PRACTICAL EXAMPLES AT THE CUTTING EDGE OF NATURAL LANGUAGE PROCESSING (HYBRIDNL)

Dr Iain Wadie, VP UK&I, expert.ai

Webinar

Wednesday, 13 October 2021, 15:00 BST

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A Word From Today's Chairman

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Managing Director

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Today's Agenda

- 15:00 – 15:05 Chairman's Introduction
- 15:05 – 15:25 Keynote Presentation – Dr Iain Wadie
- 15:25 – 15:45 Question & Answer

Today's Speaker

Dr Iain Wadie

VP UK&I

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Next Gen NLP

Increase Accuracy and Efficiency With a Hybrid AI Approach

Dr Iain Wadie, VP UK&I, expert.ai

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13th October 2021

“Practical examples at the cutting edge of Natural Language Processing (HybridNL).”

“When working with NLP, there are two key AI techniques that can be used to extract insight and understanding from unstructured language data: symbolic and machine learning. Symbolic is a knowledge-based approach, leveraging knowledge graphs, linguistic feature engines, and reasoning engines. Machine Learning is an inference-based approach using deep learning neural networks, and constructs such as transformers for feature engineering. Both methods have their benefits and challenges. A symbolic approach depends upon the creation of a knowledge graph, while machine learning requires the annotation of large amounts of data. Despite their differences, both approaches complement each other, allowing more to be done with real-world datasets. In this webinar we draw on insights from previous FS Club webinars, discuss both NLP approaches, and provide examples from our research into HybridNL.”

Which branch of NLP are you familiar with?

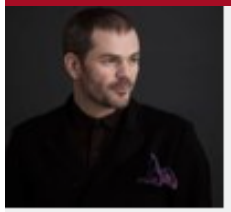
- **Symbolic NLP (KG + Liguistic Analysis)**
- **ML NLP (Deep learning algorithms such as transformers)**
- **Both Symbolic and ML**
- **Neither Symbolic nor ML**

Some interesting and relevant FS Club Webinars

Text To Intelligence – The Future Of Knowledge Graphs
Webinar

Dr Robert Hercock
Chief Research Scientist
British Telecommunications
Security Research Practice

Deception & Truth Analysis For Investors... There Is 86.5% Of Alpha Begging To Be Mined, Right There In Those Reports, Briefings & Transcripts On Your Desk!
Webinar - USA



Jason Voss
Chief Executive Officer
Active Investment Management (AIM) Consulting

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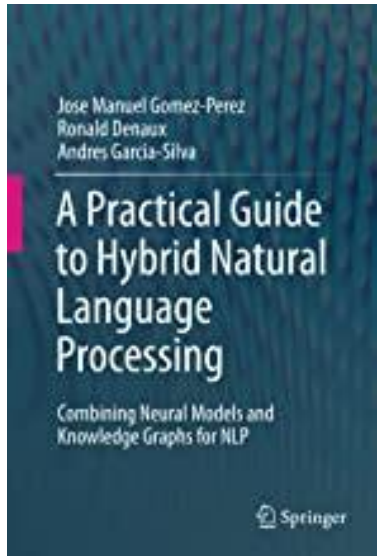
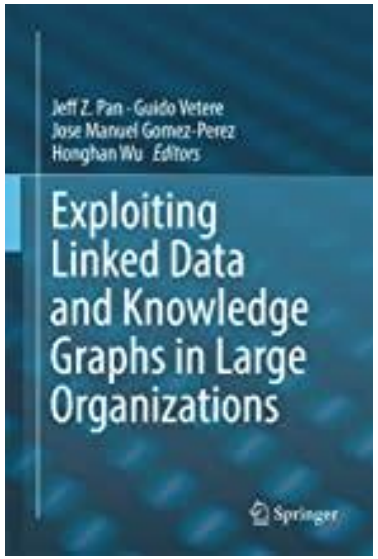
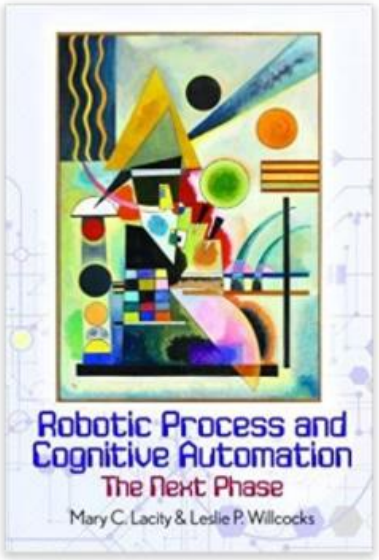
Expert.ai: Our Research into HybridNL



expert.ai R&D team has written the book on HybridNL



HybridNL leverages the "symbolic imperative" for successful NL AI



Ch 7: How expert.ai abstracts medical codes from verbose reports for Zurich.

Gartner

Gartner webinar which discusses composite AI (aka Hybrid)

FORRESTER®

Forrester webinar explaining the need for both ML and Symbolic

MESA

M+E Daily article which discusses Dow Jones use of expert.ai

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What are the obstacles to using NLP?

- **Lack of Data**
- **Annotating Data**
- **Creating Knowledge Graphs**
- **Explain-ability**
- **Other**
- **None!**

Machine Learning Has a Knowledge Problem

90%

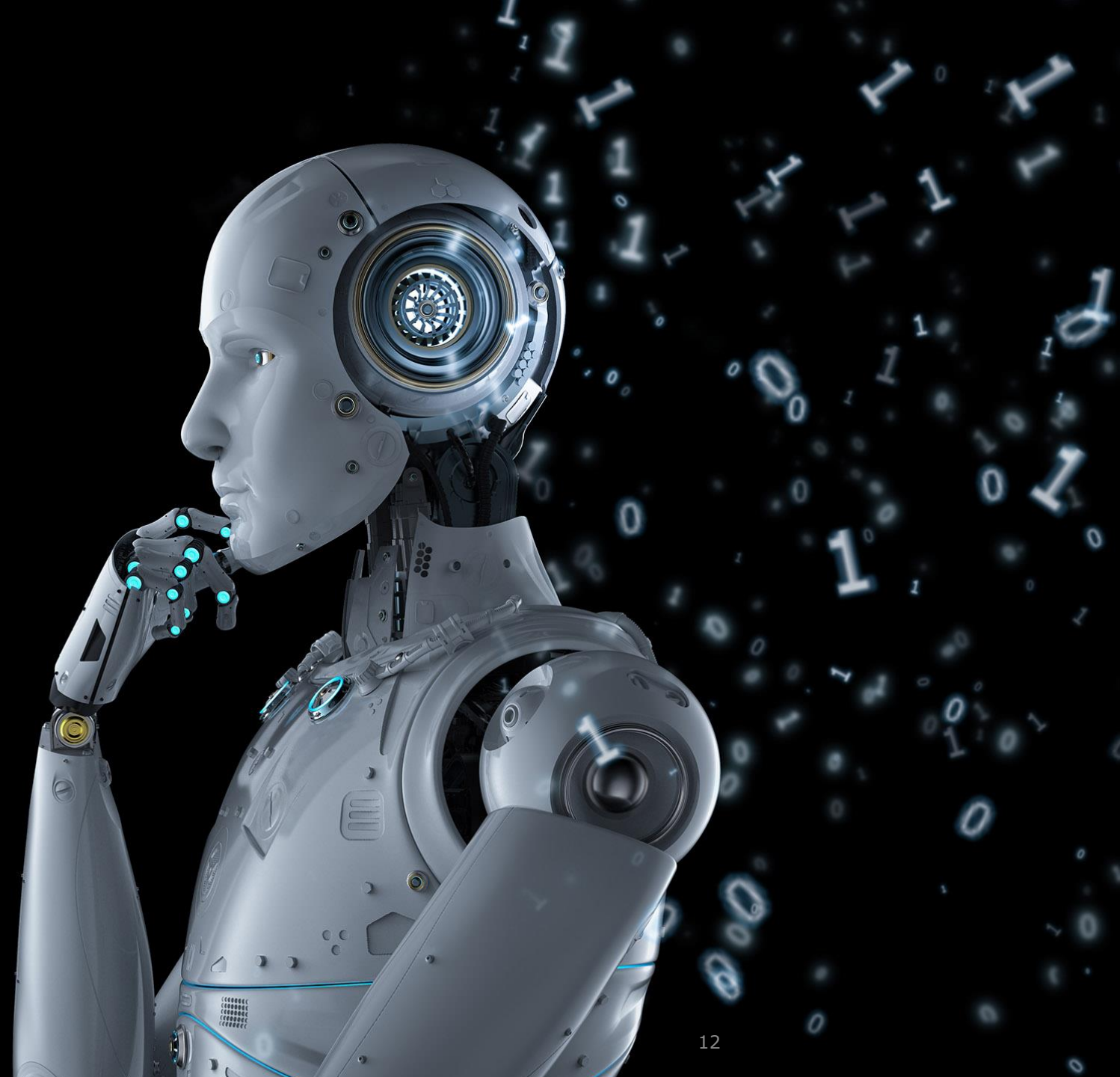
of projects never make it to production

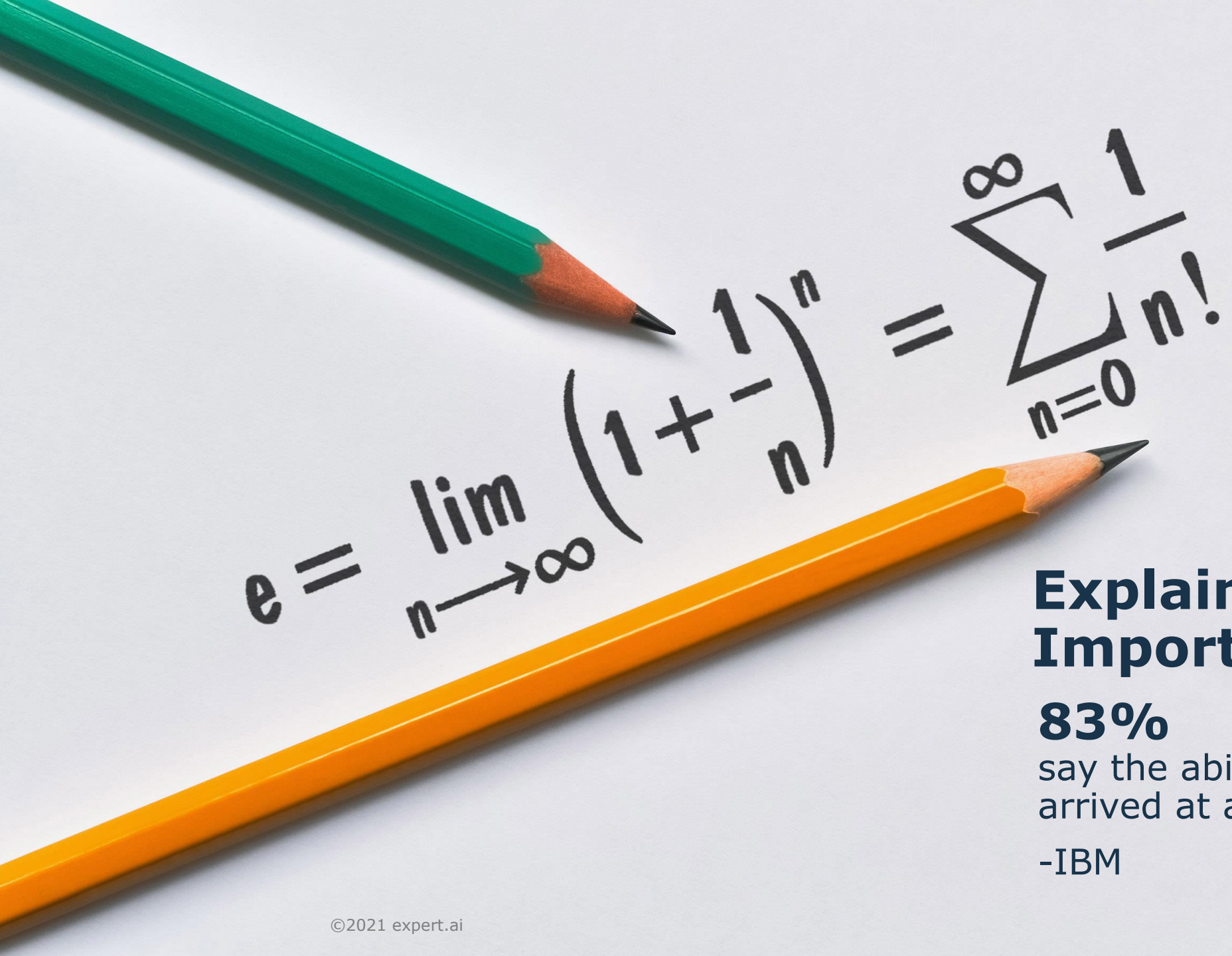
-*BCG*

96%

experienced problems with data quality, data labelling, & building model confidence

-*Dimensional Research*





Explainability is Important

83%

say the ability to explain how AI arrived at a decision is important.

-IBM

Language in **Business**

- **Humans handle most language data**
- **Machine Learning struggles to detect nuances in language**
- **Scaling AI language data-driven processes is difficult**

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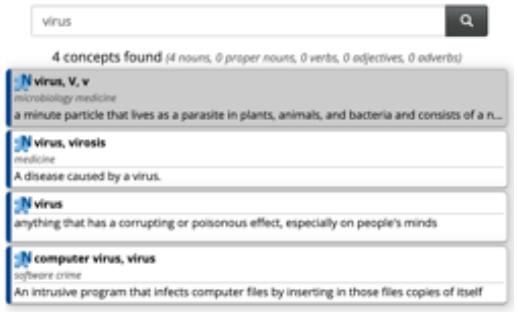
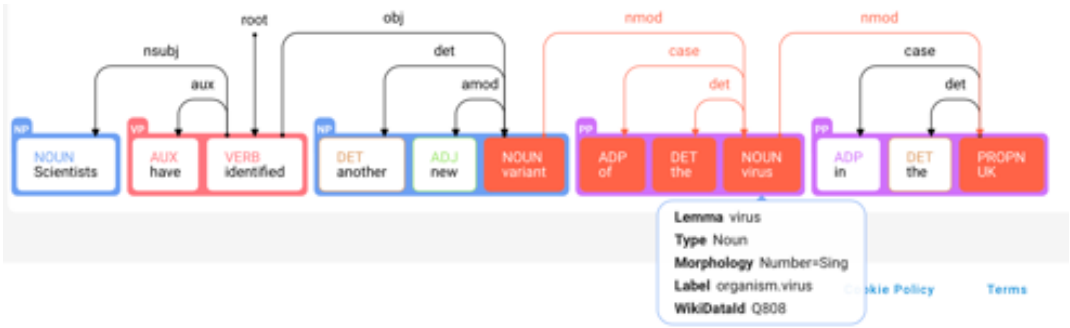
Choice of AI Technique is a Key Success Factor

Two main approaches.

Symbolic Approach

This approach involves designing hand-built linguistic rules to apply to text. Rules follow a very simple criteria:





Pros

- Designed by humans, easy to understand, accurate results fast
- Explainable results
- Robustness to data scarcity and variability (model drift)
- Computationally efficient
- Complement (augment) ML annotation and model building

Cons

- Requires specific skills and learning proprietary language
- Curation of domain specific knowledge graph can be complex
- Data scientists lack of knowledge about this technique

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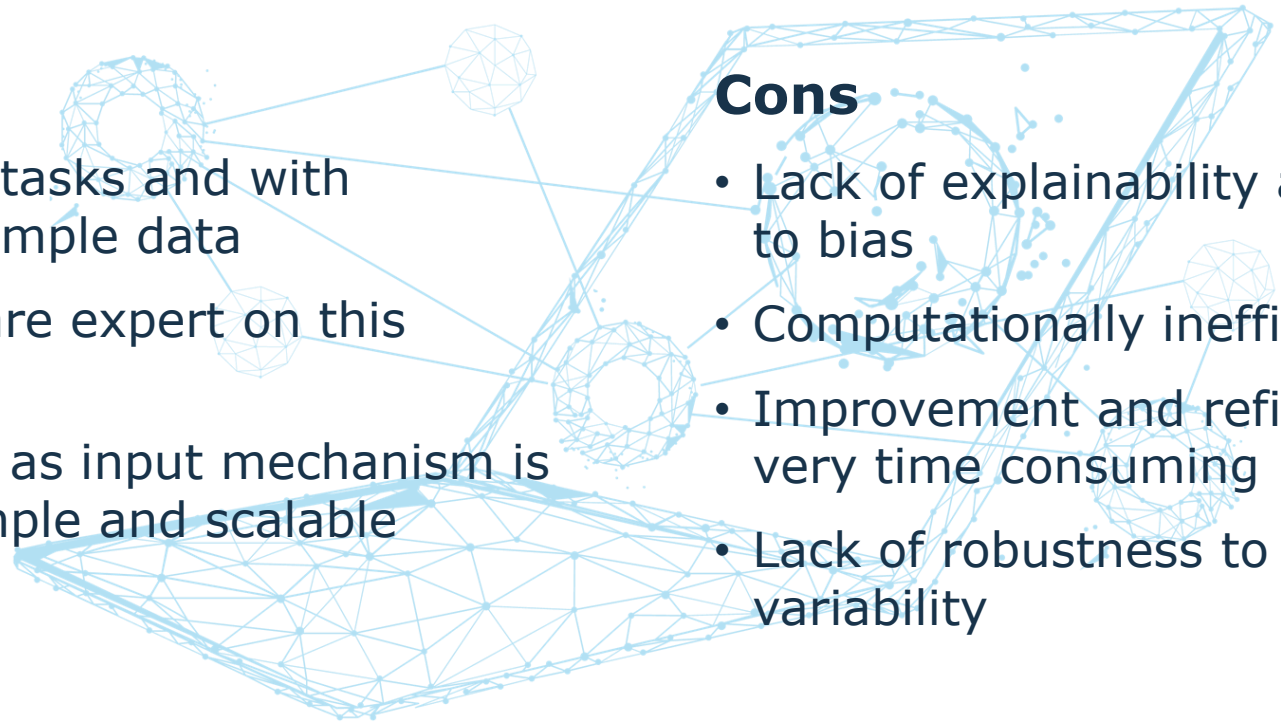
Machine Learning Approach

Machine Learning employs algorithms capable of learning directly from training data.

Most Machine Learning algorithms are not based on Artificial Intelligence, the system uses statistical methods relying on recurrent patterns and textual associations to train itself.



Pros

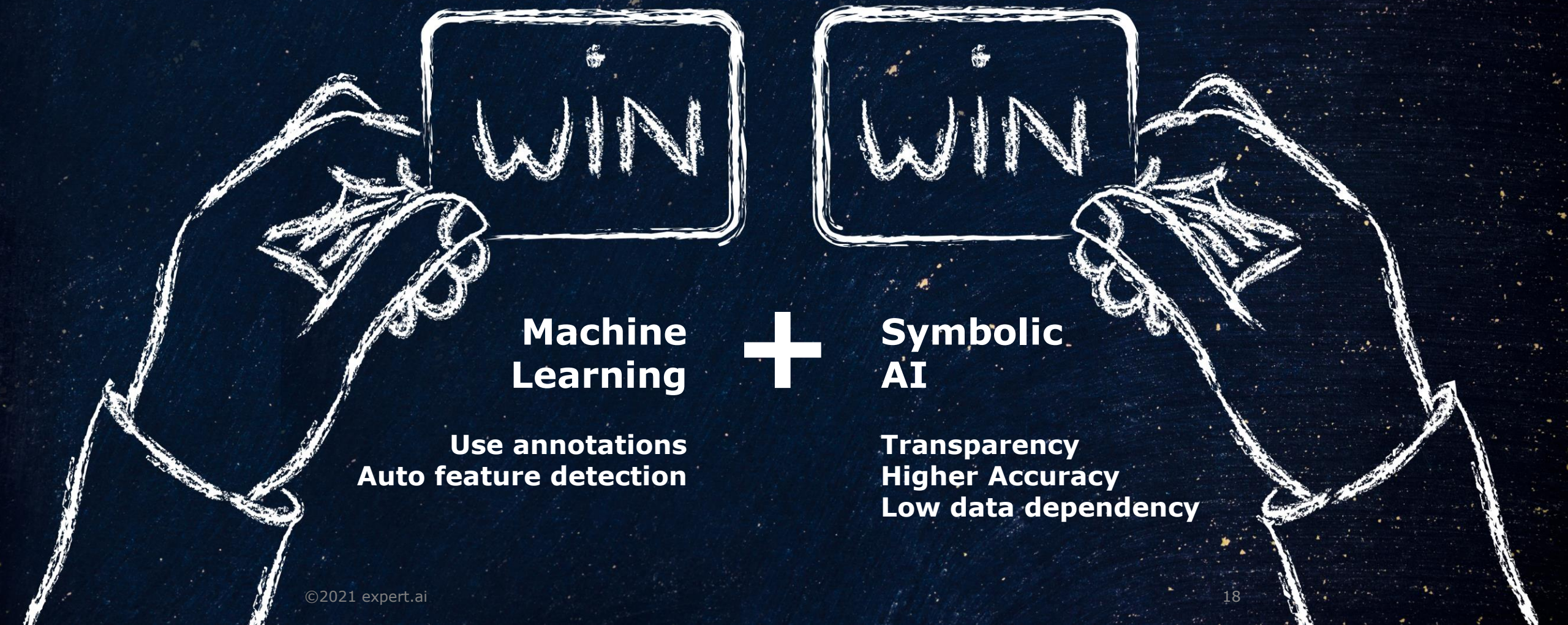
- Ideal for simple tasks and with abundance of sample data
- Data scientists are expert on this technique
- Data annotation as input mechanism is perceived as simple and scalable

Cons

- Lack of explainability and easily subject to bias
- Computationally inefficient
- Improvement and refining tasks can be very time consuming
- Lack of robustness to data scarcity and variability

Hybrid AI

Leverage the strengths of both ML and knowledge-based techniques to generate results.



Machine Learning

Use annotations
Auto feature detection

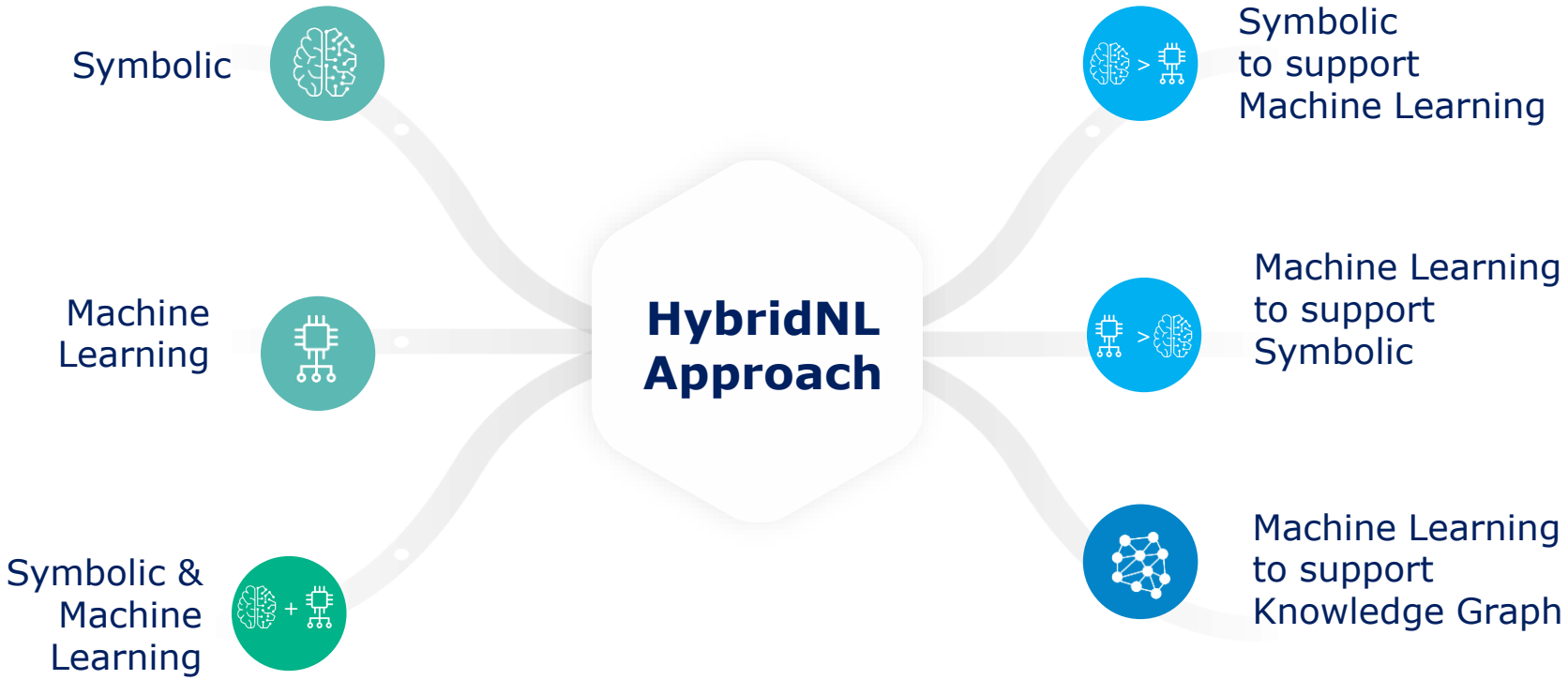
+

Symbolic AI

Transparency
Higher Accuracy
Low data dependency

The HybridNL Approach

Combine AI techniques to achieve better results



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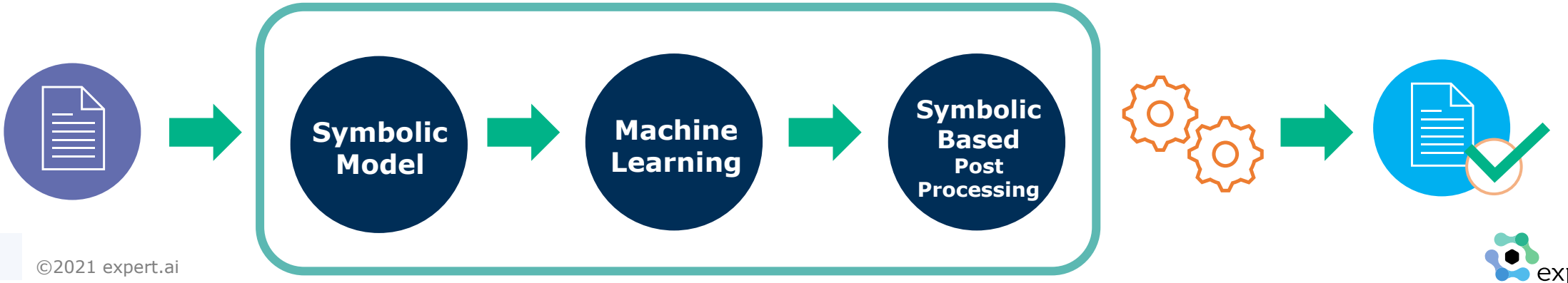
Real Life Hybrid Scenario

Extraction

Need: Collect multiple strategic data points from financial press releases

Challenge: Extracting information about parties and advisory firms to parties is a very challenging task for both Symbolic and Machine Learning

Solution: Create a pipeline that combines a Symbolic and Machine Learning model in sequence. Benefit from the accuracy of a Symbolic model with a Machine Learning algorithm to maximize performance.



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Real Life Hybrid Scenario 2

Categorization

Need: Classify stock transactions as “Change in Control”

Challenge: Complex scenario requiring the ability to identify the connections between “sold” and “hold” as well as identify transactions without a change in control

- Ex. Berg Holding SA: Sells package of shares in unit Farmy Fotowoltaiki for 0,5 M ZLOTYS. Now holds 94.51% stake in unit.
- AutoML OK (95%) for yes: easier as more frequent (more data) and “default” event
- AutoML KO (50%) for no: more complex because less data, more diverse situations and lots of ambiguity

Solution:

- Augment Auto ML capabilities by leveraging symbolic model for features engineering
- If a symbolic rule kicked in and feeds that information to Auto ML

Results:

- **Increased performance by 25% with a hybrid approach**

Real Life Hybrid Scenario 3

Explainable Categorization

Need: Classify documents

Challenge:

- Limited data set annotated (taxonomies are representative and ~50 docs/category)
- Minimize the need/cost of retraining due to expected data drifting

Solution:

- Leverage the advantages of robustness to data scarcity and drifting with a symbolic rule-based model for classification
- Symbolic ruleset automatically generated via ML creates models made of linguistic rules that you can easily modify to adapt to changes in data or incorrect predictions

Results:

- Transforms ML approach with explainable, interpretable and accountable AI

Which function will benefit most from NLP?

- **Customer interactions (chatbots, email handling)**
- **Processing unstructured documents (extraction from/categorisation of contracts, policies, reports)**
- **Enabling faceted search of document libraries (categorisation, tagging)**
- **Intelligence (supply chain, AML, financial markets, marketing feedback …)**
- **Sentiment analysis, marketing feedback, predicting elections …**

Enabling faceted search

Customer Interactions

Language IS data

Sentiment and integrity analysis

PEP/SIP/SIE/Bad news

Intelligence – market, supply chain

…

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Comments, Questions & Answers

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Thank You For Listening

Forthcoming Events

- Thu, 14 Oct (15:00-15:45) Asynchronicity & The Future Of The Workplace
- Wed, 20 Oct (09:00-10:00) Launch Of Global Green Finance Index 8
- Thu, 21 Oct (10:00-10:45) Escape From Model Land: The Dangers Of Over-Confidence In Mathematical Models And How To Avoid It
- Mon, 25 Oct (16:00-16:45) Privacy By Design Is Essential To Complementing Regulatory Compliance: Privacy Laws Are No Longer Sufficient

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