Algorithm 1. Mix-CBP

Input: Patient representation after concatenation $v_p \in R^c$ and doctor representation after concatenation $v_d \in R^c$

Output: Fused representation of v_p and v_d: $v_{mix} \in R^d$

procedure Mix-CBP$\left(v_p, v_d, c, d\right)$

  For $k \leftarrow v_p, v_d$ **do**

    if h_k, s_k not initialized **then**

      Generate random but fixed $h_k \in R^c$ and $s_k \in \{+1. - 1\}^c$ where $h_k(i)$ is uniformly drawn from $\{1 \ldots d\}$, s_k is uniformly drawn from $\{-1, +1\}$.

    $v_k' = \psi\left(v_k, h_k, s_k, c\right)$

    Generate random but fixed $W_k, W_k \in R^{d \times c}$, where each entry is -1 or +1 with equal probability.

  $x_{ts} = FFT^{-1}\left(FFT\left(v_d'\right) \odot FFT\left(v_p'\right)\right)$

  $x_{rm} = \frac{1}{\sqrt{d}}\left(W_{vp} v_p\right) \odot \left(W_{vd} v_d\right)$

  $\phi_{ts} = sign(x_{ts})\sqrt{|x_{ts}|}$

  $\phi_{rm} = sign(x_{rm})\sqrt{|x_{rm}|}$

  $v_{mix} = \phi_{rm} + \phi_{ts}$

  return v_{mix}

procedure $\psi(v, h, s, c)$

  $y = [0, \ldots, 0]$

  for $i \leftarrow 1, \ldots, c$ **do**

    $y[h[i]] = y[h[i]] + s[i] \cdot v[i]$

  return y