Investigating and Forecasting User Activities in Newsblogs: A Study of Seasonality, Volatility and Attention Burst

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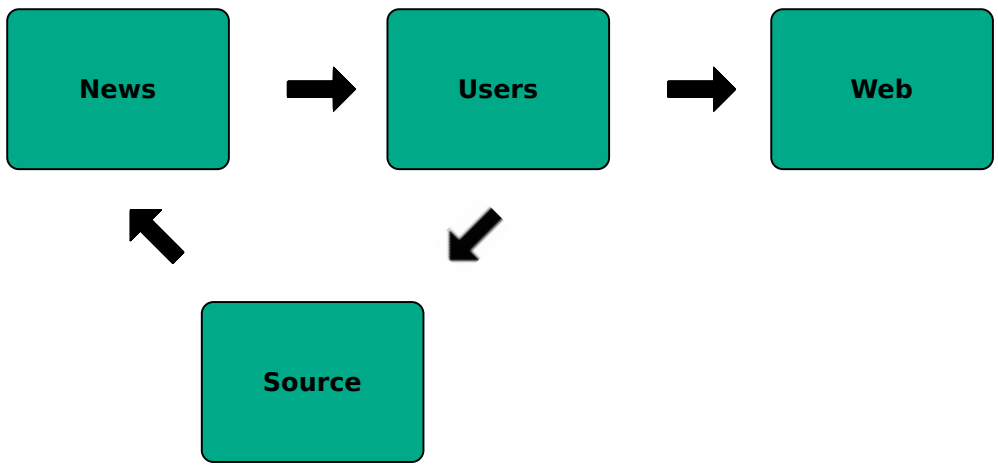
Overview

- Introduction and motivation to Web-user Analytics
- A look at Wordpress
- Periodicity analysis
- Attention shifts
- Understanding system volatility and predictive analysis

Introduction

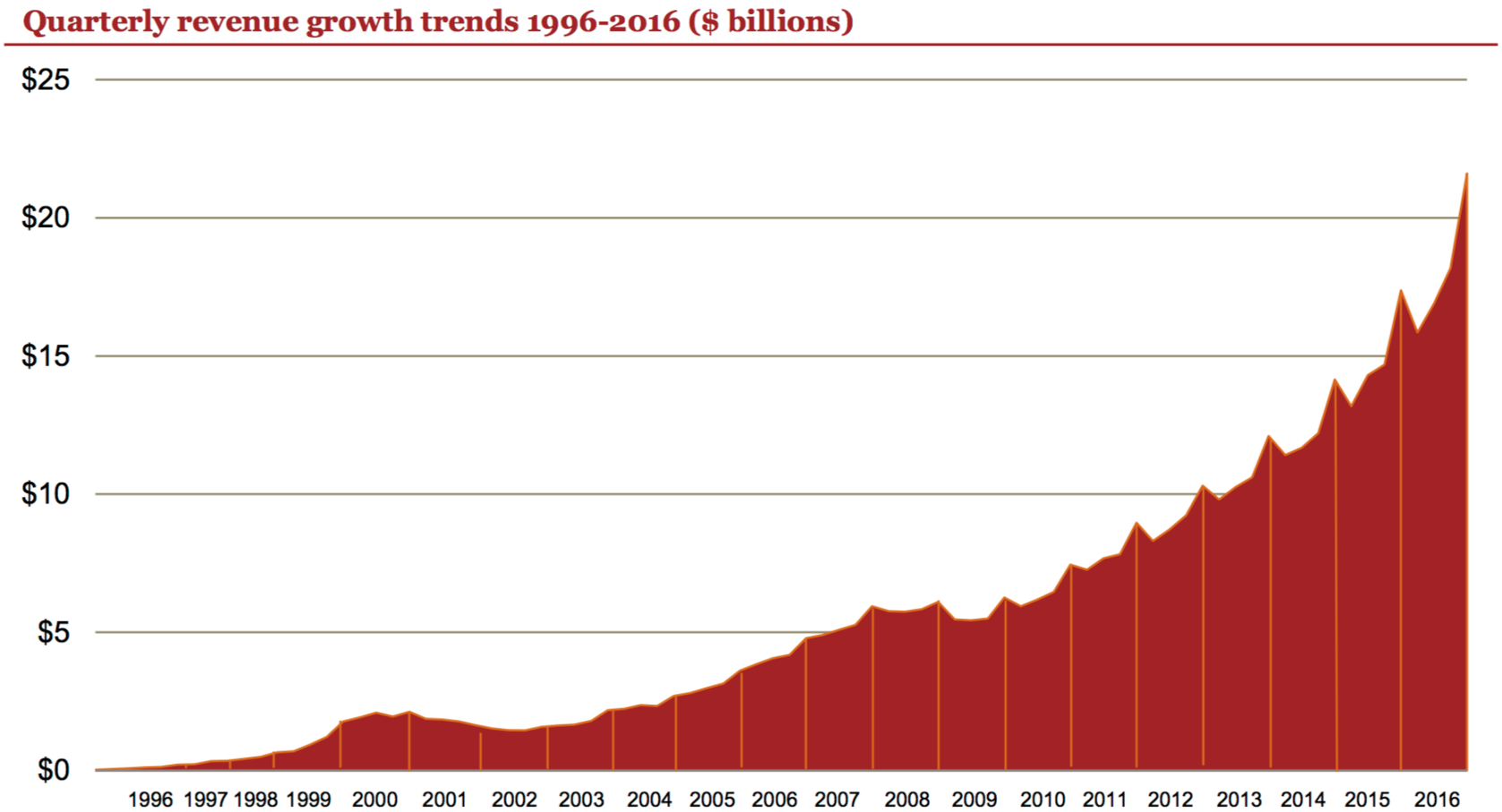
- Most of the attention: News Virality and User Behavior
- How about the sources
- Do they have a saying?



Introduction (2)

- Studying behavioral activities of newsblog users with respect to seasonality, attention shifts and volatility
- Aiming to find possible patterns to help content provider and advertisement operators with informed decision making
- Our proxy: **Number of comments** made on posts

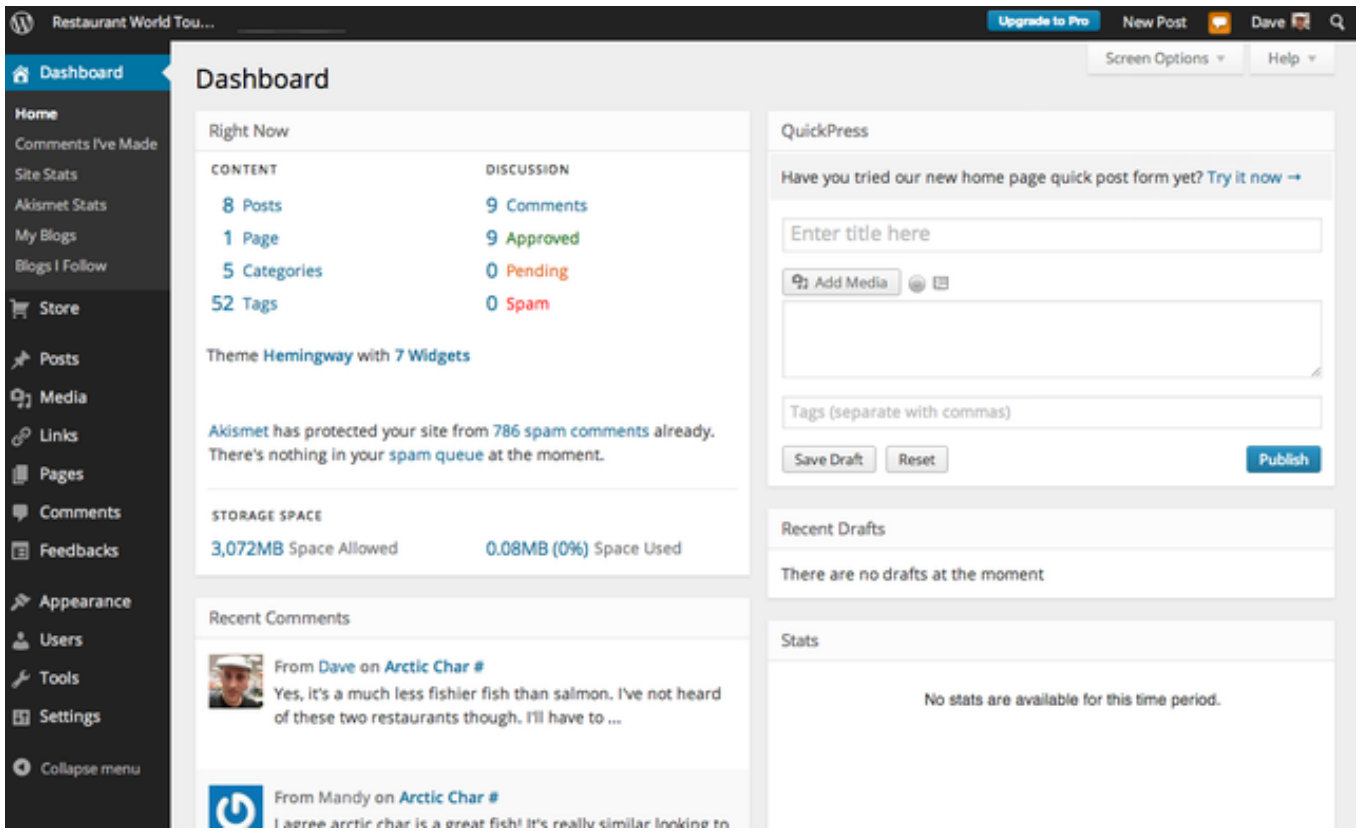
Introduction (3)



Source: IAB/PwC Internet Ad Revenue Report, FY 2016

Blogosphere

WordPress

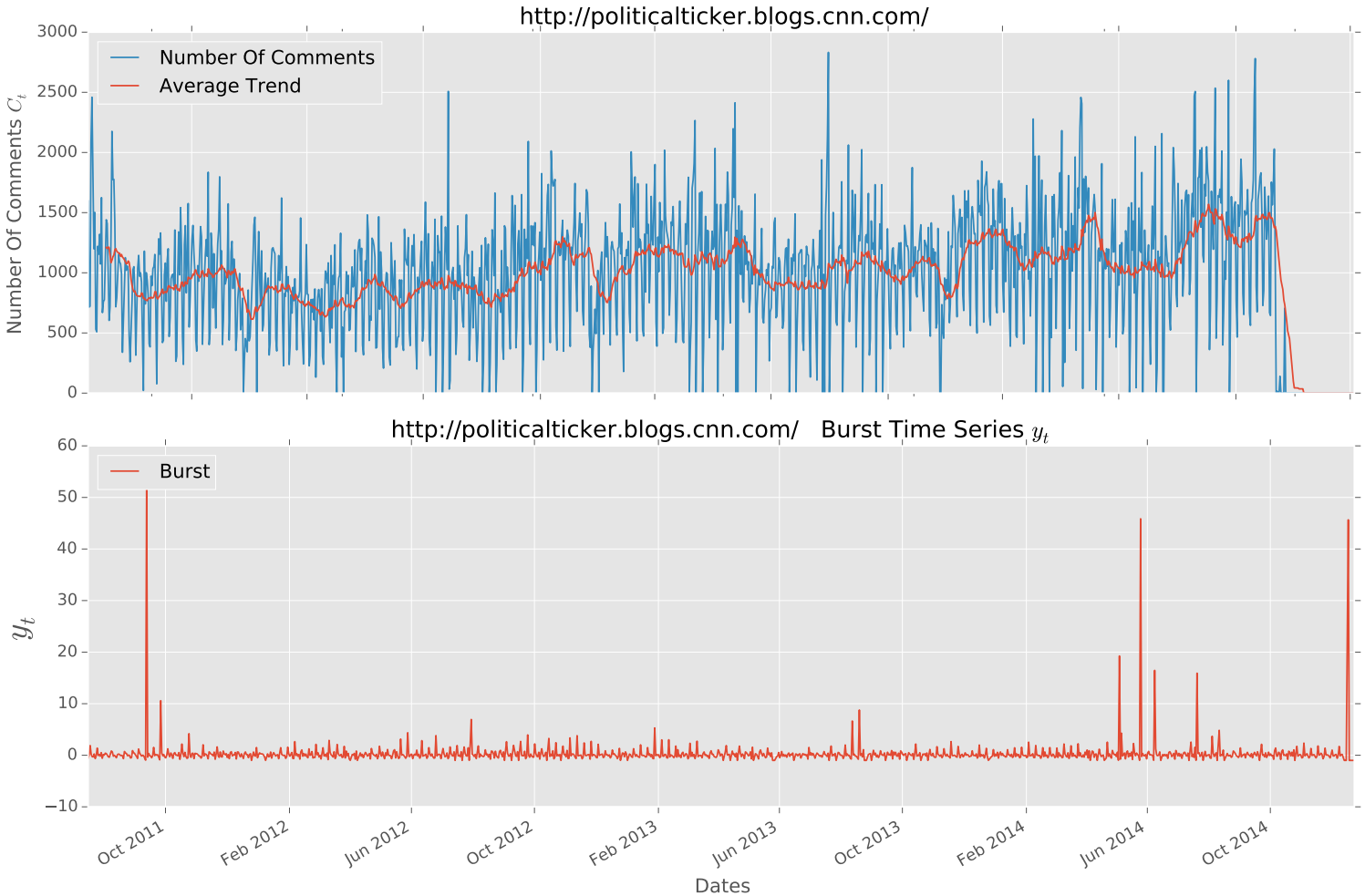


Data Set

number of blogs	203
number of posts	713,122
number of comments	14,883,752
time span of activity	2006-2014

Blog URL	News Genre	Viral Post Count
le-grove.co.uk	Sport	620
politicalticker.blogs.cnn.com	Politics	542
order-order.com	Politics	294
sloone.wordpress.com	Personal	248
technologizer.com	Technology	136
snsdkorean.wordpress.com	Entertainment	116
collegecandy.com	Magazine	108
seokyualways.wordpress.com	Personal	96
religion.blogs.cnn.com	Religion	93
kickdefella.wordpress.com	Personal	89

A Typical Newsblog Time Series



Modeling Burst and Volatility

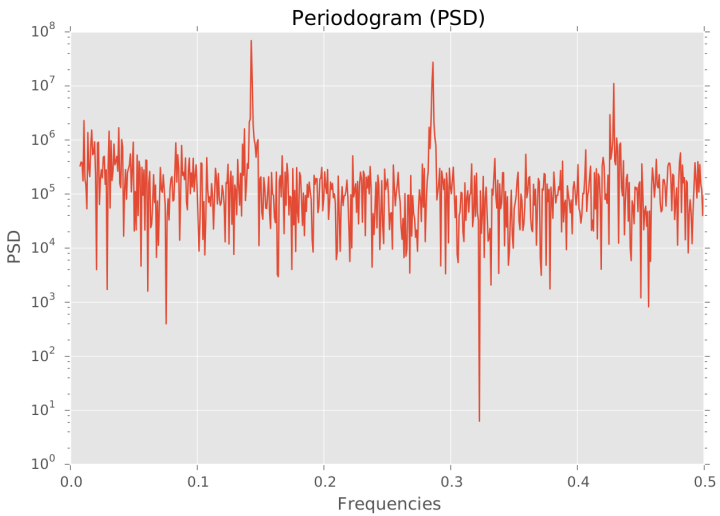
In order to characterize the popularity of a particular news source, we require a quantitative measurement of attention shifts. These can described via an iter-burst (logarithmic derivative) measure:

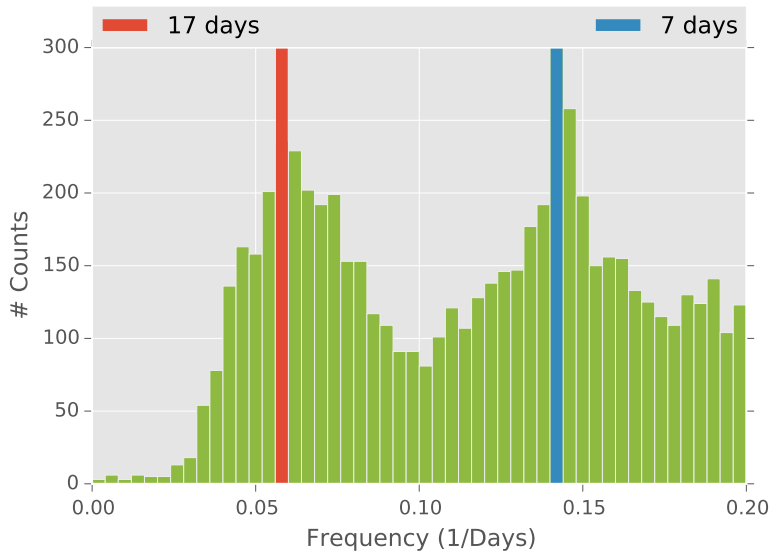
$$y_t = \frac{C_t - C_{t-1}}{C_t}$$

For volatility we refer to Generalized Autoregressive Conditional Heteroscedasticity (GARCH):

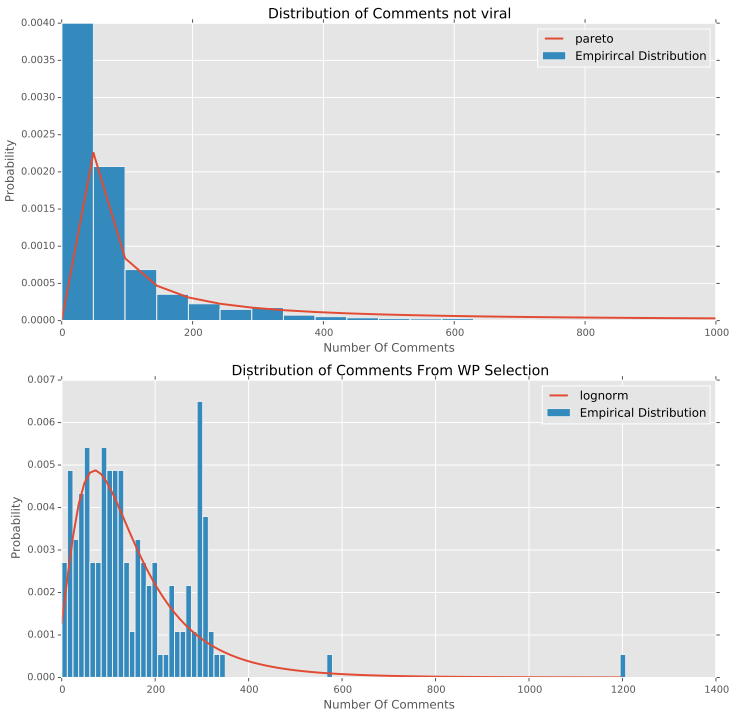
$$\sigma_t^2 = \omega + \sum_{k=1}^{q} \alpha_k \epsilon_{t-k}^2 + \sum_{l=1}^{p} \beta_l \sigma_{t-l}^2$$

Periodogram



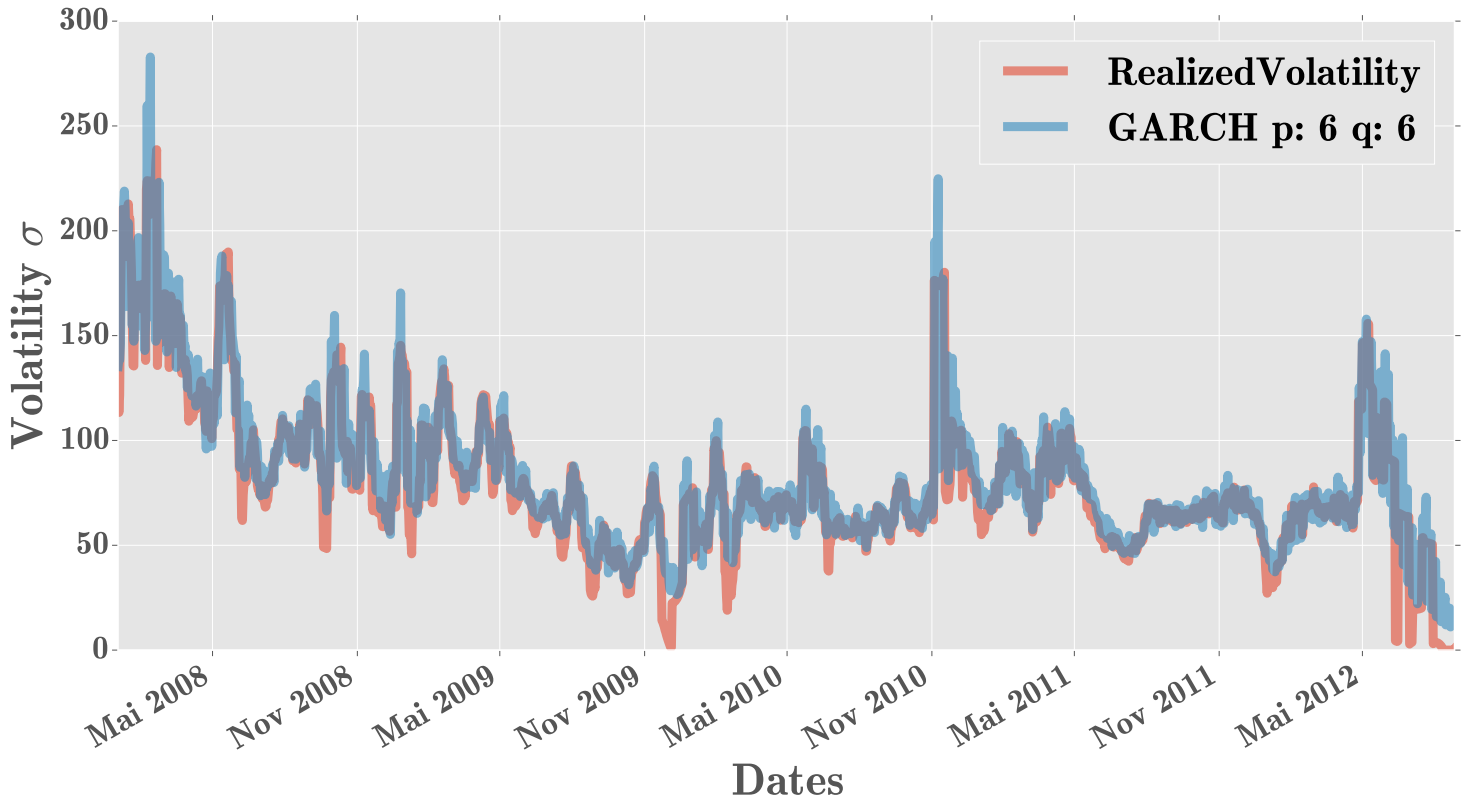


Attention Proxy



- Normal blogs: an average fluctuation value of -96.14
- Relevant blogs: average fluctuation value for the important posts of 71.12
- This shows that *most of the comment behavior arises from popular or viral posts*

Realized and Conditional Volatility



Results

Blogs	Best Model	MSE	MSE p=1 q=1	# Comments
le-grove.co.uk/	(7, 7)	2.00	1.87	1625633
politicalticker.blogs.cnn.com/	(3, 2)	4.48	4.16	1461266
order-order.com/	(5, 5)	4.87	3.80	1289484
sloone.wordpress.com/	(8, 7)	1.39	1.16	93493
technologizer.com/	(9, 1)	594.34	649.79	165856
snsdkorean.wordpress.com/	(2, 5)	0.40	0.28	83081
collegecandy.com/	(9, 1)	0.71	0.61	51495
seokyualways.wordpress.com/	(1, 6)	3.76	2.41	130460
religion.blogs.cnn.com/	(9, 9)	21.66	18.74	2426437
kickdefella.wordpress.com/	(6, 8)	0.22	0.17	39312

- MSE of .74 for best AIC models (100 blogs)
- MSE of .66 for p=1 q=1 (100 blogs)

Conclusion

- We aimed at understanding the dynamics of the collective attention of populations of newsblogs readers
- Seasonality is uncovered by the analysis of the periodogram function of the time series of comments
- We used logarithmic derivative to model attention shifts and found that virality plays an important role for the shifts
- Volatility, on the other hand, is uncovered by analyzing the deviation of the variable fluctuations in time
- Found behavioral patterns of news-reader attention
- **Future Work:** Incorporating more information about the users and the content into attention modeling

Thank You!

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