



## HOW ML ADOPTION BENEFITS YOU

Machine learning can help any lender increase revenue and reduce risk through better underwriting, but it does present new concerns for the credit risk team. ZestFinance Automated Machine Learning (ZAML) software was built to solve these concerns.



**Achieve outstanding underwriting results.** ZAML software has helped lenders reduce loan losses by up to 30%. Others have increased approvals by 15%. Some clients have realized even bigger gains. How? Better prediction ability helps you avoid toxic borrowers and identify previously overlooked creditworthy borrowers. ZAML tools make it easy for you to adjust your model to exceed your credit goals while staying compliant with your existing policy.



**Comprehensively understand your model.** With our explainability tools, there is no 'black box.' You will be able to understand how the model was built, including its limitations and risks. You will be able to explain the contribution of every variable in your model, the interactions among them, and how the model arrives at each decision. Should the model deviate from expected performance, you'll have the tools to investigate why and take action.



**Safely execute your credit policy decisions.** Our tools ensure that your ML underwriting model can satisfy all risk, regulatory, and compliance requirements, because you can fully explain, document, and validate the way it arrived at every lending decision in real-time.



**Stay confident of future model performance.** Our tools continuously monitor input variables, allowing you to identify quickly any changes to your applicant population or other market conditions. You'll be able to avoid surprises and nimbly adjust your model.



**Leverage world-class technology expertise.** ZAML enables you to adopt the latest technology in underwriting and avoid the expense and hassle of hiring and training a team of data scientists.

## WHAT YOU SHOULD KNOW

Among the most frequent questions we get from credit teams:

### How is my job going to change?

Not much. Our tools provide automated reports for technical and performance monitoring, allowing you to understand your model at the global and applicant level. Our tools alert you whenever anything looks concerning and when the underlying nature of the applicant pool changes or macro-economic factors change that may necessitate a model refit or rebuild.

In addition to the automated monitoring reports and alerts, you have the option to learn how to use the ZAML tools and their analysis functions. Our training program makes it easy for you to learn how to conduct deep dives on the model and its outputs.

## What exactly does it mean that your models are explainable?

Machine learning allows you to use more of the data that you already have to vastly improve the performance of your model. However, the flipside is that machine learning models are often so complex that they do not give the human user the ability to understand how the model arrived at its decision. ML, in other words, can be a 'black box.' That's a particularly big problem in credit underwriting since companies must be able to prove to their regulators that their lending practices are safe, fair and in full compliance with the law.

ZAML tools rely on sophisticated math that analyzes the contribution of up to thousands of variables, and the potentially trillions of complex interactions between those variables, giving users insight into feature importance on a global and customer-specific level. This allows users to gain the benefits of ML to achieve better results and explain every step of the credit decision process. Other ML solutions claim that they do this but often use far fewer variables and/or take mathematical shortcuts that sacrifice accuracy, consistency and speed that can run afoul of regulators.

## The value demonstrated by the ZAML model is based on historic information. What guarantees do I have that actual performance will be as good as the expected performance?

ZAML model monitoring tools provide you with the ability to evaluate how your model is performing. This transparency gives you insight into how well your model is performing compared to expected performance and identifies when divergence occurs due to changes in operating conditions since the model was completed. This allows you to understand what's driving change in model performance and make any necessary adjustments. In particular, ZAML monitoring gives you real-time feedback on:

- **Model Inputs:** When we compare the current variables to the data the model was trained on, are there any changes to the variables that might be affecting the model's ability to score applicants?
- **Top Variables / Features:** What variables are having the biggest impact on a decision? How is this changing with time?
- **Model Outlier Rate:** Are there outliers that could distort the decision-making behavior of your model?
- **Model Outputs:** Are there significant changes in the model's scores over time?
- **Technical Performance:** Did the model work for every single applicant? How quickly were you able to return a response?
- **Long-Term Performance:** Are there any changes in default rates over time?

## How can I be confident that my ZAML model is not engaging in discriminatory lending?

Although the increased complexity of ML models makes it harder to tease out discriminatory lending practices, ZAML tools enable you to see the discriminatory effect that every feature or variable has in the model. That way you can proactively make adjustments to avoid disparate impact. Often, these variables can be removed with little to no impact on performance. ZAML's new fairness tools also allow you to attenuate discriminatory variables that contribute to the models' performance, rather than just remove them, in order to maximize fairness and accuracy.



## HOW ML ADOPTION BENEFITS YOU

Machine learning can help any lender increase revenue and reduce risk through better underwriting, but it does present new concerns for the business team. ZestFinance Automated Machine Learning (ZAML) software was built to solve these concerns.



**Significantly reduce losses, increase approvals, and boost yield.** Our tools typically help lenders reduce loan losses by 30% and increase loan approvals by 15% or more by swapping out riskier borrowers and replacing them with more creditworthy ones.



**Grow market share by reaching new borrowers.** Our tools typically help lenders approve more good borrowers (and avoid the most toxic ones) no matter where they fall on the credit spectrum. They also enable you to assign customers to pricing tiers more accurately, allowing you to beat the competition by providing the most competitive offer to the best borrowers.



**Build the ML model that is right for your organization.** Our tools and team of machine learning underwriting experts will help you to build the model that you want -- not just deliver an off-the-shelf solution -- and help support your IT, modeling, and risk teams at every step along the way.



**Make implementing powerful machine learning models easy.** Our software tools are built with optionality, flexibility and a minimal footprint. Adoption of machine learning underwriting can fit within and even accelerate your technology roadmap. In fact, our clients typically start using their models three months after the start of the first engagement.



**Safely develop and deploy your model.** Our tools ensure that your ML underwriting model is always sound and compliant. Because you can fully explain, document, and validate the way your model arrived at every lending decision, you'll be able to satisfy all internal risk reviews as well as regulatory compliance requirements.



**Recognition as a business leader.** Most AI models get stuck in the lab because risk and regulatory explainability requirements can be exceedingly difficult to satisfy. With ZestFinance, join a select group of global lenders successfully using AI. Raise your public profile and be recognized within your organization and industry as a leader for the responsible adoption of emerging innovative technologies like machine learning.

## WHAT YOU SHOULD KNOW

Among the most frequent questions we get from the business leaders we work with:

### How is my job going to change?

Don't worry: we won't expect you to code. But we will need your leadership! In our experience, successful deployment of ML-based underwriting requires an internal champion at the top to align key internal stakeholders -- such as your model risk management, modeling, IT, and compliance teams -- and drive transformational change. There undoubtedly will be skeptics. So we'll be at your side as trusted advisors who can help educate your organization on why moving to ML underwriting is critical and we will work collaboratively with your executive and IT team to drive significant results.

### How does machine learning more effectively price risk?

Our ZAML tools enable you to take advantage of more of the data that you already have on hand. Indeed, we primarily apply better math to existing applicant credit scoring data so that we can explore all of the variables that go into generating a credit score, as well as the complex interactions between those variables. By analyzing up to thousands of variables, ZAML-enabled models provide a more granular segmentation than traditional logistic regression models (which rely on only about 30 or so variables). That allows you to make a better decision on who to approve and how to price risk.

### Will this pass muster with our regulators?

Yes. Our tools enable you to build and deploy a ML underwriting model safely in a way that can fully satisfy all regulatory compliance requirements. Here are a few ways that you can be confident in our technology:

- **Model Development:** We use advanced math that allows you to analyze the impact of every variable, and every interaction between those variables, has on your model. As a result, you will be able to explain accurately, consistently, and quickly how your model arrived at any underwriting decision.
- **Model Validation:** By using fully explainable math, our models make it easy to validate their results and give you the confidence that they can be safely put into production using your existing model validation process.
- **Model Documentation:** Our tools auto-document and capture all details and decisions from model development so you can more easily understand the inner workings of your model and comply with the model risk management guidance.
- **Model Monitoring:** Our tools automatically detect subtle changes in model operating conditions (such as changes in the applicant pool or economy) in real-time so that you can decide whether you need to tweak or rebuild the existing model.



## HOW ML ADOPTION BENEFITS YOU

Machine learning can help any lender increase revenue and reduce risk through better underwriting, but it does present new concerns for the modeling team. ZestFinance Automated Machine Learning (ZAML) software was built to solve these concerns.



**Build more powerful models.** Our tools can help you maximize your data and build more accurate, consistent, and efficient models that have helped our typical client achieve a 15% increase in approvals (without taking on more risk) or reduce their losses by 30% or more, while holding approvals constant.



**Work in what you know.** Our tools are built to be platform agnostic so they will augment, not disrupt, how you work—whether it is in SAS, R, Python, or other types of code.



**Comprehensively understand your model.** With our explainability tools, there is no ‘black box.’ You will be able to understand how the model was built, including its limitations and risks. Further, you will be able to explain the contribution of every variable in your model, the interactions between them, and how the model arrives at each decision.



**Automated model risk management documentation.** Our tools automate the creation of the comprehensive risk and regulatory documentation of key model details and decisions, including documentation needed to satisfy regulators at the OCC, Federal Reserve, FDIC, and other agencies. Our tools help facilitate and work within your existing model governance process.



**Ensure model fairness and transparency:** Our fairness tools help you identify the model that maximizes fairness without decreasing model performance, while avoiding variables and interactions of variables that may introduce disparate impact. Further, we provide applicant-based explainability so that you can be confident your model is operating fairly for individual customers and across all applicants.

## WHAT YOU SHOULD KNOW

Among the most frequent questions we get from credit teams:

### How will my job change?

Zest tools empower you to do your job faster and more productively. You can design and implement a more performant model that is right for your business. But, ZAML explainability tools can help automate the critically important but tedious stuff such as model documentation, model validation, and model monitoring. That will allow you to put your model into production in as little as three months, accelerate iterative improvements, and free you up to focus on the more rewarding, creative, and fun aspects of model development.

### **Where does the model's value typically come from?**

There are a lot of ML solutions out in the market today; frankly, it's a bit of the Wild West. The value of Zest's approach is that our tools allow you to make better use of the data that you already have. ZAML allows you to explore all of the data that feeds into generating each applicant's aggregate credit score, as well as the complex interactions among those variables. You also may consider other sources such as application data, CRM data, or other third-parties like LexisNexis, Clarity, or E-Bureau. ZAML lets you maximize the ROI of your data budget by analyzing thousands of variables to figure out which ones contribute most to accuracy and predictive power (and get rid of the ones that don't). Traditional underwriting models, which rely on logistic regression, rely on only about 30 or so variables. ZAML models draw upon thousands of variables.

### **Do ZAML models satisfy fair lending and other regulatory compliance requirements?**

Yes. ZAML tools will ensure that your model can meet all existing regulatory requirements, including ECOA, FCRA, and UDAAP.

ZAML uses new and more powerful math that can show users the contribution of every variable, as well as the impact of the complex interactions between them. This allows users to gain the benefits of ML to achieve better results and explain every step of the credit decision process. What's more, other ZAML tools help automate the documentation of all details and decisions during the model building process, making it easier and more efficient to comply with current model risk management (MRM) guidelines. As a result, our clients typically get their model out of the lab and into production in just three months with the confidence they are adhering to the law.

Although the increased complexity of ML models makes it harder to tease out fair lending risks, ZAML tools enable you to see the discriminatory effect that every feature or variable has in the model. ZAML tools allow you to remove variables or features that present fair lending risks and understand its effect on performance. Often, these variables can be removed with little-to-no impact on performance so you can maximize fairness without sacrificing performance.

### **Will my ZAML model work on new data or if economic conditions change?**

Yes. One of the biggest benefits of using ZAML tools is the availability of real-time, automated model monitoring. We recognize that the real world is in a constant state of change and so are the inputs upon which your ML model relies.

ZAML's tools were specifically designed to flag even the most subtle changes that occur in model operating conditions so you can decide whether it warrants changes to your model. And thanks to our model building, verification, and documentation tools, you will be able to get that new ML model up and running safely in a matter of months.

### **Will you show us the math Zest's tools use?**

Yes. Zest's own modelers are happy to walk you through each and every step. Prior to contract, we are happy to provide you with a detailed conceptual understanding on how our ZAML tools drive fully explainable models. Once you formally engage us, we would be glad to walk you through the mathematical details of the ZAML explainability tools.

### **Will ZAML tools work in my preferred platform?**

Yes. ZAML's software is built in R and Python and works across a wide array of platforms. That means you can code in whatever language works best for you. That should minimize the learning curve and get you up-and-running faster.

Visit our website at [www.zestfinance.com](http://www.zestfinance.com) or contact us at [partner@zestfinance.com](mailto:partner@zestfinance.com) to learn more.



## HOW ML ADOPTION BENEFITS YOU

Machine learning can help any lender increase revenue and reduce risk through better underwriting, but it does present new concerns for the regulatory compliance team. ZestFinance Automated Machine Learning (ZAML) software was built to solve these concerns.



**Ensure model fairness and transparency.** ZAML software is already great at identifying hidden bias in credit models. Our new ZAML Fair tools go even further, letting you fine-tune any ML model to produce the maximum fairness at any target rate. ZAML provides explainability down to the applicant level so you can be confident your model is making safe and fair decisions for customers across applicant pools.



**Safely develop and deploy your model.** Our tools ensure that your ML underwriting model can satisfy all regulatory and compliance requirements, including ECOA, FCRA, and UDAAP. You will be able to fully explain, document, and validate the way the model was built and how it arrived at every lending decision.



**Confidence in your adverse action reasons.** Our explainability tools open the notorious 'black box' of machine learning and directly interrogate a model and its decisions. ZAML generates accurate and consistent key codes to feed into your adverse action and customer notification processes.



**Automated model risk management documentation.** Our tools automate the creation of the comprehensive regulatory documentation expected by the OCC, Federal Reserve, and FDIC. With a push of a button, you can produce a report in minutes with all key model details, data, and decisions. This manual process used to take months.



**Recognition as a compliance leader.** Most AI models get stuck in the lab because regulatory explainability requirements can be exceedingly difficult to satisfy. With our tools, you can lead your organization and industry as a champion of the responsible adoption of AI.

## WHAT YOU SHOULD KNOW

Among the most frequent questions we get from the regulatory compliance teams:

### How is my job going to change?

Not much. Our tools take advantage of the latest AI to ensure that your ML models are fair, transparent, safe, and satisfy all regulatory and compliance requirements. They give you the same information you need today to do validation and oversight but in a more powerful, ML environment.

## **How does ZAML facilitate adverse action for ECOA Reg B? How are the specific adverse action reasons generated? Can the mapping and reasons be reviewed or changed?**

ZAML software lets you fully explain for any applicant decision the impact of each variable and the impacts of the complex interactions among those variables. That lets you identify the specific reasons for the adverse decision and comply with Reg B requirements. Models built using ZAML facilitate an accurate and consistent adverse action mapping process. You may choose to supplement additional reasons should the model include new data sources or variables previously not used in underwriting.

## **What data are my ML models using? Is the use of this data fair from a Fair Lending and UDAAP perspective?**

ZestFinance helps you take better advantage of the data you own or to which you already subscribe. But instead of relying on aggregated credit scores, our tools allow you to use the raw data that make up those credit scores by looking at the underlying credit report. The resulting models are able to harness a much larger number of variables in credit decisioning. In some cases, customers have also supplemented that data with customer application data and other data from third-party sources such as LexisNexis, Clarity, and e-Bureau. However, we do not engage in screen-scraping or use social media data.

ZestFinance as a practice does not use any variables that would be correlated to discrimination against a protected class, such as age, sex, marital status, ethnicity, and race. Our ZAML Analyze and Fair tools ensure that we can identify each and every variable of our models that could lead to disparate lending outcome – and enable our clients to pre-emptively remove or attenuate them.

## **How does Zest conduct Fair Lending analysis and allow clients to take steps to mitigate risk?**

The Consumer Financial Protection Bureau (CFPB) issued interagency guidance requiring lenders to account for any differences in loan approval rates between a number of different protected classes and a reference white population (often referred to as BISG methodology).

Our ZAML Analyze tools allow you to proxy for protected classes or use hard data sets to evaluate average approval and denial rates for those classes and identify the variables driving those outcomes. It then allows our clients to compare those variables to those driving the outcomes of a White reference population or control group. Clients can then take appropriate action to either remove those variables that drive disparity but not performance, or attenuate the ones that do drive performance but reduce their disparity to an acceptable level.

## **How do your models maintain compliance throughout their lifecycle?**

ZAML models do not change overnight or quickly. They do not ‘self-learn.’ Yet the model’s fairness or performance may degrade over time without any action. ZAML mitigates this risk with an automated model risk monitoring tool that can detect subtle changes in model operating conditions, such as shifts in the borrower applicant pool or in the economic environment, to identify whether the model’s fairness or performance has changed. These tools alert you when a change has occurred so you can decide if a model refit or rebuild is necessary.



## HOW ML ADOPTION BENEFITS YOU

Machine learning can help any lender increase revenue and reduce risk through better underwriting, but it does present new concerns for IT teams. ZestFinance Automated Machine Learning (ZAML) software was built to solve these concerns.



**Easily implement powerful ML models.** Our software tools are built with optionality, flexibility and a minimal footprint. Our tools can be deployed using any platform (Microsoft, AWS, IBM, etc.) and complements your existing IT investments.



**Build the ML model that is right for your organization.** Our tools allow your team to build the model that you want -- not an off-the-shelf solution offered by a big-name or boutique vendor.



**Build with security in mind.** All data are securely encrypted, whether in transit or at rest. Our tools employ military-grade data deletion policies and are both SOC 1 and 2 certified.



**Demonstrate business value quickly.** Our clients typically begin using their models within three months of first use of our software. Our tools automatically package your model for deployment on your model hosting service of choice. You may eliminate IT complexity by having us manage model hosting and infrastructure for you.

## WHAT YOU SHOULD KNOW

Among the most frequent questions we get from the IT teams we work with:

### How is my job going to change?

Not much. We built ZAML to alleviate any disruption to the way you approach your job. ZAML is platform agnostic. You can deploy on the cloud, on-prem, and anything in between. We are compatible with Amazon, Microsoft, IBM, and open source environments. If anything, ZAML should make it easier for you to safely implement the powerful ML models that your business demands.

### What is ZAML?

ZAML is a set of R and Python libraries that you can run in any development environment. It's not some exotic system that will require specialized administrators or an expanded staff. Nor is ZAML a general machine learning database or platform. It is how lenders around the world successfully and safely develop, deploy, and operate fully explainable machine learning models.

### **It is it going to work?**

Yes. We developed ZAML tools using our own lending book and lived through the ups and downs of lending out our own money. Now, we license it to the world's most innovative financial institutions who are achieving great results. We have successfully deployed ZAML in a broad array of environments (on-prem, in the cloud, hybrid, etc.) and on a variety of platforms (Microsoft, Amazon, IBM, open source). And, ZAML works very well on all of them.

### **Should we build or buy?**

We believe there should be a compelling reason to buy versus building something on your own. That said, nothing on the market comes close to the accuracy, consistency, and speed that ZAML tools provide in term of ML model explainability. Our proprietary set of algorithms enables you to safely take advantage of machine learning and represents years of research and development. In fact, we have many issued and pending patents on our technology.

ZAML complements the open source data science and machine learning tools that now exist. You can use the latest tools and algorithms in concert with ZAML tools to enable your business to access the full value of machine learning. We've already done the hard work for you and have incorporated many of these best-in-breed open source data science and machine learning tools within ZAML. Our standard practice is to provide a full list of open source dependencies in compliance with any open source compliance policies you have.

### **How do you ensure information security?**

ZAML is built with security in mind across deployment platforms, including the cloud and on-prem. Though we don't expect any problems or issues, we maintain a documented incident response plan that is tested at least annually for rigor and speed. Further, we support secure deletion of any backed-up or archived data and our procedures provide assurance that all computing resources can be sanitized at your discretion.



## HOW ML ADOPTION BENEFITS YOU

Machine learning can help any lender increase revenue and reduce risk through better underwriting, but it does present new concerns for the model validation team. ZestFinance Automated Machine Learning (ZAML) software was built to solve these concerns.



**Comprehensively understand your model.** With our explainability tools, there is no ‘black box.’ You will be able to understand how the model was built, including its limitations and risks. Further, you will be able to explain the contribution of every variable in your model, the interactions among them, and how the model is arriving at each decision.



**Work within your existing validation process.** Our tools and technology auto-document comprehensive model risk reports, enabling you to review and validate a model within your existing model governance process, as you would a traditional logistic regression model.



**Improve model oversight.** A single ML model can replace multiple segment-specific models. As such, you will only have to review one model, allowing you to gain greater oversight and efficiency of your underwriting. Our automated tools also detect subtle changes in model operating conditions and flag potentially discriminatory model features, which may warrant refitting or rebuilding your model.



**Replicate your model** with confidence. Our automated documentation tools capture every decision you make in building the model at every step along the way. That means you can replicate every part of the model development process.



**Automated model risk management documentation.** Our tools automate the creation of the comprehensive risk and regulatory documentation of all key model details and decisions that are expected by your regulators including the OCC, Federal Reserve, and FDIC.

## WHAT YOU SHOULD KNOW

Among the most frequent questions we get from the model validation teams we work with:

### How is my job going to change?

Not much. Because machine learning (ML) models are more complex than the logistic regression models you are more familiar with, there may be some differences in the validation methods that we suggest. However, the good news is that our technology and tools render ML models as transparent as legacy models and follow your existing model validation process. Plus, our tools automatically generate much of the required documentation for validation, making your process more efficient.

### **Why should I trust the ZAML model and the choices made while building it? What is the decision process behind each decision?**

Our tools allow ML models to be rigorously tested and evaluated. Research shows that our explainability techniques are more accurate, consistent and efficient than alternative methods and are used by the world's largest financial institutions. We will gladly talk through any questions that you have.

Further, models built using ZAML ensure model fairness and transparency. Our tools collect information relating to all key model details and auto-documents these decisions to give you full visibility and oversight into the inner workings of the model. Our fairness tools also help you to identify the model that maximizes fairness without decreasing model performance by avoiding variables and interactions of variables that may introduce disparate impact.

### **How do you know your explainability method is correct and the contribution of each variable on the model?**

We rely on sophisticated mathematical techniques that enable us to examine every variable in our model as well as the complex interactions among those variables. That greatly enhances model accuracy and consistency yet is less computationally intensive so it does not sacrifice speed. This is particularly important for real-time credit decisioning. We would be happy to answer any question you have about the math and point you to some helpful academic reports and some of Zest's own proprietary research.

### **How do you ensure that there is no degradation to model performance over time?**

Our automated model risk monitoring tools can detect subtle changes in model operating conditions, such as shifts in the borrower applicant pool or in the economic environment, so that you can determine whether a model refit or rebuild is warranted. Because our tools allow you to put models into production quickly, you can maximize the performance of your models over time.

### **What is the level of retraining necessary?**

We believe that our tools are intuitive and easy to use so an experienced model validation staff will be able to learn everything they need to know in just a few hours. We are happy to provide additional academic research papers and reports should you wish to dive deeper. And rest assured, our underwriting experts are there to support your model validation team at every step along the way.