Public Libraries & AI

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LIBRARY OF MICHIGAN

2. How AI "Learns"

Series 1: How AI Works (For Non-Techies)

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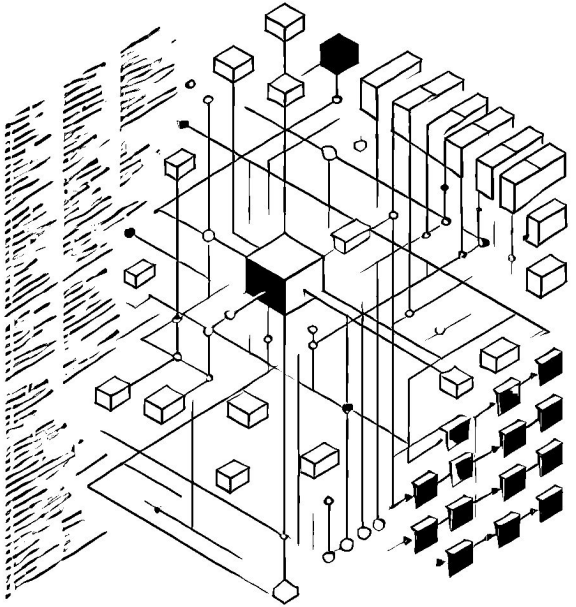
AI Training Overview

- AI is **not** programmed like traditional software
- AI does **not** store data like a traditional database
- Instead, AI "learns" by analyzing large amounts of data ("machine learning")
- AI contains facts and information "learned" from our language.

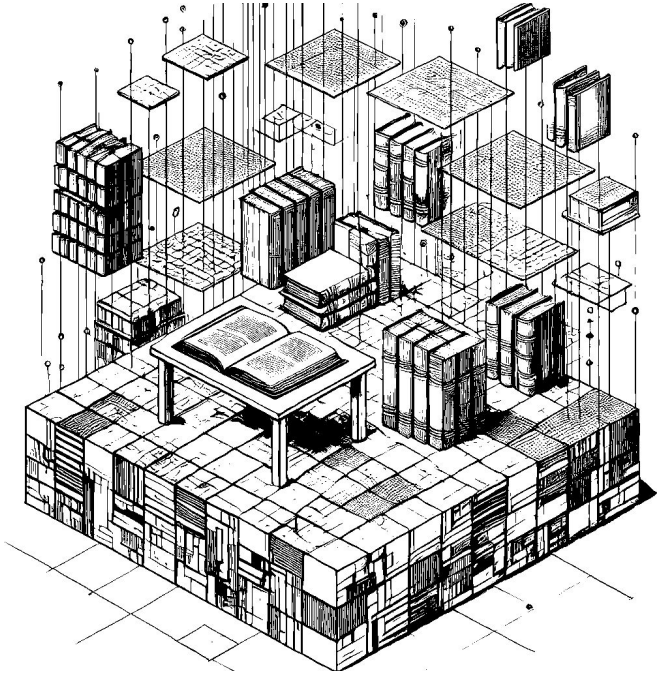
Traditional Software

- Rule-based, logical
- Predictable results: only does what's programmed to do
- Can't handle ambiguity, new tasks, etc.



Traditional Database / Knowledge Base

- Facts, data, information, knowledge, etc.
- Organized & categorized to human standards
- Examples:
  - **AUTHOR = 'Mo Willems'**
  - **Paris is the capital of France.**



Machine Learning

Software that analyzes past data to spot patterns and make predictions about future data

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"Machine Learning" Applications

- Email Spam Filters
- Speech Recognition
- Optical Character Recognition (OCR)
- Handwriting Recognition
- Facial Recognition
- "You May Also Like..." Recommendation Systems
- Autocorrect / grammar check
- Autocomplete / prediction

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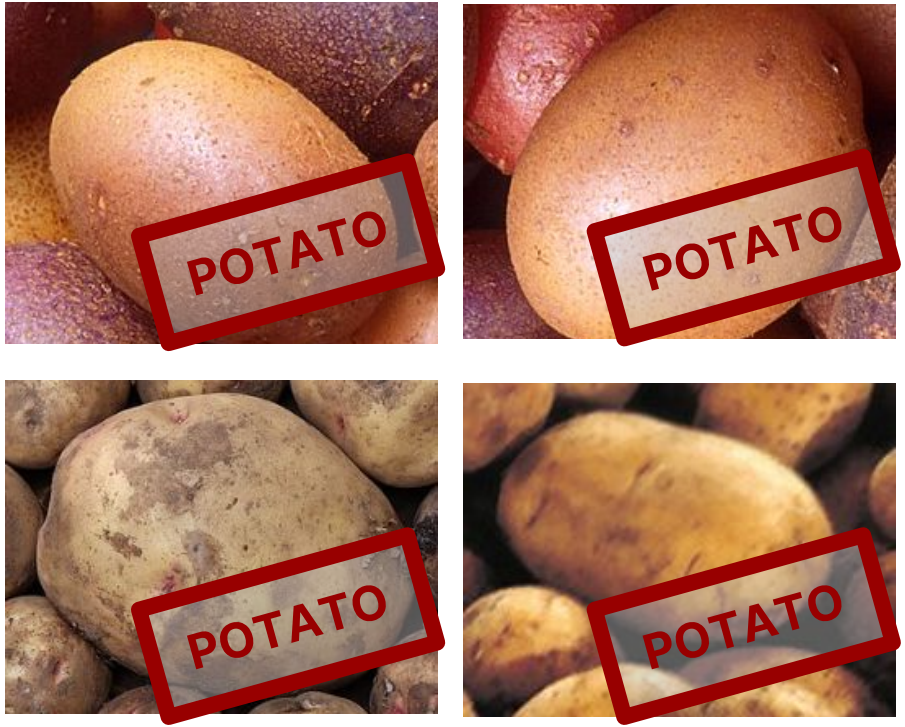
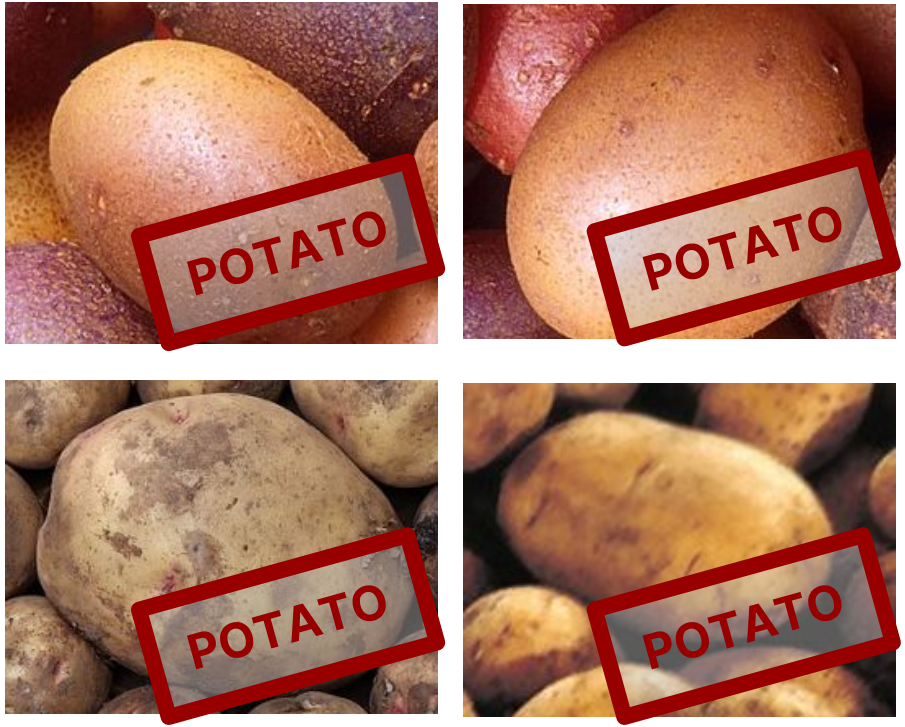
Machine Learning: Image Classification

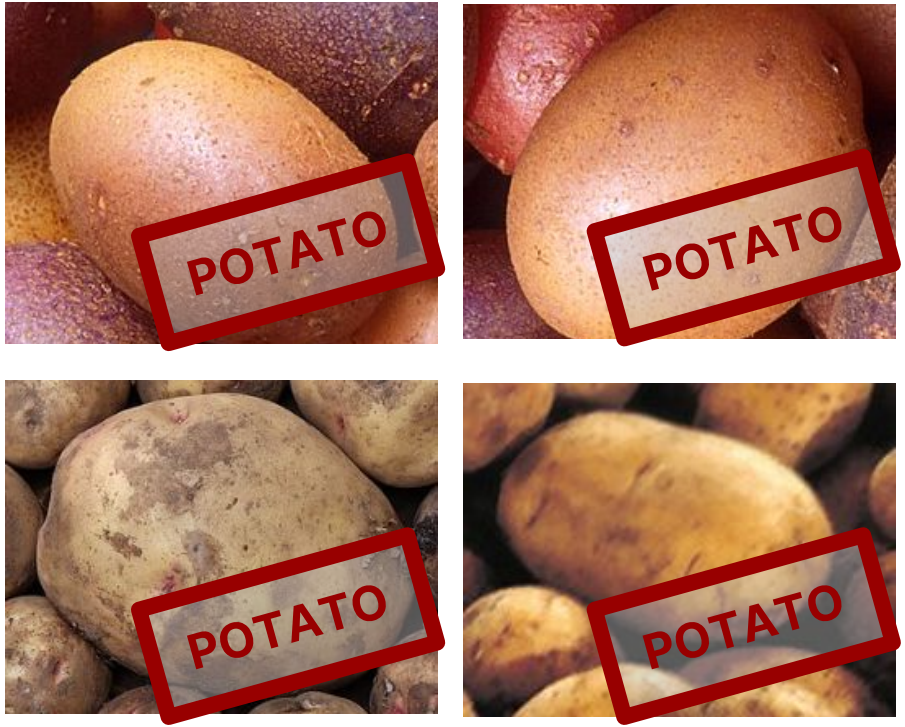


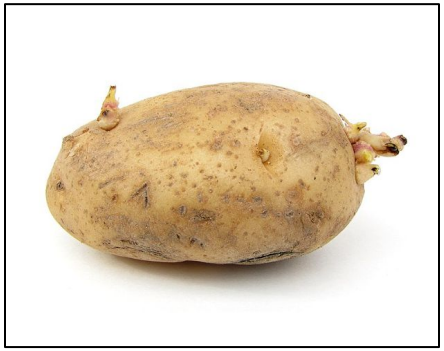
Machine Learning: Image Classification



Potato	98%
Not potato	02%

Machine Learning: Image Classification





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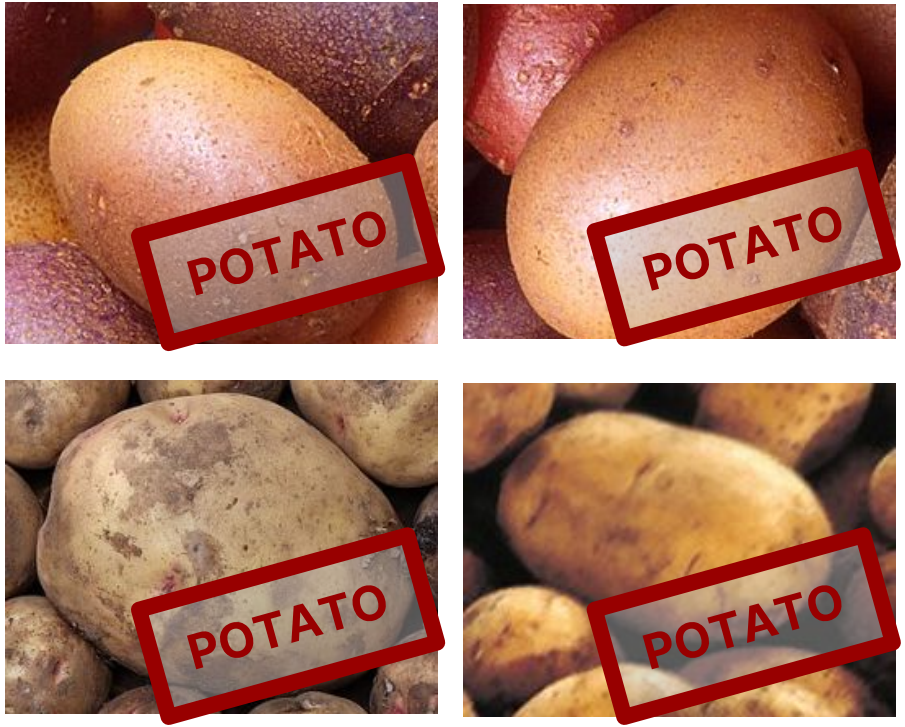
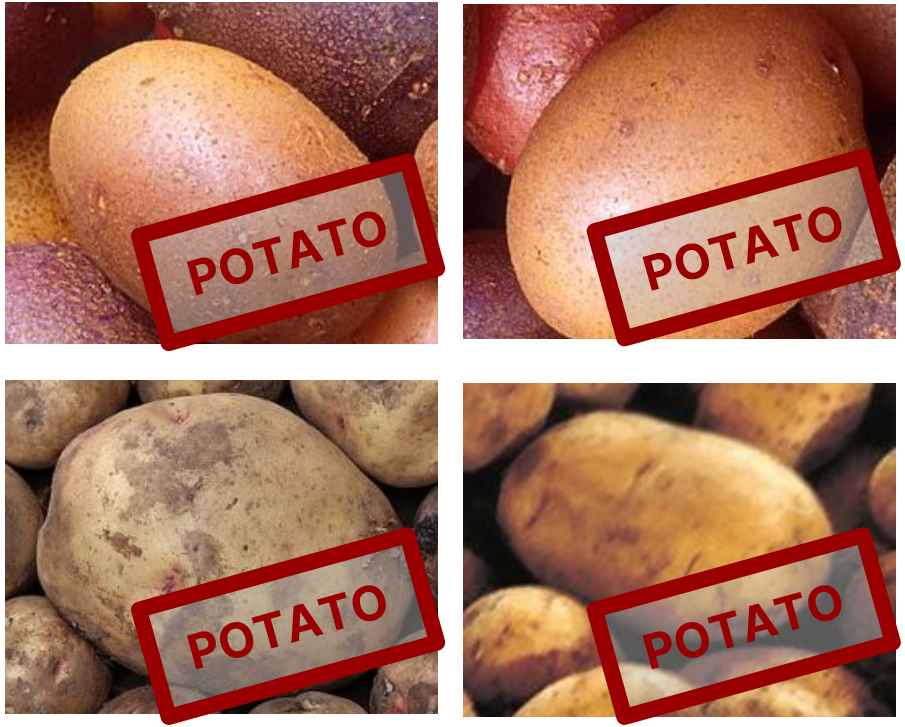
Not potato	04%

Machine Learning: Image Classification



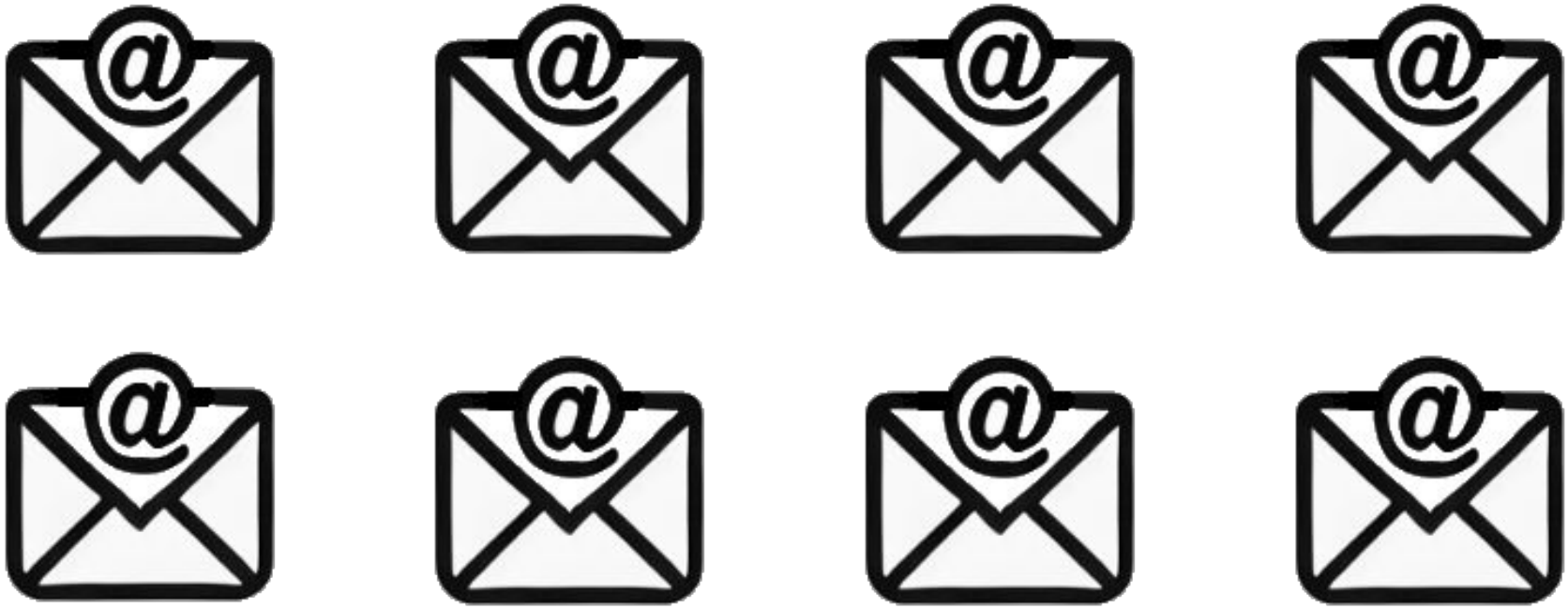
Potato	40%
Not potato	60%

Machine Learning: Image Classification



Potato	75%
Not potato	25%

Machine Learning: Email Spam



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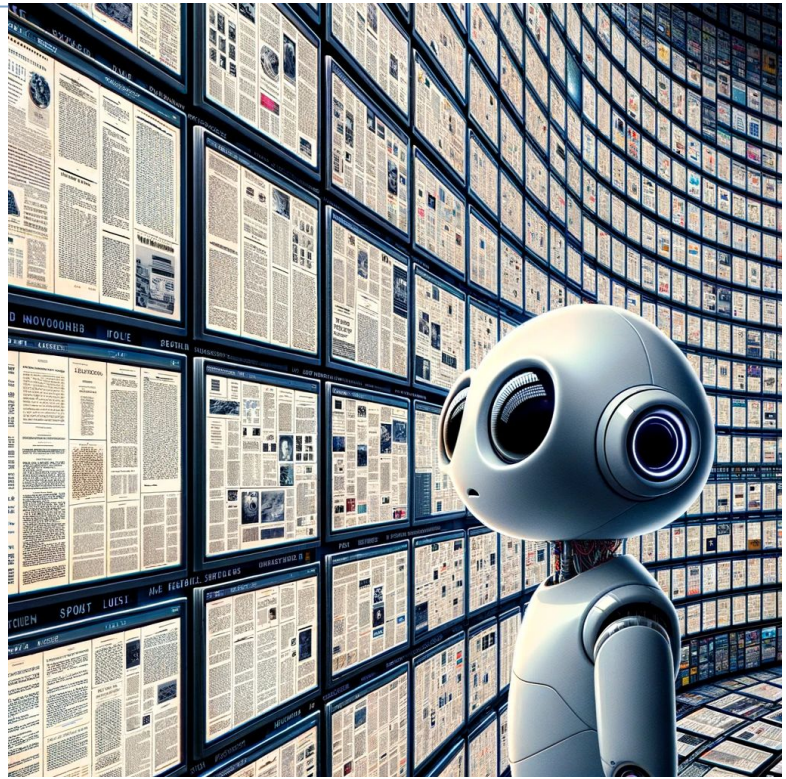
Machine Learning: Email Spam

AI Training Data

- AI is "trained" by providing it with large amounts of data to analyze.
- For a language/chat model, the system is trained on text. Image models are trained on images.
- (Is absorbing publicly-available but copyrighted data into an AI model a violation of copyright? The courts are currently deciding…)



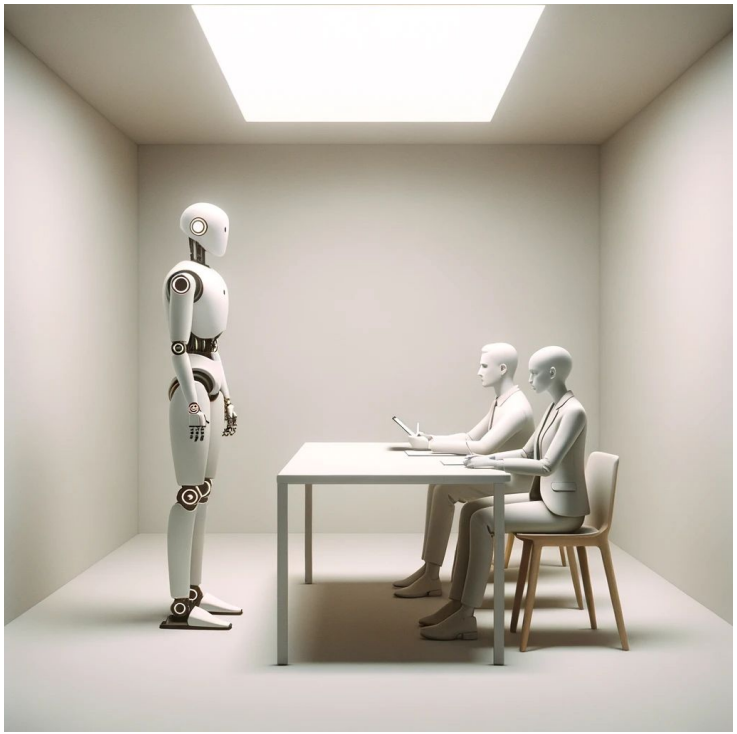
What is the AI "learning" from?

Source	Description
CommonCrawl	Public Web Crawler Data
Wikipedia	Online Encyclopedia
Reddit	Community Forums
PubMed	Medical / Biology Archive
GitHub public repos	Open Source Software Code
Project Gutenberg	Public Domain Book Archive
"Books1, Books2, Books3"	Pirate / Shadow Libraries

In AI terms, this collection of data is called a "training corpus"

Learning With Human Feedback

- Human AI trainers test the AI and “grade” the responses
- They steer it towards more appropriate and valuable responses
- The AI model adjusts based on this feedback, like a student correcting mistakes



OpenAI has faced controversy for hiring underpaid humans in developing nations for this work

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Reinforcement Learning for Human Feedback ("RLHF")

An AI training method where humans shape an AI's behavior by rewarding positive output that matches human expectations.

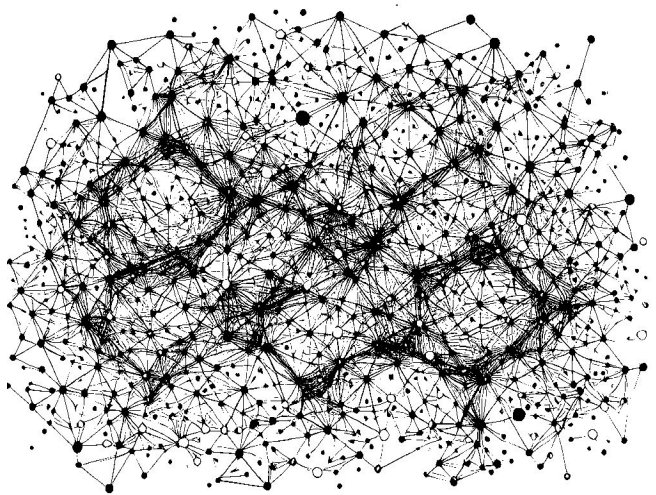
Relationships and Connections

- Language, images, other data transformed into numbers
- "Semantic search" understands meaning & context
- Involves a LOT of math!

This is probably the most technical slide in the video and it's still over-simplified about a thousand times.

Large Language Model

- Doesn't understand anything; **no "knowledge"**
- Only analyzing **patterns** of data in human language samples.
- Dynamic results can vary based on **probabilities**



Traditional Database vs Large Language Model

Traditional Database

english_word	spanish_word
left	izquierda
leg	pierna

Traditional Database vs Large Language Model

Traditional Database

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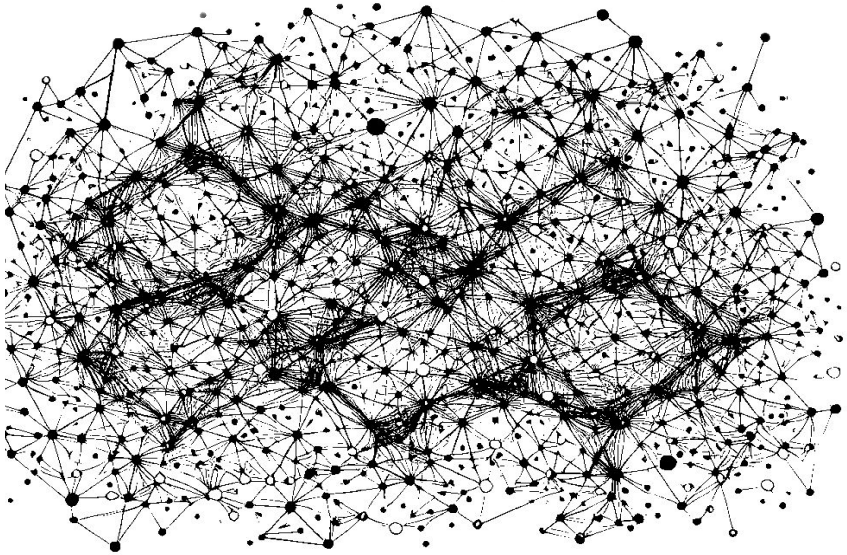
Large Language Model



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AI (might have) learned from...

- 22 different English-Spanish bilingual dictionaries written over the past hundred years
- 4,758 glossaries from various "Intro to Spanish" courses
- 10 different linguistics doctoral theses describing the historical development of names for body parts
- 8 passionate arguments on Reddit about whether "pierna" and "leg" truly capture the same linguistic concept.
- 8,952 translated exercise blog posts about "skipping leg day"
- 3,264 TV show closed-caption transcripts for translated shows

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Traditional Database vs Large Language Model

Traditional Database

english_word	spanish_word
left	izquierda
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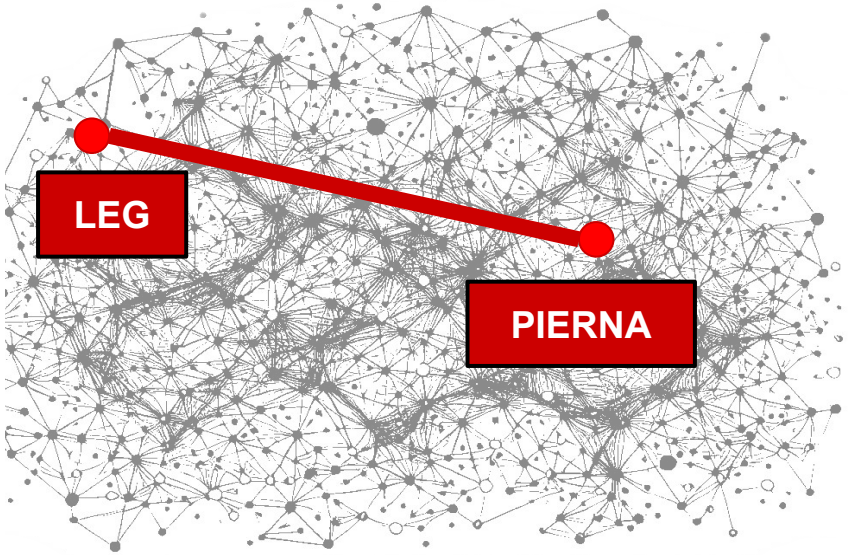
Large Language Model



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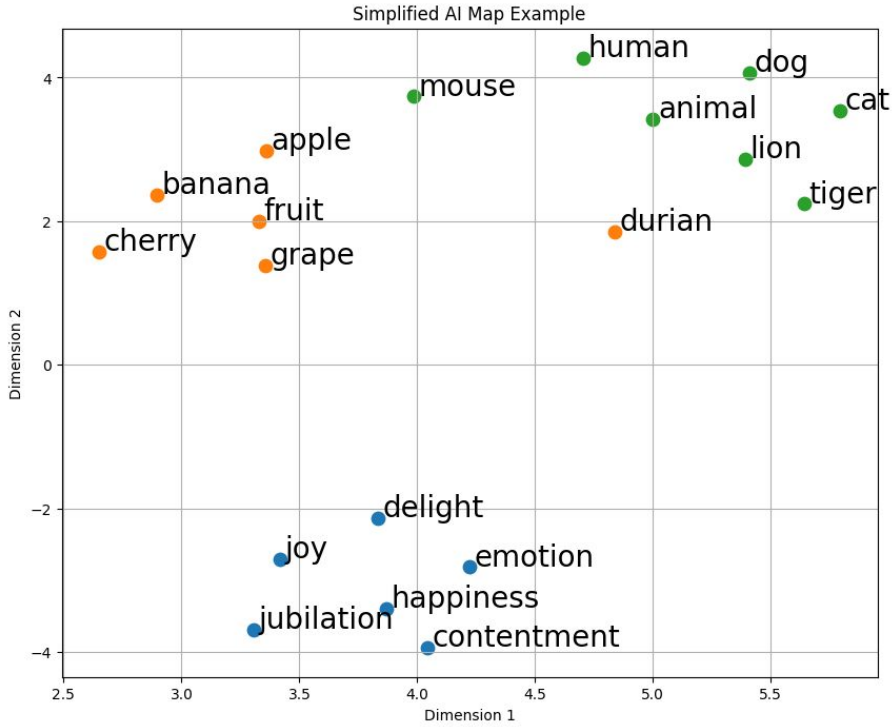
Simplified LLM Example



Uses python sentence-transformers with all-MiniLM-L6-v2 and KMeans clustering

Example: Traditional vs. AI

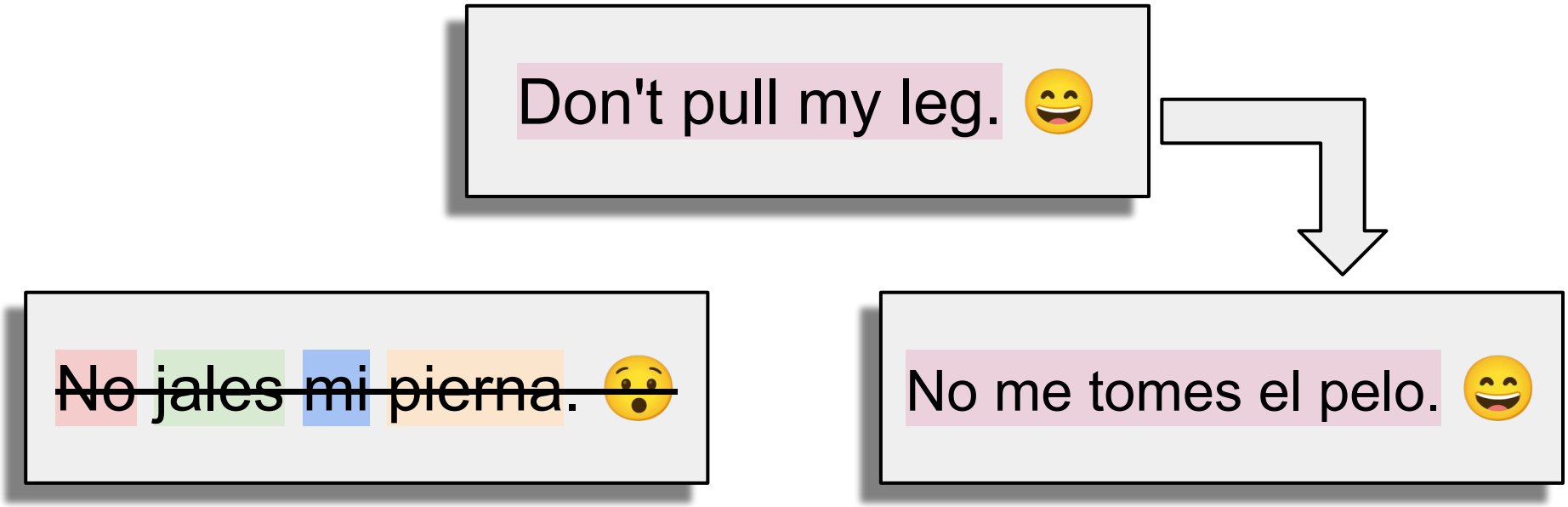
Don't pull my leg. 😄

Example: Traditional Translation

Don't pull my leg. 😄

No jales mi pierna. 😮

Example: AI-based Translation



Limitations of AI: Context and Knowledge

- Struggles with missing context
- Only knows what it was "trained"

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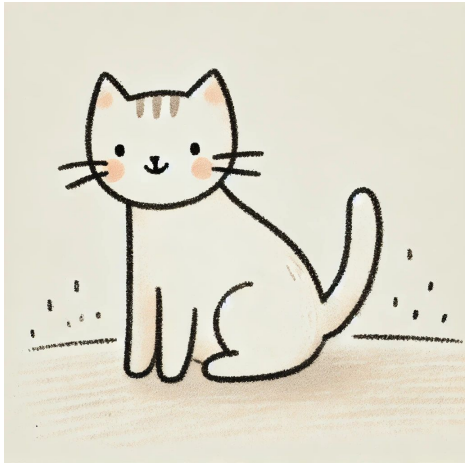
Limitations of AI: Context and Knowledge

- Struggles with missing context
- Only knows what it was "trained"
- Can make hard-to-spot mistakes. And other mistakes.



DOG

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Coming up...

- Why context is so important with AI
- Understanding prompts and responses

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Optional Activities

- If you (or a colleague) speak multiple languages, compare an AI translation of a passage with slang, idioms, and/or humor vs. a typical dictionary translation.
- Try testing some recent patron reference questions on an AI chat tool to check accuracy!

Thanks for watching!