

CS 295A/395D: Artificial Intelligence

Introduction: What is AI?

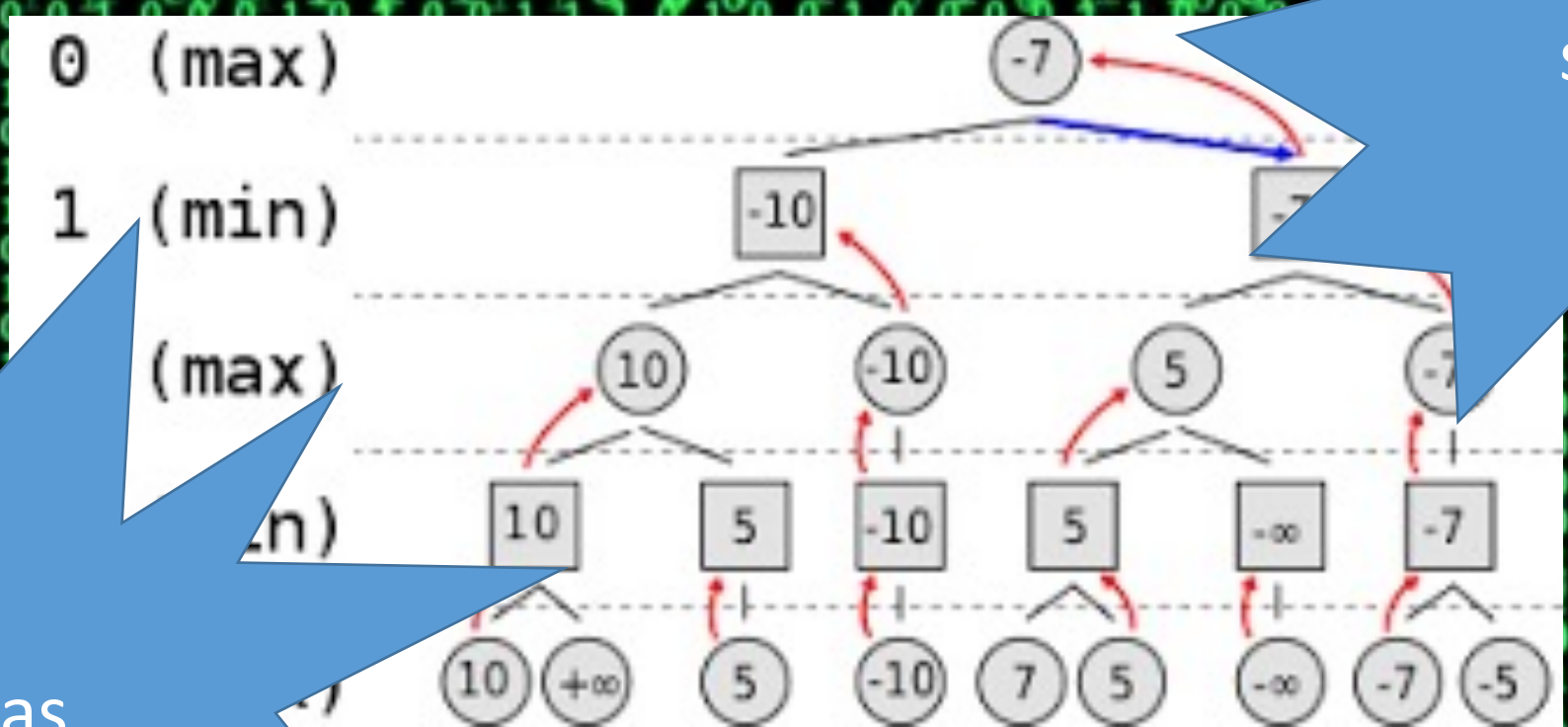
Prof. Emma Tosch

19 January 2021



The University of Vermont

Implemented as glorified if-statements.



Can be understood as part of classical computer science!

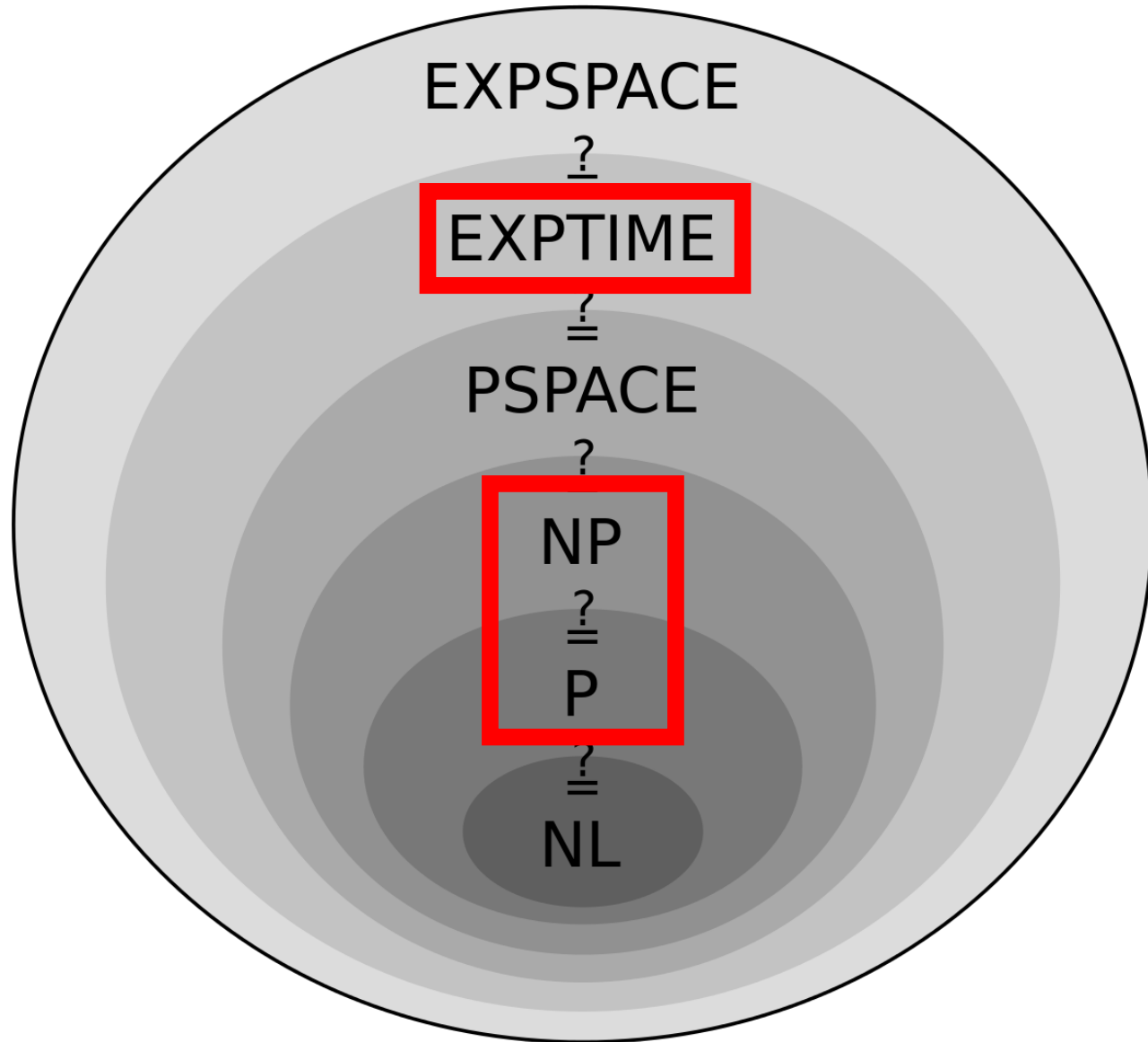
Artificial intelligence is the study of **heuristic**, possibly **sub-optimal algorithmic solutions** to

NP-hard problems.

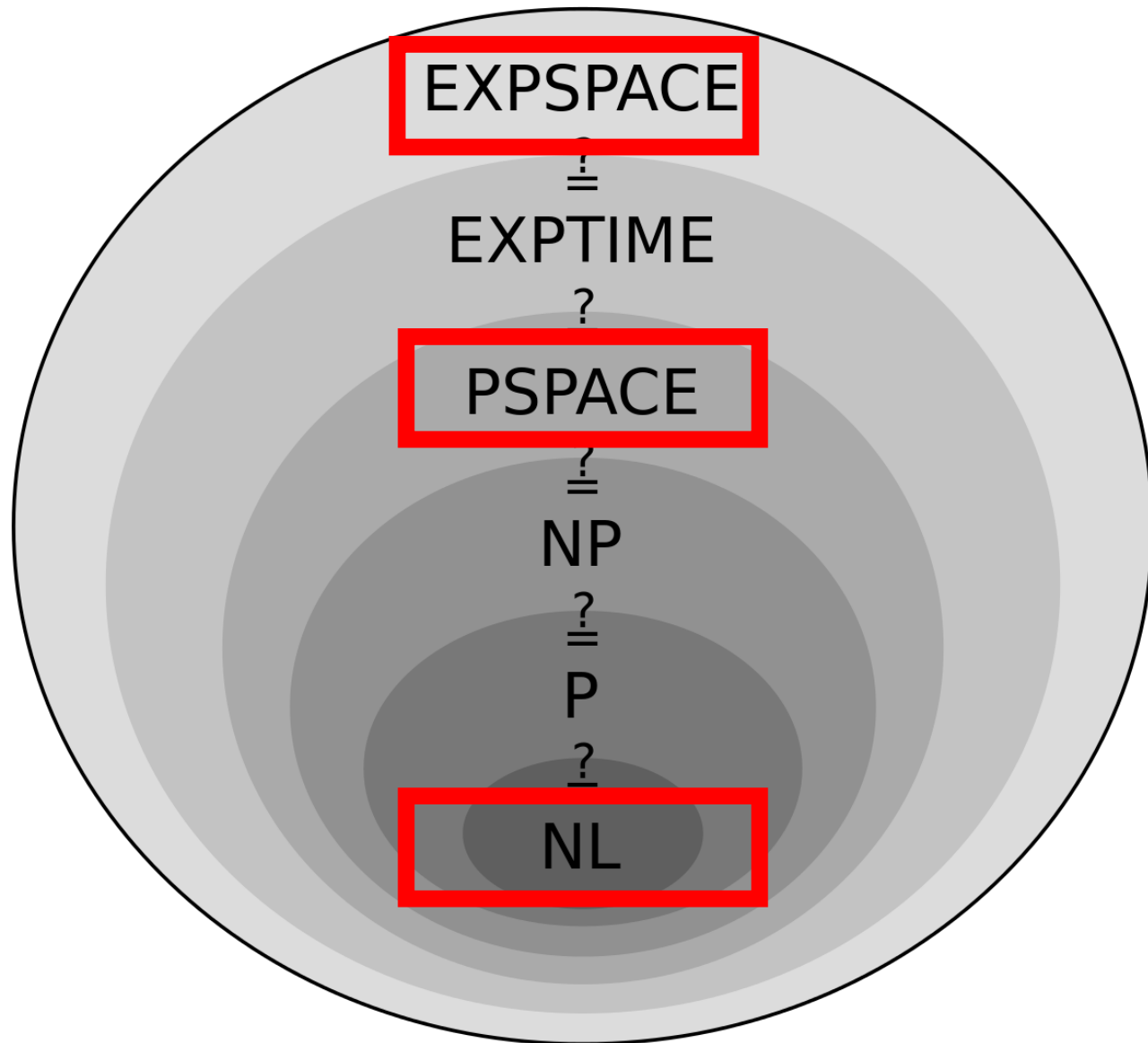
Computational Complexity Theory

The study of the **classification** of **problems** according **resources** required to compute **solutions**.

Time



(CS 125)



(CS 125)

Computational Complexity Theory

The study of the **classification** of **problems** according **resources** required to compute **solutions**.

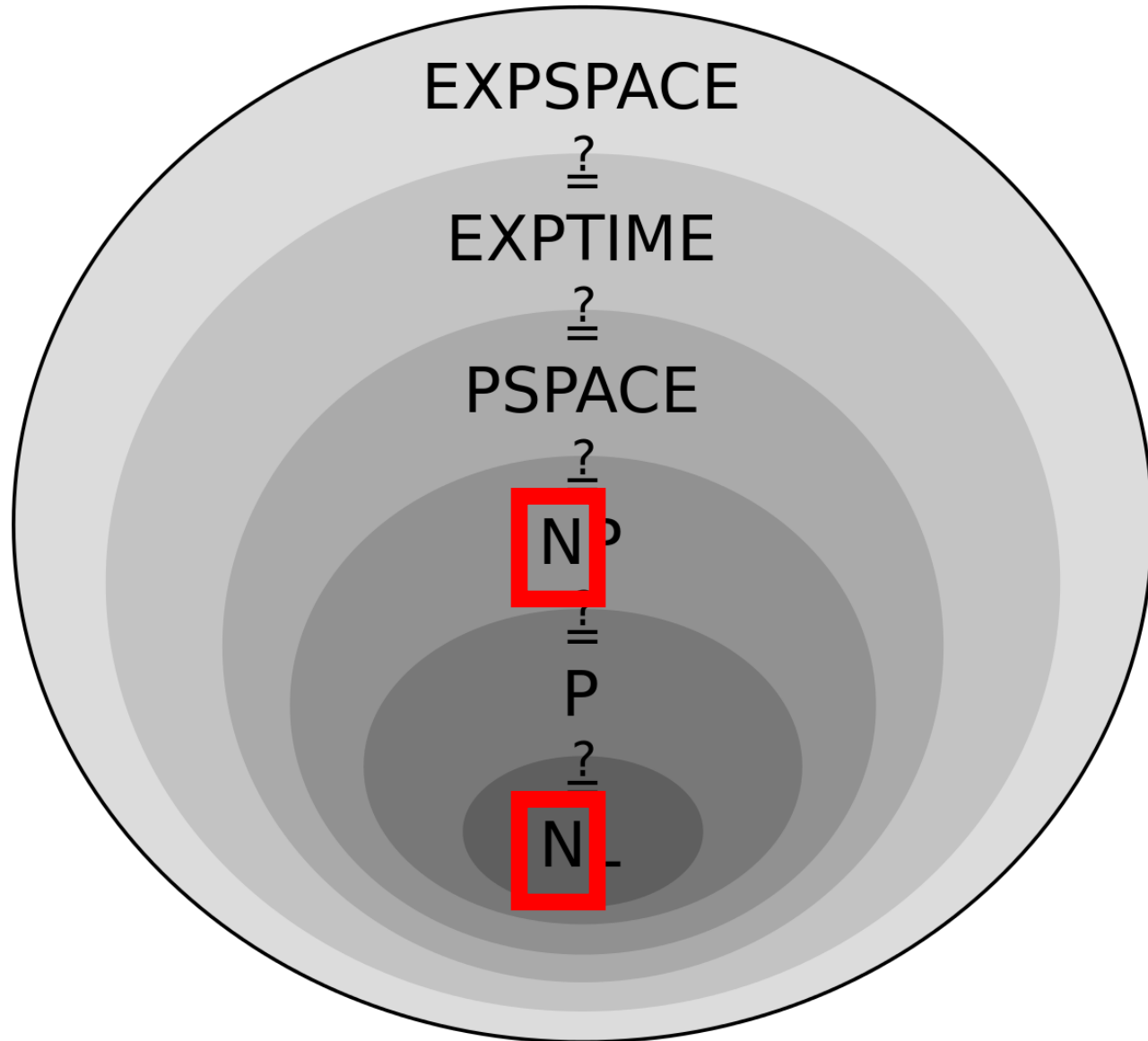
Time · Space

Computational Complexity Theory

The study of the **classification** of **problems** according **resources** required to compute **solutions**.

Time · Space

Randomness · Parallelism



(CS 125)

Computational Complexity Theory

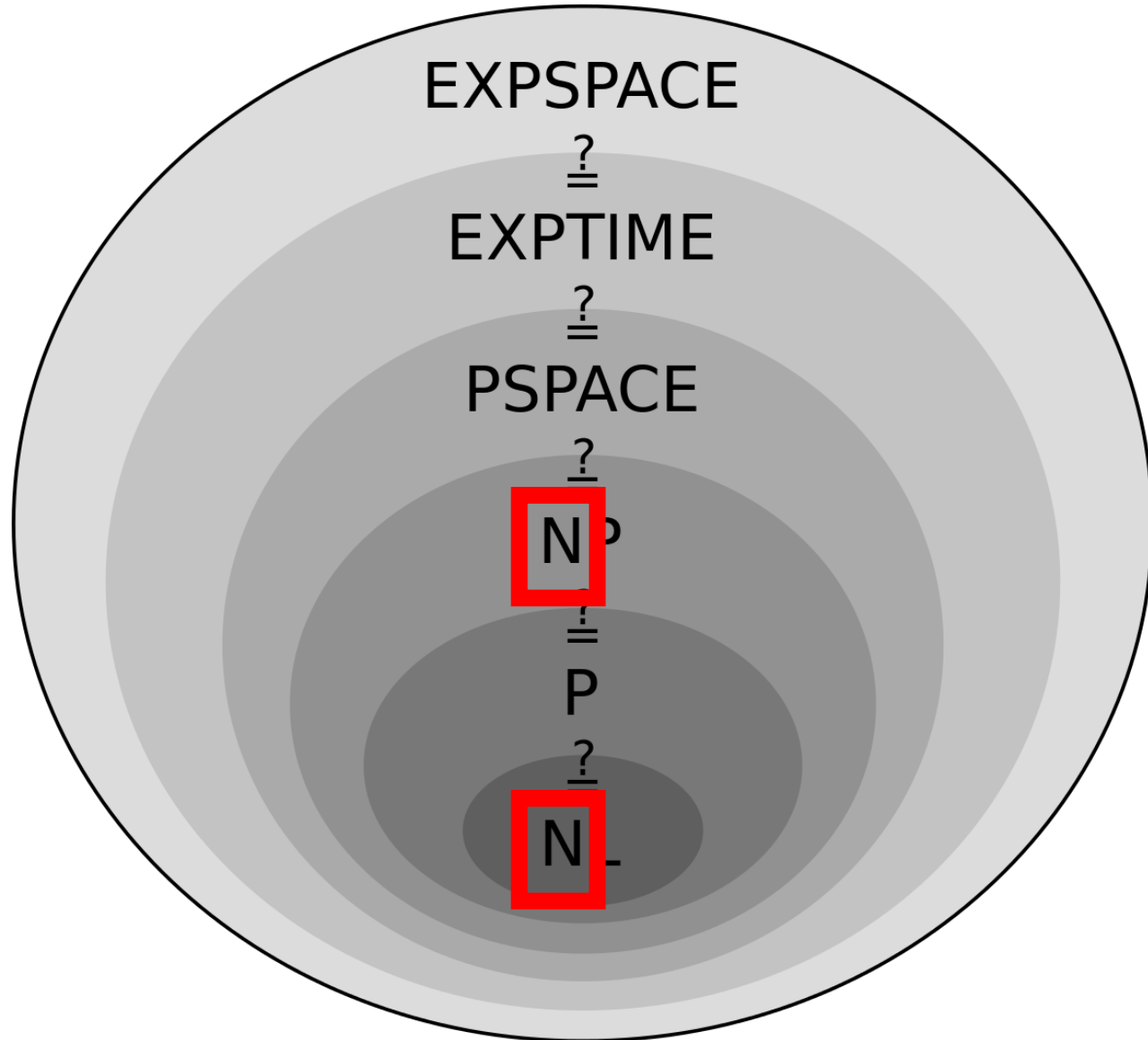
Classification:

1. How long to **find** a solution?
2. How long to **check** a solution?

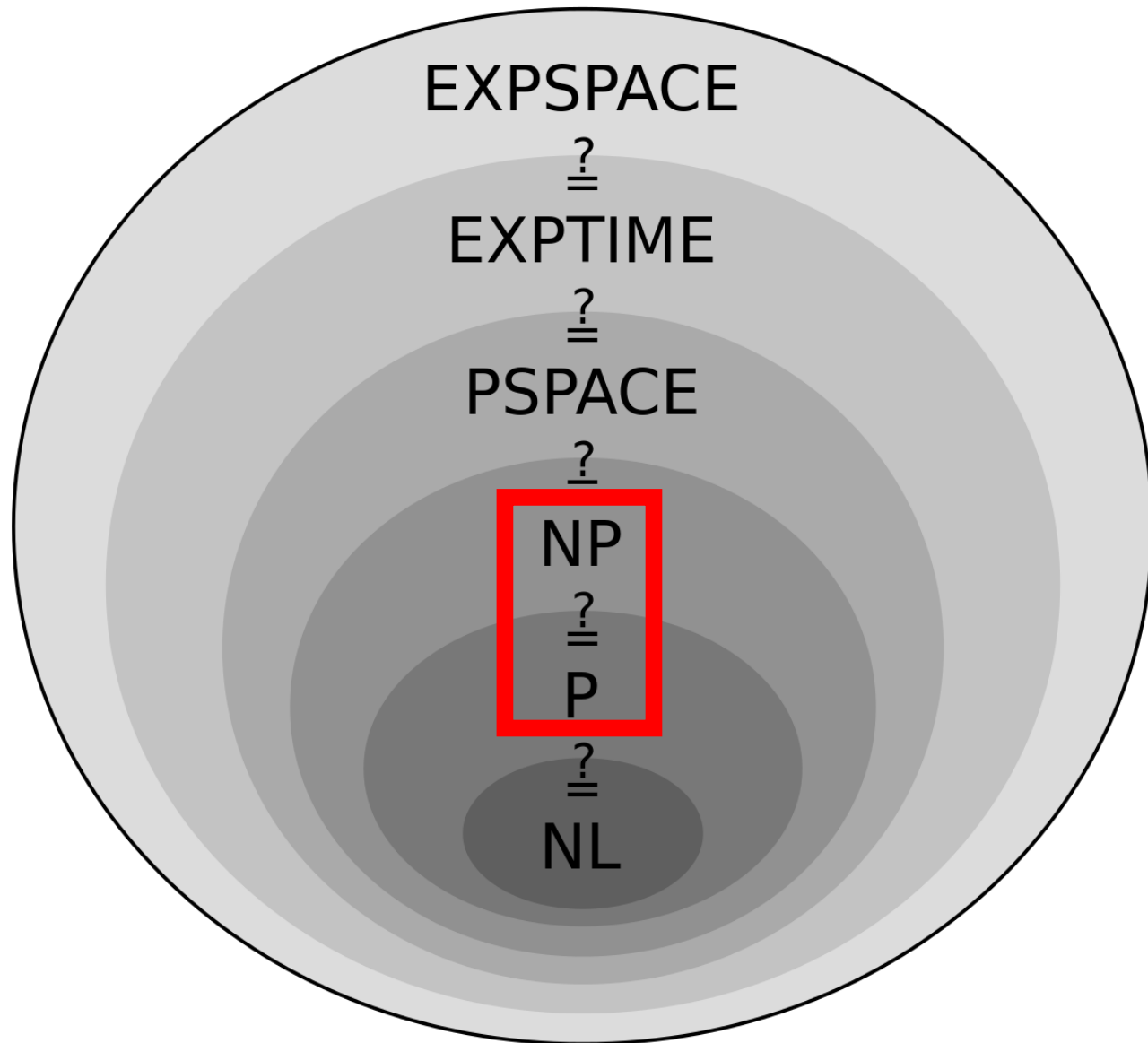
Sometimes we only know the complexity of #2...

So we **assume we just have** #1...

“N” prefix == “non-determinism”



(CS 125)



(CS 125)

Computational Complexity Theory

Classification:

1. How long to **find** a solution?
2. How long to **check** a solution?

“P vs. NP”

P: #1 **AND** #2 *definitely* in polytime

NP: #2 *definitely* in polytime

#1 *at least* in polytime

Computational Complexity Theory

Classification:

1. How long to **find** a solution?
2. How long to **check** a solution?

Hard problems “start” in NP

NP-Hard: at least as hard as any problem in NP

Exact algorithmic solutions **may be** impractical

EXPSPACE

?

EXPTIME

?

PSPACE

?

NP

?

AI makes NP-Hard solutions practical!

Artificial intelligence is the study of **heuristic** possibly **sub-optimal algorithmic solutions** to **NP-hard problems.**

heuristic

A **function, technique, rule, or other approach** to solving a problem that is **practical** and returns a *good enough* (possibly sub-optimal) solution.

Often encodes domain knowledge!

(i.e., uses some specialized knowledge about the problem space)

Example (preview of unit 1)

Boolean satisfiability problem (SAT)

- *Find an assignment of the variables to make the whole expression true*
- NP-complete (in NP and as hard as the hardest problems in NP)
- Many real-world problems can be expressed as SAT!
- DPLL algorithm – foundation that uses cost function + search to find solutions

Logic

Probability

Or as I like to call it...

“applied computer science”

Artificial Intelligence

AI Problem Spaces

- SAT/SMT solvers

Not AI:

- Heuristic search (e.g., games, web search)

- General algorithms

Where's the “artificial intelligence”?

- Planning

- Data-driven solutions

- Game theory

- Machine learning

- Decision theory

- Statistics

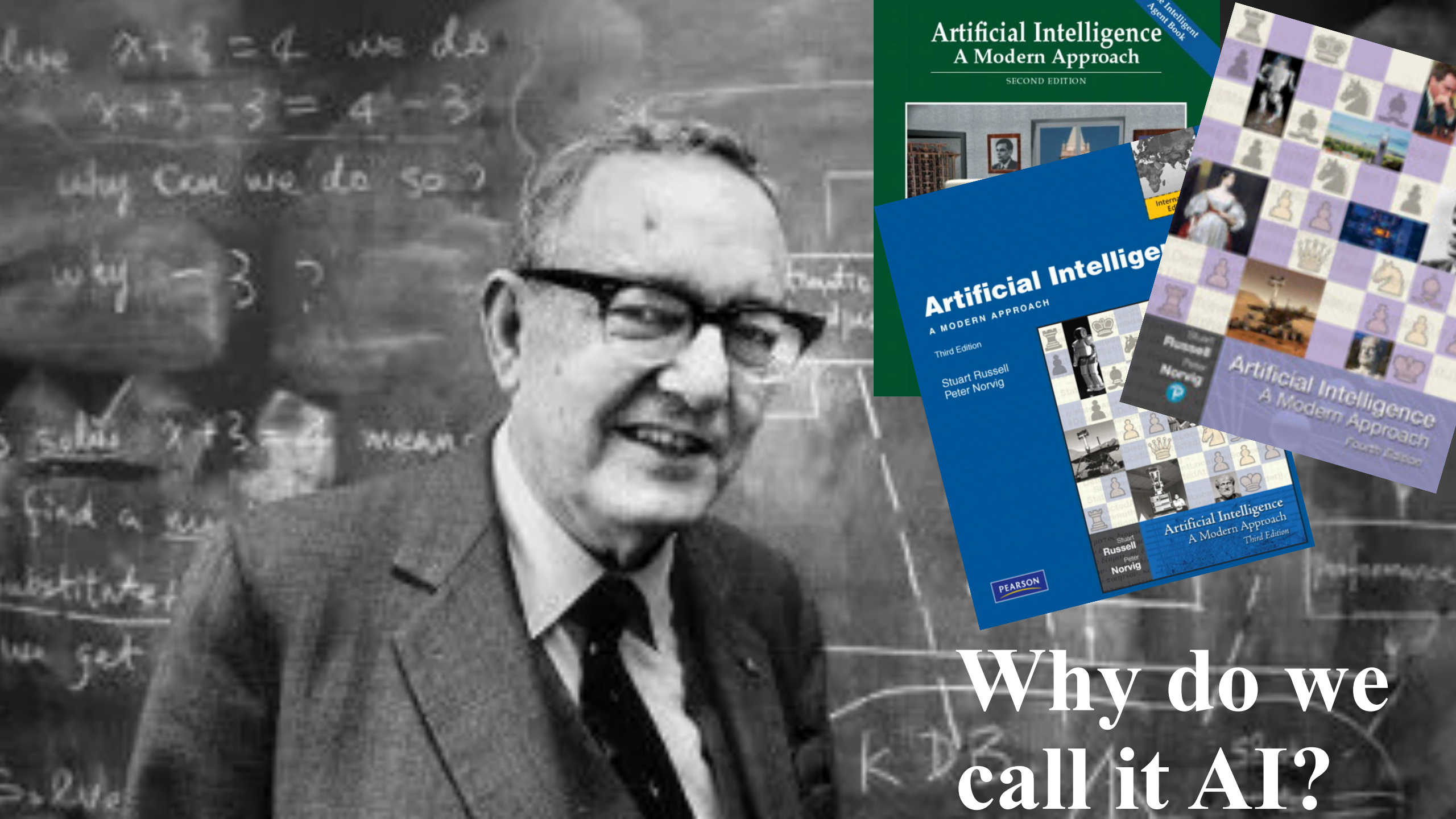
- Sequential decision-making

AI Problem spaces

- SAT/SMT solvers
- Heuristic search (e.g., games, web search)
- Planning
- Game theory
- Decision theory
- Sequential decision-making

Not AI:

- General algorithms
- Data-driven solutions
 - Machine learning
 - Statistics
- Philosophy of Mind
- Cognitive Science

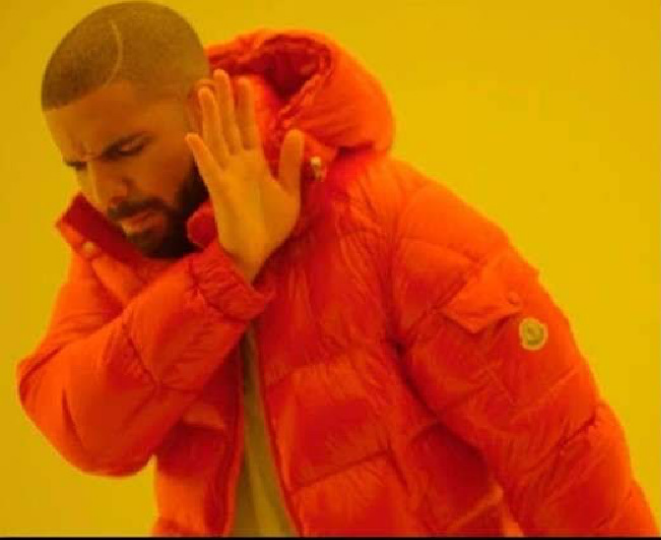


Artificial Intelligence
A Modern Approach
SECOND EDITION

Artificial Intelligence
A MODERN APPROACH
Third Edition
Stuart Russell
Peter Norvig

Artificial Intelligence
A Modern Approach
Fourth Edition

Why do we
call it AI?



Abnegating responsibility due to the anthropomorphisation of if-statements.



Maintaining a sense of wonder about the possible

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Stay Measured

- AI is not magic
- AI can be useful
- Complementary methods for understanding:
 - Analytic/Formal/Interpretable
 - Numerical/Empirical/Explainable
- Apply critical inquiry directly to forehead

The use of this meme macro does not condone the behavior of any of the individuals represented therein.



Syllabus Time



Artificial Intelligence

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[Course Blog](#)

[Covid Policies](#)

[UVM Resources](#)

Grading System

All students will be graded on a points-based system. Points are assigned as follows:

Type	Subtype	Graduate Points	Undergraduate Points
Participation	In-class quizzes	1	2
Participation	Blog Posts	9	6
Participation	Blog Comments	3	3
Homework	Theory Assignments	10	10
Homework	Programming Assignments	15	15
Exams	Hourly Exams	25	25
Exams	Final Exam	100	100
Bounties	Bounties	5	5

Note that there are well over 100 points available. In fact, there are possible (although not probable!) worlds where a single student could earn over 400 points! However, such worlds might require an unreasonable amount of time and an unfortunate lack of engagement from other students (e.g., such a student might elect to write a blog post for every class).

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Student hours (Office hours)

Modality

Platforms and Software

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Classroom Environment

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Academic Alerts

Incompletes

Graduate Qualifying Exam in AI

Course Evaluation

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Type	Min	Max
Participation	0	20
Homework	0	70
Exams	70	100
Kudos	0	15

Only applies if you take the exam at the regular time.

Exam Info:

- In person, on paper, closed-book
- Make-up: within 1 week with note
- 50min class → aim for 25-30min exam
- 3pt deduction for leaving early

Letter Grade	Graduate Points	Undergraduate Points
A+	N/A ¹	Above 150 ²
A	188-200+	143-150
A-	175-187	135-142
B+	162-174	127-134
B	149-161	119-126
B-		
C+		
C		
C-		
D+		
D		
F	Below 70	Below 70



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Note that there are well over 100 points available (and it's probable!) worlds where a single student could require an unreasonable amount of time and effort to complete. Students (e.g., such a student might elect to

Assignment Info:

- Programming
 - Soft deadline: exams
 - Hard deadline: last day of classes
 - Quasi-self-graded
 - Submit in BB
- Theory
 - Soft deadline: 1 week before exam
 - Hard deadline: 1 class before exam
 - Autograded in BB, infinite retry
 - 1 question autograded incorrectly

Artificial Intelligence

CS 295A/395D: Artificial Intelligence

Grading System

All students will be graded on a points-based system. Points are awarded for various activities throughout the course.

If you think you know the incorrectly marked answer, submit a formal justification in BB.

Type	Min	Max
Participation	0	20
Homework	0	70
Exams	70	100
Kudos	0	15

There may be legit mistakes...

Activity	Points
Homework	10
Theory Assignments	15
	25
	100
Boundties	5

Note that there are well over 100 points available. In fact, there are possible (although not probable!) worlds where a single student could earn over 400 points! However, such worlds might require an unreasonable amount of time and an unfortunate lack of engagement from other students (e.g., such a student might elect to write a blog post for every class).

- Grading System
- How should I plan what to do?
- In-class quizzes
- Blogging
- Assignments
- Exams
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typo in grade breakdown table #10

Edit

New issue

Open

etosch opened this issue 19 seconds ago · 0 comments



etosch commented 19 seconds ago

Member

Syllabus Github
☆ 0 👤 0

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To make the grading scheme reasonable, **graduate students** will be graded out of a **least upper**

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s/bounties/Bounties

Assignees

No one—assign yourself

Labels

None yet

Projects

None yet

Milestone

No milestone

Linked pull requests

Successfully merging a pull request may close this issue.

None yet

Notifications

Customize

Unsubscribe

You're receiving notifications because you're watching this repository.

1 participant

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what to

am in AI

Example iClicker question

Have you had a course in discrete math or other course that covers induction, basic set theory, propositional logic, and similar topics?

- A) Yes, more than one such course
- B) Yes, but only one
- C) I think so? But it's kind of fuzzy.
- D) I don't think so?
- E) Definitely not