

How Deep Learning and NLP Answer Consumers' Complex Questions

Dr. Catherine Havasi



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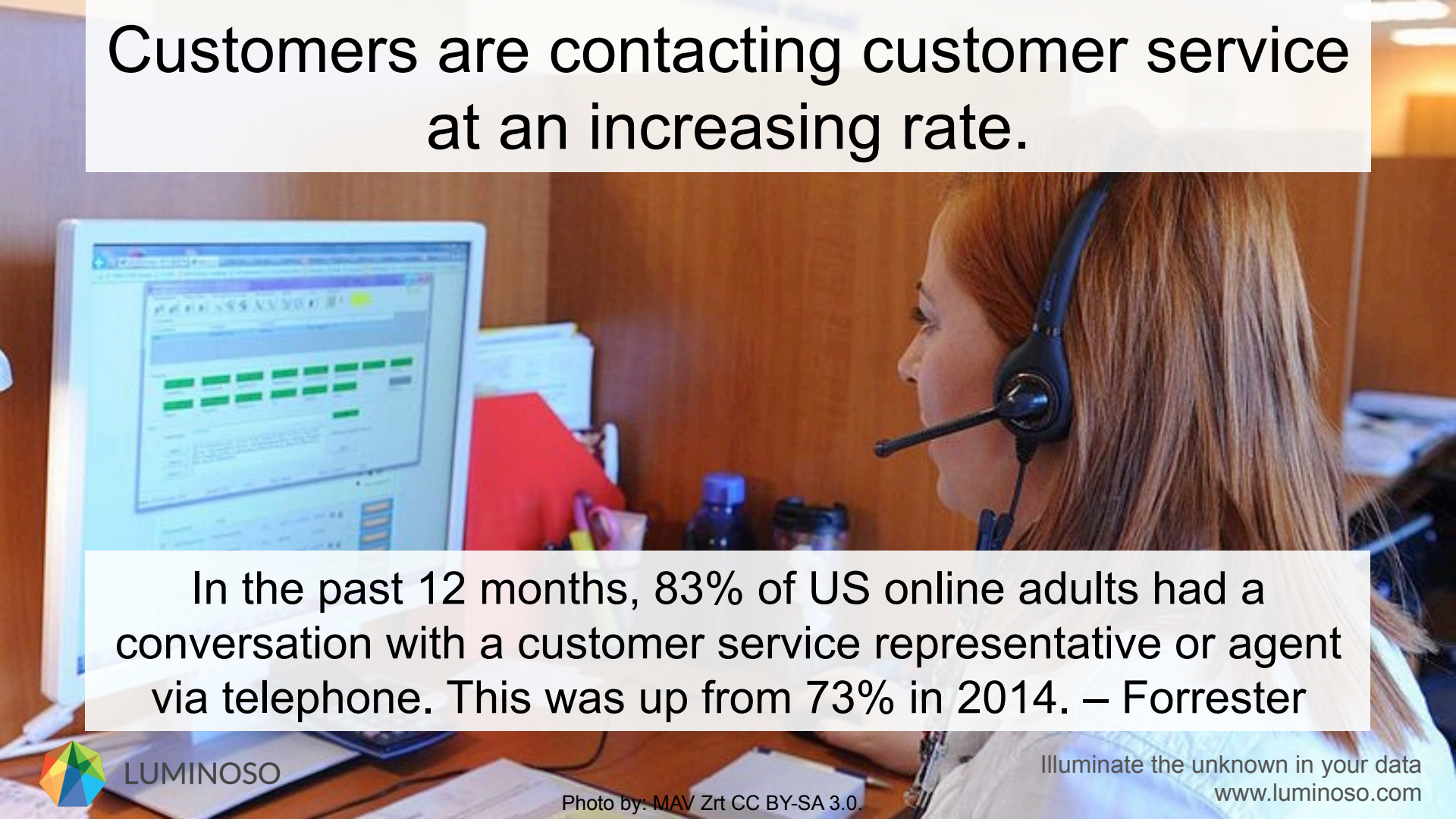
We make products that **transform**
the way **enterprises** **interpret** and
act on customer, employee, and
social conversations.



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Customers are contacting customer service at an increasing rate.

A woman with long blonde hair is shown in profile, wearing a black headset with a microphone. She is looking at a computer monitor which displays a web application with a grid of green buttons. The background is a wooden wall. The scene is lit with warm, indoor lighting.

In the past 12 months, 83% of US online adults had a conversation with a customer service representative or agent via telephone. This was up from 73% in 2014. – Forrester



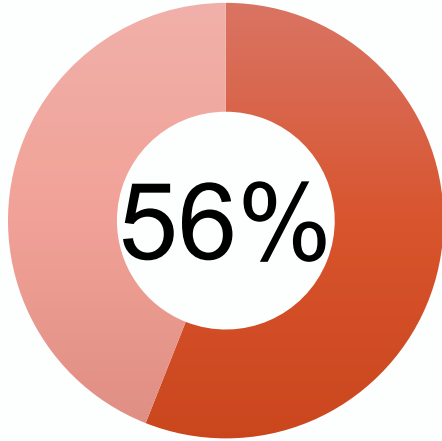
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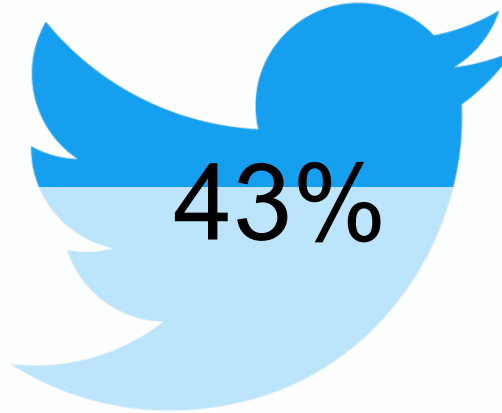
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Good news!

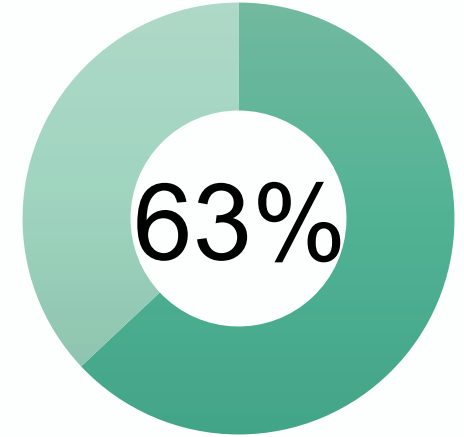
Customers are also increasingly do-it-yourselfers!



tried to resolve their issue by leaving a message on an online forum or community. This was up from 50% in 2014 and 31% in 2012.



tweeted at a company's support handle on Twitter to resolve an issue. This was up from 37% in 2014 and 22% in 2012.



used voice self-service (either touchtone or speech recognition) to contact a company's support center.



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But customers' questions are hard...



And they already failed at self-help!



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“How do consumers’ views
on distribution channels
change as you consider
healthier lifestyle choices?”



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“What indicates that offering a promotion to a consumer will alleviate churn risk during a difficult customer service interaction?”



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Understanding language is hard.

“No one in your retail stores can tell me why I’m getting nickled and dimed!”

“My payment didn’t go through!”

“I do not understand the charges on my bill. Cancelling next year.”



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Advances have transformed language understanding.



1960s

Pattern Matching
& Keywords



1990s

Rule Sets &
Ontologies



2000s

Unsupervised
ML (Bayes)



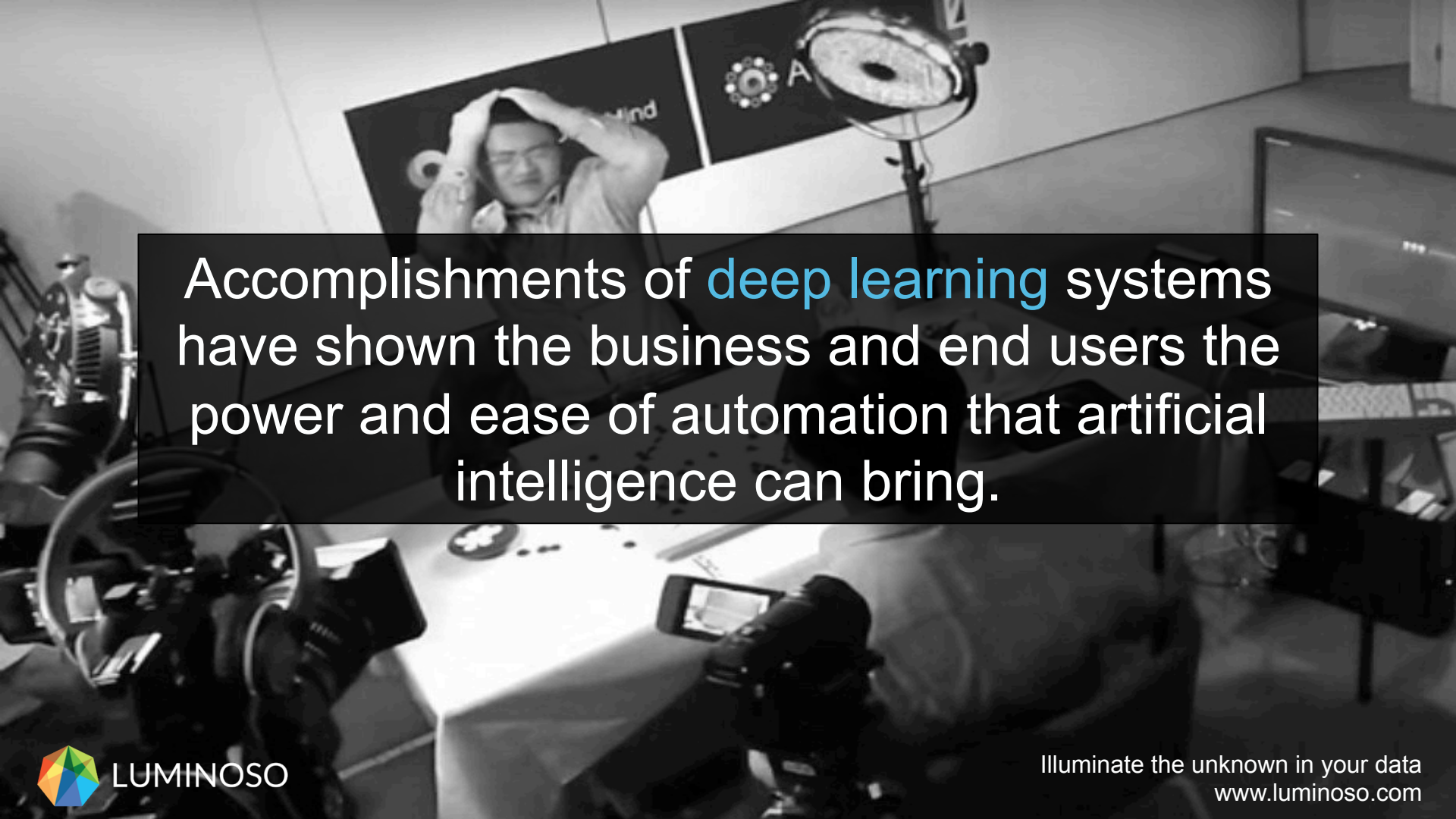
2010s

Word Embeddings
("Deep Learning")

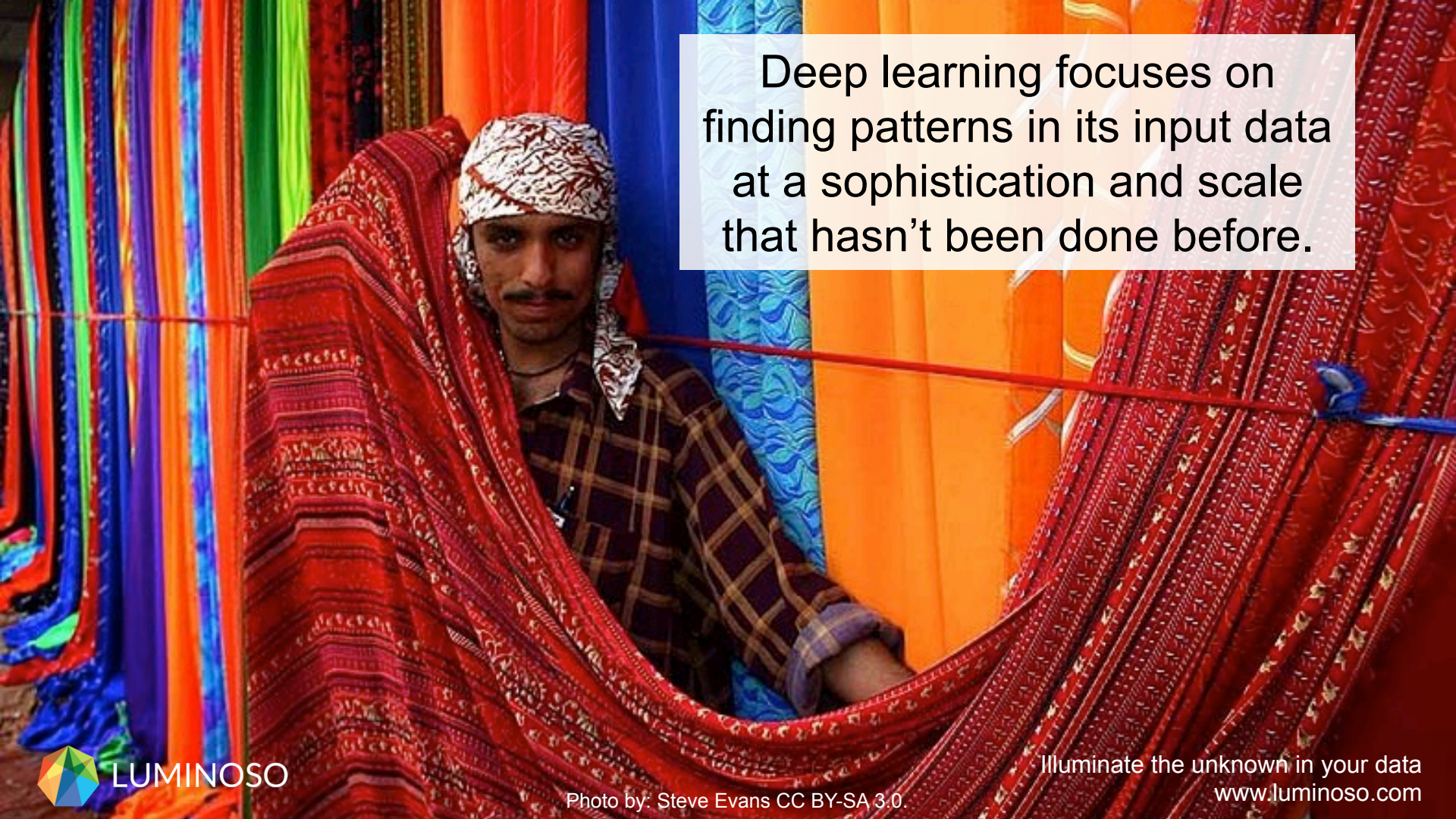


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A black and white photograph of a man in a lab coat holding his head in his hands, suggesting frustration or stress. In the background, there is a large medical light and a poster featuring a person's face and the word "Mind".

Accomplishments of **deep learning** systems have shown the business and end users the power and ease of automation that artificial intelligence can bring.

A man with a mustache, wearing a white and red patterned headscarf and a purple and brown plaid shirt, is seated and weaving a vibrant red textile with intricate patterns on a loom. The background is filled with various colorful fabrics in shades of orange, blue, and green. A semi-transparent white box with a subtle pattern is overlaid on the upper right portion of the image.

Deep learning focuses on finding patterns in its input data at a sophistication and scale that hasn't been done before.

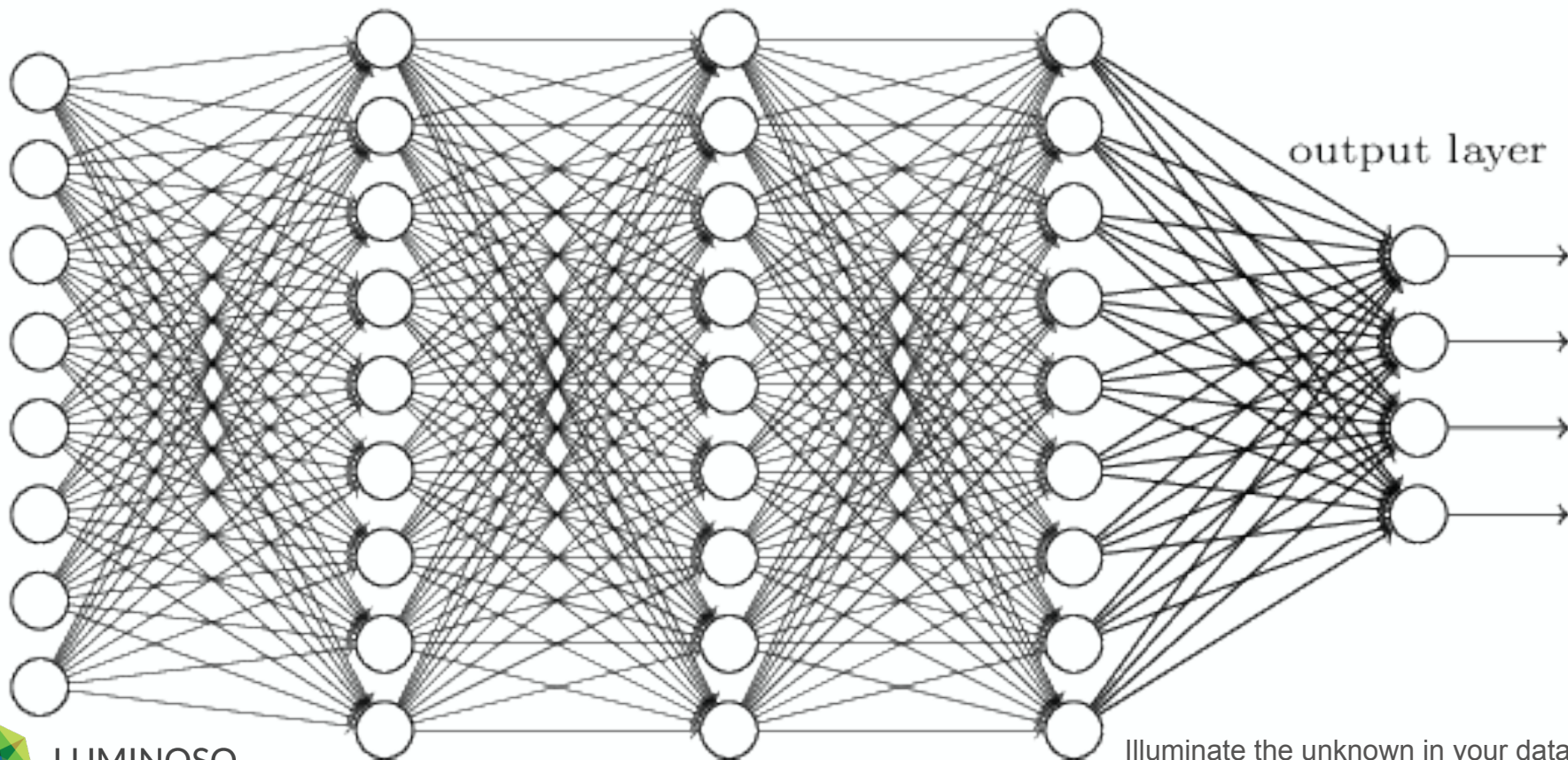
input layer

hidden layer 1

hidden layer 2

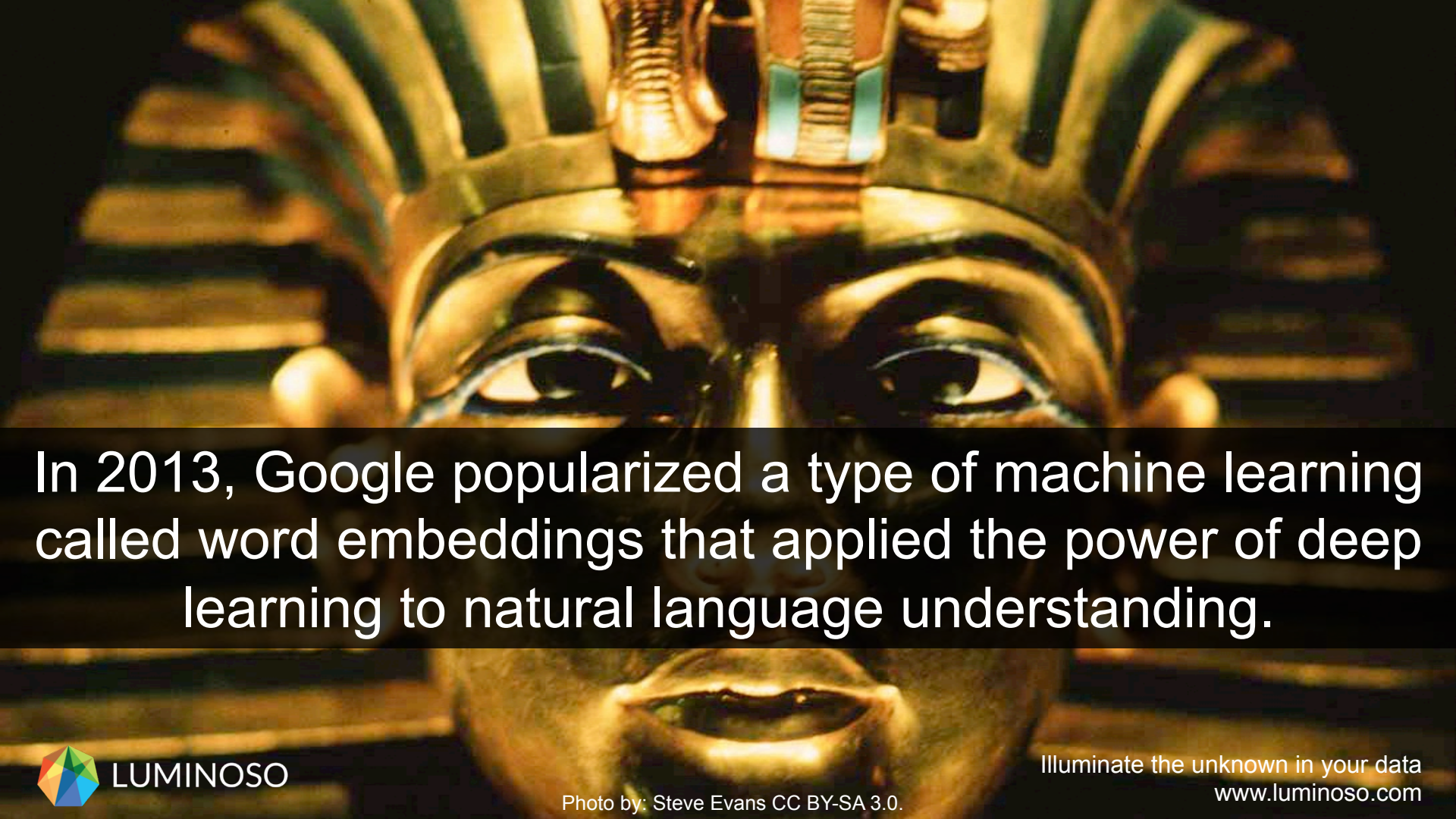
hidden layer 3

output layer



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In 2013, Google popularized a type of machine learning called word embeddings that applied the power of deep learning to natural language understanding.



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Could deep learning be the key to language understanding?



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For natural language understanding to be successful, it must be:



Multilingual &
Global



Adaptable



Unbiased &
Ethical



Explainable



Automated



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The flaw in deep learning is that it requires more data, time, and compute than is practical in most circumstances.



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A collection of various hand-painted ceramic items, including bowls, plates, and vases, arranged on a patterned rug. The items feature vibrant, abstract designs in shades of blue, purple, green, and yellow. Some items are stacked, while others are placed individually. The background shows a wooden chair and a patterned cushion, suggesting a rustic or bohemian setting.

This flaw exists because the model must learn from scratch each time it learns anything.

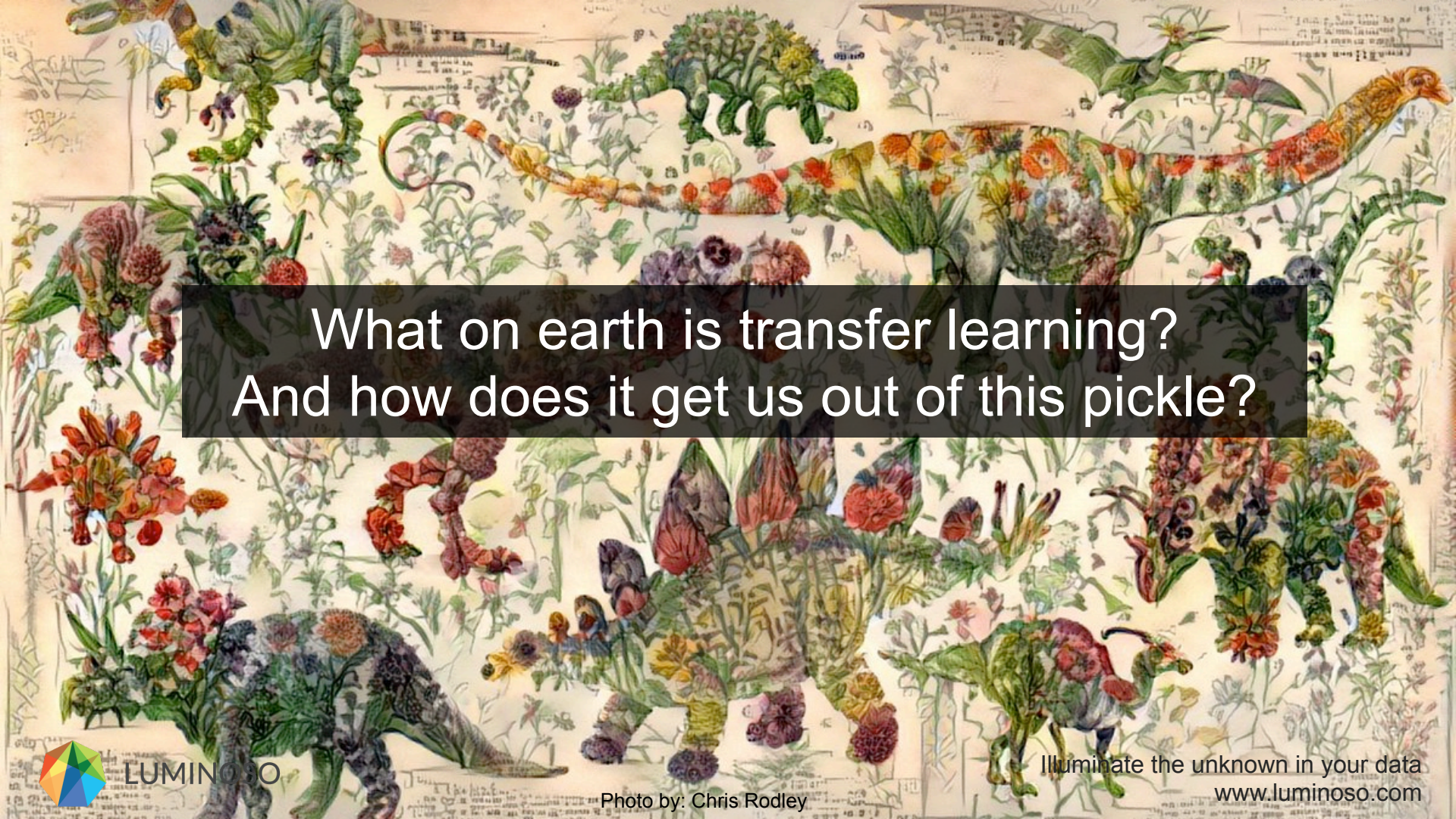
This isn't how people work.



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Photo by: Carl Hoffman

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What on earth is transfer learning?
And how does it get us out of this pickle?



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Photo by: Chris Rodley

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“Transfer learning will
be ... the next driver of
ML commercial
success.”

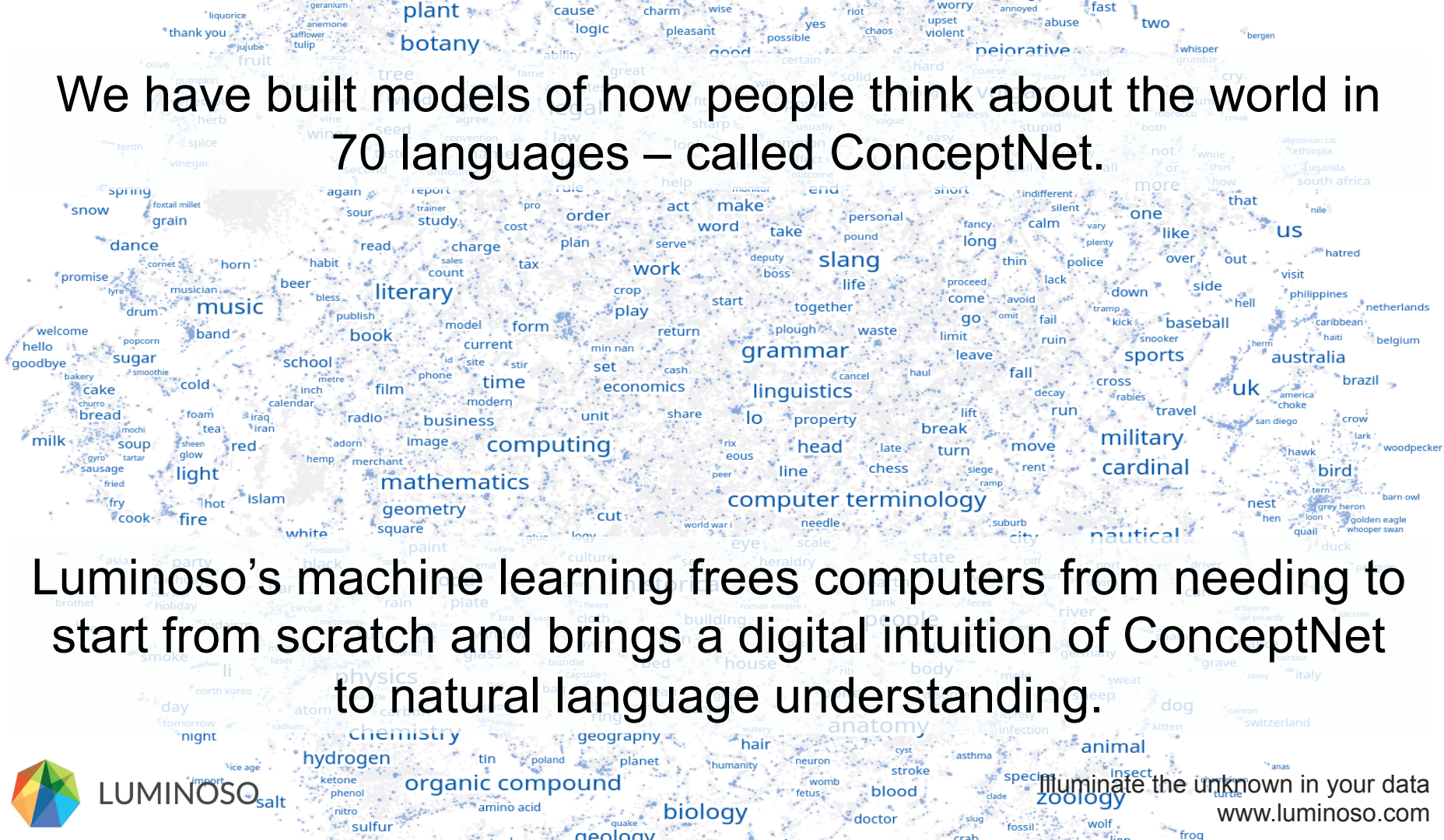
— Andrew Ng 2016



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We have built models of how people think about the world in 70 languages – called ConceptNet.



Luminoso's machine learning frees computers from needing to start from scratch and brings a digital intuition of ConceptNet to natural language understanding.



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Big changes in store



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A high-angle, wide shot of a car body on an automated assembly line. Several yellow robotic arms with red and blue cables are positioned around the car, performing welding tasks. Bright sparks are visible from one of the welding points. The background shows more of the factory environment with various mechanical components and structures.

The key to self-help is automation.



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Multilingual reasoning is important



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Practical
examples

...



And useful advice.



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P3

That's great.

What if you're just getting started?



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Artificial intelligence doesn't just allow us to
do the same thing faster.

It lets us do **more.**



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A person is driving a car, with their hands on the steering wheel. The car's dashboard and instrument cluster are visible. A semi-transparent box with a black border is overlaid on the center of the image, containing the text 'Case Study' and 'Why does my car smell?'.


Case Study

Why does my car smell?



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Combine
knowledge
across
channels.



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Case Study

Breaking down silos



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I found insights!

...now what?



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Slowly **rework**

your process so that you evaluate results
more automatically and more often.



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Thank you!

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