

# Embracing Uncertainty

## Transitioning from Trend Forecasts to Future Scenarios - How Data and AI can Guide the Way

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## About Creme Global

**We advance global health,  
safety and nutrition.**

Through our world class scientific modelling,  
data science, predictive analytics, machine  
learning and computing capabilities.



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# Embracing Uncertainty





## Imagine a Trend leading to a Future Scenario

E.g. it could be:

- Price of a commodity
- Sales of your product
- Consumer intake of an ingredient
- USD price in Euro





## Past Scenario / Historic Data

It is only possible to see this trend by looking backwards





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**Past performance is no guarantee of future results!**



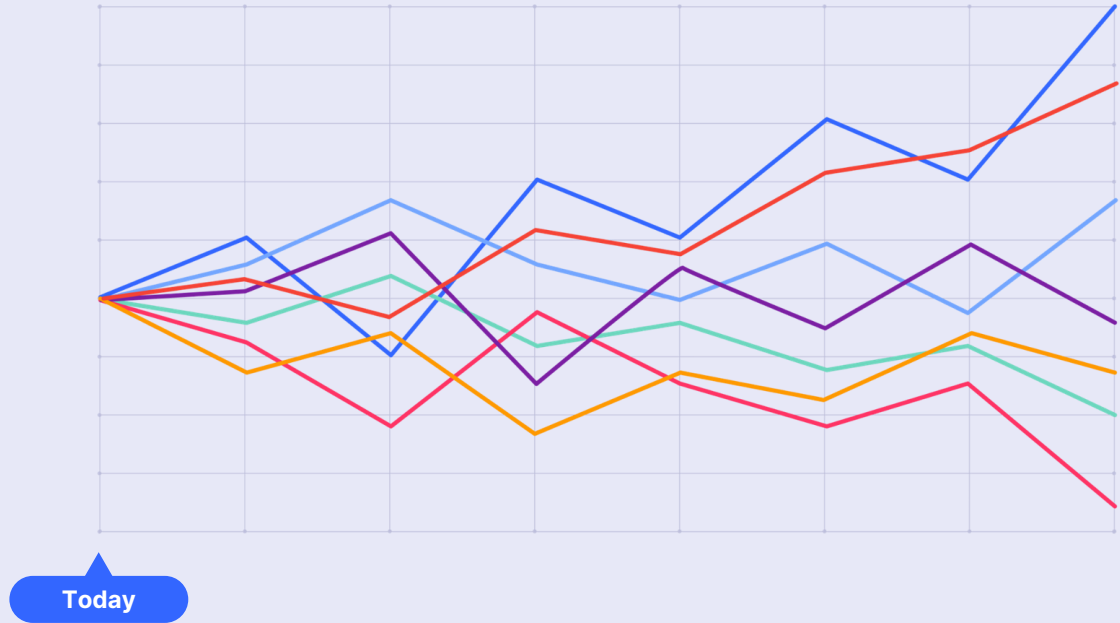
## **Looking Forward**

**What the future really looks like**



## Looking Forward

What the future really looks like

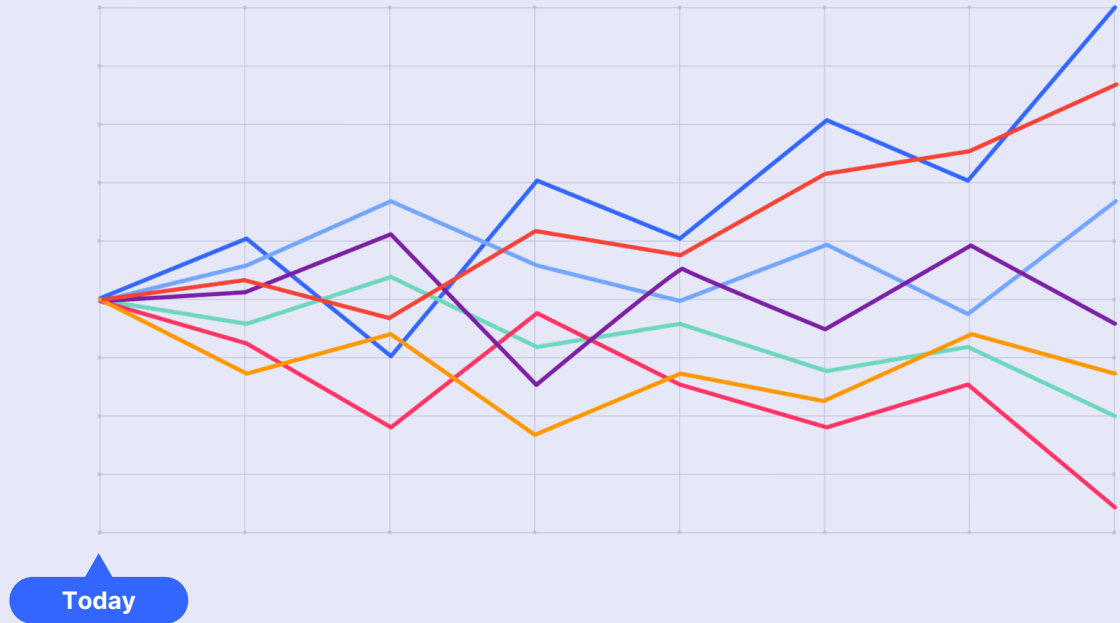






## Looking Forward

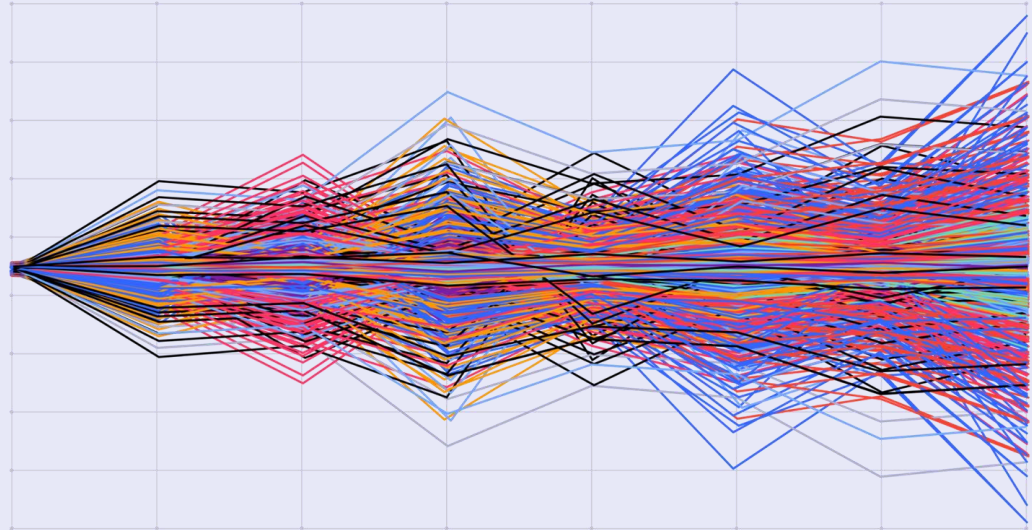
What the future really looks like  
Future Scenarios are Uncertain  
Trends are 'Probabilistic'





## Looking Forward

What the future really looks like  
Future Scenarios with Uncertainty  
Modelled with higher resolution  
(more 'probabilistic' paths)

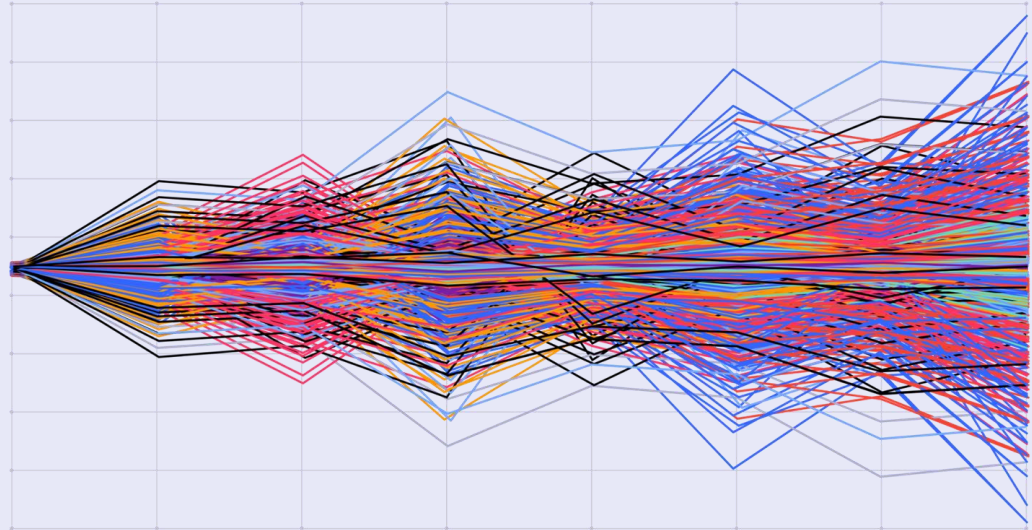


Today



## Looking Forward

Need to account for this variability and uncertainty in your scenario planning

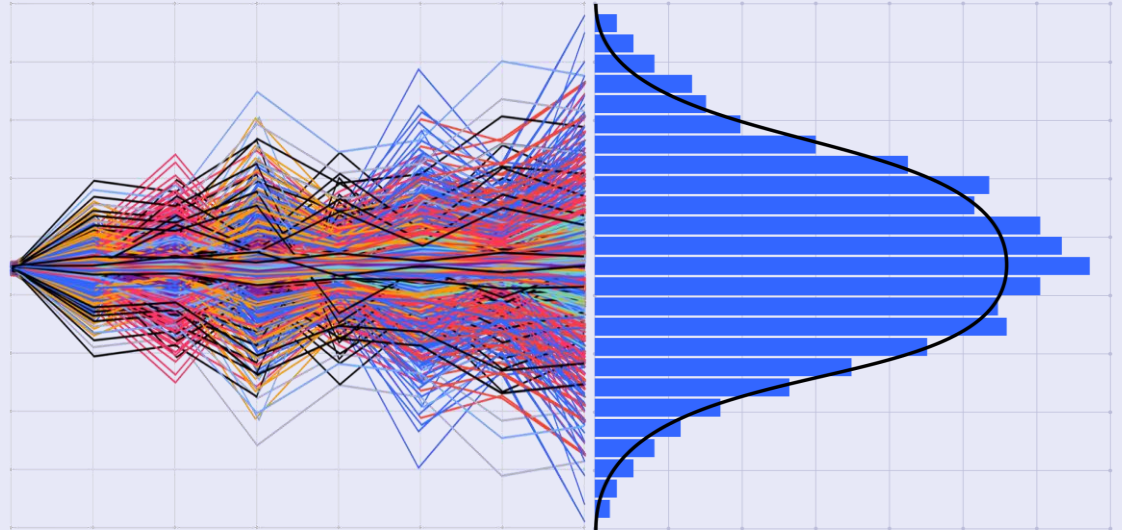


Today



## Future Scenarios with Uncertainty

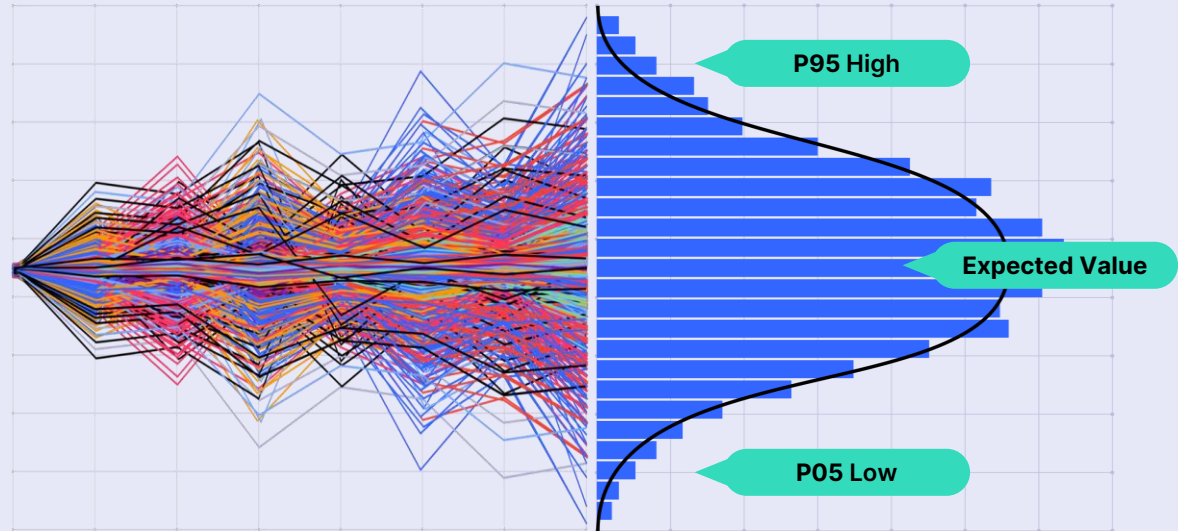
Distribution of outcomes





## Future Scenarios with Uncertainty

Distribution of outcomes  
Expected and extreme values





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## Future Scenarios with Uncertainty

Distribution of outcomes  
Expected and extreme values





## Models with Big Data and Probabilistic Input Parameters

- Discreet or single point estimate
- Known range
- Min, max, most likely
- Normal distribution
- Big data / empirical data
- Parametric distributions
- Can all be used probabilistically



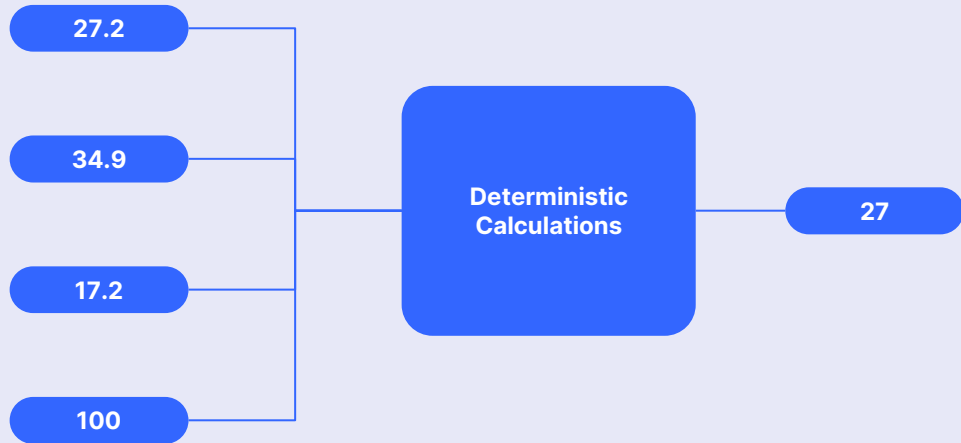




## Deterministic Calculations

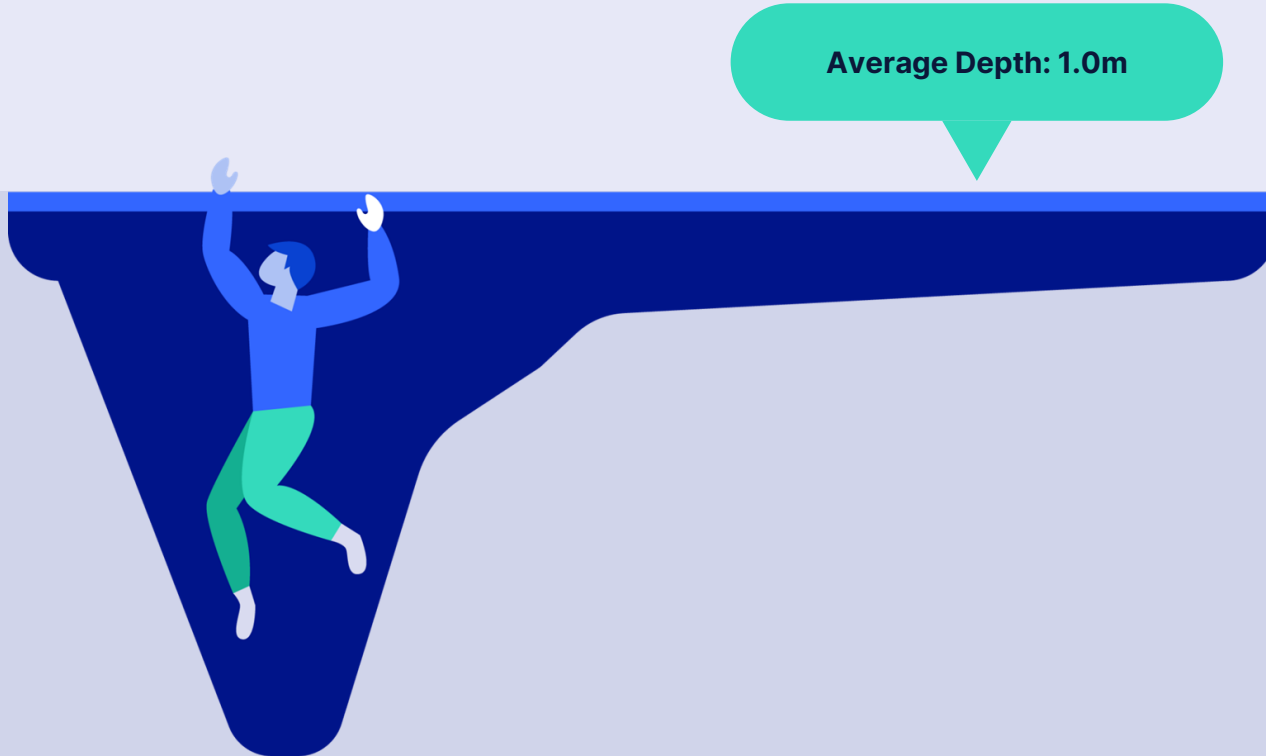
E.g. standard Excel approach

Deterministic Data



# Uncertainty & Risk

## The Flaw of Averages



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**Multivariate Data?**

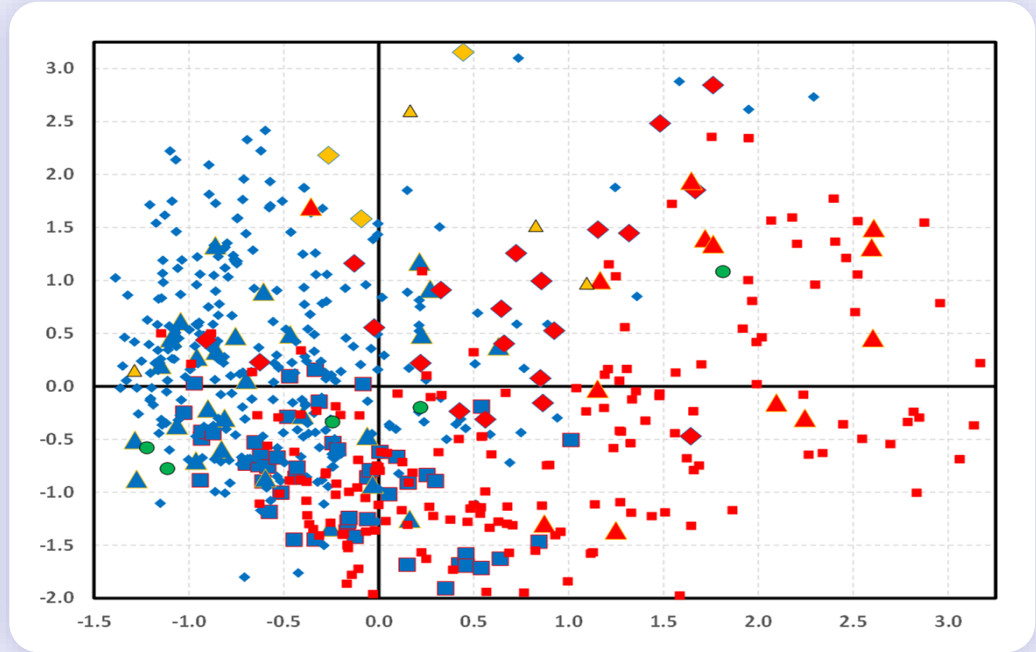




## Multivariate Data

Now, imagine your data has multiple dimensions (dependent variables), eg.:

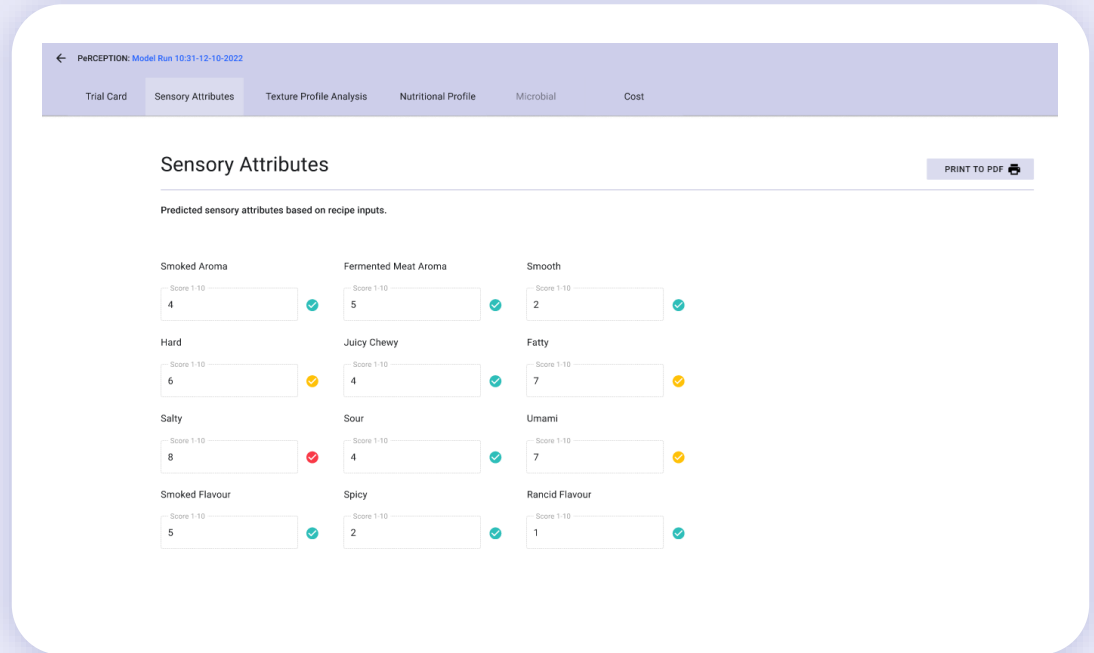
- Production Time
- Energy Cost
- Quality
- Volume
- Lead time
- Demographics
- etc.





## Scenario Analysis Most Probably Scenarios

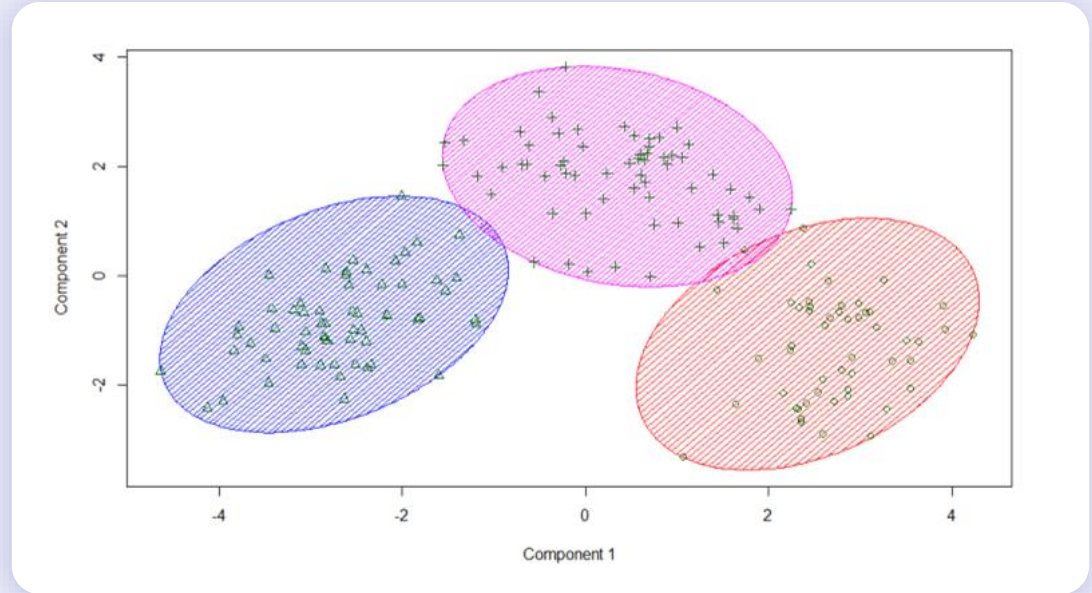
- Your planning needs to be probabilistic to take account of variability and uncertainty from multiple sources
- Machine learning can identify hidden trends and probable future scenarios
- Data and predictive analytics can highlight areas of opportunity
- Data and computing technologies are required





## Machine Learning

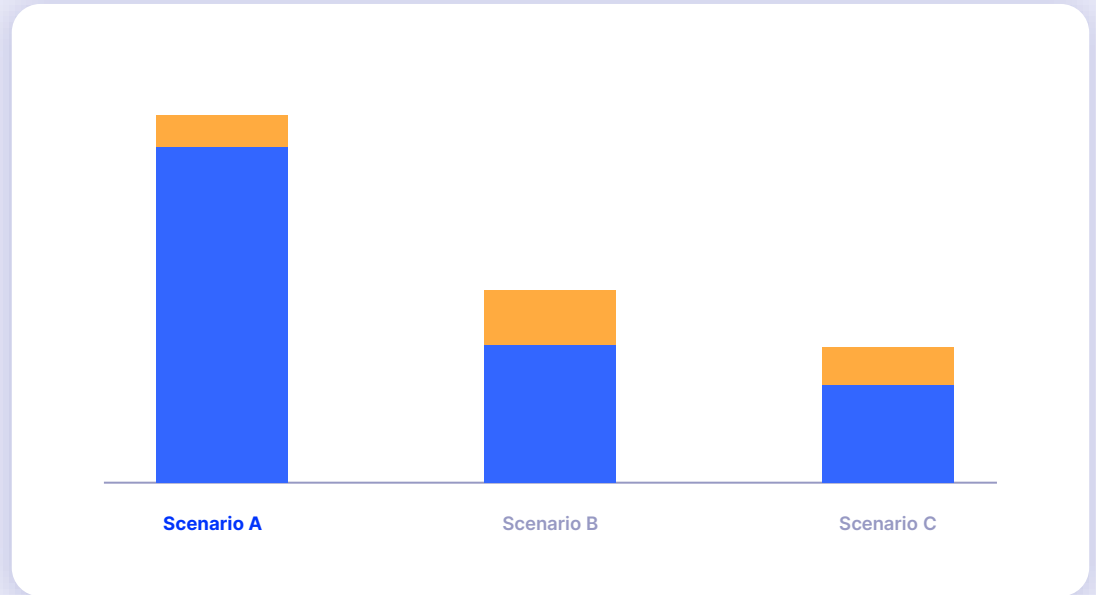
- Supervised or unsupervised machine learning
- Cluster your future scenarios into categories for you
- Most probable scenarios
- Highest risk scenarios
- Most profitable scenarios





## Machine Learning

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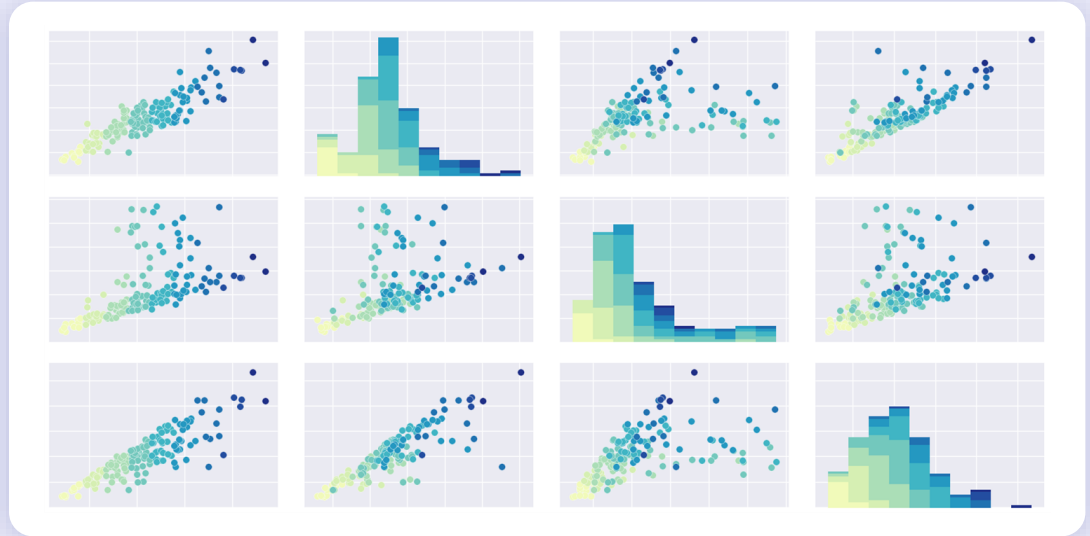




## Data is Key

Data is needed to inform the uncertainty, variability and interdependence of key variables in your business

Machine Learning can deal with multiple streams of variable and uncertain data



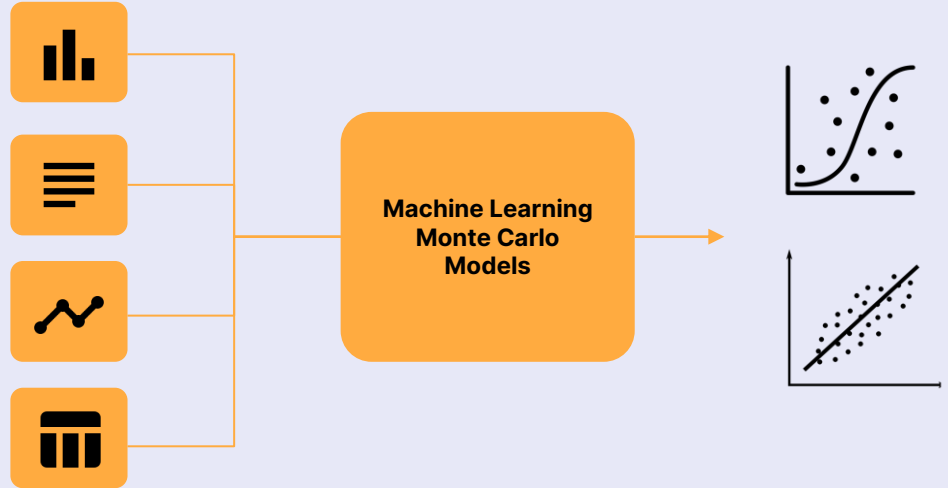




## Probabilistic Modelling Calculations

Predictive Analytics  
Machine Learning  
Monte Carlo simulation  
Compute most probably scenarios

Probabilistic Data  
And Parameters



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**Analysis that can account for:**

**Uncertainty**

**Variability**

**Trends**

**Likely scenarios**

**Correlations**

**Constraints**

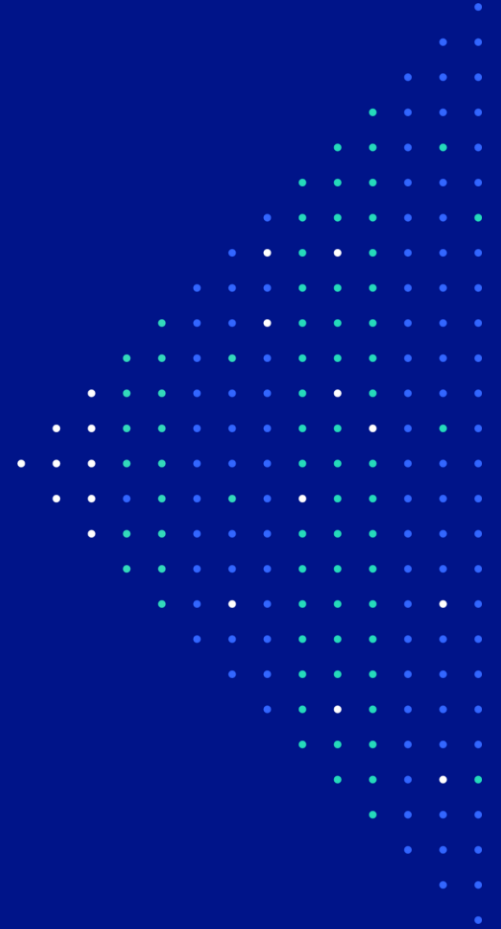
**Risk**

**Reward**



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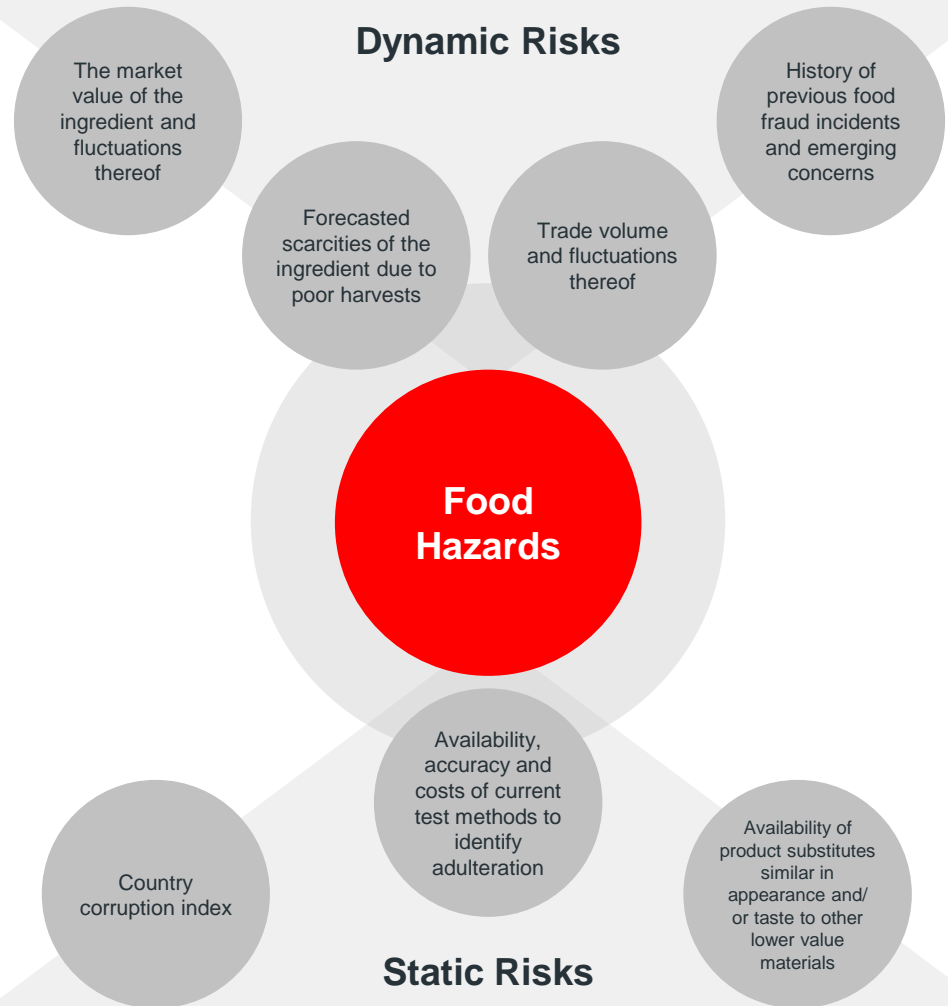
# **Case Study: AI for Food Hazard Identification**





# Supply Chain

Horizon scanning  
Predicting Emerging Risk





Improves food safety and efficiency of resources for all participating companies

## Fiin

The Food Industry Intelligence Network (fiin) was established in 2015 to help ensure the integrity of food supply chains and protect the interests of the consumer.

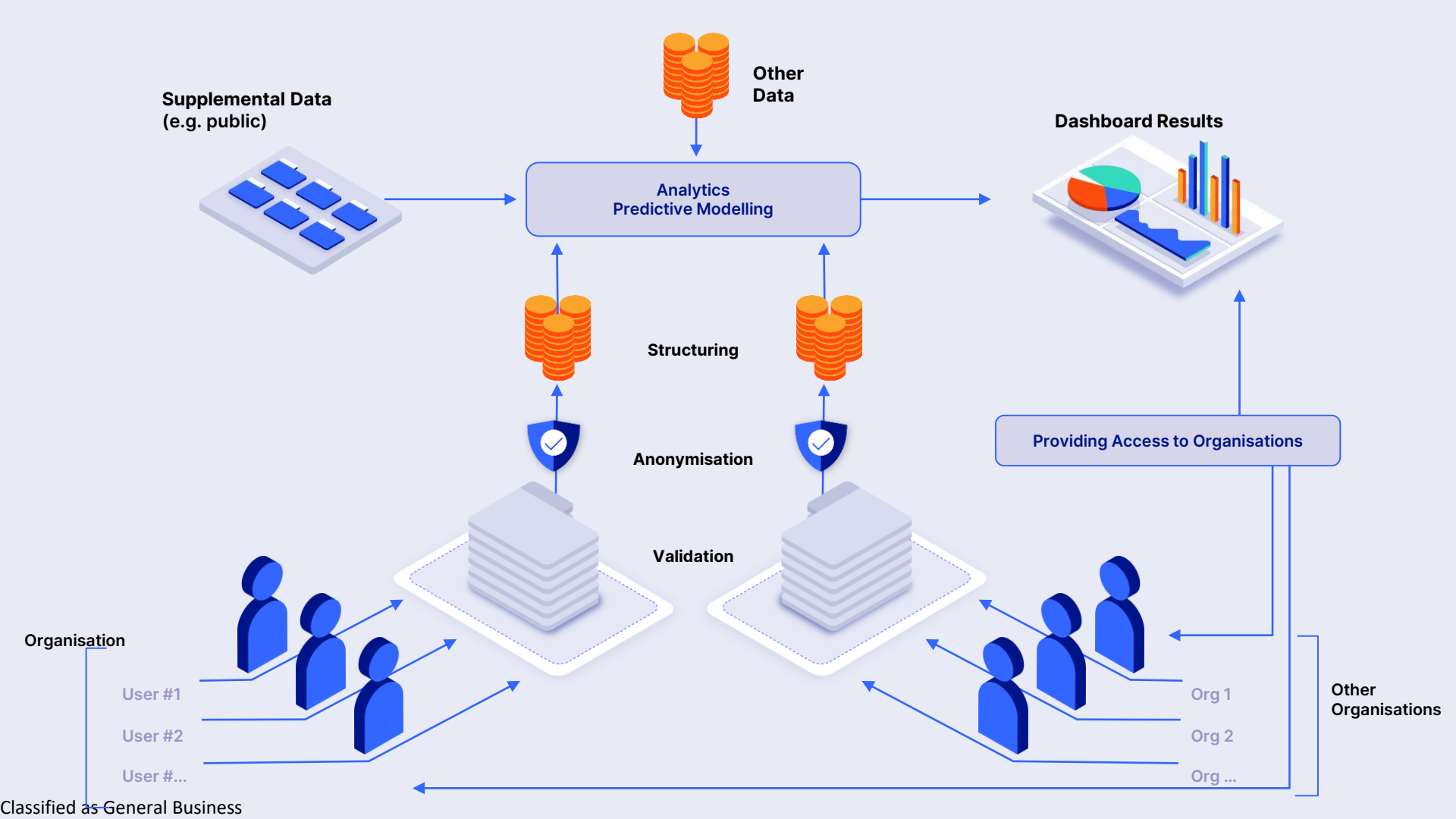
>60 food companies & retailers share incoming inspection data

Creme Global provides the computing platform and predictive analytics

- ✓ Private and secure
- ✓ Scalable
- ✓ Data validation
- ✓ Data visualisation
- ✓ Risk Ranking



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# Data Collection

- Data Upload Portals
- Excel, CSV, XML, JSON
- Data APIs

The screenshot displays the 'Data Approval Portal - Q2 2023' interface. At the top, there is a header with the 'fih' logo, the text 'DATA APPROVAL', and a 'CA' status indicator. Below the header, the title 'Data Approval Portal - Q2 2023' is followed by a brief instruction: 'Received tables will show up here. Select the file you wish to review. Once submitted for review, files may no longer be edited.' Two tabs are visible: 'RECEIVED DATA' (active) and 'QUARTERLY DATA'. The main content is a table with the following columns: Name, Type, Owner, Modified, Status, and Action. The table contains four rows of data, each with a 'for review' or 'rejected' status button and a three-dot menu icon.

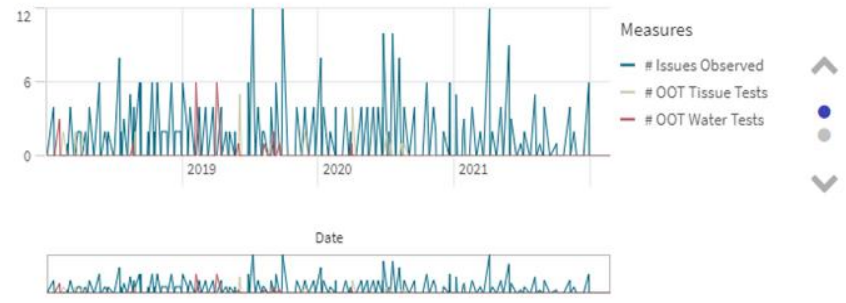
Name	Type	Owner	Modified	Status	Action
test41	Laboratory Testing	Creme Submitter	2023-05-12 12:23:18	for review	...
test2	Laboratory Testing	Creme Submitter	2023-05-04 09:21:17	for review	...
test4	Laboratory Testing	Creme Submitter	2023-04-24 15:18:56	for review	...
Test	Laboratory Testing	Creme Submitter	2023-03-22 08:46:50	rejected	...

By Date

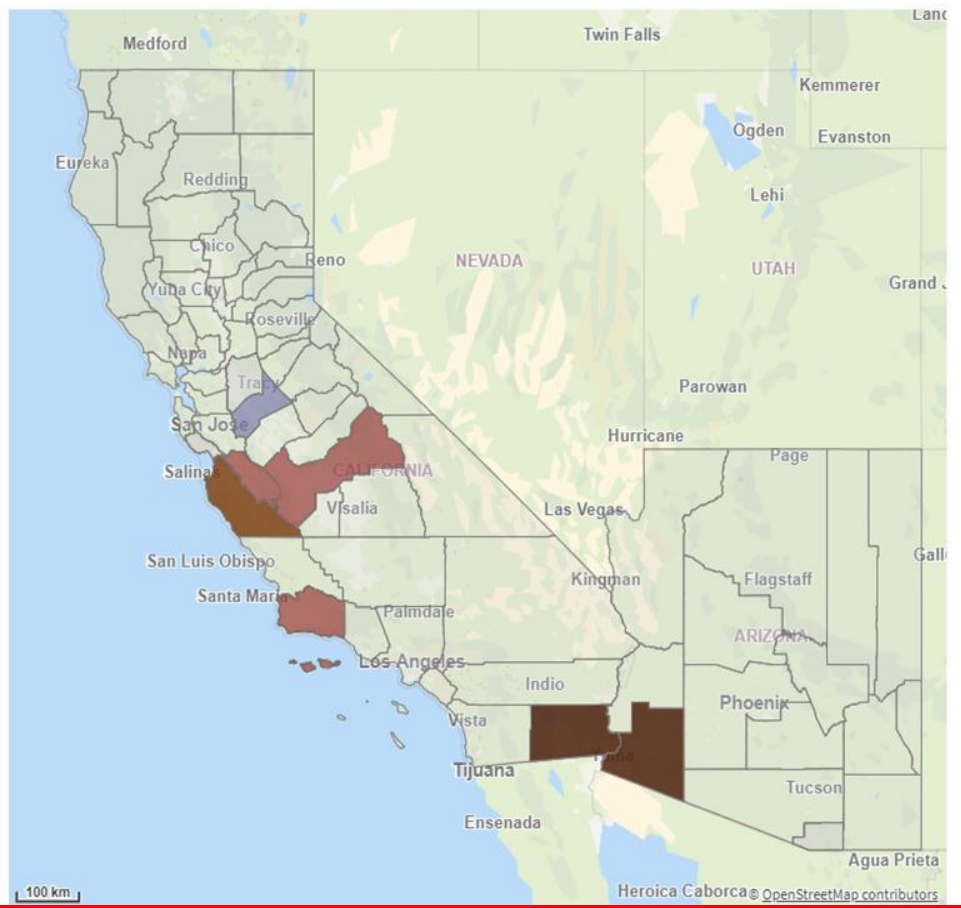
By Month

By Region

### Risk Events by Date



Date	Region	# Total Overlapping Events	# Issues Observed	# OOT Tissue Tests	Water Type	# OOT Water Tests (Type-specific Tolerances)	# OOT Water Tests (Type A Tolerance)
2/7/2019	Imperial Vly	0	0	0	Unspe...	5	5
4/4/2019	Imperial Vly	0	0	0	Unspe...	5	5
9/5/2019	Central Vly	0	0	0	Unspe...	2	2
8/22/2018	-	0	0	0	Type A	1	1
2/7/2019	Yuma	0	0	0	Unspe...	1	1
6/1/2019	-	0	0	0	Type A	1	1
8/9/2019	Central Vly	0	0	0	Unspe...	1	1
9/20/2019	-	0	0	0	Type A	1	1
4/1/2020	-	0	0	0	Type A	1	1
7/10/2019	Salinas	0	6	0	Unspe...	0	0





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# Moving from Trends to Likely Scenarios



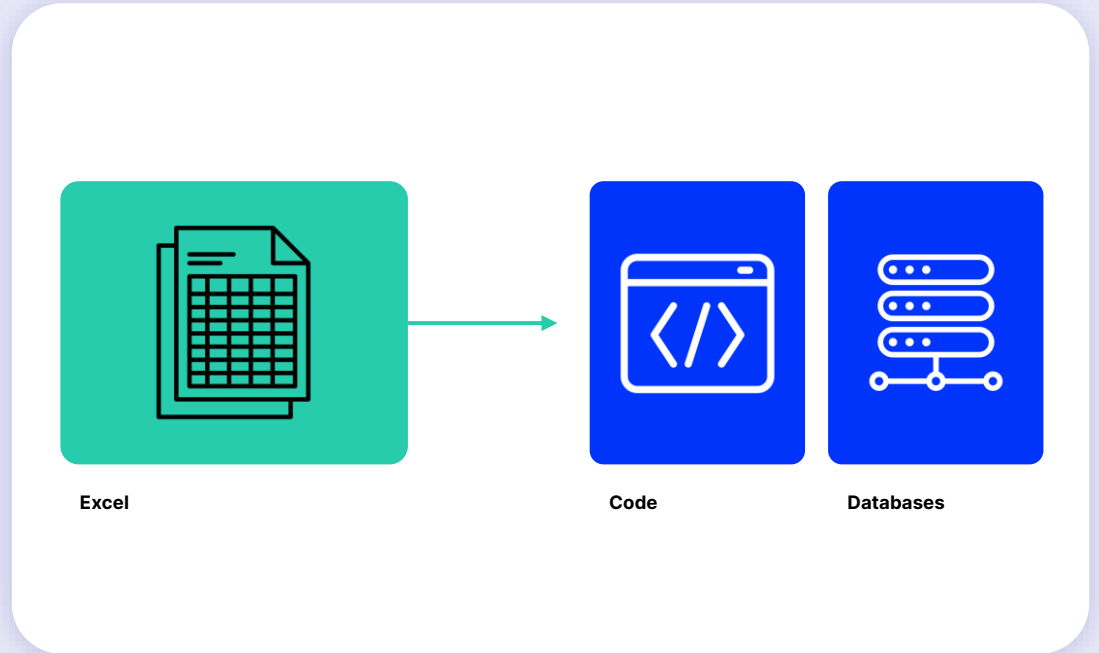


## Data & Analytics

Move from Excel to databases and predictive analytics algorithms - code

Use all of the data to allow the system to understand the uncertainty, trends and constraints

Inform future scenarios and opportunities



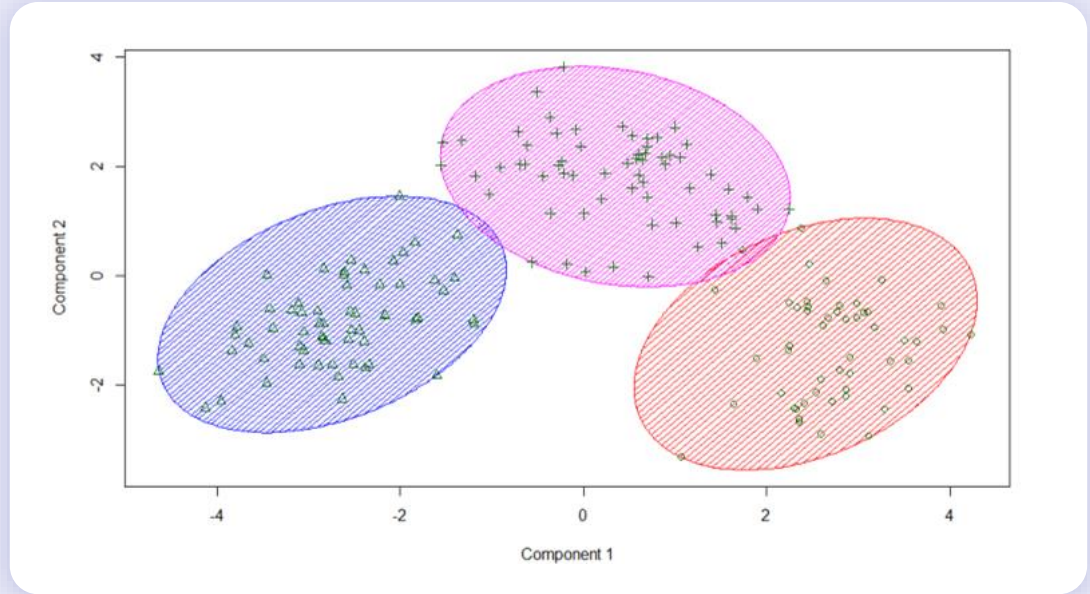


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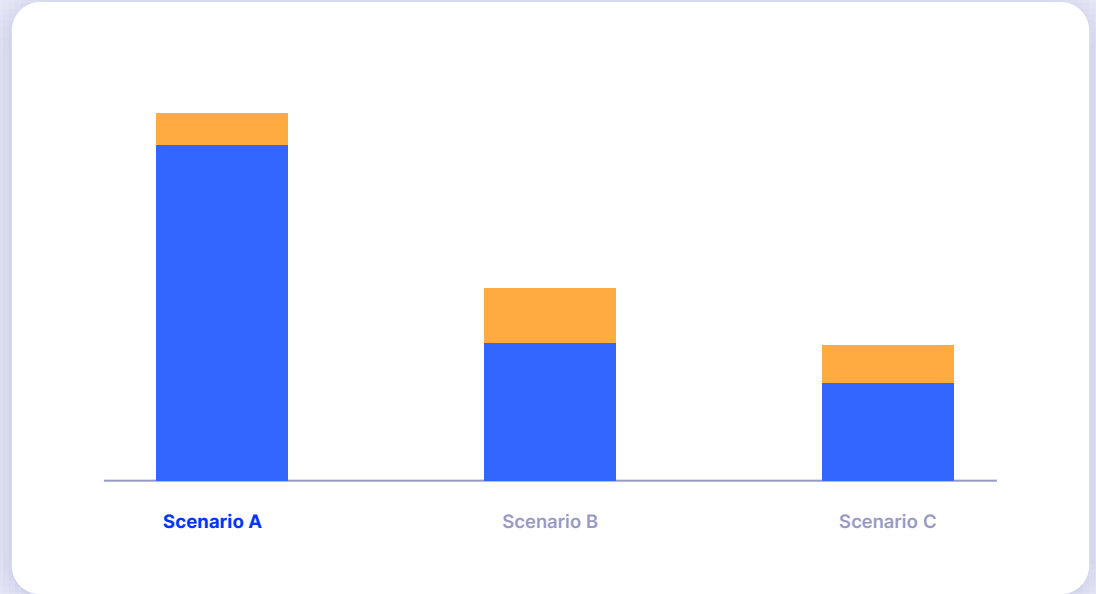


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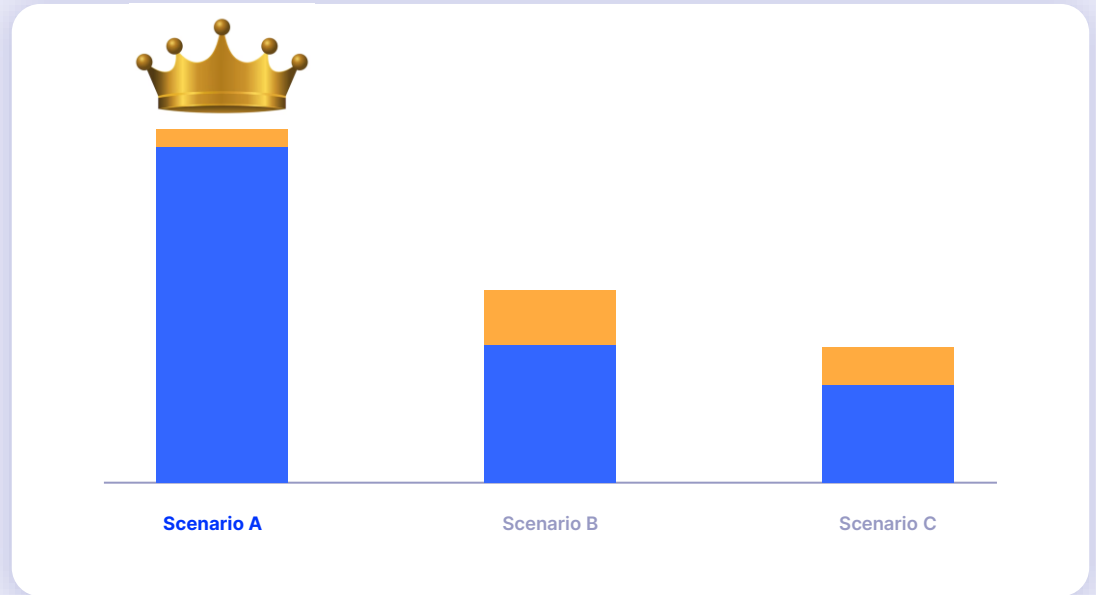


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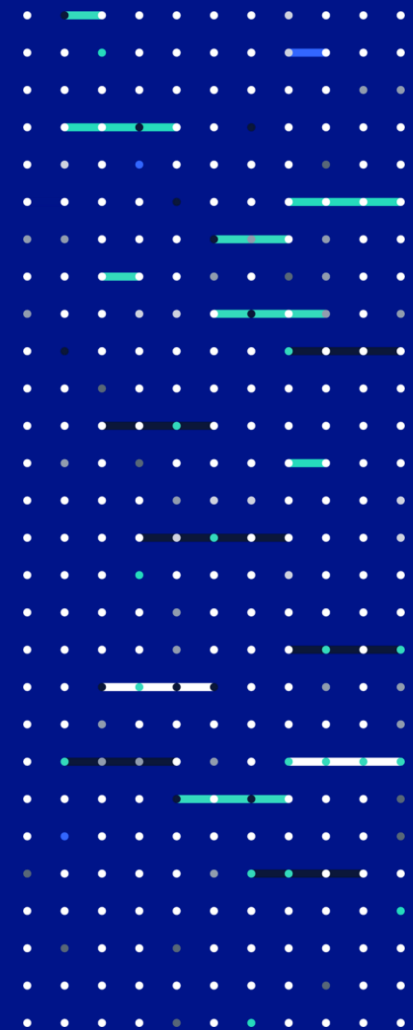
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