We also impose local $SU_2$ invariance

$$\bar{\psi}_n \rightarrow \bar{\psi}_n + ig^2 \frac{\tau^a}{2} A^a$$

Pauli-Wiên notation

$$W = \frac{i}{\sqrt{2}} (W^1 - iW^2)$$

Then

$$\text{in gauge invariant}$$

$$\begin{pmatrix} 1 \bar{\psi} \end{pmatrix} (\bar{\psi}) = \begin{pmatrix} w^+ \\ \bar{\psi} \\ w^- \end{pmatrix}$$

$$\begin{pmatrix} \frac{i}{\sqrt{2}} & \bar{\psi} \\ \bar{\psi} & 0 \end{pmatrix}$$

$$\begin{pmatrix} \bar{\psi} \\ \bar{\psi} \end{pmatrix}$$

$$\begin{pmatrix} 0 \\ \bar{\psi} \end{pmatrix}$$

$$W^- = \frac{i}{\sqrt{2}} (W^1 + iW^2)$$

Lagrangian for charged particle

$$\mathcal{L}^\pm = -\frac{g}{2\sqrt{2}} \bar{\psi} \gamma^\mu (1 - \gamma_5) e W^\mu_+ + \bar{\psi} \gamma^\mu (1 - \gamma_5) \gamma^\mu W^-$$

Note that

$$L = \left( \frac{\bar{\psi} \gamma^\mu (1 - \gamma_5) \gamma^\mu \psi}{2\sqrt{2}} \right)$$

This form of the interaction was known before the standard model.