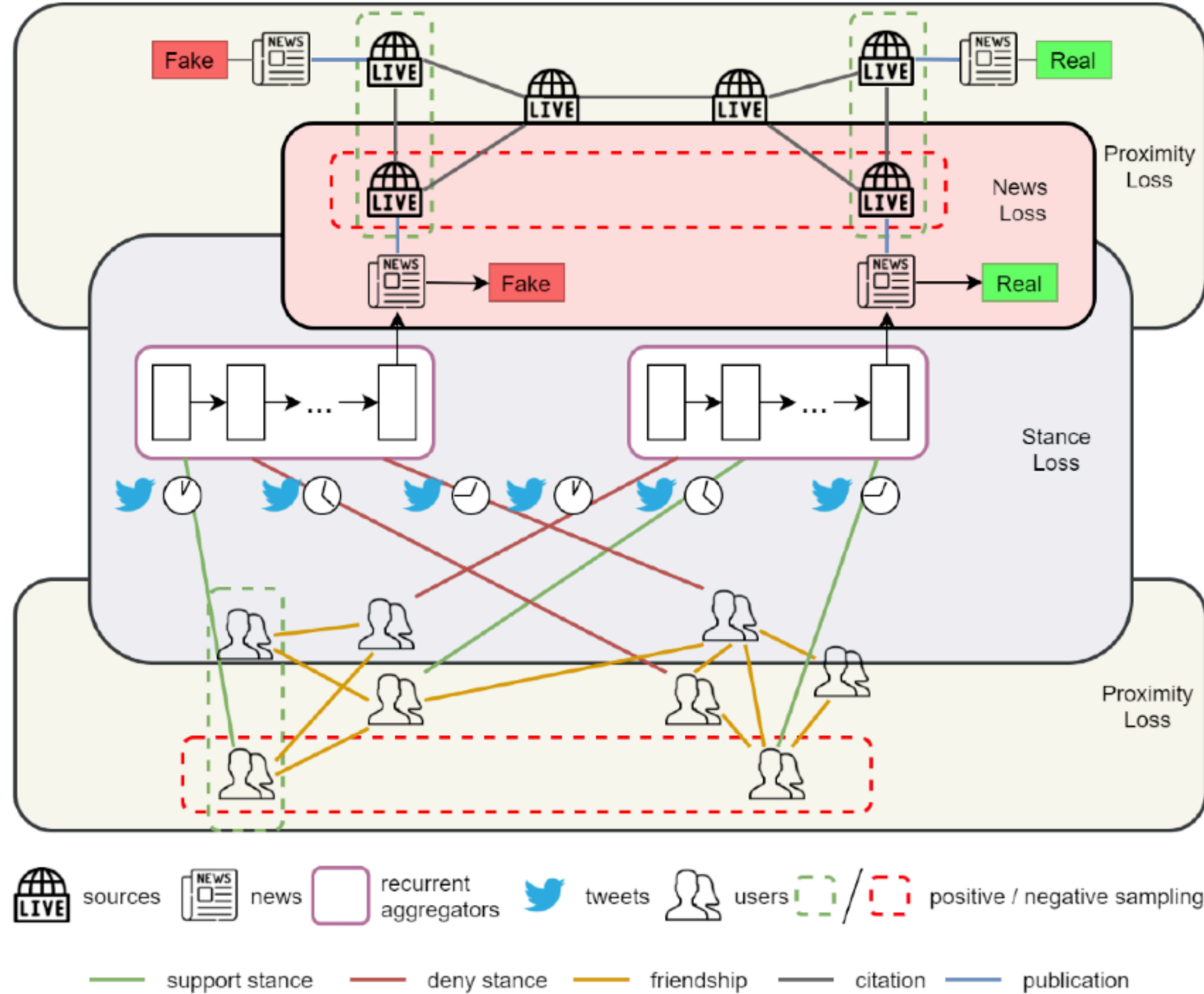# Methodology
FANG: Total loss function

Algorithm 1: FANG Learning Algorithm

Input : The social context graph $G = (A, S, U, E)$
The news labels Y_A, and the stance labels $Y_{U,A,C}$

Output: FANG-optimized parameters θ

Initialize θ;

while θ *has not converged* **do**
$\quad$ **for** *each news batch* $A_i \subset A$ **do**
$\quad\quad$ **for** *each news* $a \in A_i$ **do**
$\quad\quad\quad$ $U_a \leftarrow$ users who have engaged with a;
$\quad\quad\quad$ $z_a \leftarrow$ Equation (2);
$\quad\quad\quad$ $z_s \leftarrow GraphSage(s)$;
$\quad\quad\quad$ **for** *each user* $u \in U_a$ **do**
$\quad\quad\quad\quad$ $z_u \leftarrow GraphSage(u)$;
$\quad\quad\quad\quad$ $\mathcal{L}'_{stance} \leftarrow$ Equation (4);
$\quad\quad\quad$ **end**
$\quad\quad$ **end**
$\quad\quad$ $\mathcal{L}'_{news} \leftarrow$ Equation (5);
$\quad$ **end**
$\quad$ **for** *each news–source or user sub-graph* G' **do**
$\quad\quad$ **for** *each entity* $r \in G'$ **do**
$\quad\quad\quad$ $P_r \leftarrow$ positive samples of r in G';
$\quad\quad\quad$ $N_r \leftarrow$ negative samples of r in G';
$\quad\quad\quad$ $\mathcal{L}'_{prox.} \leftarrow$ Equation (3);
$\quad\quad$ **end**
$\quad$ **end**
$\quad$ $\mathcal{L}_{total} \leftarrow$ SUM($\mathcal{L}'_{stance}, \mathcal{L}'_{news}, \mathcal{L}'_{prox.}$);
$\quad$ $\theta \leftarrow$ Backpropagate($\mathcal{L}_{total}$);

end

return θ

Experiments
Dataset

Fake	448	Publications / source	2.38	Cites / source	8.38
Real	606	Engagements / news	71.9	Friends / user	58.25
Sources	442	Neu. support / news	19.07	Deny / news	5.27
Users	54461	Neg. support / news	10.83	Report / news	36.73

- Twitter dataset

- For each article, collected its source, a list of engaged users, and their tweets if they were not already available in the previous dataset.

  - Also includes Twitter profile description and the list of Twitter profiles each user follows.

- Further crawled additional data about media sources, including the content of their *Homepage* and their *About us* page, together with their frequently cited sources on their *Homepage*.

- Label obtained from Snopes and Politifact