Parton Distribution Functions

- The Proton (According to the Parton Model)

  $\Rightarrow$ 2 *valence up quarks and 1* valence down quark
  $\Rightarrow$ *sea* of quark-antiquark pairs
  $\Rightarrow$ gluons

- Each parton carries some fraction, x, of the total momentum of the proton.
- Parton distribution functions: $q_i(x)$

$$\sum_i \int_0^1 x q_i(x) dx = 1$$

$$i \in \{u, \bar{u}, d, \bar{d}, \ldots, g\}$$

$$\int_0^1 \left[u^p(x) - \bar{u}^p(x)\right] dx = 2 \text{ valence up quarks}$$

$$\int_0^1 \left[d^p(x) - \bar{d}^p(x)\right] dx = 1 \text{ valence down quarks}$$