Sensible Machine Learning for CPM

Future Finance at Your Fingertips

Table of Contents

The Shift to Intelligent Finance

For CFOs, whether artificial intelligence (AI) and machine learning (ML) will play a role across enterprise planning processes is no longer a question. Today, the question instead focuses on how organizations plan to operationalize ML in ways that return optimal results and scale.

**The answer is where things get tricky.**

Why?

Business agility is critical in the rapidly changing world of planning. To think fast and move first, organizations must overcome challenges spanning the need to rapidly grow business, accurately predict future demand, anticipate unforeseen market circumstances and more. The increasing volumes of data across the organization can make it difficult for decision-makers to zero in on the necessary data and extrapolate the proper insights to positively impact planning cycles and outcomes. To further exacerbate the problem, many advanced analytics processes and tools only leverage high-level historical data, forcing decision-makers to re-forecast from scratch as soon as unforeseeable market shifts hit.

Those dynamics underscore why now is the time for Intelligent Finance.

Universal Truths

13%
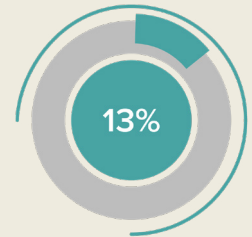
of standard ML projects make it into production [1]

70%
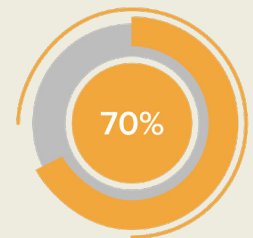
of machine learning is data wrangling [2]

Model building is
not a one-time task.
It is an iterative process [2]

> **"** If your competitors are applying AI and they're finding insight that allows them to accelerate, they're going to peel away really, really quickly.**"**
>
> — *Deborah Leff* | *CTO for data science at IBM* [3]

Recognizing the Opportunity for ML

The opportunity for Finance to leverage data analytics and ML cannot be overstated. With access to the largest current and historical data sets available to the organization — and with resources and access to some of the best ML use cases and applications available — Finance can transform efficiency and effectiveness across the enterprise. That transformation reduces the challenges that have plagued Finance over the years (see figure 1).
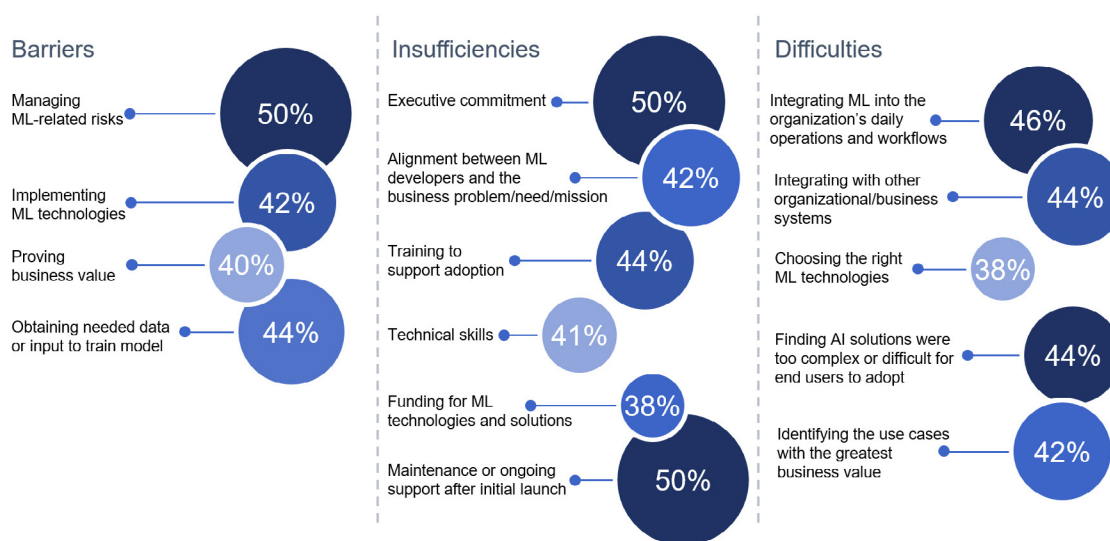
Barriers

Managing ML-related risks	50%
Implementing ML technologies	42%
Proving business value	40%
Obtaining needed data or input to train model	44%

Insufficiencies

Executive commitment	50%
Alignment between ML developers and the business problem/need/mission	42%
Training to support adoption	44%
Technical skills	41%
Funding for ML technologies and solutions	38%
Maintenance or ongoing support after initial launch	50%

Difficulties

Integrating ML into the organization's daily operations and workflows	46%
Integrating with other organizational/business systems	44%
Choosing the right ML technologies	38%
Finding AI solutions were too complex or difficult for end users to adopt	44%
Identifying the use cases with the greatest business value	42%

Figure 1: Traditional ML Challenges [4]

For instance, one global financial services organization recently explained its move to a unified planning solution. The organization suffered from a lack of accuracy and consistency between its line-of-business results, group results and the general ledger (GL). This situation caused many embarrassing moments in meetings and too much manual effort to reconcile. As a result, monthly forecasts became a frantic scramble with multiple panicked phone calls to help fix urgent issues.

To complicate the already volatile environment, the organization continued to add planning and reporting applications until it had 11 in total. The resulting sluggish planning silos required a large team to constantly push changes between applications, leaving very little time for validating data or strategizing on key business issues.

? But what if organizations could **unify the power of machine learning** with enterprise business planning?

Creating Value with Sensible ML

Would anyone drive blindfolded for 30 seconds?

The answer is simple — an emphatic "NO." Everyone understands the dangers of not being able to adjust to other traffic, turns in the road, weather conditions or that person not paying attention who just walked out in front of the car. Disaster awaits every second the driver takes his or her eyes off the road, missing an enormous amount of data, increasing risks and missing opportunities to increase performance.

If everyone is smart enough to avoid driving blindfolded, why do so many leaders blindly manage their businesses?

Unfortunately, the answer isn't simple. All leaders want timely and accurate insights to increase performance efficiently and effectively, but few can consistently gain access to them. In the **State of AI Enterprise**[5] survey, 67% of respondents reported they are currently using ML, and almost all (97%) plan to use it in the near future.

Many of the 67% have struggled to gain insights for improving the accuracy of the accrual process or speeding up account reconciliation and, ideally, eliminate any traces of human bias — all of which is further compounded by the typical business value horizon of years vs. months (see figure 2).
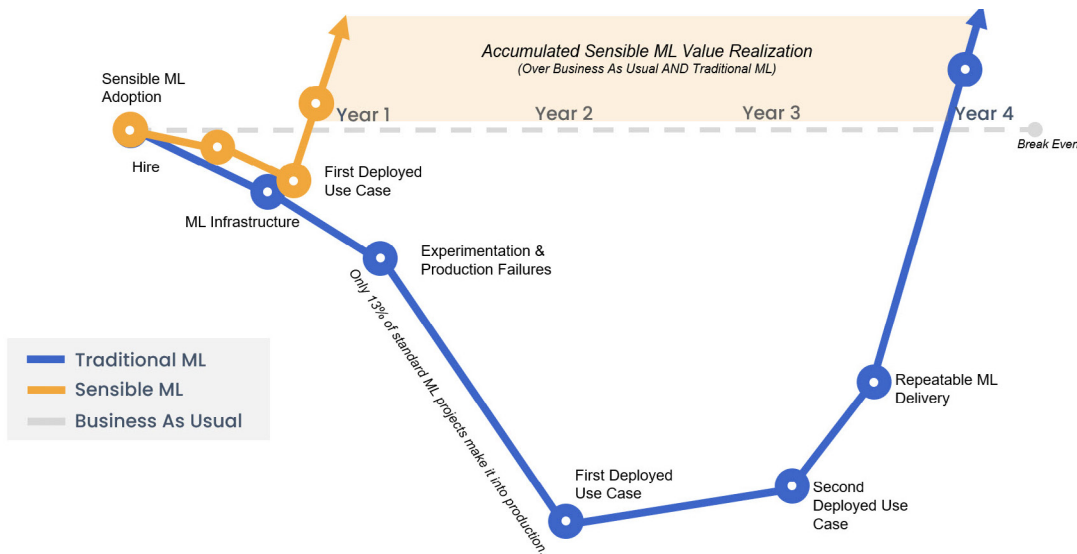

Figure 2: Sensible ML Acceleration to Business Value

Sensible ML, OneStream's first AI-enabled solution, is designed to **productize time-series ML modeling for corporate performance management (CPM)** and break down the traditionally high barriers to entry of advanced analytics for organizations. Instead of taking on the burden of building models and investing in the underlying infrastructure, Sensible ML unleashes the power and sophistication of data science across Finance and Operations **at scale and at a fraction of the total cost of alternative solutions.**

Unleashing Data with Sensible ML

If data fuels the business strategy, then poor data can kill it. **Why?** In today's digital economy, companies have access to more data than ever before. This data creates a foundation of intelligence for important business decisions. But to ensure employees have the right data for decision-making, companies must invest in data management solutions that improve visibility, reliability, security and scalability. Poor data can lead to disastrous results that cost millions.

Unlike "most" predictive analytics forecasting capabilities (which look at prior results and statistics and then generate forecasts based on past events), **Sensible ML has unique sophistication.** Sensible ML not only looks at prior results and statistics, but also considers additional business intuition such as events, pricing, competitive information and weather to help drive more precise/robust forecasting (see figure 3).
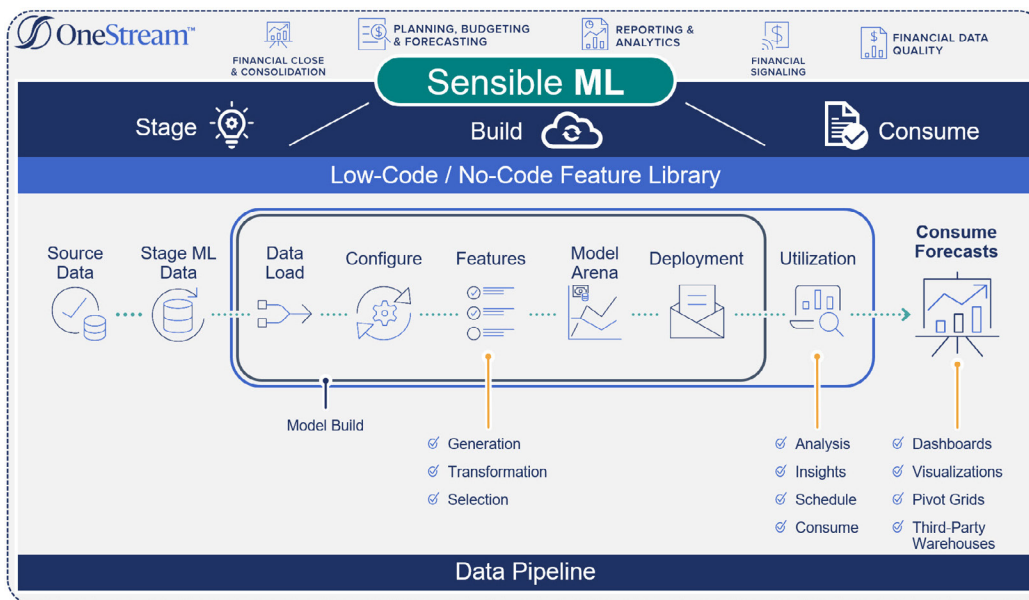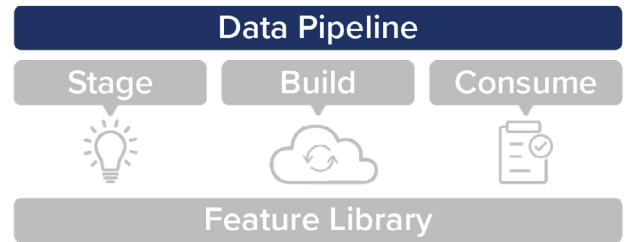

Figure 3: Sensible ML Process Flow

Manage Data End-to-End

Enterprise data is critical for the success of any ML forecasting use case. But purpose-built pipelines that scale cost-effectively and deliver great user experiences require sophisticated solutions such as Sensible ML to accelerate and automate key decisions in the data journey, from source to consumption (see figure 4).

Advanced data pipeline capabilities encourage the following:

① Trust in the governance of data

by ensuring data privacy, compliance with organizational standards and transparent data lineage traceability.

② Enriched internal data with external sources

by adding external variables that fuel improvements (e.g., retailers adding external variables like GDP, PPI or CPI to existing data to better profile and recognize customer needs for recommendations, upselling and cross-selling).

③ Accelerated data processing

by continuously monitoring quality, timeliness and intended context of data.

Figure 4: Sensible ML Pipeline
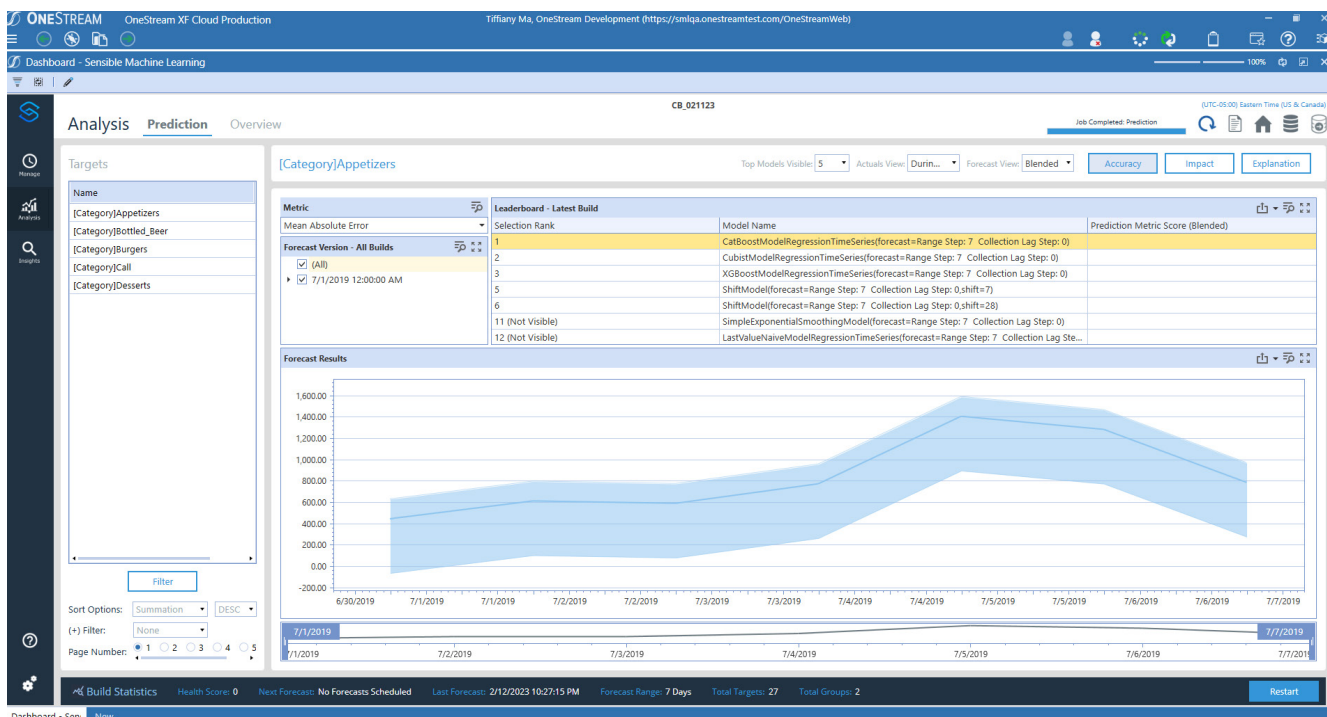
Most data scientists agree that ML pipelines are the end-to-end construct that orchestrates the flow of data into and output from an ML model (or set of multiple models). Pipeline includes raw data input, features, outputs, the machine learning model and its parameters, and prediction outputs.

Sensible ML leverages OneStream's built-in data management capabilities to ingest source data and business intuition. APIs automatically retrieve external data that can be used in the model-building process. While Sensible ML then automatically tests the external data sources without any user intervention — **users ultimately decide which data to use.**

Why Are ML Data Pipelines Important?

The design and implementation of data pipelines lie at the core of enterprise ML solutions and fundamentally determine performance and effectiveness. In addition to the software design, though, additional factors must be considered, including the choice of ML libraries and runtime environments (i.e., processor requirements, memory and storage).

Sensible ML's data pipeline monitors the way data pipelines typically behave and executes validation checks to ensure the integrity of the source data. Here are a few examples:
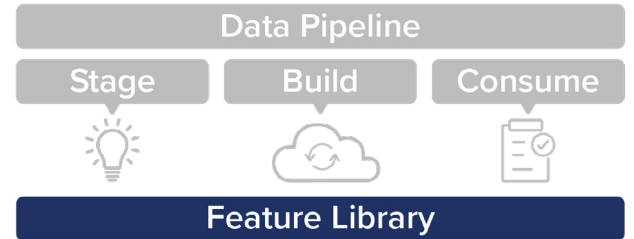
(1) **Data Freshness** — Did the data arrive when it should have?

(2) **Data Volume** — Are there too many or too few rows?

(3) **Data Schema** — Did the data organization change?

Accelerate Insights

with Low-Code / No-Code Sensible ML Feature Library

With Sensible ML's built-in Low-Code / No-Code (LC/NC) capabilities, Finance teams and analysts can quickly build time-series ML models ready for consumption across the organization — **and do it in a way everyone can understand and use.** Sensible ML's Feature Library enables Finance and Operations teams to enrich data using predefined external sources like the Consumer Price Index, weather or gas prices — without lengthy complicated code only data scientists would understand (see figure 5). Sensible ML will then do all the "hard work" to identify which of these external sources / variables are relevant to contribute to forecast model performance — and to what extent.

Why Does the Feature Library Matter?

Without Sensible ML's LC/NC Feature Library, Finance teams and data scientists would be forced to identify external data sources on their own, manage each integration and spend time cleaning data. And all of that is before doing all the hard work to gauge whether or not the external data contributed is useful for forecasting. Alternatively, Sensible ML accelerates time to value, reduces technical overhead and increases productivity with few, if any, programming skills required.
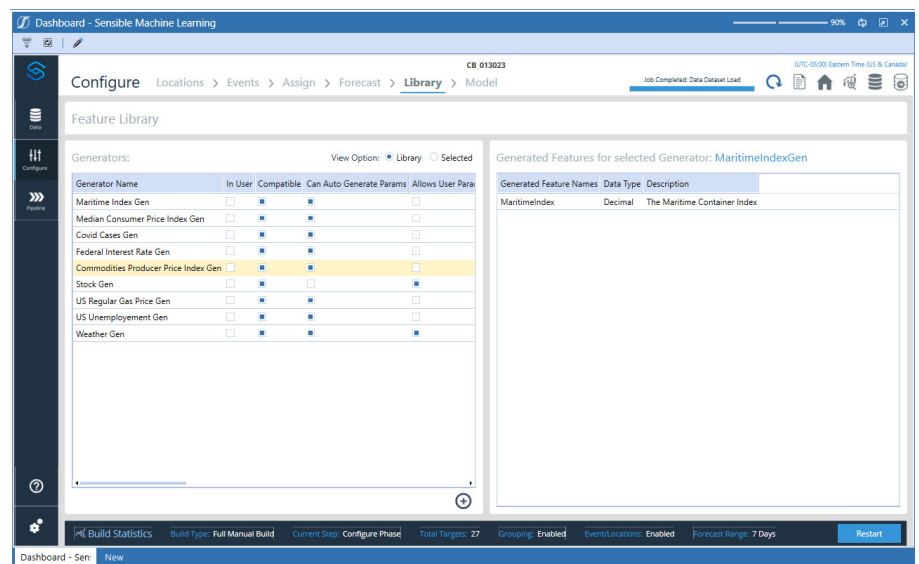

Figure 5: Sensible ML Feature Library

Accelerating Time to Value Provides 3 Key Advantages:

① Reduce Long Cycle Time

Building robust AI models at an enterprise scale takes time. According to The News Stack, **80% of companies**[6] say it took 6 months to produce a single AI model.

② Containing Model Drift

With continuous changes in the external market, business dynamics and foundational data, models tend to go stale rapidly. Model drift leads to a drop in accuracy and poor business decisions.

③ Address the Data Science Talent Shortage

Data science practitioners who can solve business challenges by applying AI are in short supply. Many strategists state that a shortage of skills is a major reason behind slow AI adoption.

Building Trust into Machine Learning Models
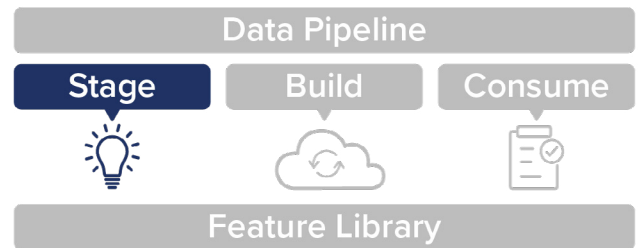
Building trust in ML models is paramount for the success of any project. Sensible ML allows data scientists and business users to seamlessly work together throughout the process. In effect, preparing the data, building models, sharing the results and putting the models into production can now happen on the same unified platform, allowing for unprecedented collaboration. This approach builds trust across previously siloed teams, leading to an effective and dynamic fraud detection program.

Enriching internal sources of data with external sources — such as weather, macroeconomic data (e.g., GDP, oil prices, housing starts) and so on — increases the performance of the model.

While ML models take input data and transform it into a prediction, understanding the mechanisms involved can sometimes be difficult. For example, patterns learned by black-box models can be complicated to understand, particularly for business analysts focused on a certain area of business. In short, no transparency exists for business users leveraging traditional ML solutions.

> Sensible ML delivers **greater insight from data** than traditional approaches. The rewards will be greatest for those who can **trust in and have transparency with the models.**

In addition to built-in data pipeline management, Sensible ML provides end-to-end capabilities, among others:

Figure 6: Sensible ML Feature Engineering
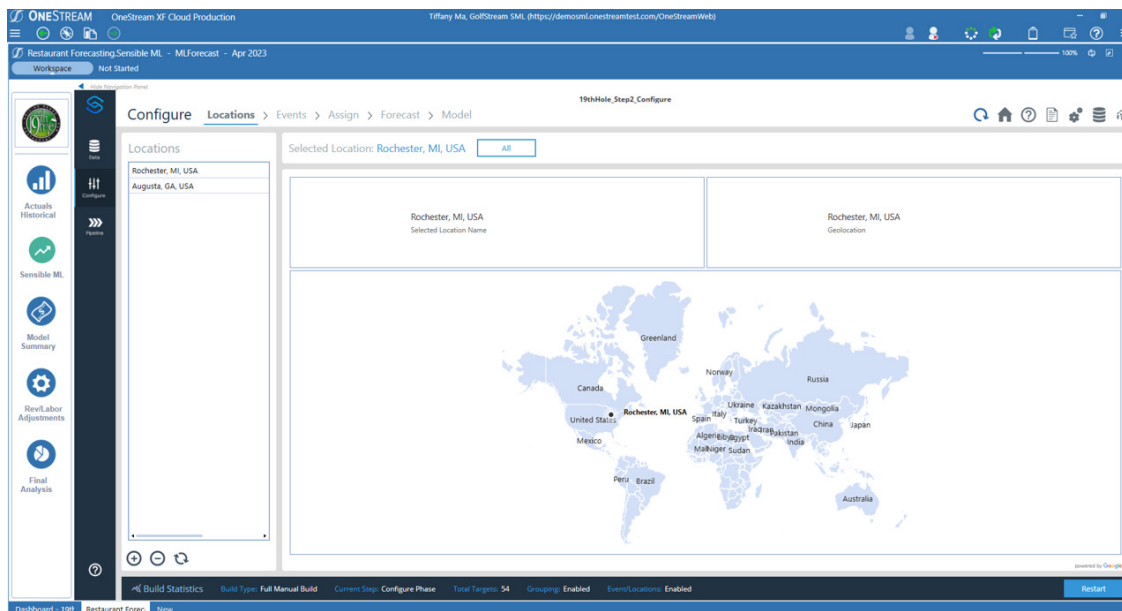
① **Auto Feature Engineering** automatically applies transformations to extract "new features" from existing data. For example, assume US housing starts or housing permit activity is a "feature" to help forecast a manufacturer's door sales. **Sensible ML will automatically calculate whether a 1-month, 2-month or more lead or lag helps improve forecast (door sales) accuracy** (see figure 6).

② **Configure Target** is the column of the data set about which the user wants the ML model to predict. **Sensible ML is designed to ensure massive target scalability to optimize the ML process and performance.**

Figure 7: Global Weather Patterns

- **Target scalability** — A metric that indicates how many targets a data set can contain. Examples in retail include individual stores, categories of products per store, SKUs per category and so on. The greater the target scalability, the more detailed information the ML model will determine, making the process more efficient.

③ **Introduce Events** knowledge and intuition from business users that can help inform the model of potential forecast anomalies. In **Sensible ML, the Custom Event Builder allows the user to easily add custom events to the model** and can look at prior results and take on additional business intuition — such as events, pricing, competitive information and weather (see figure 7) — to help drive more precise/robust forecasting while getting more accurate over time (e.g., training), retraining itself the more it "experiences".

- Use knowledge from a business user to help inform the model of potential forecast "anomalies"

- Include Events, Promotions, and Holidays that are known to influence forecasts

④ **Model Training** is the process where the ML algorithm uses the training data set to determine the best performing or most accurate at predicting the targets. The goal of training is to iterate through numerous model variations to determine the best one. **In Sensible ML, multiple models are trained per target – which ensures the best model performance.**

Automatically Compare ML Models

Data Pipeline

Stage | **Build** | Consume

Feature Library
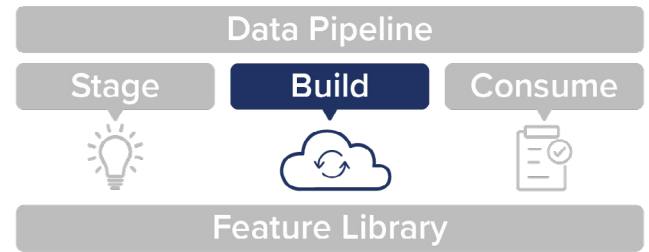
In traditional ML tools, model performance begins to degrade once placed into production, and manual efforts only further hamper model performance. For these reasons alone, effective and scalable ML solutions must automatically compare and contrast models and contain the following capabilities to create speed to value for Finance and Business analysts:

- **Accelerated** model training time and experimentation to **efficiently** produce **forecasts** and **re-forecasts**
- **Agility** to utilize Sensible ML to address different business use cases
- **Continuous** monitoring of model health score and performance over time and **auto-retraining**

Sensible ML can simultaneously handle large amounts of data and users to feed the required vast volumes of data to train models properly. And as users and use cases proliferate, ML-powered solutions must be able to handle the extra load. If the solution fails to scale, performance bottlenecks can diminish the value of using ML — which is why accelerating model train time and experimentation is so critical.

Sensible ML's pre-built systematized processes and infrastructure conquer the traditional complexities of disparate development tools that hinder the deployment of ML at scale and time-to-deployment. The goal of monitoring models in production is to achieve the following:

- **Detect problems** and then take action by triaging and troubleshooting models in production
- Ensure the predictions and results **can be explained and reported**
- Ensure the model's prediction process is **transparent** to relevant stakeholders for **proper governance**
- Provide a path for **maintaining and improving** models in production

Accelerate Model Train Times and Experimentation in Sensible ML's Model Arena

Users can continuously monitor model health scores and performance over time and auto-retrain in Sensible ML's Model Arena – where all the model variations compete against each other to identify the best-performing ones and determine which ones to deploy (see figure 8).
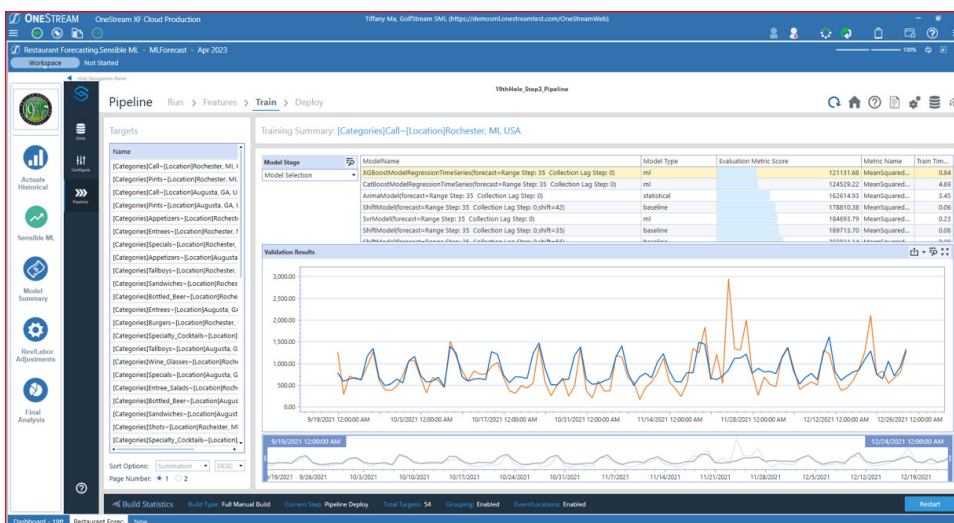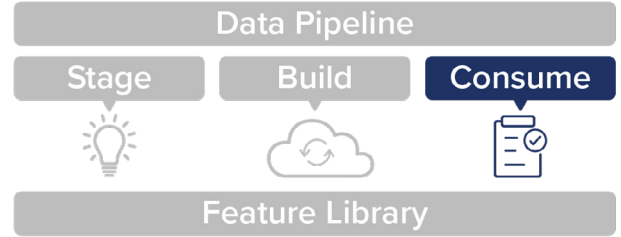

Figure 8: Sensible ML Model Arena

Unify & Consume

## the Power of ML with Enterprise Performance

Time series analysis is crucial to understanding organizational data. The ability to look forward and backward, to drill down from years to days, and see data trends over different periods of time is essential for the most comprehensive analysis. For FP&A and operational teams, Sensible ML **automatically creates and deploys thousands** of ML forecast targets across the enterprise ready for consumption. That process includes the following key capabilities:

- **Unify** planning and data science on a **common platform** without pushing data to third-party algorithms and avoiding **technical debt**
- Empower data insights via **transparency** to **analyze** and compare human-generated and ML forecasts
- **Utilize** model results in OneStream and other 3rd party systems

Sensible ML enables users to consume models via dashboard, reports and business analytics tools by leveraging the OneStream platform. The platform **unifies enterprise planning and data science on a common platform** without pushing data to third-party algorithms and avoiding technical debt while providing **transparency to analyze** and compare human-generated and ML forecasts to empower data insights (see figure 9).

Figure 9: Sensible ML Dashboard
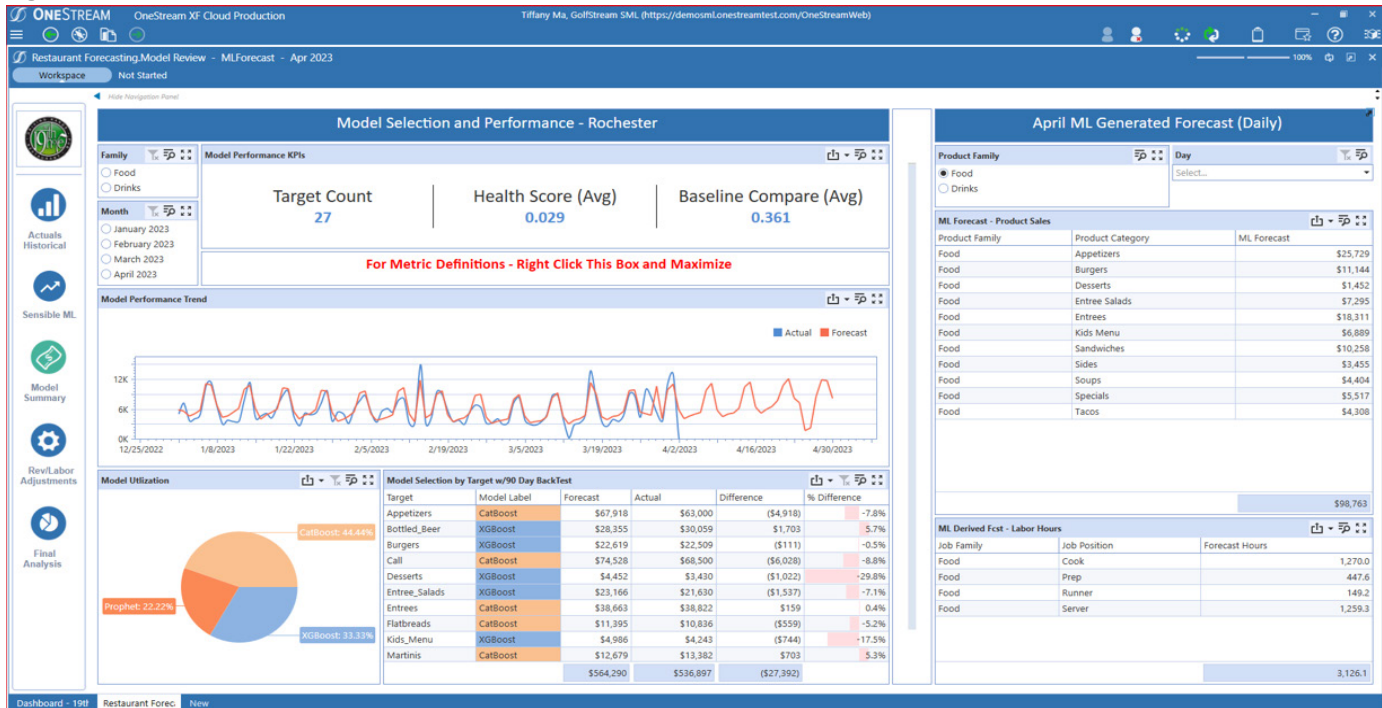
Sensible ML Makes Forecasting Easy

Sensible ML makes forecasting easy because OneStream breaks down the barriers that have traditionally held back Finance and Operations teams and others from embracing ML within core planning processes. While ML has powerful potential to help scale work like never before, organizations face several challenges (see figure 10).
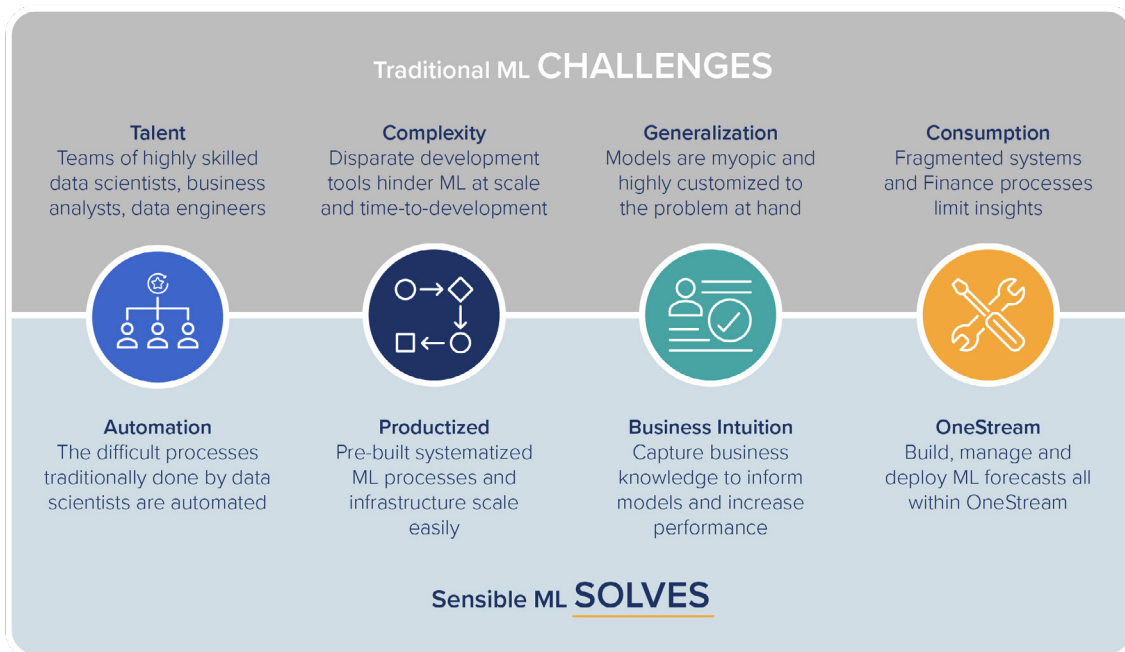

Traditional ML CHALLENGES

Talent
Teams of highly skilled data scientists, business analysts, data engineers

Complexity
Disparate development tools hinder ML at scale and time-to-development

Generalization
Models are myopic and highly customized to the problem at hand

Consumption
Fragmented systems and Finance processes limit insights

Automation
The difficult processes traditionally done by data scientists are automated

Productized
Pre-built systematized ML processes and infrastructure scale easily

Business Intuition
Capture business knowledge to inform models and increase performance

OneStream
Build, manage and deploy ML forecasts all within OneStream

Sensible ML SOLVES

Figure 10: Sensible ML Solves for Traditional ML Challenges

Sensible ML Use Cases Foster Success

Sensible ML enables organizations to more quickly and accurately foster success with the following use cases (see figure 11):

1 To support **strategic planning processes**, many organizations create 3- or 5-year (or longer) forecasts to provide greater clarity of vision and roadmap to support the intent of the company, identify strategic choices, ensure clear direction and drive competitive growth.

2 To support **Annual Operating Planning (AOP)** or **forecasting processes**, organizations typically require their lines of business to translate "top-down" financial goals into granular, "bottom-up" monthly plans across product categories, sales channels and customers – which can result in **hundreds of forecasts.**

3 To support **daily or weekly Demand Planning** and/or **Sales & Operations Planning (S&OP)**, organizations typically require their demand planners, business analysts and/or Finance business partners to create granular-, product- and location- level forecasts aimed at guiding tactical staffing, procurement, logistics and inventory management decisions.

4 For **revenue expenses** or **workforce planning** where monthly forecasts per target (e.g., 60 data points per forecast target) are required for top-down planning, Sensible ML can **create predictive/statistical forecasts.**

5 For more granular, **bottom-up type forecasting by customer, product by location and/or S&OP** where organizations can share hundreds of data points per target, Sensible ML can create **weekly or even daily forecasts** that even account for specific intuition from the business analysis on impacts such as holidays, weather, pricing changes, competitive impacts or any time-based intuition.

1000's

Sales Forecasting by Product, Customer & Location

- Bottom-Up
- Daily, Weekly Forecasting
- Machine Learning Models
- FP&A, Sales

S&OP / Demand Forecasting

- Bottom-Up
- Daily, Weekly Forecasting
- Machine Learning Models
- FP&A, S&OP, HR

Revenue, Expense, Workforce Planning

- Top Down
- Monthly Forecasting
- Predictive Models
- FP&A, Operations, HR

Annual Planning / Target Setting

- Top Down
- Monthly Forecasting
- Predictive Models
- FP&A

# of Models

1

Figure 11: Sensible ML Use Case Matrix

Customer Success

A $9B auto safety supplier is a leading car safety manufacturer focused on the production of seatbelts, airbags, steering wheels and inflators. Formed in the 1950s, the supplier sells to all major car manufacturers worldwide with over 65,000 employees and operations in 27 countries. Each year, the company's products save over 30,000 lives and prevent ten times as many injuries. The supplier has become a market leader through growth, acquisition and a merger, and it operates in a complex, multi-divisional structure at both the product and organizational level.

Use Case	Expected Business Outcomes
To unlock the value of granular **transactional data, improve operational forecasting and interpret customer demand planning with ML-enhanced forecasting and reporting.** Have a single planning process to enable the auto supplier to proactively respond to market changes as information moves along the value chain and impact what is produced.	• Recognize underlying **demand trends** • Reduce volatility • Improve operational stability • Reduce fluctuations in labor planning, resulting in reduction of overtime expenditures

Solution and Benefits

Sensible ML provides the auto supplier with a unified data analytic platform that has fostered a scalable and collaborative environment across the organization. That environment now allows teams to more quickly innovate and deliver ML-powered solutions to the auto supplier's ever-changing business requirements (see figure 12).

Sensible **ML-Enriched** EDI Accuracy Lift:

35% Mean Squared Error improvement over EDI

AND

10%+ Mean Squared Error improvement over the human-adjusted EDI
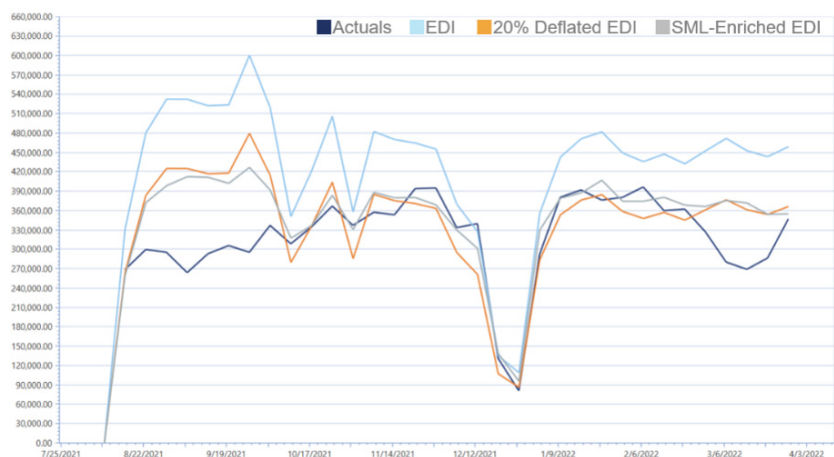

Figure 12: Sensible ML Improvement Chart

Conclusion

The explosive growth in data availability and increasing market competition are challenging for all organizations — but OneStream's Sensible ML provides Finance teams with an ideal opportunity to build better planning strategies, make smarter decisions and execute more effectively. When executives can identify opportunities faster and understand how to capitalize on them, those organizations outperform their competition — and by a wide margin. But when those decisions rely on stale data built on unreliable forecasts, it can negate even the most promising strategies.

Several challenges lie ahead for organizations of all sizes, but one of the most important decisions to make will be implementing the right ML solution that can effectively align all aspects of planning and elevate the organization toward its strategic goals. To help build trust and transparency, Finance professionals must easily understand the processes that drive the solution, so the machines are not viewed as black boxes.

Sensible ML answers that call by bringing power and sophistication to organizations to drive transparency and increase the velocity of forecasting processes with unprecedented transparency and alignment to business performance.

At OneStream, we call this Intelligent Finance.

About OneStream Software

OneStream provides an **Intelligent Finance platform** built to **enable confident decision-making** and maximize business impact.

OneStream empowers Finance and Operations teams with insights to make faster and more informed decisions every single day. We unleash organizational value by unifying data management, planning, reporting, analytics, financial close and consolidation. And we do it all through a single, modern corporate performance management (CPM) platform designed to continually evolve and scale with your organization.
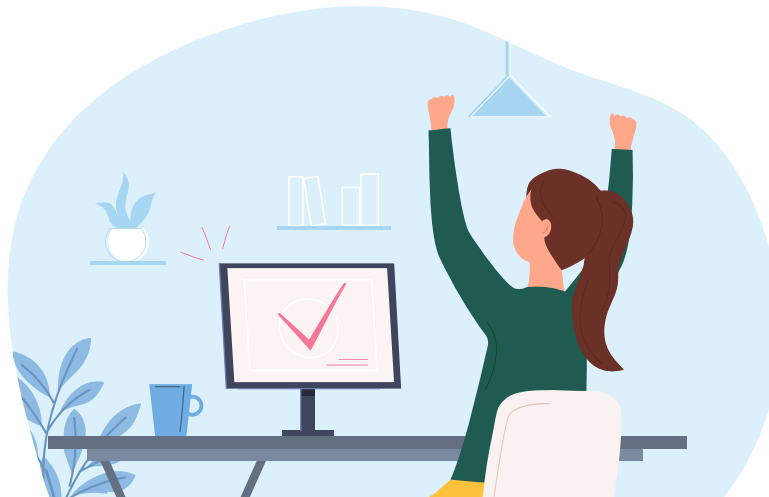
OneStream is an independent software company backed by private equity investors KKR, D1 Capital Partners and IGSB. With over 1,100 customers, 230 implementation partners and over 1,200 employees, our primary mission is to deliver 100% customer success.

For more information, visit our website at **OneStreamSoftware.com**.

Endnotes

1. **Forbes: How Do We Get To The Tipping Point For AI?**
    https://www.forbes.com/sites/forbestechcouncil/2023/01/17/how-do-we-get-to-the-tipping-point-for-ai/?sh=4c0df30626c3

2. **Towards Data Science: 10 Truths about Machine Learning**
    https://towardsdatascience.com/10-real-truths-about-machine-learning-b9cc17e09189

3. **Venture Beat: Transform 2019 Lifting the hood on the AI tech you need to know about.**
    https://venturebeat.com/ai/transform-2019-lifting-the-hood-on-the-ai-tech-you-need-to-know-about/

4. **Deloitte: Fueling the AI transformation: Four key actions powering widespread value from AI, right now.**
    https://www2.deloitte.com/content/dam/Deloitte/us/Documents/deloitte-analytics/us-ai-institute-state-of-ai-fifth-edition.pdf

5. **Deloitte: Thriving in the era of pervasive AI Deloitte's State of AI in the Enterprise, 3rd Edition.**
    https://www.deloitte.com/content/dam/assets-shared/legacy/docs/services/consult-ing/2022/DI_State-of-AI.pdf

6. **The NewStack: Add It Up: How Long Does a Machine Learning Deployment Take?**
    https://thenewstack.io/add-it-up-how-long-does-a-machine-learning-deployment-take/

Updated: January 2023