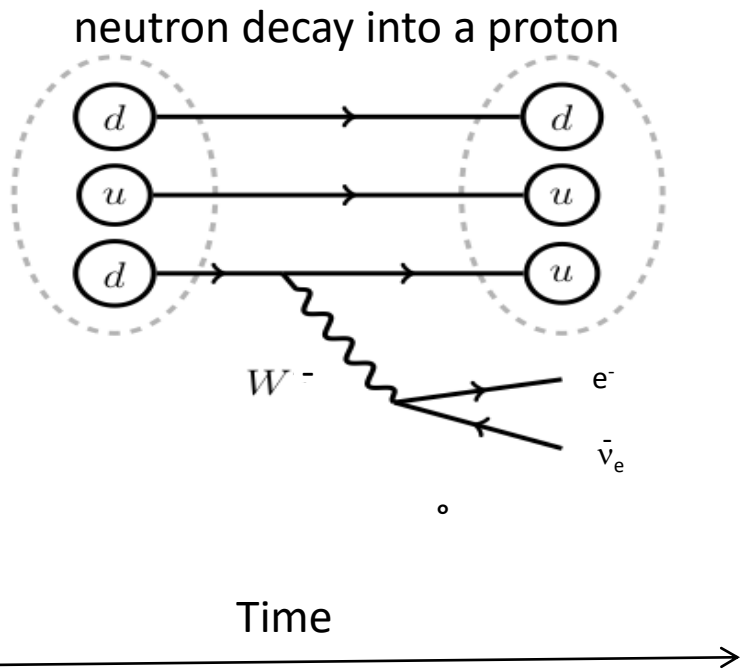
Particle Physics Q.A session

Q: About flavour and color related to quarks

Feynman diagrams for the Weak interaction

The diagrams are useful to calculate the interaction probability in one vertex

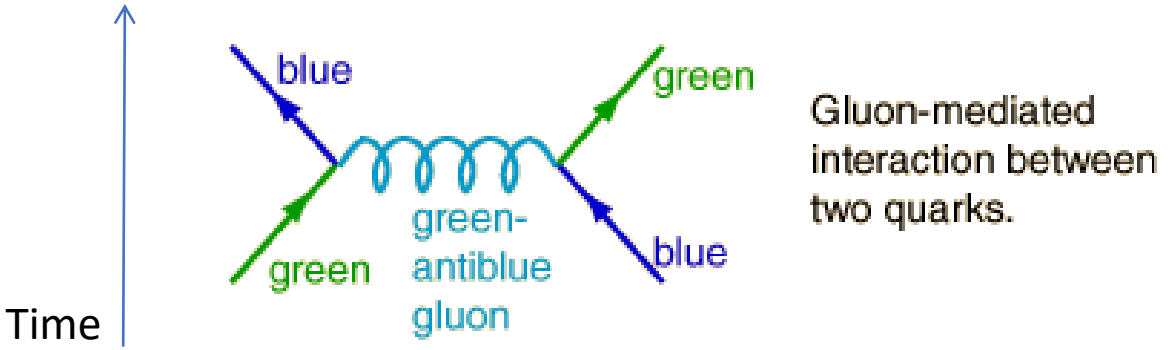
Weak interaction: n decay
W couples to:
Upper and lower members of a fermion generation.



Q: About flavour and color related to quarks

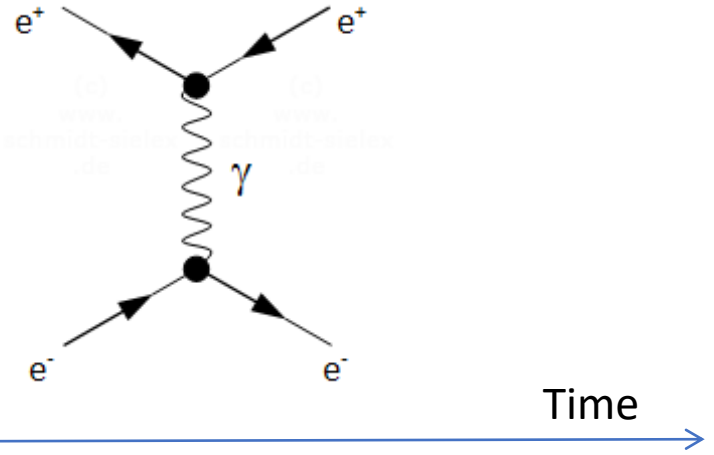
Feynman diagrams for the Strong and EM interactions

Strong interaction



Gluon-mediated interaction between two quarks.

Electromagnetic interaction



Q: on the Spin

a. A little more information about spin in quarks and what spin protons etc. have?

- The angular momentum of a particle is quantized in unit of h (Planck constant: $6.625\ 10^{-34}\ J \cdot s$);
- Spin **S** of an electron: is intended as "intrinsic" angular momentum (Uhlembeck-Goudsmit experiment 1926). A bound electron in the H atom has also an orbital angular momentum **L** , hence tis total angular momentum is the vectorial sum **J=S+L**.
- Spin **S** of a proton: the spins of the three valence quarks combine to get a value of 1/2 h (for the component along z axes). The orbital angular momentum L of the three quarks can be 0,1,2,… A proton in L=0 will have a total angular momentum **J**=1/2.

b. Are spin in electrons and protons connected, i.e., is it the same thing? See a) answers

c. Does spin have anything to do with proton excitation?

- No directly but the total angular moment J yes. For L=1,2,.. The 'excited' proton results in other particles with the same quark content!