If You Can’t Beat ‘Em, Join ‘Em: Embracing Automation and Machine Learning

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Paul Reiman, Commvault

Moore’s law: Rate of computing power growth since the 1980's

| Today | -> | 18 Months | -> | 3 Years |

Equivalent rate of Growth of Machine learning power since 2012
Artificial Intelligence is a lot like teenage sex:
Everyone talks about it
Nobody really knows how to do it
Everyone thinks everyone else is doing it
So everyone claims they are doing it

- Based on a Dan Ariely Quote

One simple version of how AI started

Arthur Samuel
The HYPE

Oversimplified Machine Learning

«Remember from Grade School

We learned how to plot a dot

(\(x, y\))
Oversimplified Machine Learning

∞ Remember in Middle School

We learned how to plot lines
• \( Y = mX + b \)

Some of us learned how to do fancy lines
• \( Y = ax^2 + bx + c \)

∞ Remember from High School (or maybe college)

We learned how to make lines of best fit
We call that regression

Calculate Standard Error:
For things like variance, standard deviation, R-Squared, etc.

And Along with and related to that, we talk about things like R-squared and can blend in what we learned in statistics about probability and looking at outcomes.
Oversimplified Machine Learning

- Remember still from High School (or maybe college, or maybe graduate school)
- There was STATISTICS
- Which dealt with probability and prediction

There are 52 cards in a standard poker deck, and a hand is made up of five of those cards.

This means that we have 52 choices for our first card. Once that card is out of the deck, there are 51 cards left for our second card. Then there are 50 left for our third card, and so on:

<table>
<thead>
<tr>
<th>Cards</th>
<th>Probability</th>
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<tbody>
<tr>
<td>52</td>
<td>1/1</td>
</tr>
<tr>
<td>51</td>
<td>1/2</td>
</tr>
<tr>
<td>50</td>
<td>1/3</td>
</tr>
<tr>
<td>49</td>
<td>1/4</td>
</tr>
<tr>
<td>48</td>
<td></td>
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</tbody>
</table>

So, to get the total number of ways to draw five cards from a 52 card deck, we multiply those numbers together: $52 \times 51 \times 50 \times 49 \times 48 = 311,875,200$.

Machine Learning (and Data Analytics Concepts)

- Supervised vs. Unsupervised Learning
- Classification vs. Regression/Continuous
- Neural Networks
- Natural Language Processing
- Data Featuring
Different tools for different problems

Machine Learning Algorithms Cheat Sheet

Unsupervised Learning: Clustering
- Gaussian Mixture Model
  - Prefer Probability
  - Categorical Variables
  - Need to Specify k

Unsupervised Learning: Dimension Reduction
- Dimension Reduction
  - Topic Modeling
  - Probabilistic
  - Latent Dirichlet Analysis

Supervised Learning: Classification
- Linear SVM
  - Data is Too Large
- Naive Bayes
  - Explainable
  - Speed or Accuracy

Supervised Learning: Regression
- Decision Tree
  - Random Forest
- Neural Network
  - Gradient Boosting Tree

Performance vs. Generality

Human level

Human level

10X

.1X

.01X

.001X

.0001X

0.06X

0.13X

0.25X

0.5X

2X

4X

8X

Human

Different tools for different problems
What About Deep Learning?

**AlphaZero** performance

Beat previously best machines at

- Chess (Stockfish)
- Shogi (Elmo)
- Go (AlphaGo Zero)

each of which handily beats humans
AlphaZero generality

Go, chess and shogi
Possibly others
What you have to know about AI right now?

- What is it good for?
  - What kind of problems are ripe for AI?
  - What kind of issues do you deal with that AI is terrible at?
- Do you have the right kind of data?
  - Even if AI is suited for a problem really well such as a retention analysis, is the data really organized, and robust enough to do it well?
Using only data from the conference website passed the basic NLP workflow from the last slide, we created an automated, scalable analysis of the topics of conference sessions, which anyone can explore, drill down into, etc.

(Check our getnerdyhr.com for links and some explanation)

So what could go wrong?
Inherent Risks with AI

1. Data → Conclusions

2. ♦ (What’s True ≠ What’s Right)

3. Even the robots can be fooled

I’ve got this unemotional, sociopathic, amoral friend who doesn’t know right from wrong. They are ignorant of all laws, truly don’t care if people live or die, and have no understanding of the public relations impact of their choices. But they are amazing at analyzing data and can predict who to hire and how much to pay. I can’t fully explain how they do it, but it’s magical.
I am 99.12% sure this is a...

Problems occur when we don’t respect what AI is...

Or when we assume it adds no value.
Well this is awkward...

Look mom!
That’s me!

And then the good news

About a year later McKinsey did a similar analysis on the same groups, and put automation at about a 20% risk (very low).

Who should we believe?
The answer is BOTH

Much of the work we **have done** can be automated

There is other work we can (and should) do

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### Machines + People <> Machines vs. People

<table>
<thead>
<tr>
<th>Lead</th>
<th>Empathize</th>
<th>Create</th>
<th>Judge</th>
<th>Train</th>
<th>Explain</th>
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<td>Human-Only Activities</td>
<td>Human + Machine Activities</td>
<td>AI Gives Humans Super Powers</td>
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**“Human + Machine | Reimagining work in the age of AI”**
How to Outrun the Robots…

- Data Science/Analytics
  - Data Visualization
    - Microsoft BI, Tableau, Qlik, Microstrategy, etc.
  - Analytics
    - Python, R, KNIME, Alteryx, etc.
- Training
  - Business Knowledge/Expertise
  - Technical and Data skills
  - Statistics/Quantitative Skills
  - Communications/Story Telling

<table>
<thead>
<tr>
<th>Less</th>
<th>More</th>
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<tbody>
<tr>
<td>Survey Job Matching</td>
<td>Advising and Planning</td>
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<td>Peer Group Selecting</td>
<td>Market Microtargeting</td>
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<tr>
<td>Manager Arm Twisting</td>
<td>Good Decision Defaulting</td>
</tr>
<tr>
<td>Generic Talking Points</td>
<td>Customized Communication</td>
</tr>
</tbody>
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The evolution of business questions to ask

**Evolution 1:** A computer can do what?

**Evolution 2:** So a computer can predict the future?

**Evolution 3:** Realizing that prediction isn't a big deal?

**Evolution 4:** Digging into "accuracy" of the prediction?

**Evolution 5:** Realizing that "accuracy" isn't as important as meaningfulness, relevance, or the impact of random chance?

**Evolution 6:** Now that I learned something, is it actually useful or something we can change?

**Evolution 7:** Is there a risk that by making a change, I could be creating some unintended consequence, (illegal, unethical, otherwise)?

**Evolution 8:** If we implement this, are we going to create some "moral hazard", laziness, or lack of attention, by relying too much on the technology?

**Evolution 9:** Will people be able to "beat the system" or use it against our organization?

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Thank you!

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