

This is the kind of thing to calculate :

$$W(i, j, l) = X(i) + \sum_{j,k \in R} Y(i, j) Z(k, l) \delta_{jk}$$

The  $W(i, j, l)$  takes three integers,  $i, j, l$  as inputs, and returns a number, e.g.,

$$W(1, 2, 3) = 7$$

It is a better to think of,  $W(i, j, l)$ , as a function, not an array. It is to described by an instance of the term class, which contains this function.

$$\sum_{j,k \in R} Y(i, j) Z(k, l) =$$

$$Y(i, 0)Z(0, l) + Y(i, 0)Z(1, l) + Y(i, 1)Z(0, l) + Y(i, 1)Z(1, l)$$

The  $\delta_{ij}$  controls the indices

$$\delta_{ij} = \begin{cases} 1 & \text{if } i == j \\ 0 & \text{otherwise} \end{cases}$$

$$W(i, j, l) = X(i) + \sum_{j,k}^{j,k \in R} Y(i, j)Z(k, l)\delta_{jk}$$

The  $\sum$  sums over all indices,  $j, k$ , in the range  $R$ . E.g., if  $R = \{0, 1\}$

$$\sum_{j,k}^{j,k \in R} Y(i, j)Z(k, l)\delta_{jk} =$$

$$Y(i, 0)Z(0, l)\delta_{00} + Y(i, 0)Z(1, l)\delta_{01} + Y(i, 1)Z(0, l)\delta_{10} + Y(i, 1)Z(1, l)\delta_{11}$$

The  $\delta_{jk}$  constrains the indices according to

$$\delta_{jk} = \begin{cases} 1 & \text{if } j == k \\ 0 & \text{otherwise} \end{cases}$$

So

$$\sum_{j,k}^{j,k \in R} Y(i, j)Z(k, l)\delta_{jk} =$$

$$Y(i, 0)Z(0, l) + Y(i, 1)Z(1, l)$$

Diagram illustrating the components of the equation  $W(i, j, l) = X(i) + \sum_{j \in R} Y(i, j) Z(k, l) \delta_{jk}$ :

- Indices:** The variables  $i, j, l$  in  $W(i, j, l)$  are labeled as "Indices".
- Range:** The set  $R$  in the summation  $\sum_{j \in R}$  is labeled as "Range".
- Summation:** The summation symbol  $\sum$  is labeled as "Summation".
- Terms:**
  - The expression  $W(i, j, l)$  is identified as a "Term".
  - The expression  $X(i)$  is identified as a "Term".
  - The entire summation term  $\sum_{j \in R} Y(i, j) Z(k, l) \delta_{jk}$  is identified as a "Term".

$$W(i, j, l) = X(i) + \sum_{j \in R} Y(i, j) Z(k, l) \delta_{jk}$$

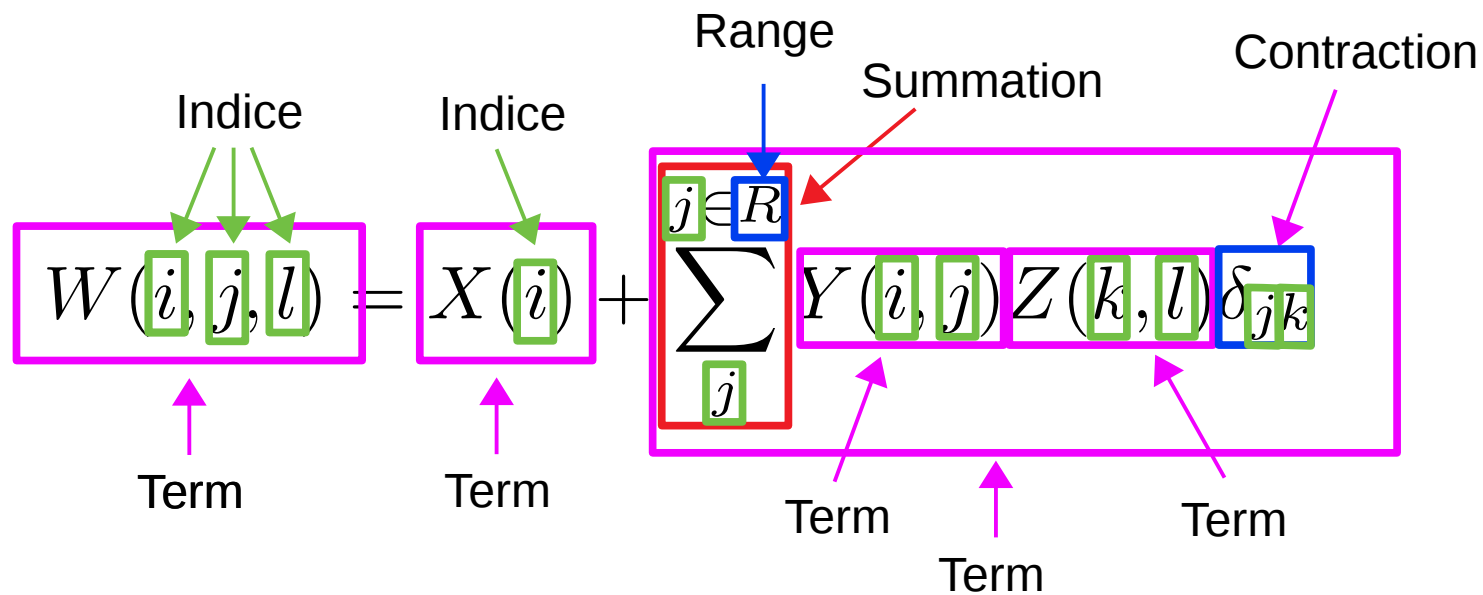
Diagram illustrating the components of the equation  $W(i, j, l) = X(i) + \sum_{j \in R} Y(i, j) Z(k, l) \delta_{jk}$ :

- Indices:** The variables  $i, j, l$  in the function  $W$  are labeled as "Indices".
- Term:** The function  $W(i, j, l)$  is labeled as a "Term".
- Summation:** The summation symbol  $\sum$  is labeled as "Summation".
- Range:** The range of the summation,  $j \in R$ , is labeled as "Range".
- Term:** The expression  $Y(i, j) Z(k, l) \delta_{jk}$  is labeled as a "Term".

$$Q(j) = U(j) + \sum_{m, n} \sum_{i, k} V(m, n) W(i, j, k)$$

Diagram illustrating the components of the equation  $Q(j) = U(j) + \sum_{m, n} \sum_{i, k} V(m, n) W(i, j, k)$ :

- Summation:** The summation symbol  $\sum$  is labeled as "Summation".
- Term:** The expression  $V(m, n) W(i, j, k)$  is labeled as a "Term".



$$Q(j) = U(j) + \sum_{m, n} \sum_{i, k}^{m, n \in R^m \quad i, j \in R^i} V(m, n) W(i, j, k)$$

Diagram illustrating the summation structure:

- Summation:** Points to the summation indices  $m, n$  and  $i, k$ .
- Term:** Points to the entire summation term  $\sum_{m, n} \sum_{i, k} V(m, n) W(i, j, k)$ .

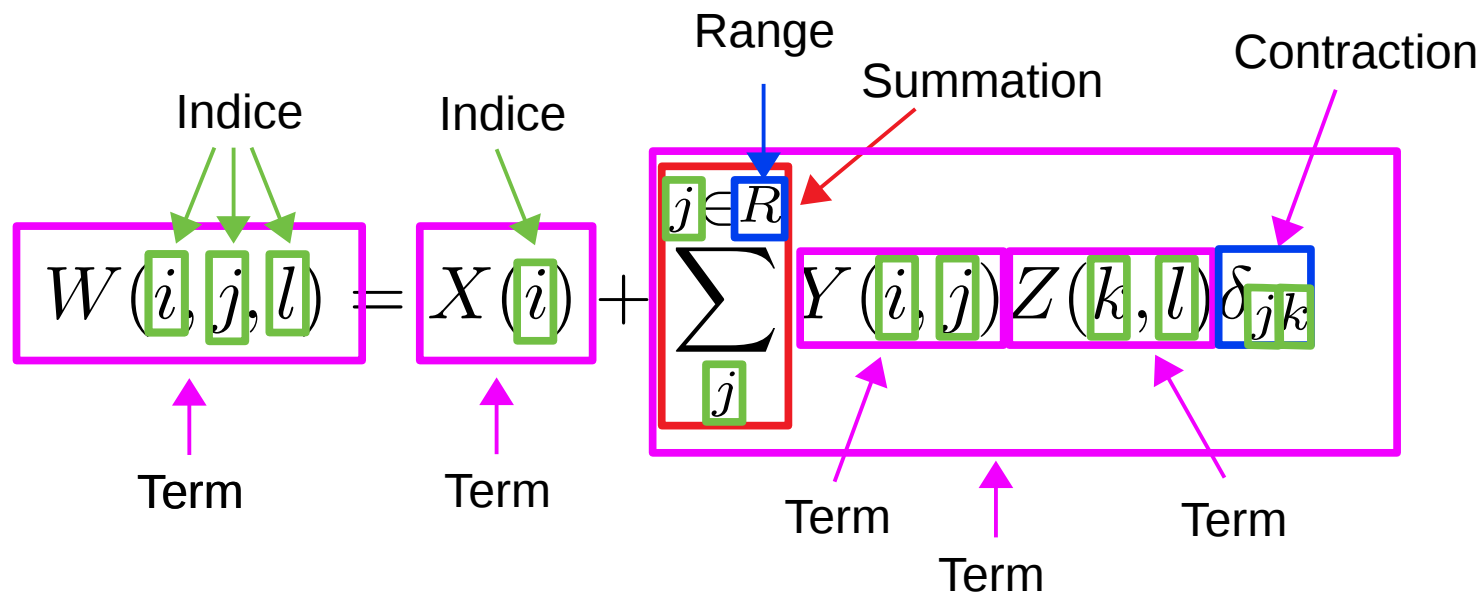


Diagram illustrating a summation operation:

**Summation**: Points to the summation symbol  $\sum$ .

$$Q(j) = U(j) + \sum_{m, n \in R^m} \sum_{i, j \in R^i} V(m, n) W(i, j, k)$$

**Term**: Points to the entire expression  $V(m, n) W(i, j, k)$ .