Key automobile feature demand based on online commentary

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Motivation

❖ What are automobile features that customers truly care about?

❖ What are pain points faced by customers?

❖ Data Sources - Edmunds, Youtube, Kelley Blue Book, Cars

❖ Analysis across various market cross-sections
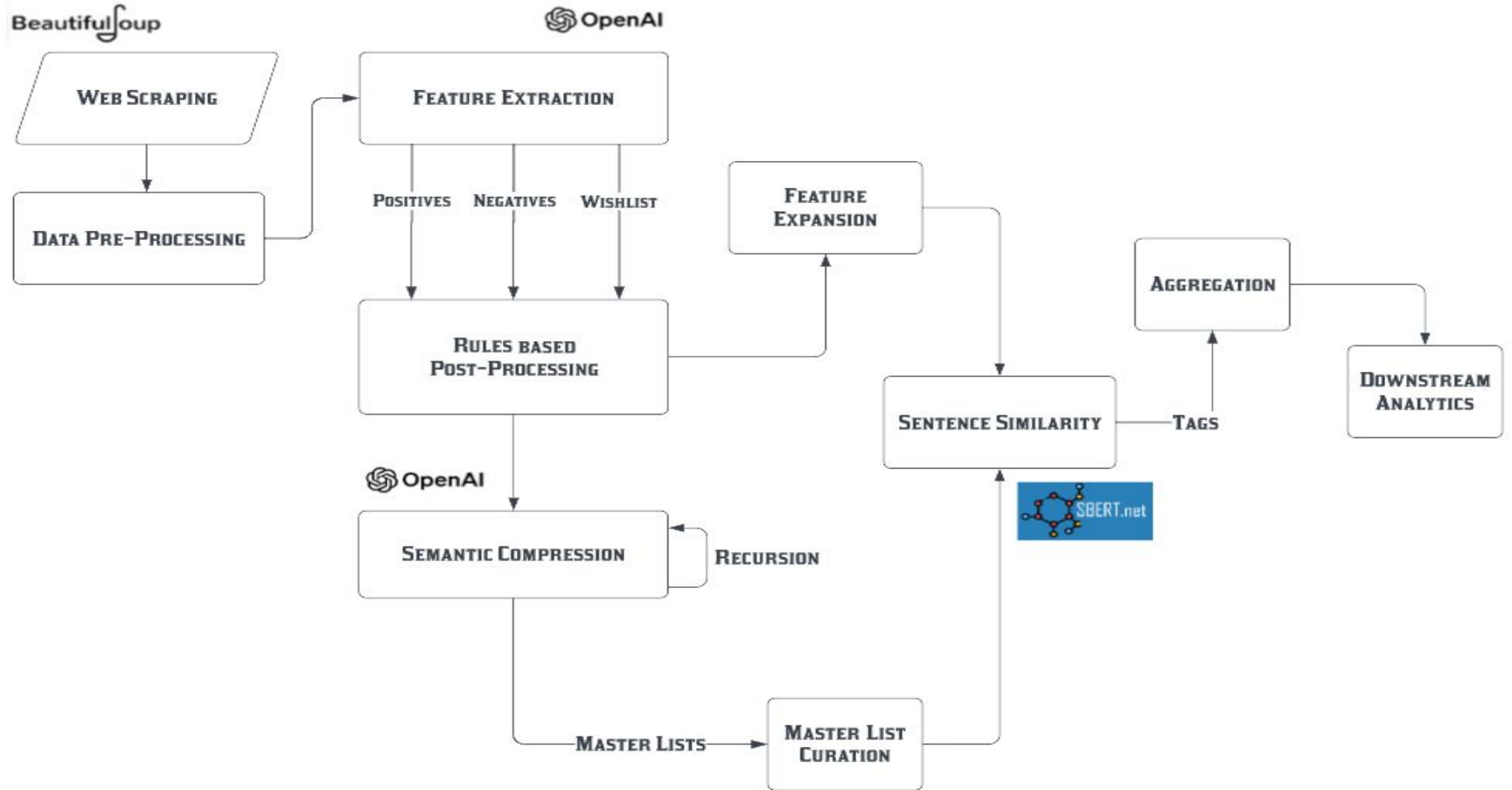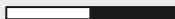
  ➢ Make
  ➢ Vehicle Segment
  ➢ Model

Data

❖ Years Considered : 2021 - 2023

❖ Non-EV Vehicles : 137 Models, 23 Companies

❖ EV Vehicles : 42 Models, 23 Companies

Make	Model
Toyota	Tacoma
Mazda	Cx-30
Subaru	Impreza
Honda	Hr-v
Chevrolet	Trax
Nissan	Titan
Mazda	Cx-5

Make	Model
Audi	E-tron gt
Porsche	Taycan electric
Tesla	Model s
Bmw	Ix xdrive 50
Genesis	G80
Volvo	C40
Bmw	I7
Rivian	R1s

Model Primer

❖ **Information Extraction** - *ChatGPT - GPT 3.5 Turbo*

➢ Context Length: 4096 Tokens

Sample Prompt:

```
{"role": "system", "content": "You are a helpful assistant that helps answer questions and perform the specific task being asked."},
{"role": "user", "content":" We are attempting to understand what vehicle features customers truly care about and what the pain points are based on customer comments.
Note that the comments are related to automobile reviews hence pay more attention to certain words like Blind Spot Detection, Braking, Steering, Acceleration and other Car related features
if they exist in the comments. Also make sure to focus only on the present vehicle being talked about and not on thoughts on similar vehicles owned at a prior time. With that in mind,
what are the positives and the negative takeaways the customers had based on the following comment? Did the customer have any specific wishes? If so, list those out as part of a separate
wishlist. Note that if the customer had a wish or a requested feature or doesn't list any relevant vehicle features, do not consider that as a positive or a negative. For each comment,
formulate the answer with Positives, Negatives and Wishlist categories with short keywords per bullet. Do not number the bullet points. Summarize each bullet into specific keywords
relating to vehicle features and make it a priority keep it as short as possible, around 3 - 4 words per bullet. Prefer concise words representing vehicle features over longer phrases.
Do not add anything else to the response. Do not add an overall or summary section Wishlist. The following comment is in regards to the vehicle : Enter Make, Enter Model, Enter Comment"}
```

❖ **Sentence Similarity** - *all-MiniLM-L6-v2*

Sample Analyses

❖ Nissan vs Toyota - Sedan [Positives, Negatives, Wishlist]

❖ Nissan vs Subaru - SUVs [Positives, Negatives]

❖ Nissan vs Hyundai - EV Sedans Non-Luxury [Positives, Negatives]

❖ Tesla vs Lucid - EV Sedans Luxury [Positives, Negatives]

Results

Nissan vs Toyota - Segment: Compact, Lower Midsize, Performance Positives

Nissan

Features	Frequency
Great Dealership Experience	558
Great build quality	305
Powerful Engines	280
Attractive Styling	247
Outstanding Road Performance	228
Good Value for Price	212
Smooth driving experience	211
Smooth Ride Quality	192
Spacious Interiors	188
Fuel Efficiency (MPG rating)	177

Features	Frequency
Dual Moonroof	13
Sunroof	13
Hatchback Design	12
Rear Cross Traffic Alert	12
Turn Signals	12
Blind Spot Indicators	12
Hybrid Mode	11
Excellent Nav System and Voice Command Feature	11
Off-road Capabilities	10
Blind Spot Monitoring	10

Toyota

Features	Frequency
Fuel Efficiency (MPG rating)	428
Great Dealership Experience	394
Great build quality	263
Reliable and Dependable	249
Smooth driving experience	243
Excellent Safety Features	240
Smooth Ride Quality	210
Attractive Styling	205
Powerful Engines	203
Outstanding Road Performance	195

Features	Frequency
User-friendly interface (UI)	21
Large selection of Options	21
Fast Heating	21
Blind Spot Monitoring	21
Loaded with Tech and Connectivity Options	18
Loaded with Safety Features	18
Rear Cross Traffic Alert	17
Lane Departure Mitigation	17
Heads-up display (HUD)	16
Exhilarating exhaust package	16

Results

Nissan vs Toyota - Segment: Compact, Lower Midsize, Performance Negatives

Nissan

Features	Frequency
Affordable Price	348
Easy-to-Use Vehicle Features	329
Smooth Transmission	224
Lack of technology features	179
Engine Power	160
Dated Interior Design	149
Brand quality	128
Ride Quality	110
Comfortable Driving Experience	108
Braking	108

Toyota

Features	Frequency
Easy-to-Use Vehicle Features	266
Affordable Price	231
Lack of technology features	166
Engine Power	164
Low visibility out the back	127
Fuel Efficiency	110
Engine Noise	101
Acceleration	81
Brand quality	79
Noisy	79
Customer service	78
Uncomfortable Driver's Seat	78
Dated Interior Design	77

Results

Nissan vs Toyota - Segment: Compact, Lower Midsize, Performance Wishlist

Nissan

Features	Frequency
Turbo engine	130
Improved safety features	112
Improved ride quality	111
Powerful engine	107
Better interior materials	64
Optional manual transmission	64
Improved Transmission	57
Improved reliability	54
Lower price point	45
Upgraded model options	38
Advanced braking	36
Updated Infotainment features	29

Toyota

Features	Frequency
Turbo engine	96
Powerful engine	84
Improved safety features	75
Hybrid options	61
Improved ride quality	51
Better interior materials	49
Optional manual transmission	44
Improved rear seat space	33
Fuel efficiency	32
Lower price point	32
More responsive accelerator	25

Results

Nissan vs Subaru - Segment: SUVs (Combined)

Positives

Nissan		Subaru	
Features	**Frequency**	**Features**	**Frequency**
Great Dealership Experience	326	Excellent Safety Features	652
Smooth Ride Quality	282	Smooth Ride Quality	378
Spacious Interiors	248	Great Dealership Experience	357
Excellent Safety Features	240	Spacious Interiors	312
Comfortable Leather Seats	211	Comfortable Leather Seats	284
Great build quality	204	Smooth driving experience	278
Fuel Efficiency (MPG rating)	186	Great build quality	238
Smooth driving experience	185	Outstanding Road Performance	218
Attractive Styling	170	Fuel Efficiency (MPG rating)	201
Outstanding Road Performance	156	Powerful Engines	181
Good Value for Price	153	Good Value for Price	169
Reliable and Dependable	134	Reliable and Dependable	162
Powerful Engines	132	Handles great in the snow	147
Stylish Exterior	93	Attractive Styling	125
Large cargo space	91	Suitable for Daily Commutes and Long Drives	106

Results

Nissan vs Subaru - Segment: SUVs (Combined)

Negatives

Nissan

Features	Frequency
Engine Power	68
Easy-to-Use Vehicle Features	64
Smooth Transmission	62
Affordable Price	58
Customer service	49
Braking	45
Engine Noise	44
Reliability	39
Trunk release	38
Uncomfortable Driver's Seat	35
Safety Features	34
Delayed performance - Sluggish Engine or Stalling	33
Fuel Efficiency	33
Lack of technology features	32
Steering	30
Rearview Camera	30

Subaru

Features	Frequency
Engine Power	114
Uncomfortable Driver's Seat	101
Laggy infotainment	98
Low visibility out the back	96
Fuel Efficiency	86
Affordable Price	84
Fewer safety features like Autostop	78
Easy-to-Use Vehicle Features	78
Lack of technology features	76
Engine Noise	68
Safety Features	68
Braking	64
Smooth Transmission	61
Remote start	60
Road Noise	59
Trunk release	58

Results

Nissan vs Hyundai- Segment: Non-Luxury EV

Positives

Nissan

Features	Frequency
Driving Experience	103
Powerful Engine	59
Good Handling	48
Sedan Crossover	45
Comfortable Interior	39
Stylish Design	39
Low Running Costs	38
Driver Assistance Features	37
Reliability	32
Good Visibility	30
Luxury Features Included in Base Price	27
Original and Innovative	25

Hyundai

Features	Frequency
Stylish Design	157
Driving Experience	110
Good Handling	106
Sedan Crossover	82
Powerful Engine	72
Sporty Driving Experience	68
Good Visibility	62
Quick Charging	56
Comfortable Interior	49
Driver Assistance Features	49
Luxury Features Included in Base Price	48
Original and Innovative	47

Results

Nissan vs Hyundai- Segment: Non-Luxury EVs

Negatives

Nissan

Features	Frequency
Charging Infrastructure Availability & Convenience	105
Price Affordability	86
Range per Charge	71
Luxury Features	62
Autonomous Driving Technology	61
Acceleration Capabilities	50
Battery Lifespan and Replacement Costs	47
Fuel Efficiency	47
Safety Concerns	40
Build Quality	39
Legroom in Back Seats	38
Cargo Space	35
Towing Capability	34
Exterior Design and Style	33
Comfortable Seating	27

Hyundai

Features	Frequency
Charging Infrastructure Availability & Convenience	180
Price Affordability	161
Luxury Features	152
Autonomous Driving Technology	76
Battery Lifespan and Replacement Costs	68
Build Quality	65
Towing Capability	60
Safety Concerns	58
Range per Charge	58
Exterior Design and Style	57
Spacious Interiors	54
Fuel Efficiency	53
Legroom in Back Seats	44
Cargo Space	44
Reliability	41

Results

Tesla vs Lucid - Segment: Luxury EVs

Positives

Tesla		Lucid	
Features	**Frequency**	**Features**	**Frequency**
Driving Experience	231	Stylish Design	176
Powerful Engine	207	Powerful Engine	155
Acceleration	193	Original and Innovative	90
Good Handling	151	Sedan Crossover	85
Speed	140	Good Visibility	82
Performance	139	Performance	71
Charging Network	126	Luxury Features Included in Base Price	71
Stylish Design	118	Build Quality	64
Sedan Crossover	112	Driving Experience	53
Sporty Driving Experience	105	Comfortable Interior	53
Quick Charging	94	Good Handling	51
Safety Features	93	Speed	49
Luxury Features Included in Base Price	90	No specific positives mentioned	47
Comfortable Interior	88	Driver Assistance Features	41

Results

Tesla vs Lucid - Segment: Luxury EVs

Negatives

Tesla

Features	Frequency
Build Quality	226
Autonomous Driving Technology	209
Price Affordability	203
Luxury Features	171
Safety Concerns	171
Charging Infrastructure Availability & Convenience	167
Spacious Interiors	143
Durability	121
Reliability	120
Acceleration Capabilities	116
Comfortable Seating	111
Legroom in Back Seats	107
Range per Charge	106
Visibility Enhancement Features	102
Handling	97

Lucid

Features	Frequency
Price Affordability	460
Luxury Features	251
Build Quality	187
Charging Infrastructure Availability & Convenience	144
Safety Concerns	138
Exterior Design and Style	131
Autonomous Driving Technology	125
Acceleration Capabilities	104
Battery Lifespan and Replacement Costs	75
Fuel Efficiency	69
Towing Capability	68
Durability	67
Visibility Enhancement Features	66
Cargo Space	64
Reliability	63

Topic Modeling Approach - BERTopic

❖ Very large number of topics.

❖ Topic reduction is a heuristic approach and isn't reliable.

❖ Sentiment is ambiguous.

❖ Provides general insights but lacks precision for specific questions.

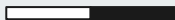❖ Has value as supplementary analysis and in cross-referencing.

Challenges and Limitations

❖ Information Loss through Feature Extraction and Compression.

❖ Accuracy of sentence similarity.

❖ Subjectivity of master list curation.

❖ Prompt Engineering not being fully understood.

❖ Significant amount of data left on the table.

❖ Privacy concerns if proprietary data sources are used.

Future Work

❖ Utilizing more powerful pre-trained models.

➢ GPT-4 for Feature Extraction and Semantic Compression.

➢ Larger Models for Sentence Similarity.

❖ Greatly expand customer comments.

❖ Stratified semantic compression through recursion.

❖ Improved curation of master lists through domain experts.

Thank you!

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