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**Algorithm 1:** weakly supervised learning for point cloud semantic segmentation

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**Input:** Point cloud  $P \in \mathbb{R}^{N \times D}$ , Labels  $y \in \mathbb{Z}^M (M \ll N)$   
**Output:** Predictions  $p \in \mathbb{Z}^{N \times C}$

// Stage 1;  
**for**  $epoch \leftarrow 1 \dots 100$  **do**  
    **for** each mini-batch  $B$  **do**  
        Train one step:  
         $w = w - \eta \nabla (l_{seg}(y, p_l | w) + \lambda_{ent} l_{ent}(p_u | w) + \lambda_{cc} l_{cc}(p^{teacher}, p | w));$   
        #  $w$  is learned parameters of the student model,  $p_l$  and  $p_u$  are  
        predictions in labeled and unlabeled data;  
        Update Teacher model:  
         $w_t^{teacher} = \alpha \cdot w_{t-1}^{teacher} + (1 - \alpha) w_t^{student};$   
    **end**  
**end**  
// Stage 2;  
**for**  $epoch \leftarrow 1 \dots 100$  **do**  
    **for** each mini-batch  $B$  **do**  
        Generate pseudo-labels:  
         $y_i^{pl} = \operatorname{argmax}_i p_i^{teacher}, i \in B \cap P_u;$   
        Train one step:  
         $w = w - \eta \nabla (l_{seg}(y, p_l | w) + l_{ent}(p_u | w) + l_{cc}(p^{teacher}, p | w) +$   
         $l_{seg}^{pl}(y^{pl}, p_u | w));$   
        Update Teacher model:  
         $w_t^{teacher} = \alpha \cdot w_{t-1}^{teacher} + (1 - \alpha) w_t^{student};$   
    **end**  
**end**

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