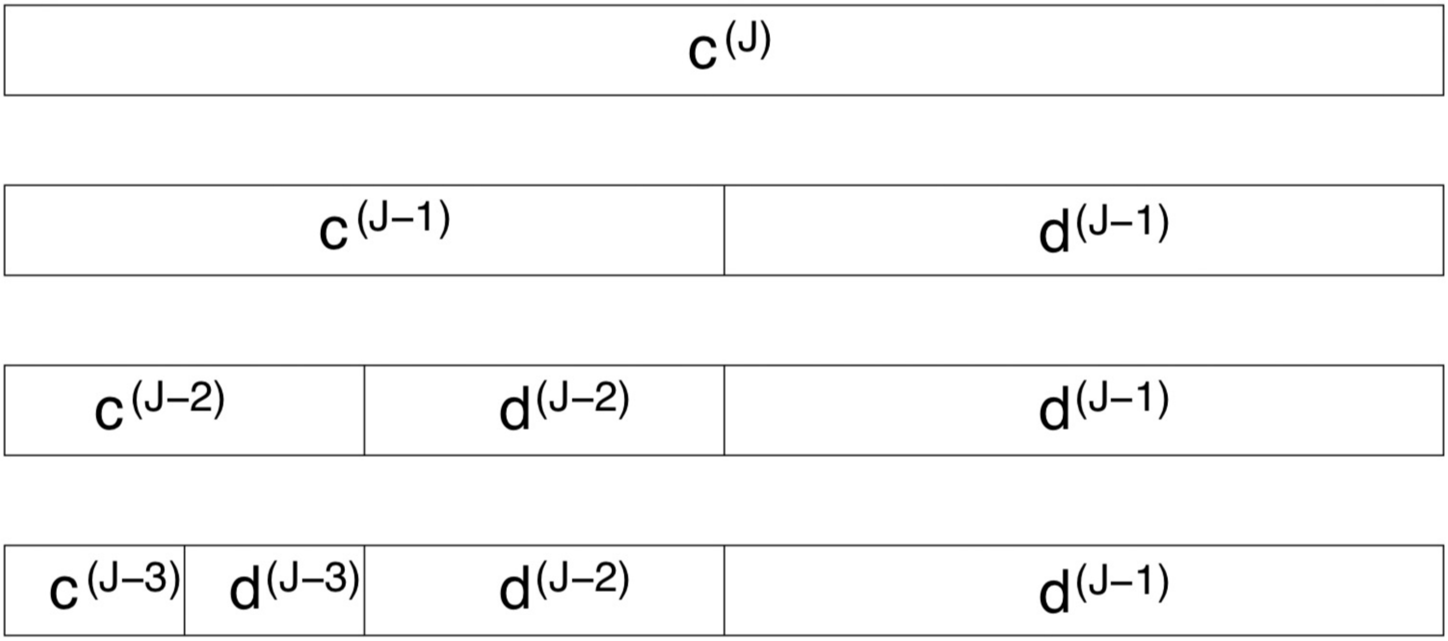
Our goal is to do the transformation:



Starting with $c^{(3)} = s = [1,2,3,-1,1,-4,-2,4]^T$ as input

Remember that the transformation from a finer level to a coarser one can be splitted in low and high pass filters:

Low-pass Filter

$$h_1 = \frac{1}{2}\begin{bmatrix} 1 & 1 \end{bmatrix}$$

$$h_2 = \frac{1}{2}\begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}$$

$$h_3 = \frac{1}{2}\begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \end{bmatrix}$$

High-pass Filter

$$H_1 = \frac{1}{2}\begin{bmatrix} 1 & -1 \end{bmatrix}$$

$$H_2 = \frac{1}{2}\begin{bmatrix} 1 & -1 & 0 & 0 \\ 0 & 0 & 1 & -1 \end{bmatrix}$$

$$H_3 = \frac{1}{2}\begin{bmatrix} 1 & -1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & -1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & -1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & -1 \end{bmatrix}$$

$$c^{(3)} = S$$

$$d^{(2)} = H_3 c^{(3)} = \left[-\tfrac{1}{2},\ 2,\ \tfrac{5}{2},\ -3\right]^T$$

$$c^{(2)} = h_3 c^{(3)} = \left[\tfrac{3}{2},\ 1,\ -\tfrac{3}{2},\ 1\right]^T$$

$$d^{(1)} = H_2 c^{(2)} = \left[\tfrac{1}{4},\ -\tfrac{5}{4}\right]^T$$

$$c^{(1)} = h_2 c^{(2)} = \left[\tfrac{5}{4},\ -\tfrac{1}{4}\right]^T$$

$$d^{(0)} = H_1 c^{(1)} = \frac{3}{4}$$

$$c^{(0)} = h_1 c^{(1)} = \frac{1}{2}$$

Output vector: $\left[c^{(0)}, d^{(0)}, d^{(1)}, d^{(2)}\right]^T$

$$= \Big[\underset{c^{(0)}}{\tfrac{1}{2}},\ \underset{d^{(0)}}{\tfrac{3}{4}},\ \underbrace{\tfrac{1}{4},\ -\tfrac{5}{4}}_{d^{(1)}},\ \underbrace{-\tfrac{1}{2},\ 2,\ \tfrac{5}{2},\ -3}_{d^{(2)}}\Big]^T$$