

$$\left\{ \begin{array}{l} \text{Mod: } \boxed{\text{Sign}} \rightarrow \text{Cat}^{\text{op}} \xrightarrow{L-1} \text{Set}^{\text{op}} \\ \text{Sen: } \text{Sign} \rightarrow \text{Set} \xrightarrow{P} \text{Set}^{\text{op}} \end{array} \right.$$

$$\begin{array}{ccc} F_{\Sigma} & & \\ \Sigma & & \\ | \text{Mod}(\Sigma) | & \xrightarrow{F_{\Sigma}} & \text{Sen}(\Sigma) \\ \downarrow \varphi & & \downarrow \text{Sen}(\varphi) \\ \Sigma' & & \\ | \text{Mod}(\Sigma') | & \xrightarrow{F_{\Sigma'}} & \text{Sen}(\Sigma') \end{array}$$

$$\left(\begin{array}{c} \text{---} \\ \text{---} \end{array} \right) \text{Sign} \xrightarrow{| \text{Mod}(-) |} \text{Set}^{\text{op}} \xrightarrow{P(\text{Sen}(-))}$$

$$\frac{m' \models_{\Sigma'} \text{Sen}(\varphi)(s)}{\text{Mod}(\varphi)(m') \models_{\Sigma} s}$$

$$\begin{array}{ccc} | \text{Mod}(\Sigma) | & \xrightarrow{F_{\Sigma}} & P(\text{Sen}(\Sigma)) \\ \uparrow | \text{Mod}(\varphi) | & & \uparrow P(\text{Sen}(\varphi)) \\ | \text{Mod}(\Sigma') | & \xrightarrow{F_{\Sigma'}} & P(\text{Sen}(\Sigma')) \end{array}$$

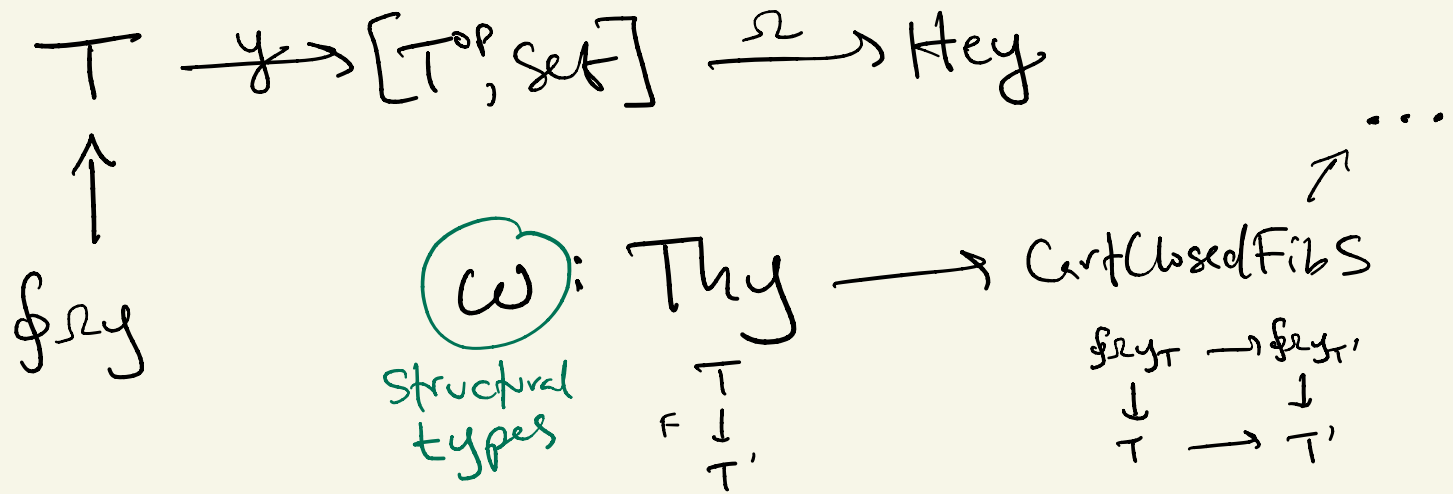
$$\mathbb{I}ns := \underline{obj} \left(\text{Sign}, \text{Mod}, \text{Sen}, \text{F} \right) *$$

$$\text{Room} := \underline{obj} \left(M, S, R : |M| \rightarrow P(S) \right)$$

$$\underline{mor} \left(\begin{array}{ccc} f \downarrow & g \downarrow & \downarrow \\ M', S', R' : |M'| \rightarrow P(S') \end{array} \right)$$

$$\oint [(-)^{\circ p}, \text{Room}] = \mathbb{I}ns \quad \underline{\underline{\text{2-category}}}$$

$$\text{Sign} \longmapsto (\text{Mod}, \text{Sen}, \text{F})$$



$$ML: \text{Thy} \longrightarrow (M, S, R)$$

power comes from axioms

LTL linear temporal logic (properties of systems)
automata generate languages \Rightarrow demand formulas,
then model-check

FOL first-order logic (specify systems)
ex. arrays

* people don't appreciate axioms.