# Lecture 4B

- (I) interpretation satisfies (S) sentence if: (S) makes (I) true
  - (I) models (S)
- Formula is satisfiable/consistent, if has model
- Formula = valid IF if ALL interpretations satisfy it
- Inconsistent means formula has no models
- Interpretation SATISFIES formula IF universal closure satisfied

- Entailment: Formula $\phi$ entailed by set of formulae $\Gamma$ (if)
  - every model of $\Gamma$ also a model of $\phi$:

"$\Gamma \rightarrow \phi$ is valid" $\Leftrightarrow$ $\Gamma \models \phi$

$\Gamma \cup \{\neg\phi\}$ = false.

  - i.e, adding negation shows NO models (:. makes it INconsistent
    - This is how $\phi$ is VALID

- How do we REASON in FOL?
  - Forward chaining: generate consequences #Datalog
  - Backward reduction: subgoal reduction #Prolog

- $\dfrac{A \rightarrow B \quad A}{B}$ : Modus Ponens #FundamentalFOL

- $\dfrac{A \to B \quad C \vee D}{B \vee D}$ $(\neg A \vee C)\theta$ must be valid as $A$ and $C$ unify

- literal = atom $\vee \neg$ atom
  clause = disjunction of literals $\vee$ disj $\vee$ disj $\vee \ldots \vee \ldots$
  - $(c_1 \wedge c_2 \wedge \ldots \wedge c_n) \to (d_1 \vee d_2 \vee \ldots \vee d_n)$