A New Design Principle for Open-ended Evolution (OEE)

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A Social Network Service: RoomClip

http://roomclip.jp/

mow the lawn

plant

entrance

2014-05-25

2015-07-16 17:04:06

この写真をシェア

allow me to *like* all at once

entrance

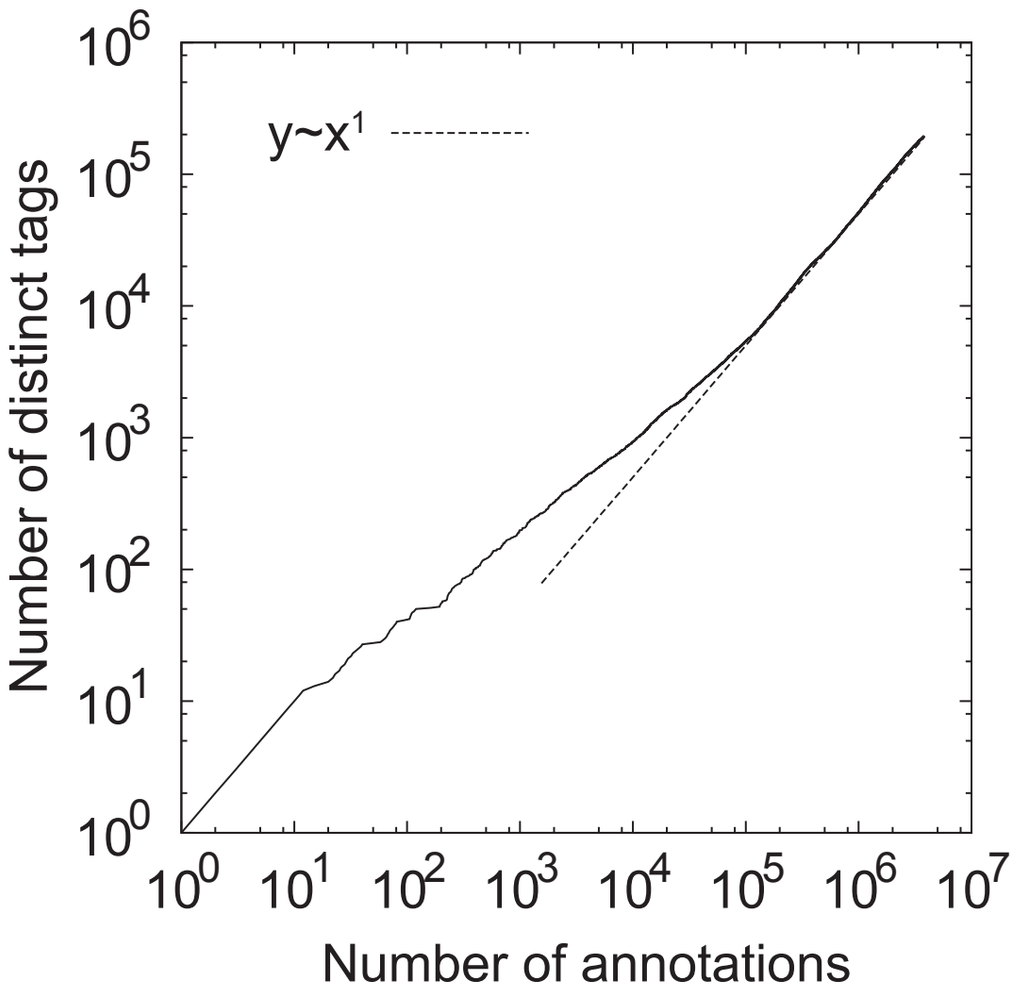
cheer up Fukushima

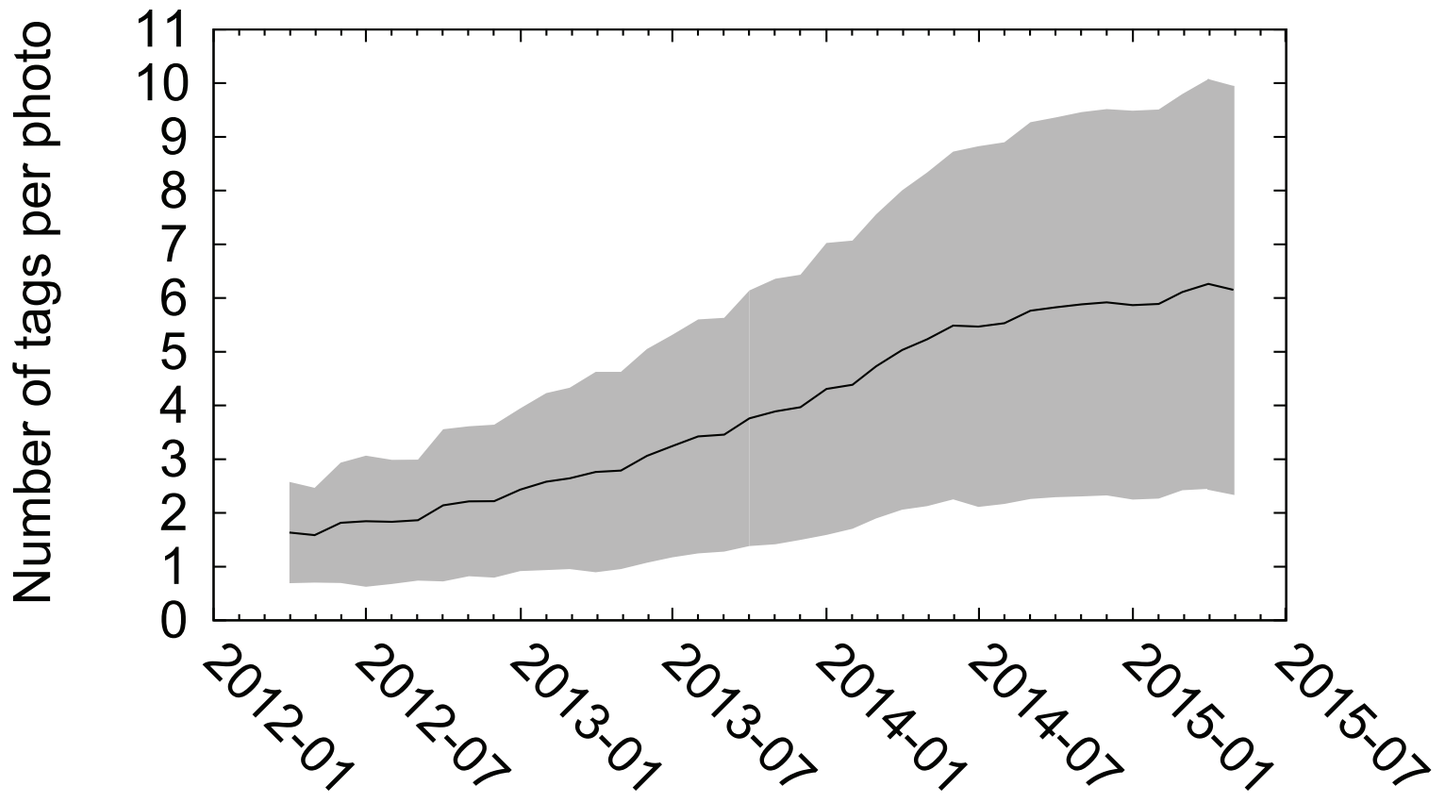
Let's review storage space

2015-07-16

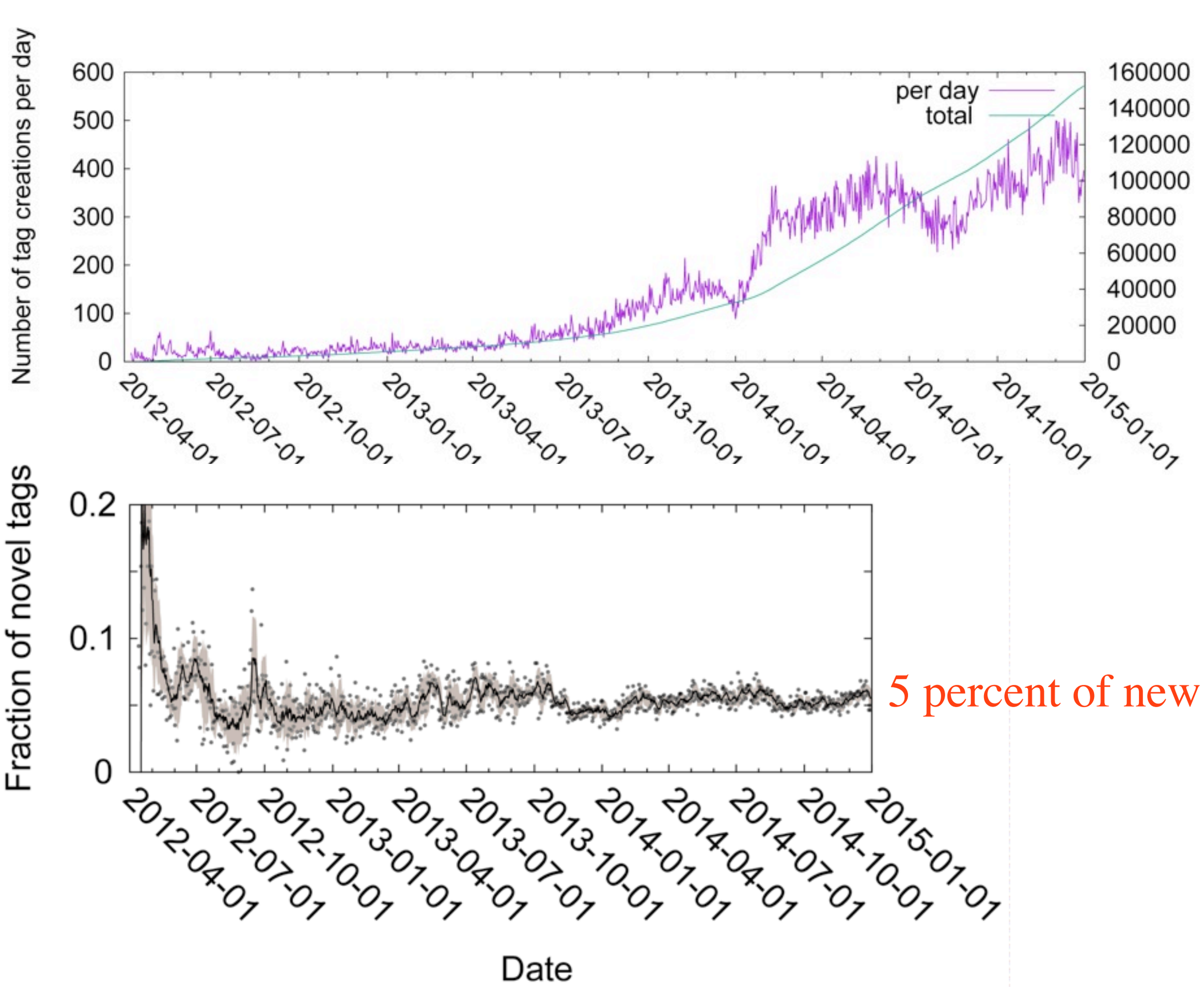
15年7月20日月曜日

Since the launch of the service, the number of users has shown sustainable growth, and the total number of users is around 410,000, as of April 2015



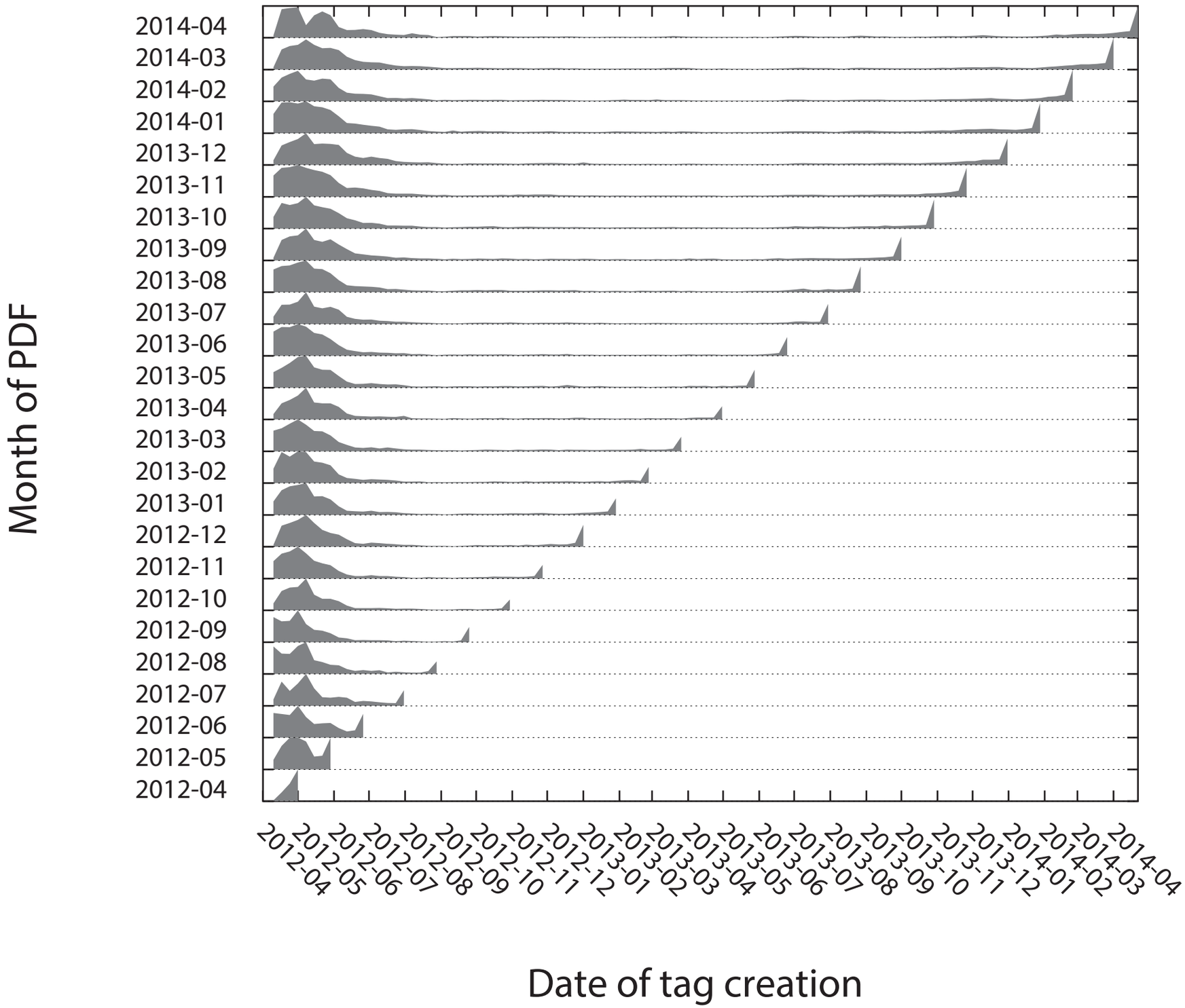


distribution of the distinct number of tags (vocabularies) over the number of annotations (Left) and the average number of tags used per photo over time (Right).



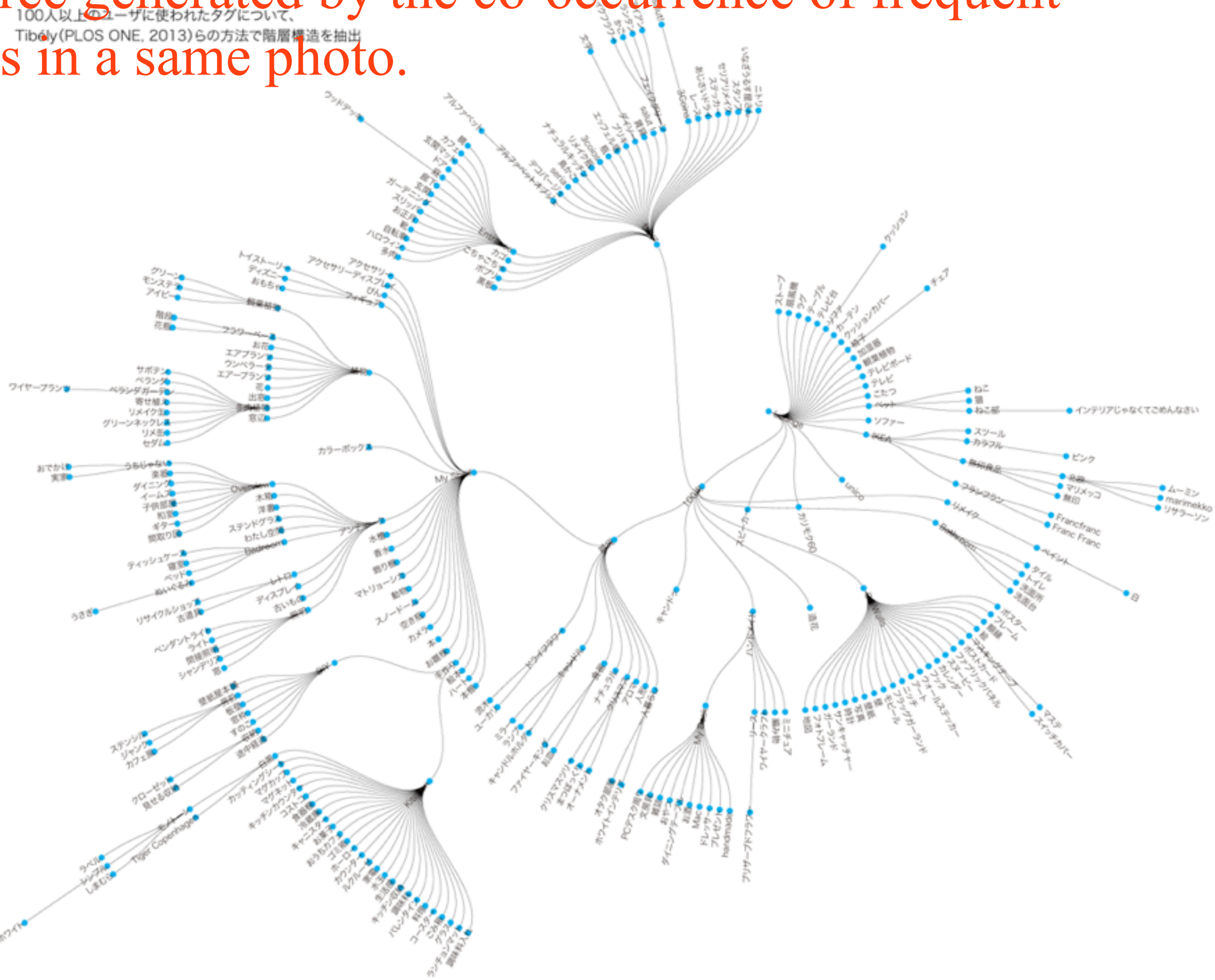
5 percent of new tags

Combinatorial evolution by the old and latest tags.

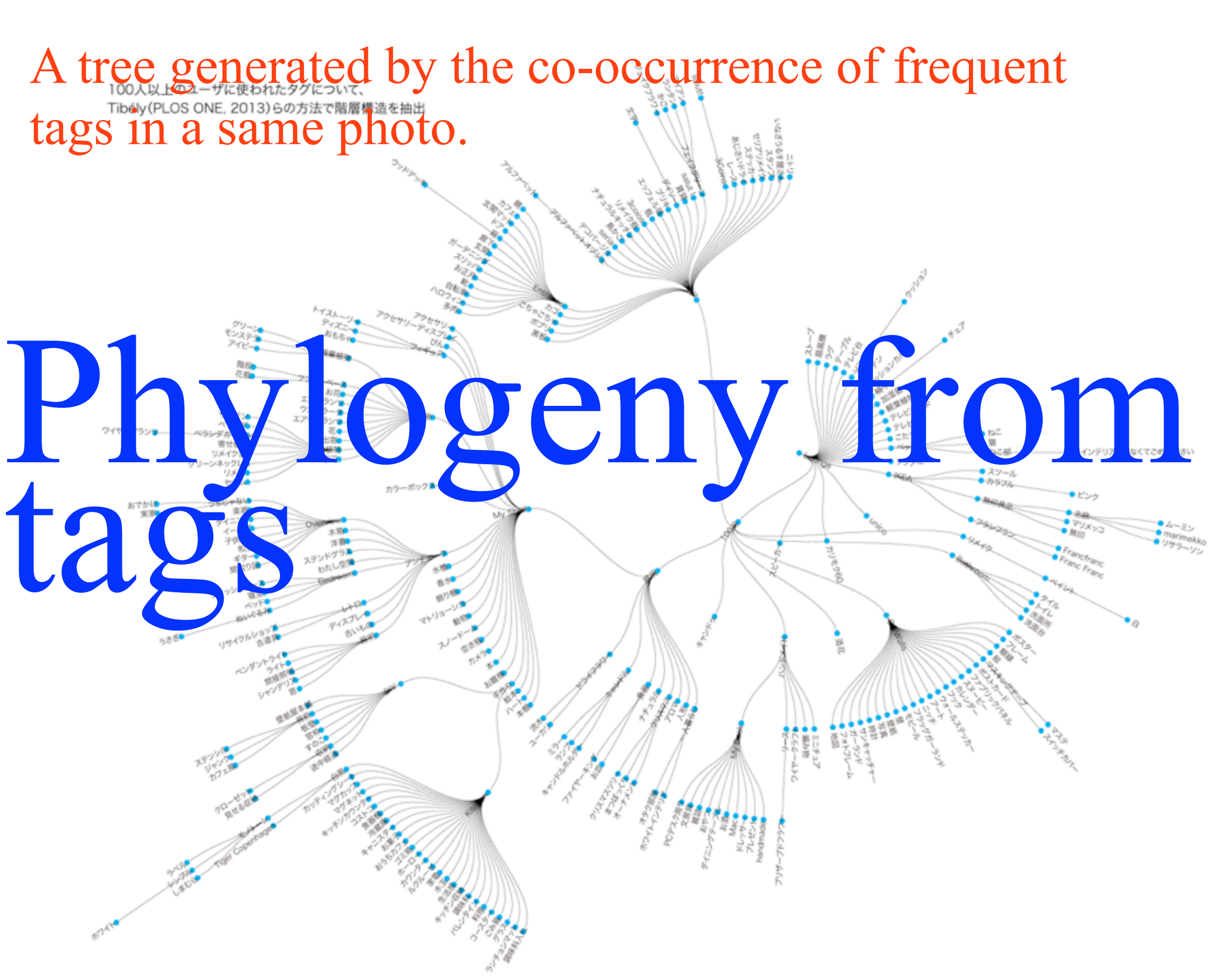


Histogram of used tags mapped to the time when they were created.

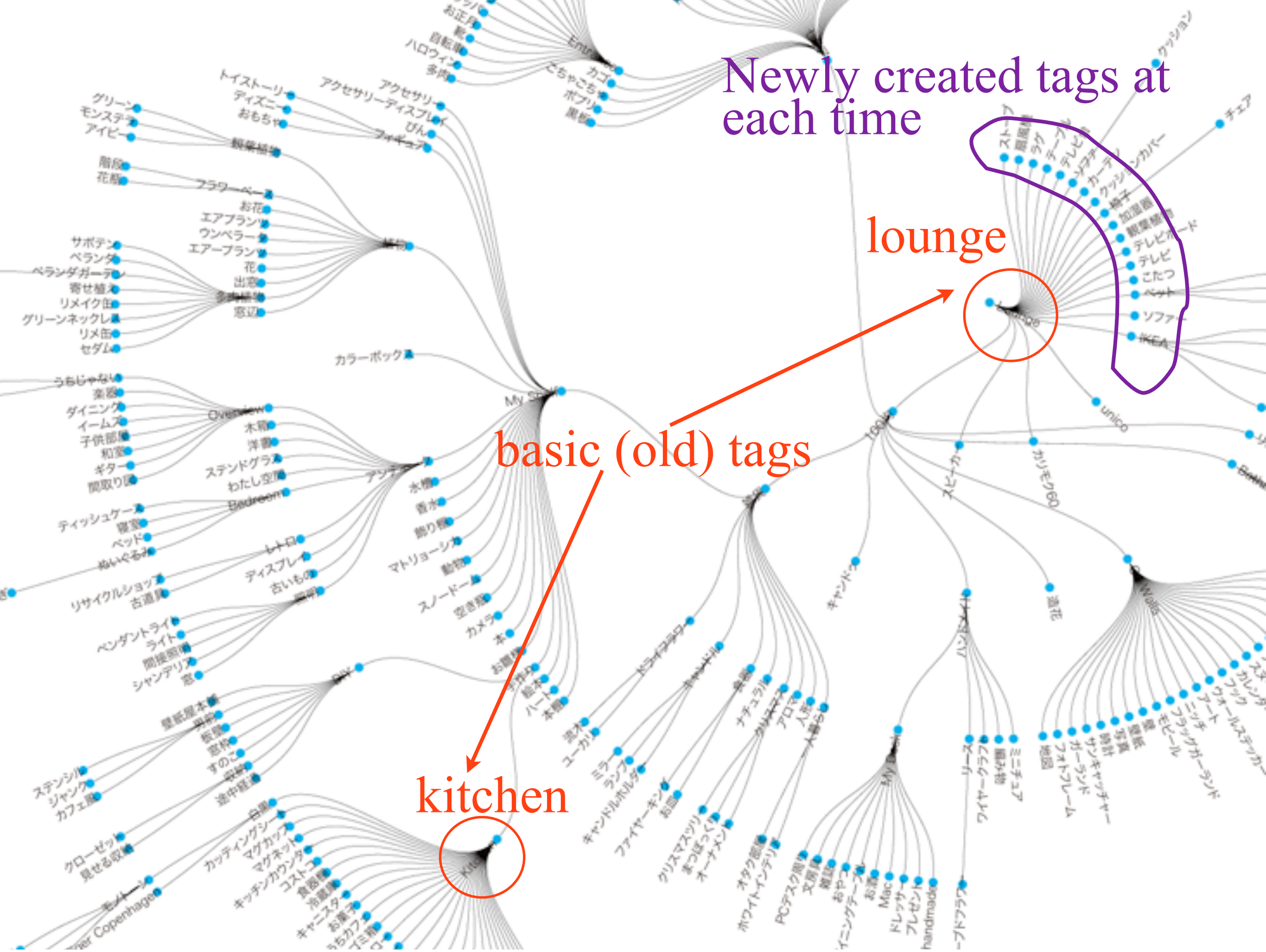
A tree generated by the co-occurrence of frequent tags in a same photo.



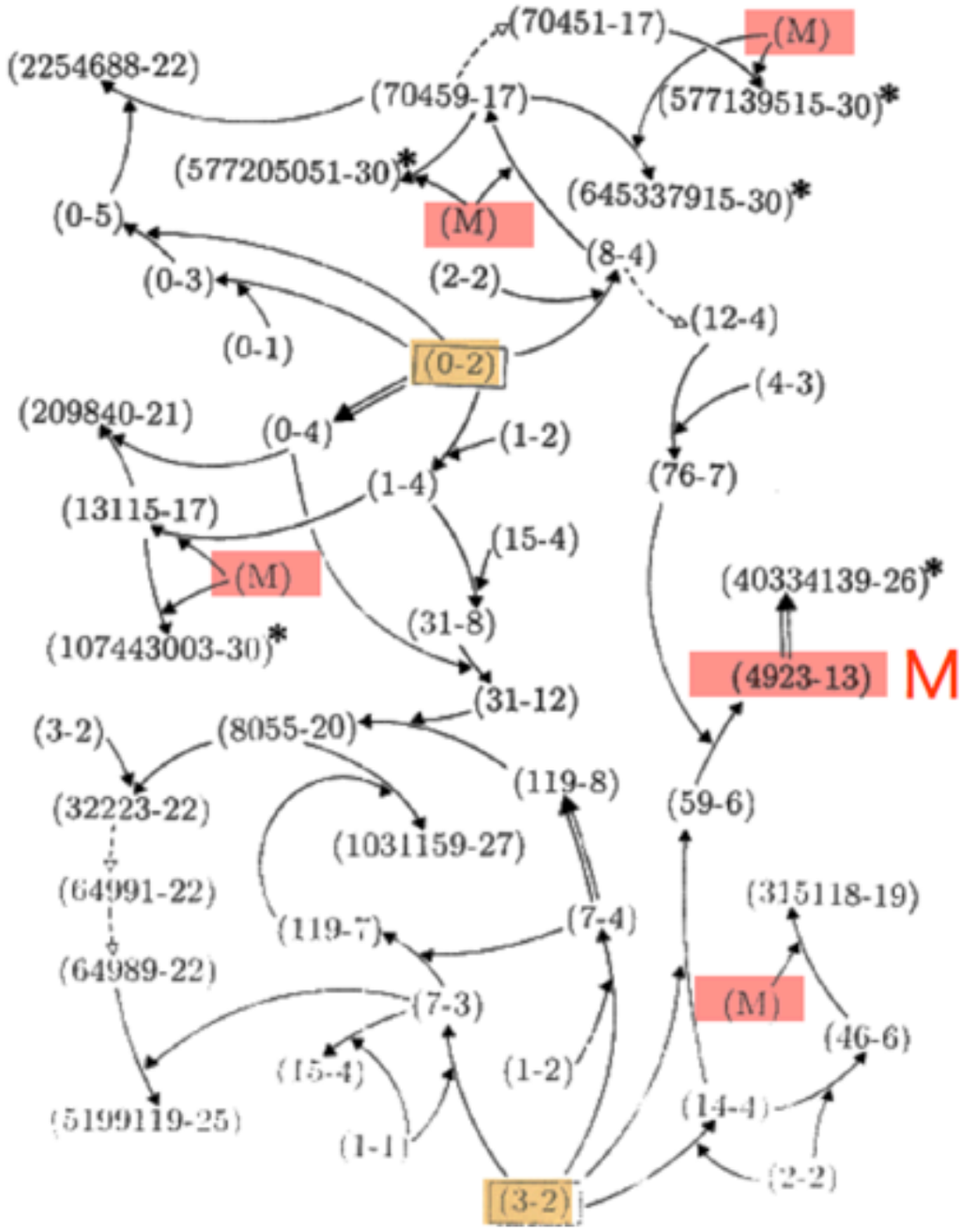
A tree generated by the co-occurrence of frequent tags in a same photo.



Phylogeny from tags

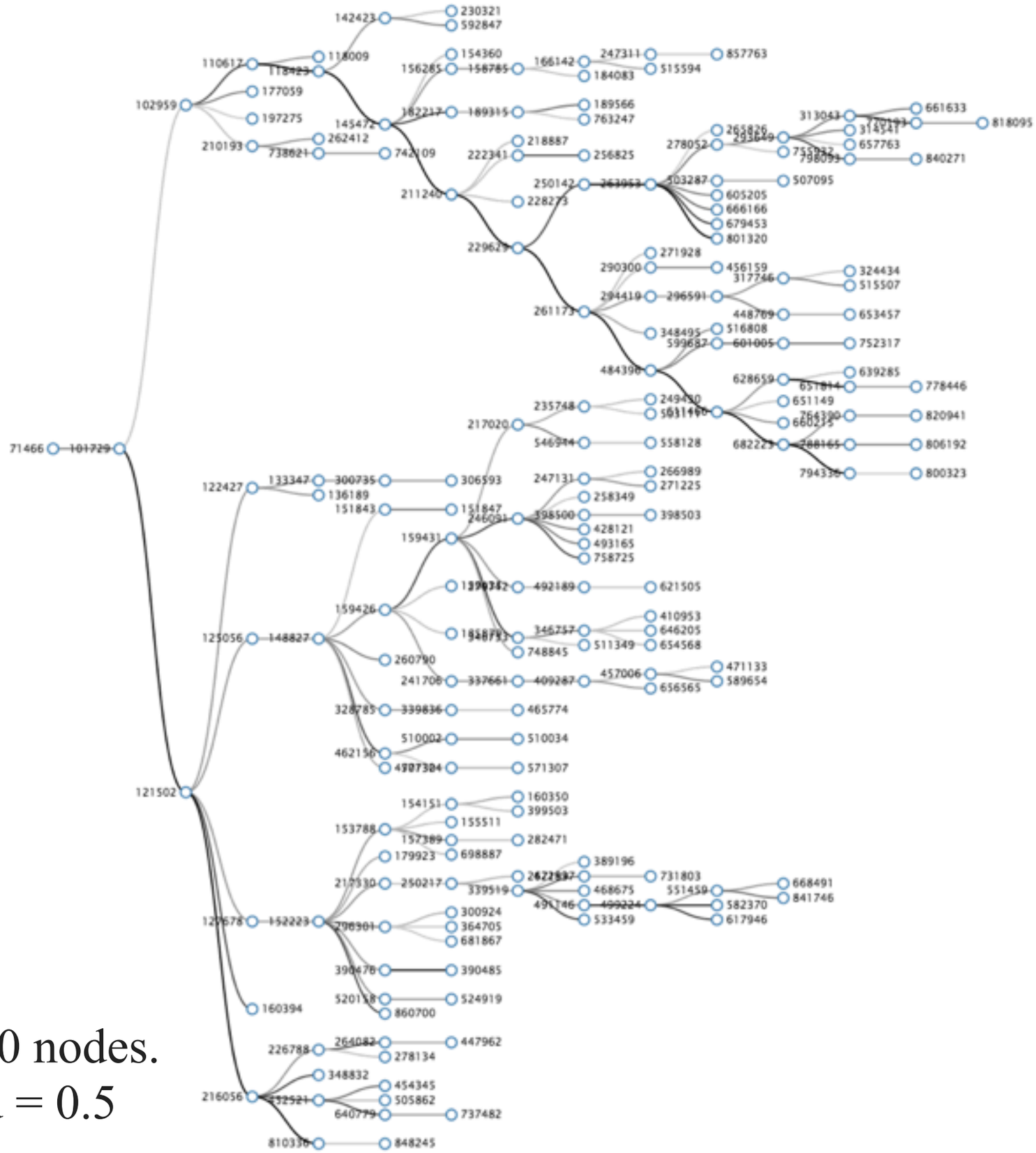

Newly created tags at each time
lounge
basic (old) tags
kitchen

cf. Genetic Fusion



Takashi Ikegami and Kunihiko Kaneko: **Genetic Fusion** *Phys. Rev. Lett.* 65:3352-3355, 1990.

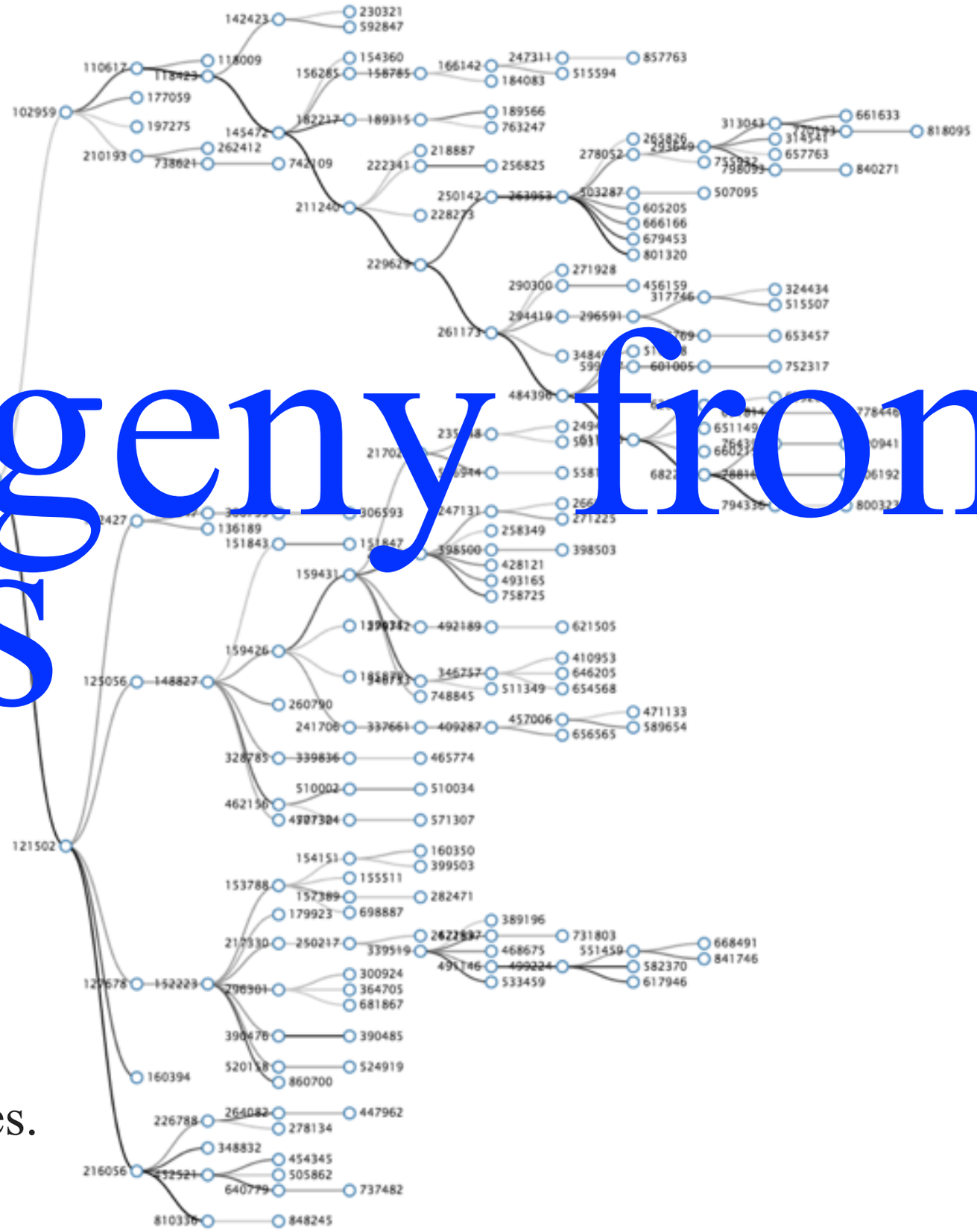
Jaccard coefficient (|A∩B|/|A∪B|) is computed from the annotated tags to define parent-child relationships between two photos:



A tree with more than 100 nodes.
A Jaccard coef. threshold = 0.5

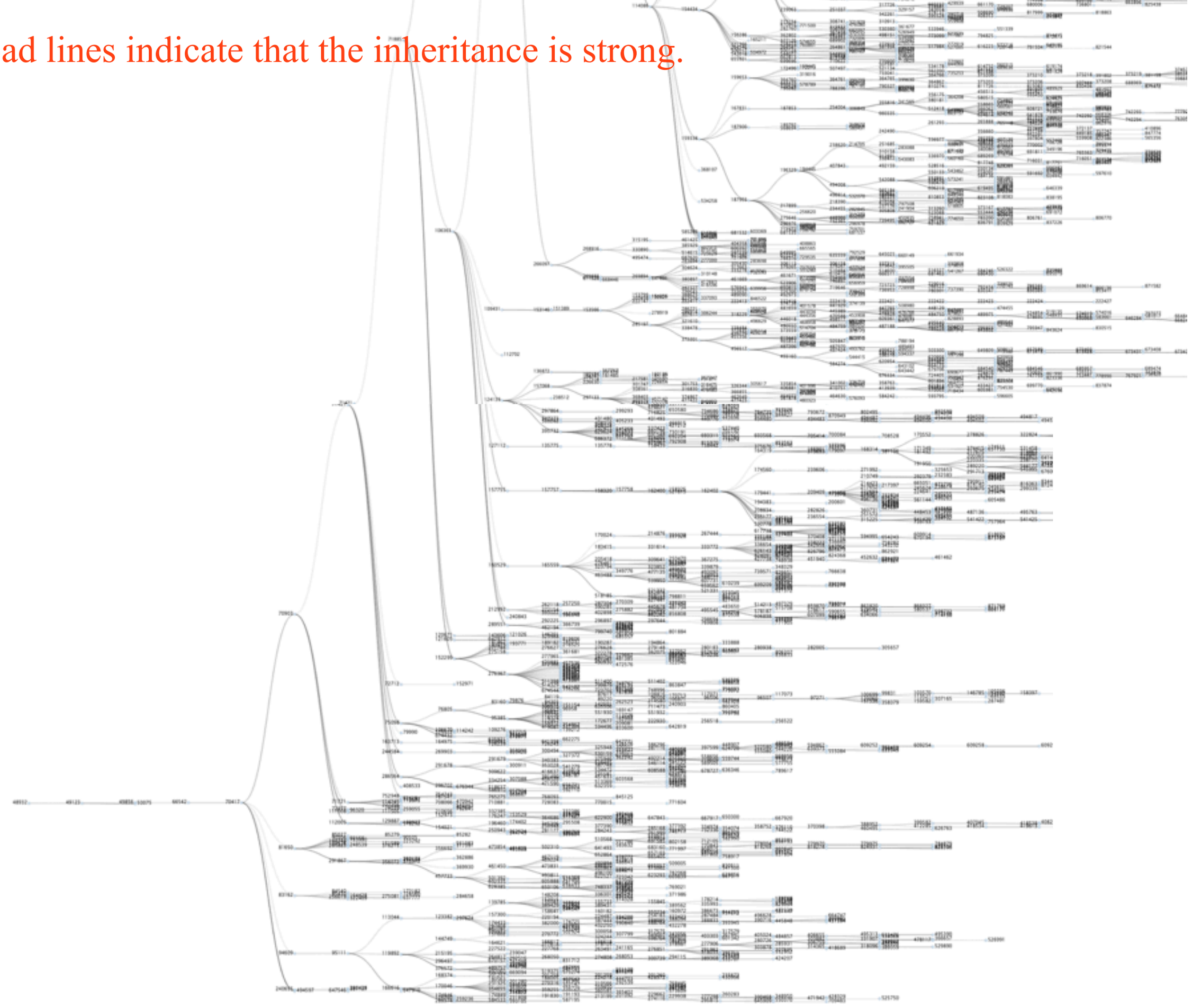
Jaccard coefficient (|A∩B|/|A∪B|) is computed from the annotated tags to define parent-child relationships between two photos:

Phylogeny from photos



A tree with more than 100 nodes.
A Jaccard coef. threshold = 0.5

broad lines indicate that the inheritance is strong.

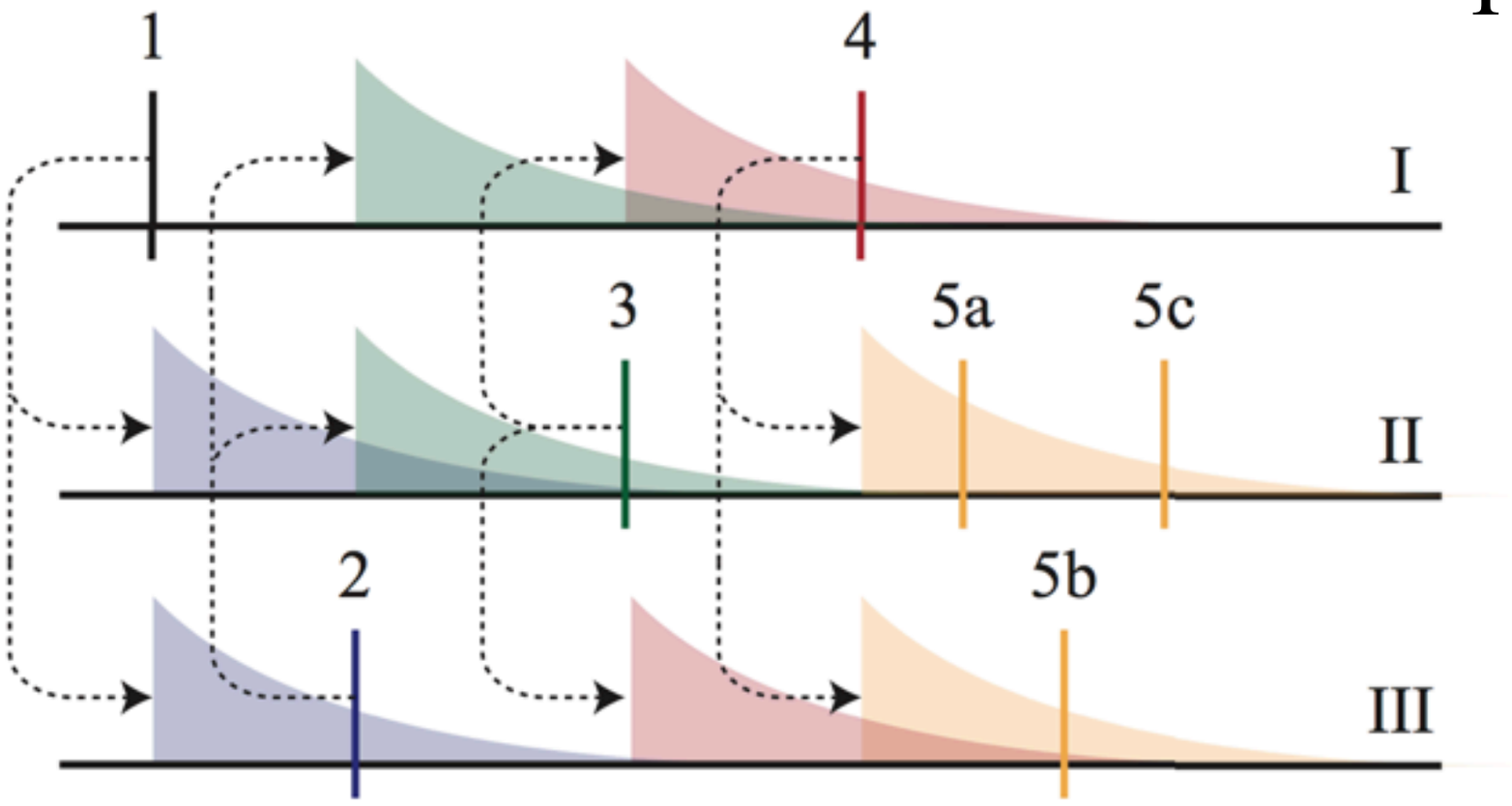


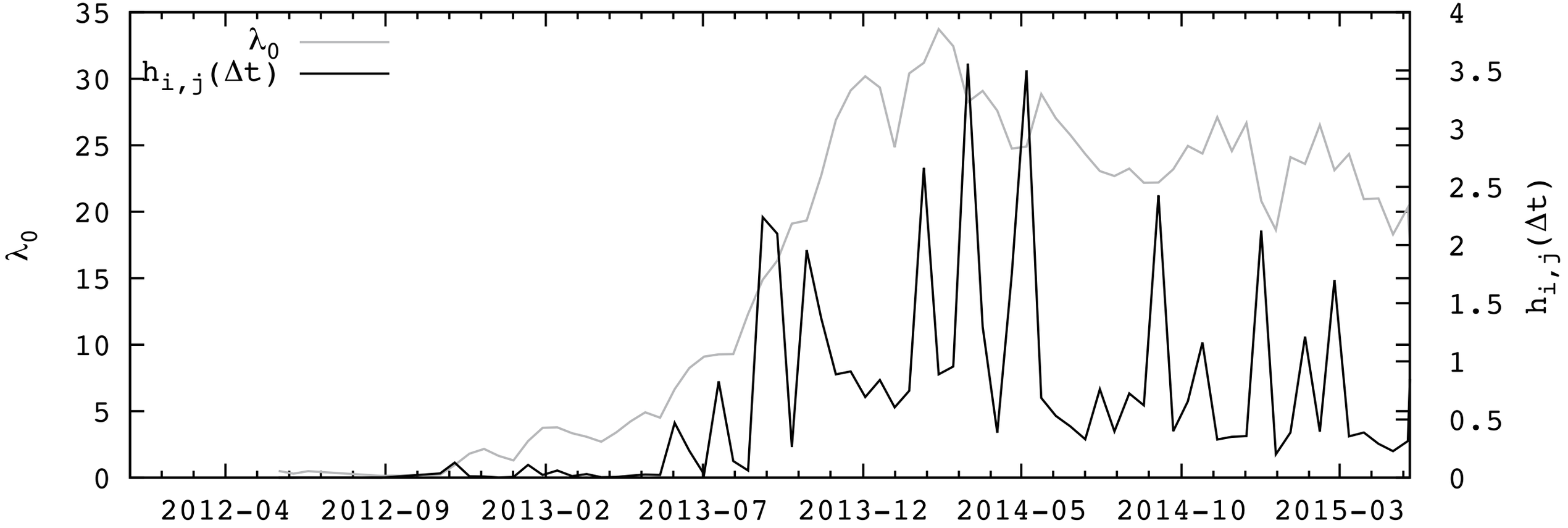
Measuring *vitality* of the web service

We fitted the users 'time series of 'like' events by the Hawkes process by maximizing the likelihood and analysed the users those who posted more than 300 photos.

$$\lambda^k(t) = \lambda_0^k(t) + \sum_{k'} \int_0^\infty h^{k,k'}(t-\tau)\lambda^{k'}(t-\tau)d\tau$$

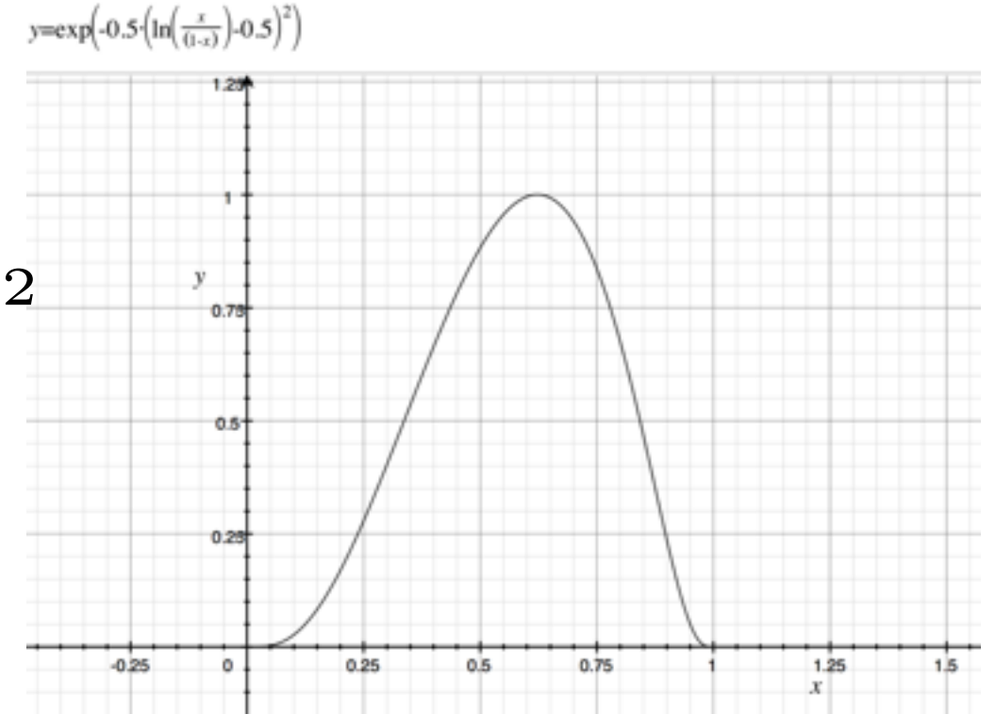
Hawkes process (1971)





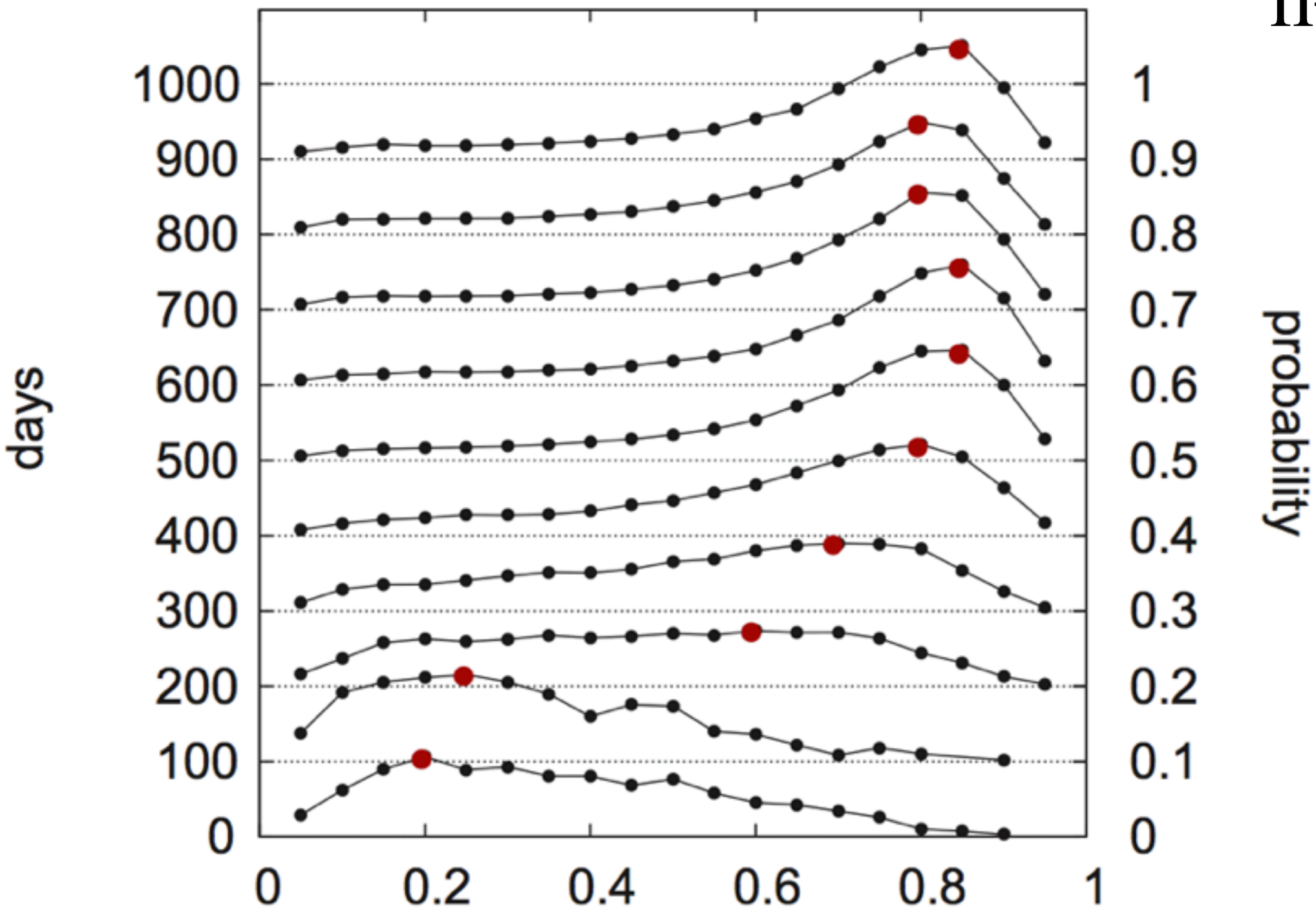
$$\lambda^k(t) = \lambda_0^k(t) + \sum_{k'} \int_0^\infty h^{k,k'}(t-\tau)\lambda^{k'}(t-\tau)d\tau$$

$$h(t-\tau) = ae^{-\tau(\ln(t/(1-t))-b)^2}$$



Temporal Development of endogeneity (n)

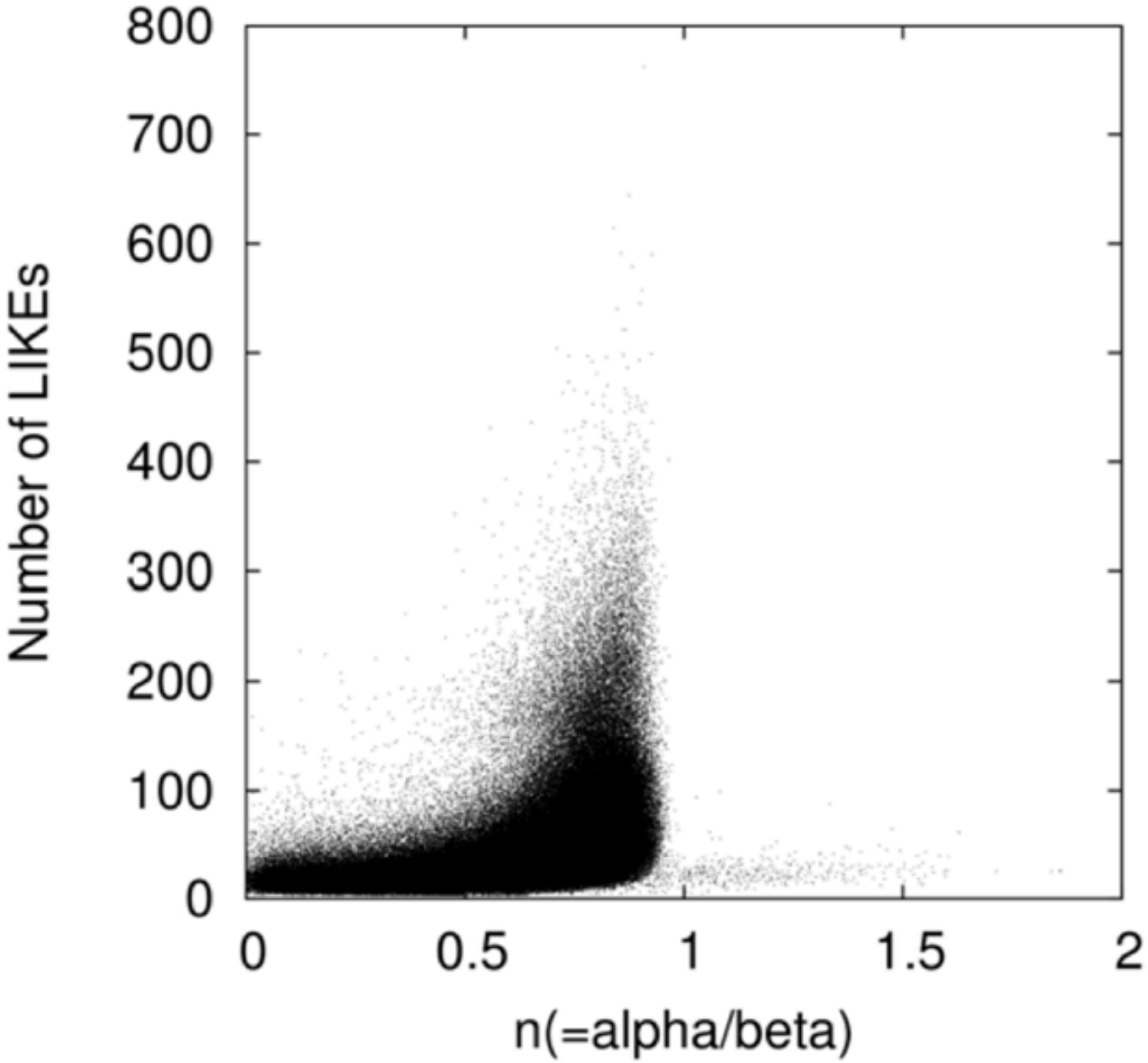
n=a/b



$$h(t-\tau) = ae^{-bt}$$

Result :

Distribution on n ($=\alpha/\beta$)



A new design principle of OEE

Web system maintains its activity by increasing vocabularies in a progressive way. *Certain types of tags stimulate users to invent new combinations. At the same time, users take photos to annotate with these tags. This type of tags, which we call innovative tags, can be used to derive the OEE of the service*. As this study shows, we claim that *genotype-phenotype mapping* is a powerful mechanism to maintain and create the OEE, and it is applicable to other nonbiological and, possibly, to biological systems.

collaborators

Yasuhiro Hashimoto

Mizuki Oka

Please also come to the talk in the morning session 24th!!!!