$$\text{Stop}(\cdot) = \begin{cases} 1, & \begin{cases} \max \hat{\beta}_{i\sim j} > \Delta \\ n_{im} < n_{\max} \\ |i \sim j| > 1 \text{ for any } i \sim j \end{cases} \\ 0, & \text{otherwise} \end{cases} \tag{1}$$

$$\begin{cases} m = j - i + 1 \\ s = \lceil i - 1 + 2^{\lceil m-1 \rceil} \rceil \end{cases} \tag{2}$$

Algorithm 1 Improved Sequential Bifurcation Algorithm

get $y_{(K)}$ and $y_{(0)}$ at test $\boldsymbol{x}_0$ and $\boldsymbol{x}_K$
$\hat{\beta}_{i\sim j} = y_{(K)} - y_{(0)}$
while Stop(·) **do**
    if $i = j$ **then**
        $im \leftarrow [im; i]$
        $n_{im} \leftarrow n_{im} + 1$
    else
        calculate s by Eq. (2).
        if $I(i-1)$ **then**
            get $y_{(i\sim s)}$ at test $\boldsymbol{x}_{i\sim s}$
            $\hat{\beta}_{i\sim s} = y_{(i\sim s)} - y_{(0)}$
        else
            get $y_{(s)}$ at test $\boldsymbol{x}_s$
            $\hat{\beta}_{i\sim s} = y_{(s)} - y_{(i-1)}$
        end if
        if $I(s)$ **then**
            get $y_{(s+1\sim j)}$ at test $\boldsymbol{x}_{s+1\sim j}$
            $\hat{\beta}_{s+1\sim j} = y_{(s+1\sim j)} - y_{(0)}$
        else
            get $y_{(s)}$ at test $\boldsymbol{x}_s$
            $\hat{\beta}_{s+1\sim j} = y_{(j)} - y_{(s)}$
        end if
    end if
    delete $i \sim j$
    $i \sim j = \arg\max_{i\sim j} \hat{\beta}_{i\sim j}$
end while