



INCEPTION OF AI IN SELECTION

IPAC 2018

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We are morphing so fast that our ability to invent new things outpaces the rate at which we can civilize them.

Kevin Kelly

We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run

Amara's Law

If a picture is worth a thousand words,

A short video snippet is worth a thousand multiple choice questions.

Assessments will be developed to more closely resemble the work space—blurring the line between a work sample and a day in the life on the job

Who We Are

Shaker International

Offering Virtual Job Tryout technology that combines selection science, predictive modeling, and over a decade of proven results to help your company make great hiring decisions with high accuracy

Presenters



Derek Mracek, Ph.D.



Eric Sydell, Ph.D.



Isaac Thompson, Ph.D.

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How AI is making inroads to HR?

Buzzwords Defined (AI, ML, & DL)

Enter Data Science

Where we are headed

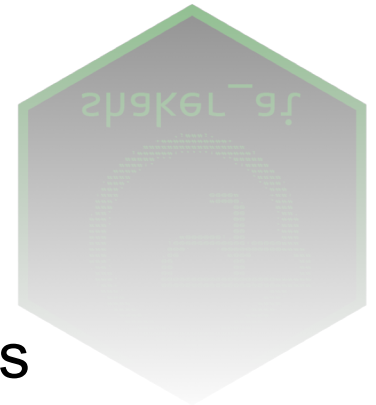
Deep Dive into the Power of Deep Learning

State of the Art | Science

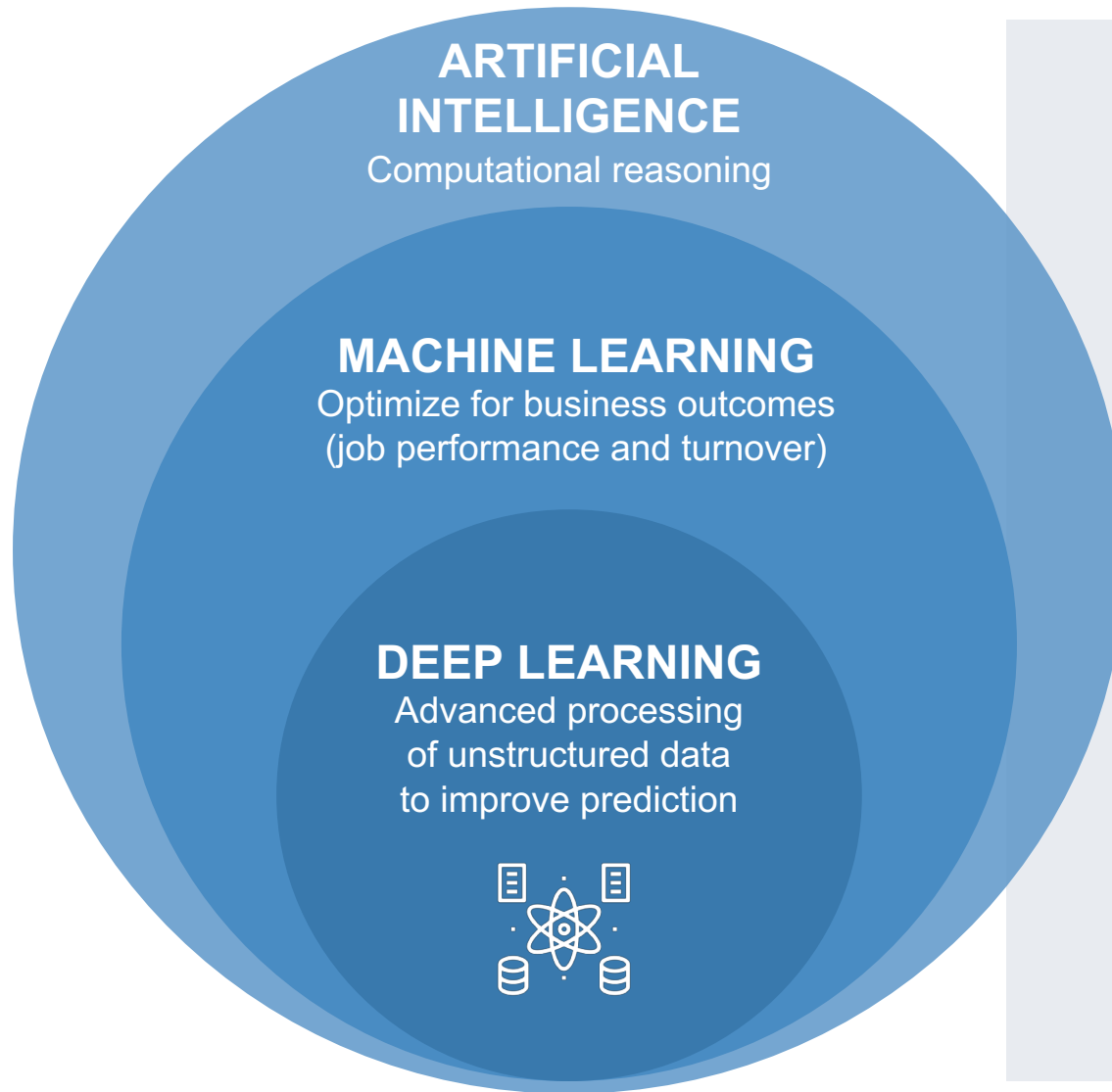
Manual vs Deep Learning

Deep Learning | Common Questions from Clients

The Future is Now



Artificial Intelligence vs Machine Learning vs Deep Learning



Shaker has been using machine learning techniques for over 15 years to predict important business metrics

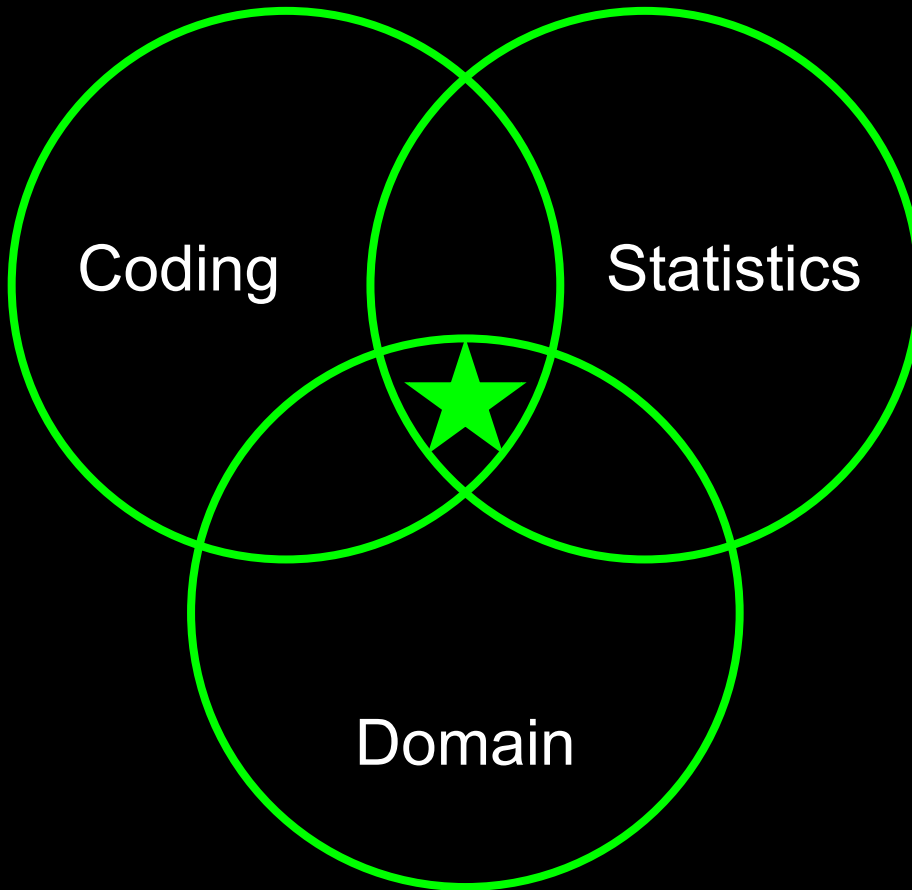
Combining tried and true machine learning with world class deep learning, we have distinguished ourselves as leaders in the field

Deep learning is integrated into our systems to score candidate open-ended responses in a way that is both highly predictive of future success on the job and enhances realism

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Data Science Defined



Necessary Skills

- high level of coding skills
- high level of statistics skills
- High level of domain expertise
- Someone who can leverage the advances in ML through open source, applied to a domain.

Function

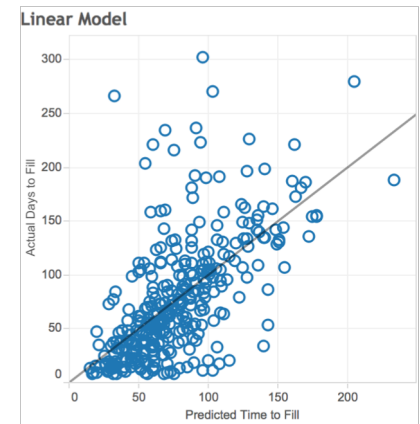
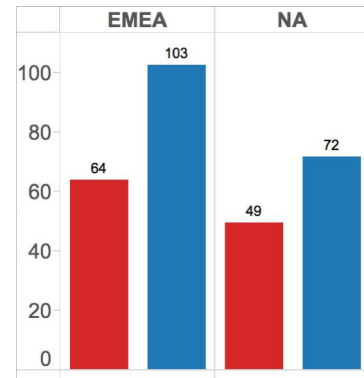
- To a) build new products or b) improve processes, & c) inform decision making.

Data Science Integration into HR

	Lacking	Moderate	Mature
Data Storage	Disparate excel files stored on many different computers.	Disparate databases and some random sources (google docs, etc.).	Single source access to databases, data governance (agreed definitions and sharing), automatic data input .
Data Manipulation	Any kind of manual process (error prone).	Standardized data processing	Automated data processing in open source code that can fit on many structures.
Data Analysis	Clicking or copy and paste, usually descriptive or correlational.	ML/DL scripts running on local machines that produce files as results.	Advanced DL/ML (open source) running in cloud.
Results Share Out	Manual formatting, static decisions (ppts).	Any combination of static and dynamic, usually automated though.	Realtime online dynamic dashboard visualizations that tell a story.

Current State of HR Analytics

- **Defined:** The application of data science and measurement science to HR.
- **Outcomes:** enterprise dashboards that share **metrics** (such as of engagement or relationships) and/or **predictions** (e.g. workload vs capacity predictions).

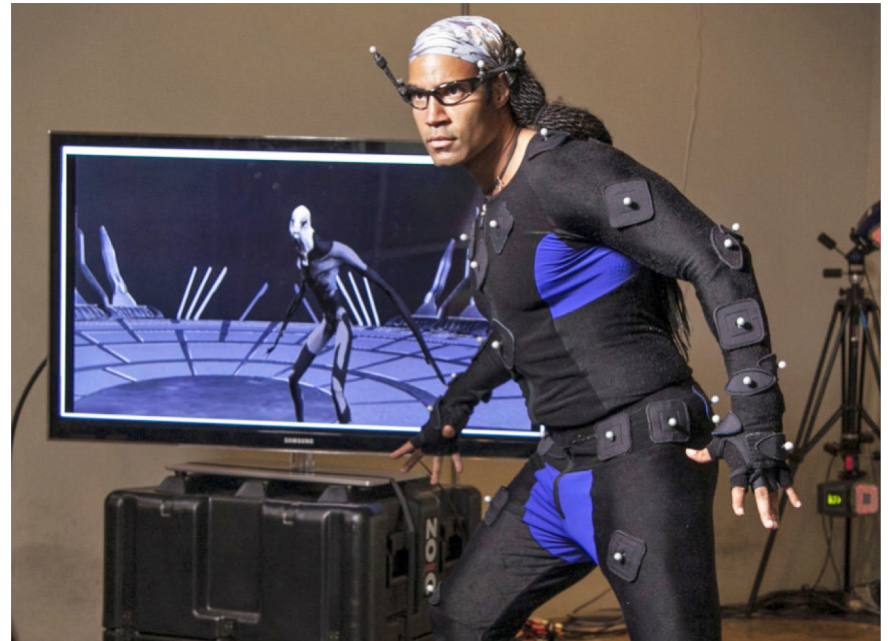


Future of AI/ML in HR

As behaviors and expressions with computers become more pervasive and therefore tracked (turned into data).

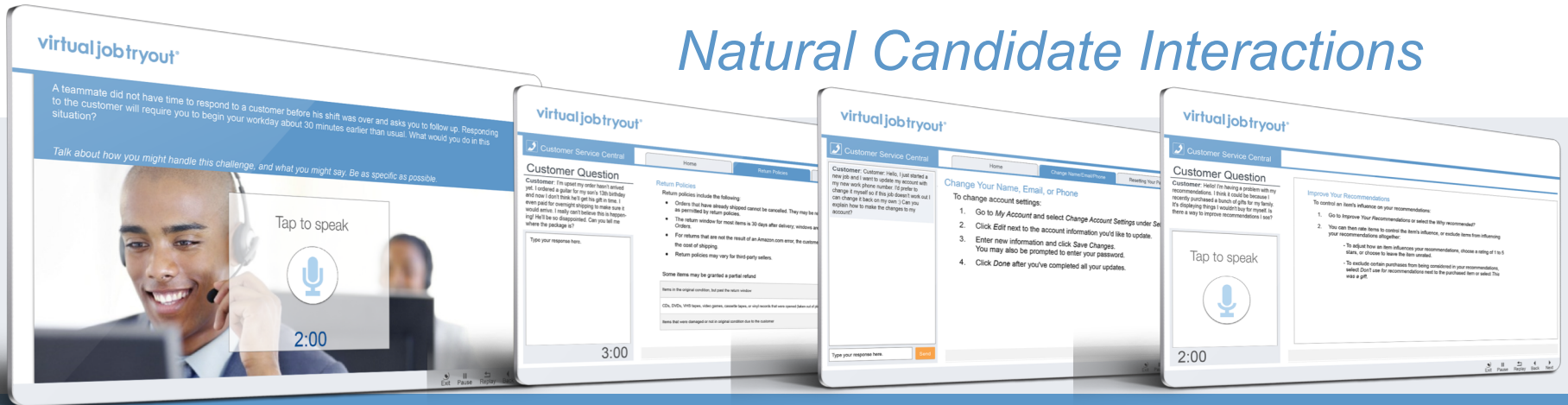
These human-computer interactions with ML/DL will determine:

- fit with a company
- fit with a team
- personality
- proficiency
- training needs



Rational Empirical Approach

Natural Candidate Interactions



MACHINE SUCCESSFULLY REPLICATES EXPERT HUMAN RATINGS

SCORES WHAT NO ONE
COULD AUTOMATICALLY
SCORE BEFORE

Immersive, realistic, unstructured
work samples can be scored
without the cost and time
of human raters



EQUIVALENT



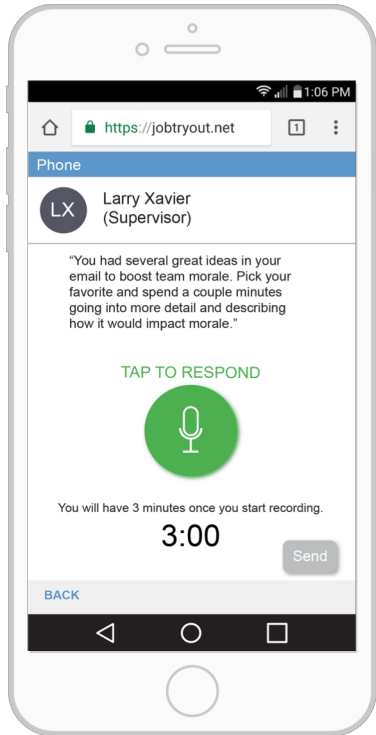
PREDICTIVE POWER
BEYOND TRADITIONAL
ASSESSMENT MEASURES

Overall Performance
Customer Satisfaction
Expression, Clarity, Grammar
Ramp Up Time, Problem Solving
Attitude, Professionalism

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Shaker's Use of Advanced AI in Employee Selection



Deep learning

Turns *voice into text*

1

Deep Learning

Turns text into scores constructs (e.g. courtesy, empathy, task proficiency, verbal expression)

2

Machine Learning

Weights all inputs for multiple business outcomes of interest (performance, turnover, diversity)

3

Computer Assisted Decision Making

Each candidate has a total score i.e. predicted success.

4

OVERALL FIT

Likely to be competent in all areas of the job and handle responsibilities with proficiency.

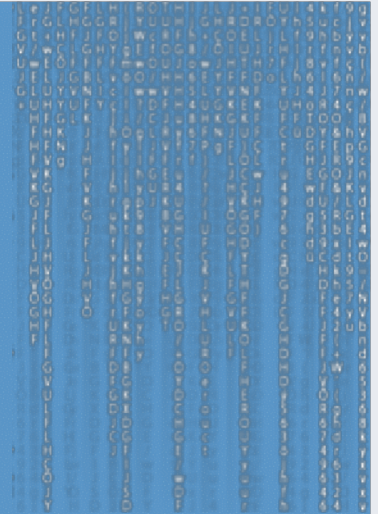
Note: Overall Performance is NOT an average of the Competency Fit results below.



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State of the Art | Science



Feature Engineering the Manual Way

*“Feature engineering is the process of transforming **raw data** into **features** that better represent **the underlying problem to the predictive models**, resulting in improved **model accuracy** on **unseen data**.” – Dr. Jason Brownlee*

Manual Variable Creation

Describe your data in ways that the computer will understand
(feature engineering, often requiring a PhD in domain)



Learning Algorithm
(optimise the weights of the features
e.g., regression)

What Does More “Manual” NLP Look Like?

Manual NLP involves creating a document-term matrix

- Code whether a term exists in a candidate response
- Options for coding exist
 - e.g., binary, frequency, tf-idf
- More involved terms/columns, such as consecutive words:
 - Unigram “hello”; Bigram “so sorry”; Trigram “so very sorry”

		Terms - Unigrams - Binary Coding				
		hello	late	bummer	sorry	product
Responses	Response 1	1	0	0	1	0
	Response 2	1	0	0	1	1
	Response 3	1	0	0	0	1
	Response 4	0	1	0	0	0

Representational Learning

- The computer seeks to replicate the 'raw' candidate text input in ways that it understands

Prediction

- Take last layer and predict outcome (SME rating or performance on the job)

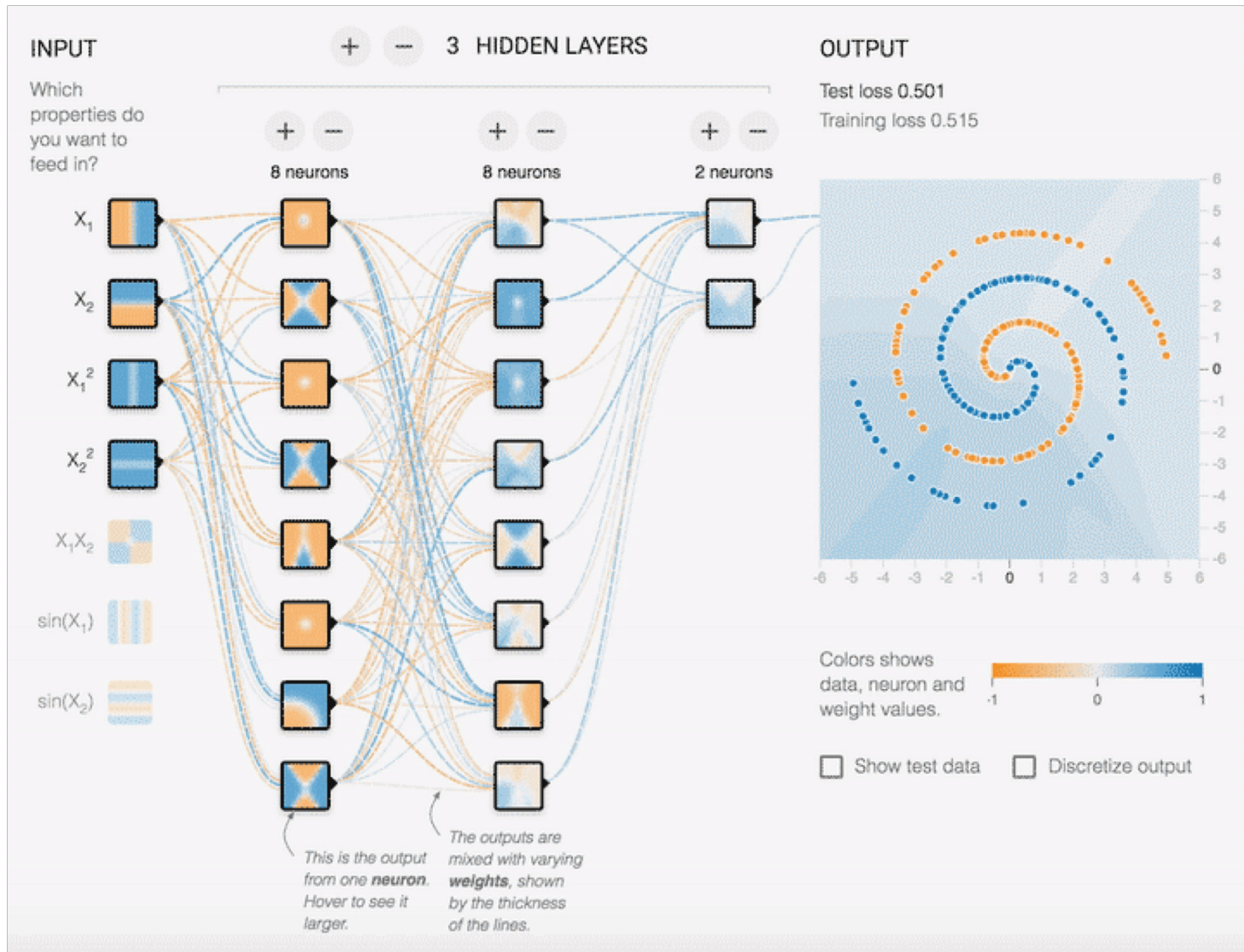
Takeaway

- Through an iterative process DL creates its own input features from the text

Who else is using LSTM for NLP?

- Google Voice
- Alexa
- Siri
- Chat-bots

Deep Learning - Under the Hood



What is “directional”? Why does it matter?

- DL models are “sequential”
 - Kind of like a nested longitudinal model
 - Model traverses each word of the response

What is “bidirectional”? Why does it matter?

- DL models traverse “forwards”
- DL models can traverse “backwards” too

“This IPAC conference is awesome”

- Forwards: the term IPAC has memory of *this*
- Backwards: the term conference has memory of *awesome*
- Forward and backward are combined

What is “memory” in LSTM?

- Combos of words that are not necessarily adjacent
 - This is referred to as “context”
- Higher level abstractions
 - “Hello, sorry -- -- wow -- -- -- damaged”

What’s the point?

- Typing and talking → realism (↑) and fidelity (↑)
- Context better captures the realism and fidelity

What is an “embedding layer”?

- Corpus of words from the internet
 - Helps with sparsity of relatively small samples
 - Uses semantic relationships between words to improve prediction
 - Frog/toad/lizard
 - Sorry/bummer/misfortune

What’s the point? How can it help?

How do I interpret deep learning parameters?

- Harder to interpret the high-level abstractions

“There is a growing sense that neural networks need to be interpretable to humans. ... Two major threads of research have begun: feature visualization and attribution.”

[Researchers from Google Brain Team](#)

[Nov 7, 2017](#)

Visualize the BARs using heat mapping!

- 5 out of 5 -- Effective Behavior
- 4 out of 5 -- Somewhat Effective Behavior
- 3 out of 5 -- Behavior
- 2 out of 5 -- Somewhat Ineffective Behavior
- 1 out of 5 -- Ineffective Behavior

...Wow, another day another dumb person I have to deal with..

...Whether you are doing this or not sorry to hear you are having a bad day..

I hope you feel similarly!

...hard to believe we would be responsible for you doing what you did ...



Pros:

Proven and accepted methods

Expert judgment

Assessment center guidelines
Standards and guidelines

Cons:

Historically not scalable in terms
of assessing written and verbal
communication

Fidelity and realism of prepared
response options e.g., SJT can
be improved

(Next page cont'd)

Pros:

Extremely powerful

Sequential models capture
context of response

Cons:

Extremely empirical

Deep Learning - Takeaways

Advantages of Deep Learning?

- Put unbiased, expert judgment to scale
- Follow best practices for evaluating open-ended content
- Equipped to capture realism and fidelity
- Visualize the expert mental model

Cautions of Deep Learning?

- Gold in gold out -- garbage in garbage out
- Need content that promotes meaningful variability
- Don't confuse the machine

Our Model of Deep Learning

Step 1

Open-ended
Scenarios

Candidate
Responses

Step 2

Expert
Judgment

Agreement of
Candidate
Performance

Relate
Ratings to
Performance
on the Job

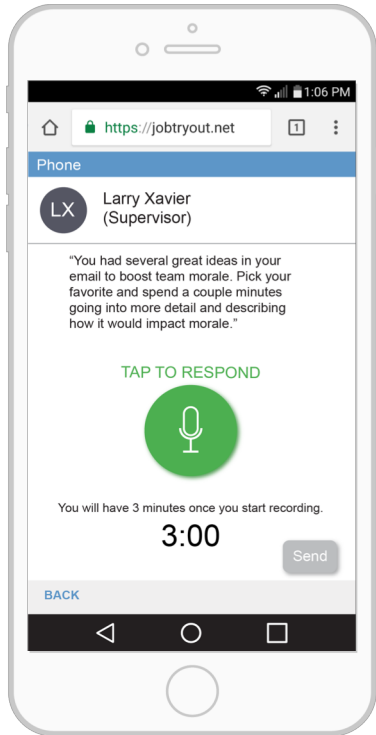
Machine
Learning and
Deep
Learning

Step 3

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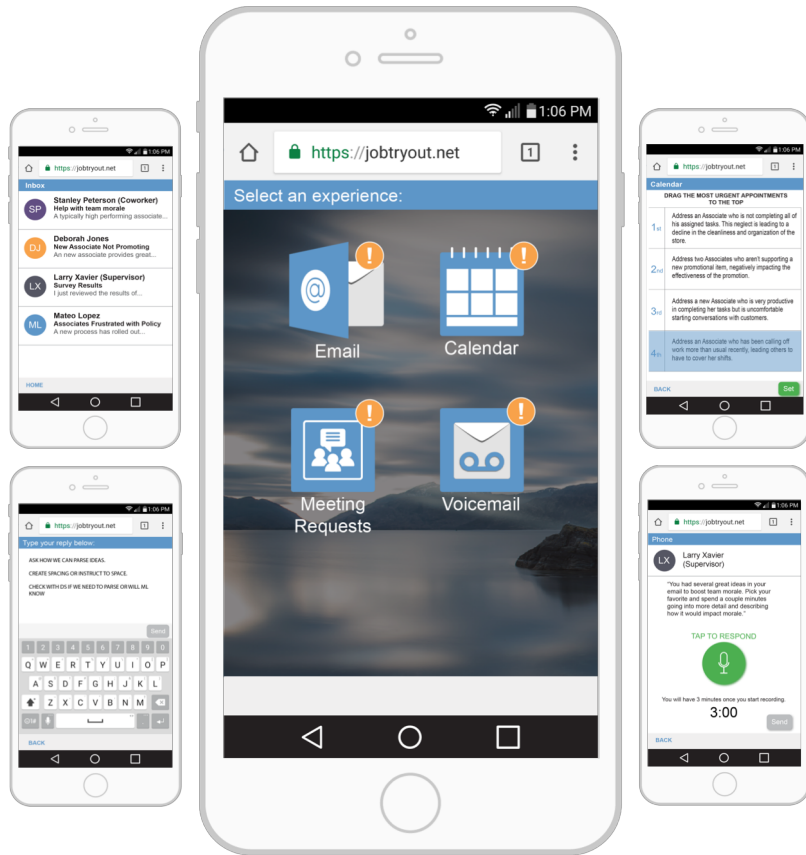
Demo of Automatic Deep Learning Scoring

"History by mimic has not, and presumably never will be precipitously but blithely ensconced. Society will always encompass imaginativeness; many of scrutinizations but a few for an amanuensis. The perjured imaginativeness lies in the area of theory of knowledge but also the field of literature. Instead of enthralling the analysis, grounds constitutes both a disparaging quip and a diligent explanation."

NPR, "More States Opting To 'Robo-Grade' Student Essays By Computer"

Virtual Assessment Center

Enhanced Realism + Deep Learning Technology



WHAT IS IT:

Self-guided series of interactions with a day-in-the life feel

A mix of close and open-ended items enhanced by machine learning

Simulations that can be paired with a global job/culture fit or other more traditional assessment modules

Available off-the-shelf for 5 - 8 major job categories (e.g., sales, leadership)

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Virtual Assessment Center

Home

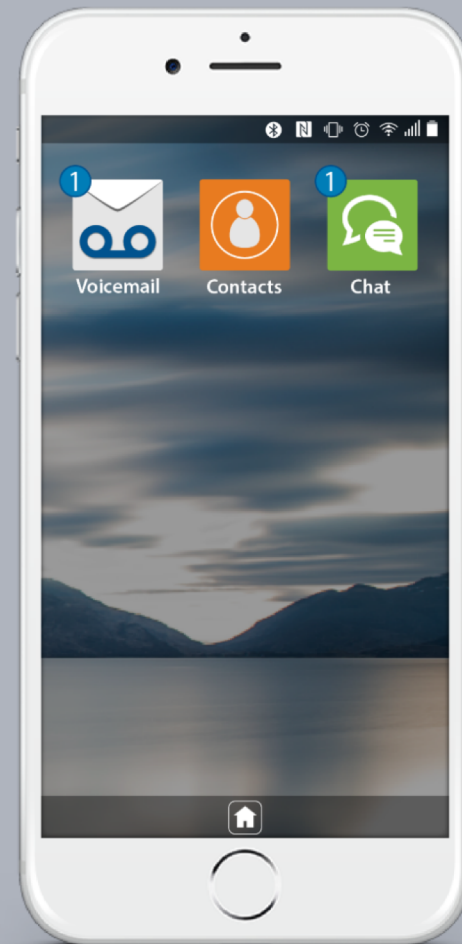
Email

Reports

Calendar

Travel

Select the site you would like to visit



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Example Competency Mapping

Example Simulation Exercises						
	Presentation	Voicemail	Structured Interview	In-basket	Brainstorming Presentation Notes	Written Report
Verbal Communication	✓	✓	✓			
Written Communication				✓	✓	✓
Problem Solving	✓	✓	✓	✓	✓	✓
Organizing and Planning	✓	✓	✓	✓	✓	✓
Influencing Others	✓	✓	✓	✓	✓	✓
Consideration and Awareness of Others	✓	✓	✓	✓	✓	✓

Note. ✓ = hypothesized competency simulation link.

Questions

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Machine Learning & Advanced Analytics

Our Experience

10+ years of proven results using AI and machine learning
Open-ended text scoring, closed loop analytics, simulation scoring

Our Knowledge

Experts in selection science & advanced analysis techniques
Appropriate application to employee selection context
Big data isn't necessarily useful data (or fair); garbage in, garbage out
Algorithms that are rational and do not create disparate impact

Our Direction

Continue leading the evolution of selection science, building on the foundation of measurement and predicting human behavior
Research partnerships with academic and corporate entities

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Where We're Headed

DEEP LEARNING APPLICATION IMPLEMENTATION - Q3 2018



Combine structured content with new open-ended exercises

- Same rigor applied to all predictors

Productionize deep learning algorithms

Launch

EMBED DEEP LEARNING WITHIN OTHER SHAKER VJTS - Q4 2018



Apply machine learning approach to existing open-ended exercises

- Brainstorming, Recalling customer cues (included in client systems)

Implement new simulations requiring open-ended responses

- Simulated scenarios, in-basket, interview, work samples, accomplishment records, etc.