



# APPRAISE

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New York

*PM, MLE, Model Eval*



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Bay Area

*MVP Lead, Model Eval Lead*



**Danny Skahill**  
Bay Area

*Infra Lead, Facilitator, MLE Lead*



**Julian Yau**  
Hong Kong

*EDA Lead, SME Lead*





// DEMO



# Addressing the Problem

## An Imbalanced Market

**Our mission was to find ways to improve the second-hand car market and the information asymmetry that favors the seller.**



# What Is Your Vehicle's Condition? <sup>①</sup>

Not sure? Take our quick condition quiz. [Start Here](#) →

## Fair

**20%**

of cars we value

Requires some  
mechanical repairs

## Good

**50%**

of cars we value

Has repairable  
cosmetic defects  
and mechanical  
problems

## Very Good

**28%**

of cars we value

Has minor cosmetic  
defects and is in  
good mechanical  
condition

## Excellent

**2%**

of cars we value

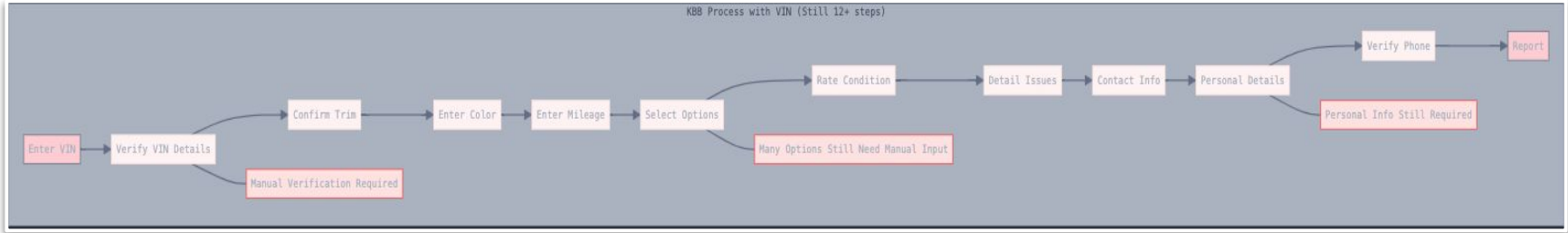
Looks new and is in  
excellent  
mechanical  
condition

Kelley Blue Book does not provide values for cars in poor condition

Next

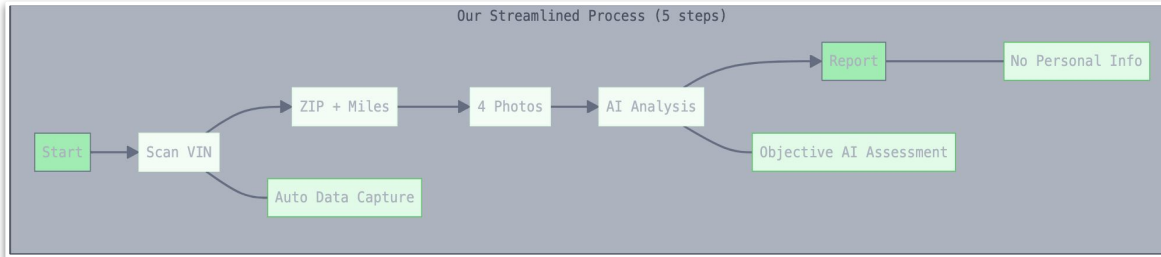
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**KELLEY BLUE BOOK EVALUATION**



## The Existing Process

Kelley Blue Book



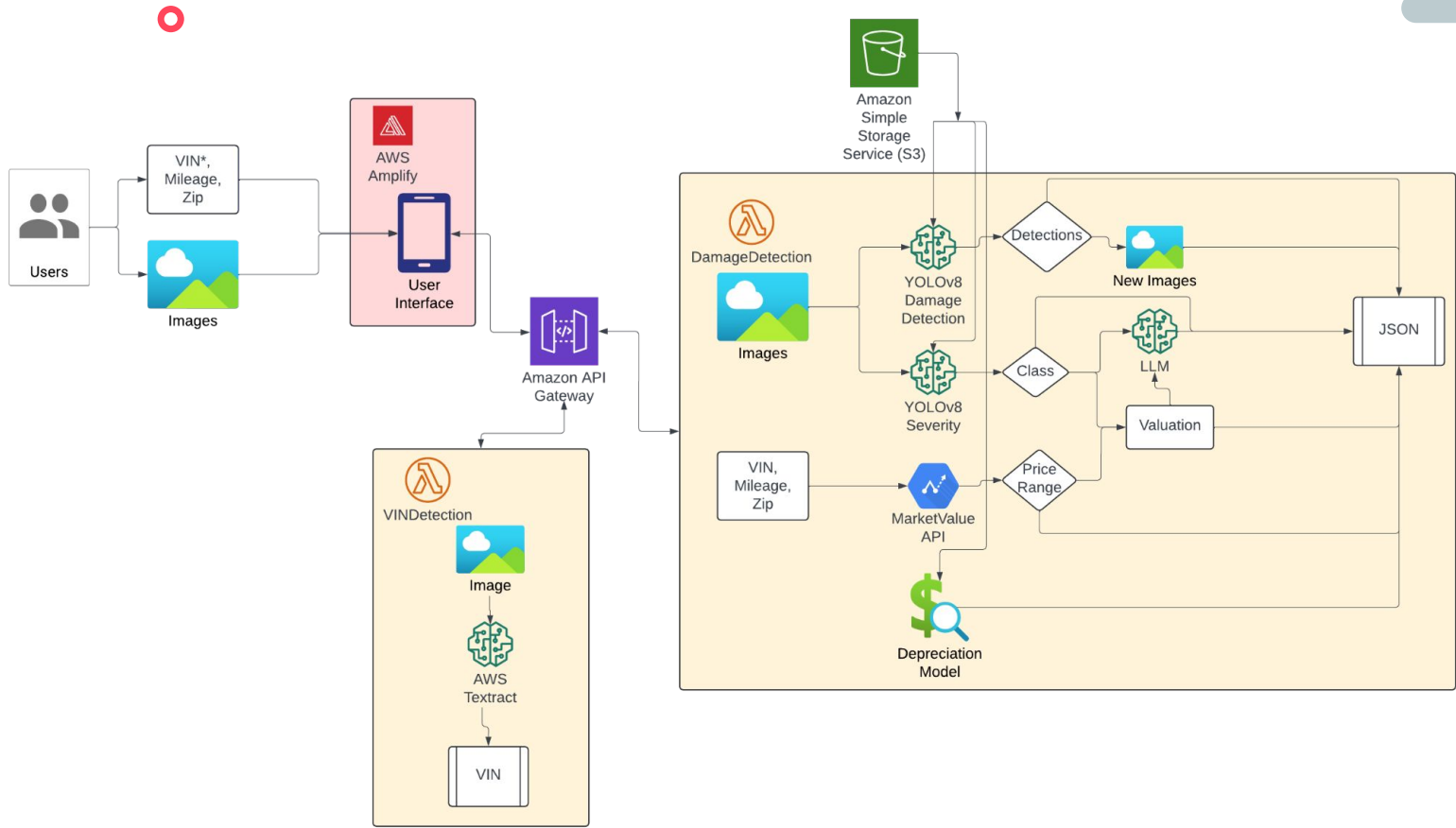
## Our Process

ApprAlse



# // Architecture





## APPRAISE ARCHITECTURE





# Data

## Car Image Data

- ❖ **Source:** <https://cardd-ustc.github.io/>
- ❖ **Description:** Comprehensive dataset containing various types of car damage, which will be used to train our model to identify and assess vehicle damage accurately.

## Severity Data

- ❖ **Source:** <https://cardd-ustc.github.io/>
- ❖ **Description:** We self annotated all 4000 images with a severity level from 1-4(1 being the most severe and 4 being least severe)





# Data

## MarketCheck API Data

- ❖ **Source:**  
<https://apidocs.marketcheck.com/#392b7a35-e299-46bb-84b9-5e60a900d875>
- ❖ **Description:** We can use the easier interface of VIN and the API will decode this VIN and extract the relevant taxonomy attributes of the car and give us an accurate price range.

## Used Car Sales Data

- ❖ **Source:**  
<https://www.gigasheet.com/sample-data/used-cars-dataset>
- ❖ **Description:** This dataset is on 426,000 used cars, with data on make, model, year, mileage, condition, and price.



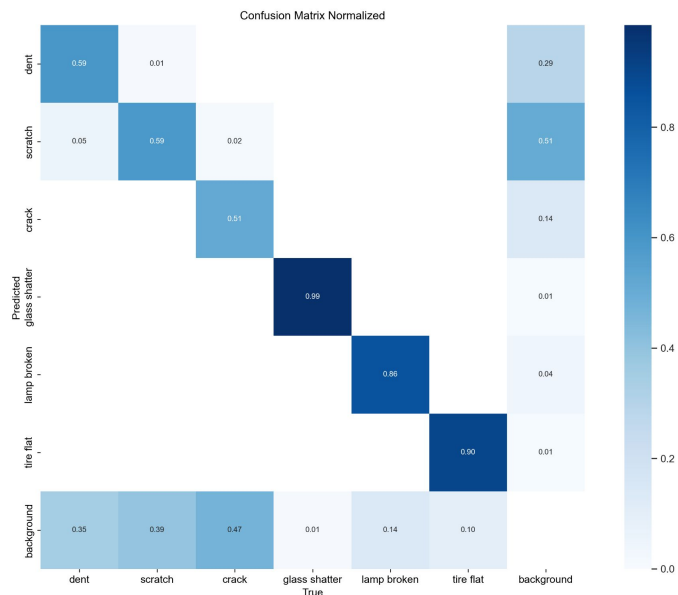


# // Model Performance

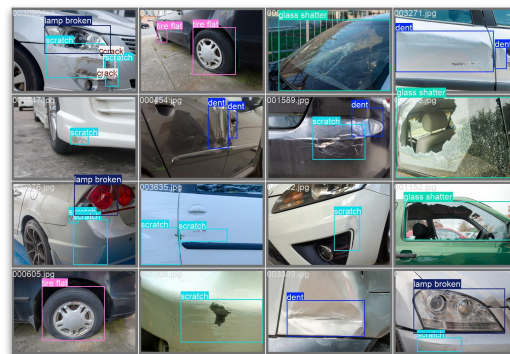


# Damage Detection Model

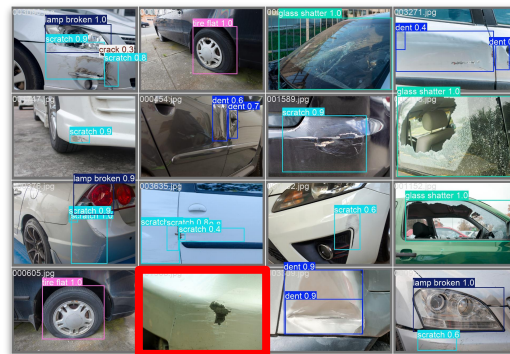
Validation Precision: 75%  
Validation Recall: 73%



GROUND TRUTH

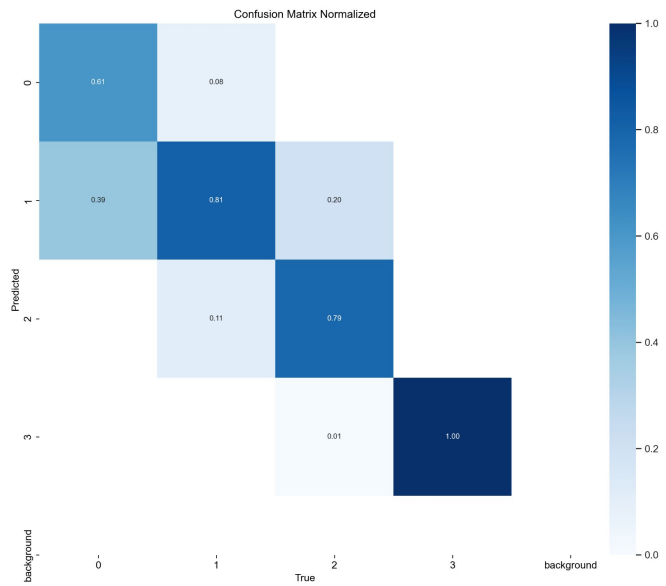


PREDICTION



# Severity Model

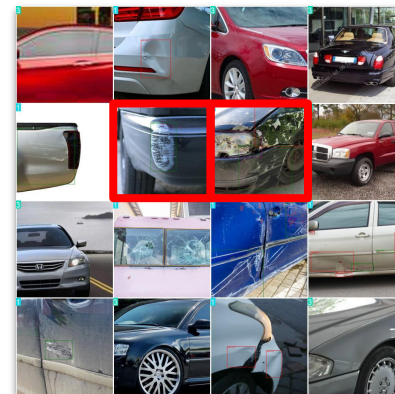
Validation Accuracy: 88%



GROUND TRUTH

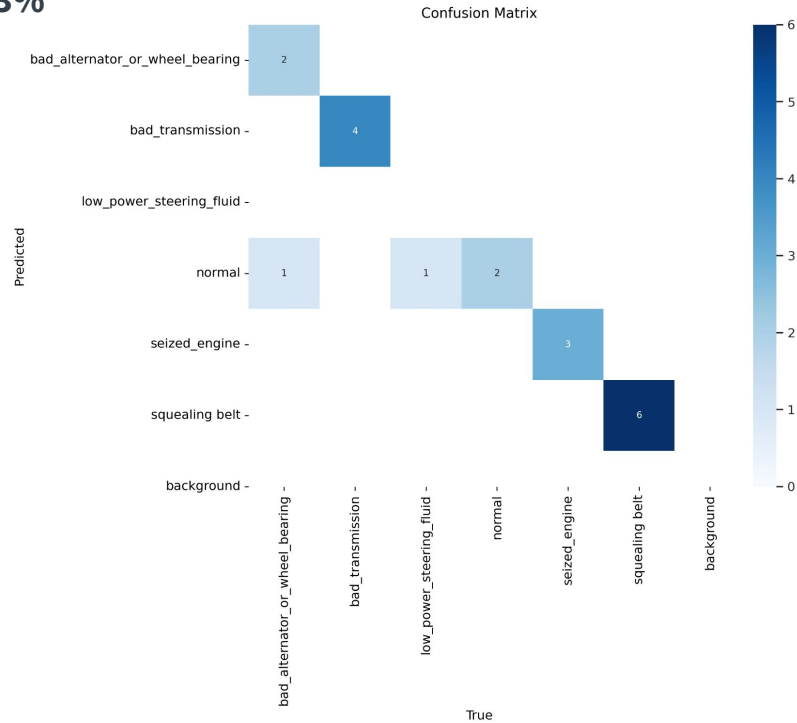


PREDICTION



# POC Audio Model

Validation Accuracy: 83%



# POC Audio Model

```
from pydub import AudioSegment
from pydub.playback import play

# Load the audio file
audio = AudioSegment.from_file("squealing belt10.mp3")

# Play the audio
play(audio)
```

```
model = YOLO('Multi-Class-Audio-Diagnostic.pt')
```

```
results = model("audio_dataset_6/images/val/squealing belt/squealing belt10.png")
```

```
results[0].names[np.argmax((results[0].probs.data)).item()]
```





# // Conclusion







# Technical Challenges

1

## Image Quality & Lighting Conditions

We noticed that things such as trees reflecting off of car windows resulted in false positives. Additionally, lighting conditions can obscure damage and lead to false negatives.

2

## Data Availability

With more data, we would have been able to develop even more a accurate model with more powerful crack, dent, scratch predictions. Our audio dataset was created from scratch by scraping online videos where quality differed greatly.

3

## Market Factors

The accuracy of our model hinges on the reliability and relevance of our training data. With many dynamic market factors and external influences across the supply chain, it is challenging to assess the precision of our output.





# Closing

With **apprAIse**, we aim to promote transparency and fairness in second-hand car sales through the use of computer vision and AI to detect and accurately evaluate the condition of a used vehicle.

Impact of ApprAIse...

- **Automated vehicle damage assessment tool**
- **Provide accurate real time evaluations**
- **Streamline valuation process**





APPRAISE

***Thank you!***

*Visit us at [appraise-my-car.com](https://www.appraise-my-car.com)*



# Contributions



**Sid Gupte**  
New York

- Damage Detection Modeling
- Car Valuation modeling
- Audio Diagnostic Modeling

**Rohit Menon**  
Bay Area

- Infrastructure Setup
- Front-End Development
- Back-End Development
- Damage Detection Modeling
- Severity Data Annotation
- Severity Modeling
- Audio Diagnostic Modeling

**Danny Skahill**  
Bay Area

- Infrastructure Setup
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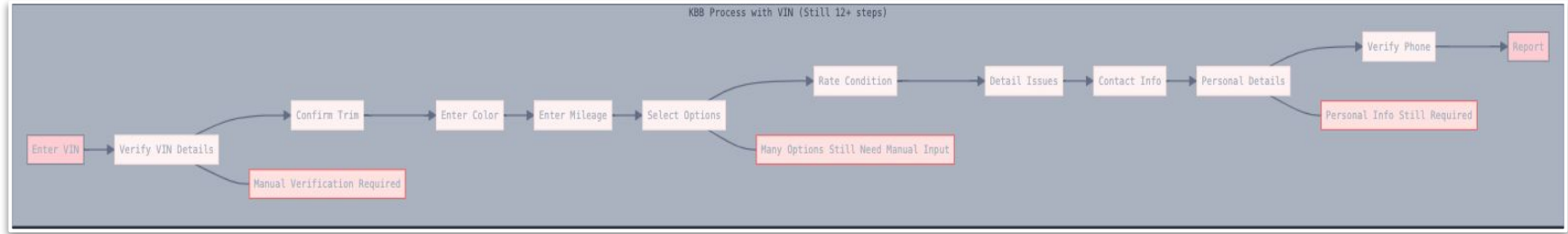
**Julian Yau**  
Hong Kong

- Presentation Development
- Brand Assets
- Logo Animation





# *Appendix*



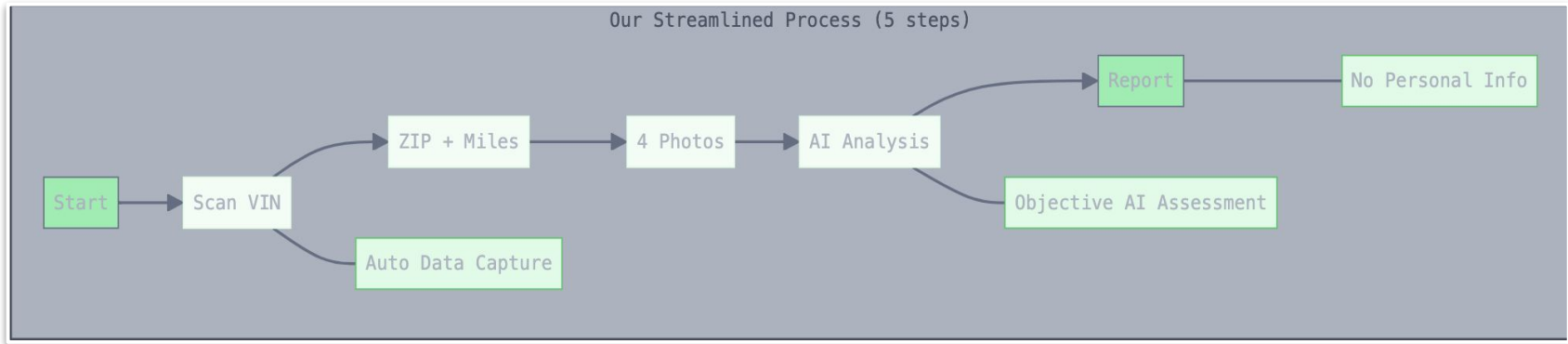
## The Existing Process

### Kelley Blue Book (KBB)

The Kelley Blue Book valuation process typically requires users to enter the Vehicle Identification Number of their car, which helps in identifying the make, model, and year. Users must then provide additional information about the vehicle's condition, features, and mileage through forms and questionnaires.

This has several drawbacks...

- **Involves more steps**
- **Subjectivity of self-reporting**
- **Precision is limited to users' knowledge**
- **Time consuming to fill out forms and evaluations**

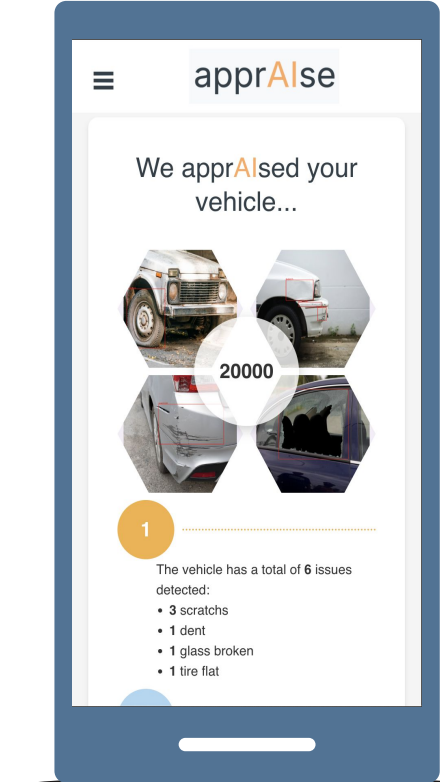
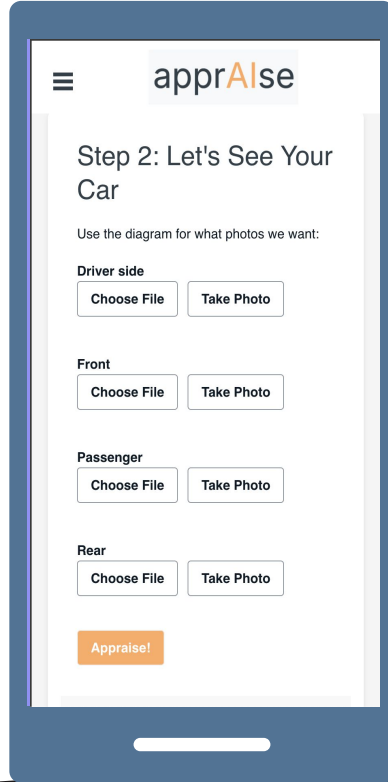
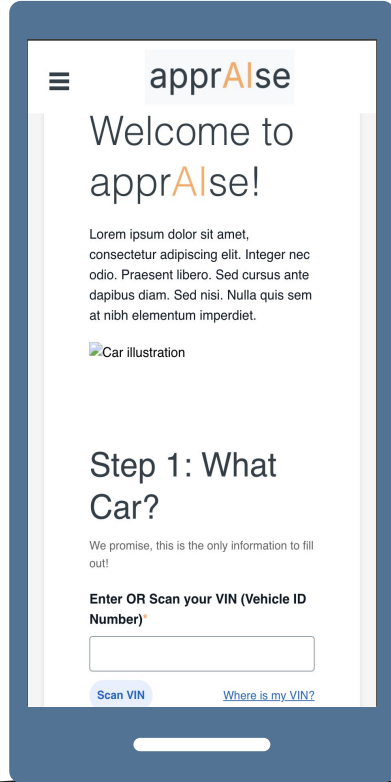


## Our Process

### A 5 Step Solution

Our tool shortens the process to five steps, presenting a clear report without human intervention or the need to disclose any personal information. **This efficient approach not only accelerates the evaluation but also enhances privacy**, as it does not require the disclosure of any personal information. By simplifying the appraisal into distinct, manageable stages, Appraise minimizes user effort and maximizes transparency, delivering objective and reliable assessments quickly.

# User Interface





# The Problem

## Information Asymmetries

**In the used car market, an imbalance of power exists between individual buyers and institutional sellers due to asymmetries in information.**

Dealerships, having professional expertise and access to detailed historical and technical data about the vehicles they sell, hold a significant advantage. They often have resources to assess and refurbish cars, manage their histories, and present them in appealing ways that may obscure potential issues. Individual buyers, on the other hand, typically lack this level of access and expertise, making it difficult for them to fully evaluate a vehicle's condition or verify the accuracy of the information provided. This discrepancy can lead individuals to make poorly informed decisions.



## Our Solution

### AI Driven Appraisals

**Our mission with ApprAlse is to improve the used car market by democratizing access to expert-level vehicle evaluations.**

We strive to empower consumers with cutting-edge data science tools that provide precise and reliable assessments of car damage. Our goal is to ensure transparency, enhance negotiation power, and foster trust in used car transactions, enabling every individual to make informed decisions with confidence and ease.



# Presenting ApprAlse

## ML Powered Vehicle Assessment

**Our product, Appraise, offers a cutting-edge alternative and potential replacement for the traditional Kelley Blue Book process, empowering individual consumers with rapid and precise vehicle assessments.**

By harnessing advanced machine learning algorithms, particularly focused on sophisticated damage detection, Appraise provides an objective and accurate evaluation of a vehicle's condition. This level of analysis can match or even exceed the diagnostic capabilities of human experts, minimizing the subjectivity typically involved in self-reporting vehicle conditions.



# Supplemental Models

## Depreciation Model

We created an estimated depreciation curve based on Craigslist posting data.

1. *Calculated age of vehicle*
2. *Aggregated by make and age*
3. *Averaged the price of the vehicles*
4. *Account for inflation with CPI*
5. *Calculated percent change*
6. *Calculated cumulative product*
7. *Received estimated depreciation curve*

## Average Annual Mileage

We calculated annual mileage thresholds for all types of vehicle makes

1. *Calculated vehicle age and average annual mileage for user's inputs*
2. *Filtered posting data by make*
3. *Computed annual mileage*
4. *Established quantile annual mileage thresholds for each vehicle make*
5. *Apply thresholds to a gauge graph to show a user what threshold their average annual mileage falls under*





# Stretch Goals



1

## Audio Model

Incorporate the model to establish if a user's car is functioning correctly

2

## Interior Vision Model

Pair another CV model to evaluate the market value of the car based on the condition of the interior of the car to the current exterior CV model

3

## Dynamic Price Adjustment Model

A more advanced valuation model would consider market repair costs and associated premiums to calculate price

