



# AI Forecasting in Industry

10 years of experiences on costs savings @ Beiersdorf HAM



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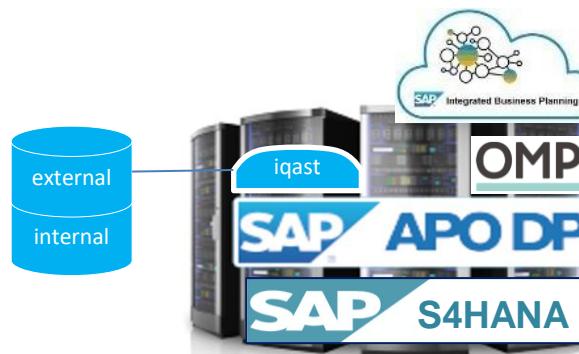
Research Centre for Marketing Analytics & Forecasting

CEO & Founder of iqast





pioneers in forecasting with artificial intelligence



BADI plug-in

add-on software: AI forecasting engine

- ❖ intelligent model selection
- ❖ intelligent forecast algorithms
- ❖ intelligent safety stocks
- ❖ intelligent outlier history correction
- ❖ intelligent anomaly detection



Bayer Business Services

Johnson & Johnson

Janssen

Hapag-Lloyd

DePuy Synthes  
COMPANIES OF Johnson & Johnson

# the hype of AI in Supply Chain Management → forecasting!

Demand Predictability and Cost Control Remain Key  
Challenges in Achieving Supply Chain Success

Leading and Aggregate Barriers  
to Success

## Barriers to Achieving Goals and Objectives

Average Last Three Years

### Consider Your Supply Chain Obstacles

#### Obstacles Top 3 Choices

Forecast accuracy and demand variability

Inability to synchronize e2e processes

Lack of cross-functional collaboration

Leadership/corporate culture

Supplier performance

Cost mitigation and control

SC talent

#### Top 5 Obstacles to Achieving SCM Goals and Objectives

Forecast accuracy and demand variability

Inability to synchronize e2e processes

Lack of cross-functional collaboration

Leadership/corporate culture

Supplier performance

Cost mitigation and control

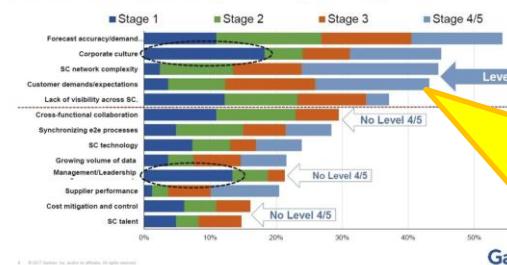
SC talent

## Gartner Study Identifies Supply Chain User Wants and Needs

Posted by Jeff Bodenstab on Jun 6, 2017 6:03:44 PM

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### Obstacles to Achieving Goals by Maturity



**Forecast accuracy was the main challenge in SCM**

The annual Gartner Supply Chain Technology User Wants and Needs Study, now its tenth year, is one of this industry's most comprehensive studies of supply chain users. This year it included more than 1,000 companies from 40 countries and 10 industries, with responses from people spanning the globe. Here are some key questions it answered:

Does supply chain maturity matter? Yes, says Gartner analyst and report author Dwight Klappich. 90% of high maturity companies (stage 4 and stage 5) report supply chain leadership ahead of their peers. And 40% of lower maturity companies (stage 1) report that they are behind their peers.

Where are leading companies focusing? On cost reduction? No, they are focusing on business growth and also on process improvements and innovation. Improving overall supply chain efficiency is well down the list.

## THE WALL STREET JOURNAL.

Home World U.S. Politics Economy Business Tech Markets Opinion Life & Arts Real Estate

### CFO JOURNAL.

Deloitte.

written and compiled by Deloitte

al News Department was not involved in the creation of the content

Insights Articles

Tax Reform Update and Resources

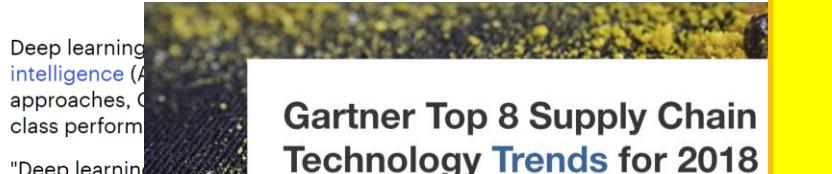
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lenges With

Cape Town, South Africa, September 20, 2017

## Gartner Says Deep Learning Will Provide Best-in-Class Performance for Demand, Fraud and Failure Predictions By 2019

80 Percent of Data Scientists Will Have Deep Learning in Their Toolkits By 2018



"Deep learning can analyze data," said Alex Hilderman, a principal research analyst at Gartner. "It can interpret massive amounts of visually important data, such as images or video, and make sense of them without a person's specific input."

## Gartner Top 8 Supply Chain Technology Trends for 2018

February 27, 2018

Contributor: Christy Petley

### SUPPLY CHAIN

AI, IoT, advanced analytics and blockchain are some of the trends driving competitive advantage for supply chains.

Olay Skin Advisor is a mobile app that relies on machine-learning algorithms to analyze skin care needs. The app performs a facial analysis from a consumer's no-makeup selfie and recommends products based on personal data and best practices from skin care experts. The artificial intelligence (AI)-enabled app also collects buying behavior data directly from the consumer and uses that data to determine the demand for and recommend specific products.

"Supply chain leaders must assess their company's risk culture to determine their readiness to explore and adopt emerging offerings."

Similarly, FlavorPrint, an AI-based platform introduced by McCormick spinoff Vivanda, determines what is called a "flavor DNA" — a digital taste identifier that matches consumers to food items. Through this direct customer engagement, FlavorPrint is sensing demand by better understanding customer preference. Furthermore, it can make this information available to the extended supply chain — suppliers, food manufacturers, content publishers — for better demand response and creation.

**Solution is in innovation of AI algorithms!**

ights, the reader should keep in mind that they reflect a population specific supply chain challenges. "But can help supply chain leaders gauge their current practices and future plans along their analytics maturity journey."

Qualified workers (64 percent) as the top

Supply Chain Challenges

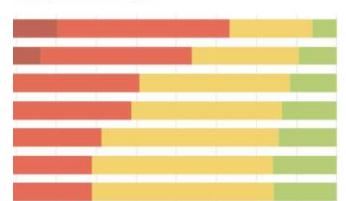
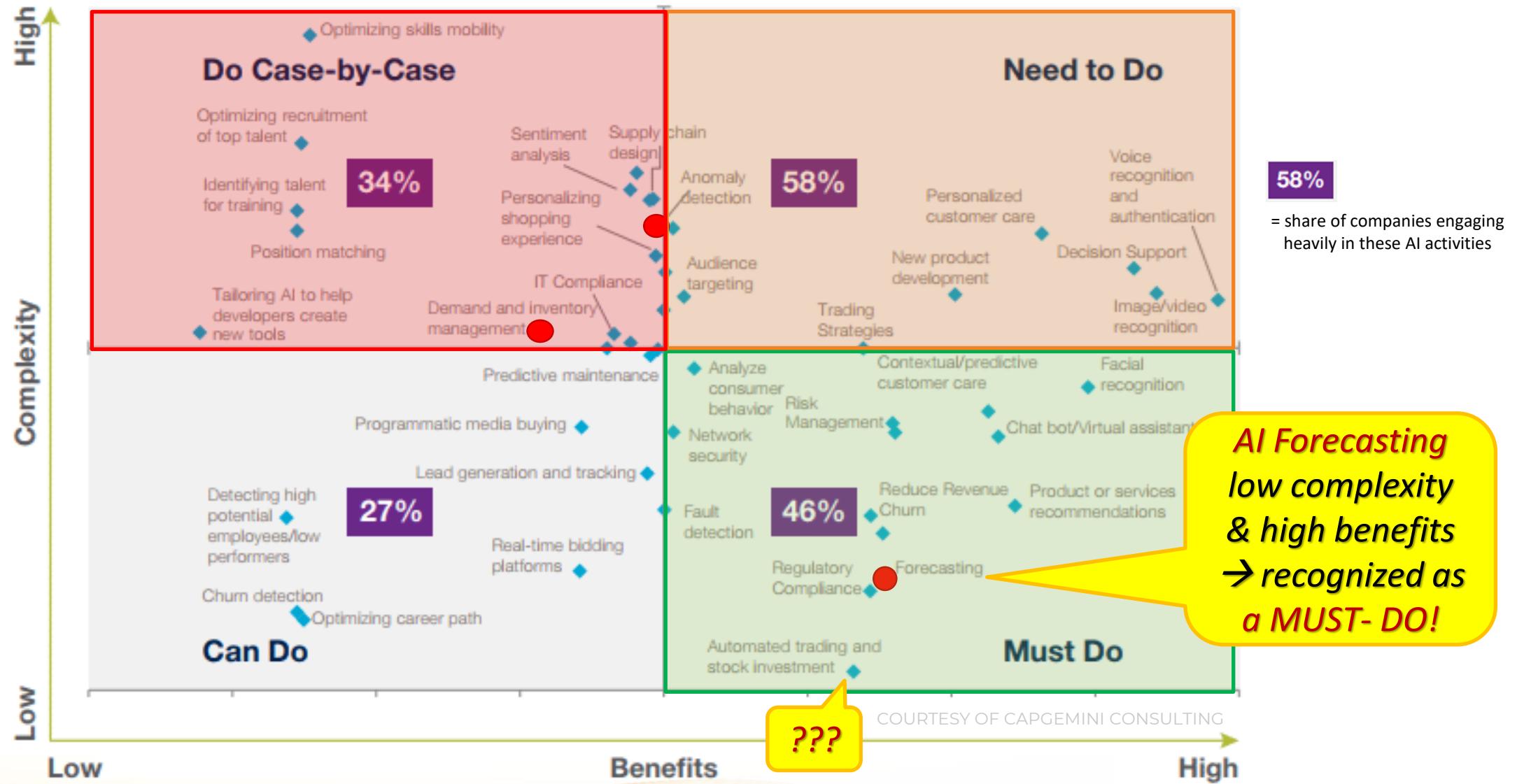
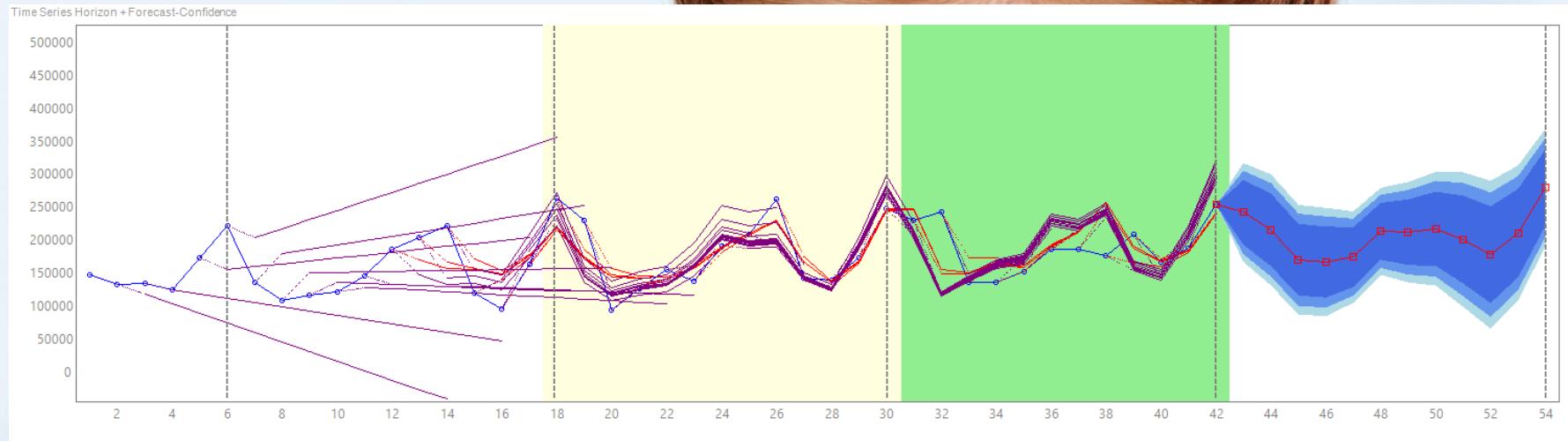


Figure 9. Distribution of use cases by benefits and complexity



# AI in FMCG Forecasting @ Beiersdorf



Median sMAPE	Test
Seasonal Linear Regression (35B)	18.20
SLR + Planner Judgment	12.08
MLP AR + Selection	9.00
Improvement	-9.02
Improvement in %	-49.8%

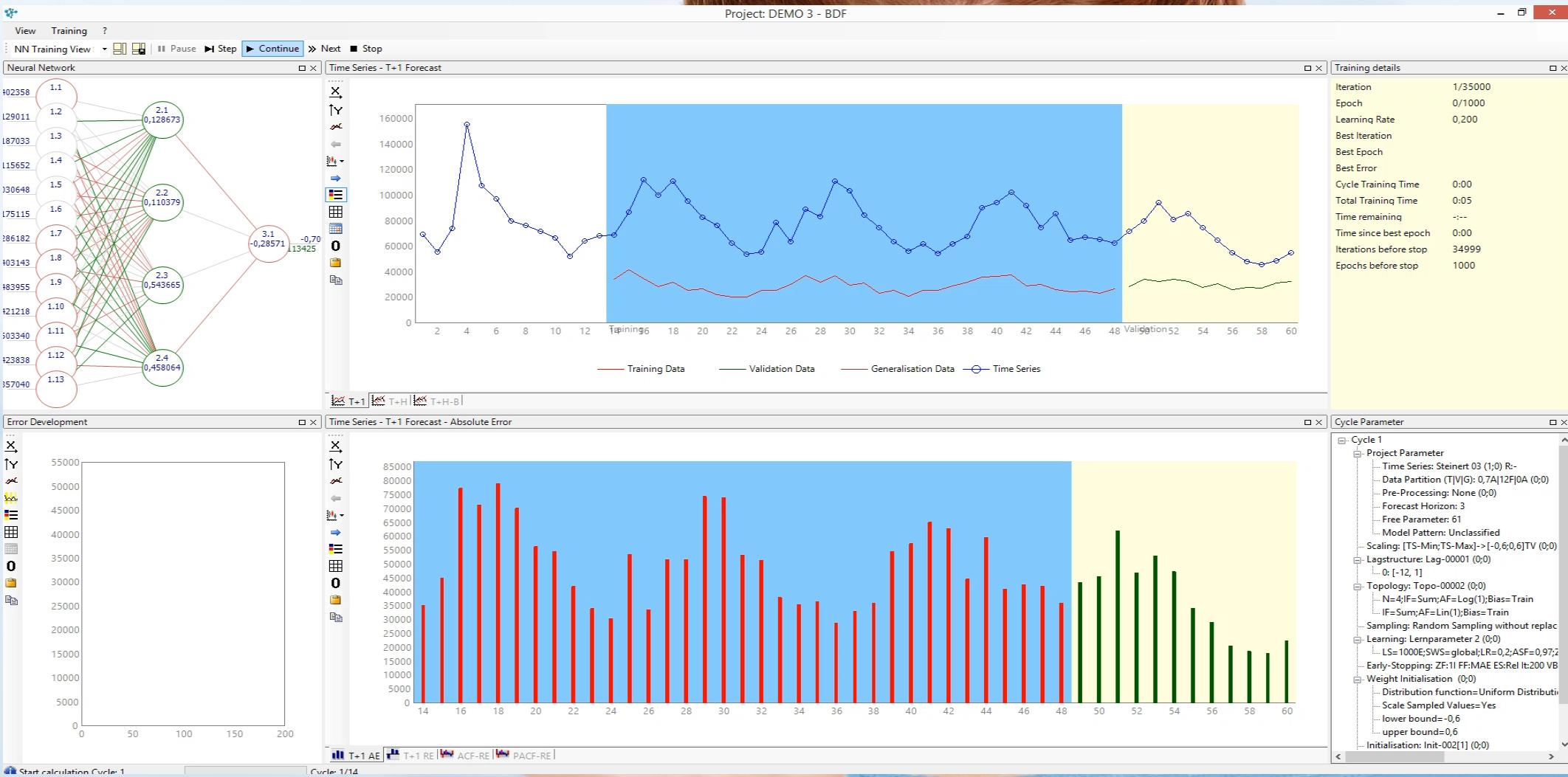
NNET achieves super-human forecast accuracy

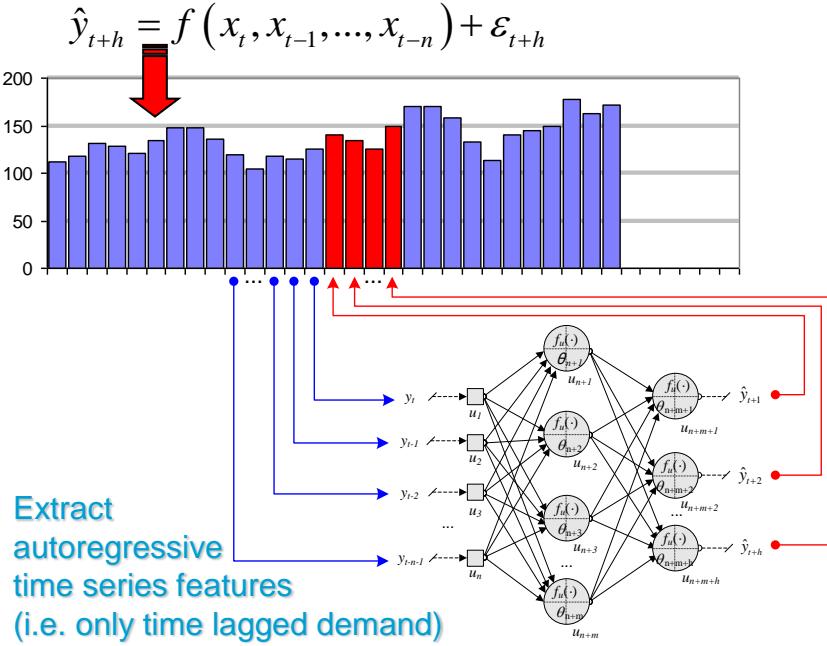


sMAPE test	SAP error	iqast error	Δ error	Δ error %	# items
Canada	40,7	33,8	-6,9	-16,9%	47
Germany	55,4	51,7	-3,7	-6,8%	155
France	43,7	42,6	-1,2	-2,7%	262
Greece	50,9	49,4	-1,7	-3,3%	196
Italy	42,7	39,9	-2,8	-6,5%	175
Netherlands	41,0	38,9	-2,1	-5,1%	154
Poland	55,2	47,1	-8,1	-14,7%	
South Africa	37,3	35,9	-1,4	-3,7%	
Average				-7,5%	

NNET achieves super-human accuracy in Pilot across countries

# AI in FMCG Forecasting @ Beiersdorf

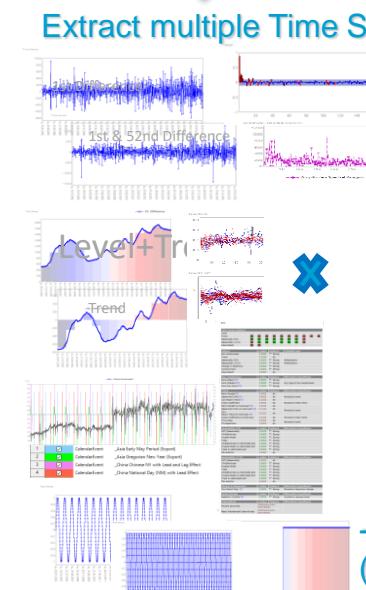
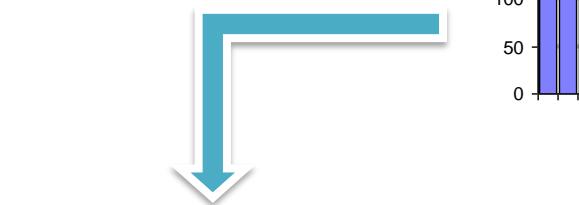


1<sup>st</sup> Generation NeuralNet Models

Impressive?

maybe, if this example was not 8 years old! (1 generation)  
 → innovators are already moving to next gen AI ...

(Note: costs &lt;€25k &amp; time &lt;15pd for install &amp; global rollout)

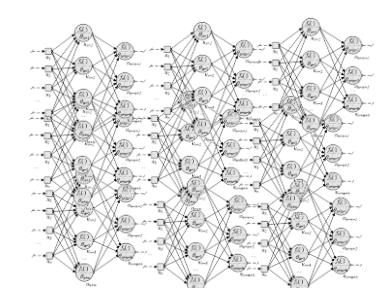
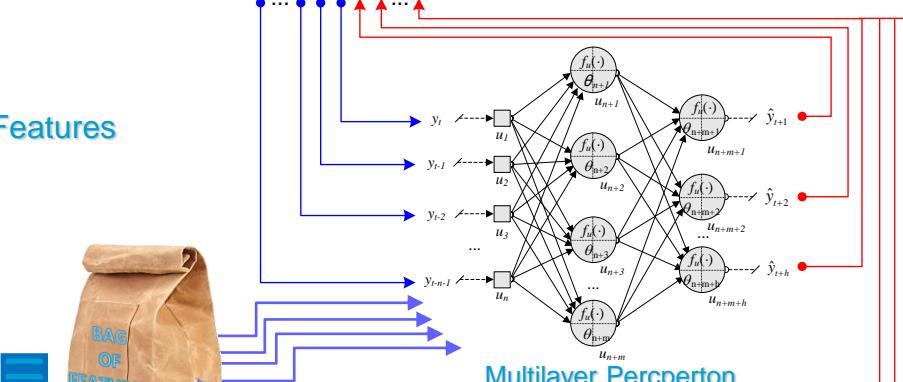
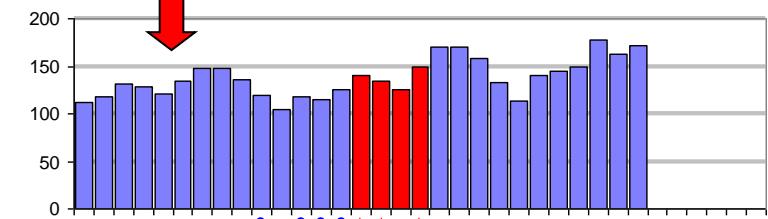
2<sup>nd</sup> Generation NeuralNet Models

Square  
Cube  
Root  
Log  
BoxCox  
Rank  
SAX

Etc. → can also use  
 + hierarchical (trend/season) patterns of products, markets, channels



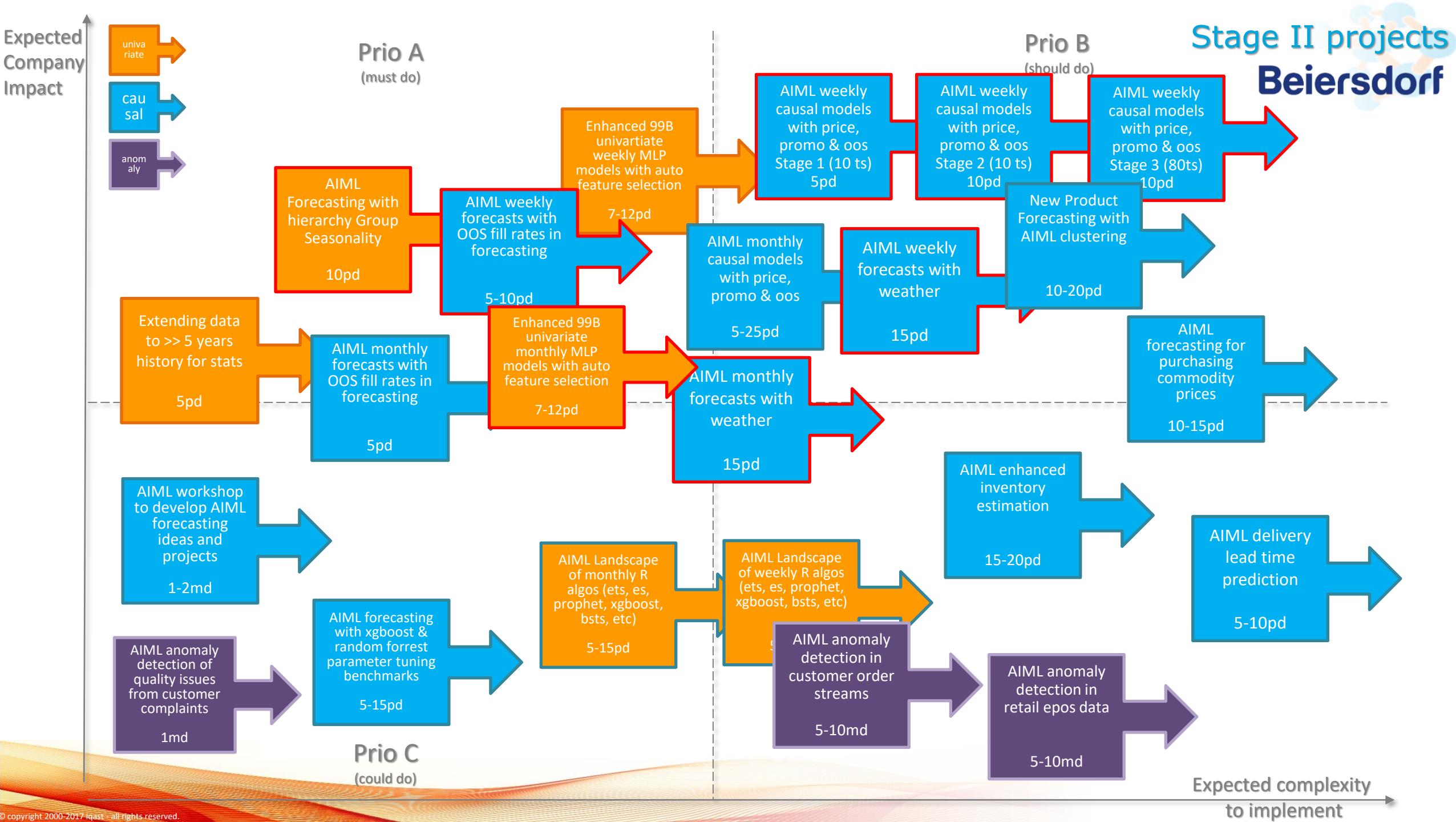
$$\hat{y}_{t+h} = f(x_t, x_{t-1}, \dots, x_{t-n}) + \epsilon_{t+h}$$

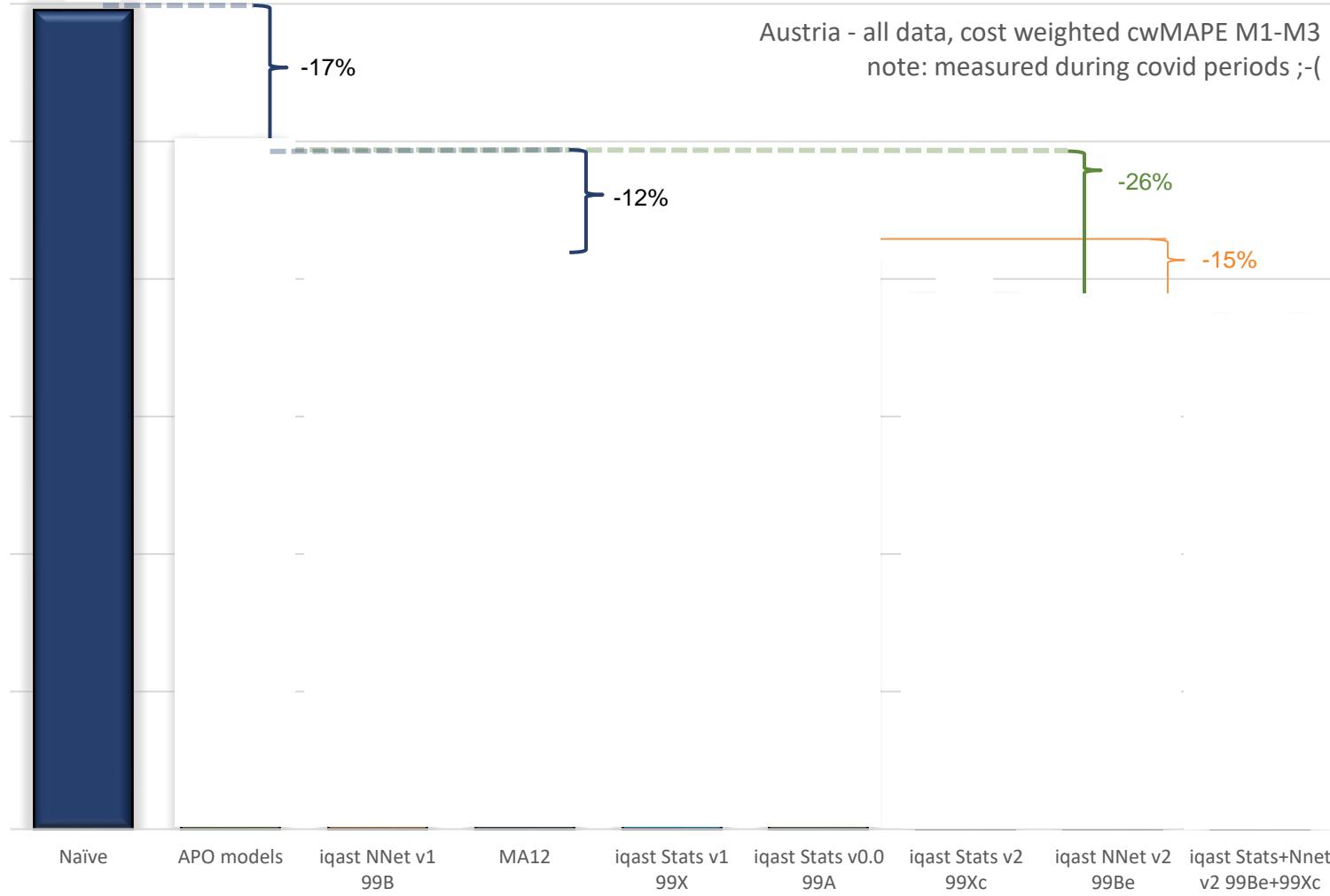


→ Enhance MANUAL feature engineering of AI, not invent new AI!

# Stage II projects

## Beiersdorf





- █ Stats benchmarks
- █ SAP APO legacy models
- █ iqast non-APO stats models
- █ iqast non-APO AIML models

Project	Austria - all data		Generalisation Errors	
	cwMAPE	Diff to 99B		Rank
99Be iqast NeuralNet v2,2 - Exp 6,6				2
99Be + 99Xc				2
99Xc iqast stats extended				3
99A SAP APO legacy models				4
99X iqast stats original				5
MA12 Moving Average				6
99B iqast NeuralNet legacy				7
APO current BDF models chosen by planners				8
Naïve RW benchmark				9

- Significant improvement from 1<sup>st</sup> gen AI → 2<sup>nd</sup> gen AI by reducing 15% wMAPE (% not pp)
- 2<sup>nd</sup> Gen AI improves on 5<sup>th</sup> Gen STATISTICS by 4% ... abd on human Planner by 26% (!)
- Business impact? \$7mio per 1% @J&J / €1.xmio per 1% @Tesa / ??? @BDF → next project ;-)

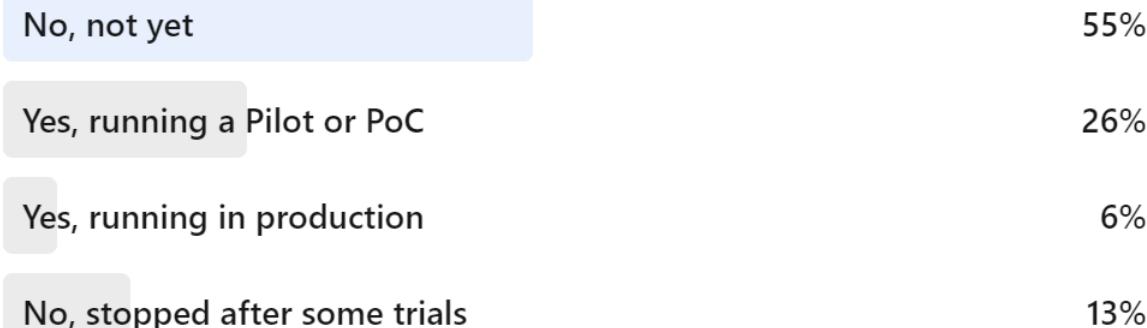


pioneers in forecasting with artificial intelligence

20 years of forecasting projects,  
(both academic & consultancy)  
but only slowly changing picture:

Has your company tried forecasting with AI/ML (Artificial Intelligence / Machine Learning) methods?

You can see how people vote. [Learn more](#)



31 votes • Poll closed

→ majority has not tried to use AI/ML in forecasting yet  
→ BUT: more failed trials than running in production!



→ SOME DEEP NEURAL NETS  
FAILED THEE TESTS!!! ;-)



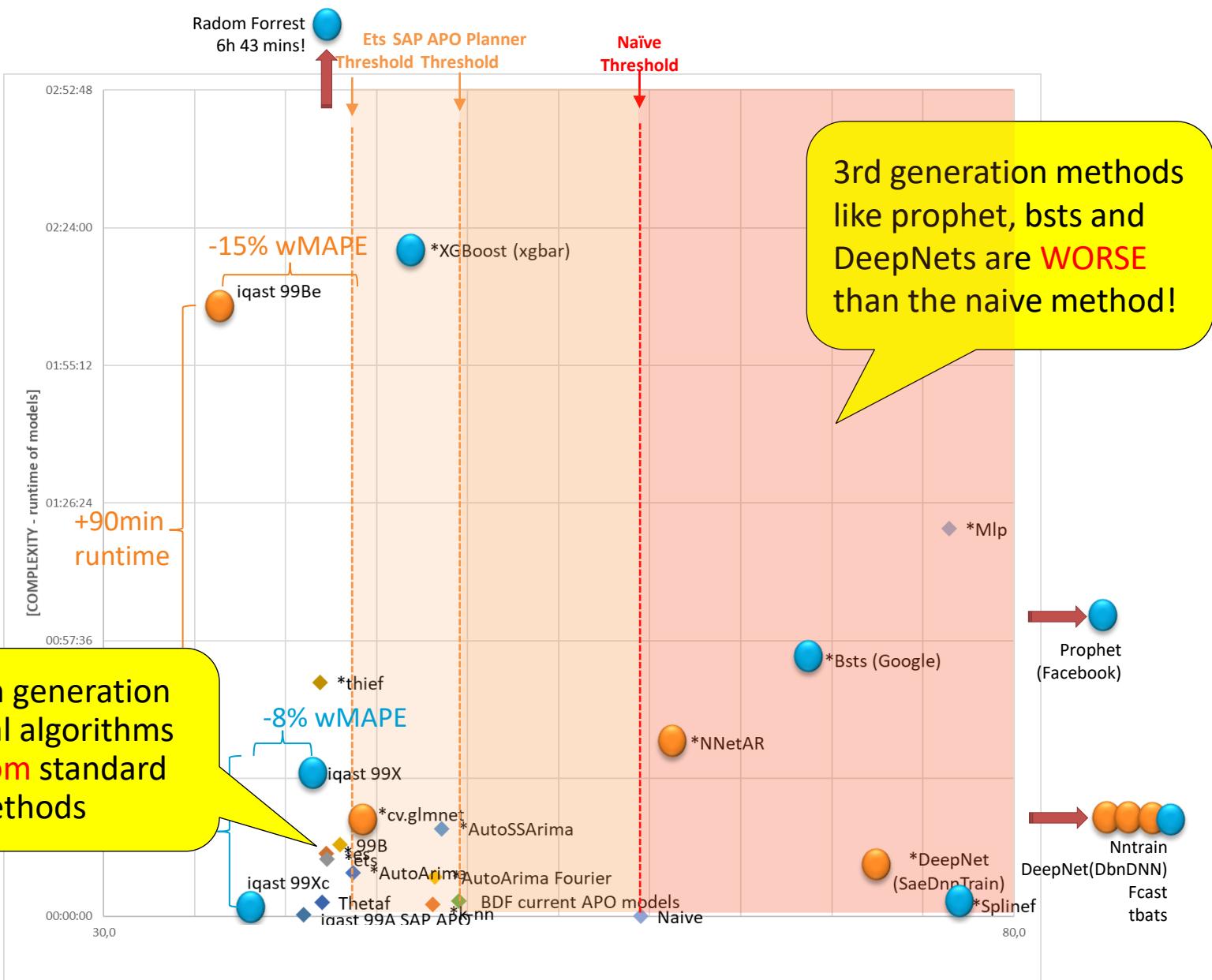
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# Benchmarking Landscape Beiersdorf Austria



→ custom-tuned 1<sup>st</sup> gen AI algorithms outperform all 2<sup>nd</sup> gen algorithms (incl. Facebook, Google and XGBoost!)  
 → 5<sup>th</sup> gen statistical algorithms also outperform 2<sup>nd</sup> gen AI → don't omit these!

# Thanks!

- AI is viable and valuable (in forecasting)
- Small & fast AI proof-of-concepts exists that are tried and tested
  - Algorithms exist, software solutions exist to integrate this easily into legacy systems, small consultancies exist → no obstacles!
  - start with these for a low-involvement high impact approach
  - postpone complexity with high(er) impact until later!
- Few multinationals or SMEs engage even today!
  - many multinationals use unis / small external experts to drive this with minimal organizational effort → opportunities for AI
  - Recent drive to develop this in-house with R/python is very costly due to talent shortage and total-cost-of-ownership → opps for solutions!
- I invite everyone to a free forecasting & anomaly detection mini POC on your data free of charge → just come over and chat ;-)

Figure 14. Every industry can benefit from a set of 'must do' use cases

Industry	Low hanging fruit – Least adopted "must do" use cases
Automotive	Managing risk Reducing revenue churn Forecasting Analyzing consumer behavior
Manufacturing	Managing risk Forecasting Detecting faults and measuring asset performance
Retail	Forecasting Tracking customer history/transaction Reducing revenue churn
Utilities	Analyzing consumer behavior Trading strategies Forecasting
Telecom	Reducing revenue churn Forecasting Managing risk Tracking customer history/transaction
Banking	Analyzing consumer behavior Trading strategies Automated trading and stock investment
Insurance	Analyzing consumer behavior Trading strategies Reducing revenue churn Complying with regulations

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