



MSc Artificial Intelligence Systems

AI PROJECT METHODOLOGY CASE STUDY

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1 Introduction

Why do loyal customers suddenly stop using a platform they once enjoyed? In today's competitive e-commerce world, keeping customers is just as important as getting new ones. When customers leave, companies not only lose sales—they also lose future opportunities to grow.

RetailGenius, a fast-growing global e-commerce company, started to face this exact problem. Even with large amounts of data from user activity, purchases, and marketing, the company couldn't clearly understand why some customers were leaving—or how to stop them from leaving.

To solve this, RetailGenius decided to use artificial intelligence (AI) to predict customer churn. The goal is to find out which customers are likely to stop using the platform and take action before they do. By turning data into useful insights, the company hopes to improve customer experience and build stronger long-term relationships.

In this case study, we will look at how the AI project is planned from a functional point of view. We'll discuss the goals, the type of data needed, the models used, how the system is built and monitored, and how different teams work together. This case study shows how AI can help solve real business problems and make smarter decisions.

2 Project Strategy

2.1 Objective

The main goal of this project is to help **RetailGenius** reduce customer churn using Artificial Intelligence (AI). Churn happens when customers stop using the platform, and this can lead to a loss in sales and lower customer engagement. By predicting which customers are likely to leave, RetailGenius can take action early—such as sending special offers or personalized messages—to keep them.

This project supports the company's broader goal of improving the customer experience, increasing loyalty, and growing its long-term revenue.

2.2 Key Performance Indicators (KPIs)

To understand if the project is successful, we need to track some important metrics, also known as **Key Performance Indicators (KPIs)**. These will help measure the impact of the churn prediction system.

- **Churn Rate:** The percentage of customers who leave the platform over a period of time.
- **Retention Rate:** The percentage of customers who continue to use the platform.
- **Model Accuracy:** How correctly the AI model predicts whether a customer will churn.
- **Precision and Recall:** How well the model identifies real churners versus false alarms.
- **Customer Lifetime Value (CLV):** How much value a customer brings during their time with the company.
- **Revenue Impact:** How much additional revenue the company earns by retaining more customers.

These KPIs will be reviewed regularly to evaluate whether the AI model is effective and to identify areas for improvement.

2.3 How AI Helps in Reducing Customer Churn

AI plays a critical role in addressing the churn problem because it can:

- **Analyze large amounts of customer data:** By analysing large amounts of data, like customer purchases, product views, and reviews, we can spot patterns that show when someone might leave. For example, if a customer stops buying or visiting the website, the AI can flag them as at risk.

- **Recommendation system:** It can help create powerful recommendation systems to suggest products customers might like, making their experience more personal and enjoyable.
- **Targeted Marketing:** It can help the marketing team create targeted campaigns by providing special offers for risky customers, and by encouraging them to stay.
- **Inventory Management:** It can provide alerts when there is going to be a sudden surge for particular products, making stocks available when the surge happens, which will provide user satisfaction and optimised inventory management.

3 Project Design

3.1 Data

Relevant Data Sources

- **User Platform Interaction:** User interaction data from the platform, like product views, searches, purchases, and reviews on the RetailGenius.
- **Purchase History:** Records of what customers bought, how often, and how much they spent.
- **Customer Demographics:** Information like age, location, and preferences to understand customers better.
- **Customer Support Data:** Details from customer complaints or inquiries to spot dissatisfaction.
- **External Data** (optional): Social media interactions, competitor pricing, and market trends to see how outside factors affect churn.

Potential Data-Related Challenges

- **Data silos:** Data might be stored in different places, like separate databases, making it hard to combine and use.
- **Data quality:** Some data might have errors, like missing values, duplicate users, which can take some time to clean the data.
- **Privacy concern:** Keeping customer data private and secure is a big concern, as there are strict GDPR/CCPA constraints on personal data storage and processing.
- **Class imbalance:** Solve the challenge of class imbalance, as churners are the minority class.
- **External data collection:** Collecting external data like social media or competitor info will be hard, sometimes requiring calling paid APIs, which can take a lot of time and money.

3.2 Models

Best model is selected based on the result of experimentation. The model that balances speed of experimentation, predictive power and operational simplicity will turn out to be the best. For experimentation the list of potential candidates is:

- **Pretrained models:** Since we are dealing with a huge amount of data, pre-trained deep learning models will be ideal for this task. For this purpose **TabPFNv2** can be considered which is a pretrained model trained on billions of tabular synthetic data. Which can perform best on out of the box tasks if fine tuned well for using our dataset it can perform really well on churn prediction. We should also consider an upgrade of this model **Real-TabPFN** which is the new state of the art and built on top of TabPFN v2 which can perform really well on real world use cases such as churn prediction.

- **Tree based Model:** Consider building tree based model like XGBoost, which can scale to large datasets while being robust to noise and outliers. Most of the churn prediction models are built on top of this model.
- **Ensemble learning :** To get the best performance combine XGBoost with TabPFNv2. TabPFNv2 need no hyperparameter tuning also great performance out of the box. Which XGBoost can scale to large datasets with excellent gradient boosting performance.

Training, Validation, and Testing : To train the model, we will use historical data split into three parts: 70% for training (teaching the model), 15% for validation (tuning the model), and 15% for testing (checking how well it works). During training, the model learns patterns, like which behaviors lead to churn. Validation helps adjust settings to improve accuracy. Testing checks if the model makes good predictions on new data. We will clean the data first to fix errors and use techniques like cross-validation to make sure the model is reliable.

Model Versioning & Serving

- **Model Versioning:** Managed using MLflow, which supports the entire machine learning lifecycle, including experiment tracking, model versioning, and deployment.
- **Containerize inference:** Containerise inference code using Docker, including trained model, scripts for preprocessing and prediction. To ensure consistent deployment across environments.
- **Model Serving:**
 - **Batch prediction:** Using **Apache Airflow**, run the churn prediction model on a group of customer records at once to generate the churn score for each profile, this can automate the churn scoring process.
 - **REST API endpoint:** Web service to predict the churn score using the customer data. This can help the platform take immediate actions like providing a discount.

3.3 Deployment

Deployment Strategies

- **Shadow deployment:** Run the new AI model in the background, without actually using its predictions to make decisions yet. It works side-by-side with the existing model, and we compare the predictions from both. This helps test the model safely before going live, so we can check its accuracy and catch any issues without affecting real customers.
- **Canary/blue-green release:** It is a safe way to launch a new model. We first give access to a small group of users (called a "canary group") while the rest continue using the current version. If everything works well with no bugs or bad predictions, we slowly roll it out to more users. This helps us catch problems early without affecting everyone.
- **A/B testing:** Split the users into two groups: one group (the control) continues with the current system, and the other group (the treatment) uses the new AI model. We then compare the churn rates and other key metrics between the two groups. This helps us see if the new model is actually better before we release it to everyone.

When deploying the model in a production environment, we need to consider:

- **Scalability:** The system must handle large amounts of data as RetailGenius grows.
- **Security:** Ensure customer data is protected by using encryption and strict access controls, in compliance with privacy regulations such as GDPR.
- **Performance:** Ensure the model makes predictions quickly, especially for real time use.

- **Cost:** Optimize resource usage to stay within the project's budget while ensuring performance and scalability.

3.4 Monitoring

To monitor the churn prediction model, we will track its KPIs, like prediction accuracy and customer retention rate, using dashboards which updates regularly. We will compare model predictions to actual churn data to see if the model is correct. We can leverage Grafana to show these results visually for the team.

Model drift happens when customer behavior changes, making the model less accurate. To handle this:

- **Regular Retraining:** Retrain the model every few months with new data to keep it up-to-date.
- **Drift Detection:** Use tools to check if the data the model sees is different from what it was trained on.
- **Performance Alerts:** Set up alerts to notify the team if the model's accuracy drops below a certain level.
- **Feedback Loop:** Use feedback from marketing and customer support to improve the model, like adding new data about customer complaints.

By monitoring and updating the model, RetailGenius can ensure it keeps making accurate predictions and helps retain customers.

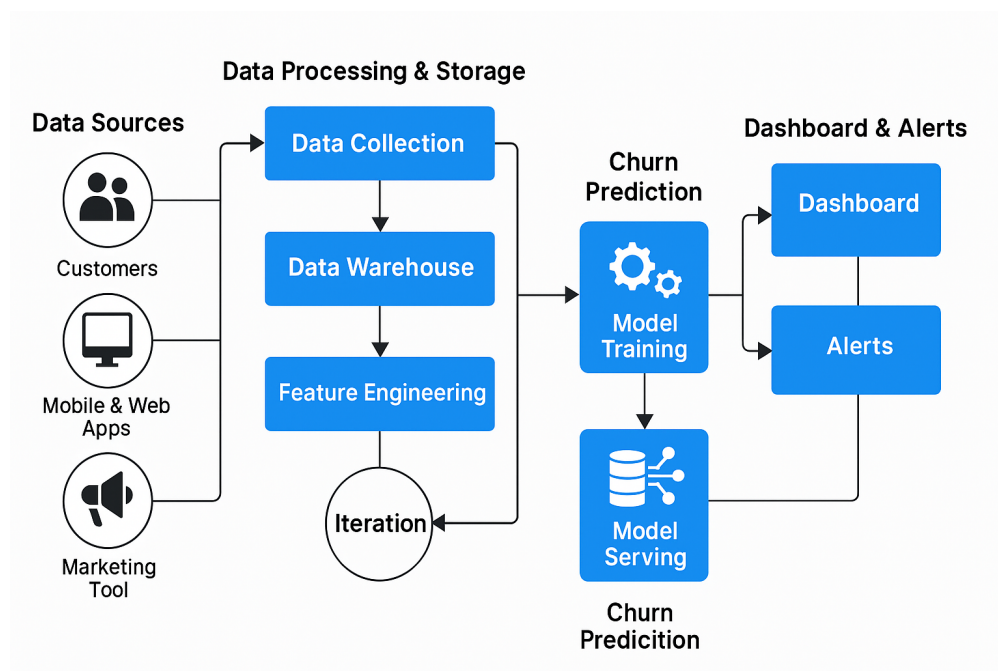


Figure 1: Architecture of Churn Prediction

4 Project Team

4.1 Key Roles and Required Expertise

- **Product Owner**
Provides vision, budget, and executive support

- **Project Manager**
Plans sprints, tracks KPIs, manages risk, and ensures on-time delivery.
- **Data Engineer**
Builds data pipelines (ETL/ELT), ensures data quality, and maintains storage solutions.
- **Data Scientist**
Designs features, trains/evaluates models, carries out testing, and interprets results.
- **MLOps Engineer**
Automates model CI/CD, handles versioning, monitors drift, and manages model serving infra.
- **Backend Engineer**
Integrates predictions into the platform, implements REST endpoints with security.
- **DevOps**
Manages cloud resources (Kubernetes, Terraform) to ensure scalability.
- **Domain Expert (Customer Analytics)**
Brings retail knowledge, defines churn labels, and validates model outputs for business sense.
- **Data Visualization Specialist**
Designs dashboards and alerting interfaces for marketers and engineers.
- **QA / Test Engineer**
Creates test plans, validates data integrity, and performs regression testing across releases.

To keep everyone informed, we will create a communication plan:

- **Weekly Updates:** Send emails with project progress, challenges, and next steps to all stakeholders.
- **Monthly Meetings:** Hold meetings to discuss milestones, share model results, and gather feedback.
- **Shared Dashboard:** Use a tool like Google Sheets, slack, teams or a project management platform to keep all team members and stakeholders updated with real-time information on tasks, deadlines, progress, and KPIs. This improves transparency and ensures everyone stays aligned throughout the project.

5 Project Governance

To ensure stakeholders are aligned and informed, we will set up governance instances:

- **Project Steering Committee:** A group of leaders from the executive, data, and technology teams that meets monthly to review progress, approve major decisions, and resolve issues.
- **Data Governance Board:** A team of data experts who ensure data quality, security, and compliance with privacy laws. They meet biweekly to check data-related tasks.
- **Regular Status Reports:** Written reports shared every week, summarizing project achievements, risks, and upcoming tasks.
- **Feedback Sessions:** Workshops are conducted where all stakeholders can suggest improvements or raise concerns about the project.

These instances will help keep the project on track and ensure everyone agrees on the direction.

The churn prediction model's outputs need to be shared with both technical and non-technical teams in a way they can understand:

- **Technical Teams (Data and Technology):**

- Share detailed reports with model performance metrics, like accuracy and precision. This helps technical team understand how well the model is performing.
 - Store model predictions in a structured database (such as SQL) so that data analysts and other teams can easily access, query, and analyze the results for deeper insights or to support decision-making.
 - Technical meetings to discuss model updates and integration with existing systems.
- **Non-Technical Teams (Marketing, Customer Support, Executives):**
 - Create simple dashboards with visuals, like charts or graphs, using tools like Tableau or Power BI, to show which customers are at risk of churning.
 - Provide simple summaries of model predictions to help non-technical stakeholders understand the insights for example, “20% of customers who haven’t made a purchase in the last 30 days are at high risk of churning.”
 - Organize training sessions to help non-technical teams understand how to use the model’s predictions, for example: how to identify which customers should receive discount offers or follow-up messages.

By using clear visuals for non-technical teams and detailed data for technical teams, everyone can use the model’s predictions effectively to help RetailGenius keep its customers.

6 AI Project Management Methodology

6.1 Chosen Methodology

For the RetailGenius churn prediction project, we will use the **Agile** project management methodology. Agile focuses on breaking the project into smaller, manageable parts called sprints, each lasting about two weeks. In each sprint, the team works on specific tasks, like collecting data or training the AI model, and reviews progress at the end.

6.2 Suitability of Agile

Agile is a great fit for this AI project for several reasons:

- **Flexibility:** AI projects often need changes, like tweaking the model or adding new data. Agile allows the team to adapt quickly without sticking to a rigid plan.
- **Collaboration:** Agile encourages regular meetings (like daily stand-ups) where the data, technology, and marketing teams can share ideas and solve problems together.
- **Fast Feedback:** Each sprint delivers a small piece of the project, like a trained model or a dashboard. This lets stakeholders test and give feedback early, ensuring the project meets their needs.
- **Handling Uncertainty:** AI projects, like churn prediction, can be unpredictable due to data issues or model performance. Agile’s short cycles help the team test ideas and fix issues quickly.

6.3 Potential Risks and Mitigation Strategies

The churn prediction project faces several risks. Below is a table listing key risks and how to address them:

Table 1: Risk Assessment and Mitigation Strategies

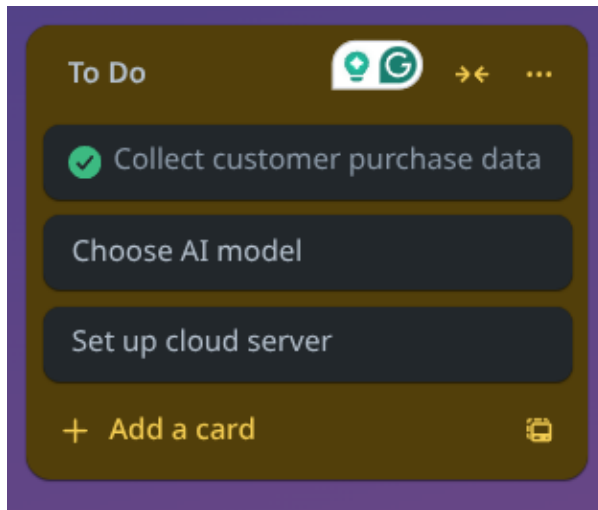
Risk	Mitigation Strategy
Poor data quality (e.g., missing or inconsistent data)	Clean data before training and perform data validation to check for errors.
Model underperformance (e.g., low accuracy)	Experiment multiple models and perform fine tune.
Too many features	Define clear goals in each sprint and review them with domain experts to stay focused.
Team miscommunication	Hold daily stand-ups and use a project management tool to track tasks.
Data privacy breaches	Implement encryption, access controls, and regular security audits.

6.4 Handling Costs and Planning Deviations

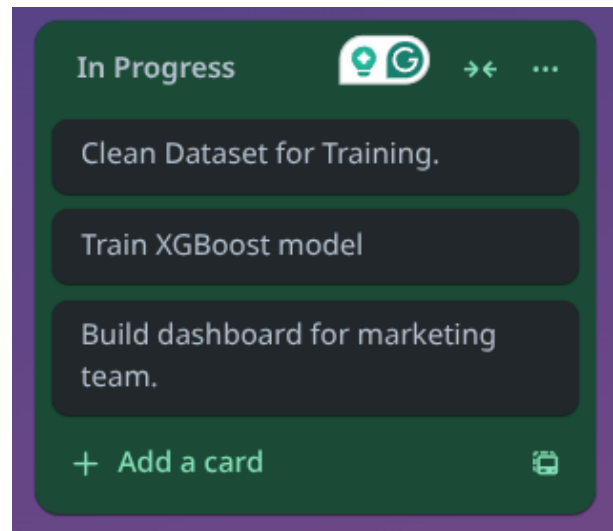
AI model iterations, like retraining or testing new models, can increase costs and delay the schedule. To handle this:

- **Budget Planning:** Set aside a portion of the budget for unexpected costs, like extra cloud computing for model training. Estimate costs based on past sprints.
- **Iterative Planning:** Use Agile's short sprints to plan priority tasks. If iterations cause delays, reprioritize tasks in the next sprint to stay on track.
- **Cost Monitoring:** Track cloud usage with tools to avoid overspending. Review costs at the end of each sprint.

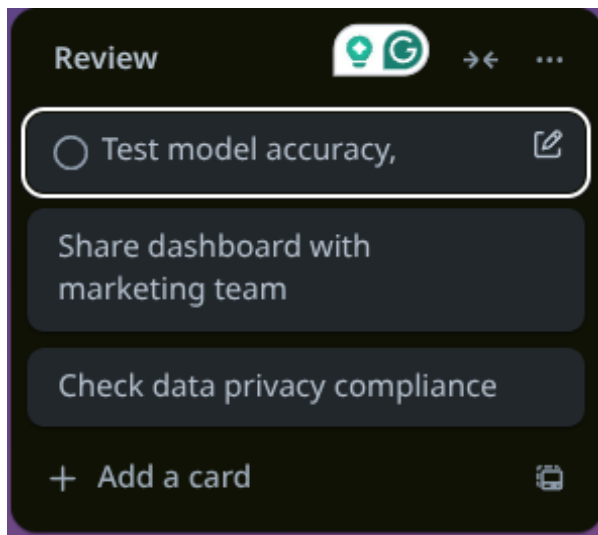
6.5 Mock Trello Kanban Board Setup



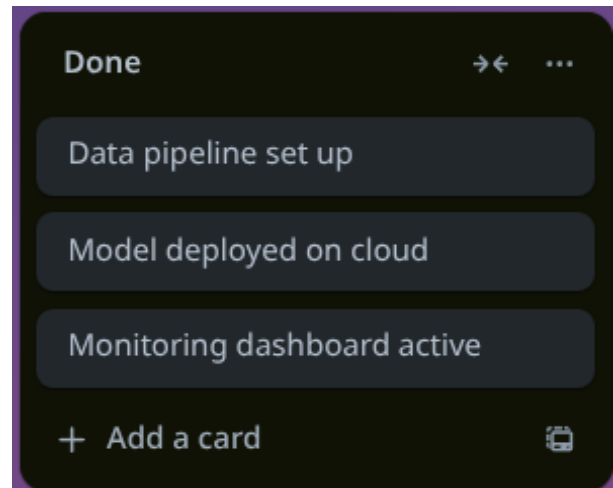
(a) Tasks to do



(b) Tasks in progress



(c) Tasks in progress



(d) Tasks done

Figure 2: Mock Trello Setup