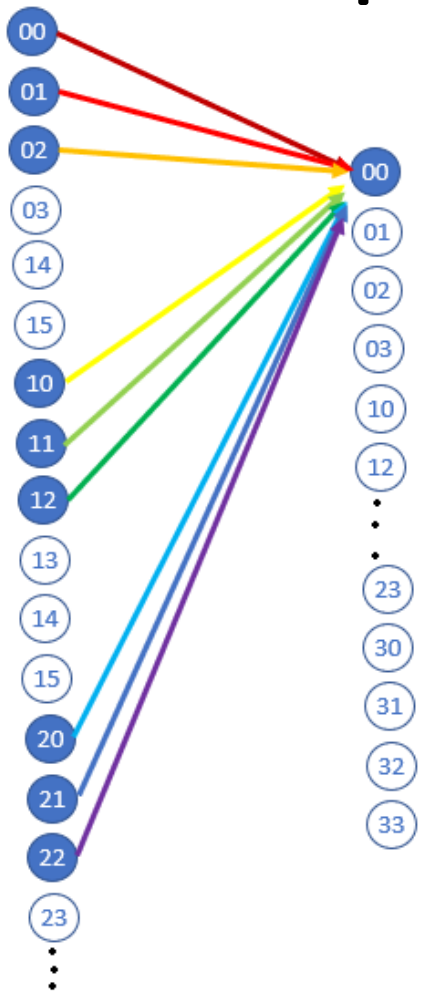
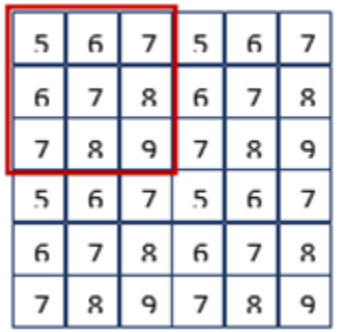
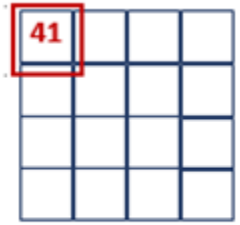
CNN – Sparsely Connected Network





Input Matrix **A**

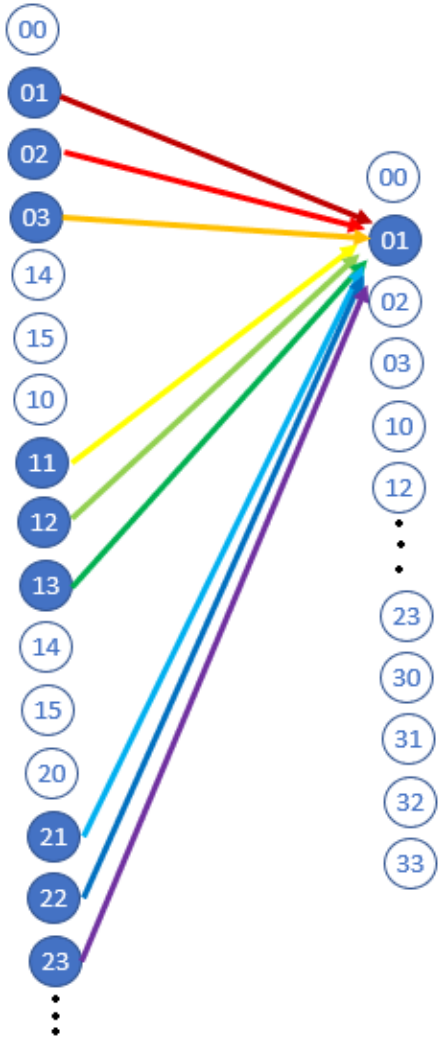
Filter **F**

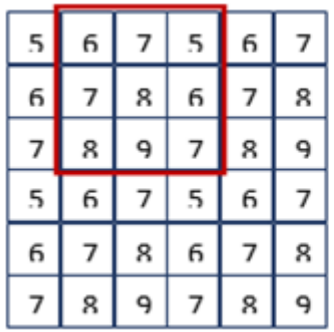


Convolution **C**

$$C_{00} = A_{00}\boldsymbol{F_{00}} + A_{01}\boldsymbol{F_{01}} + A_{02}F_{02} + A_{10}F_{10} + A_{11}F_{11} + A_{12}F_{12} + A_{20}F_{20} + A_{21}F_{21} + A_{22}F_{22}$$

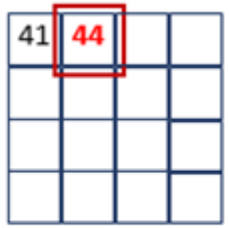
CNN – Sparsely Connected Network





Input Matrix **A**

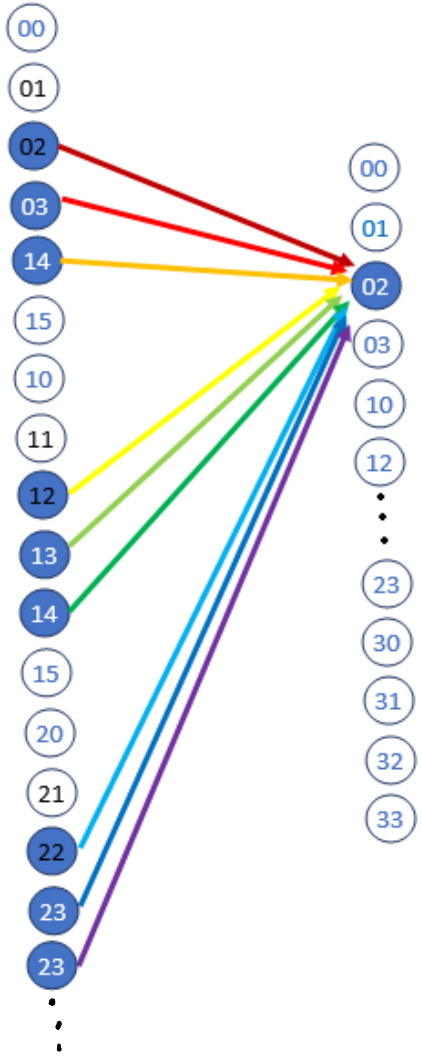
Filter **F**

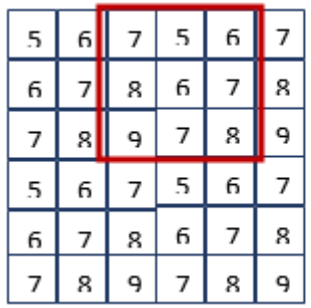


Convolution **C**

$$C_{01} = A_{01}F_{00} + A_{02}F_{01} + A_{03}F_{02} + A_{11}F_{10} + A_{12}F_{11} + A_{13}F_{12} + A_{21}F_{20} + A_{22}F_{21} + A_{23}F_{22}$$

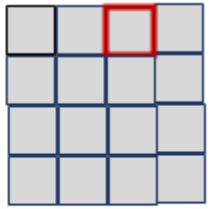
CNN – Sparsely Connected Network





Input Matrix A

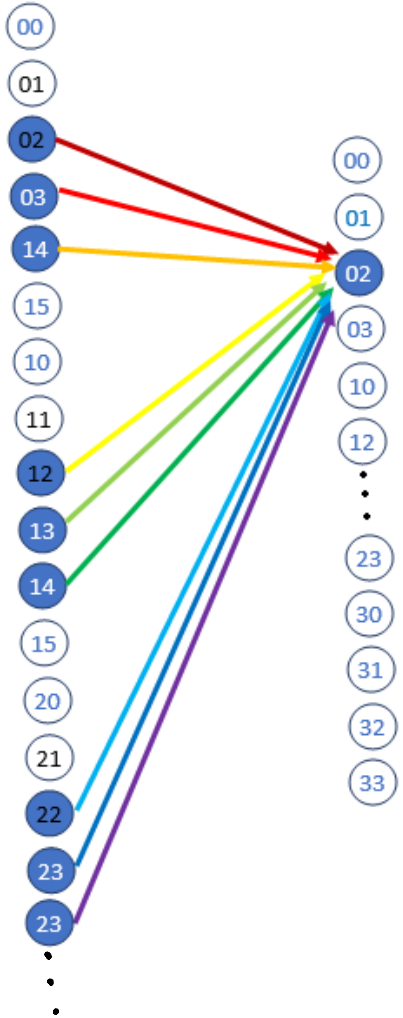
Filter F

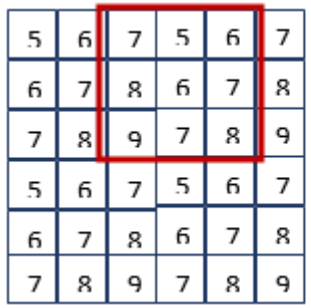


Convolution C

$$C_{02} = A_{02}\boldsymbol{F_{00}} + A_{03}\boldsymbol{F_{01}} + A_{04}F_{02} + A_{12}F_{10} + A_{13}F_{11} + A_{14}\boldsymbol{F_{12}} + A_{22}F_{20} + A_{23}\boldsymbol{F_{21}} + A_{24}\boldsymbol{F_{22}}$$

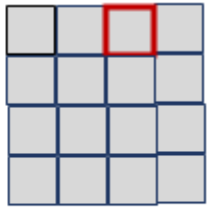
CNN – Sparsely Connected Network





Input Matrix A

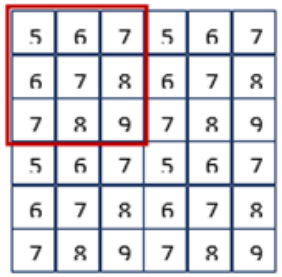
Filter F

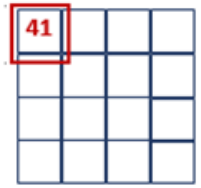


Convolution C

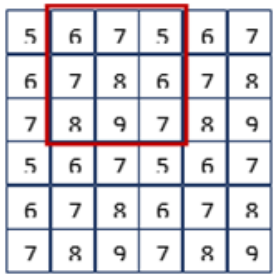
So, CNN is a sparsely connected MLP

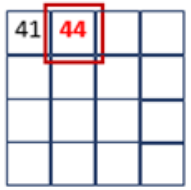
Parameters – Filters Define the Parameters



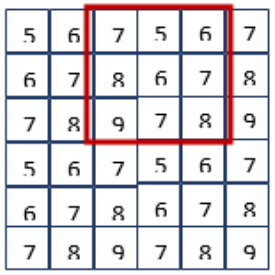


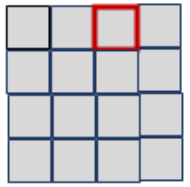
$$C_{00} = A_{00}\boldsymbol{F_{00}} + A_{01}\boldsymbol{F_{01}} + A_{02}F_{02} + A_{10}F_{10} + A_{11}F_{11} + A_{12}F_{12} + A_{20}F_{20} + A_{21}F_{21} + A_{22}F_{22}$$





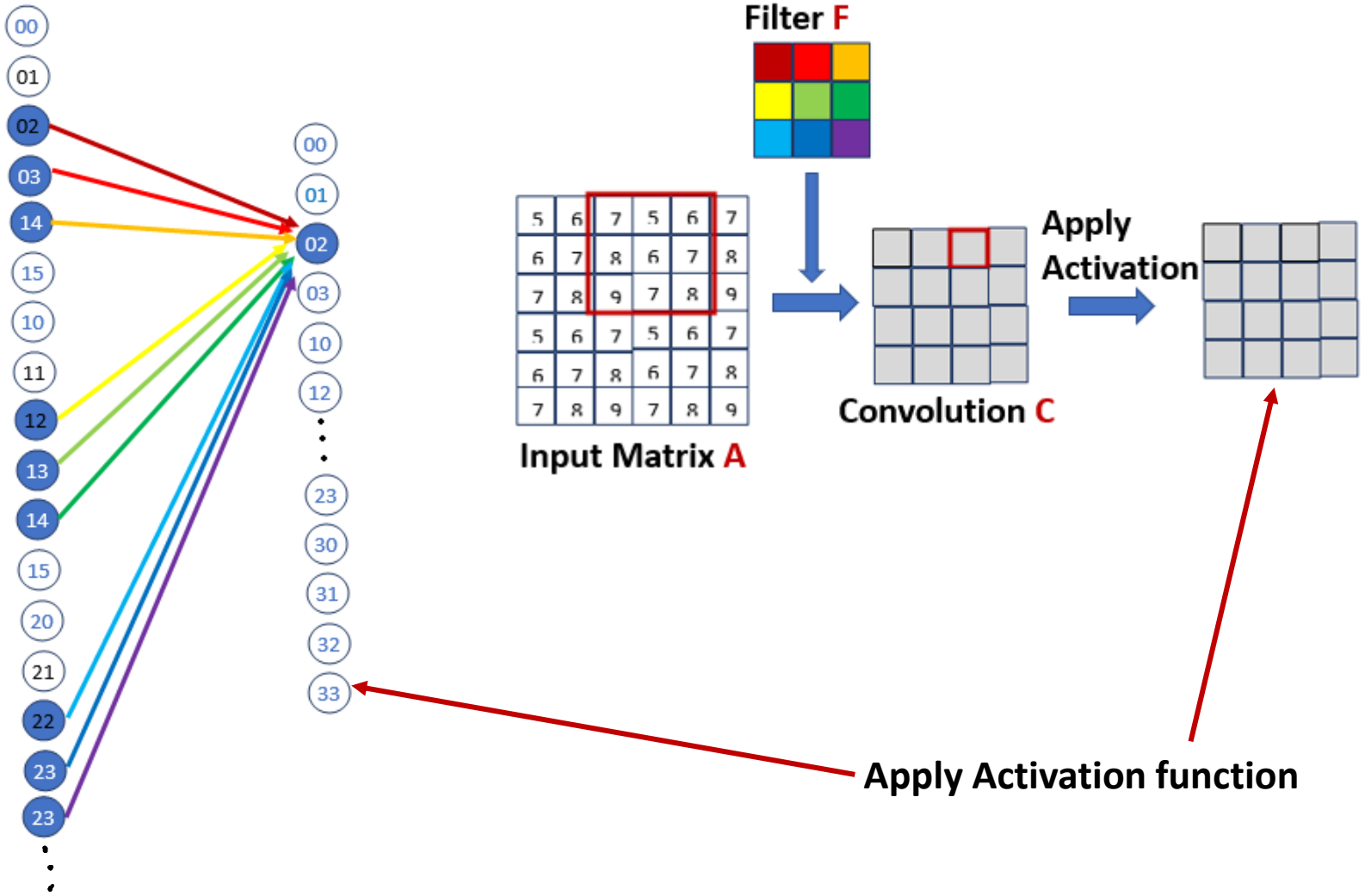
$$C_{01} = A_{01}\boldsymbol{F_{00}} + A_{02}\boldsymbol{F_{01}} + A_{03}F_{02} + A_{11}F_{10} + A_{12}F_{11} + A_{13}F_{12} + A_{21}F_{20} + A_{22}F_{21} + A_{23}F_{22}$$



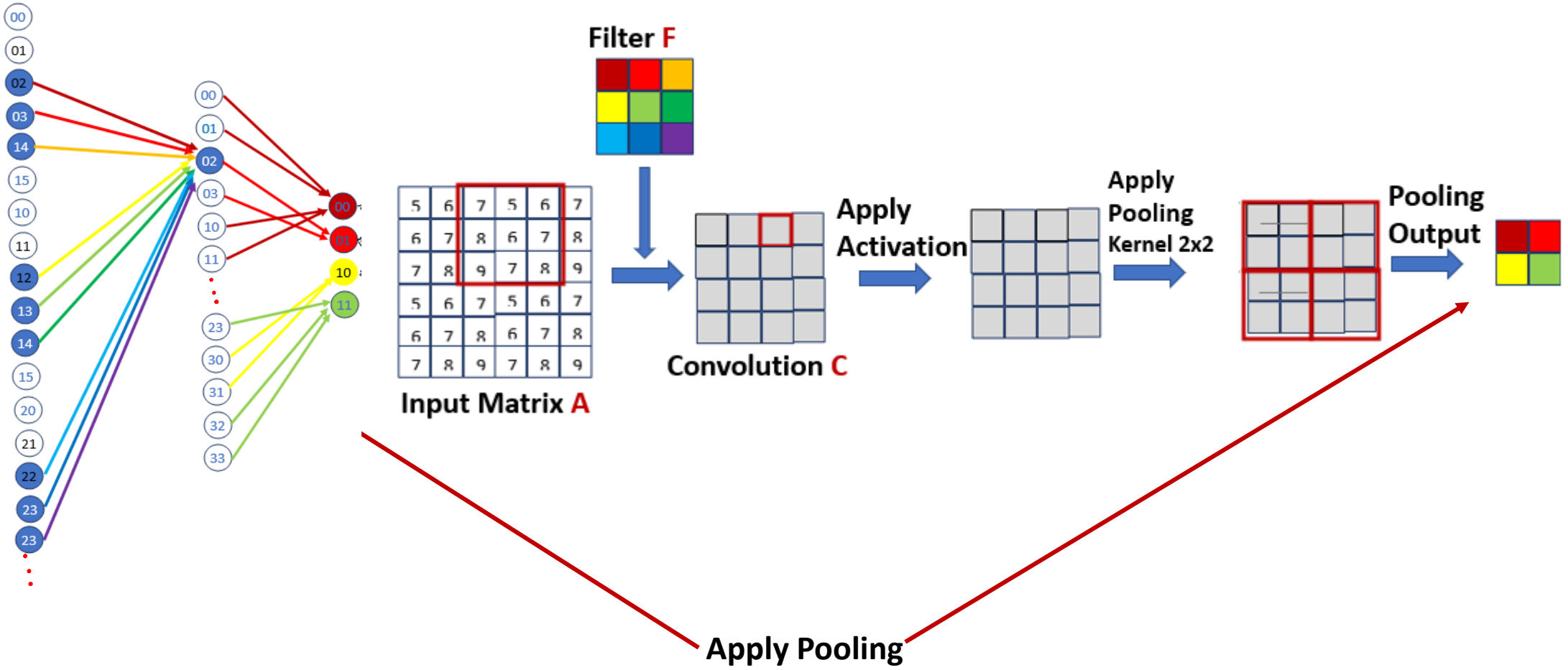


$$C_{02} = A_{02}\boldsymbol{F_{00}} + A_{03}\boldsymbol{F_{01}} + A_{04}F_{02} + A_{12}F_{10} + A_{13}F_{11} + A_{14}F_{12} + A_{22}F_{20} + A_{23}F_{21} + A_{24}F_{22}$$

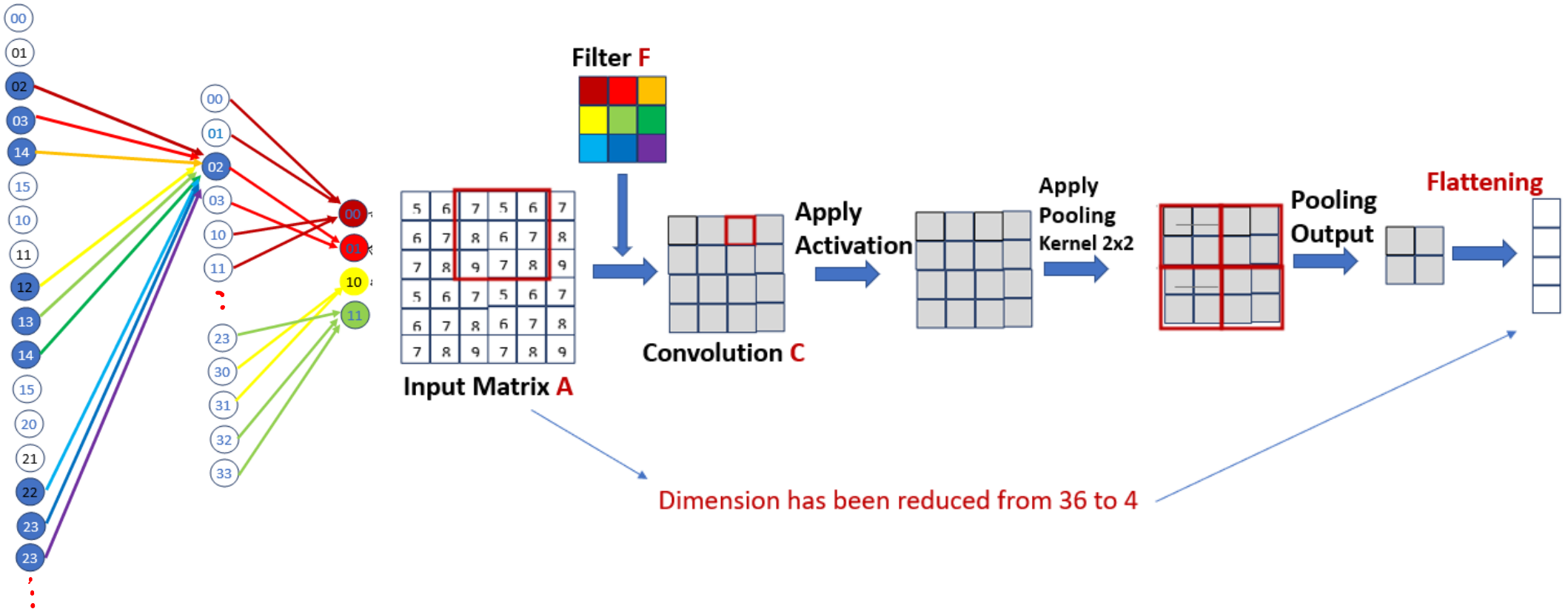
CNN – Sparsely Connected Network



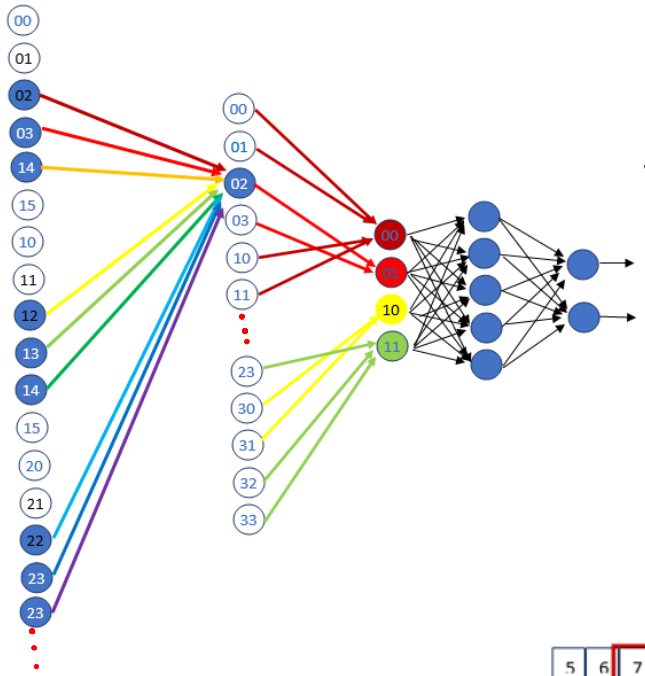
CNN – Sparsely Connected Network



CNN – Sparsely Connected Network



CNN – Dimension Reduction



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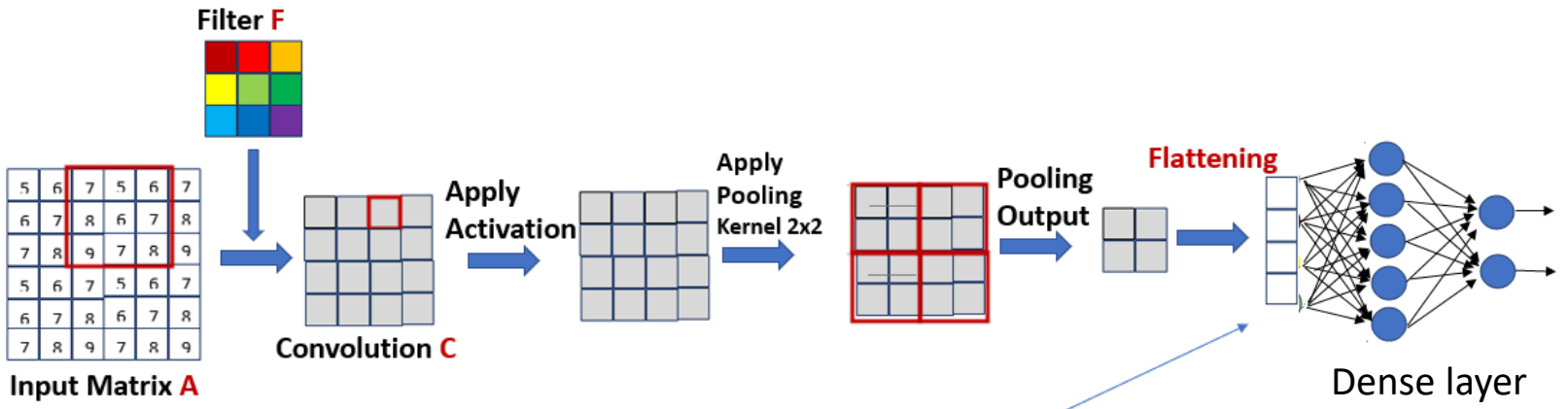
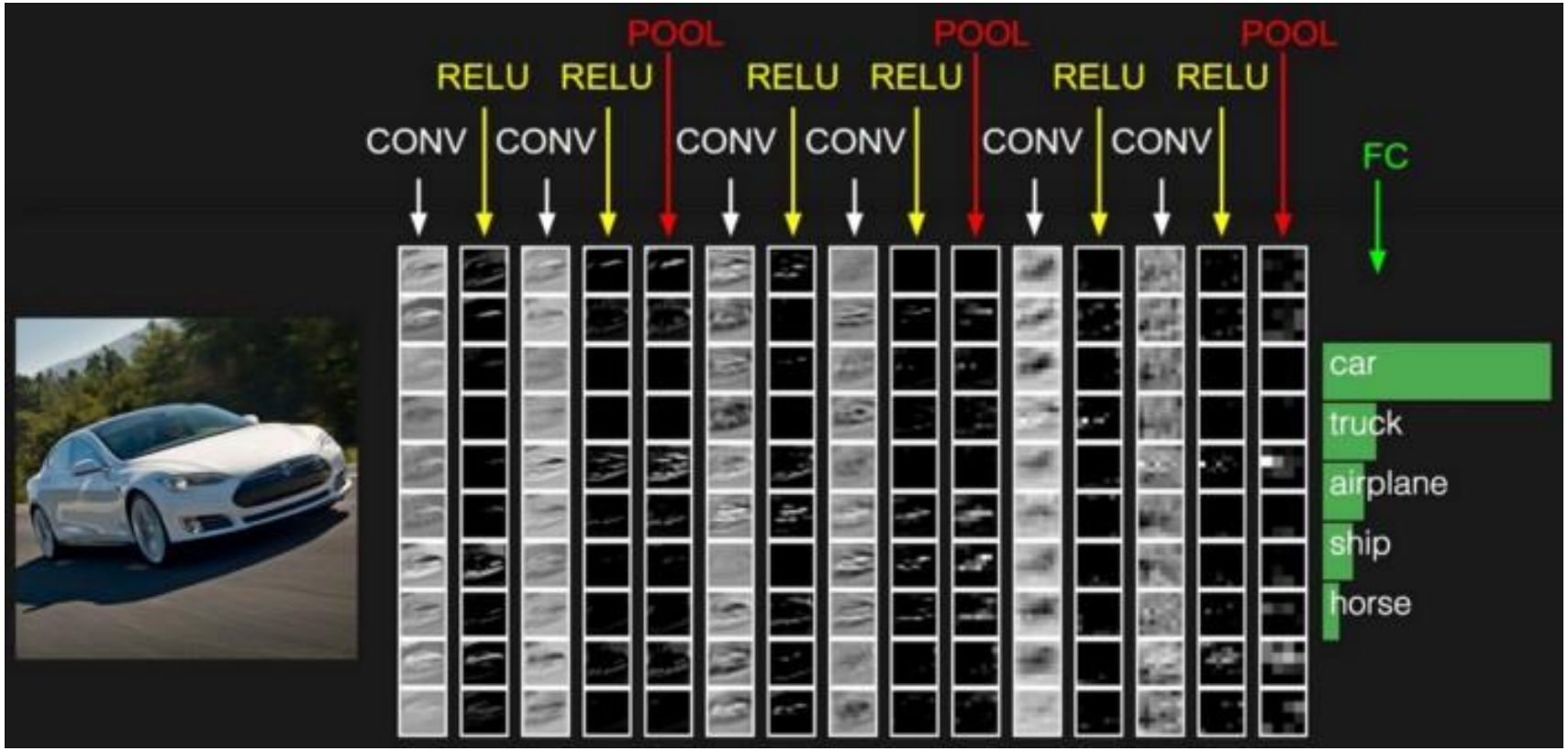


Example



Source: http://cs231n.stanford.edu/slides/2017/cs231n_2017_lecture6.pdf