\[ V(x,y) = x \text{ has visited } y \]
\[ \forall x(\sim \ldots) \]
\[ \sim \exists \ldots \]

<table>
<thead>
<tr>
<th>CD</th>
<th>BHT</th>
<th>NYC</th>
<th>Seattle</th>
<th>SF</th>
<th>AH</th>
<th>Den</th>
</tr>
</thead>
<tbody>
<tr>
<td>(x)</td>
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</tr>
</tbody>
</table>

\(\times\) means $CS(x)$ is $T$  
underline\(\times\) means $WC(y)$ is $T$

\[ \forall x \in P, \quad V(x, \text{Baltimore}) \]
\[ x \text{ has been to Baltimore} \]
\[ V(x, \text{Baltimore}) \quad T \quad V(x, \text{Balt}) \quad T \quad \text{for CD} \]
\[ T \quad \text{for DO} \]

\[ \forall x \in P, \quad V(x, \text{NYC}) \quad T \quad \text{for DO} \quad \text{counterexample: } DW \text{ or } MH \]
\[ V(x, \text{NYC}) \quad \text{both make } V(x, \text{NYC}) \quad \text{false} \]
$\exists x \in P, \text{\overline{V}(x, \text{Denver})}$
Someone has been to Denver

$\neg \exists x \in P, \text{\overline{V}(x, \text{Denver})}$
No one has been to Denver

$\forall x \in P, \text{\overline{V}(x, \text{Denver})}$
Everyone who has been to Denver has been to Atlanta.

$\forall x \in P, \text{\overline{V}(x, \text{Seattle})} \rightarrow \text{\overline{V}(x, \text{Atlanta})}$

universal conditional $\forall x \in D, \text{\overline{V}(x)} \rightarrow \text{\overline{C}(x)}$

$T$ exactly for the things you're talking about

All CS majors have been somewhere on the west coast.

$\forall x \in P, \text{\overline{C}(x)} \rightarrow \exists y \in C \text{ s.t. } \text{\overline{V}(x, y)}$

$x$ has been somewhere on the west coast
there is some $y$ in $C$ such $x$ has been to

$F$: counterexample $x = \text{JS}$ makes quantified predicate $C$: $\text{\overline{C}(	ext{JS})}$ is $T$ but $\exists y \in C \text{ s.t. } \text{\overline{V}(\text{JS}, y)} \text{ is } F$
Everyone who has been to the west coast is a CS major.

$\forall x \in P, \left( \exists y \in C \text{ s.t. } wc(y) \land v(x, y) \right) \implies cs(x)$

T exactly for $x$ who had been to west coast

F counterexample $CD$: $\exists y \in C \text{ s.t. } wc(y) \land v(cd, y)$ is $T$ (example $y = Sea$

$wc(Sea)$ is $T$ and $v(cd, Sea)$ is $T$

but $cs(cd)$ is $F$

Negation: $\neg \forall x \in P, \left( \exists y \in C \text{ s.t. } wc(y) \land v(x, y) \right) \implies cs(x)$

$\exists x \in P \text{ s.t. } \neg \left( \left( \exists y \in C \text{ s.t. } wc(y) \land v(x, y) \right) \implies cs(x) \right)$

$\exists x \in P \text{ s.t. } \left( \exists y \in C \text{ s.t. } wc(y) \land v(x, y) \right) \land \neg cs(x)$

T example $x = cd$
Everyone is loved by someone. \( L(\alpha, \beta) = \alpha \text{ loves } \beta \)

\( \forall x \exists y \text{ s.t. } L(y, x) \quad T \) if domain for \( b \) = resident \( a \) = living people

\( \exists y \text{ s.t. } \forall x \ L(y, x) \quad F \) (I think)

Universal Instantiation: \( \forall x \in D, \quad P(x) \)
\( a \in D \quad \therefore P(a) \)

Universal Modus Ponens: \( \forall x \in D, \quad P(x) \implies Q(x) \)
\( P(a) \quad \therefore Q(a) \)