

LECTURE 24:

OPEN PROBLEMS IN MACHINE LEARNING

December 11, 2017

SDS 293: Machine Learning

Overview

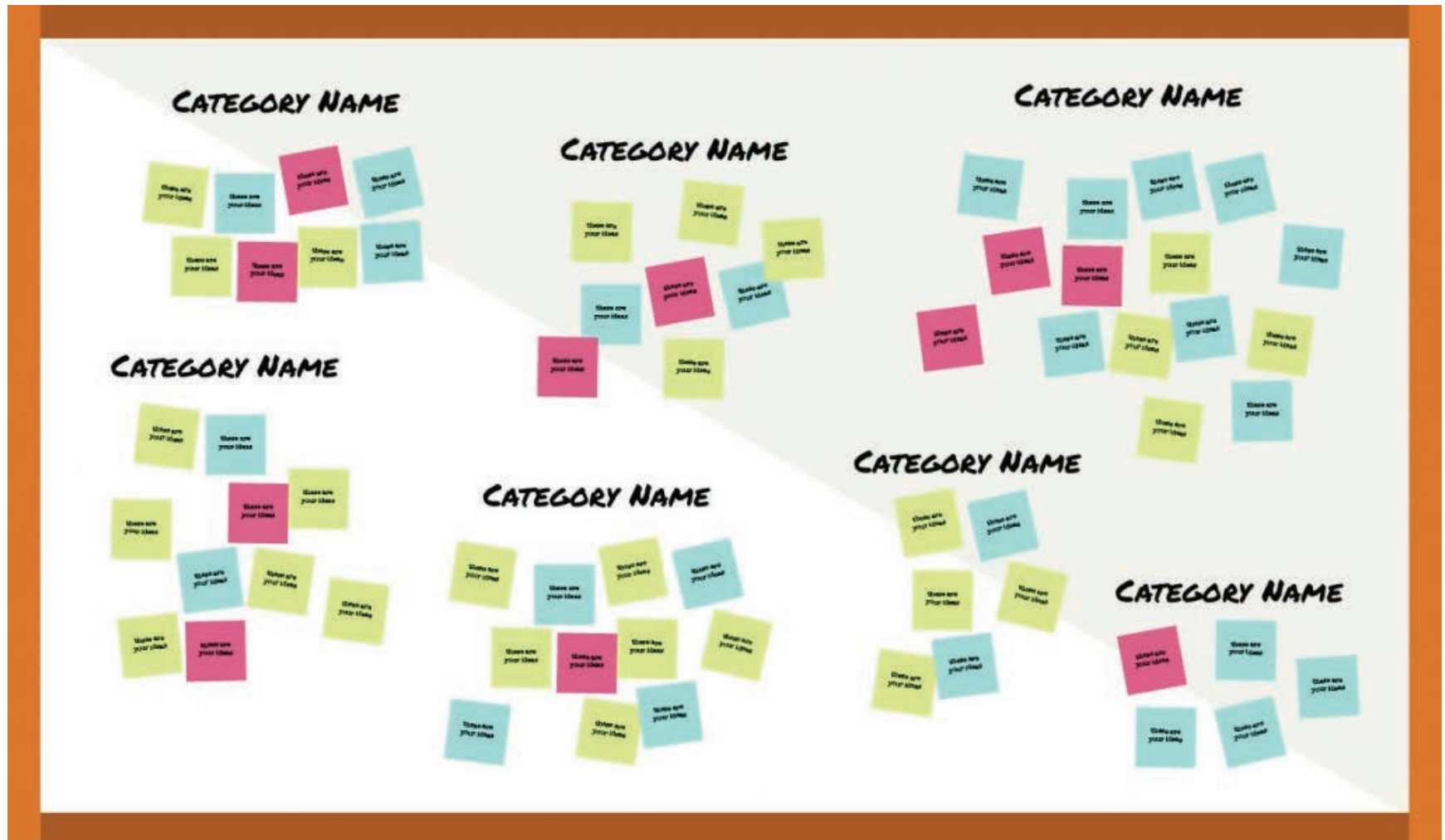
- Recap activity
- “AI Hard” problems
- Three big challenges

Recap activity (part 1)

- One useful / interesting thing you **learned**
- One thing you wish we'd **done differently**
- One **lingering question** you still have



Recap activity (part 2)



Discussion

What kinds of problems have we been **successful** at solving using ML?



“AI Complete” problems

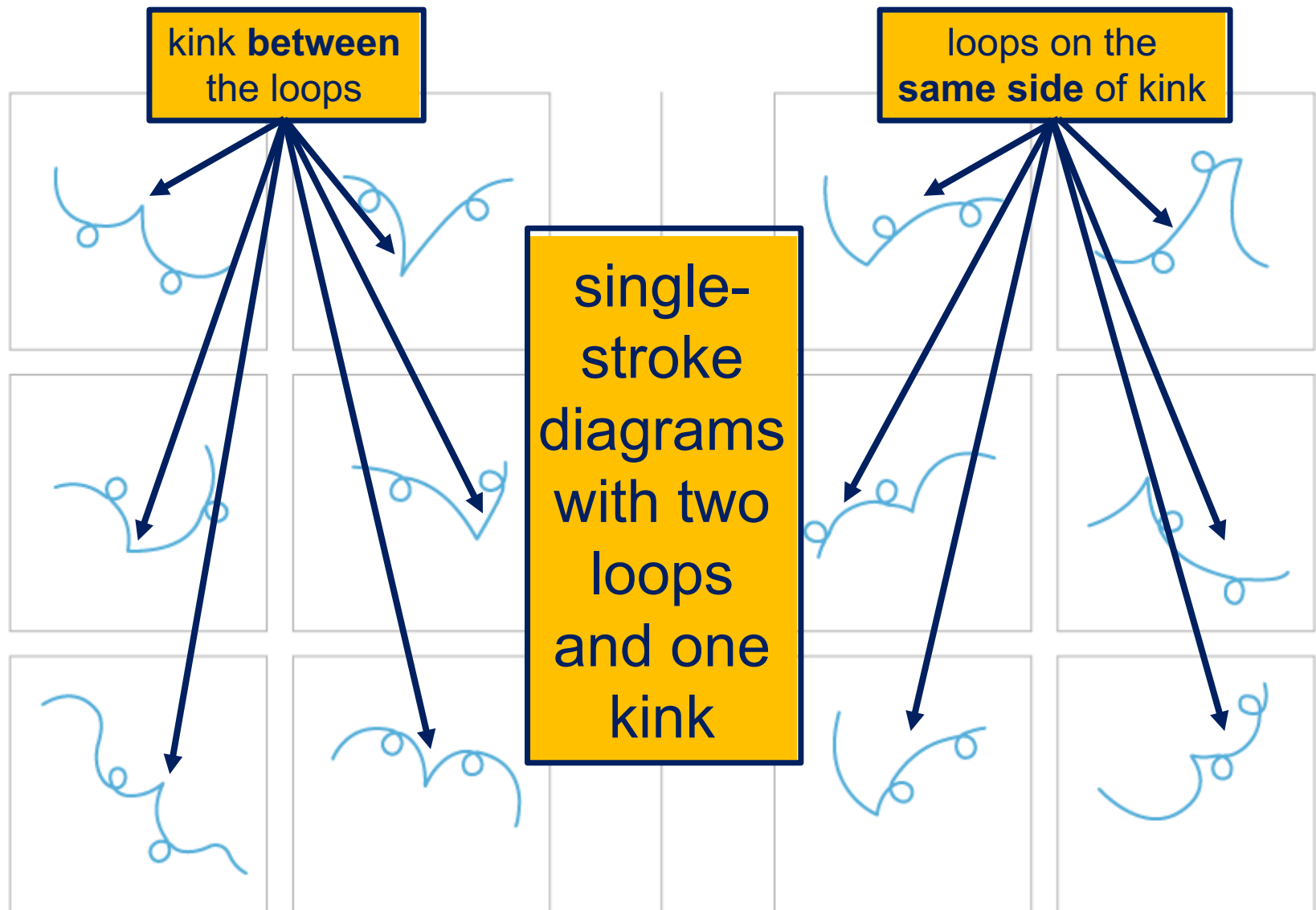


Bongard problems

- Russian computer scientist M. M. Bongard (1924 – 1971)
- **Big idea:** *pattern recognition* (esp. visual) is the foundation of mental processing
- *The Problem of Recognition* (1967) contained 100 visual puzzles as an appendix



Bongard problems



Bongard problems

Follow the rule

Don't follow the rule

65

12

47

38

96

29

53

26

93

19

68

37

2-digit
numbers

sum of digits is **odd**

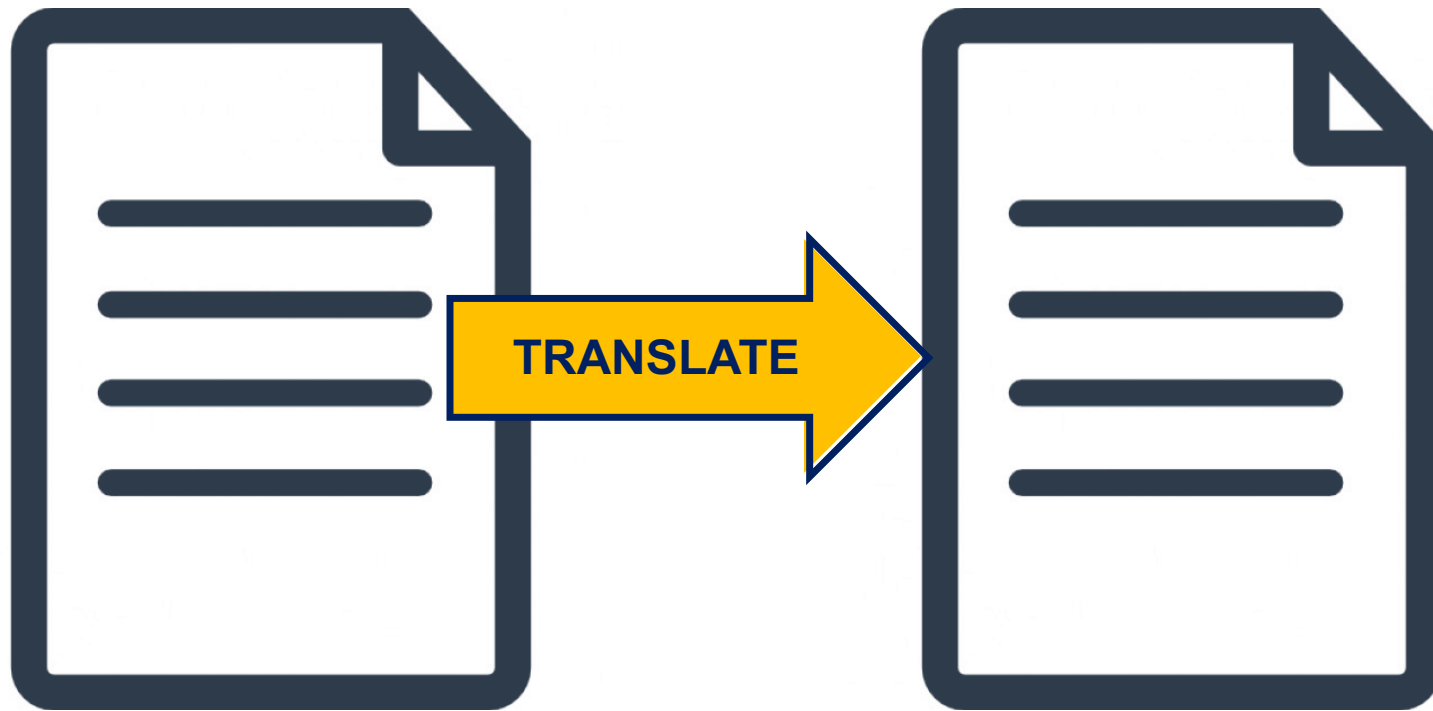
sum of digits is **even**

Discussion

What makes these
problems **hard**?



Machine translation



Source
Language

Destination
Language

Machine translation

“Y así,
del poco dormir
y del mucho leer,
se le secó el cerebro,
de manera que vino a
perder el juicio.”

- Miguel de Cervantes

“And so,
of the little to sleep
and of the a lot to read,
he it dried the brain,
of way what came to
lose the judgment.”

- Google Translate
(word by word)

Machine translation

“Y así,
del poco dormir
y del mucho leer,
se le secó el cerebro,
de manera que vino a
perder el juicio.”

- Miguel de Cervantes

“And so,
of the little sleep
and of much reading,
his brain dried up,
so he came to
lose his mind.”

- Google Translate

Machine translation

“Y así,
del poco dormir
y del mucho leer,
se le secó el cerebro,
de manera que vino a
perder el juicio.”

- Miguel de Cervantes

“Finally,
from so little sleeping
and so much reading,
his brain dried up and
he went completely out
of his mind.”

- Samuel Putnam

Discussion

What makes this
problem **hard**?



Computer vision

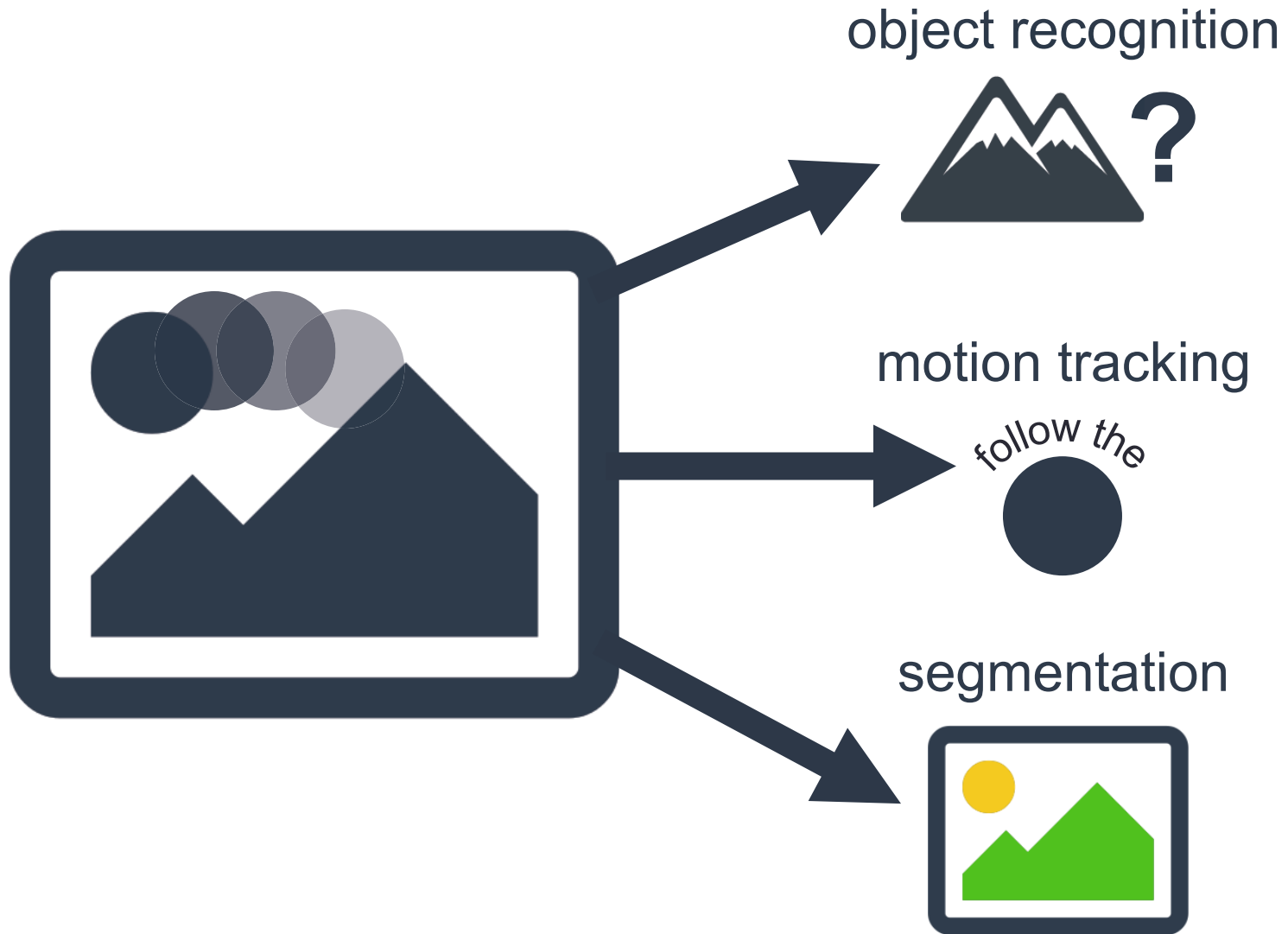


Image segmentation



Image segmentation

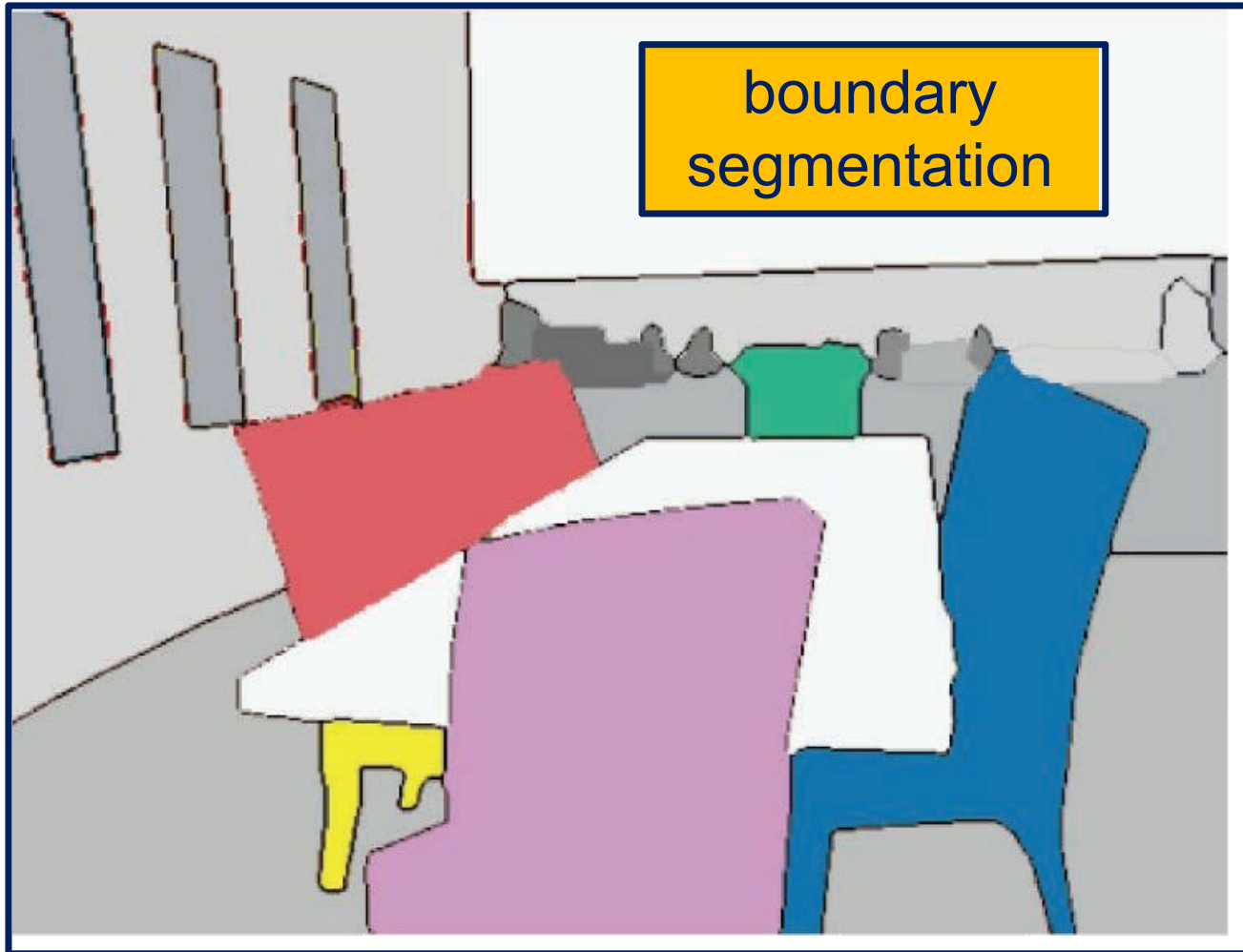


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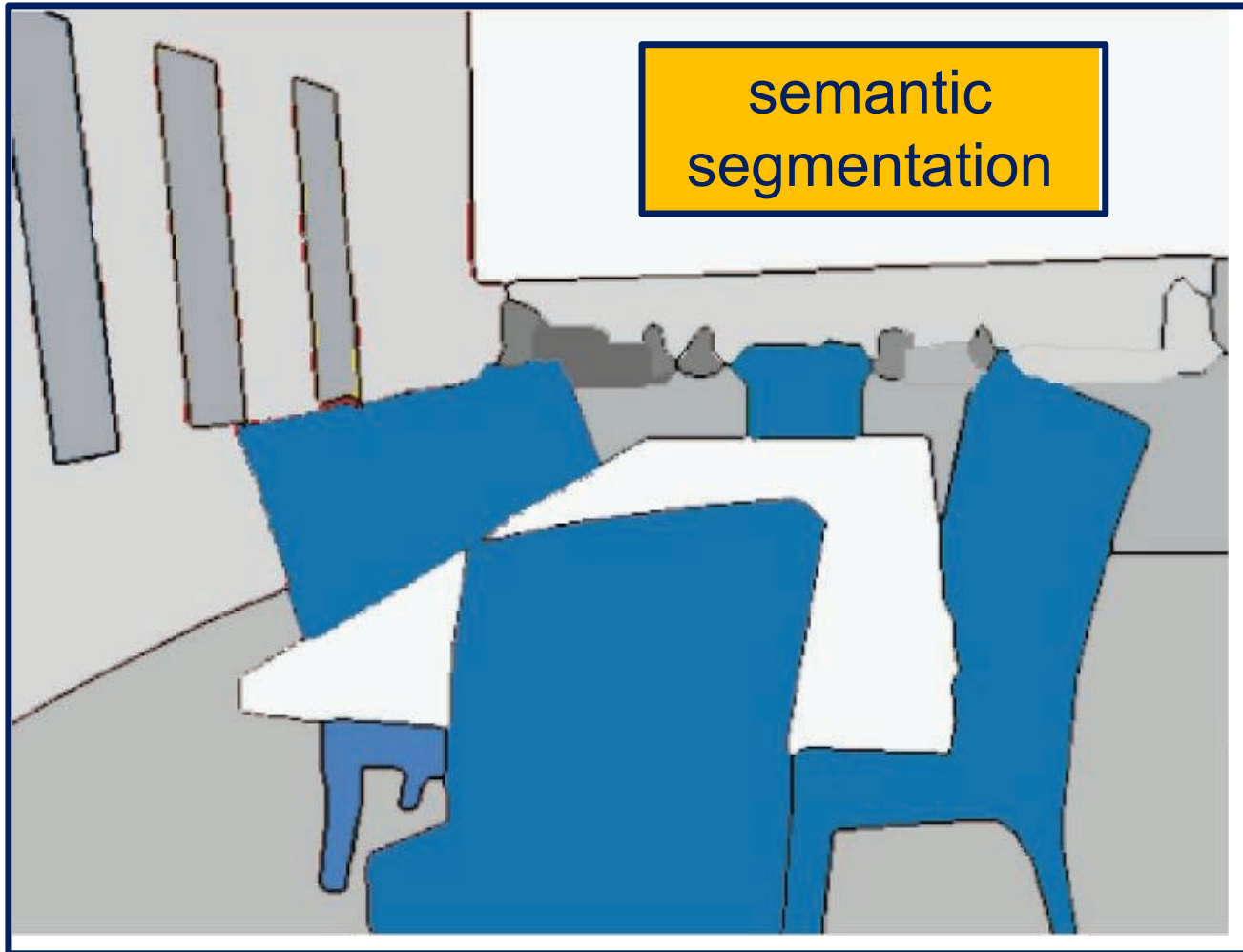
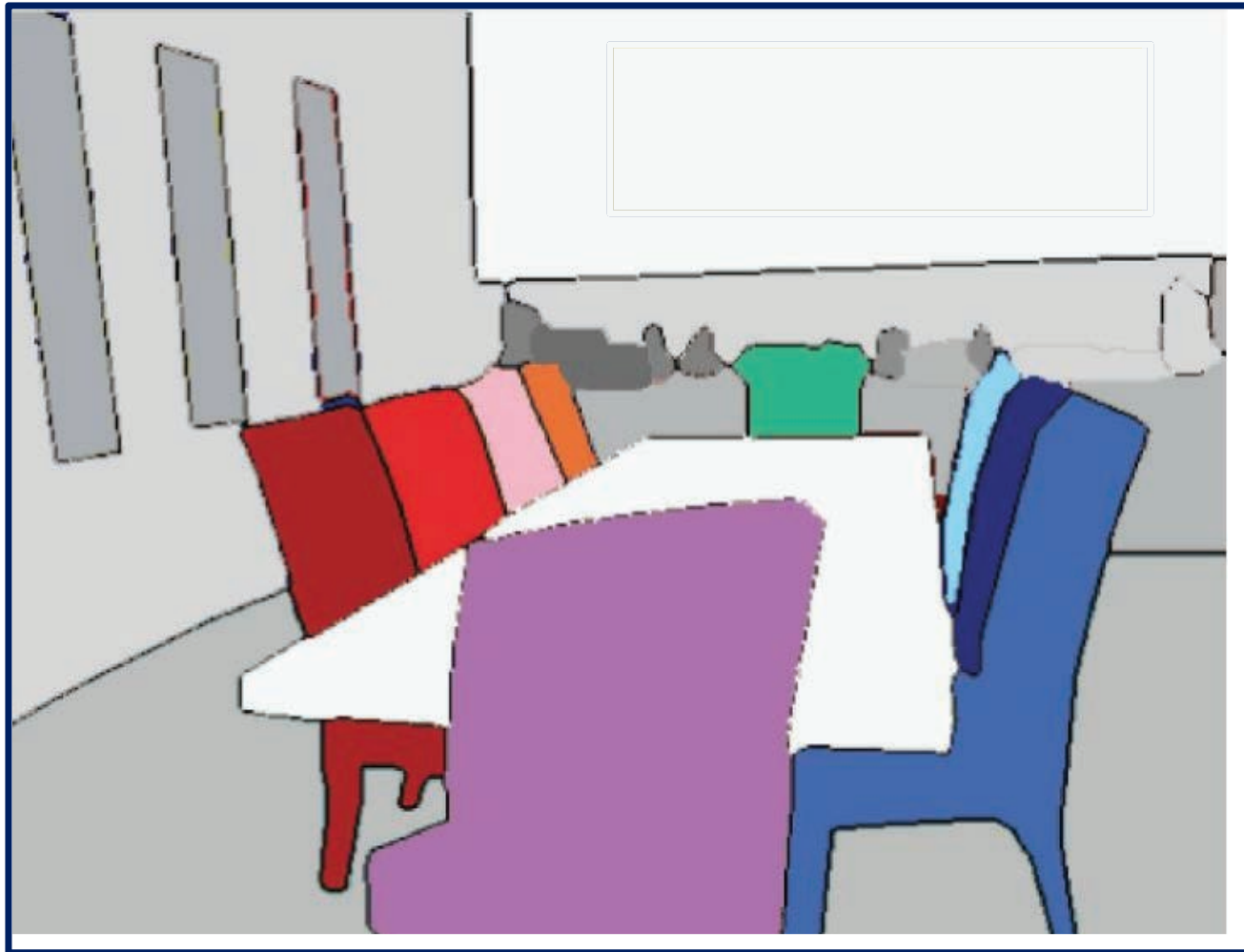


Image segmentation



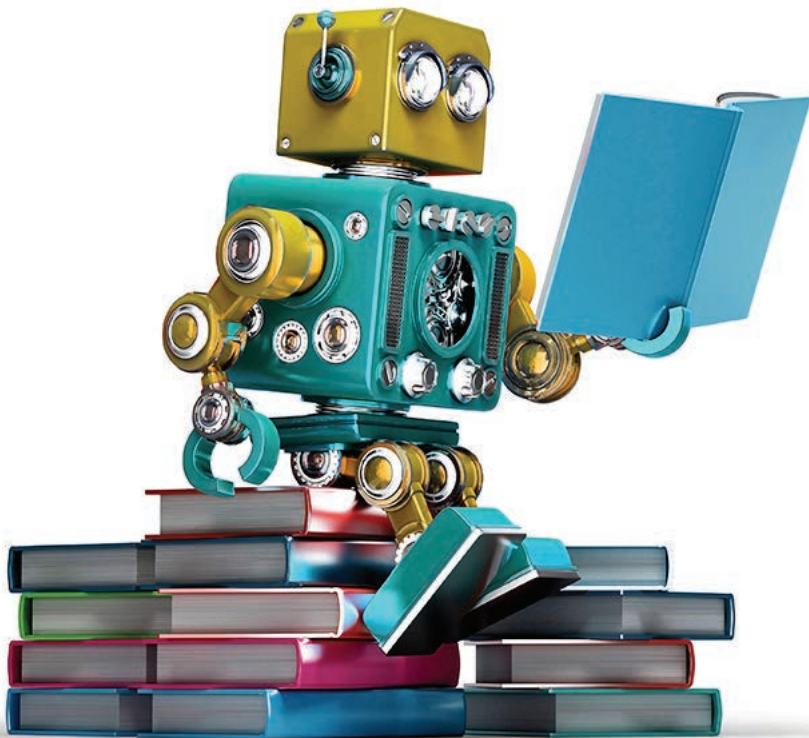
Discussion

What makes this
problem **hard**?



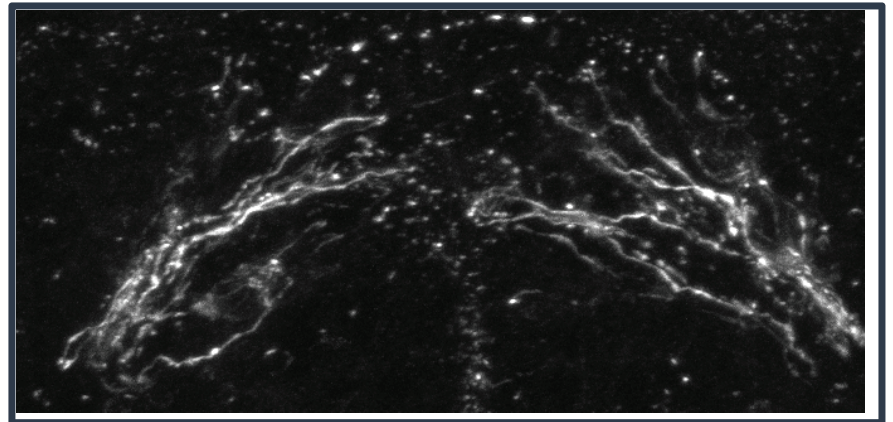
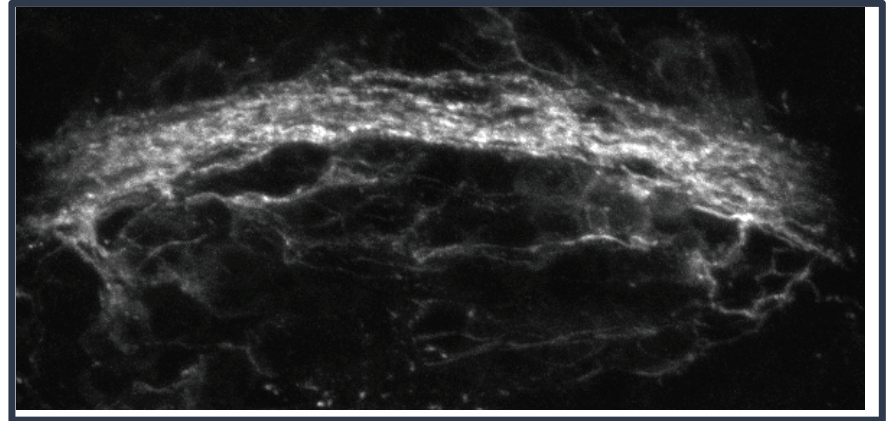
Big Challenges

Challenge 1: data scale

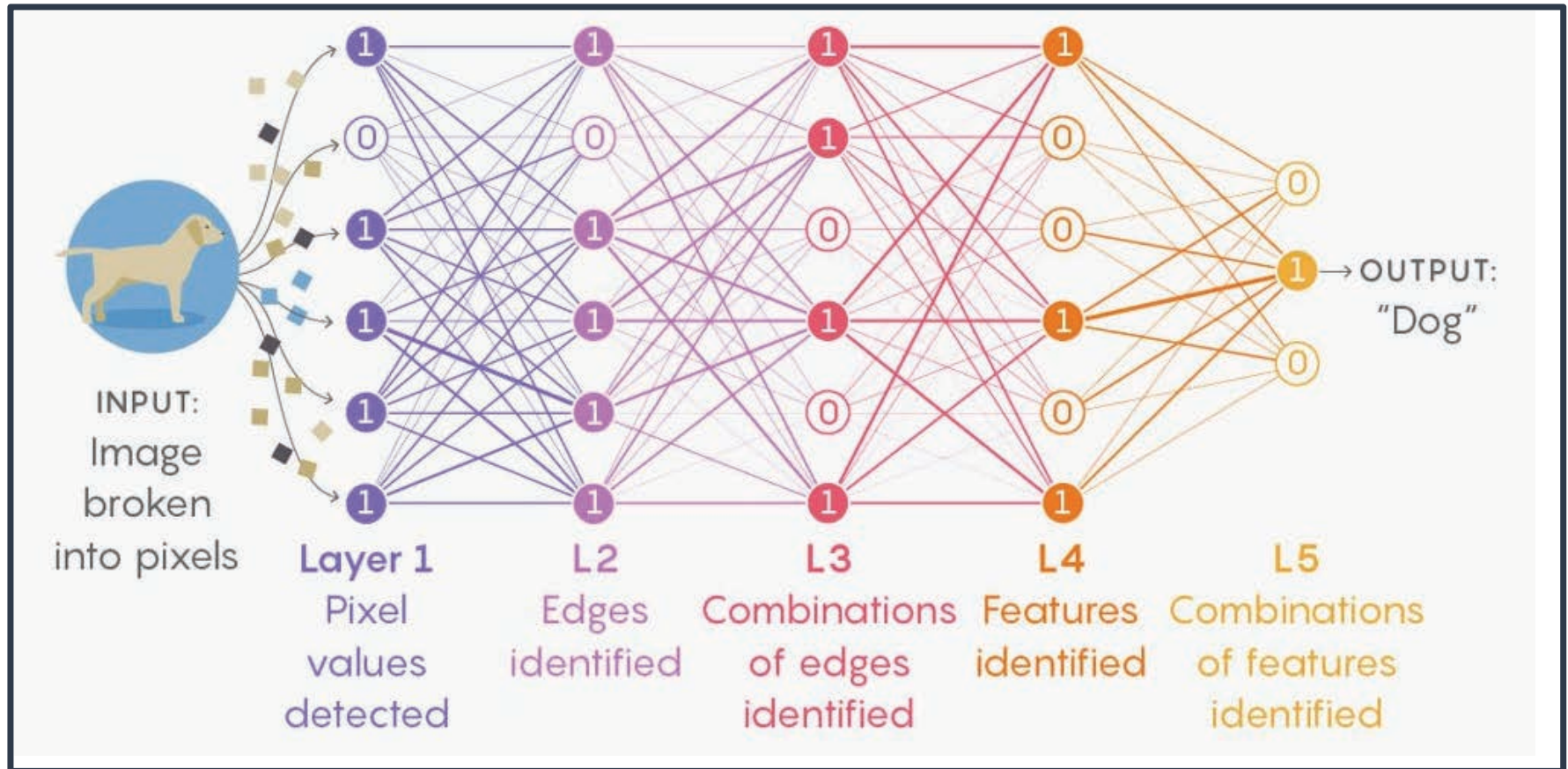


How many
observations
did your models
need to train on?

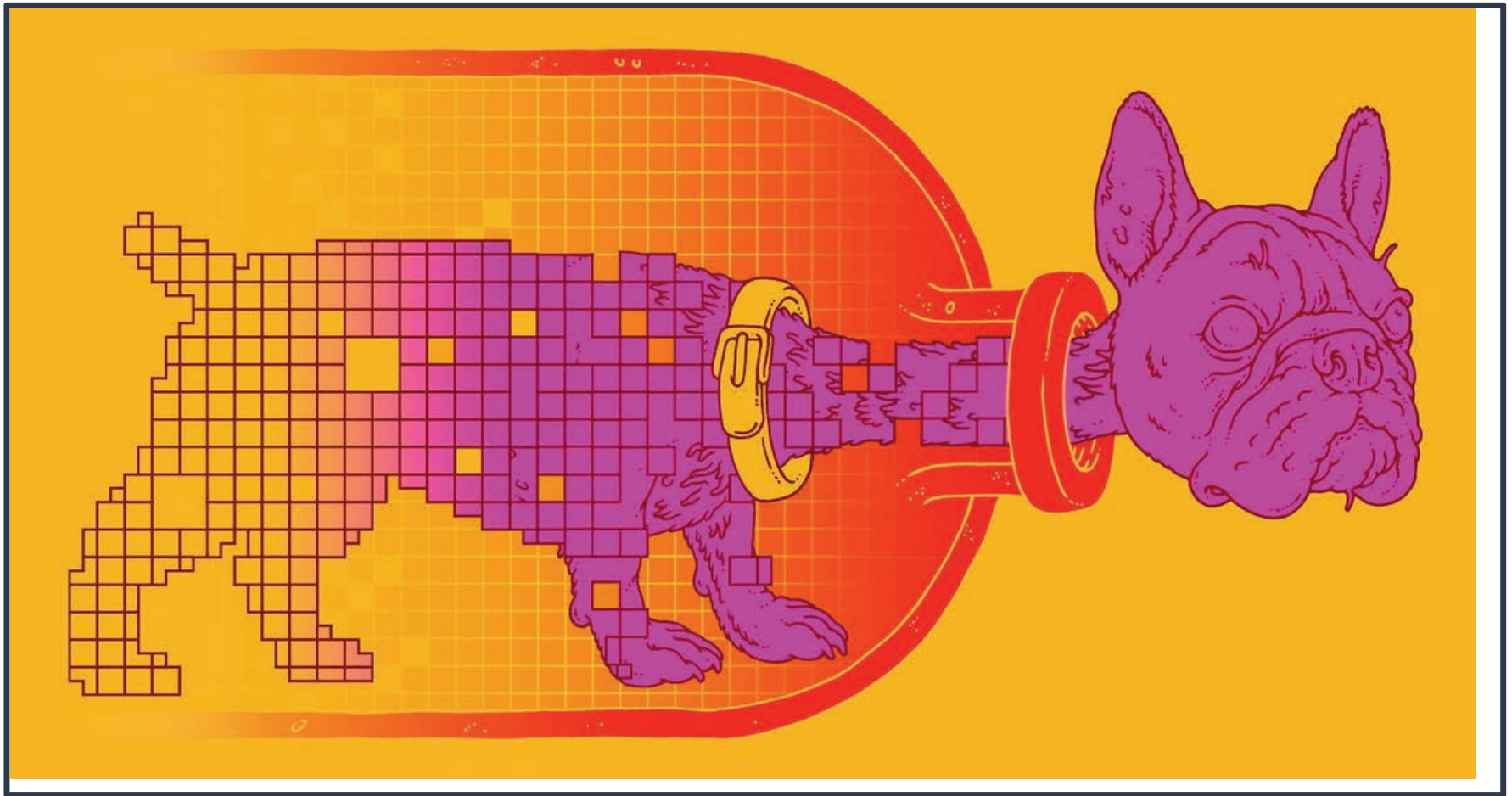
Challenge 2: specific tasks



Challenge 3: opaque learning process



Challenge 3: opaque learning process



Challenge 3: opaque learning process



In closing



✓ Understand what ML is (and isn't)



✓ Learned some foundational methods / tools



✓ Able to choose methods that make sense

Thanks for a great semester!



HUMAN COMPUTATION
& VISUALIZATION
LABORATORY

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