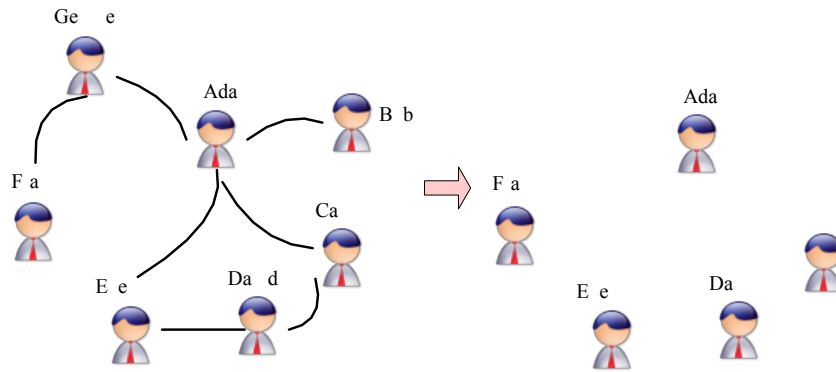


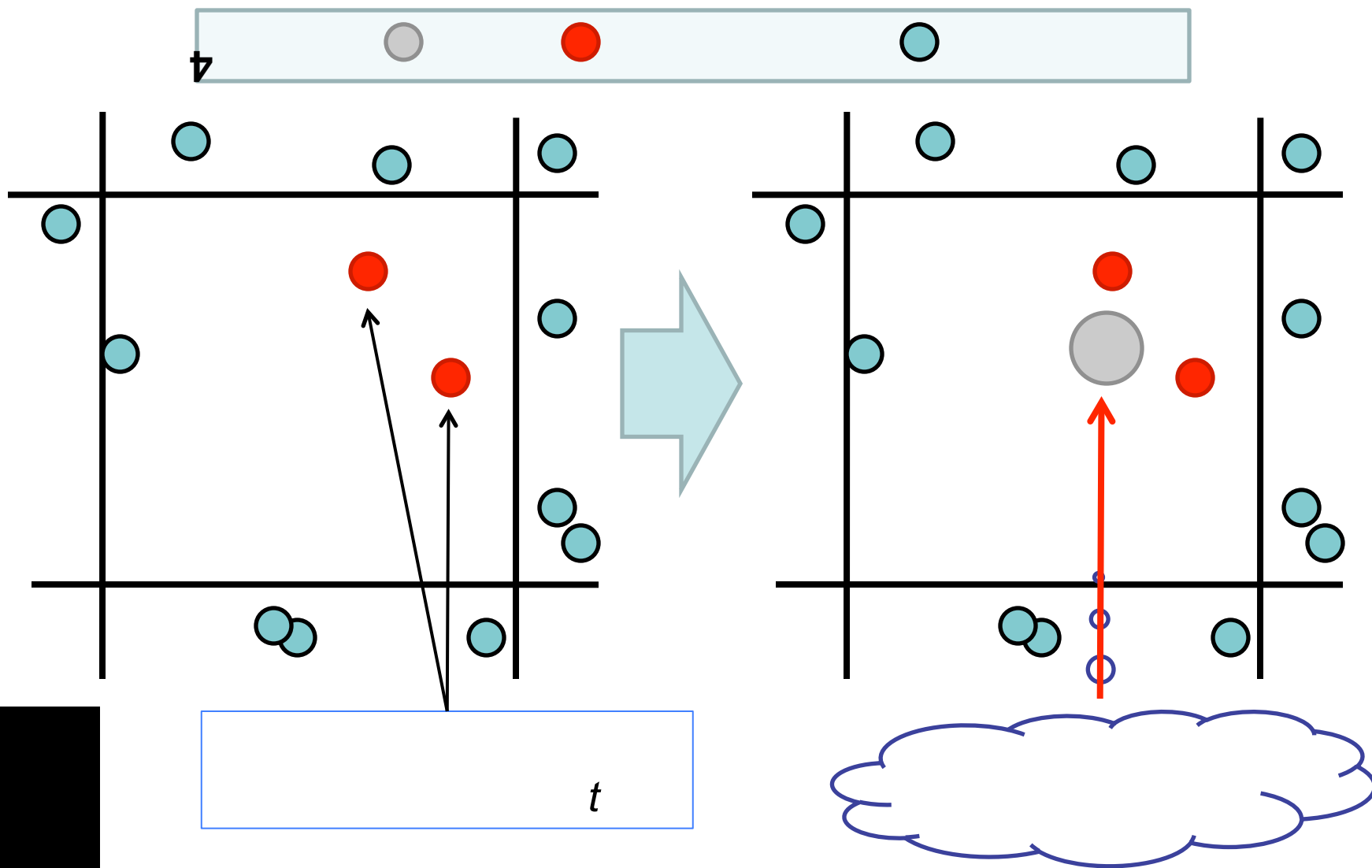
Input: coauthor network

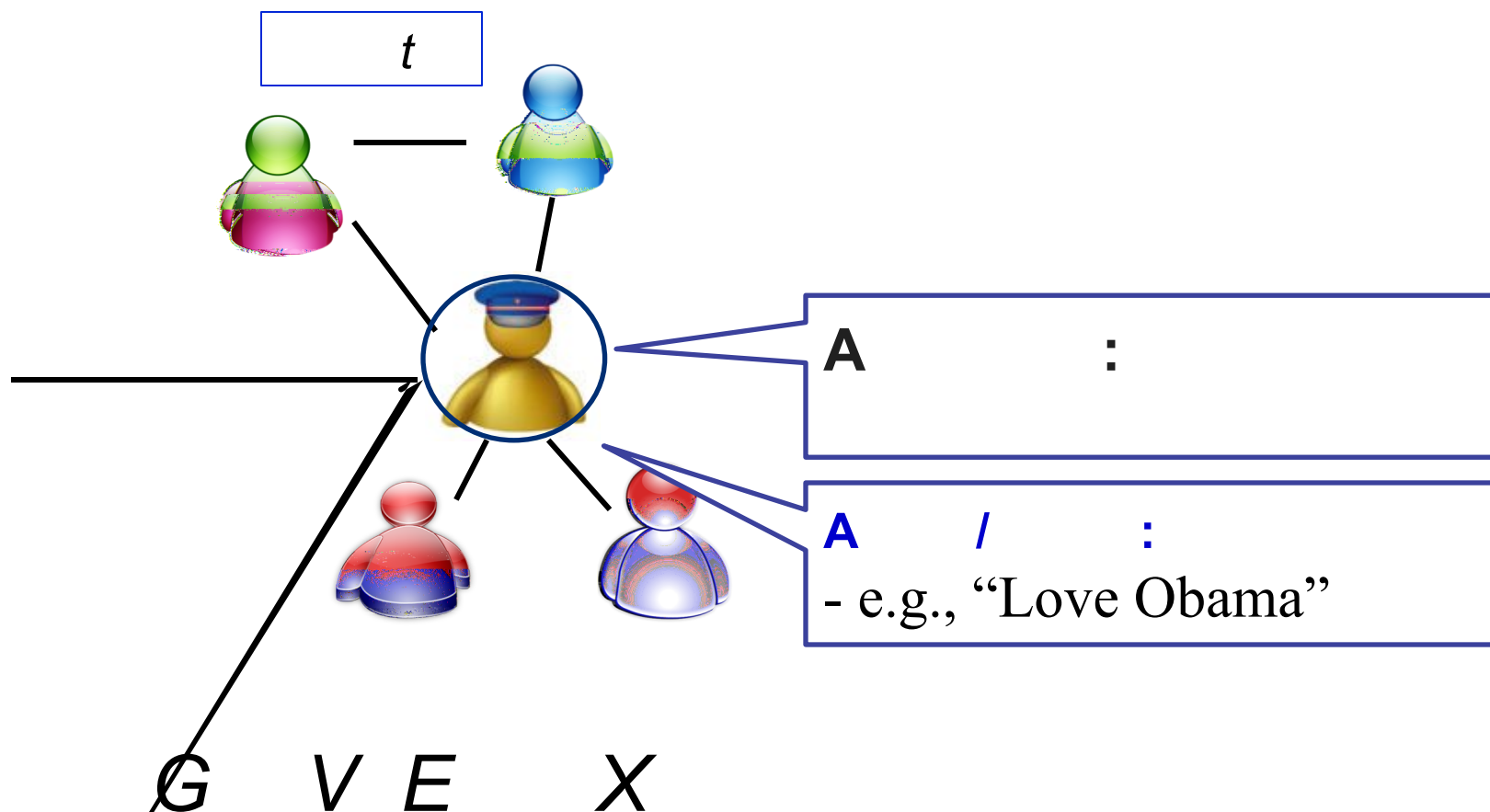






	#	#	B 4	#A
4				
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A specific action performed by user v at time t

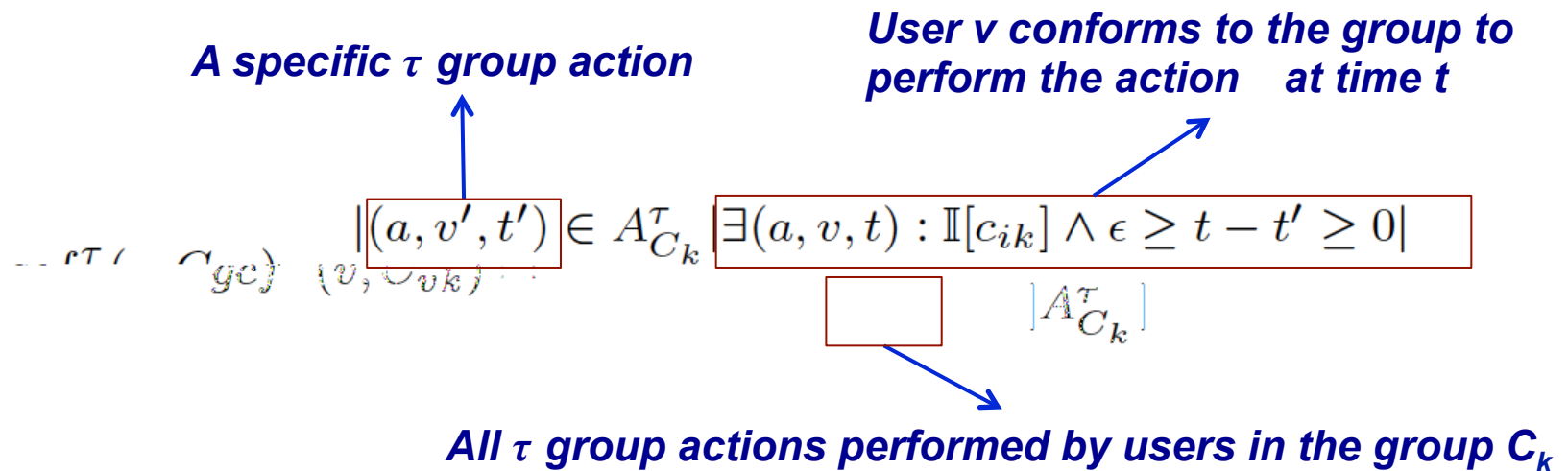
Exists a friend v' who performed the same action at time t'

$$\{(a, v, t) \in A_v \mid \exists (a, v', t') : e_{vv'} \in E \wedge \epsilon \geq t - t' \geq 0\}$$

A_j

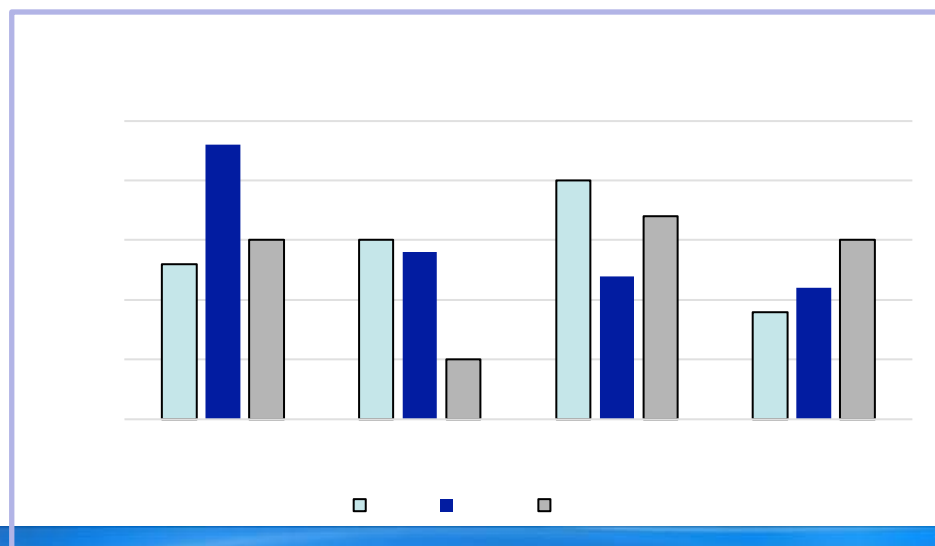
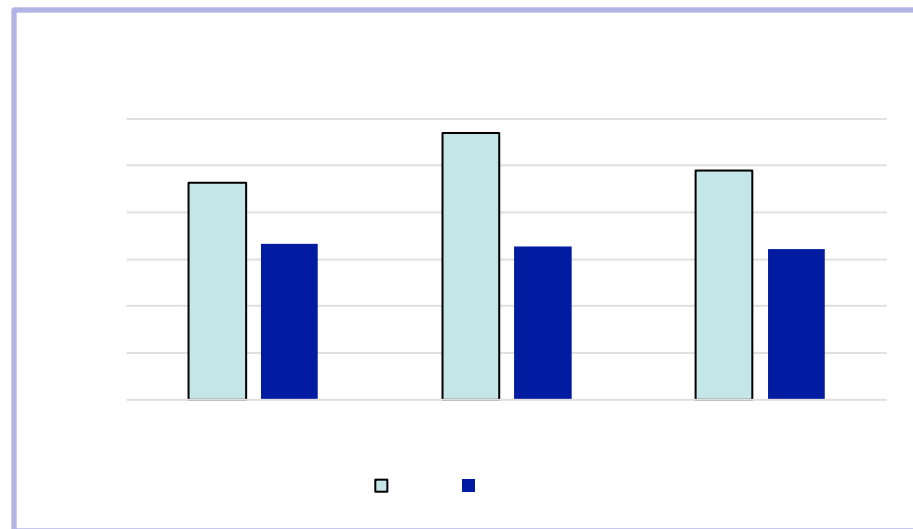
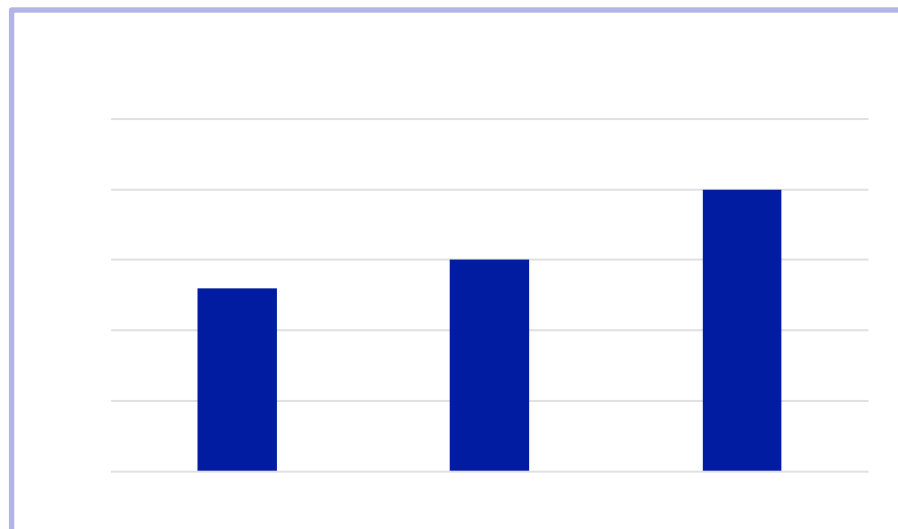
All actions by user v

τ group action: an action performed by more than a percentage τ of all users in the group C_k



C

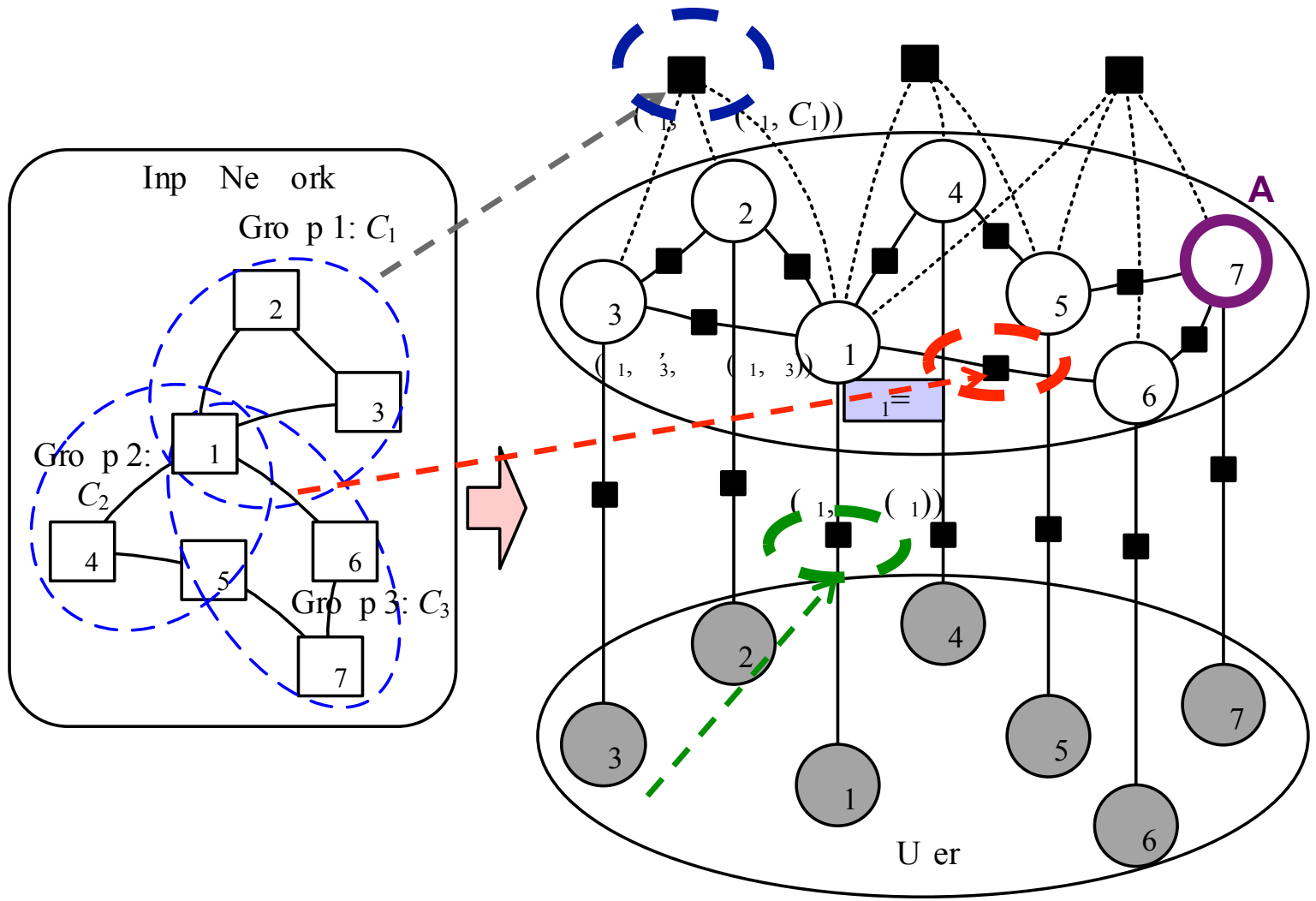
C - A



G V E C X A



$F: f(G, A) \rightarrow Y^t$



$$\mathcal{O}(\theta) = \log P_{\theta}(Y|G, A)$$

$$= \sum_{i=1}^N \left[\sum_{j=1}^d \alpha_{ij} f(y_i, x_{ij}) + \beta_i g(y_i, icf(v_i)) \right]$$

$$\sum_{e_{ij} \in E} \mathbb{I}[e_{ij}] \alpha_{ij} g(y_i, gcf^{\tau}(v_i, C_k))$$

$$+ \sum_{i=1}^N \sum_{k=1}^m \mathbb{I}[c_{ik}] \alpha_{ik} g(y_i, gcf^{\tau}(v_i, C_k))$$

$$g(y_i, gcf^{\tau}(v_i, C_k)) = \left(\frac{1}{2}\right)^{\frac{t-t'}{\lambda}} gcf^{\tau}(v_i, C_k)$$

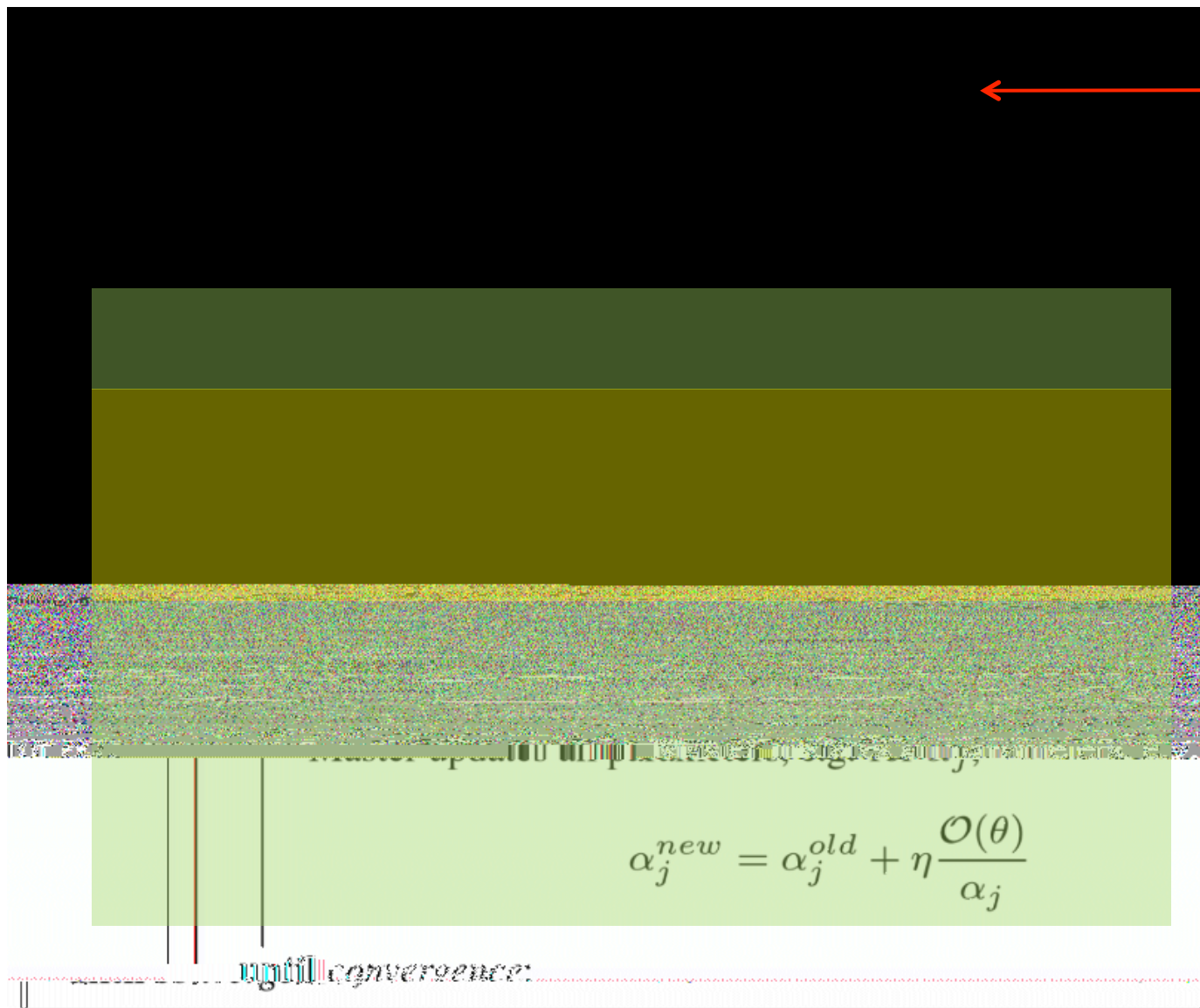
$$g(y_i, gcf^{\tau}(v_i, C_k)) = \left(\frac{1}{2}\right)^{\frac{t-t'}{\lambda}} gcf^{\tau}(v_i, C_k)$$

$$\forall e_{ij} \in E \quad g(y_i, icf(v_i)) = \sum_{k=1}^m \mathbb{I}[c_{ik}] \left(\frac{1}{2}\right)^{\frac{t-t'}{\lambda}} \frac{\|y_j^{\tau}\|}{|A_v|}$$



C 06

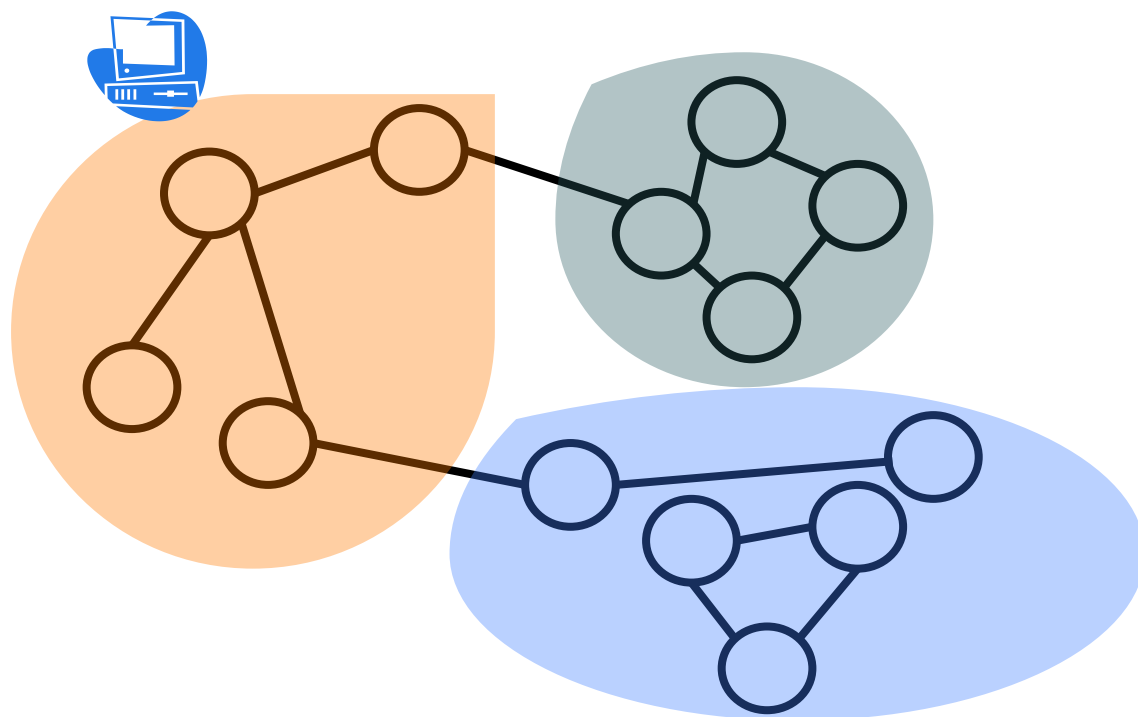
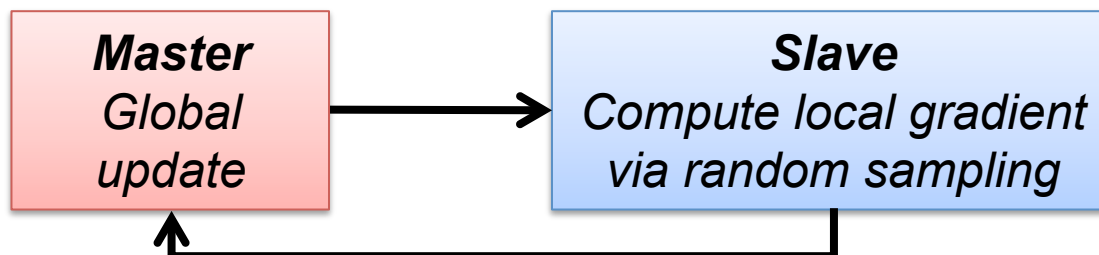
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$$\alpha_j^{new} = \alpha_j^{old} + \eta \frac{O(\theta)}{\alpha_j}$$

until convergence:

Algorithm 1: Distributed model learning.





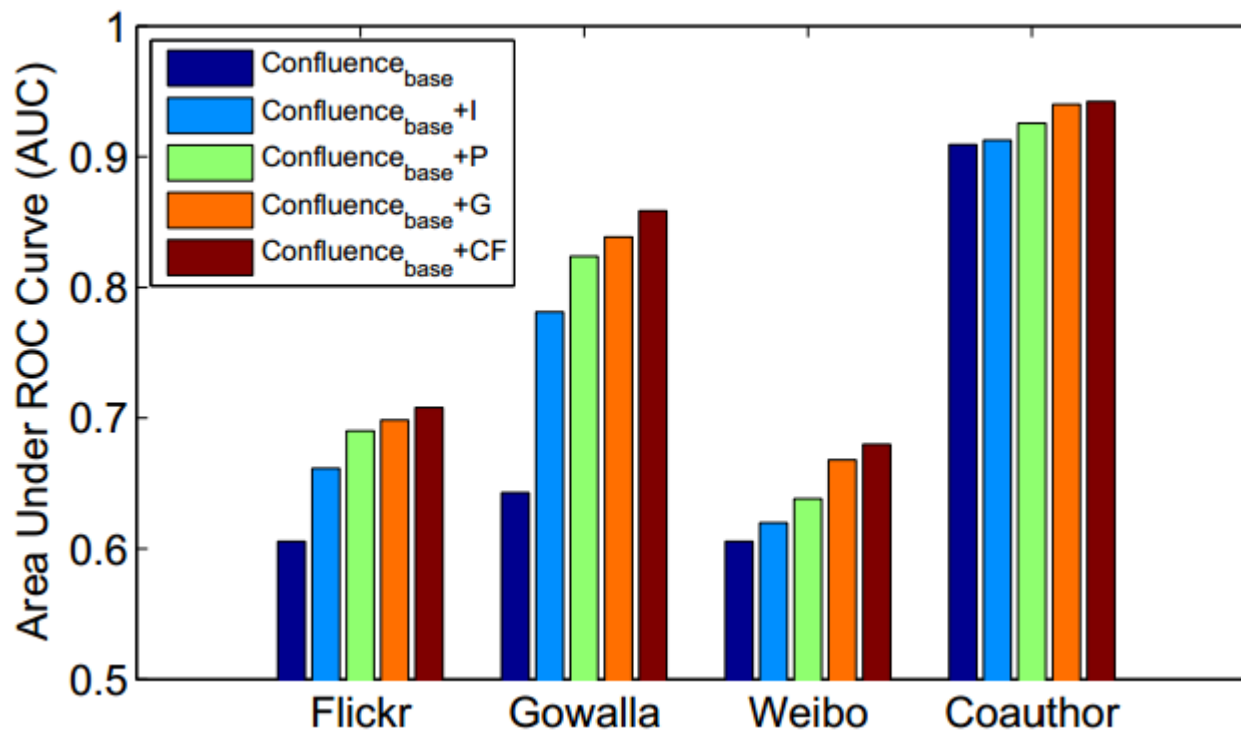
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4				
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- *Support Vector Machine (SVM)*
- *Logistic Regression (LR)*
- *Naive Bayes (NB)*
- *Gaussian Radial Basis Function Neural Network (RBF)*
- *Conditional Random Field (CRF)*

- *Precision, Recall, F1, and Area Under Curve (AUC)*

Data	Method	Precision	Recall	F1-Measure	AUC
Flickr	SVM	0.5921 (± 0.0036)	0.5905 (± 0.0031)	0.5802 (± 0.0012)	0.6473 (± 0.0004)
	LR	0.6010 (± 0.0052)	0.5900 (± 0.0057)	0.5770 (± 0.0018)	0.6510 (± 0.0008)
	NB	0.6170 (± 0.0071)	0.6040 (± 0.0083)	0.5920 (± 0.0031)	0.6520 (± 0.0019)
	RBF	0.6250 (± 0.0039)	0.5960 (± 0.0010)	0.5720 (± 0.0024)	0.6700 (± 0.0010)
	Confluence	0.5472 (± 0.0025)	0.7770 (± 0.0010)	0.6342 (± 0.0010)	0.7383 (± 0.0042)
Gowalla	SVM	0.9290 (± 0.0212)	0.9310 (± 0.0121)	0.9295 (± 0.0105)	0.9280 (± 0.0054)
	LR	0.9320 (± 0.0234)	0.9290 (± 0.0234)	0.9310 (± 0.0155)	0.9500 (± 0.0030)
	NB	0.9310 (± 0.0197)	0.9290 (± 0.0135)	0.9300 (± 0.0122)	0.9540 (± 0.0022)
	RBF	0.9320 (± 0.0254)	0.9280 (± 0.0284)	0.9300 (± 0.018)	0.9610 (± 0.0019)
	CRF	0.9330 (± 0.0100)	0.9320 (± 0.0291)	0.9330 (± 0.016)	0.9352 (± 0.0101)
Weibo	Confluence	0.9644 (± 0.0140)	0.9372 (± 0.0097)	0.9333 (± 0.0173)	0.9967 (± 0.0035)
	SVM	0.5070 (± 0.0053)	0.5060 (± 0.0381)	0.5060 (± 0.0181)	0.5460 (± 0.0210)
	LR	0.5320 (± 0.0153)	0.5190 (± 0.0141)	0.5250 (± 0.0081)	0.5690 (± 0.0098)
	NB	0.5810 (± 0.0165)	0.5390 (± 0.0132)	0.5600 (± 0.0115)	0.6310 (± 0.0121)
	RBF	0.5460 (± 0.0159)	0.5450 (± 0.0103)	0.5450 (± 0.0132)	0.5690 (± 0.0098)
Confluence	Confluence	0.6816 (± 0.0156)	0.7572 (± 0.0077)	0.7144 (± 0.0077)	0.8116 (± 0.0145)
	SVM	0.8256 (± 0.0129)	0.8562 (± 0.0115)	0.8409 (± 0.0145)	0.8671 (± 0.0346)
	LR	0.8140 (± 0.0221)	0.8500 (± 0.0030)	0.8319 (± 0.0185)	0.8640 (± 0.0185)
	NB	0.8050 (± 0.0048)	0.8720 (± 0.0074)	0.8385 (± 0.0115)	0.8510 (± 0.0115)
	CRF	0.8771 (± 0.0249)	0.8360 (± 0.0087)	0.9025 (± 0.0025)	0.8081 (± 0.0252)
Confluence	Confluence	0.9120 (± 0.0130)	0.9010 (± 0.0064)	0.9065 (± 0.0066)	0.9140 (± 0.0103)
	Confluence	0.9120 (± 0.0130)	0.9010 (± 0.0064)	0.9065 (± 0.0066)	0.9140 (± 0.0103)

p



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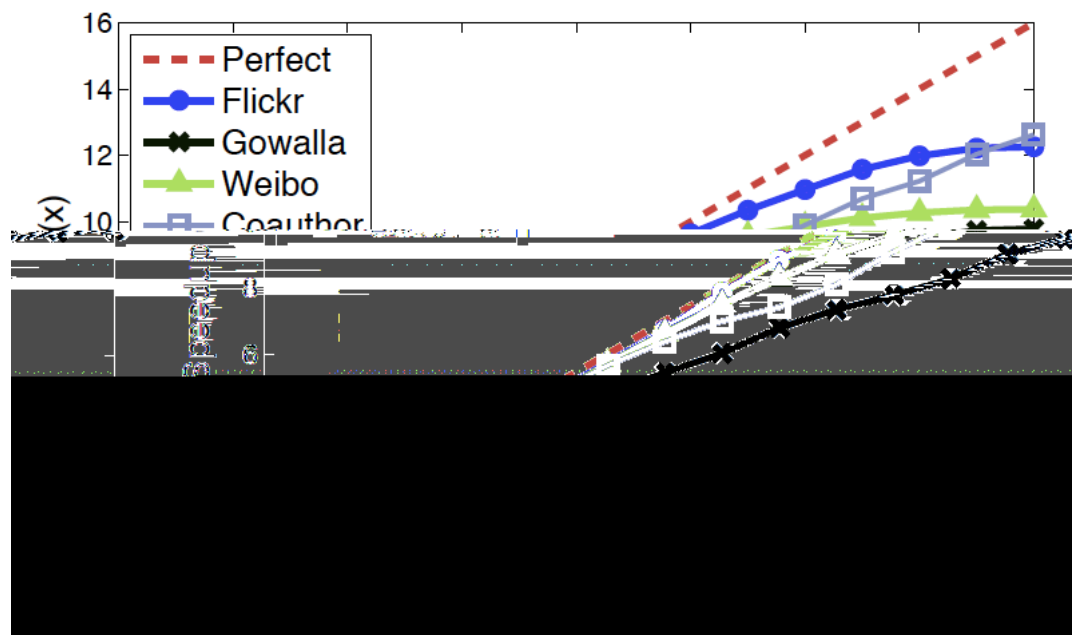


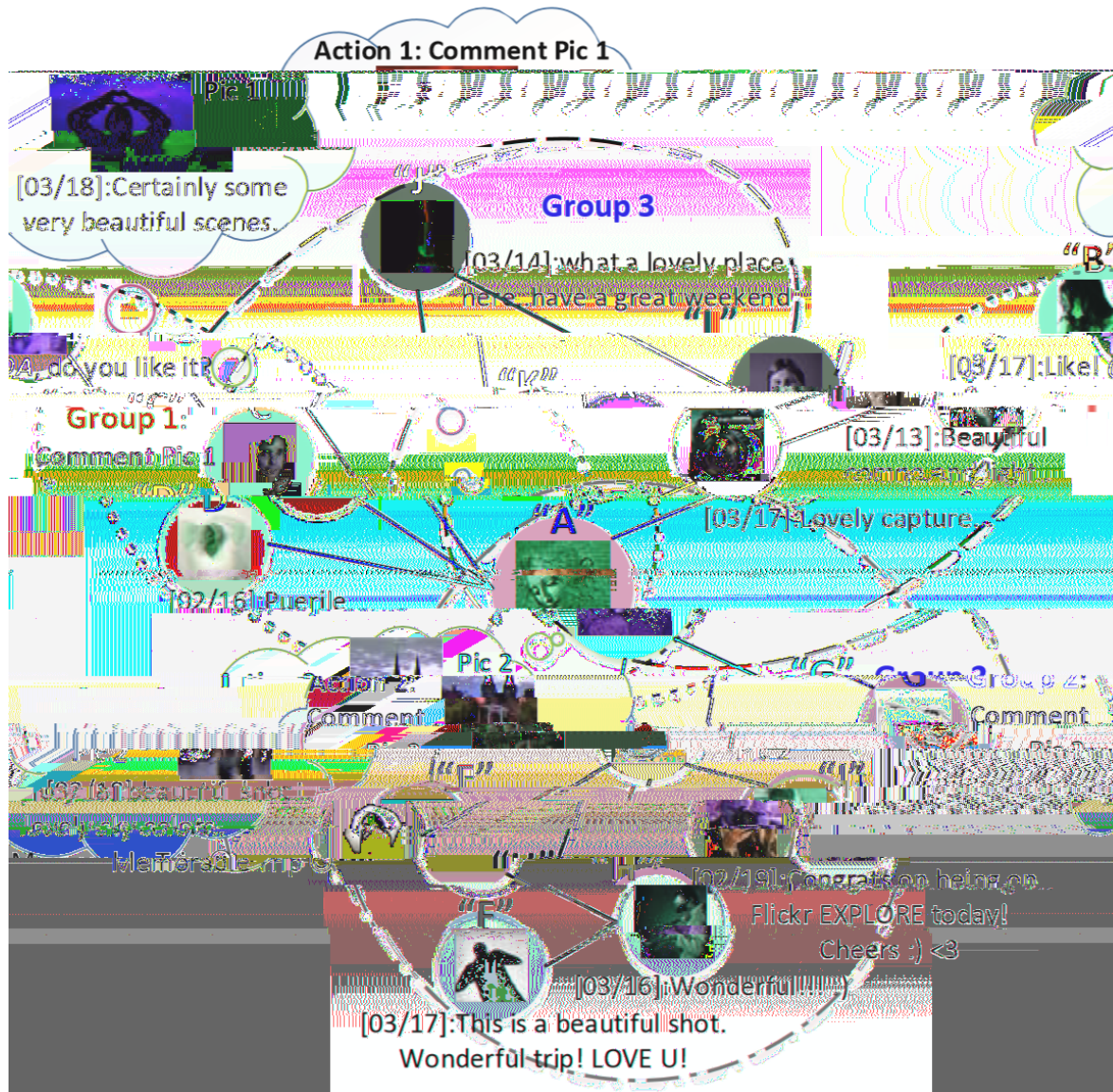
Table 4: Running time of the proposed algorithm (hour).

0.512	Confluence	1.602	0.245	1.083	
229	6.464	Confluence (single)	19.637	2.395	11.1
547	1.823	CRF	3.864	0.387	2.4

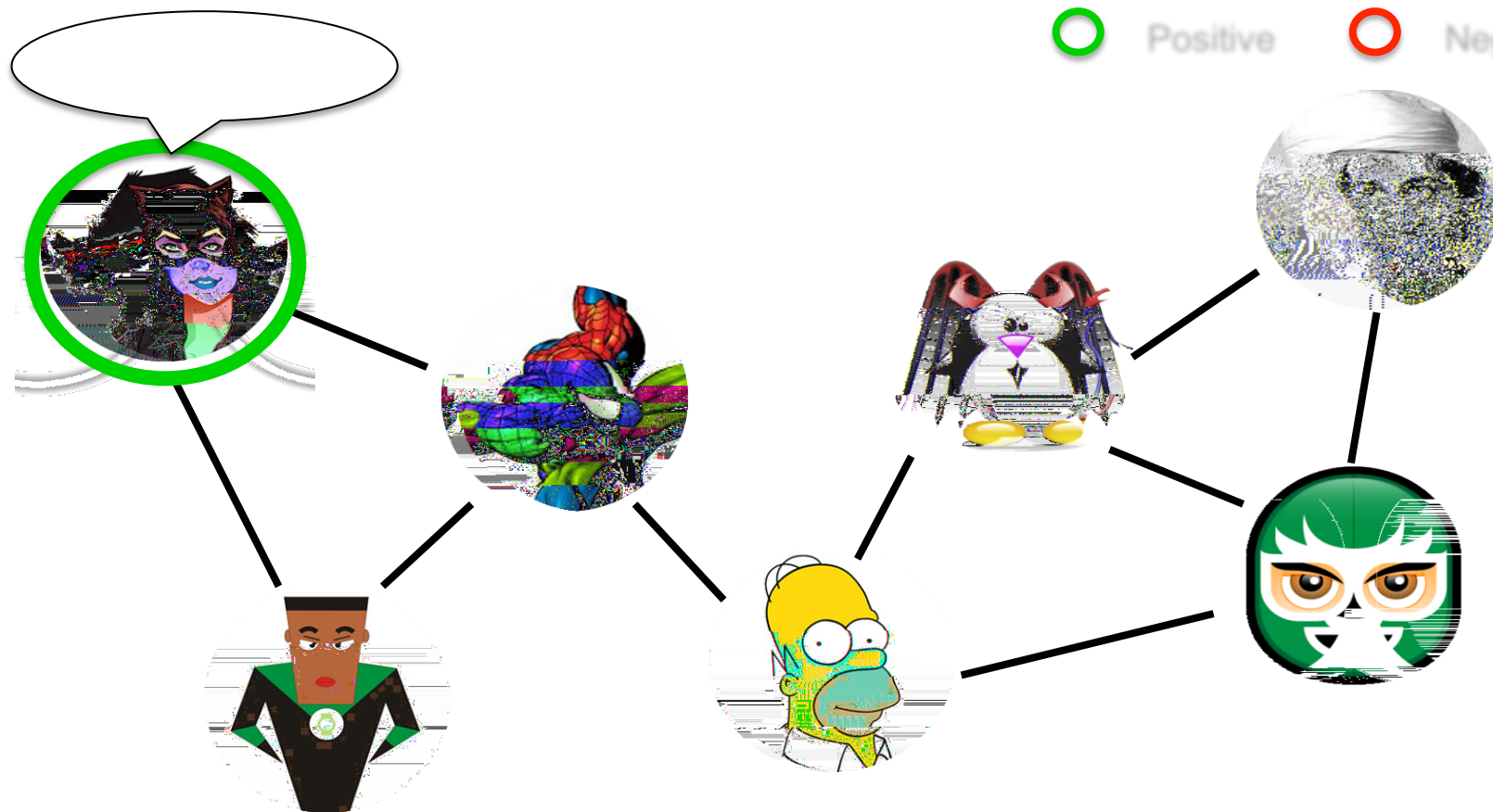








○ Positive ○ Negative



1

○ Positive ○ Negative

