$A \in \mathfrak{A} \subset \mathcal{B}(\mathfrak{H})$

$$\begin{array}{rccc} l(A): & \mathcal{L}^2(\mathfrak{H}) & \longrightarrow & \mathcal{L}^2(\mathfrak{H}) \\ & \rotatebox{90}{$\in$} & & \rotatebox{90}{$\in$} \\ & T & \longmapsto & AT \end{array}$$

ensemble of Hilbert Schmidt operators with inner product $\langle A, B \rangle_2 = \mathrm{Tr}\, A^* B$

$l(A)$ is a bounded operator on $\mathcal{L}^2(\mathfrak{H})$

- l gives $*$-representation on $\mathcal{L}^2(\mathfrak{H})$

In our case, above discussion is simplified:

$\mathfrak{H} = \mathbb{C}^n$, $\mathcal{B}(\mathfrak{H}) = M_n(\mathbb{C}) = \mathfrak{A}$

$\mathcal{L}^2(\mathfrak{H}) = M_n(\mathbb{C}) = \mathfrak{A}$