



Application of Data Analytics and Machine Learning to Boost Deal Flow in Oil and Gas Acquisitions and Divestitures

Laura Freeman and Deepankar "Dee" Biswas

2019 Dallas/Fort Worth Petroleum Data Workshop



Speakers



Dee Biswas

President and Founder of ActiveReservoir, a full service, international, consulting firm specializing in reservoir management, development and optimization using both classical and data-centric techniques.

His 20 years in the industry span research, operations, drilling and consulting. Dee has a PhD in Petroleum Engineering from the University of Texas at Austin and Finance Certificate from SMU. He has published in SPE refereed journals and presented at various conferences and workshops around the world.



Laura Freeman

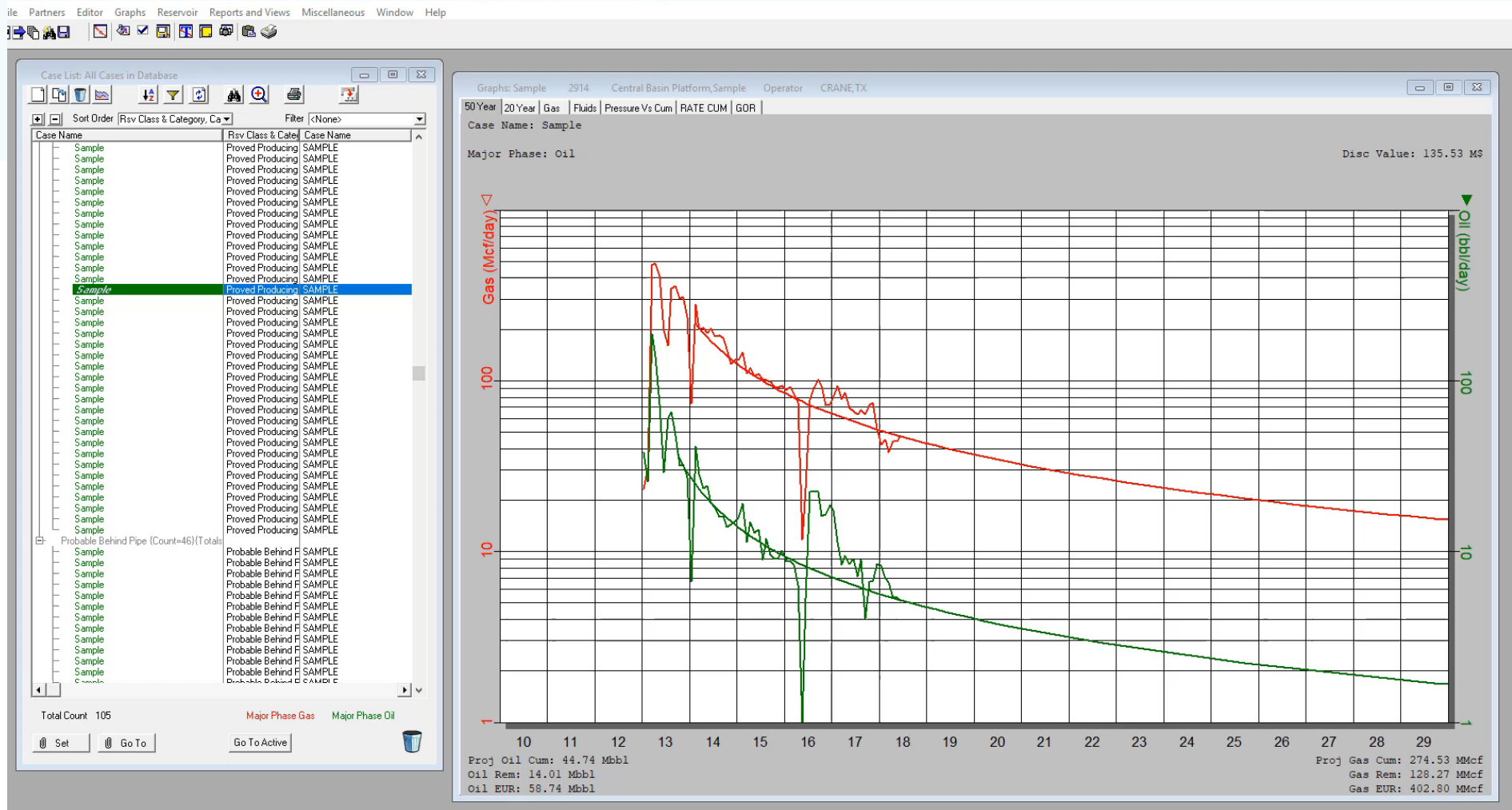
Managing Director and founder of Highpoint Global Capital specializing in buy and sell-side advisory, reserves valuation, reservoir engineering, well review, development planning, financials, strategic planning and technical due diligence.

Laura has a Masters in Petroleum Engineering as well as an MBA and has been featured as an expert on M&A, banking topics, and Reservoir Engineering for Oil and Gas Financial Journal, Society of Petroleum Engineers (SPE), and various industry events and online publications.

Big Data or Data Overload?



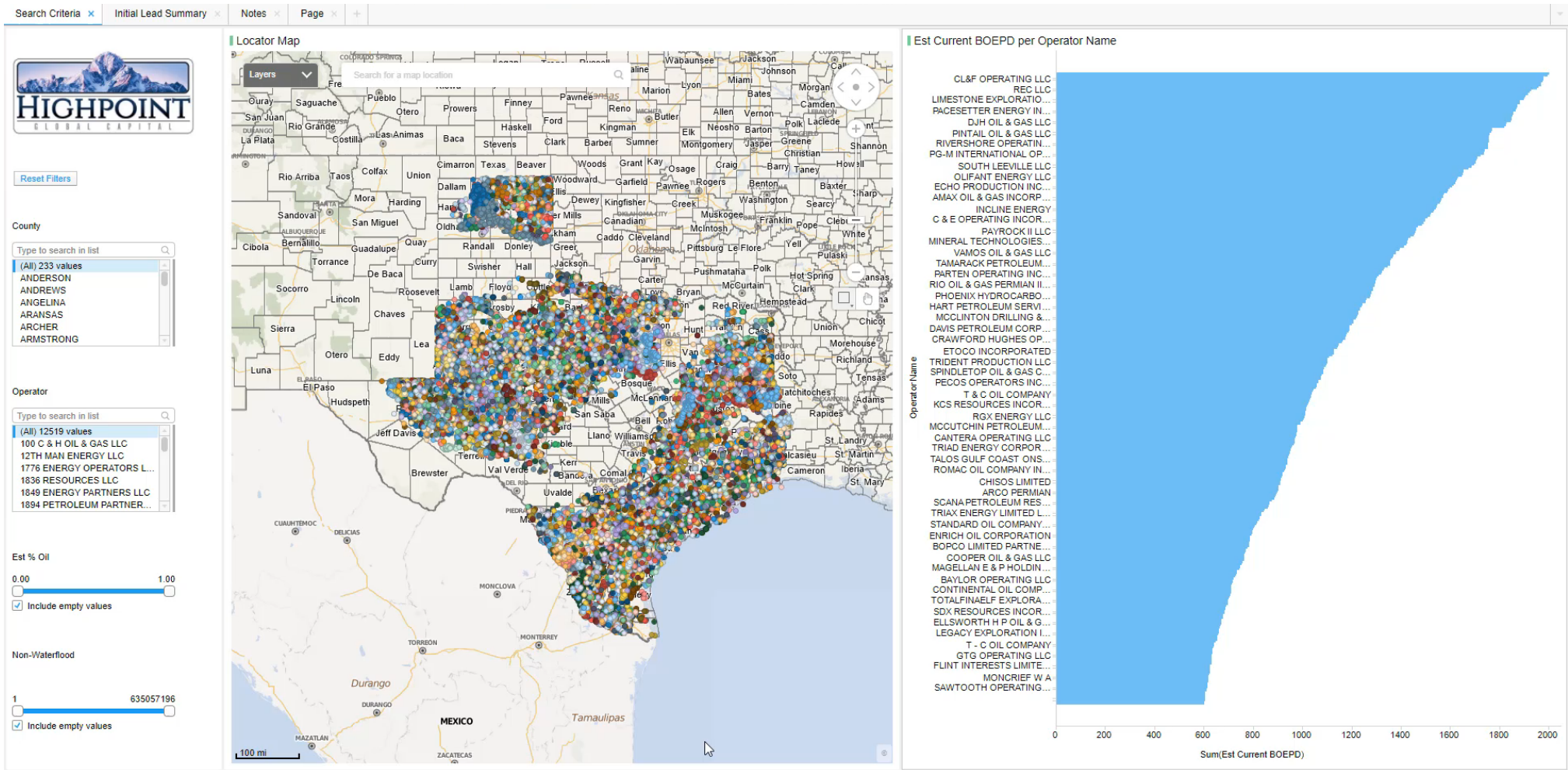
In the world of massive data availability, the enormity of “making sense”, let alone application, of information can quickly become too cumbersome or insurmountably time consuming for traditional analysis



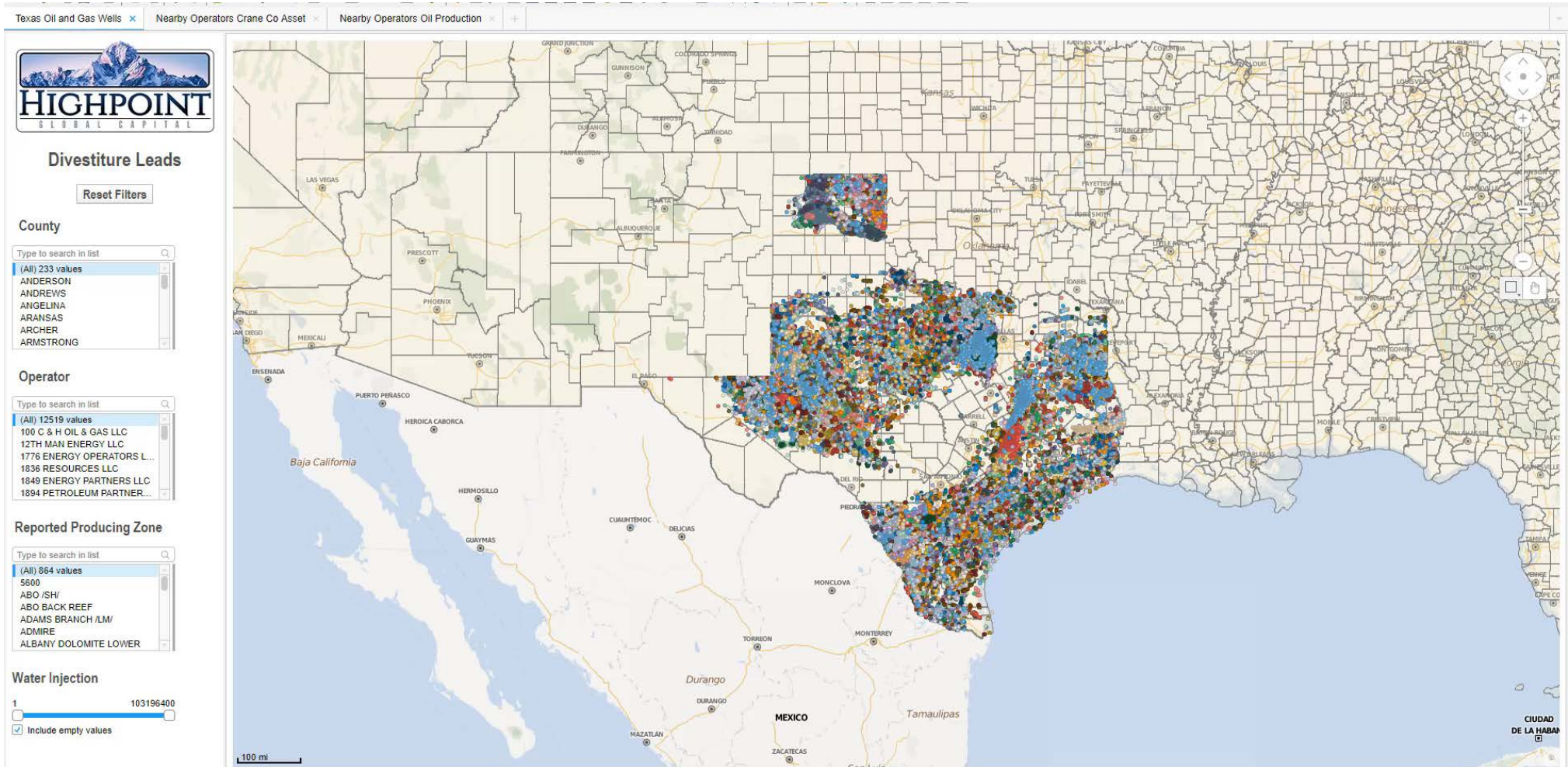
Interactive Data Visualization



Interactive data visualization can facilitate analysis of large amounts of data in a short time and allow users to explore hypothesis and relationships quickly and easily.

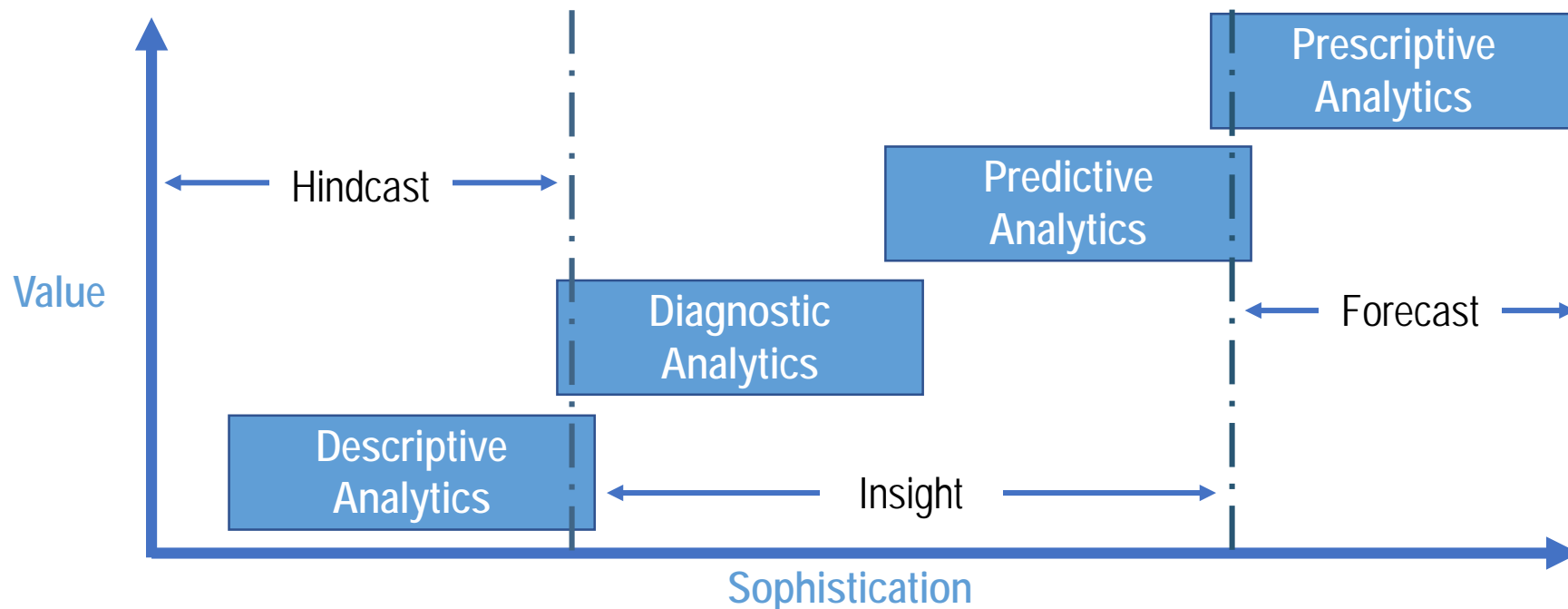


Divestiture Lead Sample



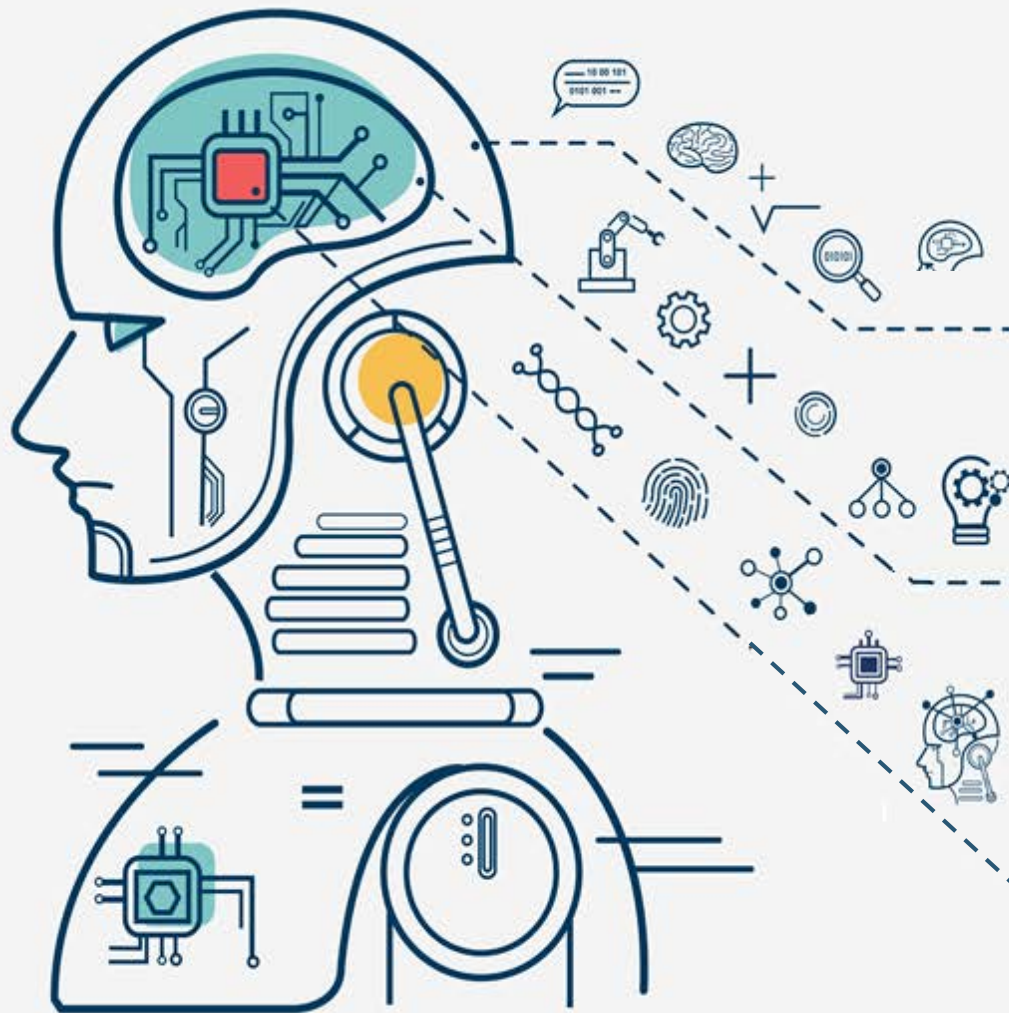
Data Science Landscape

Type	Goal	Question	Tools
Descriptive	Hindcast	What has happened?	Data aggregation and data mining
Diagnostic	Foray into Future	Why it happened?	Data visualization and dashboards
Predictive	Predict future	What could happen?	Statistical models and ML forecasts
Prescriptive	Corrective actions	What should we do?	ML optimization and simulation



Machine Learning

Attempts to systematically unravel the underlying trends between the driver and response variables

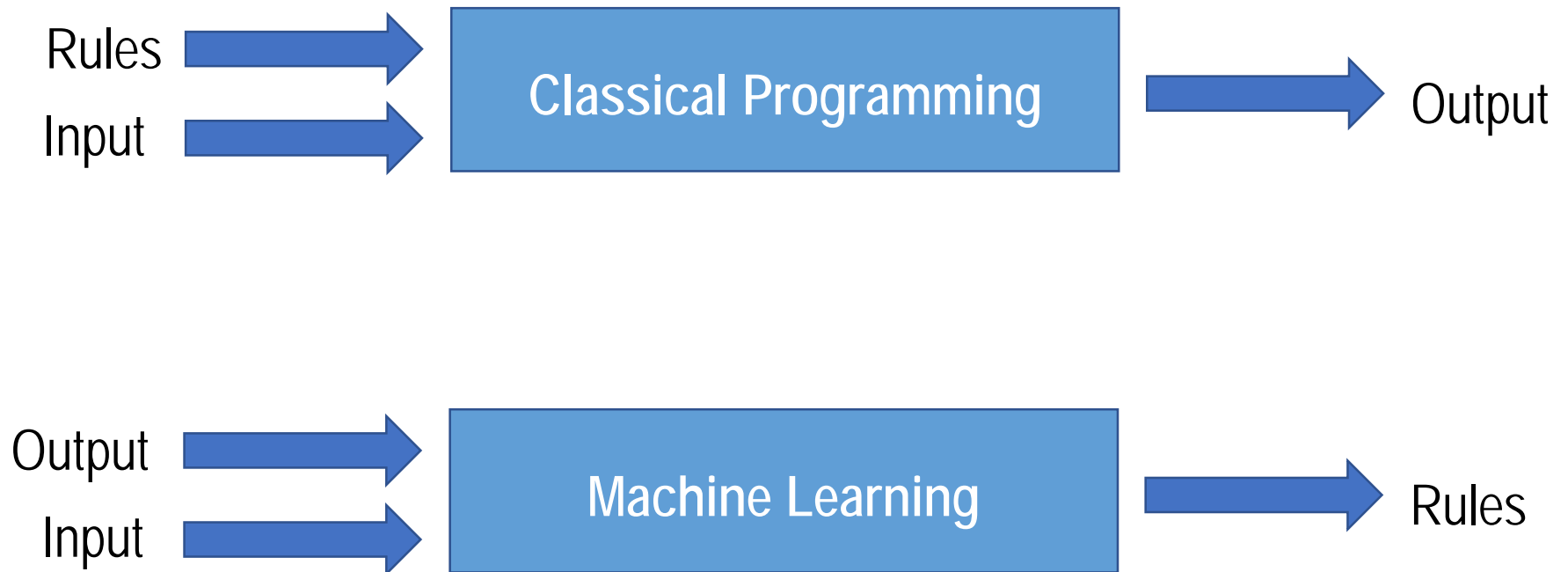


Artificial Intelligence: how to build machines capable of carrying out tasks that would typically require human intelligence

Machine Learning: teaching a computer to carry out a task, rather than programming it how to carry that task out step by step

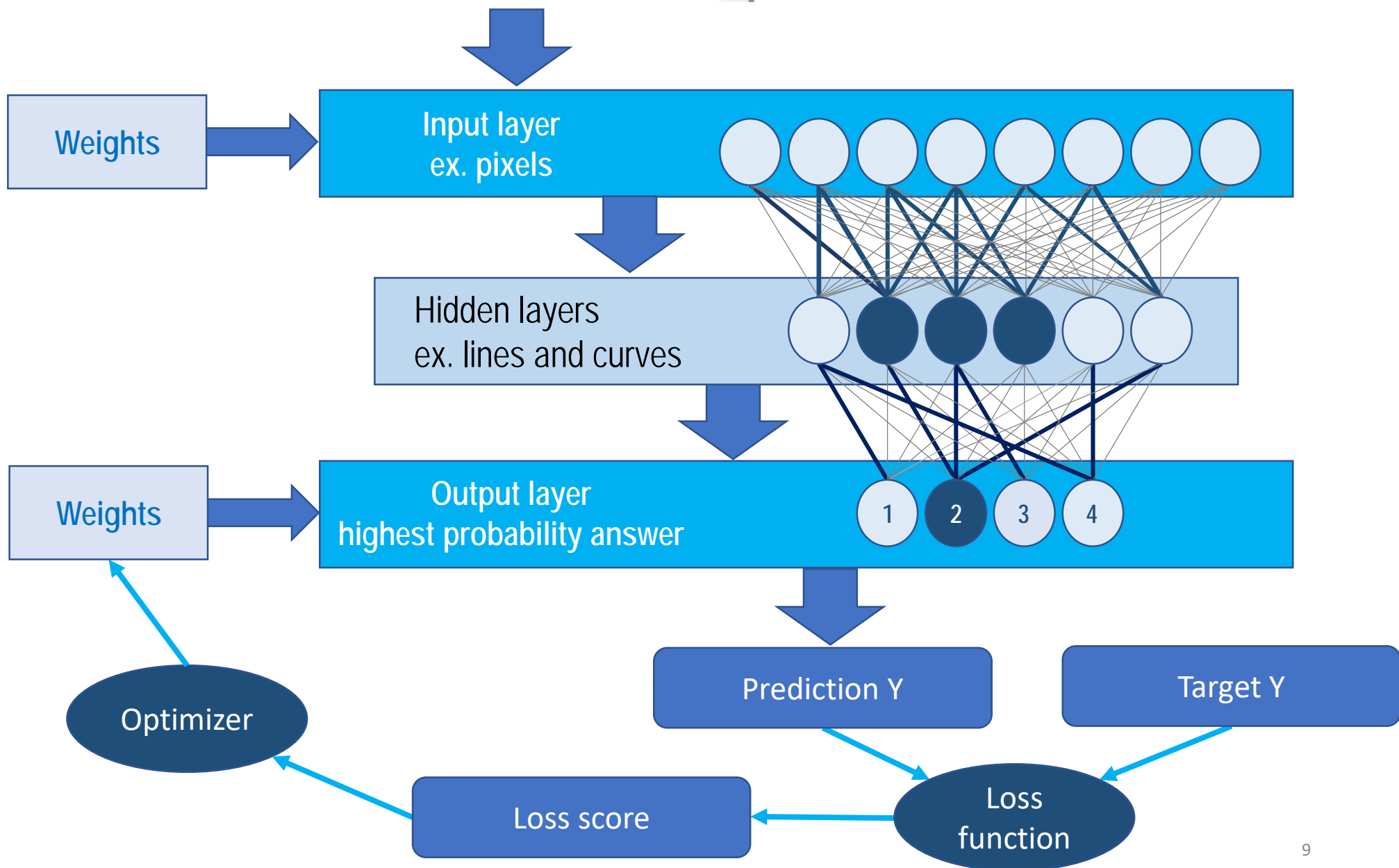
Deep Learning: deep neural networks excel at making predictions based on largely unstructured data and deliver best in class performance in areas such as speech and image recognition, with back propagation

Machine Learning Process



Deep Learning Process

Input: ex. handwritten figure 2



Machine Learning Case Study



Can ML identify drivers of deal value and other trends in the A&D Markets?

Dataset Description:

1,538 deals

23 predictors

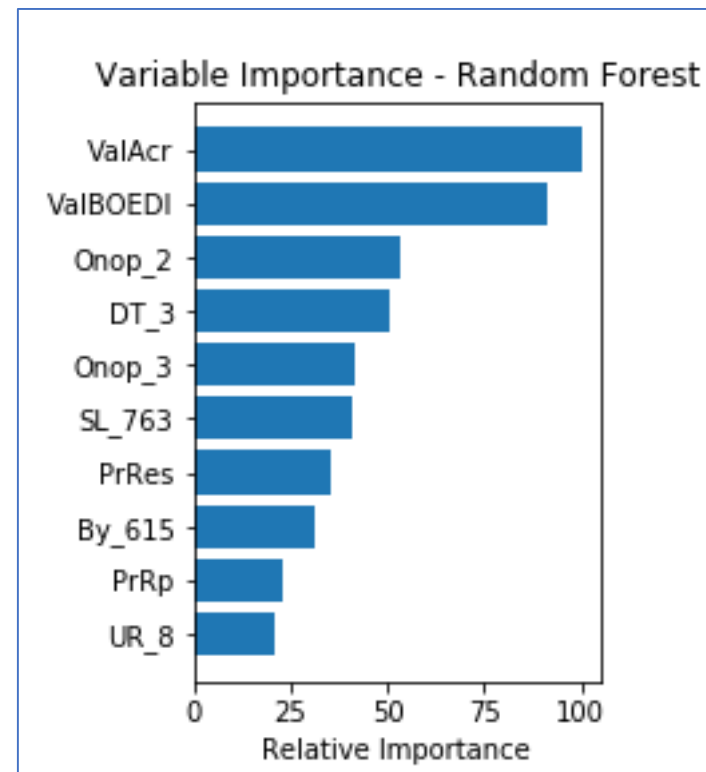
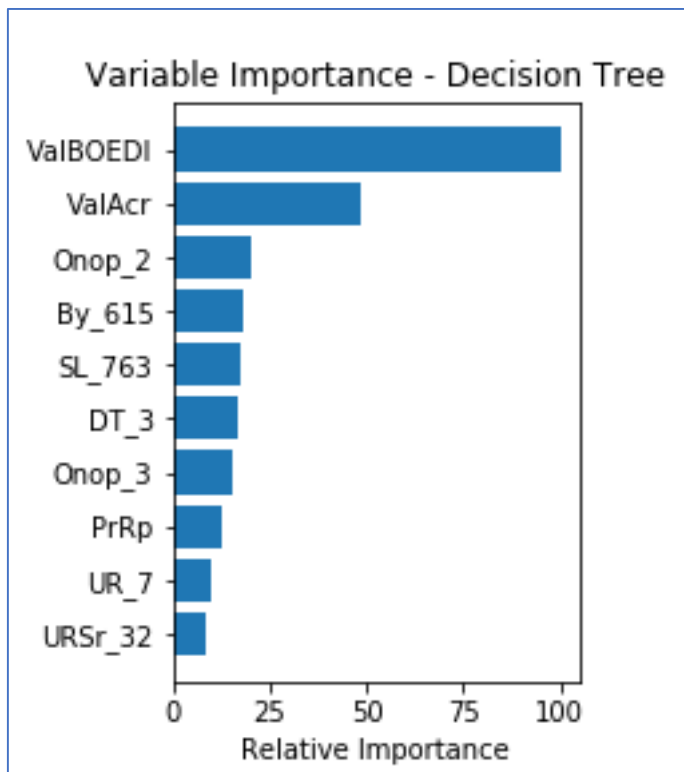
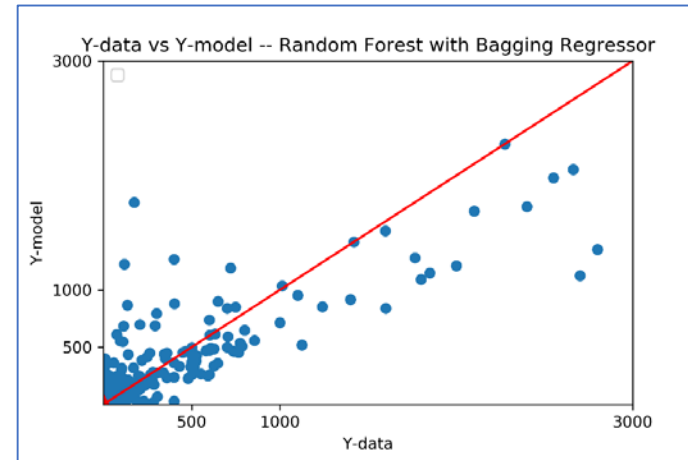
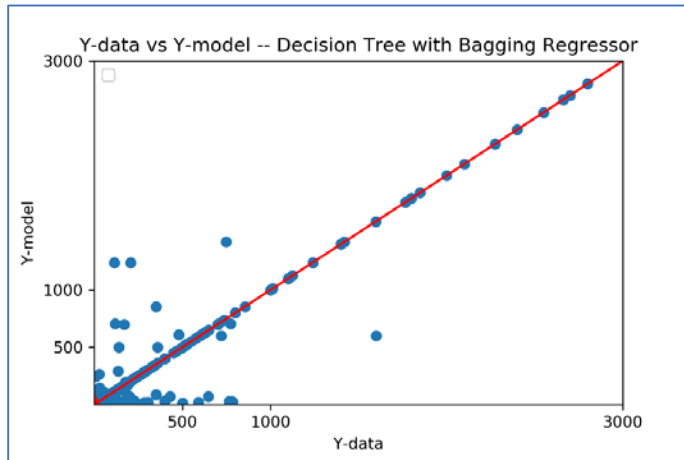
Target – Deal Value

60% of data was textual – had to be vectorized

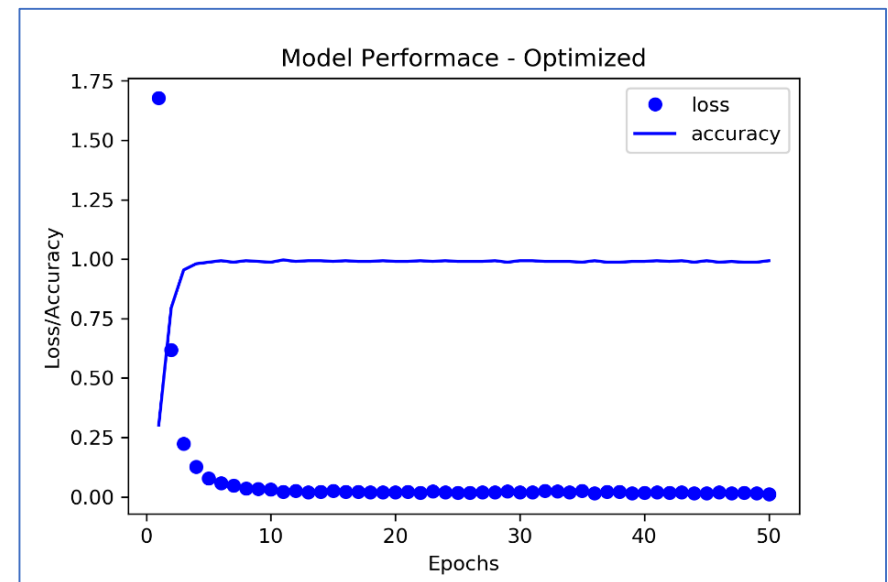
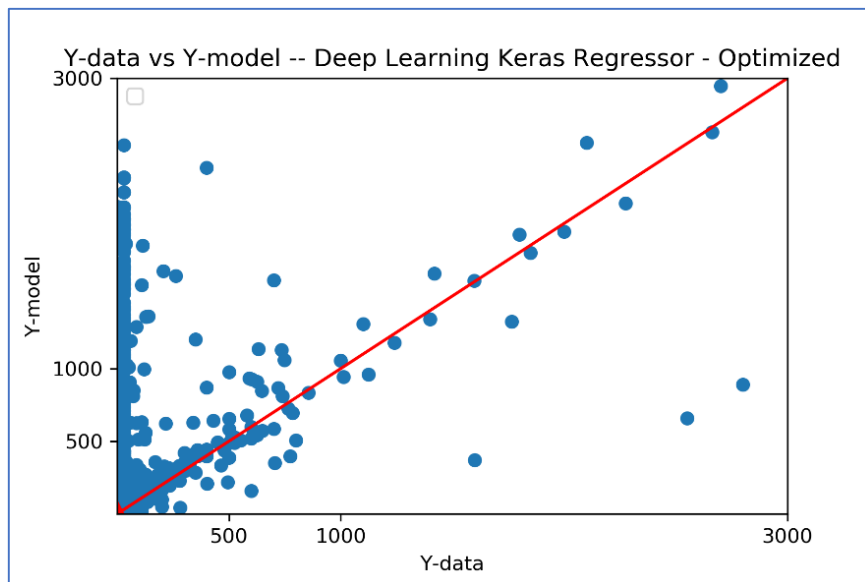
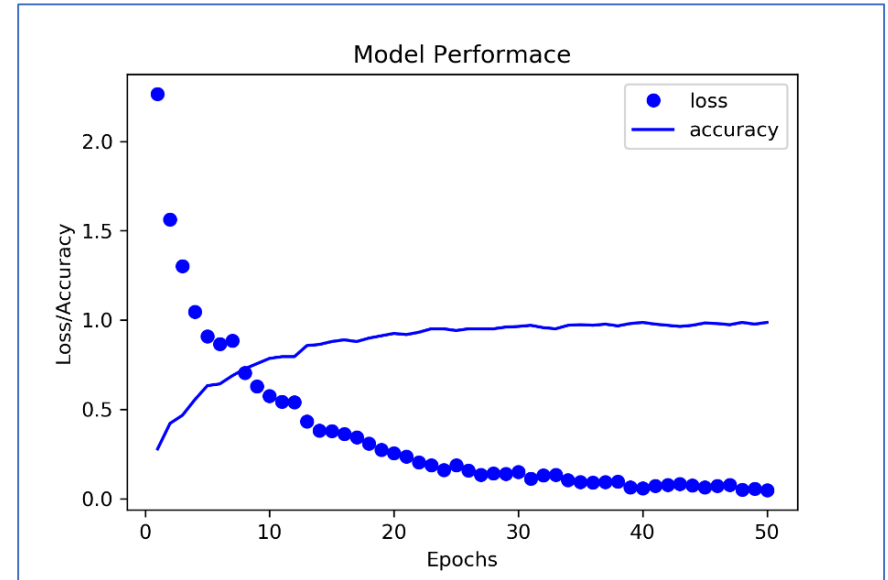
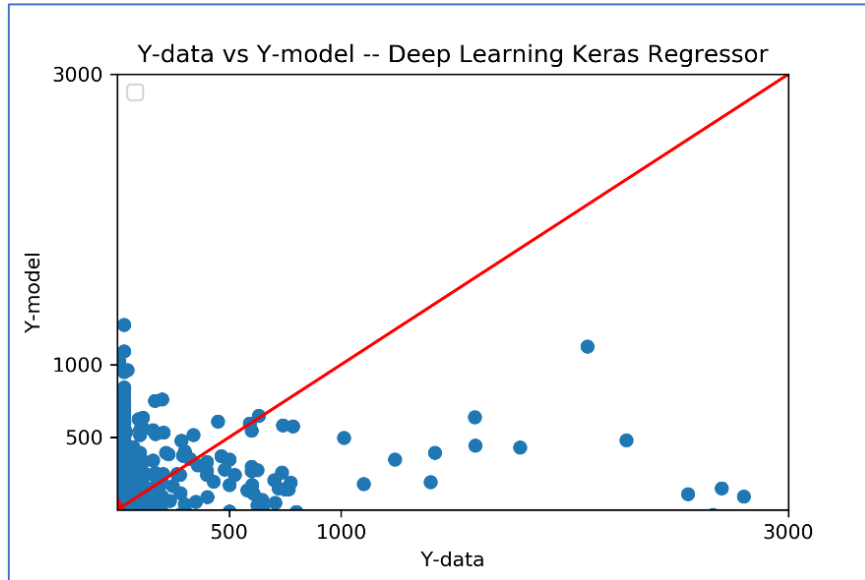
- Need to create a vocabulary
- Train DL algorithm on this vocabulary so that it can predict

Variable	Model Variable Name
Announced Date	AD
Buyers	By
Sellers	SL
Deal Value (\$MM)	DV
Op/Non-op	Onop
Deal Type	DT
US Region	UR
US Subregion	URSr
US Basin(s)	SB
US Play	UP
Onshore/Offshore	OnOff
\$/Proved BOE	ValBOEPr
\$/Daily BOE	ValBOEDI
\$/acre	ValAcr
Proved Reserves (% Oil)	PrRes
Developed (% of Proved)	DevPr

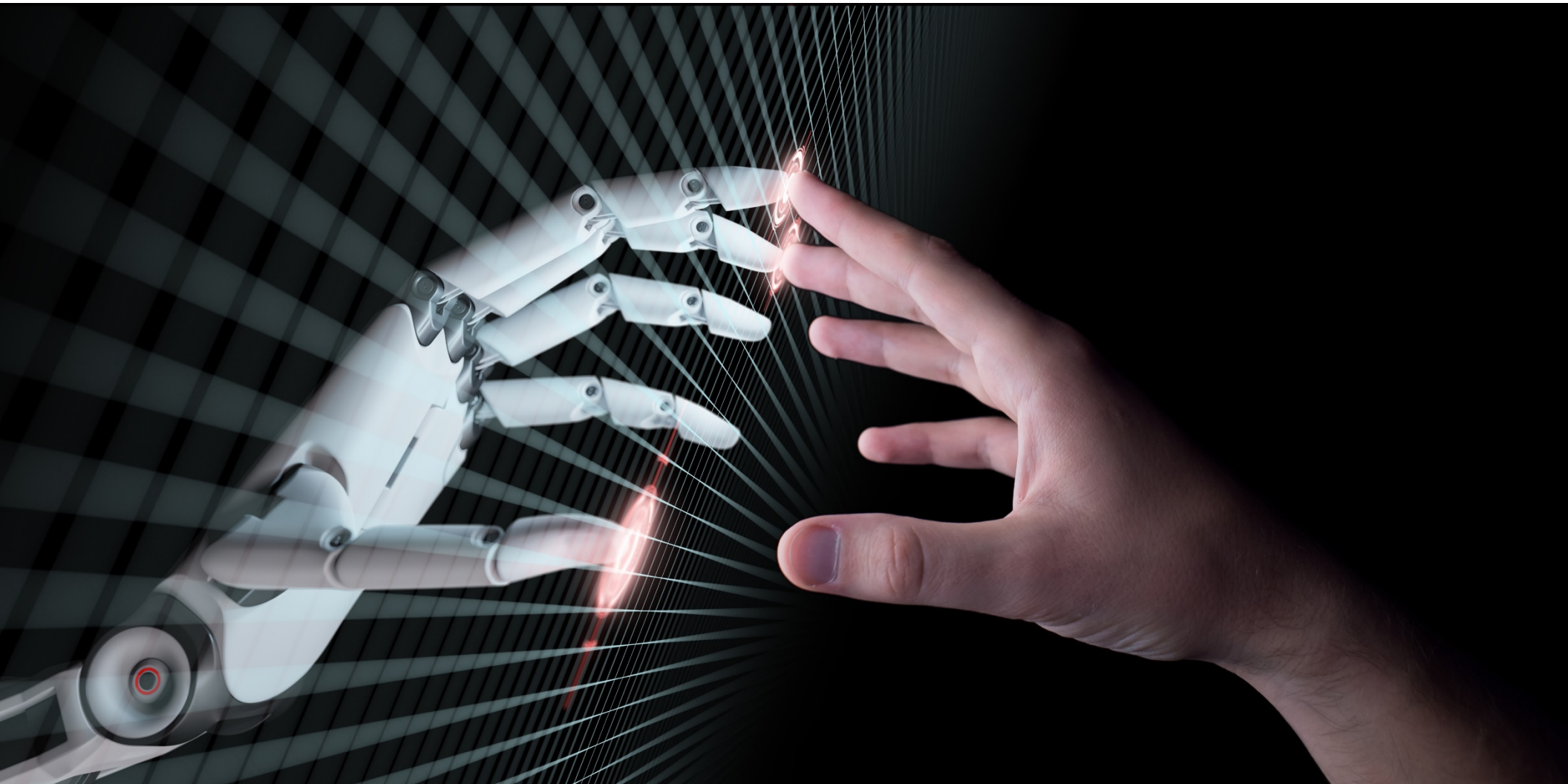
Shallow Learning and Variable Importance

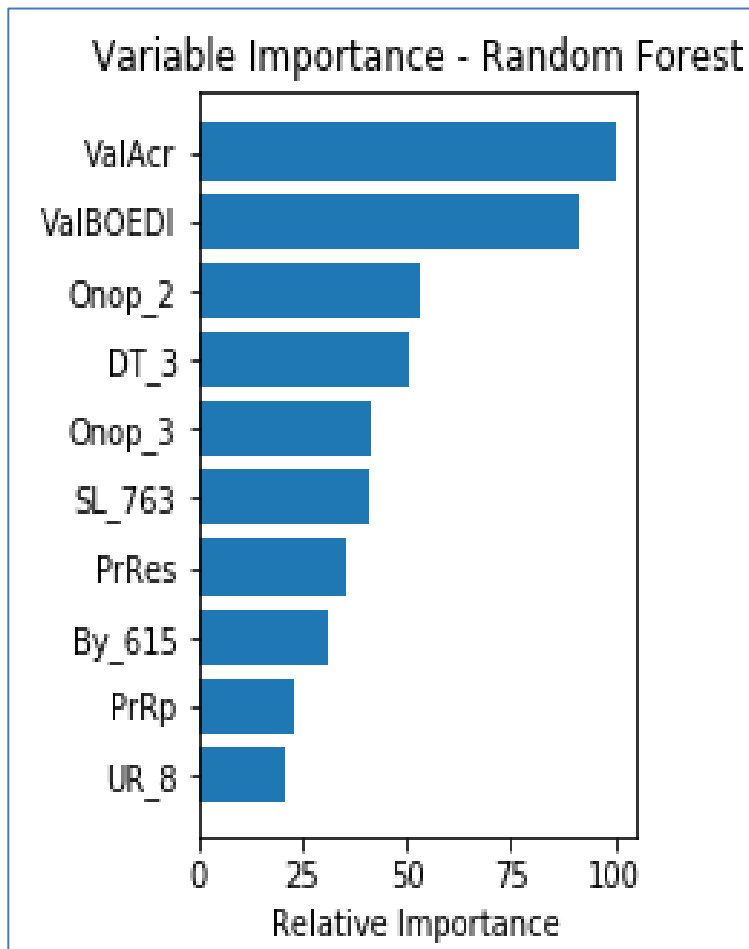


Deep Learning Results - Optimized vs Non-Optimized



What can the human learn from the machine?





Makes sense:

- \$/acre
- \$/flowing barrel

Insightful but not unexpected:

- Premium for Operated vs Non-Op
- Deal type – ex asset, JV, corporate
- Oil weighted deals going for more

Surprising - a specific seller and a specific buyer show up: Are they very active? Overpaying? Or a data/ML issue needing adjustment?

Lower importance is also insightful:

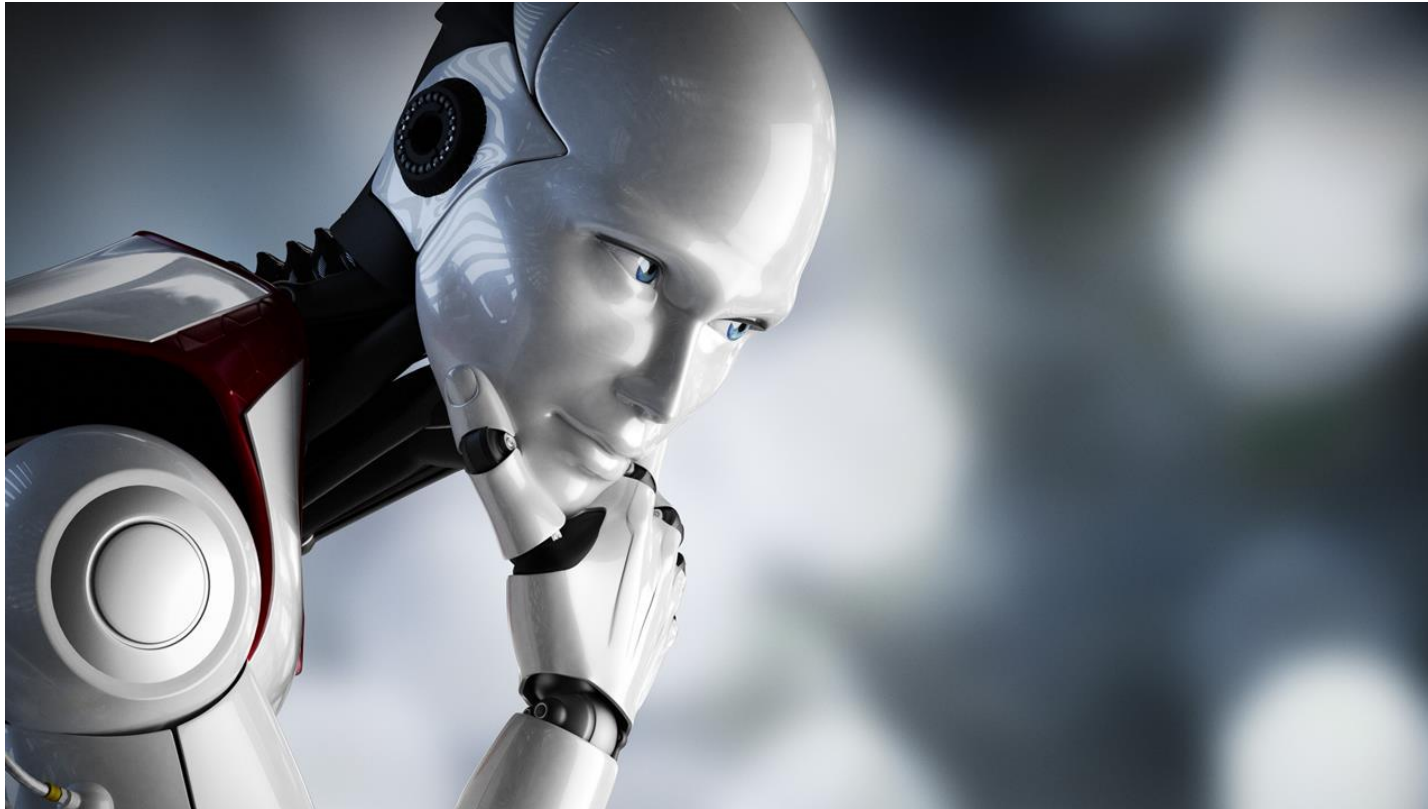
- Reserves amounts and values
- US Regions (ex Permian, Eagle Ford, Rockies)

*For more on SL and DL
applications to A&D...*

Come to our next talk!

*Reach out regarding consulting
and contract work!*

Thank You!



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