Intelligent Systems (AI-2)

Computer Science cpsc422, Lecture 1

Sept, 9, 2015

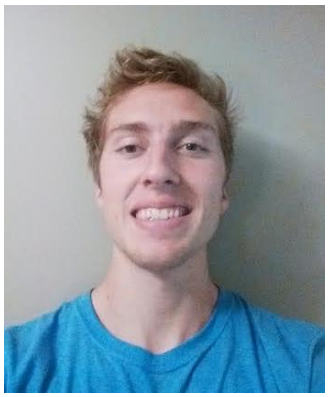
People

Instructor

- **Giuseppe Carenini** (carenini@cs.ubc.ca; office CICSR 105)

Natural Language Processing, Summarization, Preference Elicitation, Explanation, Adaptive Visualization, Intelligent Interfaces……

Office hour: my office, Mon 10-11



Teaching Assistant

Ted Grover tg.cpsc422.ta@gmail.com
Office hour: ICCS X237, for Wed 10-11

Enamul Hoque Prince enamul.hoque.prince@gmail.com
Office hour: ICCS X237, for Fri 10-11

Your UBC-AI Background

I took 322 Spring-15

A. *yes* B. *no*

I took Machine Learning (340)

A. *yes* B. *no*

Course Essentials(1)

- **Course web-pages:**

  www.cs.ubc.ca/~carenini/TEACHING/CPSC422-15-2/index.html

  - This is where most information about the course will be posted, most handouts (e.g., slides) will be distributed, etc.
  - CHECK IT OFTEN! (draft already available)

- **Lectures**:
  - Cover basic notions and concepts known to be hard
  - I will try to post the slides in advance (by 8:30).
  - After class, I will post the same slides inked with the notes I have added in class.
  - Each lecture will end with a set of learning goals:

  Student can….

Course Essentials(2)

Textbook: Selected Chapters from

- **Artificial Intelligence**, 2nd Edition, by Poole, Mackworth. http://people.cs.ubc.ca/~poole/aibook/

Reference (if you want to buy a book in AI this is the one!)

- **Artificial Intelligence: A Modern Approach,** 3rd edition, by Russell and Norvig [book webpage on course webpage]

More readings on course webpage…..

Course Essentials(3)

Connect

piazza

- **Connect OR Piazza :** discussion board
  - Use the discussion board for questions about assignments, material covered in lecture, etc. That way others can learn from your questions and comments!
  - Use email for private questions (e.g., grade inquiries or health problems).

- **AIspace** : online tools for learning Artificial Intelligence http://aispace.org/
  - Under development here at UBC!

Course Elements

- **Practice Exercises:** 0%
- **Assignments:** 15%
- *Research Paper Questions & Summaries 10%*
- **Midterm:** 30%
- **Final:** 45%
- **Clickers** 3% bonus (1% participation + 2% correct answers)

If your final grade is >= 20% higher than your midterm grade:

- Midterm: 15% ⬇
- Final: 60% ⬆

Assignments

- **There will be five assignments in total**
  - Counting “assignment zero”, which you’ll get today (as a Google Form)
  - They will not necessarily be weighted equally

- **Group work** (same as 322)
  - code questions:
    - ✓ you can work with a partner
    - ✓ always hand in **your own piece of code** (stating who your partner was)
  - written questions:
    - ✓ you may discuss questions with other students
    - ✓ you may not look at or copy each other's written work
    - ✓ You may be asked to sign an honour code saying you've followed these rules

Assignments: Late Days (same as 322)

- **Hand in by 9AM on due day** (in class or on Connect)
- **You get four late days** ☺
  - to allow you the flexibility to manage unexpected issues
  - additional late days will not be granted except under truly exceptional circumstances
- **A day is defined as:** all or part of a 24-hour block of time beginning at 9 AM on the day an assignment is due
- Applicable to assignments 1- 4 not **applicable to assignment 0**, **midterm, final** !
- if you've used up all your late days, **you lose 20% per day**

Missing Assignments / Midterm / Final

Hopefully late days will cover almost all the reasons you'll be late in submitting assignments.

- However, something more serious like an extended illness may occur ☹

- **For all such cases:** you'll need to provide a note from your doctor, psychiatrist, academic advisor, etc.
- **If you miss:**
  - **an assignment,** your score will be reweighted to exclude that assignment
  - **the midterm,** those grades will be shifted to the final.
  - **the final,** you'll have to write a make-up final as soon as possible.

How to Get Help?

- Use the course **discussion board** for questions on course material (so keep reading from it !)
- If you answer a challenging question you'll get bonus points! ☺

- Go to **office hours** (newsgroup is NOT a good substitute for this) – times will be finalized next week
  - **Giuseppe:** Mon 10-11 (CICSR #105)
  - **Ted:** Wed 10-11 (X237)
  - **Enamul:** Fri 10-11 (X237)

  Can schedule by appointment if you can document a conflict with the official office hours

Getting Help from Other Students? From the Web? (Plagiarism)

- **It is OK to talk with your classmates about assignments; learning from each other is good**
- **But you must:**
  - Not copy from others (with or without the consent of the authors)
  - Write/present your work completely on your own (code questions exception)

- **If you use external source (e.g., Web)** in the assignments. Report this.

e.g., "bla bla bla….." [wikipedia]

Getting Help from Other Sources? (Plagiarism)

When you are in doubt whether the line is crossed:

- Talk to me or the TA's
- See **UBC official regulations** on what constitutes plagiarism (pointer in course Web-page)
- Ignorance of the rules will not be a sufficient excuse for breaking them

Any unjustified cases will be **severely dealt with** **by the Dean's Office** (that's the official procedure)

- My advice: better to skip an assignment than to have "academic misconduct" recorded on your transcript and additional penalties as serious as expulsion from the university!

Clickers - Cheating

- **Use of another person's clicker**
- **Having someone use your clicker**

is considered **cheating** with the same policies applying as would be the case for turning in illicit written work.

To Summarize

- All the course logistics are described in the course Webpage

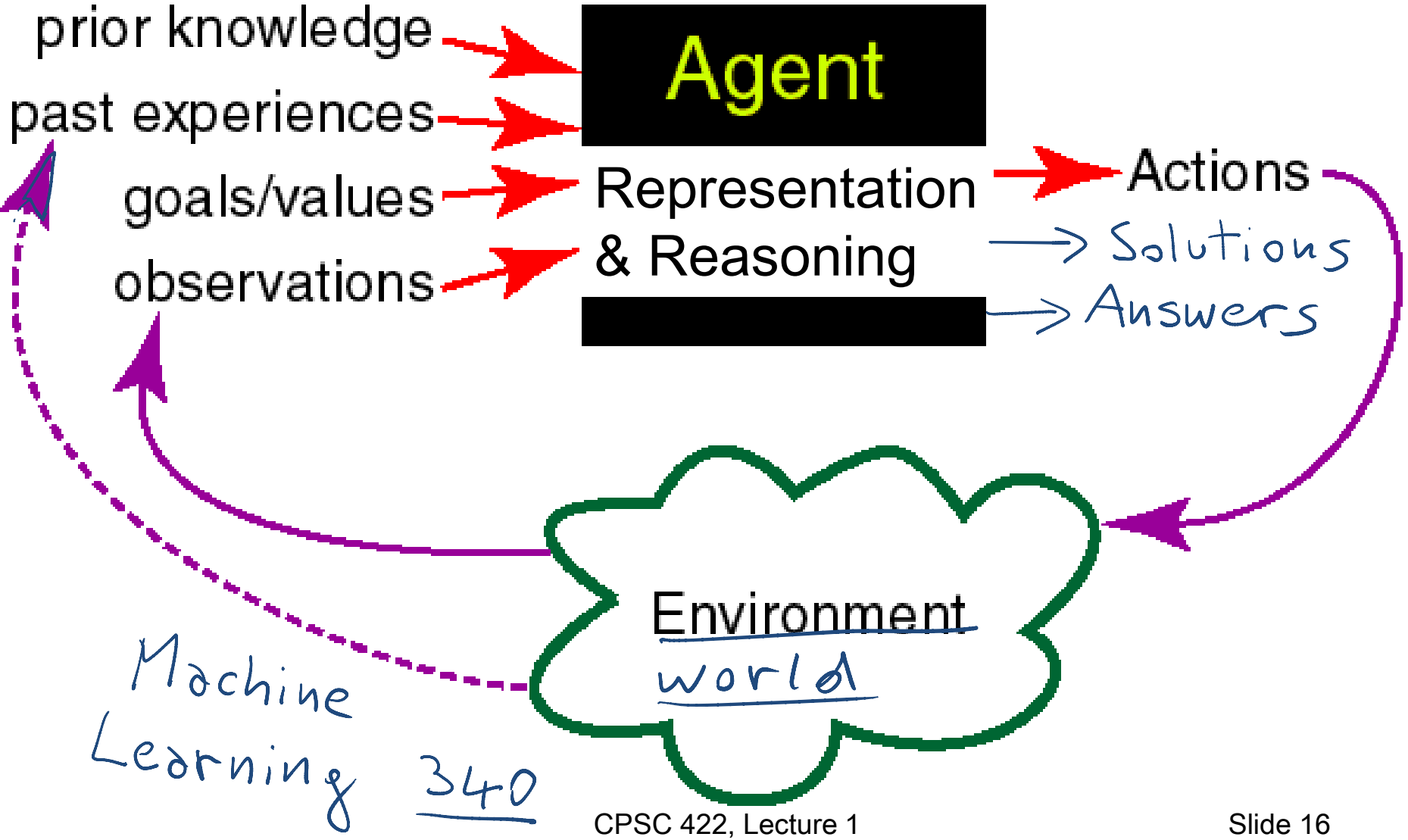
www.cs.ubc.ca/~carenini/TEACHING/CPSC422-15-2/index.html

Or WebSearch: Giuseppe Carenini

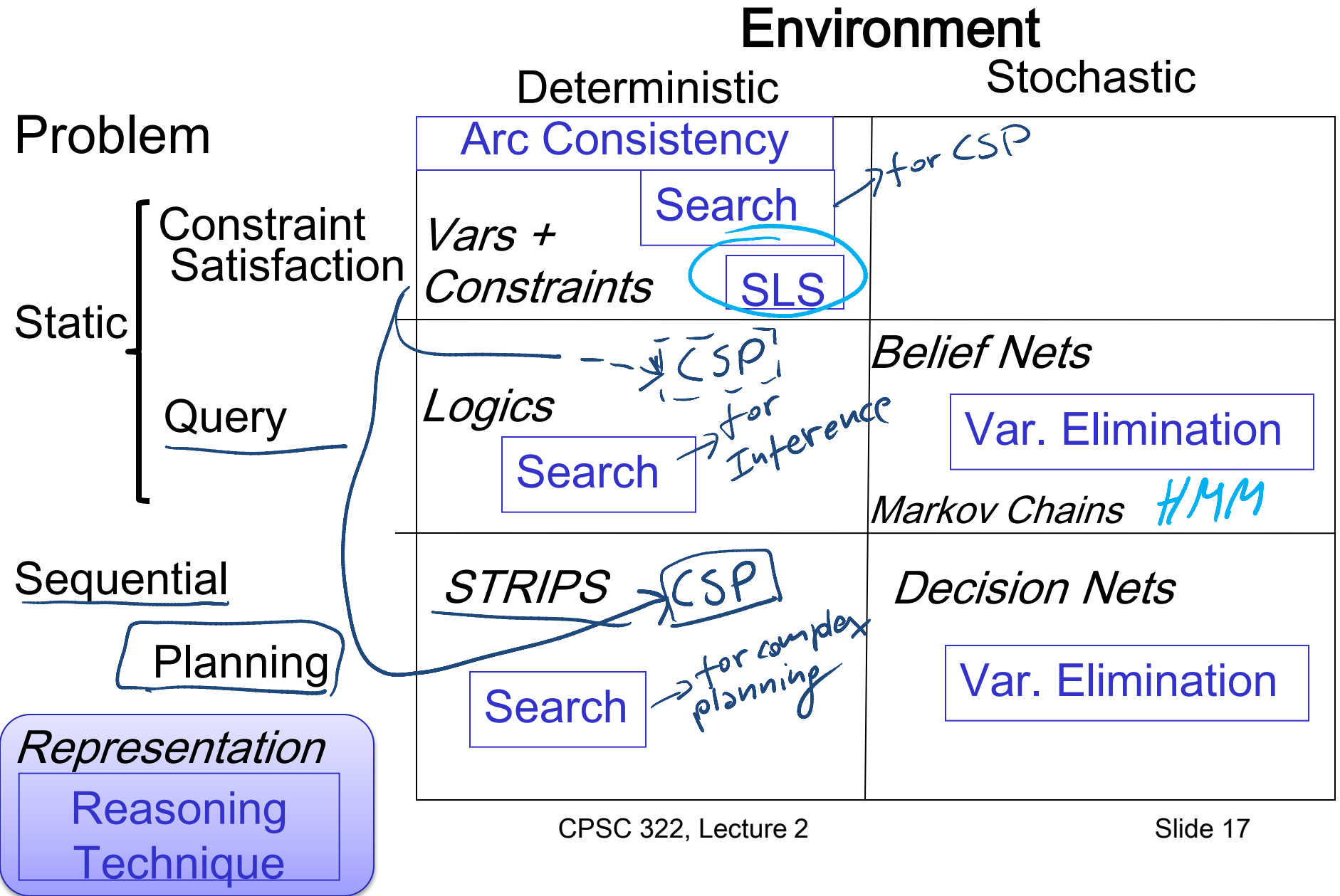
(And summarized in these slides)

- Make sure you carefully read and understand them!

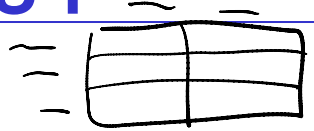
Agents acting in an environment



Cpsc 322 Big Picture



322 big picture



Machine Learning
Knowledge Acquisition
Preference Elicitation

	Deterministic	Stochastic
Query	*Logics* *First Order Logics* *Description Logics/ Ontologies* *Temporal rep.* • Full Resolution • SAT → SLS	*Belief Nets* More sophisticated reasoning *Markov Chains and HMMs* *Undirected Graphical Models* *Conditional Random Fields*
Planning	*Hierarchical Task Networks* *Partial Order Planning*	*Markov Decision Processes and Partially Observable MDP* • Value Iteration • Approx. Inference *Reinforcement Learning*

Where are the components of our representations coming from?

The probabilities?
The utilities?
The logical formulas?

From people and from data!

Applications of AI

Representation
Reasoning Technique

Datalog vs PDCL (better with colors)

First Order Logic

$\forall X \exists Y p(X,Y) \leftrightarrow \neg q(Y)$

$p(a_1, a_2)$

$-q(a_5)$

Propositional Logic

$\neg(p \vee q) \rightarrow (r \wedge s \wedge f)$,

p, r

Datalog

$p(X) \leftarrow q(X) \wedge r(X,Y)$

$r(X,Y) \leftarrow s(Y)$

$s(a_1)$, $q(a_2)$

PDCL

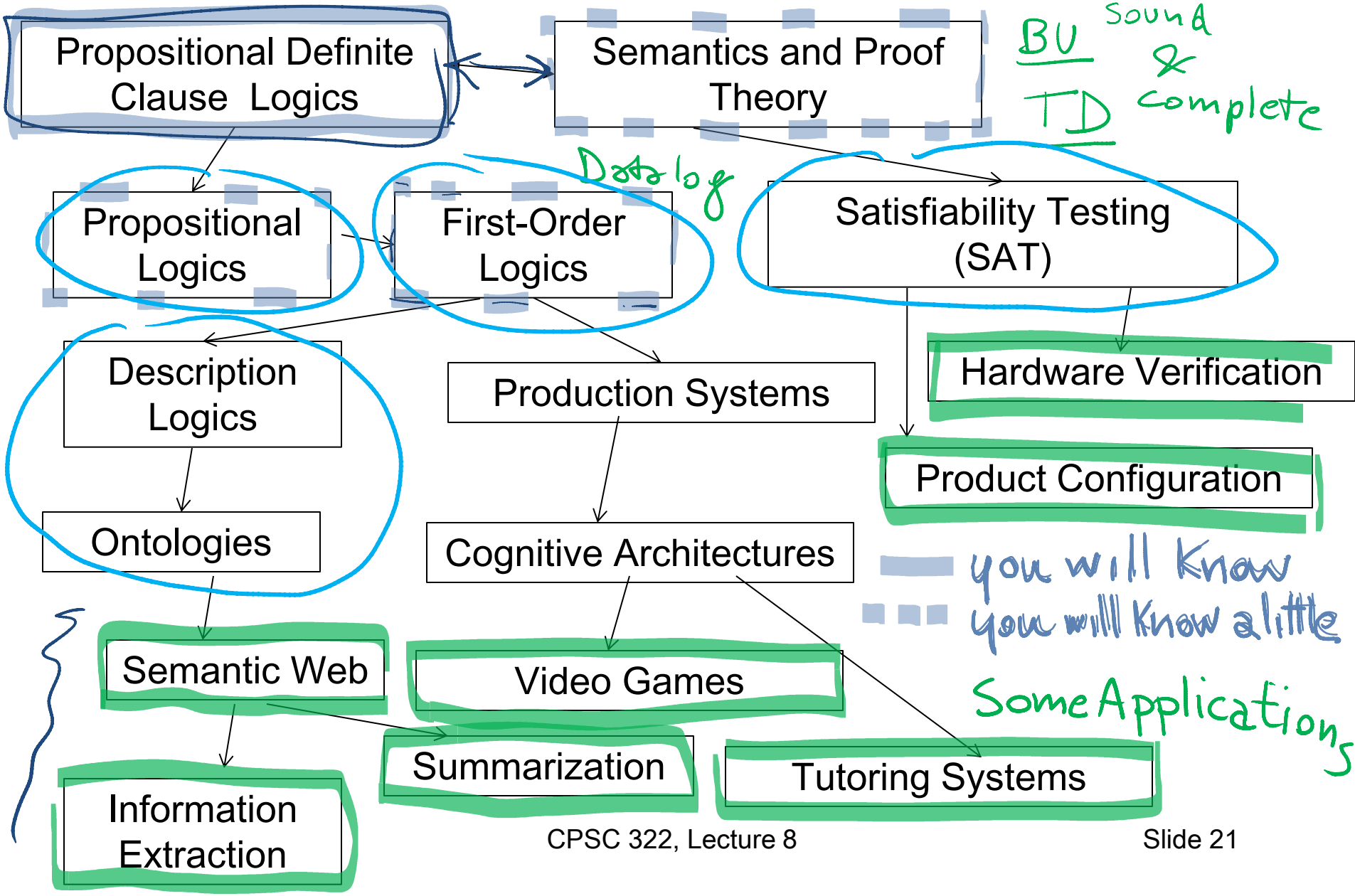
$p \leftarrow s \wedge f$

$r \leftarrow s \wedge q \wedge p$

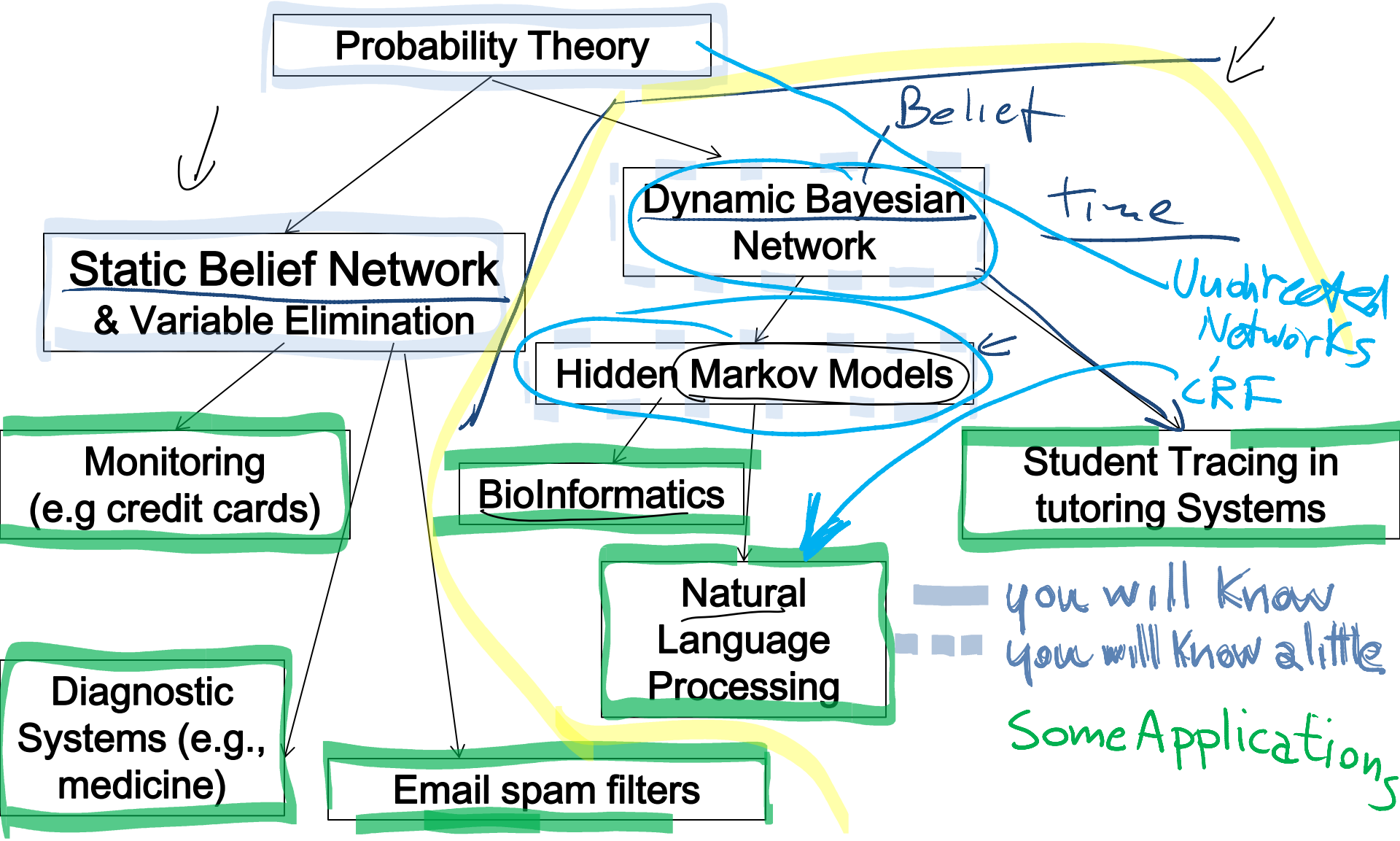
r

p

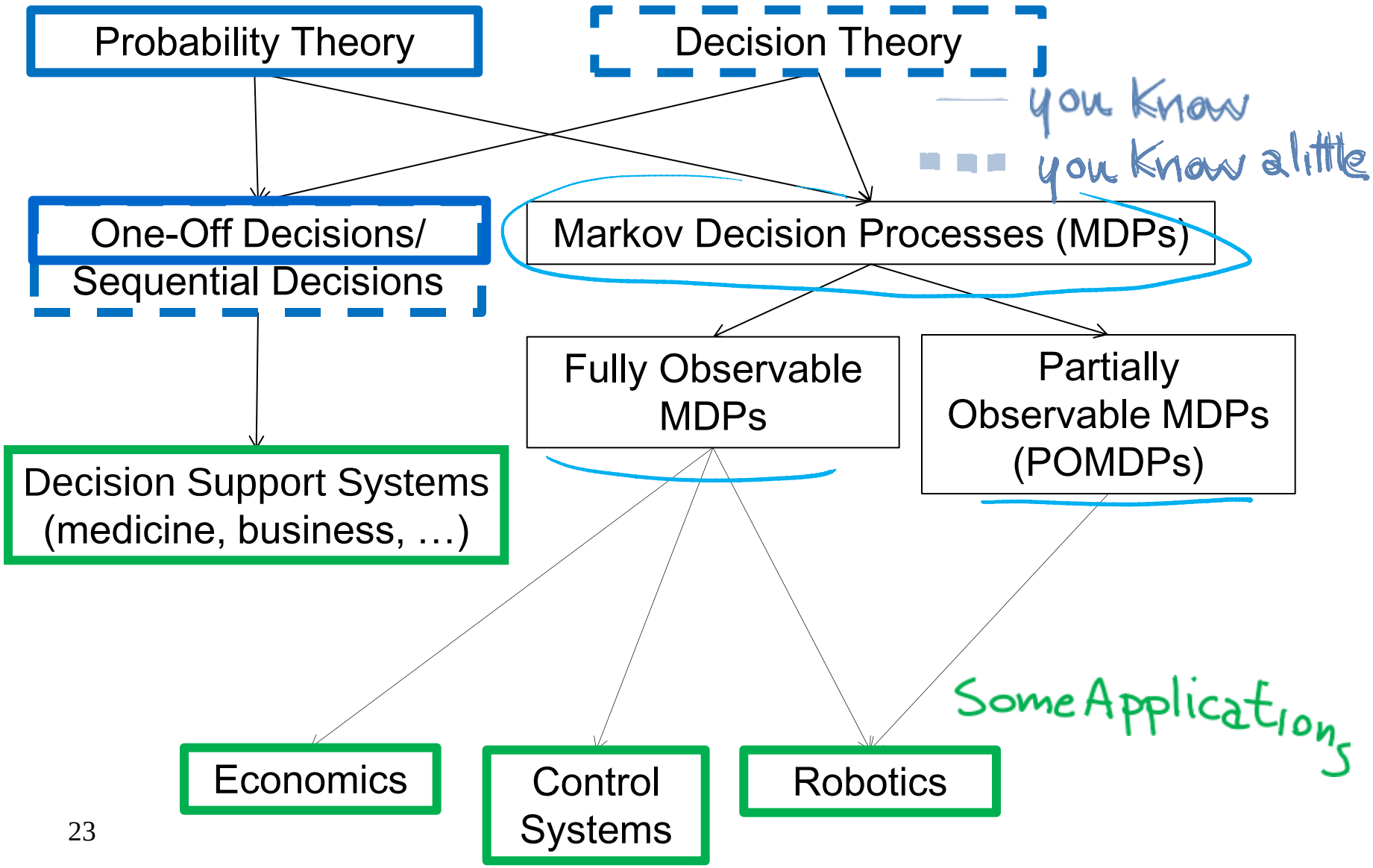
Logics in AI: Similar slide to the one for planning

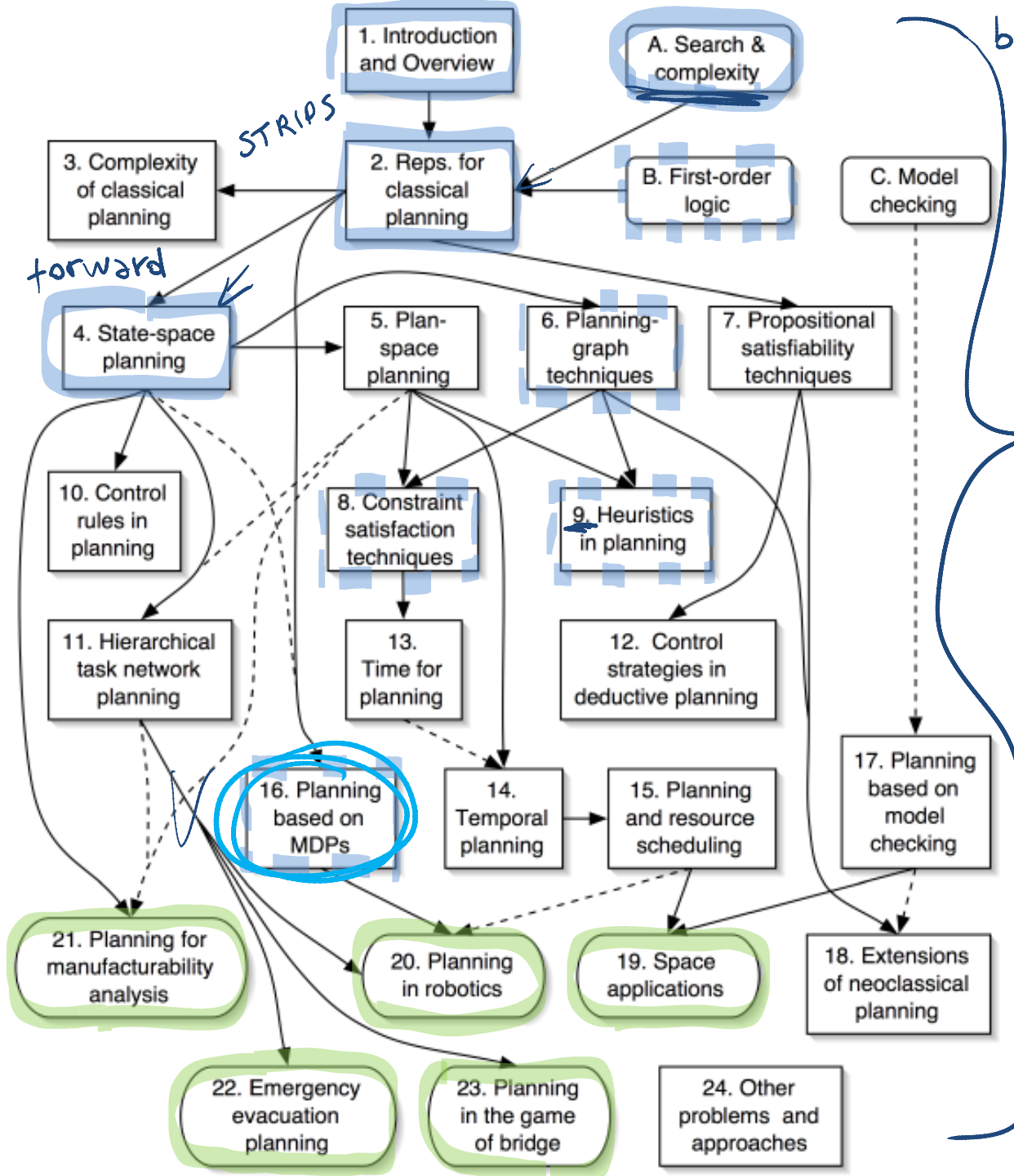


Answering Query under Uncertainty



Big Picture: Planning under Uncertainty





book chapters

No ☹, but you (will) know the key ideas ☺!

- Ghallab, Nau, and Traverso
  Automated Planning: Theory and Practice
  Morgan Kaufmann, May 2004
  ISBN 1-55860-856-7
- Web site:
  - ✓ http://www.laas.fr/planning

you know

you know a little

Applications

422 big picture

Hybrid: Det +Sto

Deterministic

Stochastic

Prob CFG

Prob Relational Models

Markov Logics

MAP MaxWalkSAT

Belief Nets

Approx. : Gibbs

Logics

First Order Logics

Markov Chains and HMMs

Forward, Viterbi….

Approx. : Particle Filtering

Ontologies

Temporal rep.

Query

- Full Resolution
- SAT

Undirected Graphical Models

Conditional Random Fields

Templates

Diff det. for Markov Blank et

rewrite as ops on factors

Planning

Markov Decision Processes and Partially Observable MDP

- Value Iteration
- Approx. Inference

Reinforcement Learning

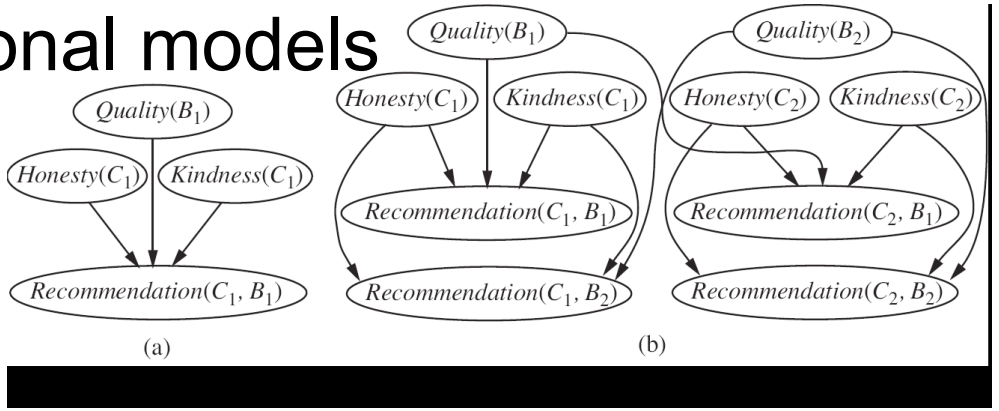
Representation

Reasoning Technique

Applications of AI

Combining Symbolic and Probabilistic R&R systems

- (a) Probabilistic Relational models
- Probs specified on relations

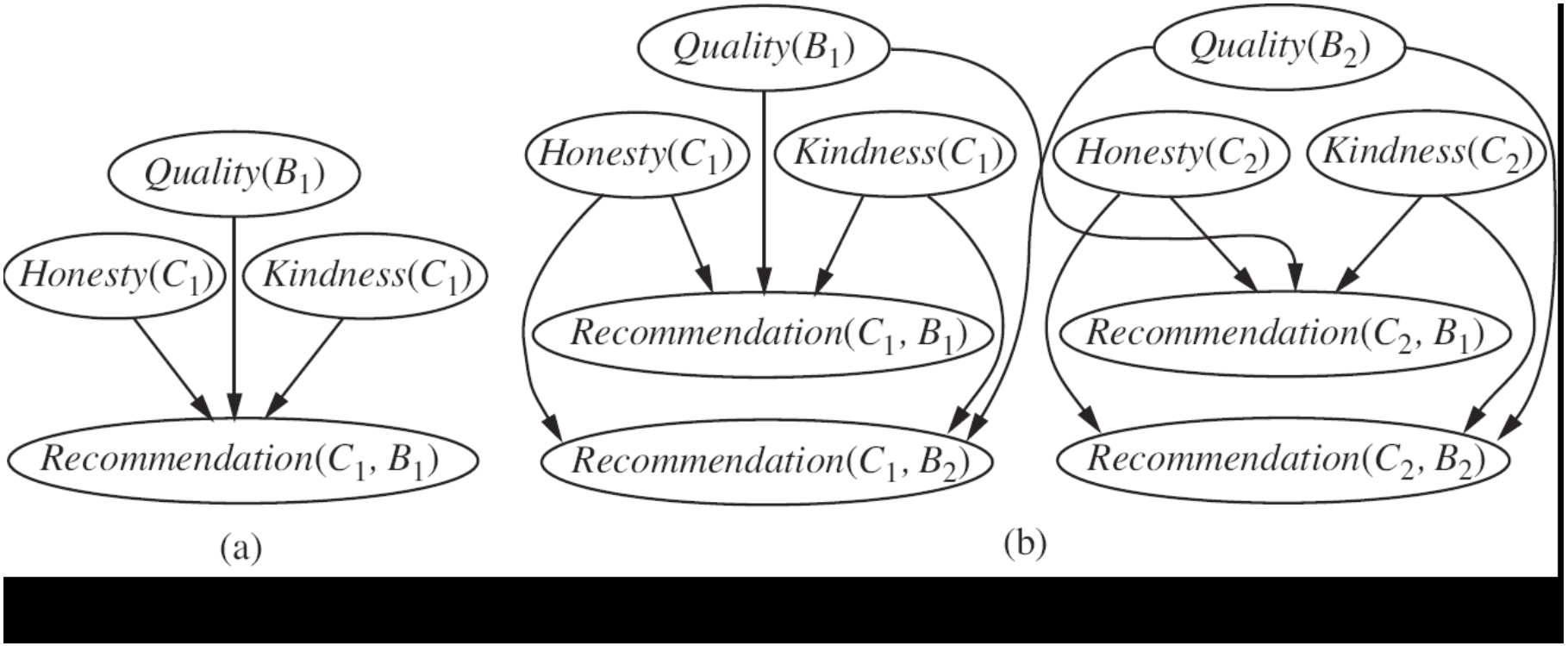


- (b) Markov Logics

$$P(\text{world}) \propto \exp\left(\sum \text{weights of formulas it satisfies}\right)$$

- (c) Probabilistic Context-Free Grammars
  - NLP parsing
  - Hierarchical Planning

(a) Example Prob. Relational models



A **customer** C will / will not *recommend* a **book** B depending On the book *quality*, and the customer *honesty* and *kindness*

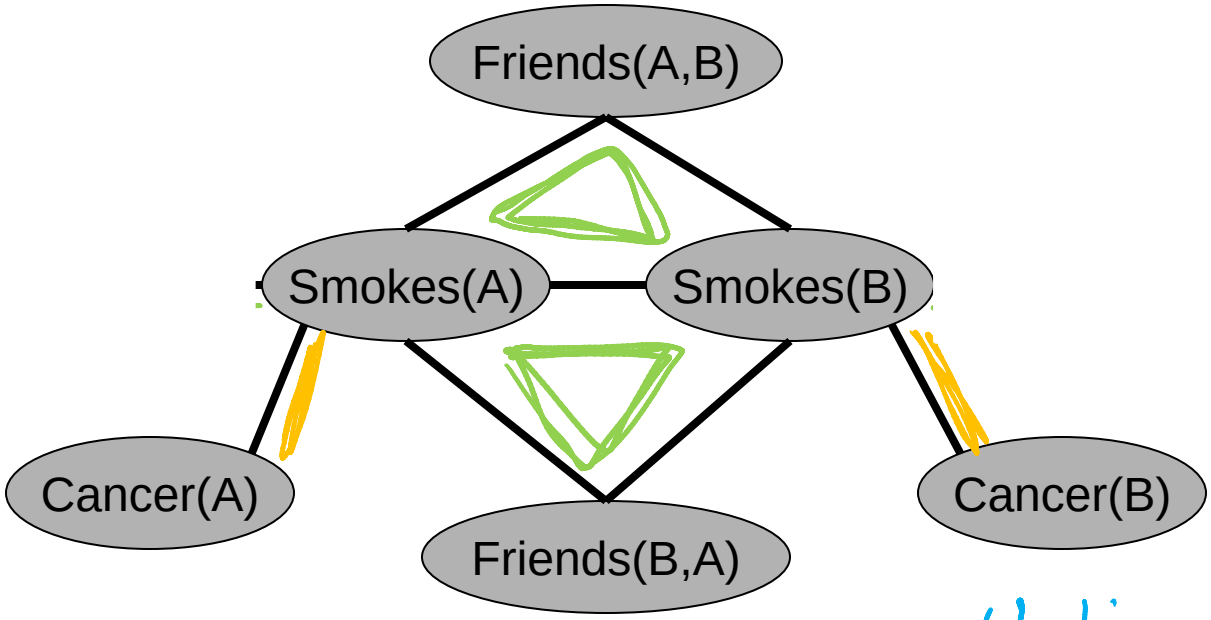
(b) Markov Logics

weights

FOL formulas

1.5	$\forall x\ Smokes(x) \Rightarrow Cancer(x)$
1.1	$\forall x, y\ Friends(x, y) \Rightarrow \big(Smokes(x) \Leftrightarrow Smokes(y)\big)$

Two constants: **Anna** (A) and **Bob** (B)



Undirected Graphical

In general, they represent feature templates for Markov Networks

Sample PCFG

$S \rightarrow NP\ VP$	[.80]	$Det \rightarrow that$ [.05] | the [.80] | a [.15]	
$S \rightarrow Aux\ NP\ VP$	[.15]	$Noun \rightarrow book$	[.10]
$S \rightarrow VP$	[.05]	$Noun \rightarrow flights$	[.50]
$NP \rightarrow Det\ Nom$	[.20]	$Noun \rightarrow meal$	[.40]
$NP \rightarrow Proper\text{-}Noun$	[.35]	$Verb \rightarrow book$	[.30]
$NP \rightarrow Nom$	[.05]	$Verb \rightarrow include$	[.30]
$NP \rightarrow Pronoun$	[.40]	$Verb \rightarrow want$	[.40]
$Nom \rightarrow Noun$	[.75]	$Aux \rightarrow can$	[.40]
$Nom \rightarrow Noun\ Nom$	[.20]	$Aux \rightarrow does$	[.30]
$Nom \rightarrow Proper\text{-}Noun\ Nom$	[.05]	$Aux \rightarrow do$	[.30]
$VP \rightarrow Verb$	[.55]	$Proper\text{-}Noun \rightarrow TWA$	[.40]
$VP \rightarrow Verb\ NP$	[.40]	$Proper\text{-}Noun \rightarrow Denver$	[.40]
$VP \rightarrow Verb\ NP\ NP$	[.05]	$Pronoun \rightarrow you$ [.40] | I [.60]	

TODO for this week

For Fri:

- Read textbook 9.4
- Read textbook 9.5
  - 9.5.1 Value of a Policy

For Mon:

- assignment0 – Google Form
- Read textbook
  - 9.5.2 Value of an Optimal Policy
  - 9.5.3 Value Iteration