Input matrix A (green):

$$\begin{bmatrix}
a_{00} & a_{01} & a_{02} & a_{03} & a_{04} \\
a_{10} & a_{11} & a_{12} & a_{13} & a_{14} \\
a_{20} & a_{21} & a_{22} & a_{23} & a_{24} \\
a_{30} & a_{31} & a_{32} & a_{33} & a_{34} \\
a_{40} & a_{41} & a_{42} & a_{43} & a_{44}
\end{bmatrix}$$

Output/feature map (blue), with kernel weights overlaid:

$$\begin{array}{ccc}
b_{00}\;(w_{21}) & b_{01}\;(w_{20}) & b_{02} \\
b_{10}\;(w_{11}) & b_{11}\;(w_{10}) & b_{12} \\
b_{20}\;(w_{01}) & b_{21}\;(w_{00}) & b_{22}
\end{array}$$

(with w_{22}, w_{12}, w_{02} on the shaded left column)

Convolution-as-matrix-multiplication:

$$
W \times
\begin{bmatrix}
b_{00} \\ b_{01} \\ b_{02} \\ b_{10} \\ b_{11} \\ b_{12} \\ b_{20} \\ b_{21} \\ b_{22}
\end{bmatrix}
=
\begin{bmatrix}
a_{00} \\ a_{01} \\ a_{02} \\ a_{03} \\ a_{04} \\ a_{10} \\ \vdots \\ \vdots \\ a_{34} \\ a_{40} \\ a_{41} \\ a_{42} \\ a_{43} \\ a_{44}
\end{bmatrix}
$$

where W is the Toeplitz (sparse) matrix whose rows contain the kernel weights $w_{00}, w_{01}, w_{02}, w_{10}, w_{11}, w_{12}, w_{20}, w_{21}, w_{22}$ shifted across the columns:

Row 1: $w_{00}\; w_{01}\; w_{02}\; \ldots\; w_{10}\; w_{11}\; w_{12}\; \ldots\; w_{20}\; w_{21}\; w_{22}$
Row 2: $\quad w_{00}\; w_{01}\; w_{02}\; \ldots\; w_{10}\; w_{11}\; w_{12}\; \ldots\; w_{20}\; w_{21}\; w_{22}$
Row 3: $\quad\quad w_{00}\; w_{01}\; w_{02}\; \ldots\; w_{10}\; w_{11}\; w_{12}\; \ldots\; w_{20}\; w_{21}\; w_{22}$
Row 4: $w_{00}\; w_{01}\; w_{02}\; \ldots\; w_{10}\; w_{11}\; w_{12}\; \ldots\; w_{20}\; w_{21}\; w_{22}$
Row 5: $\quad w_{00}\; w_{01}\; w_{02}\; \ldots\; w_{10}\; w_{11}\; w_{12}\; \ldots\; w_{20}\; w_{21}\; w_{22}$
Row 6: $\quad\quad w_{00}\; w_{01}\; w_{02}\; \ldots\; w_{10}\; w_{11}\; w_{12}\; \ldots\; w_{20}\; w_{21}\; w_{22}$
Row 7: $w_{00}\; w_{01}\; w_{02}\; \ldots\; w_{10}\; w_{11}\; w_{12}\; \ldots\; w_{20}\; w_{21}\; w_{22}$
Row 8: $\quad w_{00}\; w_{01}\; w_{02}\; \ldots\; w_{10}\; w_{11}\; w_{12}\; \ldots\; w_{20}\; w_{21}\; w_{22}$
Row 9: $\quad\quad w_{00}\; w_{01}\; w_{02}\; \ldots\; w_{10}\; w_{11}\; w_{12}\; \ldots\; w_{20}\; w_{21}\; w_{22}$