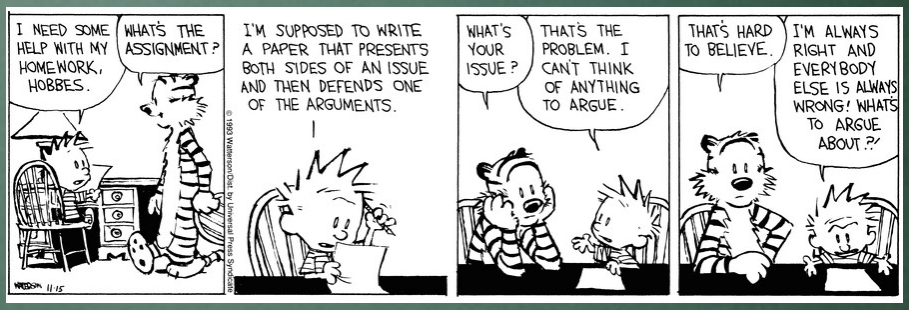
Argumentation
Lecture 1.2



CS 230: Ethical Issues in Computing

Fall 2020

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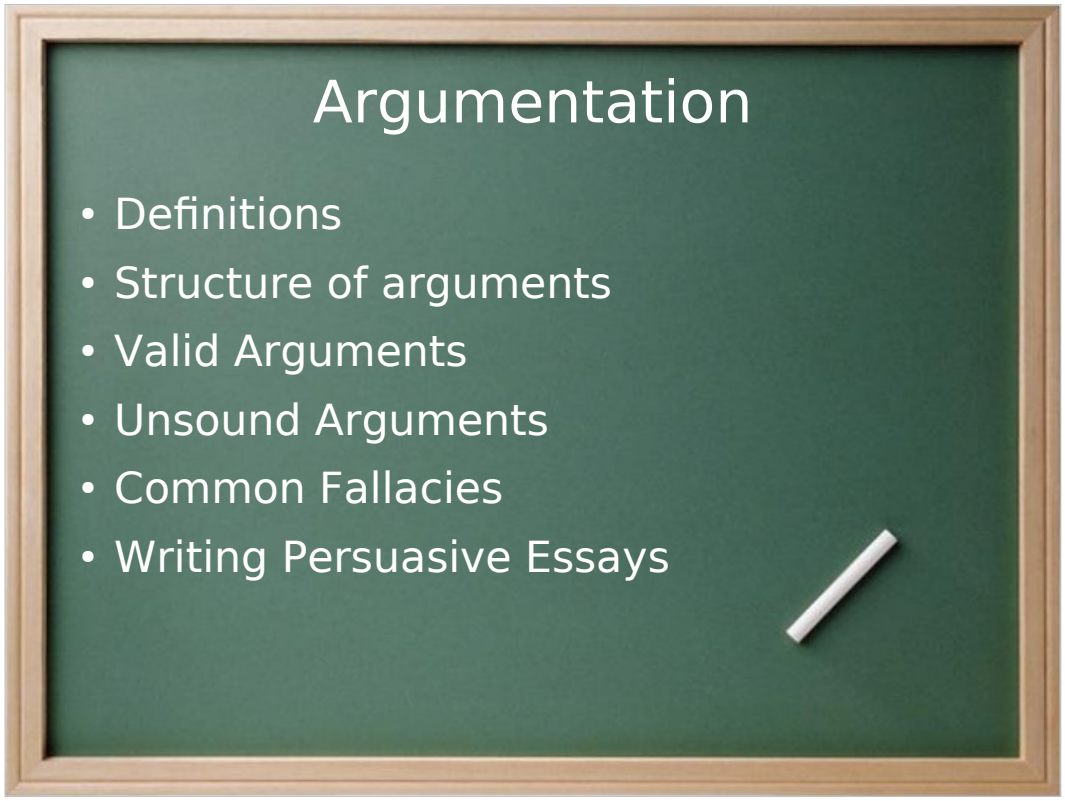
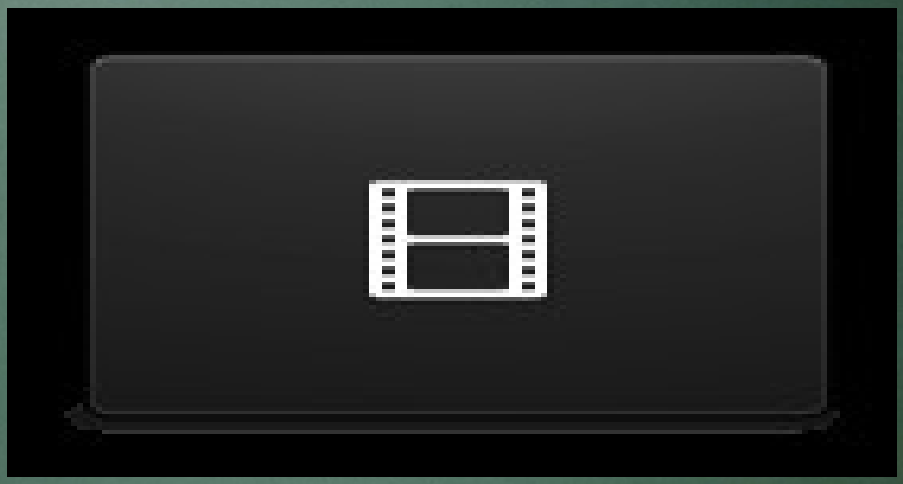

Argumentation
• Definitions
• Structure of arguments
• Valid Arguments
• Unsound Arguments
• Common Fallacies
• Writing Persuasive Essays

Definitions

- **Proposition**: the meaning of a statement
- **Premises**: the propositions leading to the conclusion
- **Conclusion**: the proposition supported by the premises
- **Warrant**: justifies the conclusion from the premises
- **Backing**: justifies the warrant
- **Argument**: a connected series of statements intended to establish a proposition

Argument Clinic



Structure of Arguments

- Propositional Variables: P, Q, R
- If P then Q

P	Q	If P then Q
T	T	T
T	**F**	**F**
F	T/F	T

- If not Q then not P

not Q	not P	If not Q then not P
F	F/T	T
T	**F**	**F**
T	T	T

Structure of Arguments

Algebra Analogy:

$x + 4 = y$

Structure of Arguments

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$x + 4 = y \quad \therefore x = y - 4$

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“argument” is valid: conclusion follows from premise

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$x + 4 = y \qquad \therefore x = y - 4$

"argument" is valid: conclusion follows from premise

$x + 4 = y \qquad \therefore x = y + 8$

Structure of Arguments

Algebra Analogy:

$x + 4 = y \quad \therefore x = y - 4$

"argument" is **valid**: conclusion follows from premise

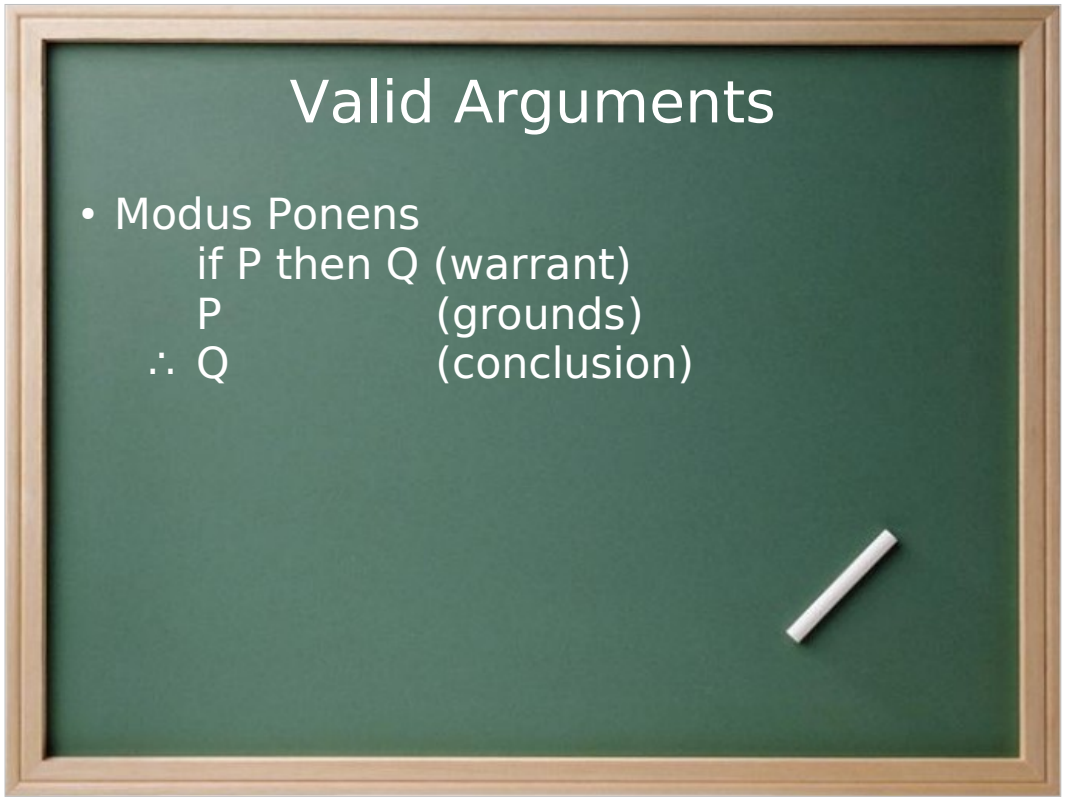
$x + 4 = y \quad \therefore x = y + 8$

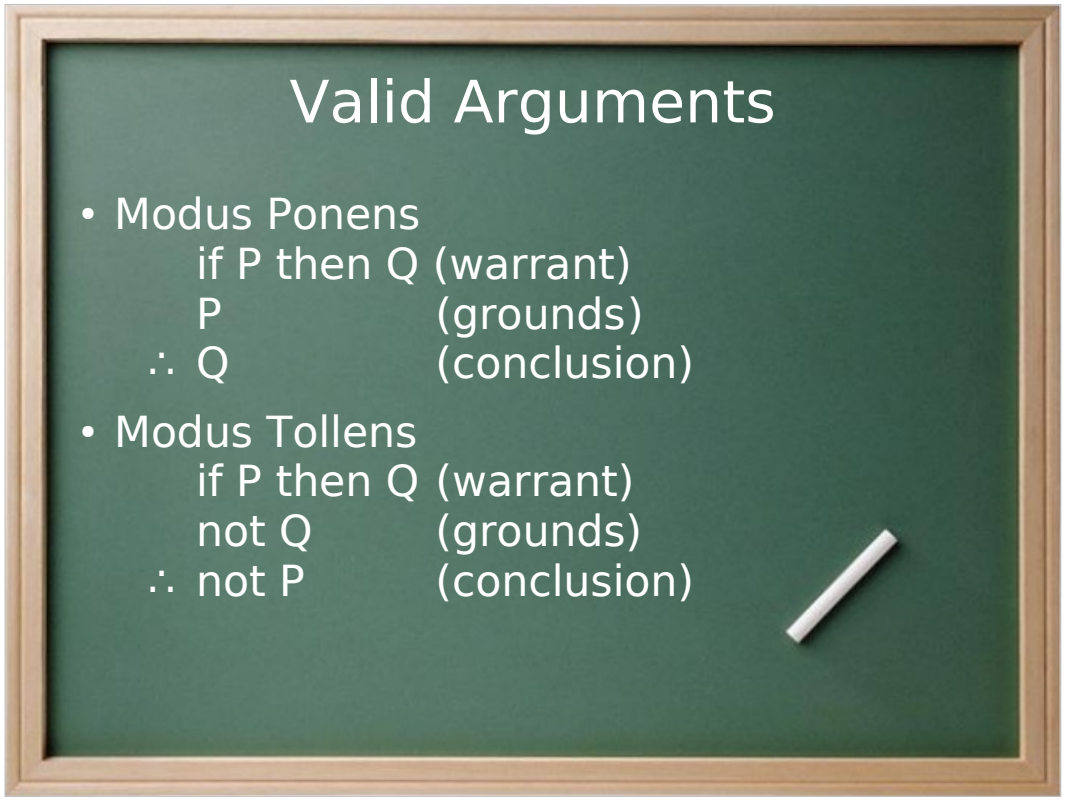
"argument" is **invalid**: there are no values for x and y to make this true

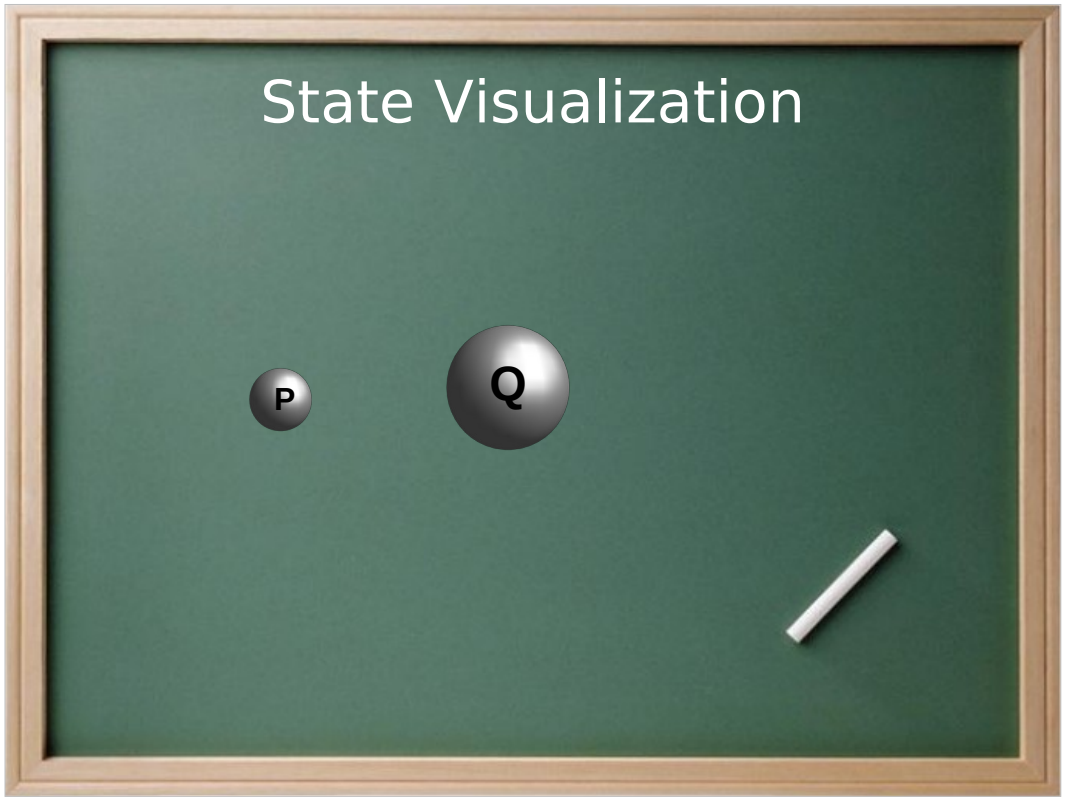
Valid Arguments

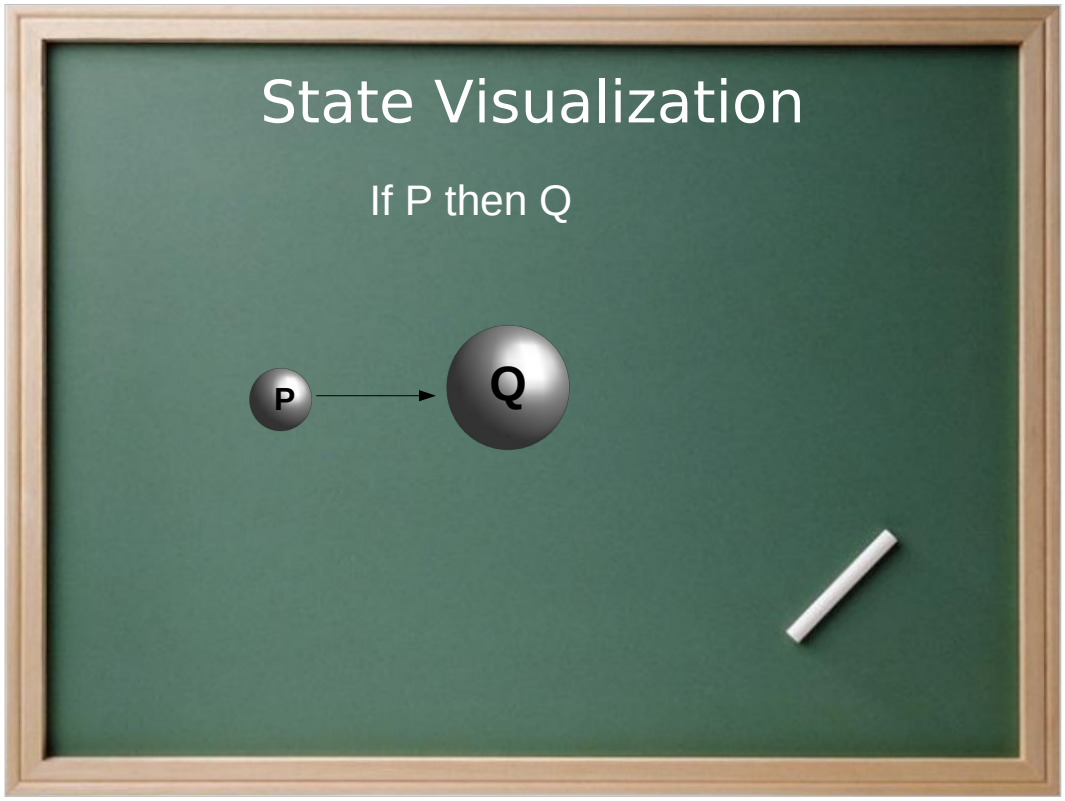
- Modus Ponens

  if P then Q (warrant)
  P (grounds)
  ∴ Q (conclusion)




Valid Arguments
• Modus Ponens
if P then Q (warrant)
P (grounds)
∴ Q (conclusion)
• Modus Tollens
if P then Q (warrant)
not Q (grounds)
∴ not P (conclusion)

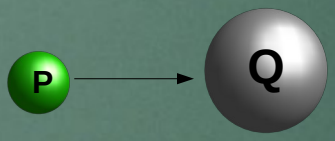

State Visualization
P
Q

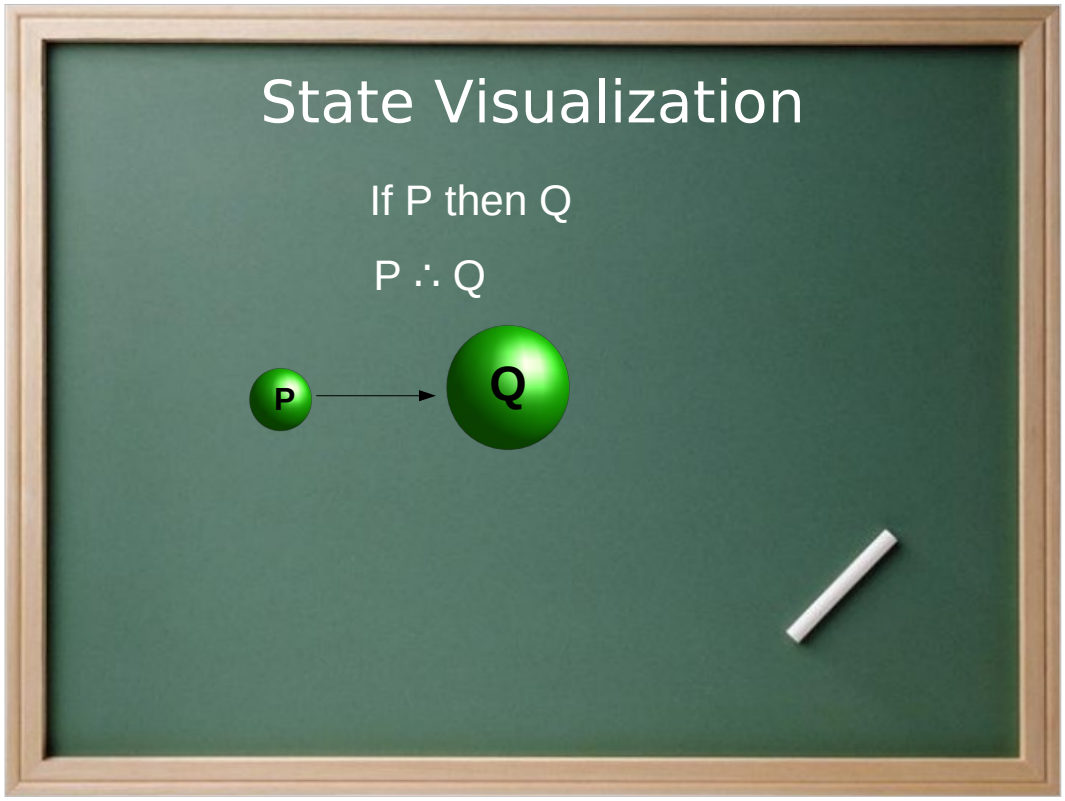

State Visualization
If P then Q
P
Q

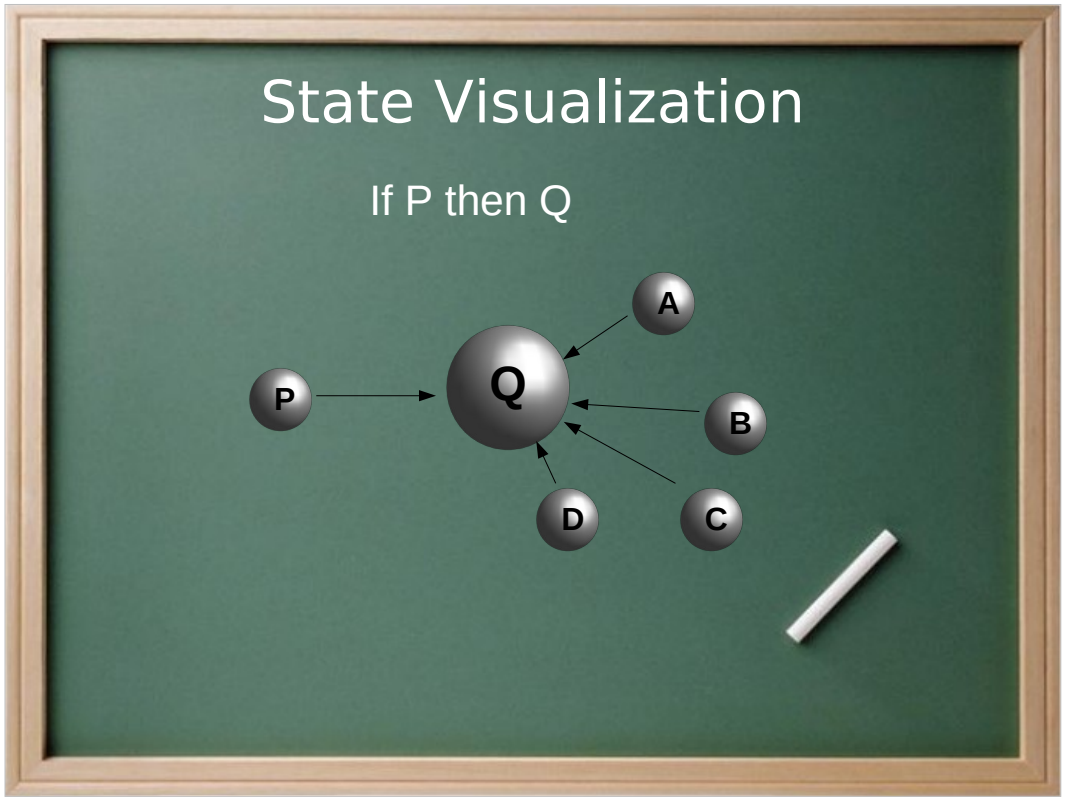
State Visualization

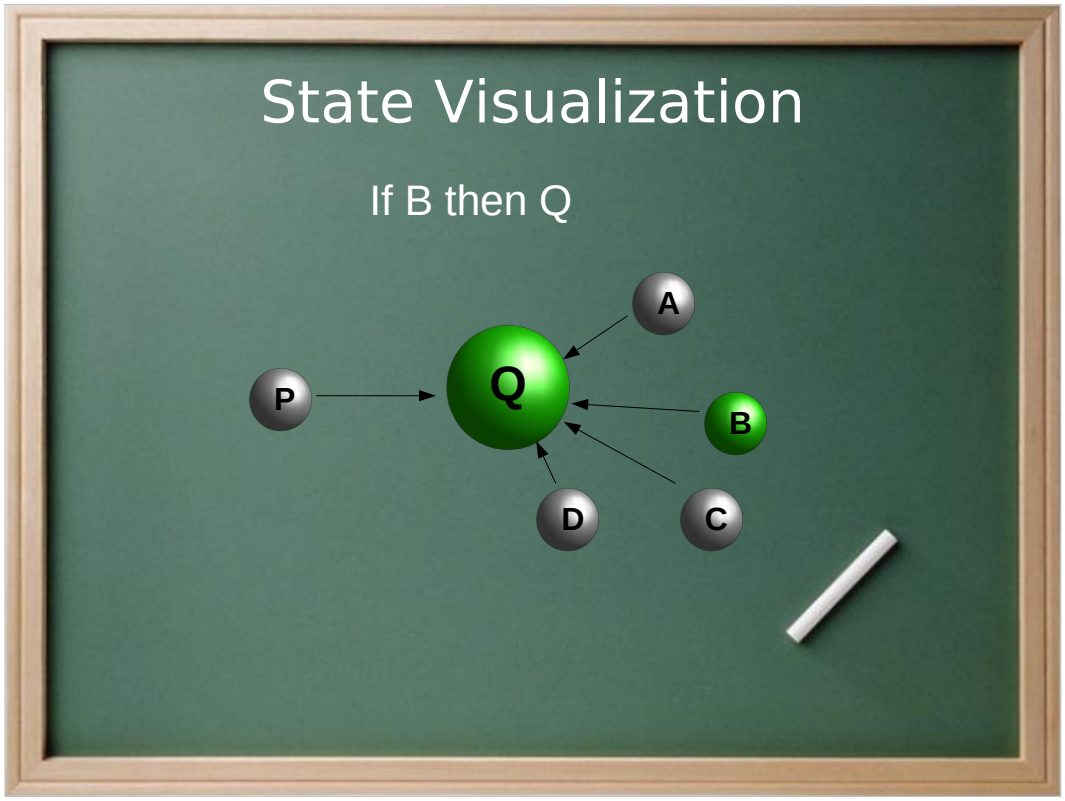
If P then Q

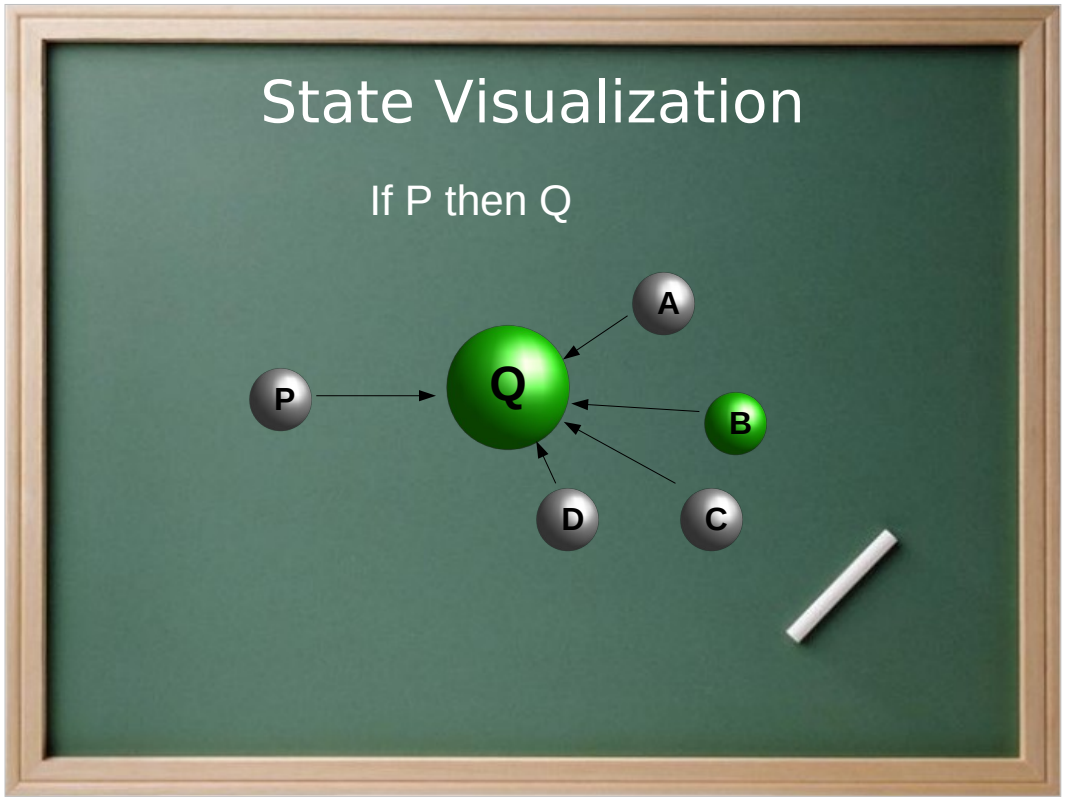
P

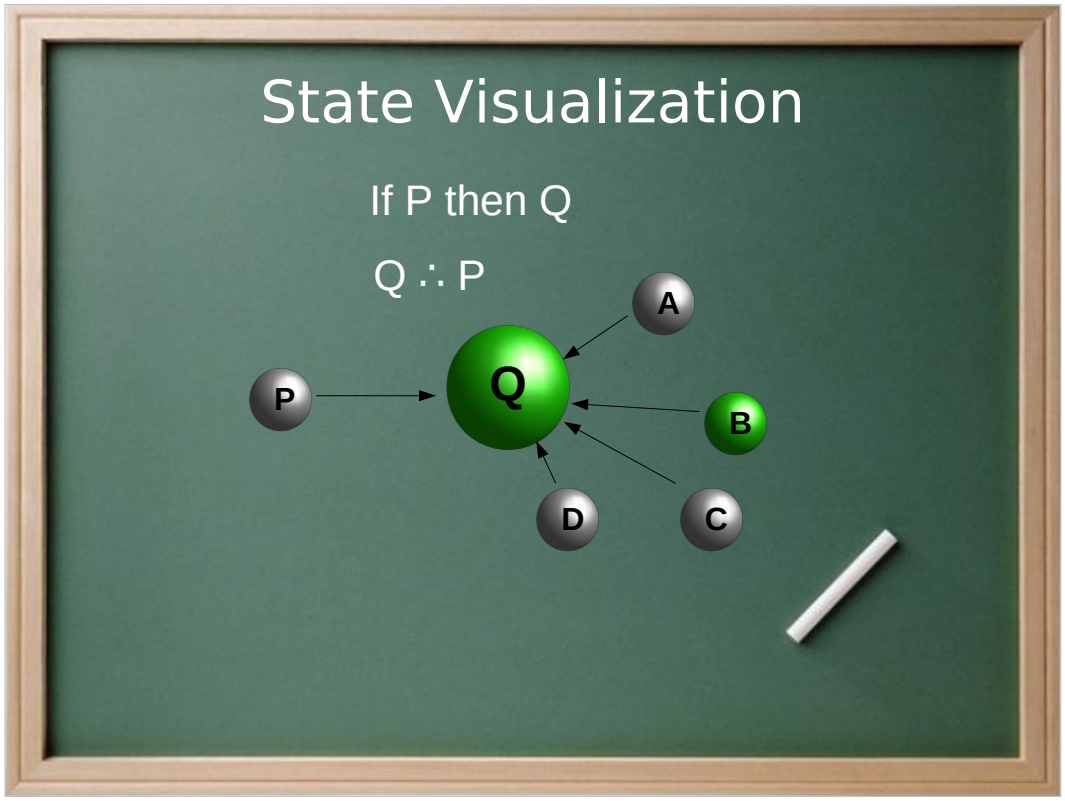


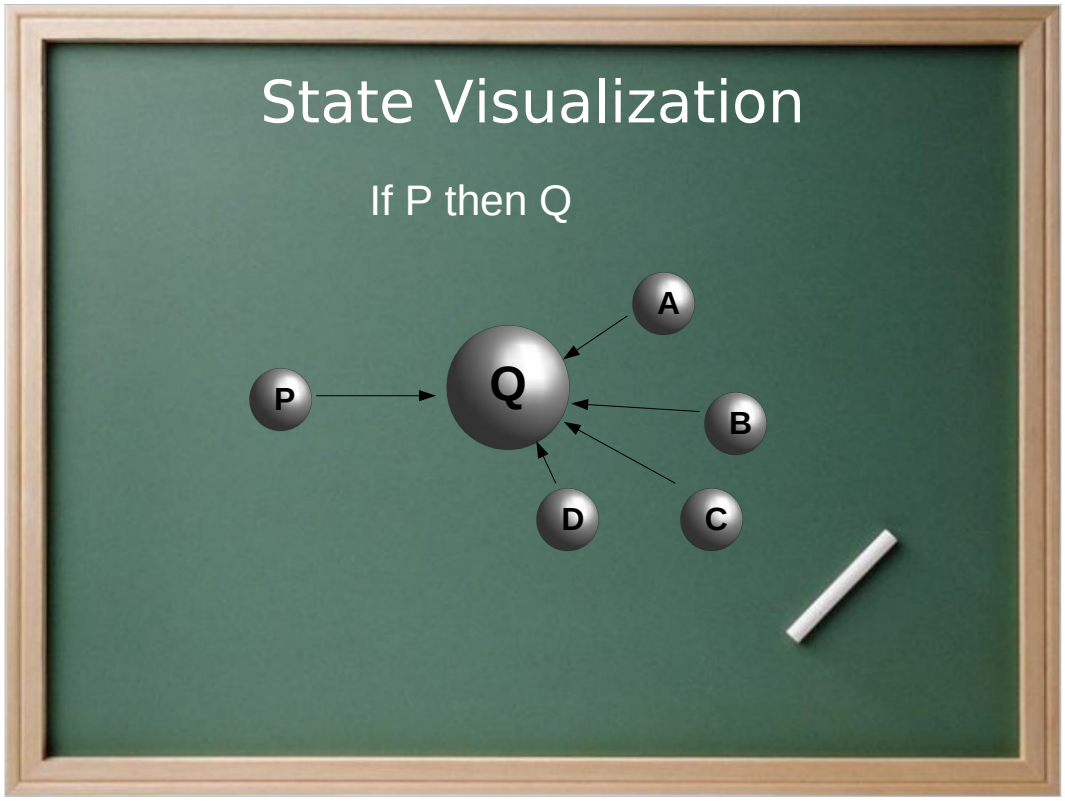

State Visualization
If P then Q
P ∴ Q
P
Q

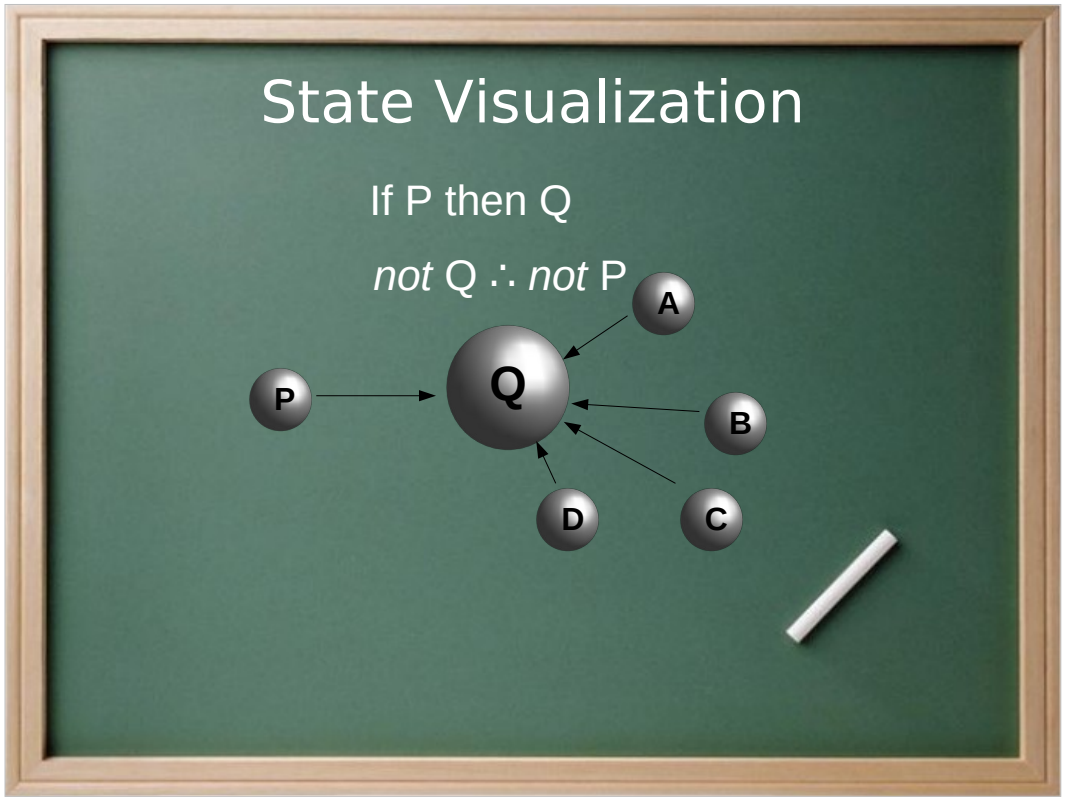

State Visualization
If P then Q
A
P
Q
B
D
C


State Visualization
If B then Q
A
P
Q
B
D
C


State Visualization
If P then Q
A
P
Q
B
D
C


State Visualization
If P then Q
Q ∴ P
A
P
Q
B
D
C


State Visualization
If P then Q
A
P
Q
B
D
C


State Visualization
If P then Q
not Q ∴ *not* P
A
P
Q
B
D
C

Valid Arguments

- Process of Elimination

  P or Q (warrant)
  not P (grounds)
  ∴ Q (conclusion)

- Chain Rule

  if P then Q (warrant)
  if Q then R (warrant)
  P (grounds)
  ∴ R (conclusion)

Unsound Arguments

- Valid arguments with a false premise
- Example:

  if P then Q
  P (assertion of P is incorrect)
  ∴ Q

if current month is July then it's summer

current month is July (false)

it's summer (unsound)

Unsound Arguments

- Example:
  if P then Q (premise is incorrect)
  P
  ∴ Q

  if pigs have snouts then pigs can fly

  pigs have snouts

  pigs can fly (unsound)

Unsound Arguments

Algebra Analogy:

$x + 4 = y \qquad \therefore x = y - 4$

“argument” is valid, i.e. values for x and y where the equations hold true

Unsound Arguments

Algebra Analogy:

$x + 4 = y \qquad \therefore x = y - 4$

"argument" is **valid**, i.e. values for x and y where the equations hold true

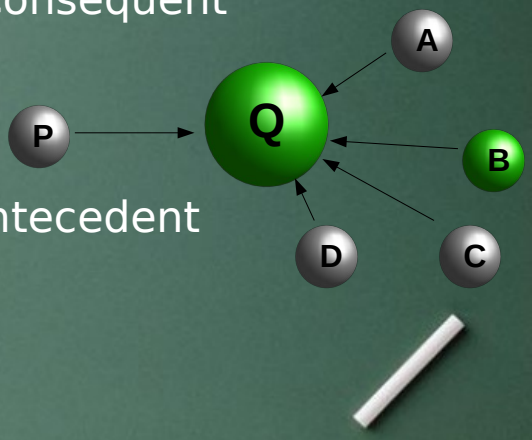
Let $x = 2$ and $y = 4$

"argument" is still **valid** but

for these "facts" it is **unsound**

Common Fallacies

- Affirming the Consequent
  If P then Q
  Q
  ∴ P
- Denying the Antecedent
  If P then Q
  not P
  ∴ not Q



Common Fallacies

- Begging the Question
  P
  ∴ P
- Slippery Slope
  - If you give a mouse a cookie …
- Bandwagon Fallacy
  - Fifty million Frenchmen can’t be wrong …
- Faulty Generalization
  - That first problem set was easy – this class is going to be a breeze!

Common Fallacies

- Division Fallacy
  - You're from Idaho? You must like potatoes
- Equivocation
  - Fine for parking here

Unfair Debating Gambits

- Red Herring
  - Whatabout ...
- Ad Hominen
  - What do you know about morality, you haven’t even taken CS 230!
- Straw Man
  - Teenager: I cleaned my room last month! Why do you want me to clean it all the time?!

Writing Persuasive Essays

- Think carefully about your thesis
- Introduction
  - Present the topic
  - Explain the relevance
  - State the conclusion
- Grounds
- Warrants with backing
- Qualifiers to the conclusion
- Rebut opposing arguments
- Repeat the conclusion