Algorithm 1 APP Embedding Algorithm

Input: G(V, E, W), Jumping Factor α, Learning Rate η
Output: Embedded Vector of $\vec{s_v}$, $\vec{t_v}$ for each $v \in V$
function PPREMBEDDING(G, α)
    Initialize: $\vec{s_v}$, $\vec{t_v}$, $\forall v \in V$
    for each $v \in V$ **do**
        for $i = 0; i < \#Sample; i++$ **do**
            u = SampleEndPoint(v)
            StochasticGradientDescent(v, u, 1)
            for $j = 0; j < k; j++$ **do**
                p = RandomUniform(V)
                StochasticGradientDescent(v, p, 0)
            end for
        end for
    end for
end function
function STOCHASTICGRADIENTDESCENT(v, u, $label$)
    $\vec{s_v}$ = $\vec{s_v}$ - η $(\sigma(\vec{s_v} \cdot \vec{t_u}) - label) \cdot \vec{t_u}$
    $\vec{t_u}$ = $\vec{t_u}$ - η $(\sigma(\vec{s_v} \cdot \vec{t_u}) - label) \cdot \vec{s_v}$
end function