



AI-Powered Tax Compliance, Part 1:

How Machine Learning is Revolutionizing Sales and Use Tax

Sales and tax compliance have grown more complex in the *Wayfair* era as states expand economic nexus rules and update guidance at a rapid pace. Traditional rule-based engines struggle with scale, ambiguity in product descriptions and cross-system data quality issues.

In this first article of a two-part series, we explain why machine learning (ML) complements rules to improve consistency, speed and auditability in sales and use tax operations. We outline the data and governance foundations for adopting ML and present Case Study 1: Automated Nexus Detection, showing how a hybrid rules-plus-ML approach pulls forward registrations, reduces manual review time and strengthens evidence for auditors.

Part 2 of the series will continue with taxability classification, error management via confusion matrices and thresholds, and filing operations.

BLENDING BRIGHT-LINE RULES WITH MACHINE LEARNING

Economic nexus thresholds and evolving state guidance have turned sales and tax into a high-frequency, data-intensive process. Teams must detect exposure, classify products correctly and file on time – across jurisdictions, channels and changing catalogs. Hard-coded

rules remain essential for bright lines, but they are brittle when data are messy or when workloads spike.

ML adds lift where scale and ambiguity dominate. By learning from labeled history and pairing predictions with human review and immutable logging, ML helps prioritize effort, standardize decisions and create defensible audit trails.

BUSINESS PROBLEM SOLVED: Companies can struggle to stay on top of complex, high-volume sales and use tax obligations, and this article shows how a hybrid rules-plus-machine-learning approach enables earlier detection, reduces manual review and ensures scalable, auditable compliance.

This article frames the modern tax stack and demonstrates a pragmatic first step – nexus detection – that combines rules for certainty with ML for triage and foresight. (Part 2 will extend this foundation to taxability classification and filing at scale.)

CASE STUDY 1: AUTOMATED NEXUS DETECTION

A mid-sized e-commerce retailer specializing in health and wellness products experienced substantial growth during the pandemic.

Leadership quickly recognized a gap in visibility regarding when their activities would trigger economic nexus obligations.

To address this issue, the company partnered with a tax technology provider to implement an ML-based nexus detection system (Bloomberg Tax (n.d.)). This solution aggregated transactional data from order management, payment processors and shipping carriers.

Using supervised learning, the model was trained to identify patterns that indicated the threshold for nexus had been crossed, including cumulative gross receipts and transaction counts.

Within six months, the ML model successfully identified four additional states where economic nexus had been triggered but not yet registered. As a result, manual review time was reduced by 60 percent, allowing the company to register proactively and avoid potential penalties (Gartner, 2024).

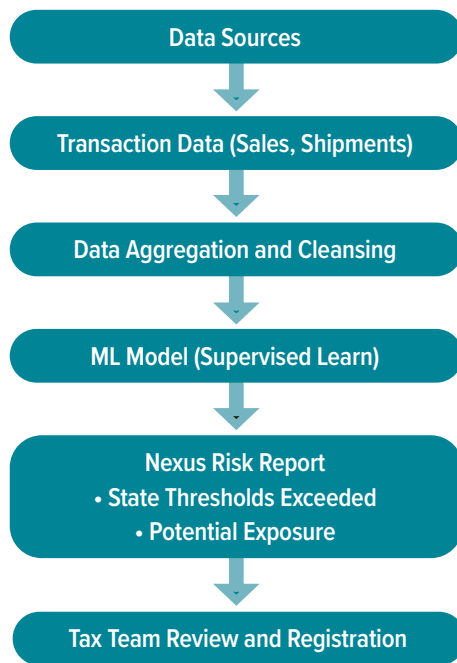


system checks the latest transactions against these thresholds. When it sees that a state’s threshold has been crossed or is about to be crossed, it automatically creates a risk report.

This report highlights which states need attention and shows exactly why the system flagged them. The tax team reviews this report to confirm whether registration is necessary. If needed, they can then register in that state before penalties or interest apply.

Figure 1: Nexus Detection Workflow Using Machine Learning

The ML system aggregates sales and shipment data, trains on historical thresholds and generates monthly risk reports for proactive registration.



Source: Compiled by Author

Main Points from the Case Study: ML enables continuous monitoring and provides early warnings regarding nexus obligations, relieving tax teams from the burden of manually reviewing thousands of transactions.

NEXUS DETECTION WORKFLOW USING ML

Figure 1 shows how ML can help companies know when they must register to collect sales tax in a state. At the start of the process, all the company’s sales and shipping data are gathered from different systems, like order records and shipping logs. This information is combined and cleaned up so that it is consistent and easy for the ML program to read.

Next, the cleaned data is fed into the ML model. This model has been trained to recognize patterns that signal when sales or transactions in a state are getting close to the legal threshold that requires registration. For example, some states set a dollar amount or number of transactions that trigger tax obligations.

The model uses the company’s historical data to learn what those patterns look like over time. Every month, the machine learning

By automating this process, the company avoids the risk of missing important deadlines. This system also saves time, because employees no longer have to review thousands of records manually. In short, the workflow helps tax teams stay proactive and confident that they are meeting all sales tax rules.

ADVANTAGES OF EARLIER NEXUS DETECTION

ML doesn’t replace bright-line rules in sales and use tax – it amplifies them. In the *Wayfair* era, exposure detection is as much a volume and timing problem as a legal one. A pragmatic

hybrid approach – rules for certainty, ML for scale and prioritization – lets teams spot nexus earlier, focus analyst effort where it matters and preserve decision evidence for auditors.

The Nexus case study shows that even a lightweight model, paired with clear ownership and immutable logs, can reduce manual review time and pull forward registrations without overbuilding a platform.

The path forward is straightforward: start with a time-boxed proof of value, measure lift against last year’s outcomes and institutionalize monthly calibration. With this foundation in place, tax teams are ready to tackle the two daily bottlenecks that drive risk and workload – taxability classification and filing – which we address in Part 2 of this series using recall-centric evaluation, human-in-the-loop thresholds and right-sized deployment choices.

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