input
\( c_1, c_2, r_1, r_2, w, v_{\text{min}}, v_{\text{max}} \)

output
\( GB \)
\( \text{The fitness value of } GB \)

begin
Initialize Population

while (max iteration or convergence criteria is not met) do
  for \( i = 1 \) to numbers of particles do
    Evaluate fitness value of the particle by C4.5
    if the fitness value of \( X_i \) is greater than that of \( PB_i \) then
      \( PB_i = X_i \)
    end if
    if the fitness value of \( X_i \) is greater than that of \( GB \) then
      \( GB = X_i \)
    end if
    for \( d = 1 \) to no of genes do
      \( v_{id}^{\text{old}} = w \times v_{id}^{\text{old}} + c_1 r_1 (pb_{id}^{\text{old}} - x_{id}^{\text{old}}) + c_2 r_2 (pb_{d}^{\text{old}} - x_{id}^{\text{old}}) \)
      if \( v_{id}^{\text{old}} > v_{\text{max}} \) then
        \( v_{id}^{\text{new}} = v_{\text{max}} \)
      end if
      if \( v_{id}^{\text{old}} < v_{\text{min}} \) then
        \( v_{id}^{\text{new}} = v_{\text{min}} \)
      end if
      if \( \text{sigmoid}(v_{id}^{\text{new}}) > U(0,1) \) then
        \( x_{id}^{\text{new}} = 1 \)
      else
        \( x_{id}^{\text{new}} = 0 \)
      end if
    next \( d \)
  next \( i \)
end while
end