1. [Start of transcript. Skip to the end.](https://courses.edx.org/xblock/block-v1:ColumbiaX+CSMM.101x+3T2020+type@vertical+block@48f43b7ec27f4dfa946090f109d6a600?show_title=0&show_bookmark_button=0#transcript-end-f41bb0bc84bd40ca8fc0bc63a2f51c32)
2. Let's now summarize what we saw about propositional logic
3. in AI.
4. Propositional logic is a formal language
5. to describe the world around us, that can
6. help an agent model the world.
7. Sentences in propositional logic have a specific syntax,
8. with symbols and connectives that
9. can form logical sentences.
10. Symbols or terms can be either true or false, or unknown.
11. Logical connectives are the implication,
12. the conjunction, disjunction, negation, double implication.
13. And we actually like to use connectives to build
14. more complex sentences.
15. It's important to know that syntax and semantics represent
16. two important and distinct aspects in propositional logic.
17. And we have seen the relationship between the two.
18. Semantic represents the configurations,
19. or the instantiations of the word with truth values.
20. We saw a very popular world of inference called Modus Ponens,
21. that actually derives new knowledge based on existing
22. knowledge, such as we have P1,Pn true.
23. And the conjunction of P1,Pn, implies q, then we can infer q.
24. This is by what we call Modus Ponens, Modus Ponens.
25. Modus Ponens deals sometimes with horn clauses
26. when we have the restrictions of the form of the clauses
27. that are in the knowledge base.
28. Horn clauses are logical propositions of the form
29. P1nP2, Pn implies q.
30. We want some inference algorithm that
31. is both sound and complete.
32. Sound is when we want to infer only true formulas, and ideally
33. complete, and we want to find all true formulas, and also,
34. specifically the bridge between the two.
35. The inference in propositional logic with horn clauses
36. is sound and complete, and actually
37. so is the resolution rule that we use to do inference.
38. So propositional logic sounds like a powerful paradigm
39. to represent knowledge about the world in AI.
40. However, it has limits.
41. First of all, propositional logic
42. is not expressive enough to describe the world around us,
43. including information about objects
44. and the relationship between objects.
45. It doesn't, for example, express also time.
46. Also propositional logic is not compact.
47. In other words, if you want to express
48. that there was a pit in all the rooms in the cave,
49. we have to write that there is a pit in 1,1, or a pit in 1,2,
50. et cetera, until a pit in 4,4.
51. And you could imagine if you have 10
52. by 10 rooms in the cave, then we have
53. to do write 100 symbols to represent that.
54. So PL is not compact enough.
55. It can't express a fact of a set of objects
56. without enumerating all of them, which
57. is sometimes very tedious, and sometimes impossible.
58. So maybe you are tired for example the Wumpus.
59. I'm going to pick another example, which
60. is the vacuum cleaner.
61. Suppose we have a Roomba to clean a 10
62. by 10 square in the classroom, and you
63. want to use propositional logic to express information
64. about the squares.
65. But to express that a square is clean,
66. we're going to use the proposition
67. square one is clean to express that the first square is clean.
68. How can you write that in a less heavy way?
69. We're good to express that all the squares in the room
70. are clean as follows square one is clean,
71. and square two is clean, and square 100 is clean.
72. So that's a little heavy.
73. We have 100 terms, the conjunction of 100 terms.
74. Now how can we express that some squares in the room are clean?
75. We're going to put a disjunction.
76. Either square one is clean, or square two is clean,
77. or square 100 is clean.
78. We can also, for example, express that some squares
79. have a chair on challenge them.
80. In other words, square one has a chair,
81. or square two has a chair, or--
82. so, it's going to become really heavy to express information
83. about all the possible components in the world.