Why is your data valuable? A machine learning and AI perspective

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Outline

1. What Exactly Is Machine Learning?
   - Some Terminology
   - Recent Highlights
2. But, How Do These Work?
   - Teach Me Master
   - There Is No Free Lunch!
   - Inevitable Nature of Things
   - Consequences
3. What Can Be Done?
   - Discrimination and Privacy-aware ML
   - Increased Transparency
4. Where Are We Heading?

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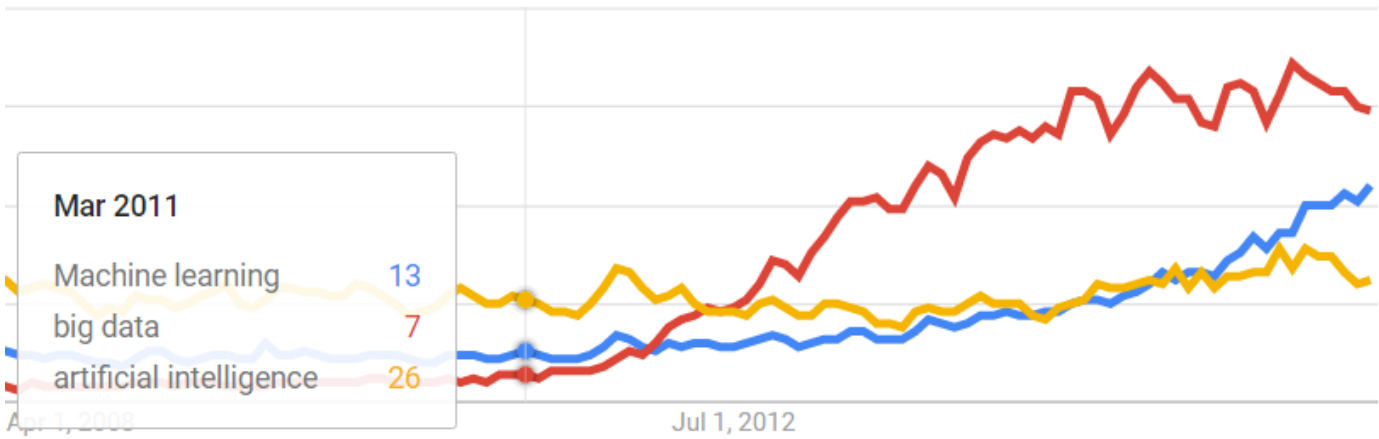
Some Terminology



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Recent Highlights

"man in black shirt is playing guitar."

"construction worker in orange safety vest is working on road."

"girl in pink dress is jumping in air."

"black and white dog jumps over bar."

Recent Highlights

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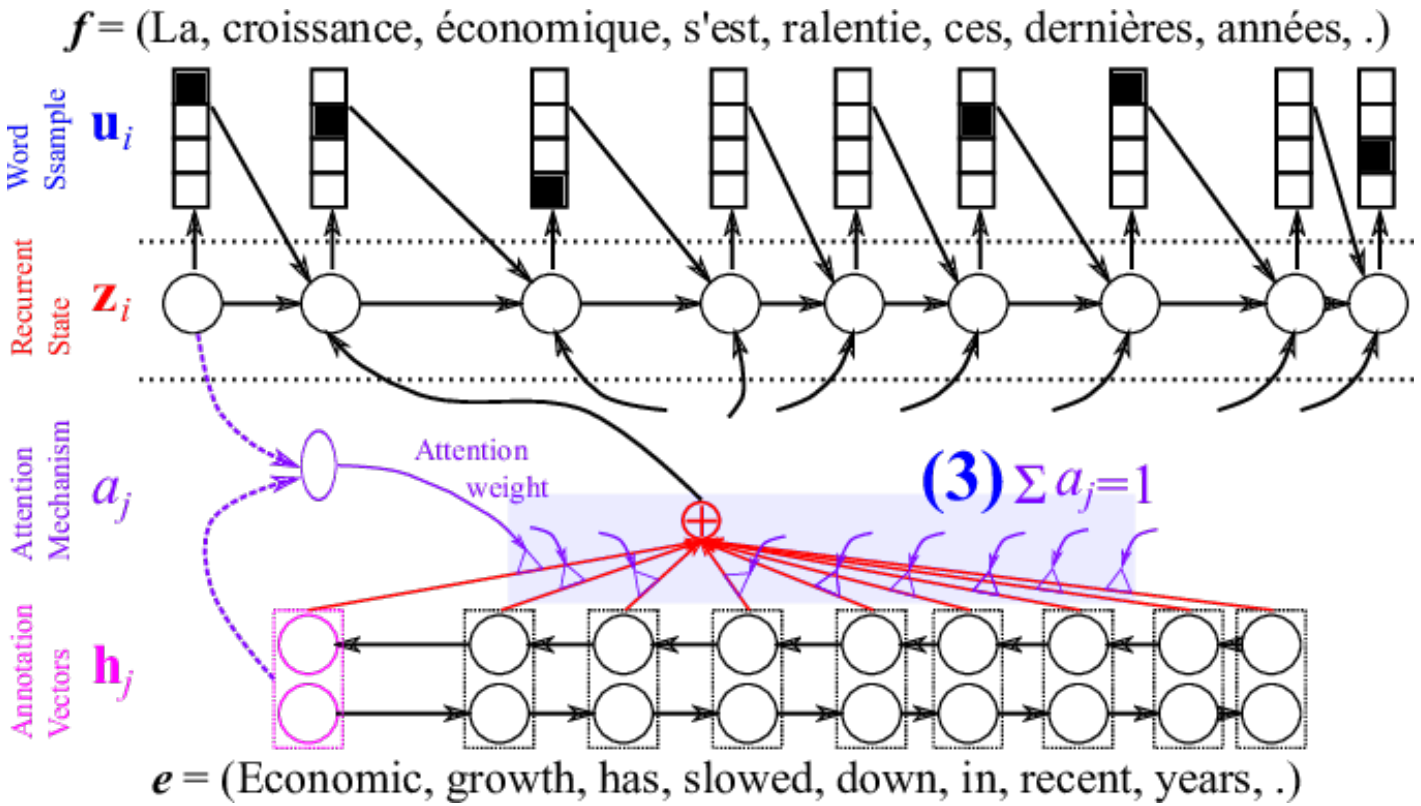

Recent Highlights

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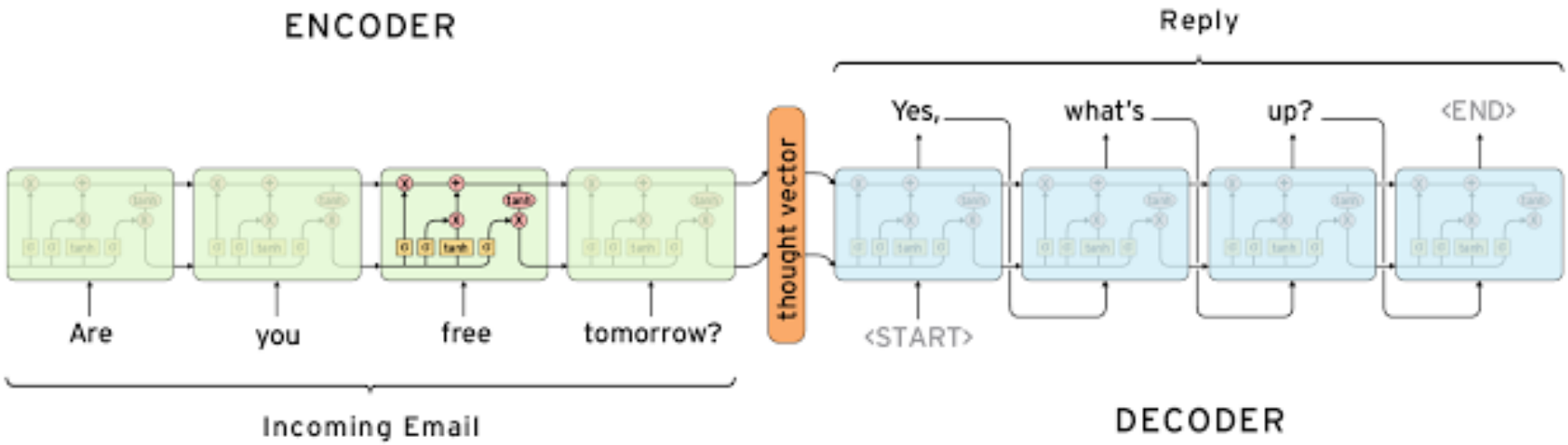

Other Examples

- Speech Recognition

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- Speech Recognition
- Decision Support Systems in Healthcare

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- Predicting Epidemics From Social Media

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(Most) Machine learning algorithms learn from examples, i.e., supervised learning.

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Accuracies tend to increase with more data.

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YOU ARE THE TEACHER!

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No Free Lunch Theorem

There is always a trade-off

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- Complexity **vs.** Interpretability & Transparency

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An Example

Certain patterns occur frequently in nature.

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Normal (Gaussian) Distribution

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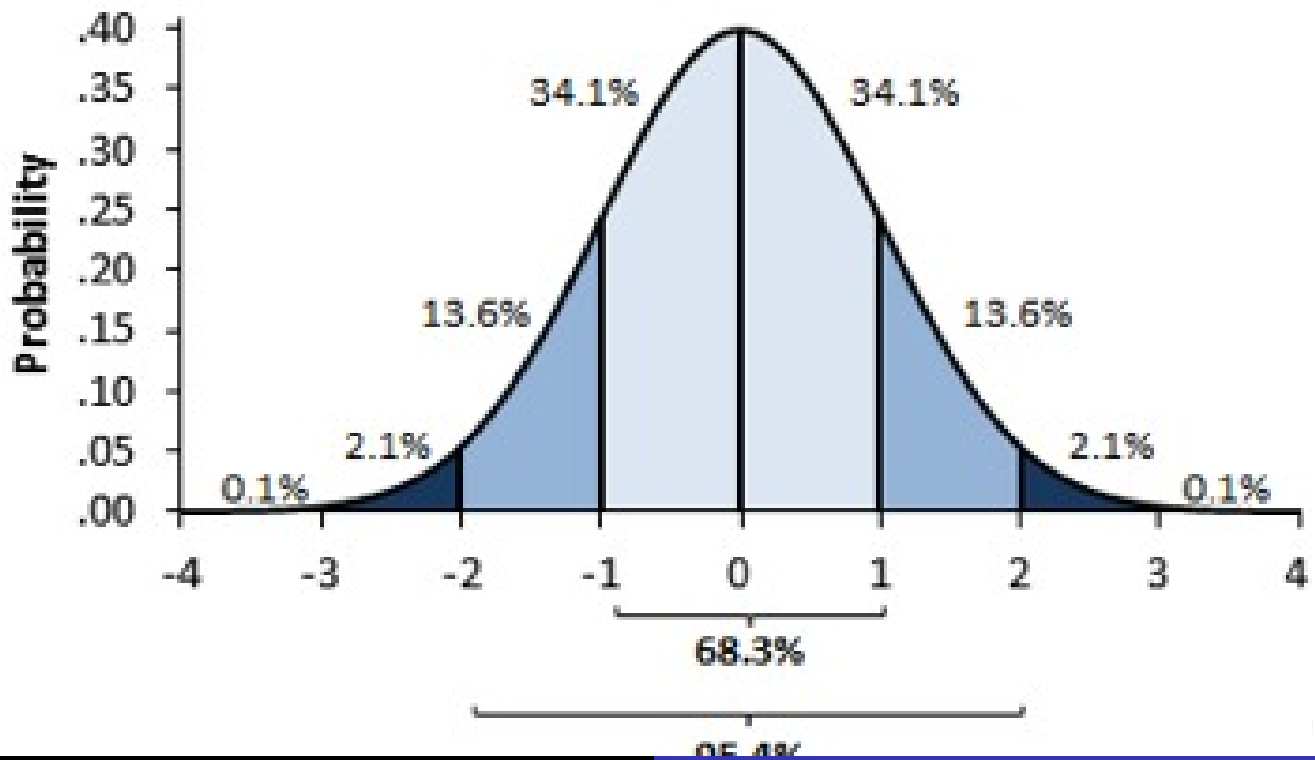
Normal (Gaussian) Distribution



Normal Distribution

- Velocity of Molecules in a Gas

Normal Distribution

- Velocity of Molecules in a Gas
- Human Height

Normal Distribution

- Velocity of Molecules in a Gas
- Human Height
- Monthly Rainfall

Normal Distribution

- Velocity of Molecules in a Gas
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- Stock Return Volatility

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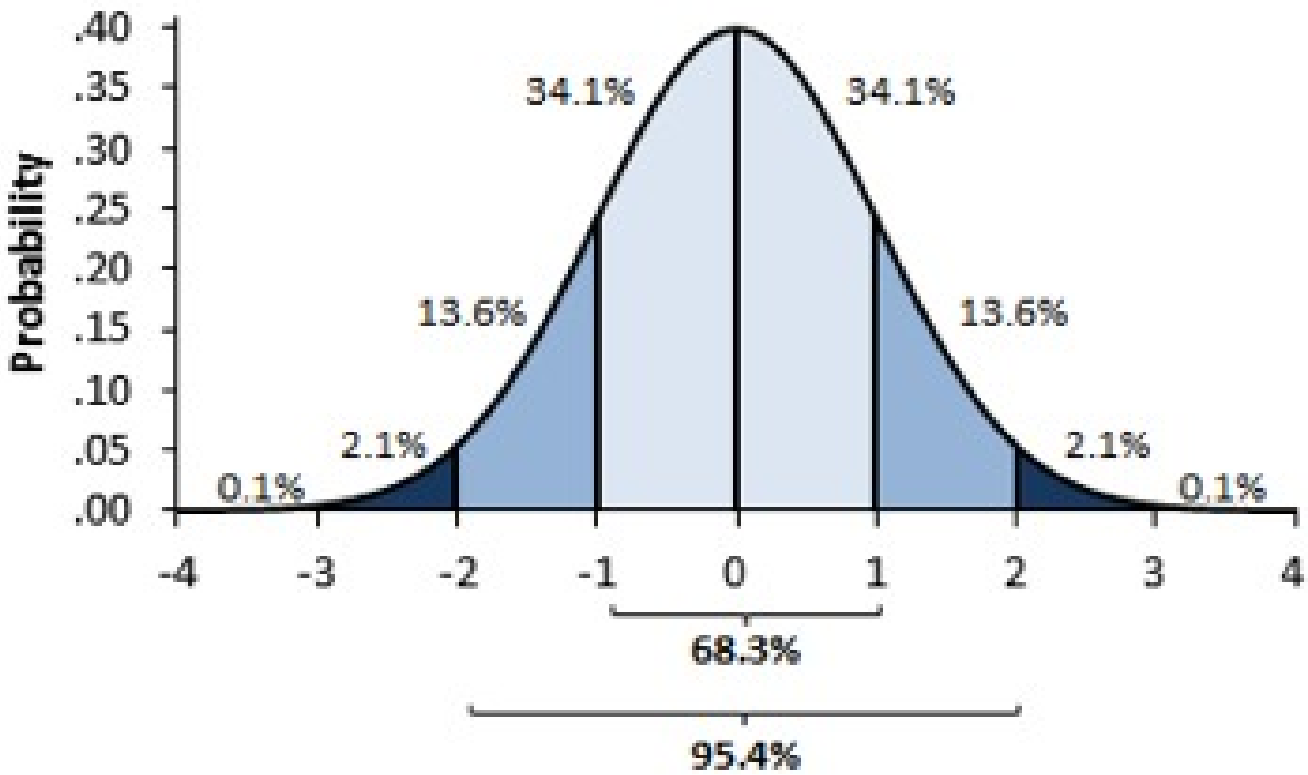
Central Limit Theorem

Inevitable Nature of Things



There will be outliers, anomalies and under-represented groups/subsets!

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So What?

Supervised Algorithms

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Supervised Algorithms

+

Biased Data

So What?

Supervised Algorithms

+

Biased Data

=

Biased Algorithms

Ugly Results

If the training data reflect existing social biases against a minority, the algorithm is likely to incorporate these biases.

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Google image search in USA for *"CEO"* produced 11 % women, even though 27 % of United States chief executives are women.

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Discrimination and Privacy-aware ML

Bias-free machine learning research should be encouraged.

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Transparent Design

Which attributes (features) have been used? Importance of attributes?

Transparent Reporting

Overall accuracy is not enough. Accuracies on different subgroups, false positive & true negative rates.

Box Is Getting Blacker

Black-box models (e.g. neural networks) are very popular!

Conclusion

MyData is important:

The fuel of ML algorithms!

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Increased awareness on interaction of MyData & algorithmic decision making systems is important:

Promotes openness, transparency and bias-free ML approaches!


THANK YOU