The strength of an acid refers to its ability or tendency to lose a proton (H^+). A strong acid is one that completely ionizes (dissociates) in a solution; in other words, one mole of a strong acid HA **dissolves in water** yielding one mole of H^+ and one mole of the conjugate base, A^-. Essentially none of the non-ionized acid HA remains. Examples of strong acids are hydrochloric acid (HCl), hydroiodic acid (HI), hydrobromic acid (HBr), perchloric acid ($HClO_4$), nitric acid (HNO_3) and sulfuric acid (H_2SO_4). In water each of these essentially ionizes 100%.

Everything is right, but it's only about **water solution**. HF can't dissociate completely in water so it weak acid in water, but when solvent is changed the strength of acid can be changed to. The reaction between HF and water is next:

$$H_2O + HF = H_3O^+ + F^-$$

So water reacts here like base (accepts proton)

It is not secret that NH_3 is stronger base than water (1.0 M aqueous solution of NH_3 has a pH of 11.6) and it's directly connected with strength of acid in this solvent (especially when it's liquid).

$$NH_3 + HF = NH_4^+ + F^-$$

NH_3 reacts here like base too, but if it's more basic it accepts protons more and that's why HF dissociates more completely or even completely. This causes HF become strong acid in liquid NH_3