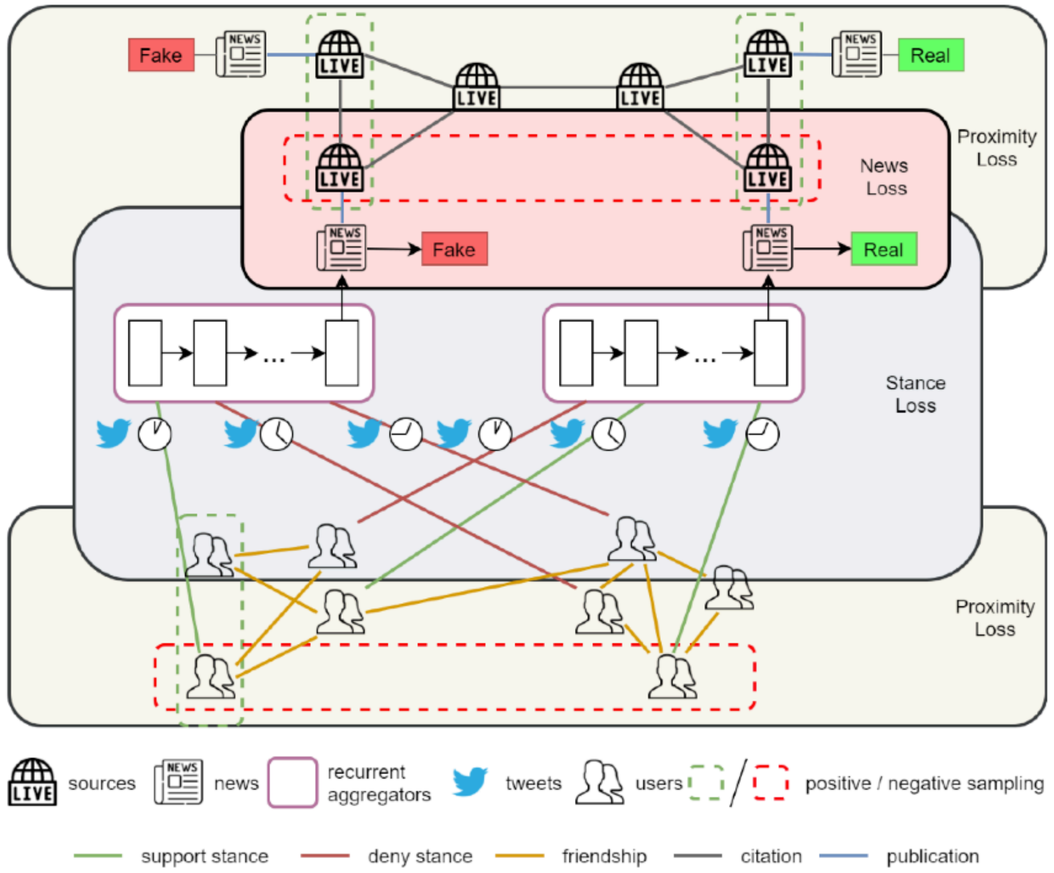
Methodology

FANG: Total loss function

- This is achieved by optimizing three concurrent losses:
  - Unsupervised Proximity Loss
  - Self-supervised Stance Loss
  - Supervised Fake News Detection Loss
- Define the total loss by linearly combining these three component losses:
- $\mathscr{L}_{\text{total}} = \mathscr{L}_{\text{prox}} + \mathscr{L}_{\text{stance}} + \mathscr{L}_{\text{news}}$



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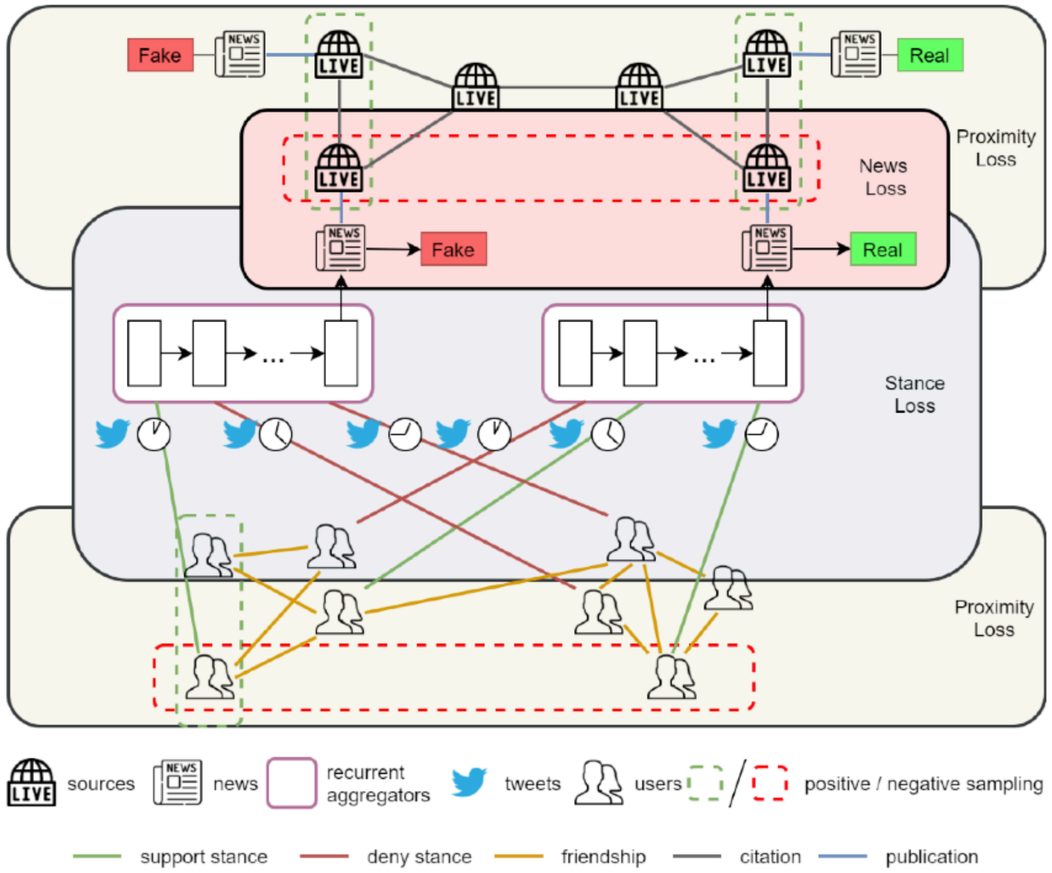
FANG: Total loss function



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**
  for *each news batch* $A_i \subset A$ **do**
    for *each news* $a \in A_i$ **do**
      $U_a \leftarrow$ users who have engaged with a;
      $z_a \leftarrow$ Equation (2);
      $z_s \leftarrow GraphSage(s)$;
      for *each user* $u \in U_a$ **do**
        $z_u \leftarrow GraphSage(u)$;
        $\mathcal{L}'_{stance} \leftarrow$ Equation (4);
      end
    end
    $\mathcal{L}'_{news} \leftarrow$ Equation (5);
  end
  for *each news–source or user sub-graph* G' **do**
    for *each entity* $r \in G'$ **do**
      $P_r \leftarrow$ positive samples of r in G';
      $N_r \leftarrow$ negative samples of r in G';
      $\mathcal{L}'_{prox.} \leftarrow$ Equation (3);
    end
  end
  $\mathcal{L}_{total} \leftarrow \text{SUM}(\mathcal{L}'_{stance}, \mathcal{L}'_{news}, \mathcal{L}'_{prox.})$;
  $\theta \leftarrow \text{Backpropagate}(\mathcal{L}_{total})$;
end
return θ