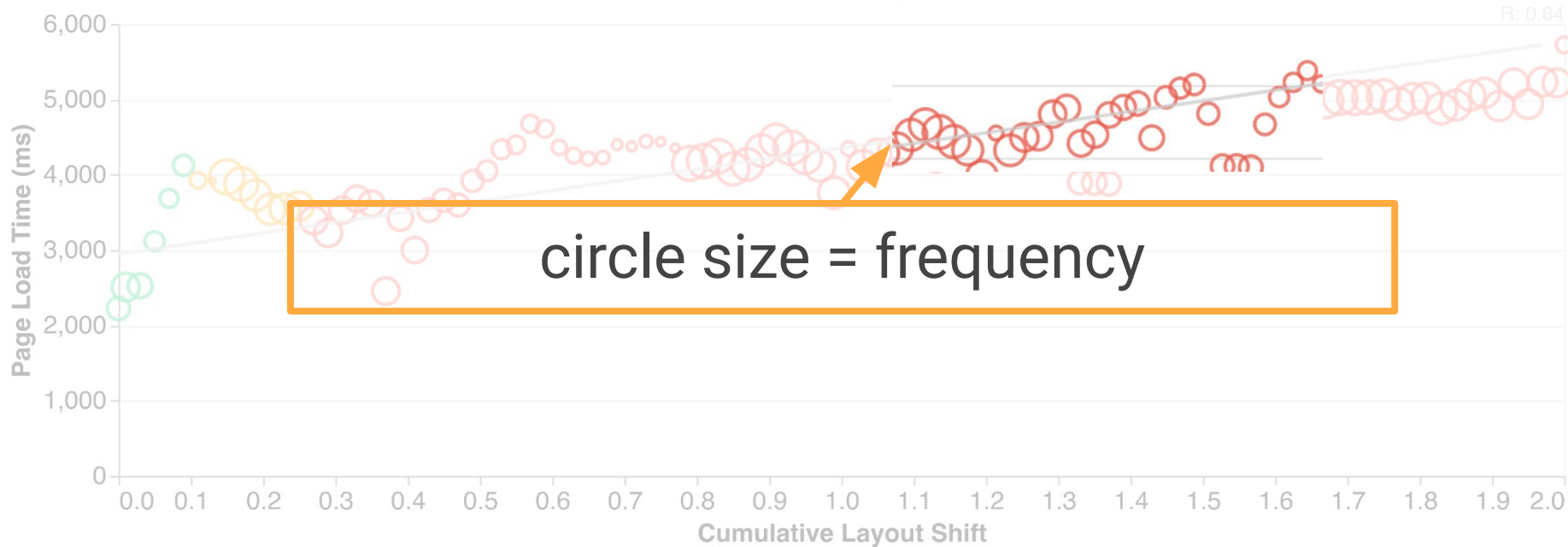
Cumulative Layout Shift vs. Median Page Load Time - Across the Web



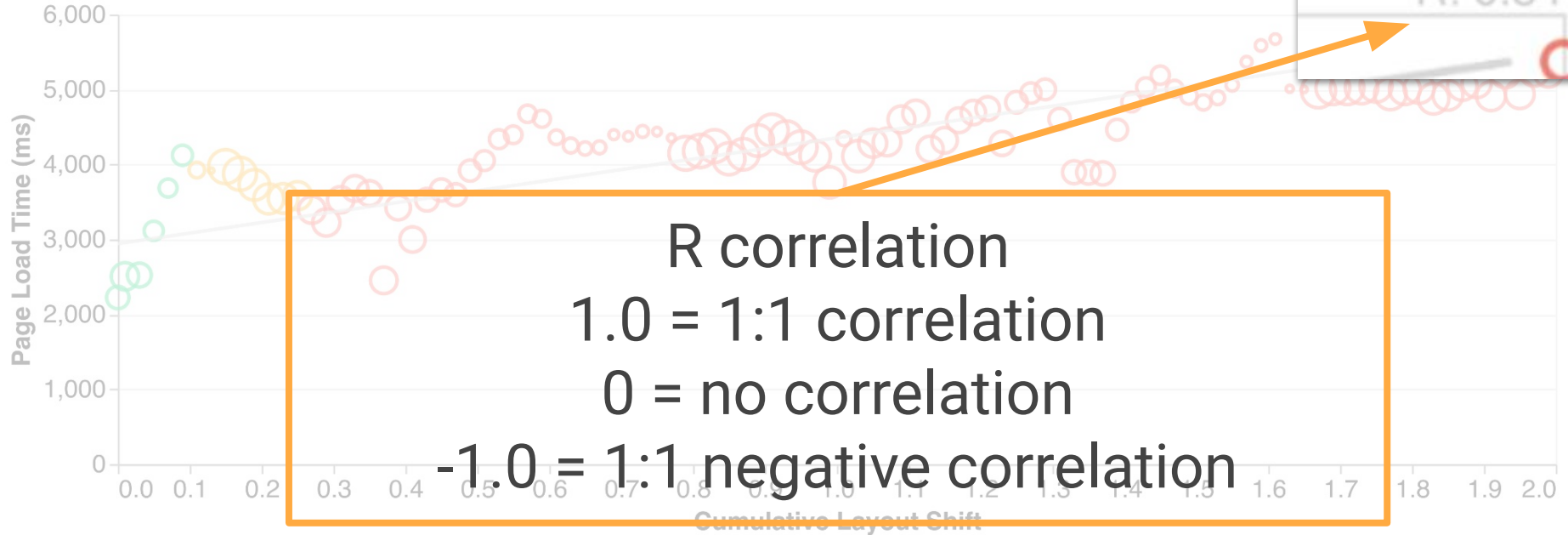
Cumulative Layout Shift vs. Median Page Load Time - Across the Web



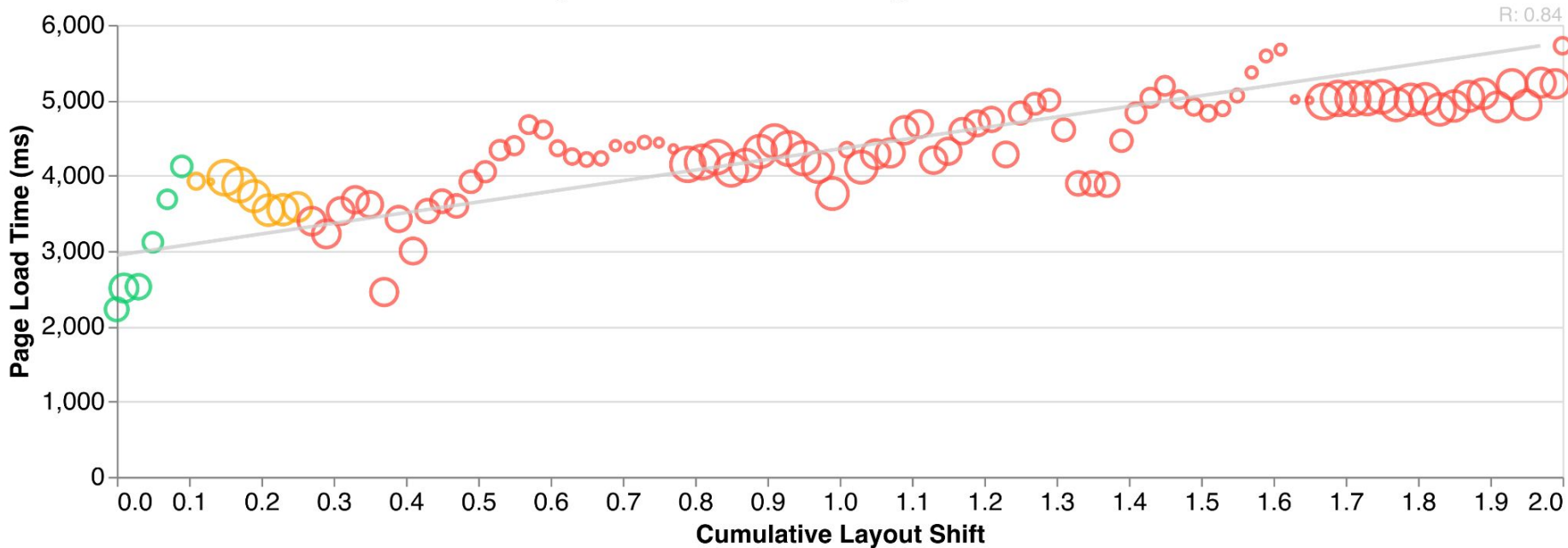
Cumulative Layout Shift vs. Median Page Load Time - Across the Web



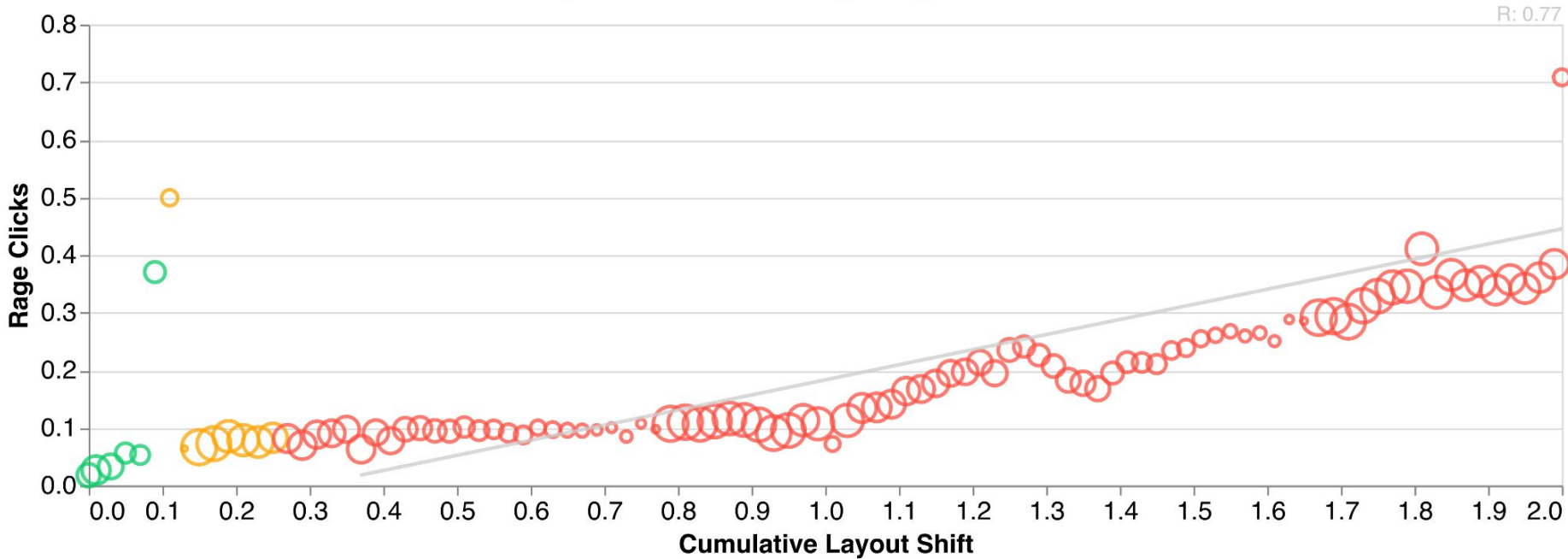
Cumulative Layout Shift vs. Median Page Load Time - Across the We



### Cumulative Layout Shift vs. Median Page Load Time - Across the Web



### Cumulative Layout Shift vs. Average Rage Clicks - Across the Web



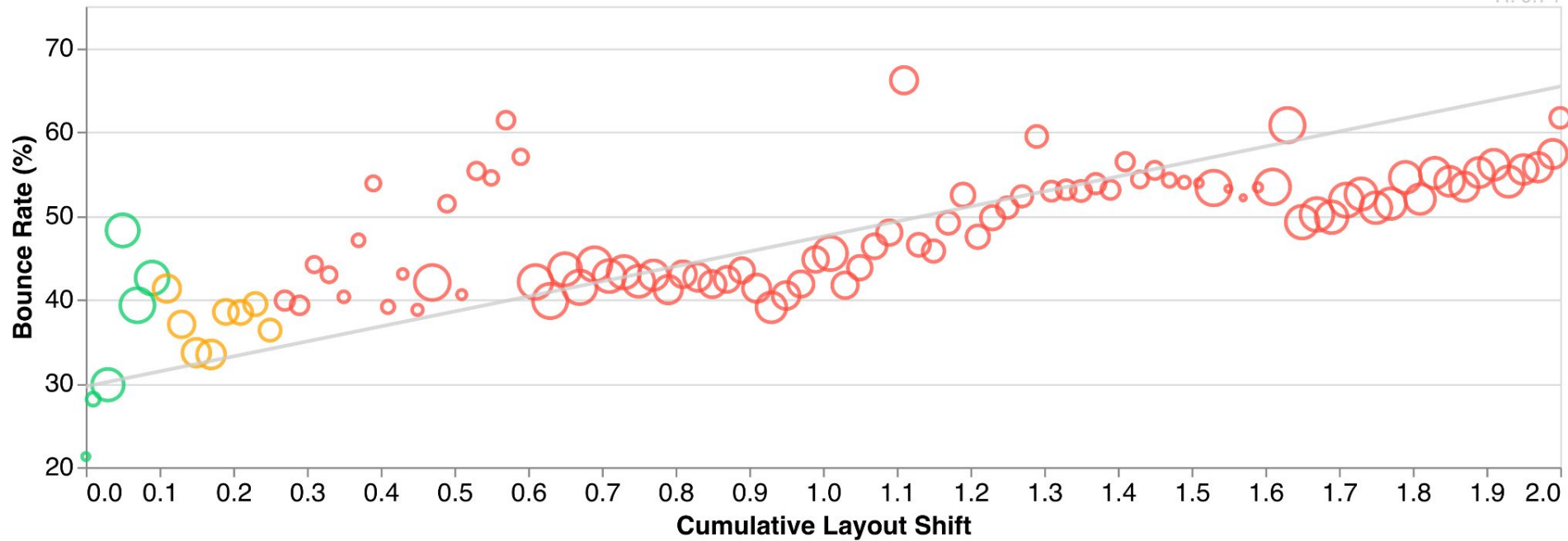
CLS - Data from individual websites

*\* unrandomly selected by Nic to make a point*

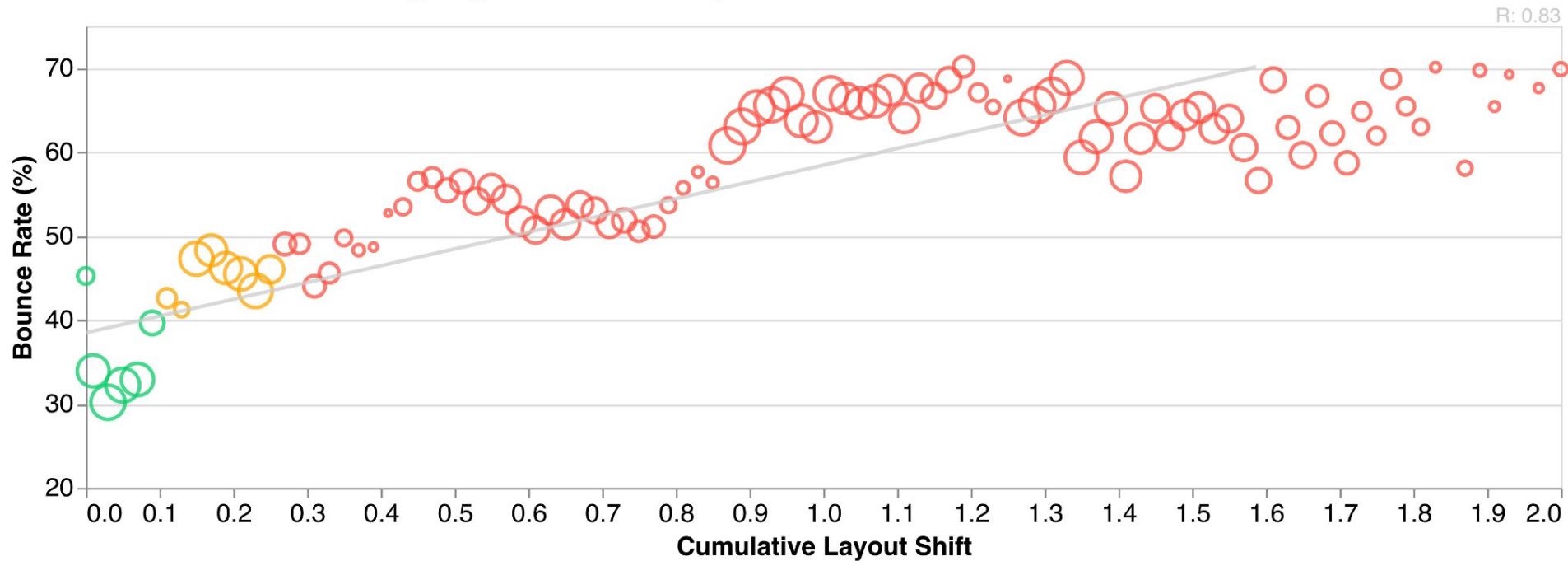


### Landing Page Cumulative Layout Shift vs. Bounce Rate - Retail Website 1

R: 0.74

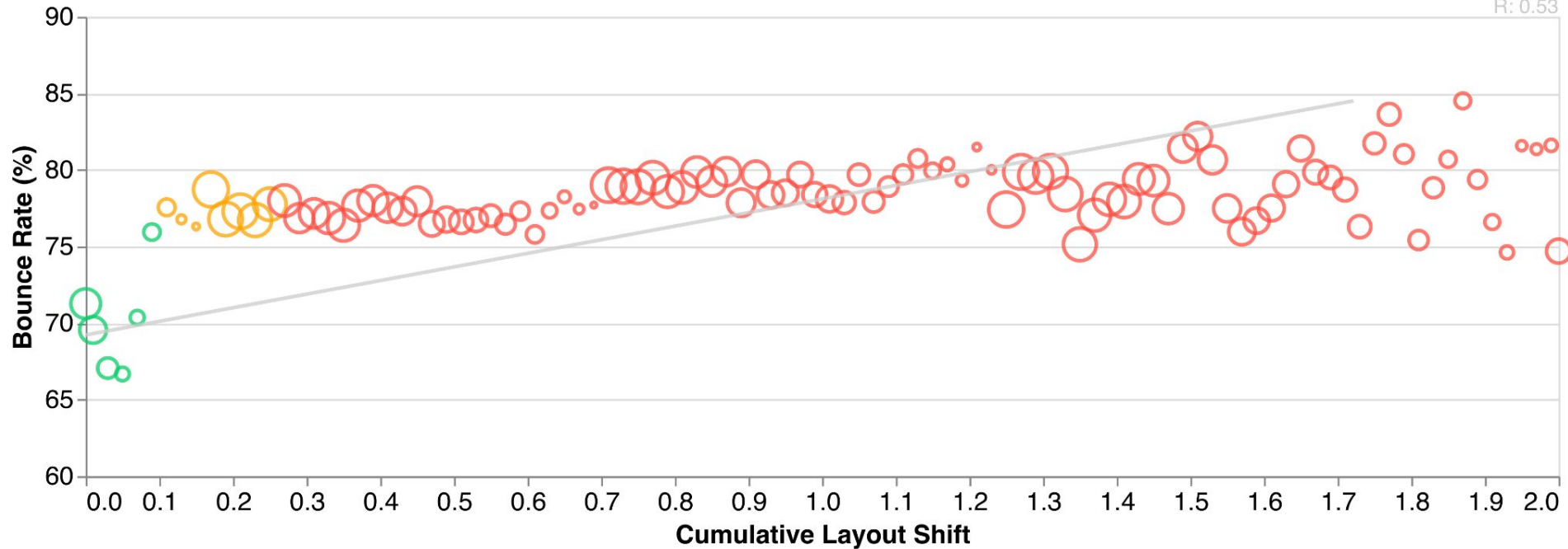


### Landing Page Cumulative Layout Shift vs. Bounce Rate - Retail Website 2



### Landing Page Cumulative Layout Shift vs. Bounce Rate - News Website

R: 0.53

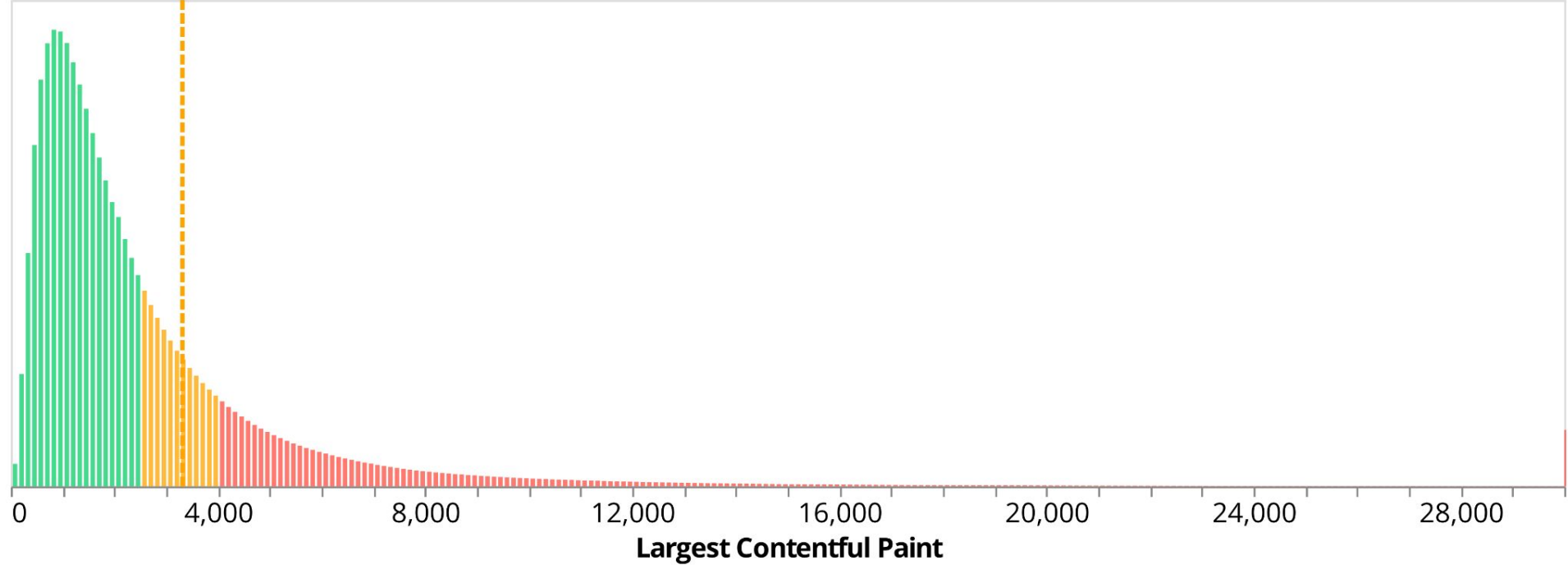


# LCP

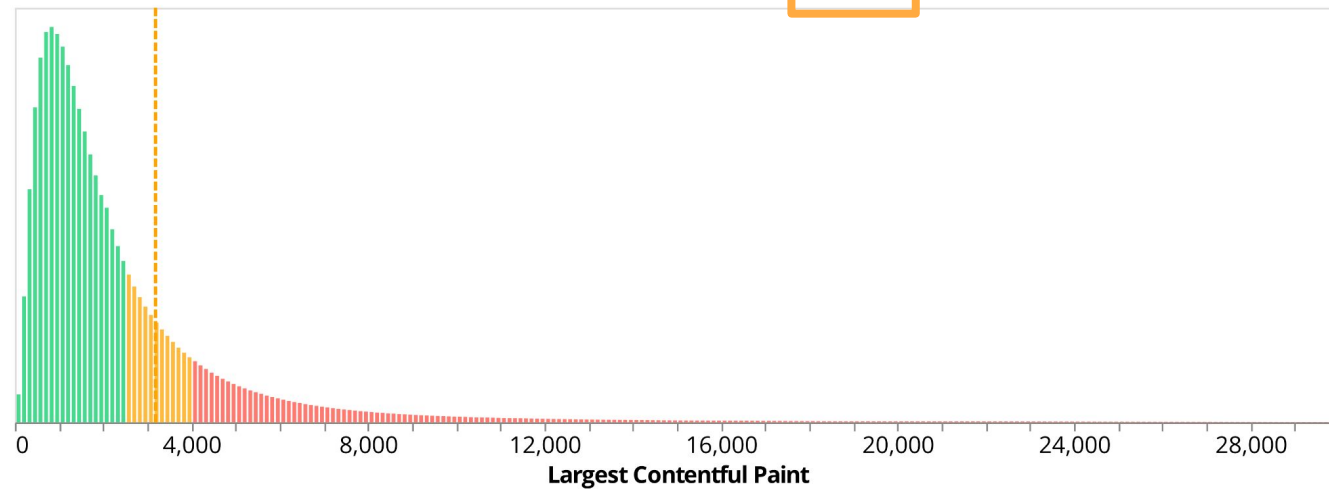
Largest Contentful Paint



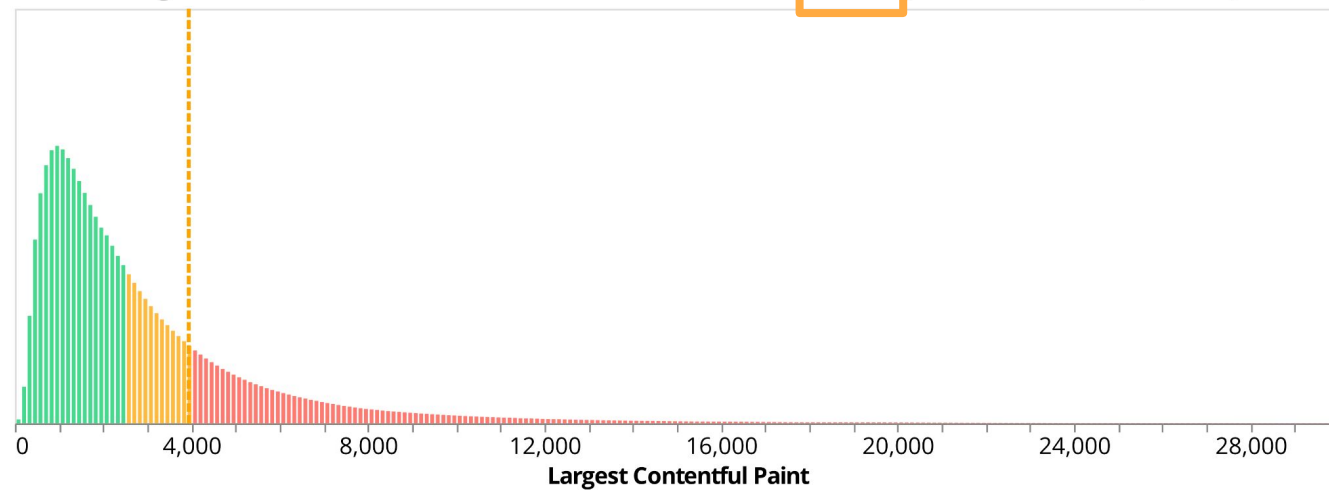
**Largest Contentful Paint Distribution - Across The Web - 2022-09 (75th Percentile = 3,312ms)**

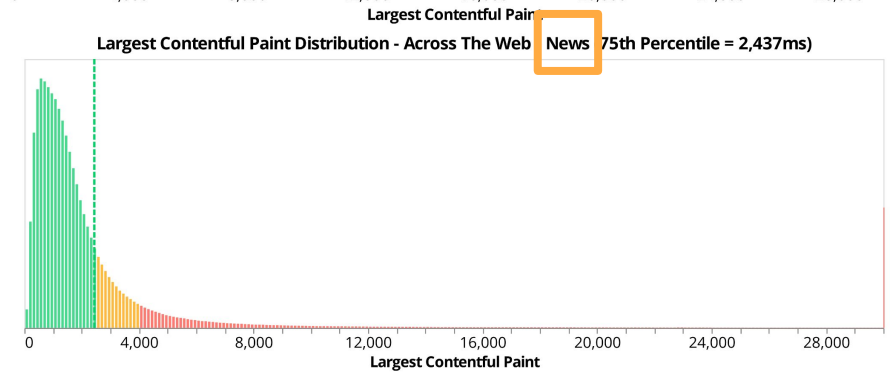
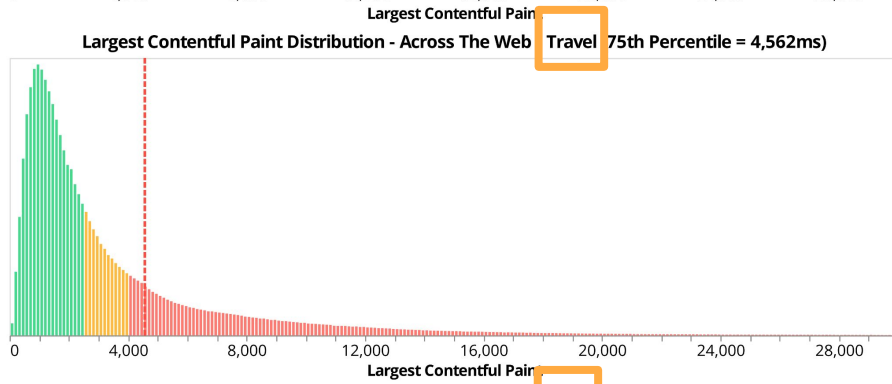
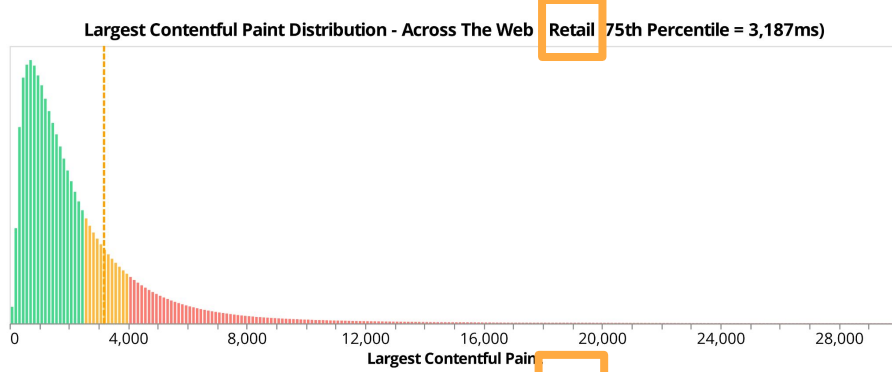


**Largest Contentful Paint Distribution - Across The Web (Desktop 75th Percentile = 3,187ms)**

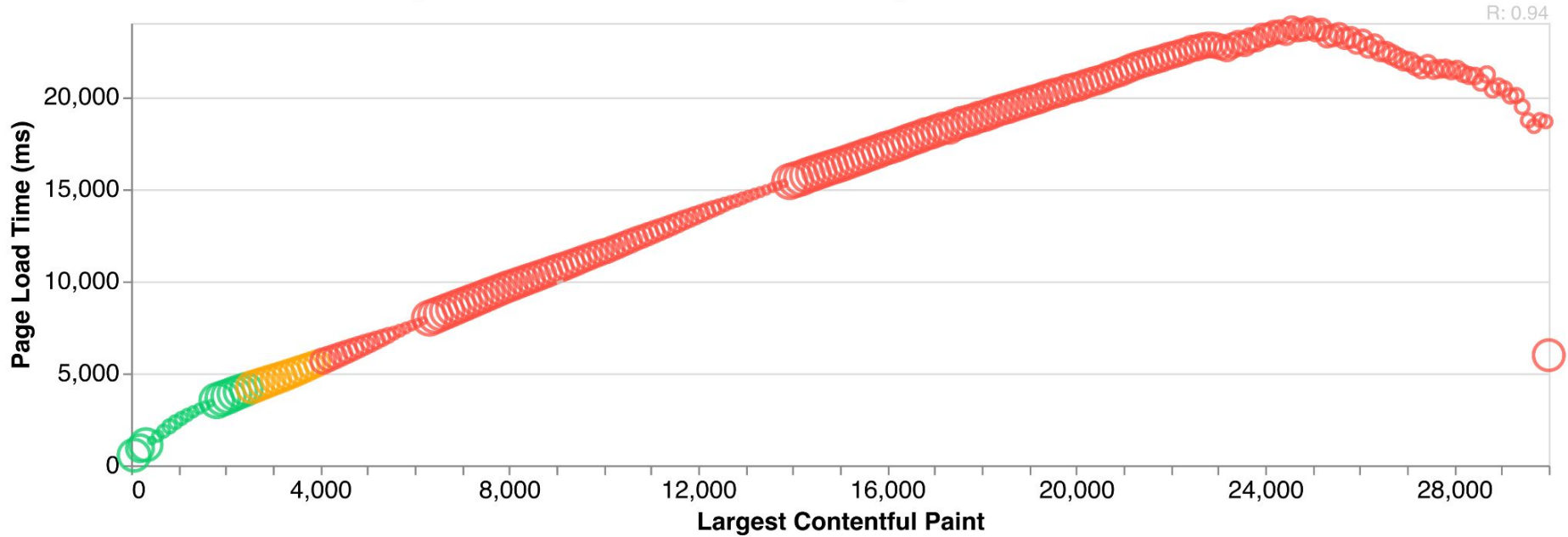


**Largest Contentful Paint Distribution - Across The Web (Mobile 75th Percentile = 3,937ms)**



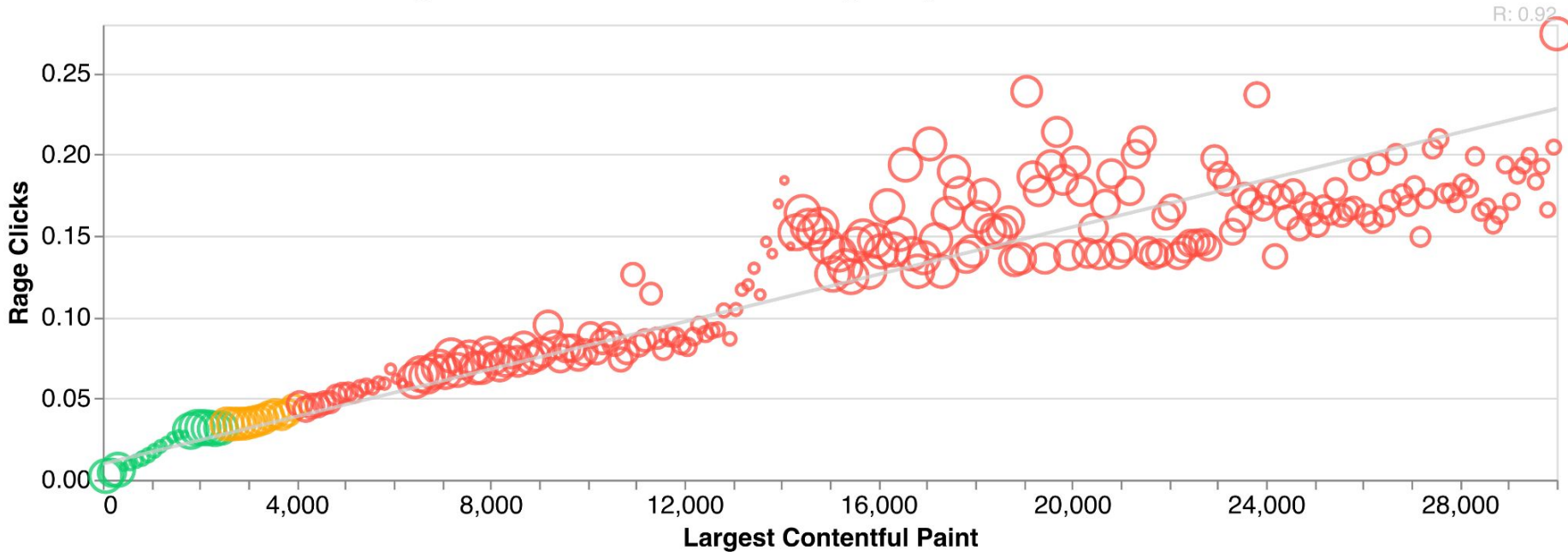


**Largest Contentful Paint vs. Median Page Load Time - Across the Web**





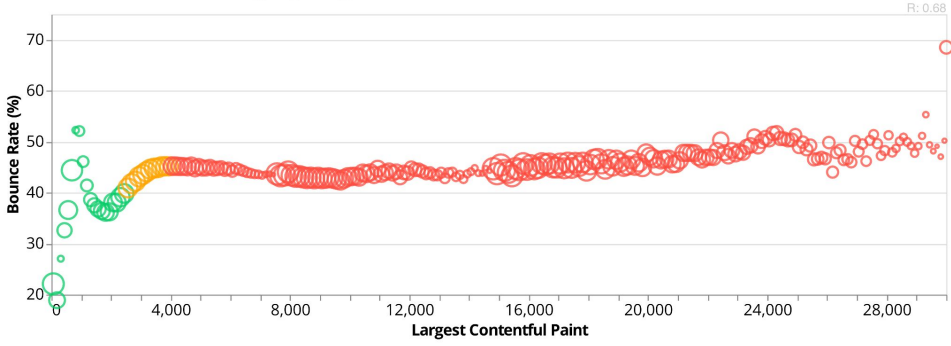
### Largest Contentful Paint vs. Average Rage Clicks - Across the Web



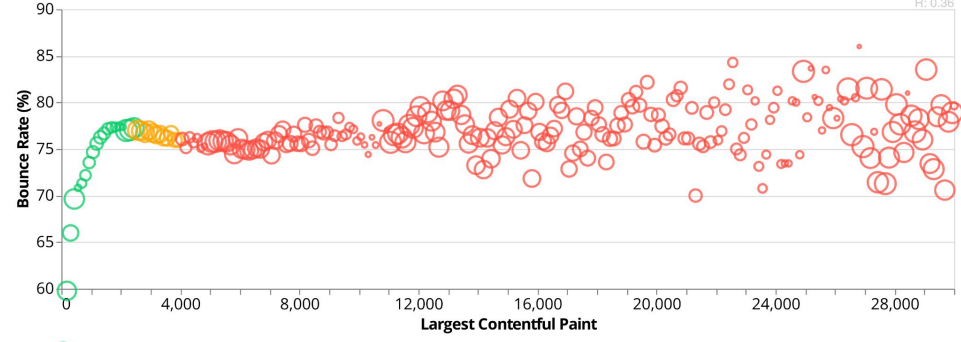
LCP - Data from individual websites

*\* unrandomly selected by Nic to make a point*

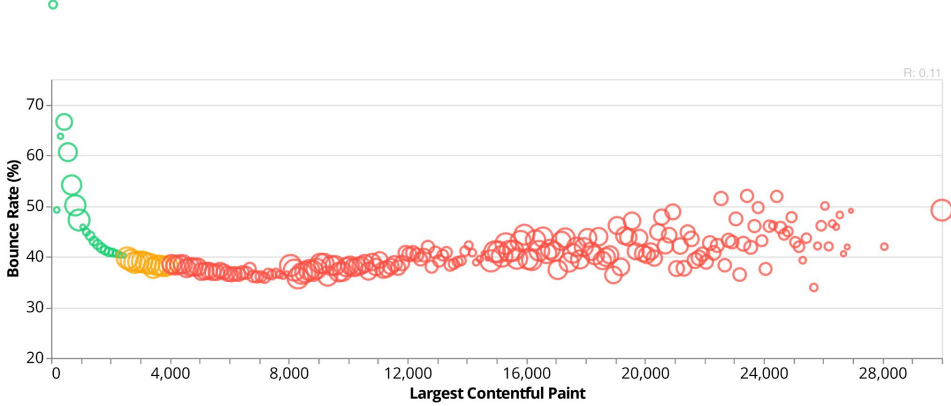
Landing Page Largest Contentful Paint vs. Bounce Rate - Retail Website 1



Landing Page Largest Contentful Paint vs. Bounce Rate - News Website 1



Landing Page Largest Contentful Paint vs. Bounce Rate - Retail Website 2

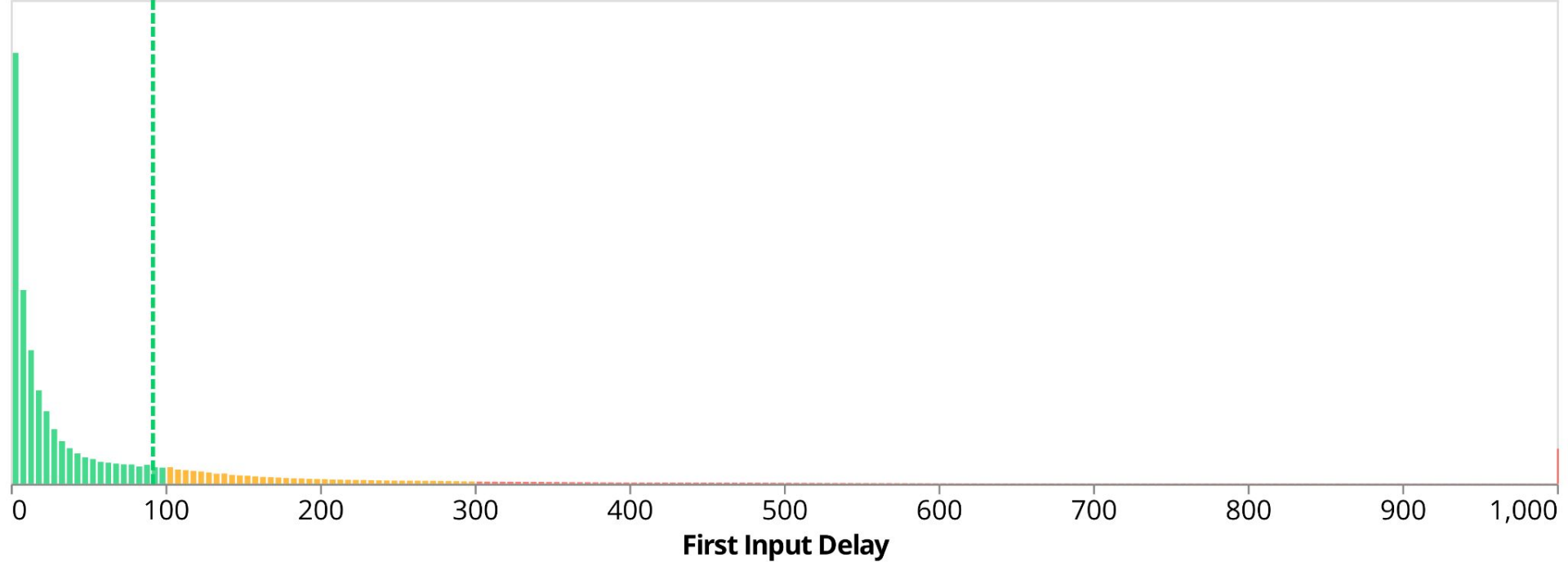


# FID

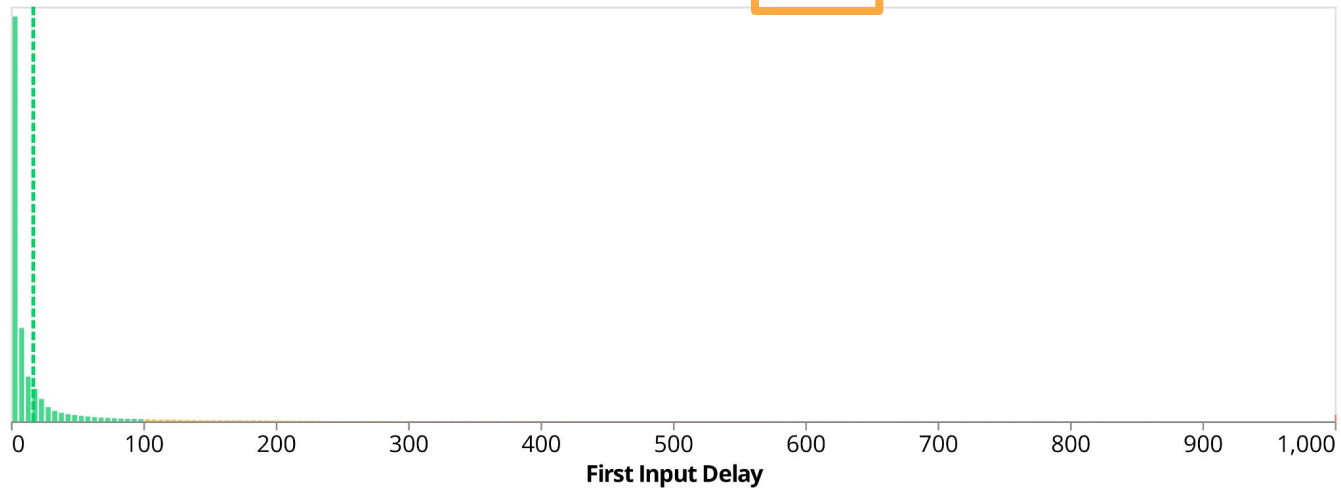
First Input Delay



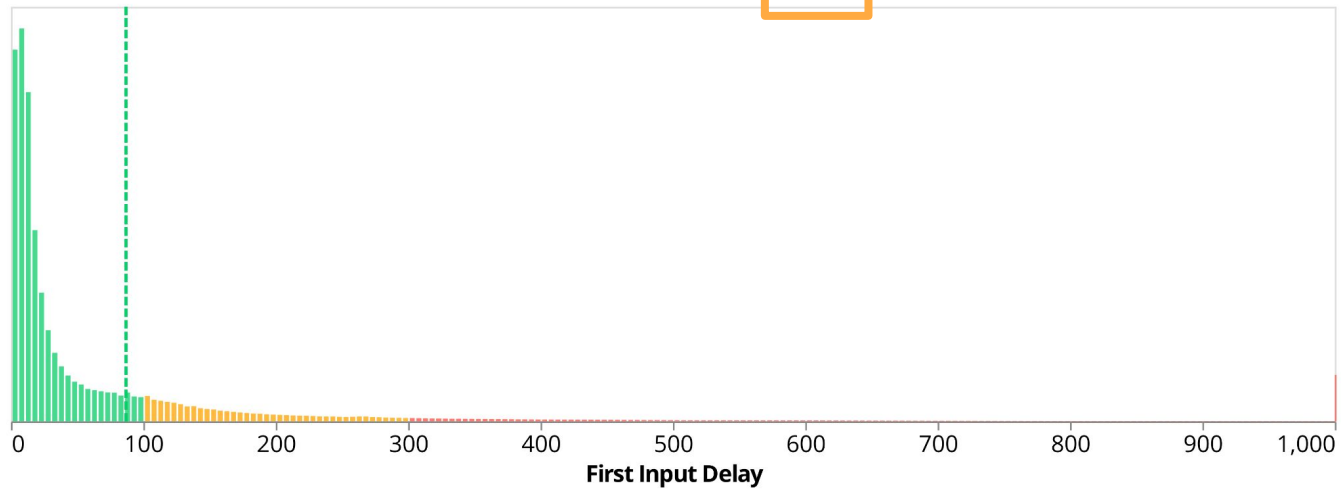
**First Input Delay Distribution - Across The Web - 2022-09 (75th Percentile = 92ms)**



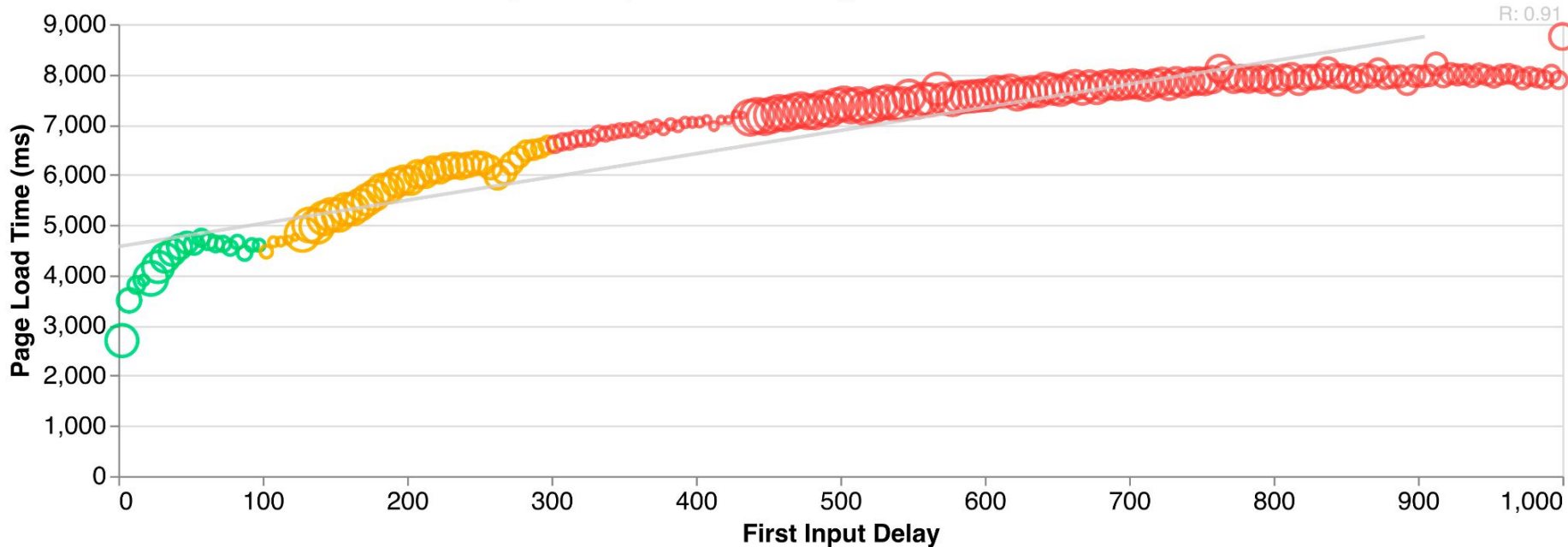
First Input Delay Distribution - Across The Web (Desktop (75th Percentile = 17ms))



First Input Delay Distribution - Across The Web (Mobile (75th Percentile = 87ms))



### First Input Delay vs. Median Page Load Time - Across the Web



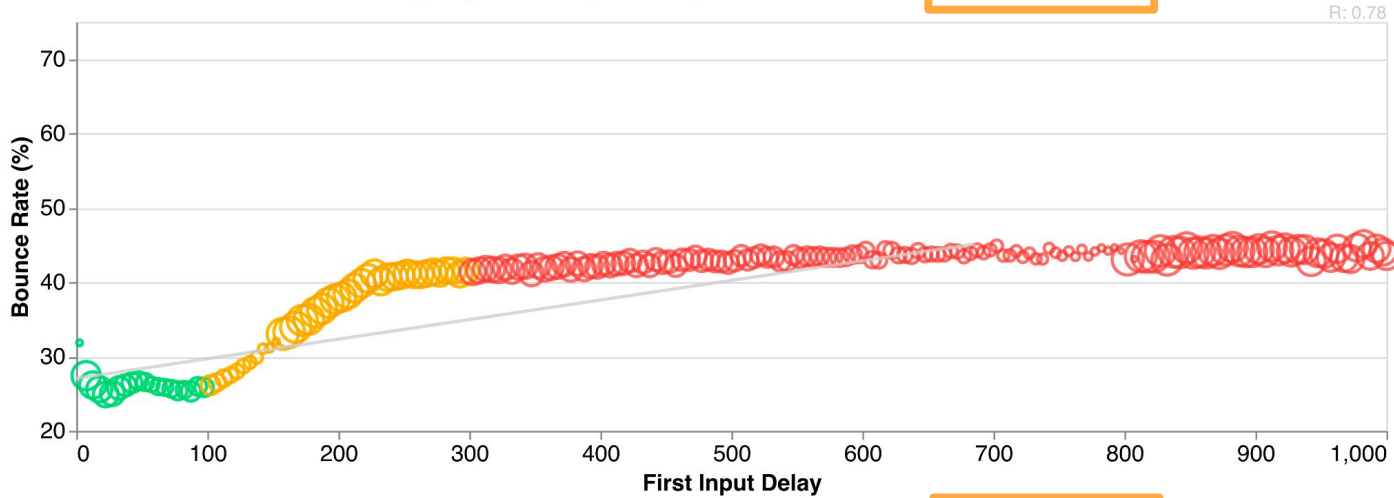
FID - Data from individual websites

*\* unrandomly selected by Nic to make a point*



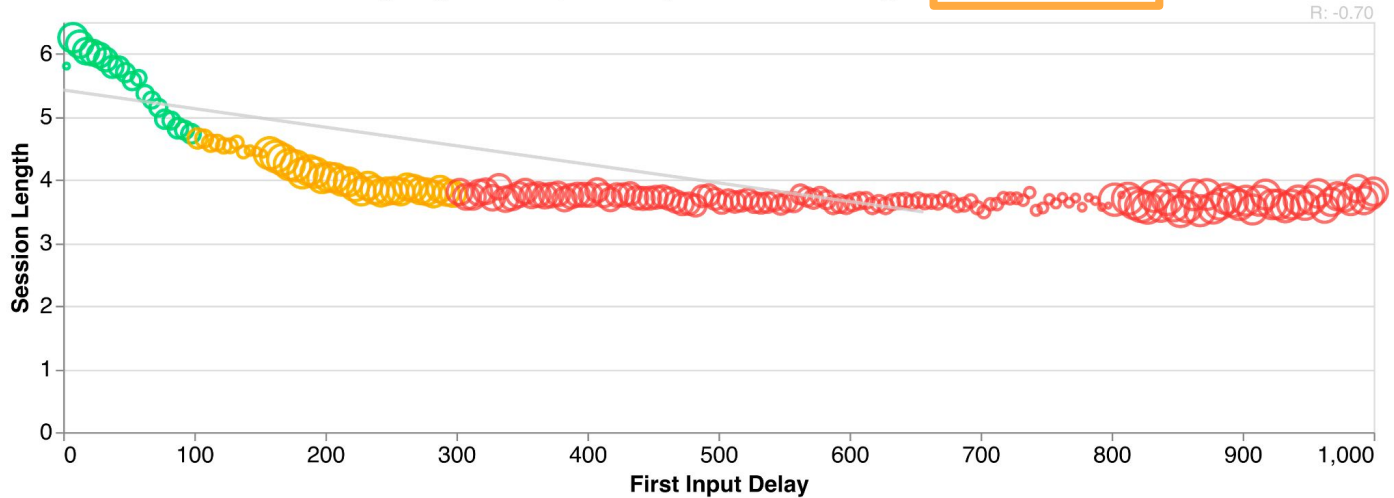
Landing Page First Input Delay vs. Bounce Rate

Retail Website 1

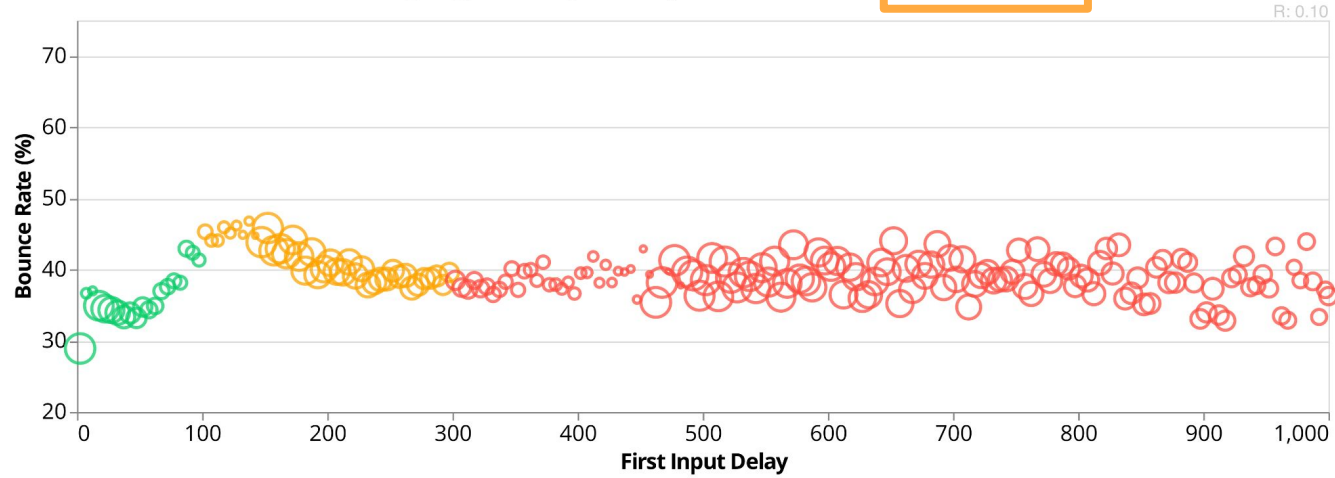


Landing Page First Input Delay vs. Session Length

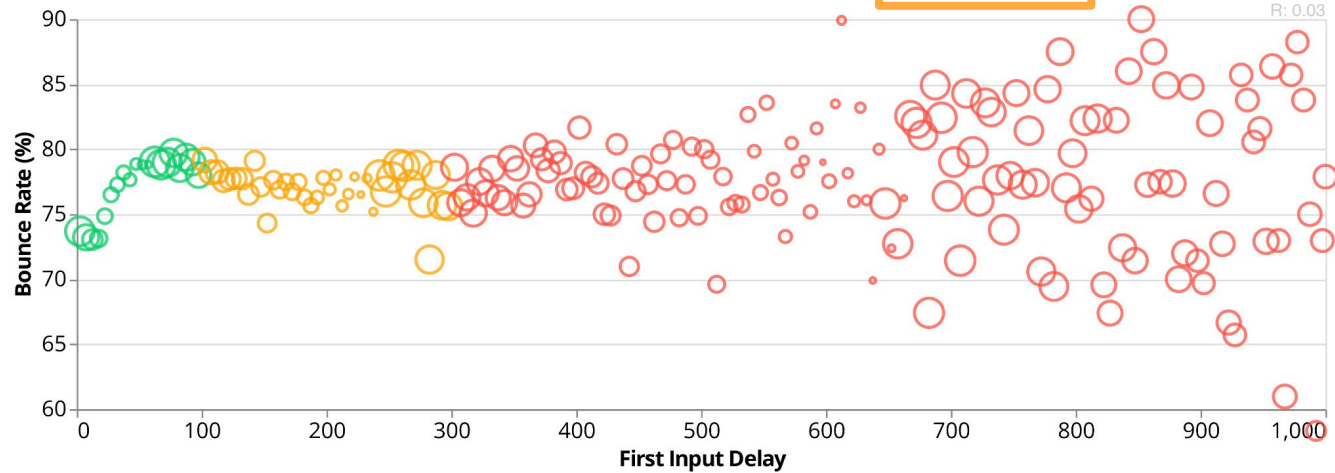
Retail Website 1



Landing Page First Input Delay vs. Bounce Rate **Retail Website 2**



Landing Page First Input Delay vs. Bounce Rate **News Website 1**



# INP

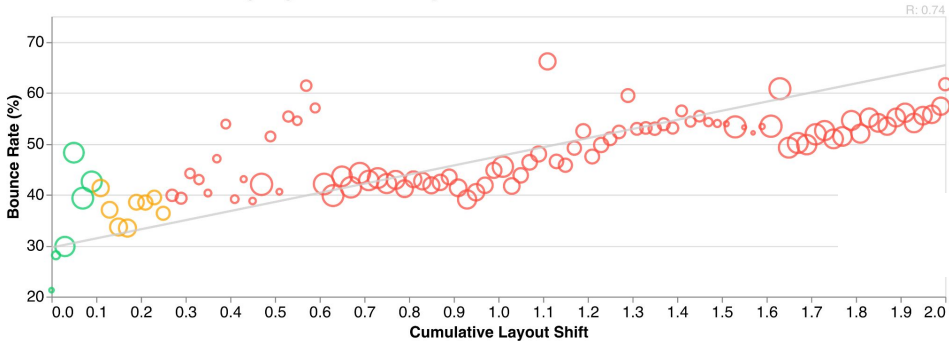
Interaction to Next Paint



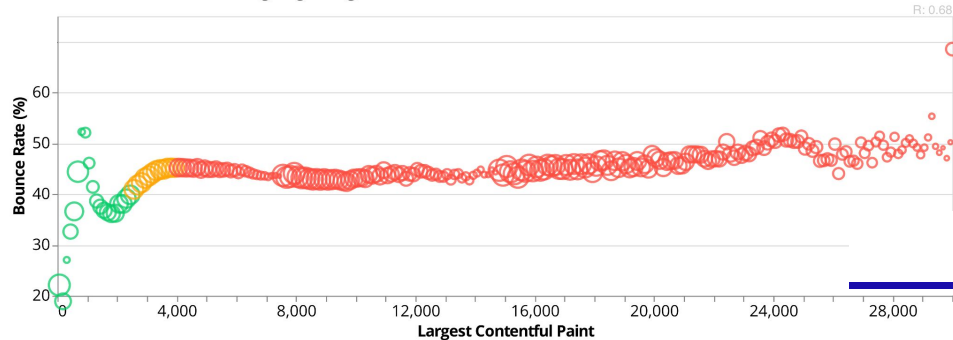
... ?

# What CWV matters to "Retail 1"?

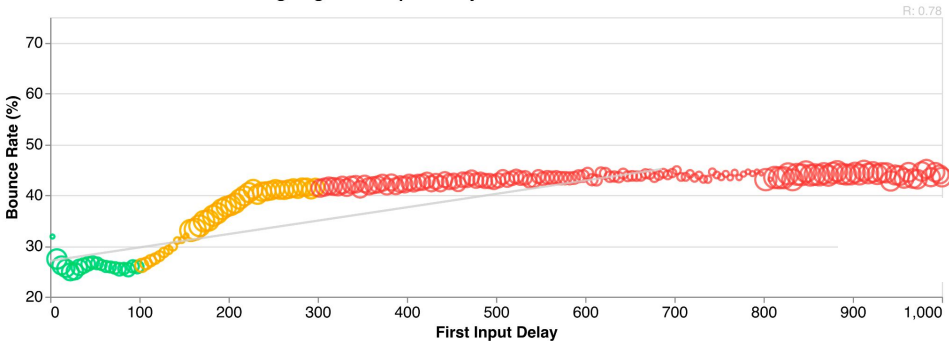
Landing Page Cumulative Layout Shift vs. Bounce Rate - Retail Website 1



Landing Page Largest Contentful Paint vs. Bounce Rate - Retail Website 1



Landing Page First Input Delay vs. Bounce Rate - Retail Website 1





How can I evaluate a "modern" metric?

# How can I evaluate a "modern" metric?

## By yourself

- RUM monitoring
- Synthetic monitoring

## Others

- Developer evangelists
- Research papers
- Conferences
- Public datasets



http.  
archive



INTERNET  
ARCHIVE



RUM Archive?

[rumarchive.com](http://rumarchive.com)

# RUM Archive

## Goals:

- Public data set of RUM data
- via Google BigQuery
- We welcome others to contribute!
  - Individuals
  - Corporations
  - Other RUM Providers
- Open-source project description, documentation and methodology

```
SELECT  COUNTRY,
        COUNT(*) AS ROWCOUNT,
        SUM(BEACONS) AS BEACONCOUNT,
        `akamai-mpulse-rumarchive.rumarchive.PERCENTILE_APPROX` (
            ARRAY_AGG(PLTHISTOGRAM),
            [0.0, 0.25, 0.50, 0.75, 0.90, 0.95, 1.0],
            100,
            false) as PERCENTILES,
        `akamai-mpulse-rumarchive.rumarchive.PERCENTILE_APPROX` (
            ARRAY_AGG(PLTHISTOGRAM),
            [0.50],
            100,
            false) as MEDIAN
FROM    `akamai-mpulse-rumarchive.rumarchive.rumarchive_page_loads`
WHERE   DATE = "2022-09-01"
GROUP BY COUNTRY
ORDER BY SUM(BEACONS) DESC
```

## Query results

JOB INFORMATION		RESULTS	JSON	EXECUTION DETAILS	
Row	COUNTRY	ROWCOUNT	BEACONCO...	PERCENTILES	MEDIAN
1	US	316228	139286298	{\"0\":0,\"1\":60999,\"0.25\":607,\"0.5\":1814,\"0.75\":3960,\"0.9\":7732,\"0.95\":12099}	1814
2	JP	56112	21096496	{\"0\":0,\"1\":60999,\"0.25\":1033,\"0.5\":2447,\"0.75\":5298,\"0.9\":10310,\"0.95\":15388}	2447
3	GB	85562	16861923	{\"0\":0,\"1\":60999,\"0.25\":1378,\"0.5\":2615,\"0.75\":5023,\"0.9\":10028,\"0.95\":15835}	2615
4	IN	99661	9155488	{\"0\":0,\"1\":60999,\"0.25\":1541,\"0.5\":3308,\"0.75\":5023,\"0.9\":10028,\"0.95\":15835}	3308

[rumarchive.com](http://rumarchive.com)

ty!

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njansma@akamai.com