Constraint satisfaction problems

Factor graph - (aka Markov random field) a set of variables $X = X_1, \ldots, X_n$ where $X_i \in \text{Domain}_i$ and factors $f_1, \ldots, f_m$, with each $f_j(X) \geq 0$. Each factor is implemented as checking a solution rather than computing the solution.

Scope of a factor f_j - the set of variables f_j depends on. **Arity -** the size of this set. "Unary factors" (arity 1); "Binary factors" (arity 2). "Constraints" (factors that return 0 or 1).

Assignment weight - each assignment $x = (x_1, \ldots, x_n)$ yields a $\text{Weight}(x)$ defined as being the product of all factors f_j applied to that assignment. $\boxed{\text{Weight}(x) = \Pi_{j=q}^{m} f_j(x)}$ (x in its entirety is passed in to each f_j for simplicity of this notation, though in reality only a subset of x would be needed for f_j)

CSP - a factor graph where all factors are binary. $\boxed{\text{For } j = 1, \cdots, f_j(x) \in \{0, 1\}}$ (the constraint j with assignment x is said to be satisfied iff $f_j(x) = 1$.)

Consistent assignment x of a CSP - iff $\text{Weight}(x) = 1$ (i.e., all constrains are satisfied.)