**Embedding Layer** 

dW dz

$$\begin{bmatrix} \delta_{000} + \delta_{120} & \delta_{001} + \delta_{121} & \delta_{002} + \delta_{122} \\ \delta_{020} + \delta_{110} & \delta_{021} + \delta_{111} & \delta_{022} + \delta_{112} \\ \delta_{030} + \delta_{100} & \delta_{031} + \delta_{111} & \delta_{032} + \delta_{112} \\ \delta_{010} & \delta_{011} & \delta_{012} \\ \delta_{130} & \delta_{131} & \delta_{132} \end{bmatrix}_{5\times3}$$

$$\begin{bmatrix} \mathbf{0} & 3 & 1 & 2 \\ 2 & 1 & \mathbf{0} & 4 \end{bmatrix}_{2\times4}$$

$$\begin{bmatrix} \mathbf{0} & 3 & 1 & 2 \\ 2 & 1 & \mathbf{0} & 4 \end{bmatrix}_{2\times4}$$

$$\begin{bmatrix} \delta_{100} & \delta_{001} & \delta_{002} \\ \delta_{020} & \delta_{021} & \delta_{022} \\ \delta_{030} & \delta_{031} & \delta_{032} \end{bmatrix}$$

$$\begin{bmatrix} \delta_{100} & \delta_{101} & \delta_{102} \\ \delta_{110} & \delta_{111} & \delta_{112} \\ \delta_{120} & \delta_{121} & \delta_{122} \\ \delta_{130} & \delta_{131} & \delta_{132} \end{bmatrix}_{2\times4\times3}$$

Backward

$w_{00}$	$w_{01}$	$w_{02}$
$w_{10}$	$w_{11}$	$w_{12}$
$w_{20}$	$w_{21}$	$w_{22}$
w <sub>30</sub>	<i>w</i> <sub>31</sub>	$w_{32}$
$w_{40}$	$w_{41}$	$w_{42}$

0	3	1	2
2	1	0	4

$w_{00}$	$w_{01}$	$w_{02}$
$w_{30}$	<i>w</i> <sub>31</sub>	$w_{32}$
$w_{10}$	$w_{11}$	$w_{12}$
$w_{20}$	$w_{21}$	$w_{22}$
$w_{20}$	$w_{21}$	$w_{22}$
$w_{20}$ $w_{10}$	w <sub>21</sub>	$w_{22}$ $w_{12}$

$\delta_{000} + \delta_{120}$	$\delta_{001} + \delta_{121}$	$\delta_{002} + \delta_{122}$
$\delta_{020} + \delta_{110}$	$\delta_{021} + \delta_{111}$	$\delta_{022} + \delta_{112}$
$\delta_{030} + \delta_{100}$	$\delta_{031} + \delta_{101}$	$\delta_{032} + \delta_{102}$
$\delta_{010}$	$\delta_{011}$	$\delta_{012}$
$\delta_{130}$	$\delta_{131}$	$\delta_{132}$

0	3	1	2
2	1	0	4

$\delta_{000}$	$\delta_{001}$	$\delta_{002}$
$\delta_{010}$	$\delta_{011}$	$\delta_{012}$
$\delta_{020}$	$\delta_{021}$	$\delta_{022}$
$\delta_{030}$	$\delta_{031}$	$\delta_{032}$
$\delta_{100}$	$\delta_{101}$	$\delta_{102}$
$\delta_{110}$	$\delta_{111}$	$\delta_{112}$
$\delta_{120}$	$\delta_{121}$	$\delta_{122}$
$\delta_{130}$	$\delta_{131}$	$\delta_{132}$