

PRD Paper by the DONUT Collaboration:

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“A Measurement of ν_{τ} CC total Cross Section”

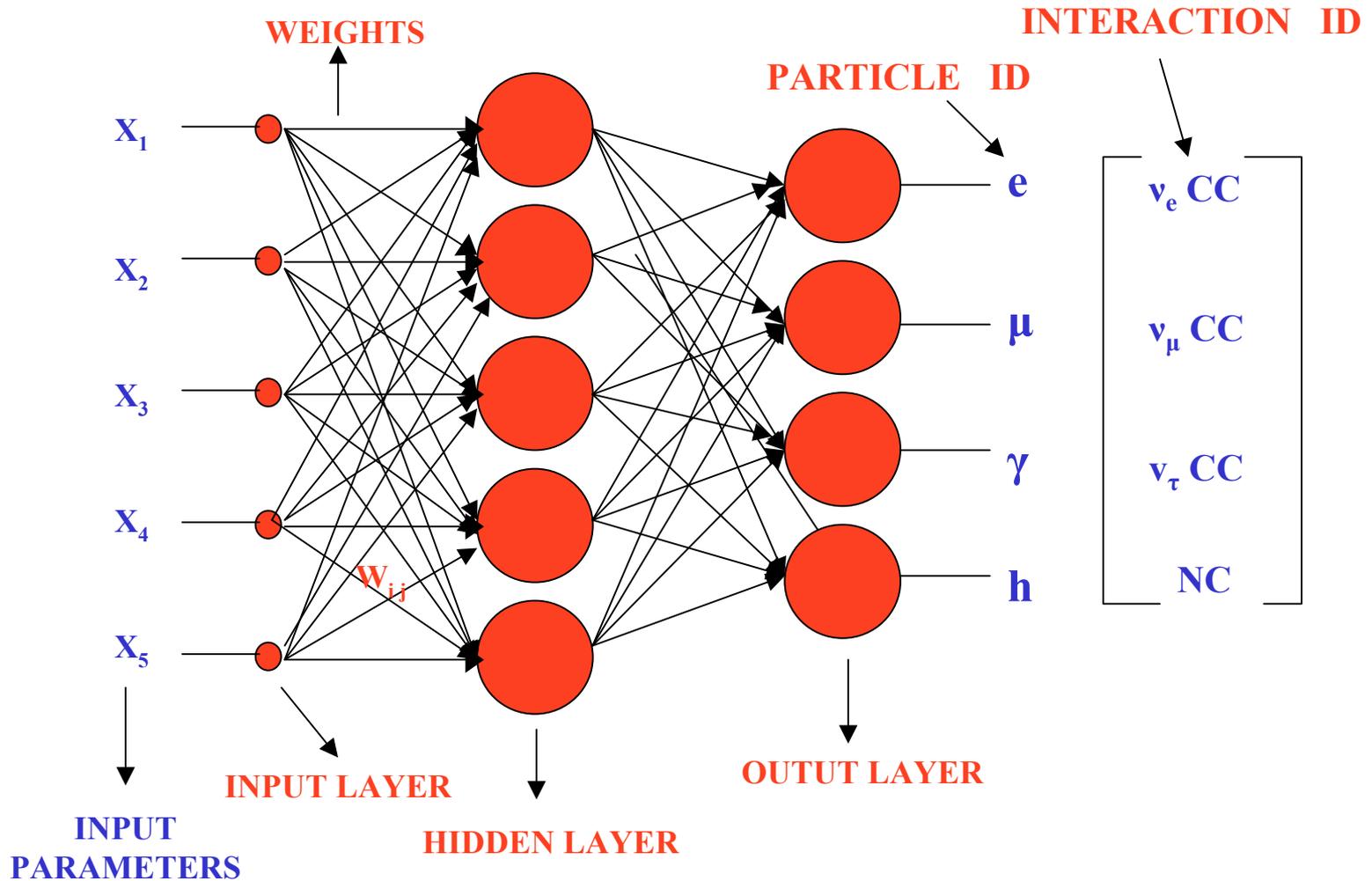
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VII. CROSS SECTION MEASUREMENT

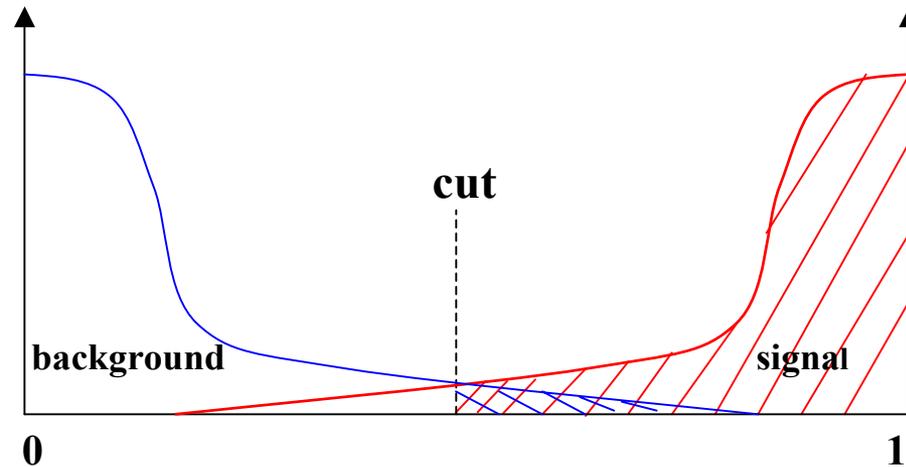
- Estimate number of ν_{μ} , ν_e , NC from efficiencies
- Visible energy distributions for ν_{μ} , ν_e , NC **FIG**
- Compare with MC distributions **FIG**
- Do combined fit with folded in known cross sections
- Extract neutrino flux
- Estimate total ν_{τ} CC cross section
- Use charm to compare and cross check

ANN Schematic



Brief Ann review : ANN parameters

Network output (selection) function for "background "and "signal" events



S = Total # Signal events

B = Total # Background events

S_C = Signal events above Cut

B_C = Background events above Cut

$$\epsilon = \text{efficiency} = \frac{S_C}{S}$$

$$P = \text{purity} = \frac{S_C}{S_C + B_C}$$

$$\text{contamination} = \frac{B_C}{B}$$

$$c_s + p = 1 \quad c_s = \text{signal contamination} = B_C / (S_C + B_C)$$

Calculate Signal and background from data

$$N_d(E_{\text{vis}}) = B_c + S_c$$

$$B_c(E_{\text{vis}}) = c_s N_d(E_{\text{vis}})$$

$$S_c(E_{\text{vis}}) = p N_d(E_{\text{vis}})$$

$$S(E_{\text{vis}}) = N_d(E_{\text{vis}}) / \varepsilon$$

Thus, we may need to determine

$$\varepsilon, p, c_s, c \text{ vs } E_{\text{vis}}$$

Neutrino Flux Calculation

- MC (large sample)
- Include inefficiencies of systems, DC, MID
- Calculate acceptance vs Energy
- Embed noise from empty frames
- Reconstruct, using current SW
- Check agreement with data (characteristic histograms)
- Do particle ID as well as permitted
- Do event ID
- Calculate signal and backgrounds to various channels
- Evis distribution
- Get known CC and NC cross sections
- Calculate neutrino fluxes.
- Do a combined fit for numu. N_{ue} , NC
- (numu CC, NC), (N_{ue} CC, NC) should give consistent results