CSC 242
Artificial Intelligence

Henry Kautz
Spring 2014

Welcome

- Instructor: Henry Kautz

  - Chair, Computer Science

  - Director, Institute for Data Science

  - Past President, Association for the Advancement of Artificial Intelligence

  - Research: combinatorial search algorithms; data mining; human-computer interaction; healthcare

- Instructor:

  - Chair, Co...

  - Director,

  - Past Pres... ...dvancement of Artifici...

  - Research... ...rithms; data mining; h... ...; healthcare

Welcome

Welcome

- Graduate TA: Xiaowan Dong

  - Undergraduate in Tianjin, China

  - Research in computer architecture

Welcome

- Graduate TA: Xiaowan Dong

    - Undergraduate in Tianjin, China

    - Research in computer architecture

- Undergraduate TA's:

    - Sean Esterkin - Class of 2014 - TA's CSC 282 Algorithms last fall; Did an REU (Research Experience for Undergraduates) at Salisbury University on Fractals

    - Daniel Scarafoni - Class of 2015 - Recipient of FIRST Robotics Scholarship; Undergrad research on automated reasoning and crowd intelligence

- Daily office hours will be posted on course home page

Welcome

- Graduate TA: Xiaowan Dong

  - Undergraduate in Tianjin, China

  - Research in computer architecture

- Undergraduate TA's:

  - Sean Esterkin - Class of 2014 - TA's CSC 282 Algorithms last fall; Did an REU (Research Experience for Undergraduates) at Salisbury University on Fractals

  - Daniel Scarafoni - Class of 2015 - Recipient of FIRST Robotics Scholarship; Undergrad research on automated reasoning and crowd intelligence

- Daily office hours will be posted on course home page

Welcome

- Graduate TA: Xiaowan Dong

  - Undergraduate in Tianjin, China

  - Research in computer architecture

- Undergraduate TA's:

  - Sean Esterkin - Class of 2014 - TA's CSC 282 Algorithms last fall; Did an REU (Research Experience for Undergraduates) at Salisbury University on Fractals

  - Daniel Scarafoni - Class of 2015 - Recipient of FIRST Robotics Scholarship; Undergrad research on automated reasoning and crowd intelligence

- Daily office hours will be posted on course home page

Welcome

- Graduate TA: Xiaowan Dong

  - Undergraduate in Tianjin, China

  - Research in computer architecture

- Undergraduate TA's:

  - Sean Esterkin - Class of 2014 - TA's CSC 282 Algorithms last fall; Did an REU (Research Experience for Undergraduates) at Salisbury University on Fractals

  - Daniel Scarafoni - Class of 2015 - Recipient of FIRST Robotics Scholarship; Undergrad research on automated reasoning and crowd intelligence

- Daily office hours will be posted on course home page

Honesty

- Dishonesty:

  - Claiming work by others as your own without attribution

  - Unauthorized collaboration with other students

- All cases will be referred to Academic Honesty Board

  - No second chances

Accommodations

- I will make appropriate accommodations for students with learning differences

- Inform me in writing within the first two weeks of class

- Make an appointment to talk with me about differences that require accommodations beyond extra time on tests

Coursework

Coursework

- 4 team programming projects (40%)

  - Teams will be assigned by me (randomly)

  - Different teams for each project

Coursework

- 4 team programming projects (40%)

  - Teams will be assigned by me (randomly)

  - Different teams for each project

- Homeworks: not graded; are preparation for:

Coursework

- 4 team programming projects (40%)

  - Teams will be assigned by me (randomly)

  - Different teams for each project

- Homeworks: not graded; are preparation for:

- 3 in-class exams plus final exam (50%)

Coursework

- 4 team programming projects (40%)

  - Teams will be assigned by me (randomly)

  - Different teams for each project

- Homeworks: not graded; are preparation for:

- 3 in-class exams plus final exam (50%)

- Frequent unannounced online quizzes (10%)

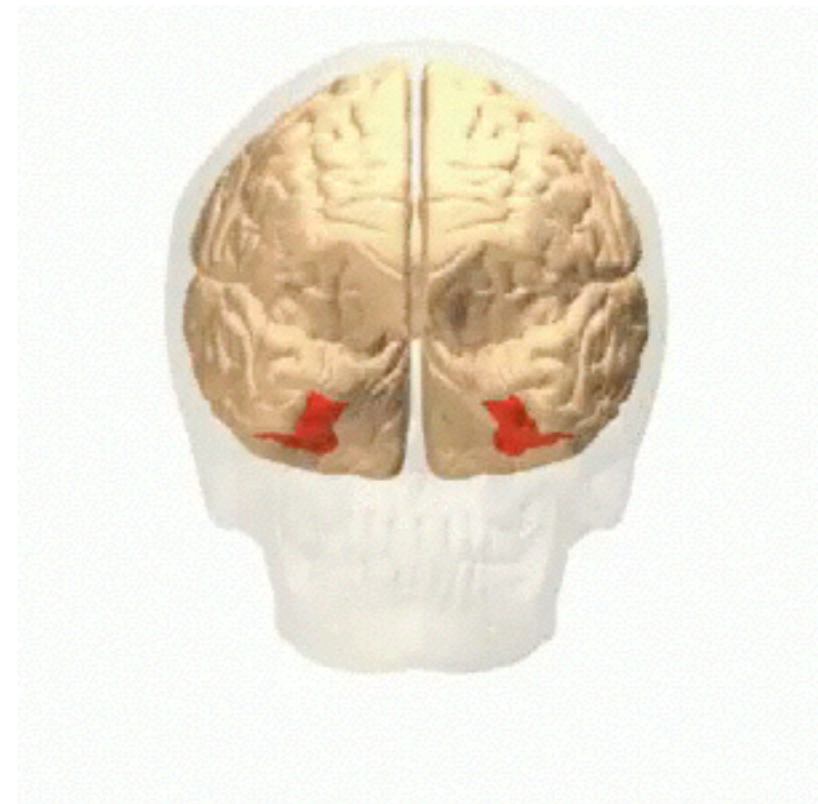 - Bring your laptop or smartphone to every class

Seating

- Starting 2nd week of class, seats will be assigned

- Seating chart changed monthly

- Reduce division between talkative students up front and quiet students lurking in the back of the room

- Reduce temptation to copy from your friends on exams

Programming

- Projects must run on Linux on URCS instructional network

- If you do not have an account (non-majors), contact grad TA Xiaowan Dong

- Can use any language: Java, C, Python, LISP, Prolog

Prosopagnosia

- Face blindness

- Other aspects of visual processing (e.g., object discrimination) remain intact

- Acquired or congenital (development) damage to fusiform gyrus
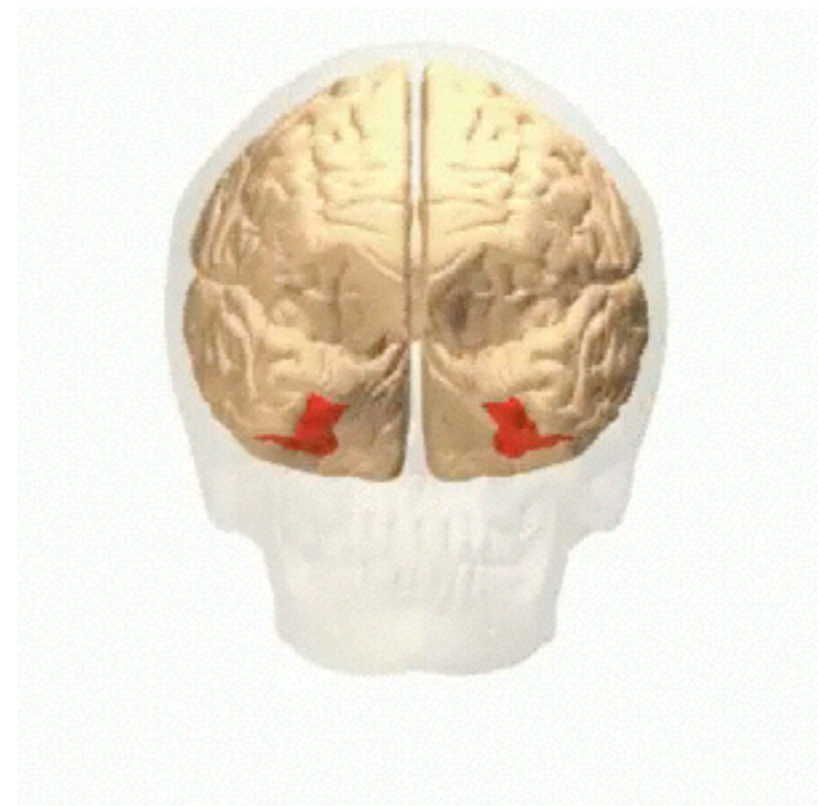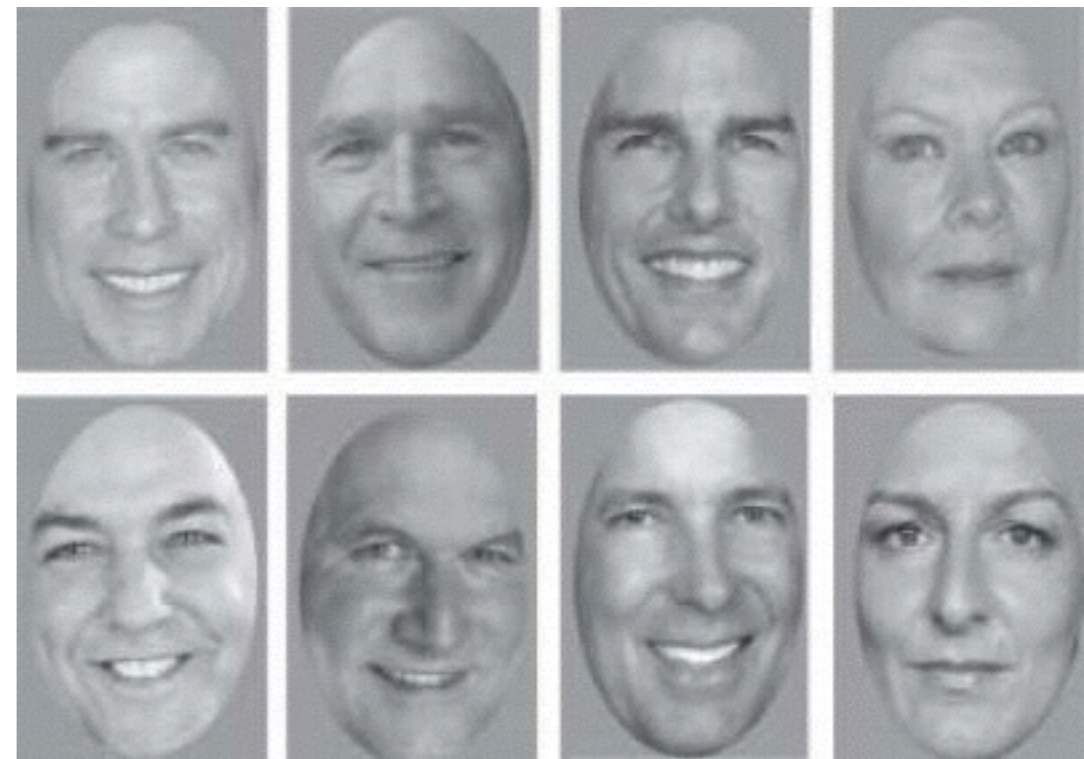
Prosopagnosia

- Face blindness

- Other aspects of visual processing (e.g., object discrimination) remain intact

- Acquired or congenital (development) damage to fusiform gyrus

Living with Prosopagnosia

- No effective therapies

- Matching to photographs unsuccessful

- Subjects try to consciously use visual clues to identify people

  - Distinctive hair, glasses, ways of dressing, place where seen

- Can sometimes learn to recognize a small number of people after months or years of frequent interaction

Oliver Sacks

- Physician, best-selling author, and professor of neurology at the NYU School of Medicine

- Books: *The Mind's Eye, Musicophilia, Awakenings, The Man Who Mistook His Wife For A Hat, Hallucinations*

- Employs a full-time assistant to help recognize people

Oliver Sacks

- "I am much better at recognizing my neighbors dogs (they have characteristic shapes and colors) than my neighbors themselves. Thus when I see a youngish woman with a Rhodesian ridgeback hound, I realize that she lives in the apartment next to mine. If I see an older lady with a friendly golden retriever, I know this is someone from down the block. But if I should pass either woman on the steer without her dog, she might as well be a complete stranger."

Mike May

©2007 BruceBrown.com

- Blinded age 3, sight restored at 43

- Had to consciously learn to recognize objects - visual neurons had been repurposed

- Biography: *Crashing Through*

  - Rode a bike as a blind child

  - Became champion blind skier

Mike May

Near the back of the store, May spotted a large object at the end of the aisle. He moved near it and put his reasoning powers to work: The object wasn't moving. It was large and squarish. It was positioned near pallets.
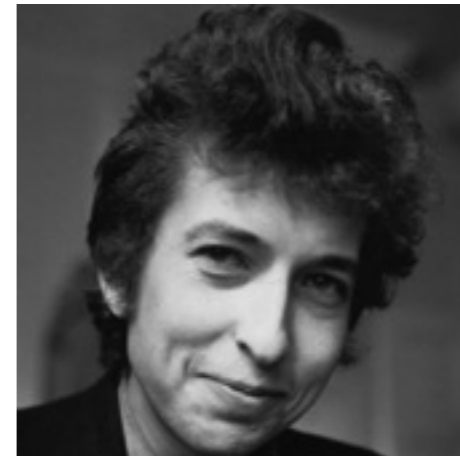
"Is that a forklift?" he asked Jennifer.

Her face went white. She waited for a moment, then leaned in to May's ear.

"No," she whispered. "That's a very, very heavy woman."

Excerpt From: Robert Kurson. "Crashing Through." iBooks. https://itun.es/us/oPYez.l

Henry Kautz

- Researcher in artificial intelligence

- Moderate prosopagnosia

- After 7 years, can recognize about 20 people at UR

- Relies on email and notes to deduce names

- Worked with two graduate students for 6 months without realizing they were the same person who sometimes used a nickname
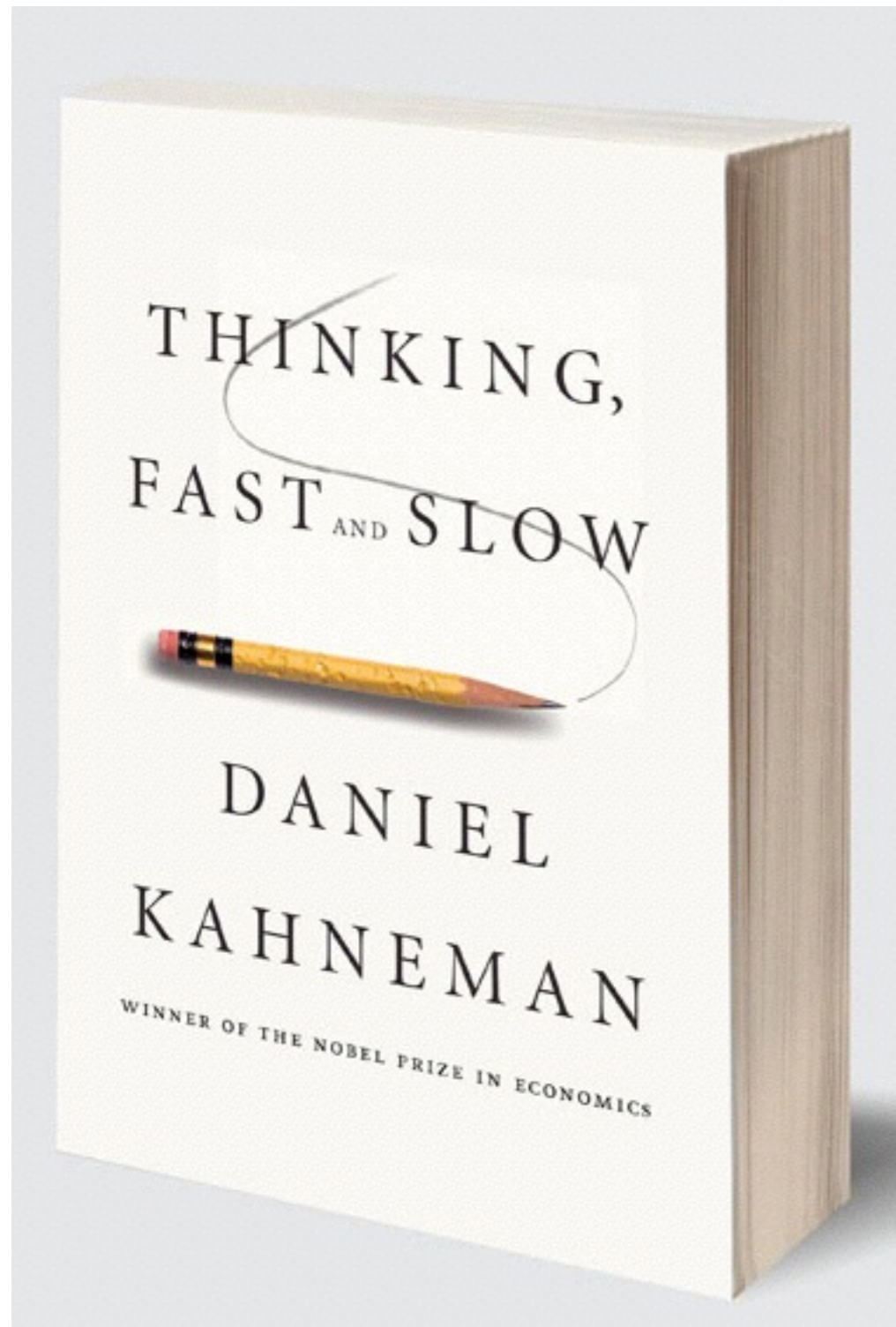

Zimmerman   **Dylan**

The Brains' Two Systems

- System 1: operates automatically and quickly, with little or no effort and no sense of voluntary control

  - Normal perception, making stereotypical judgements

  - Face recognition, speech recognition

- System 2: allocates attention to the effortful mental activities that demand it, including complex computations.

  - Conscious reasoning, self-monitoring

  - Chess, computer programming

Test

- Say the COLOR of each of the following words:

  - **CAR**

  - **TREE**

  - **BANK**

  - **TIME**

Test

- Say the COLOR of each of the following words:

  - **RED**

  - **BLUE**

  - **BROWN**

  - **ORANGE**

ar·ti·fi·cial in·tel·li·gence

noun

1. the theory and development of computer systems able to perform tasks that normally require human intelligence

What kind of intelligence(s)?

What kind of computer systems?

Origins of the Field of AI

Origins of the Field of AI

- From its start, research in AI was divided by the kinds of intelligence and computer systems studied

Origins of the Field of AI

- From its start, research in AI was divided by the kinds of intelligence and computer systems studied

- Perceptron (Rosenblatt 1957): artificial neural networks for pattern recognition
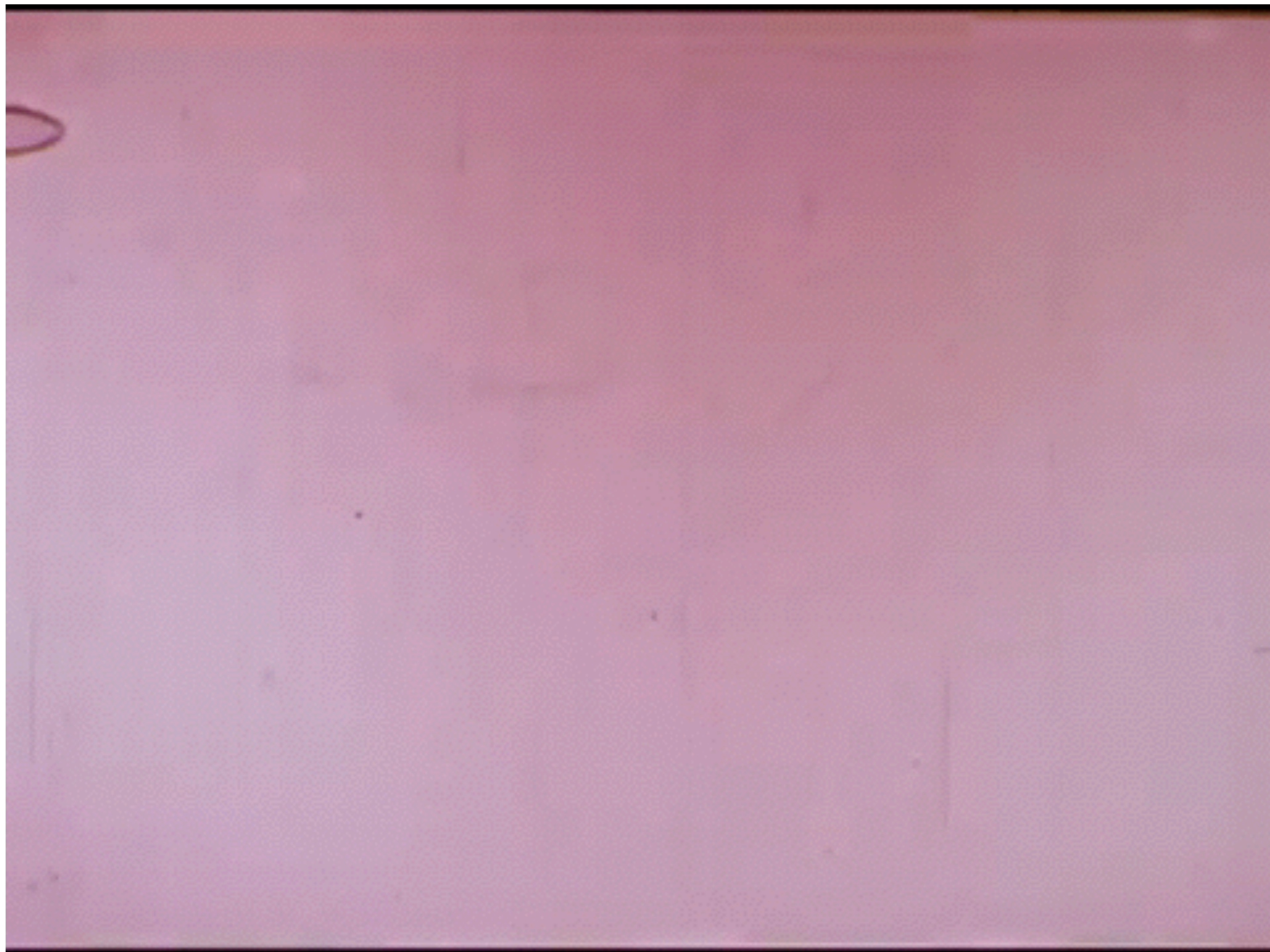
Origins of the Field of AI

- From its start, research in AI was divided by the kinds of intelligence and computer systems studied

- Perceptron (Rosenblatt 1957): artificial neural networks for pattern recognition

- Expert Systems (Feigenbaum 1965): logical rule-based systems for medicine and industry

Origins of the Field of AI

- From its start, research in AI was divided by the kinds of intelligence and computer systems studied

- Perceptron (Rosenblatt 1957): artificial neural networks for pattern recognition

- Expert Systems (Feigenbaum 1965): logical rule-based systems for medicine and industry

- Bayesian Networks (Pearl 1998): brought probability and decision theory into AI - provided the mathematics needed to (slowly) unify the field
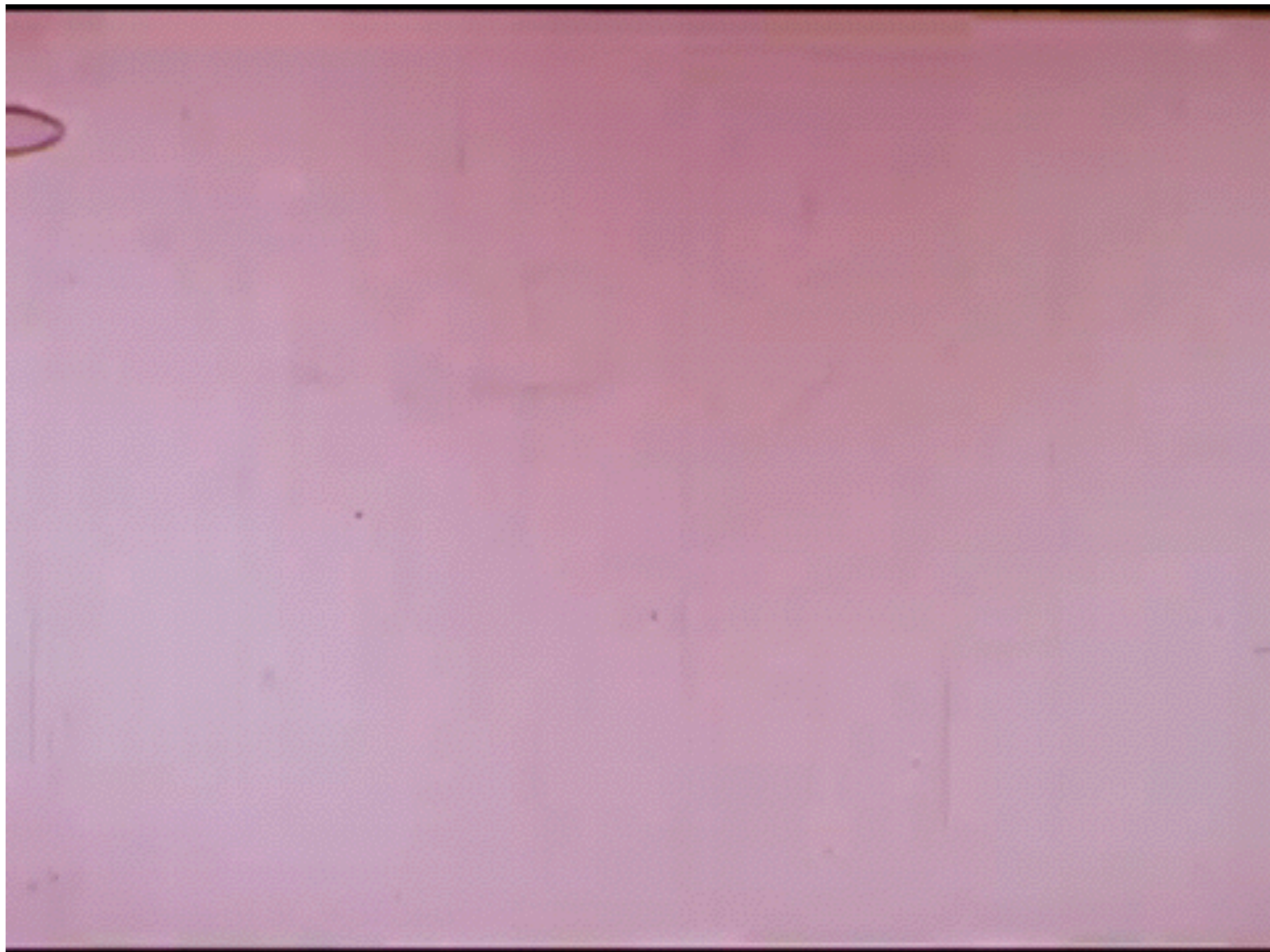
Breakthroughs

- For each of the following stories, think about:

  - Which specific kinds of intelligence behavior were achieved? In humans, would they be System 1 (automatic) or System 2 (conscious)?

  - How did the systems achieve this behavior? Could the operation of the system be plausibly analogous to the operation of the human brain?
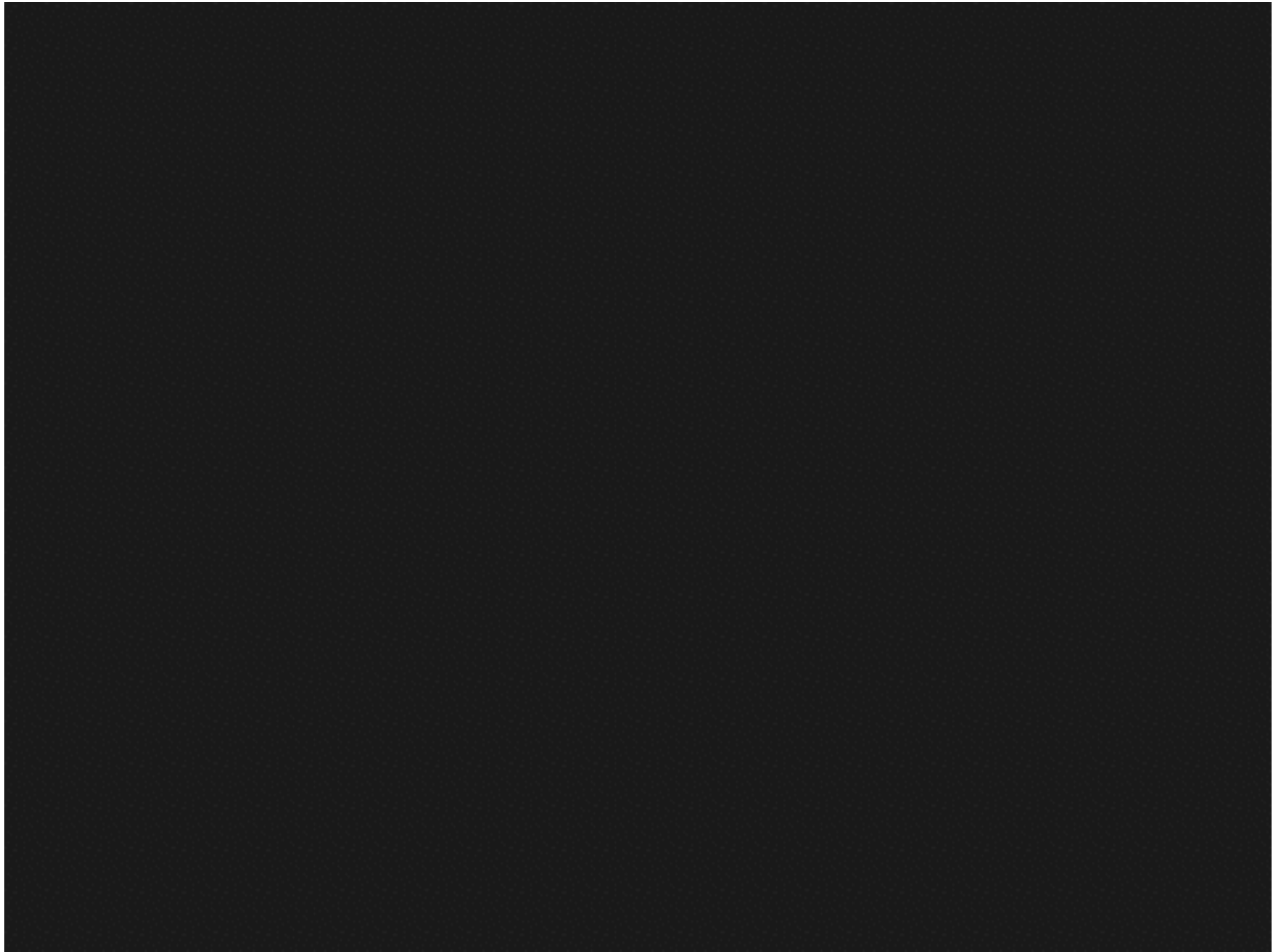
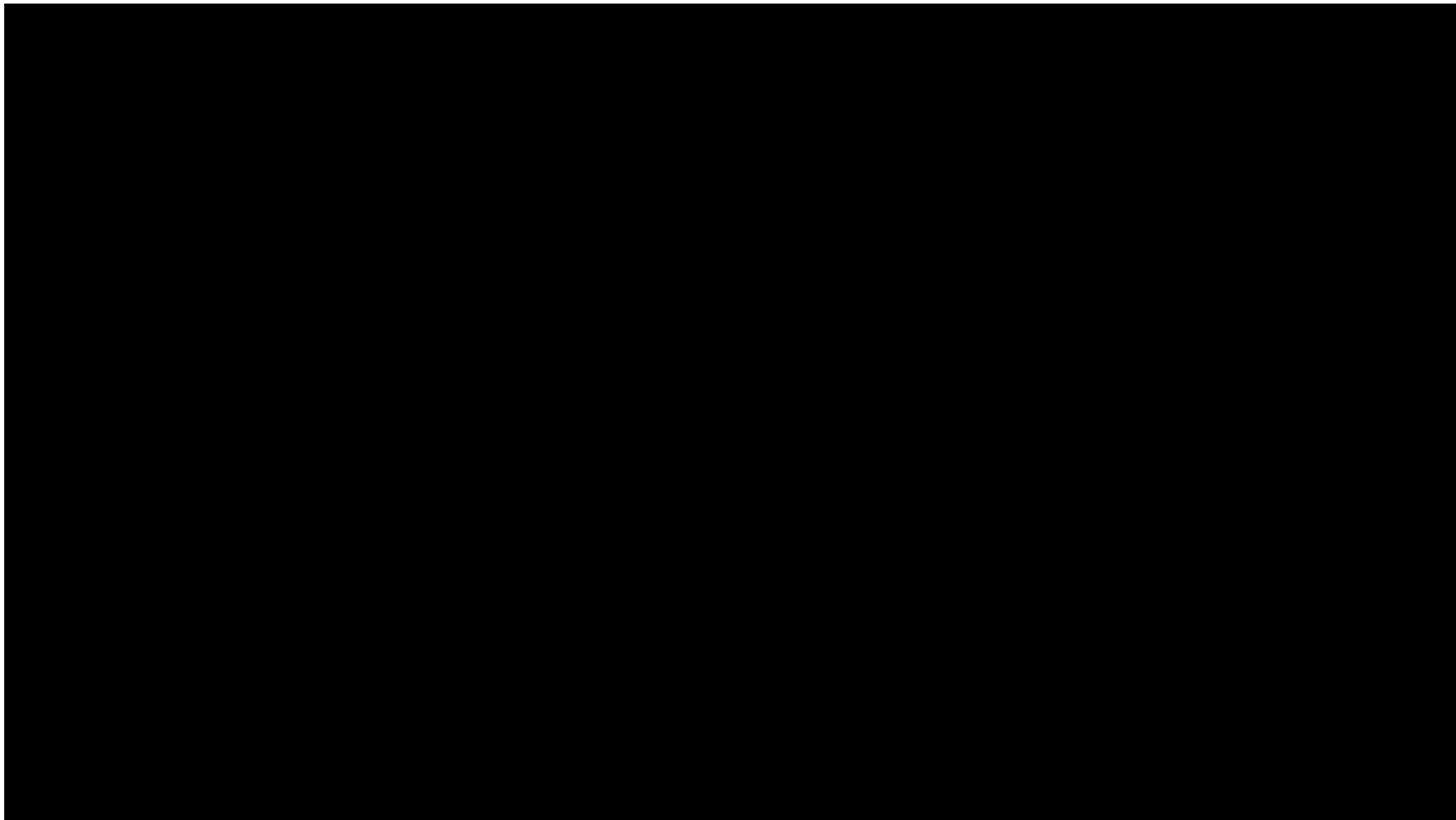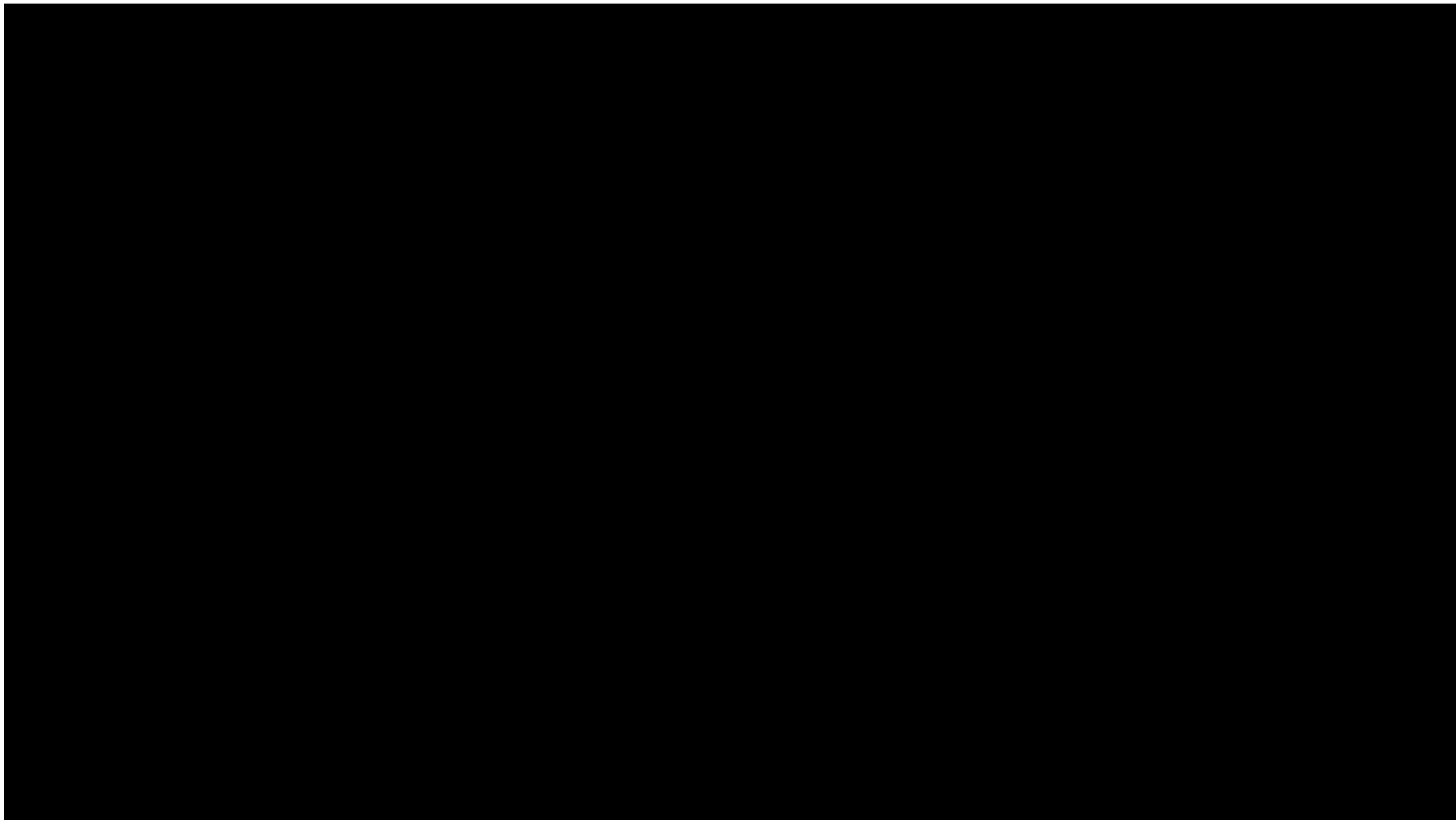# Shakey the Robot

1972

Deep Blue

1997

Stanley
2005

Watson

2011

The Assistant
2013

Syllabus

- Heuristic Search
  - Project: Othello Tournament
- Logical Reasoning
  - Project: Automated Planning
- Probabilistic Reasoning
  - Project: Email Spam Detection
- Machine Learning
  - Project: Face Recognition