The IPWE calculation

$$V(D) = E_X(E_{Z|X}(Y|X, T = D(X))$$

$$V(\hat{D}) = \sum_{i=1}^{n} Z_i I_{T_i = D(X_i)} / \sum_{i=1}^{n} I_{T_i = D(X_i)}$$

where Z is the criterion to measure the treatment performance. Z can be chosen as (i) change score, (ii) curve integral (area under the curve), (iii) weighted integral.

To train the data

- 1. Obtain the $\hat{\alpha}$ by maximizing purity or likelihood
- 2. Estimate the coefficients:

$$\text{coef}_{drg} = \hat{\beta}_1 + \hat{\Gamma}_1(\hat{\alpha}'x)$$

$$\text{coef}_{pbo} = \hat{\beta}_2 + \hat{\Gamma}_2(\hat{\alpha}'x)$$

- 3. Calculate the treatment decision rule:

	Change Score	Integral	Weighted Integral 1	Weighted Integral 2
Training set	$\hat{Y}_k = X\text{coef}_k$ $\hat{Z}_k = \hat{Y}_k(t=8) - \hat{Y}_k(t=0)$	$\hat{\theta} = \text{coef}_k$ $\hat{Z}_k = \int_0^8 f(t;\hat{\theta})dt$	$\hat{\theta} = \text{coef}_k$ $\hat{\theta}_1 = \{\hat{\theta}, \hat{\beta}_{pbo}\}$ $\hat{Z}_k = \int_0^8 w(t;\hat{\theta}_1)f(t;\hat{\theta})dt$	$\hat{\theta} = \text{coef}_k$ $\hat{\theta}_2 = \{\hat{\theta}, \hat{\beta}_{pbo}\}$ $\hat{Z}_k = \int_0^8 w(t;\hat{\theta}_2)f(t;\hat{\theta})dt$
Decision rule $\hat{T}_i$	$\hat{T}_i$ = drug if $\hat{Z}_{drg} < \hat{Z}_{pbo}$	$\hat{T}_i$ = drug if $\hat{Z}_{drg} < \hat{Z}_{pbo}$	$\hat{T}_i$ = drug if $\hat{Z}_{drg} < \hat{Z}_{pbo}$	$\hat{T}_i$ = drug if $\hat{Z}_{drg} < \hat{Z}_{pbo}$
Test set Z_i	$Y(t=8) - Y(t=0)$ (observed)	$\hat{\theta}^* = \hat{\beta}^*$ (LME without predictor) $Z_i = \int_0^8 f(t;\hat{\theta}^*)dt$	$\hat{\theta}^* = \hat{\beta}^*$ (LME without predictor) $Z_i = \int_0^8 w(t;\hat{\theta}^*, \beta_{pbo})f(t;\hat{\theta}^*)dt$	$\hat{\theta}^* = \hat{\beta}^*$ (LME without predictor) $Z_i = \int_0^8 w(t;\hat{\theta}^*, \hat{\beta}_{pbo})f(t;\hat{\theta}^*)dt$