



DEVELOPING SERVICES FOR DRIVE CONCIERGE
MARCH 2022

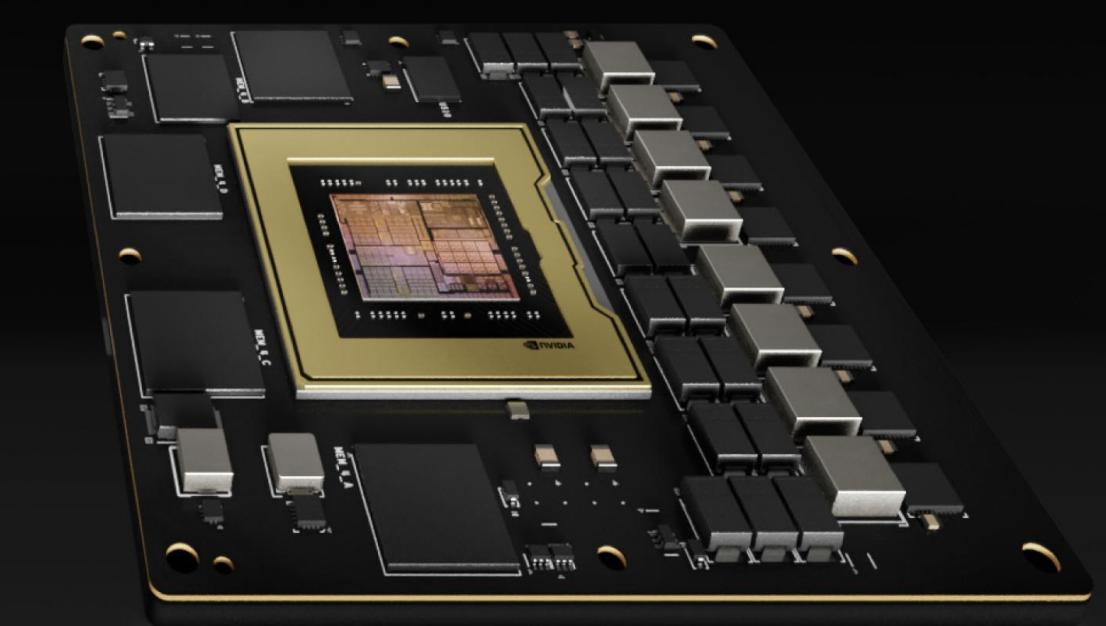
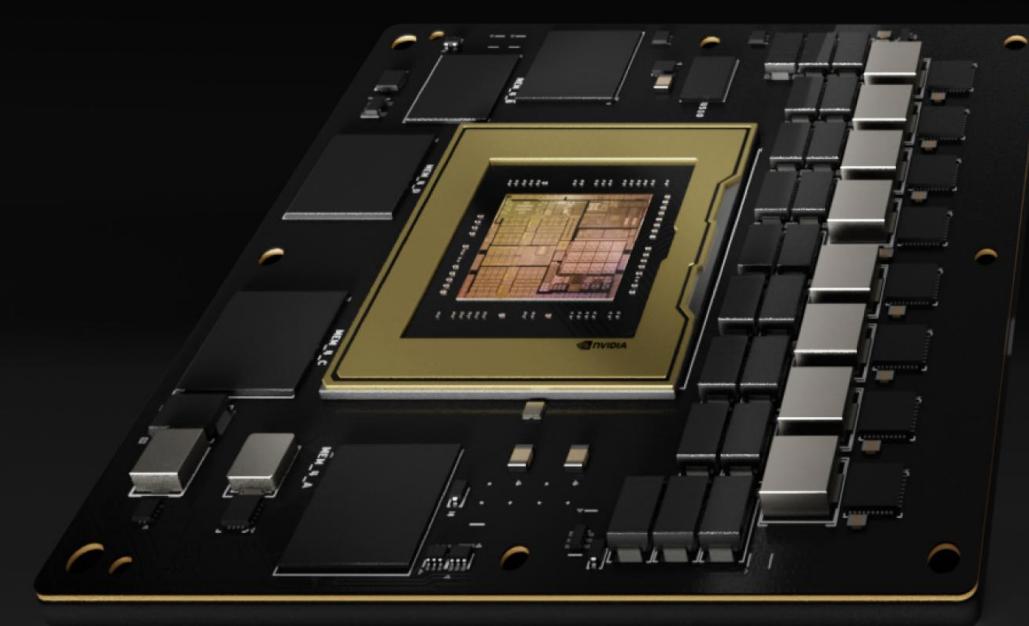
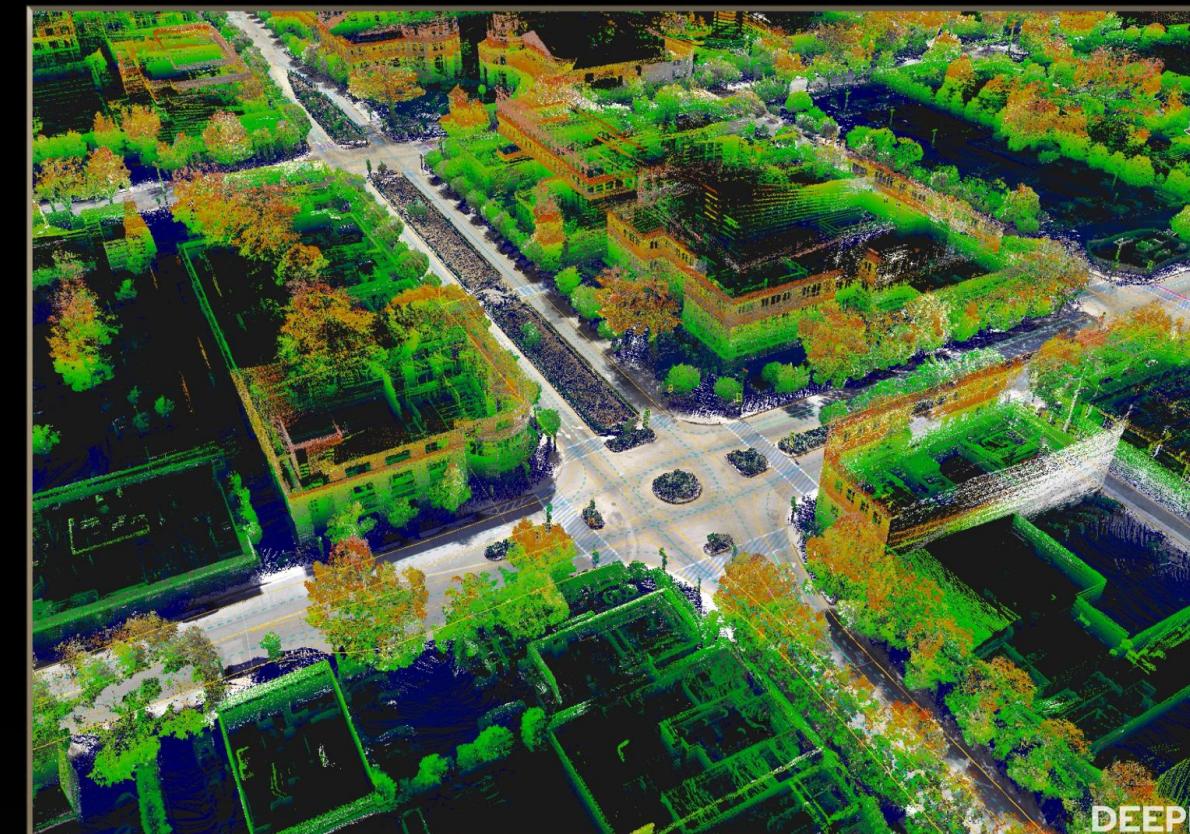


DRIVE CHAUFFEUR & CONCIERGE

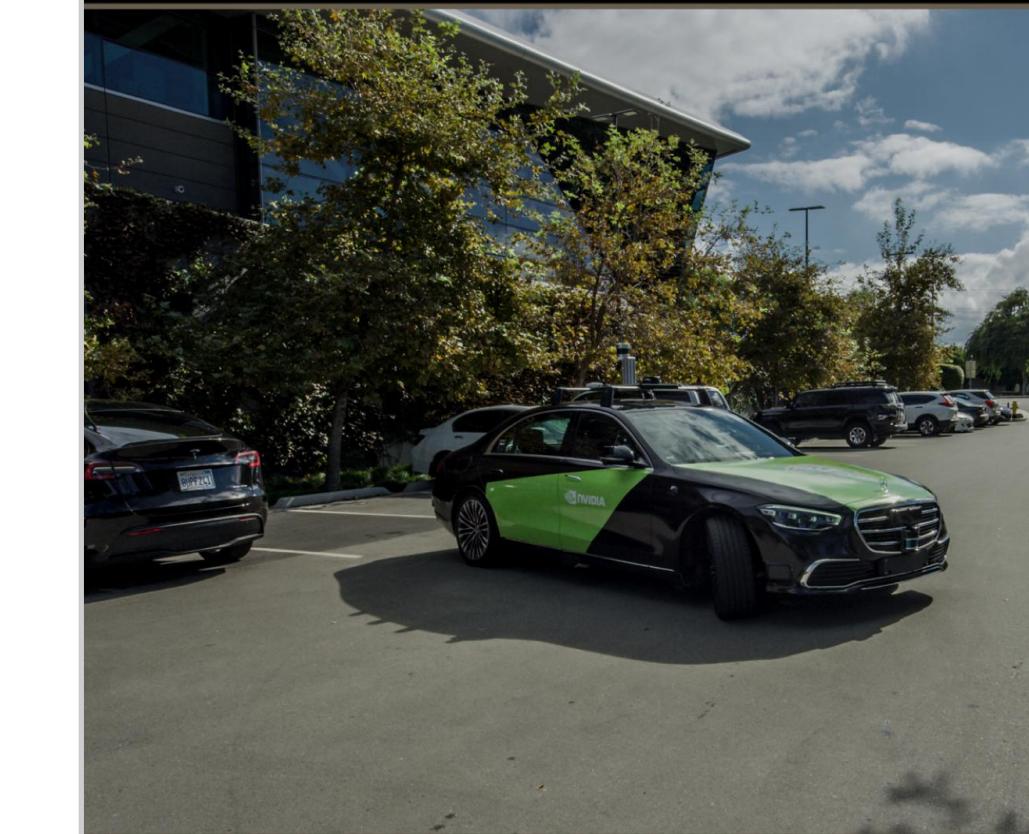
DRIVE Concierge Will Re-define the Experience Inside The Car



NVIDIA DRIVE CHAUFFEUR



NVIDIA DRIVE CONCIERGE





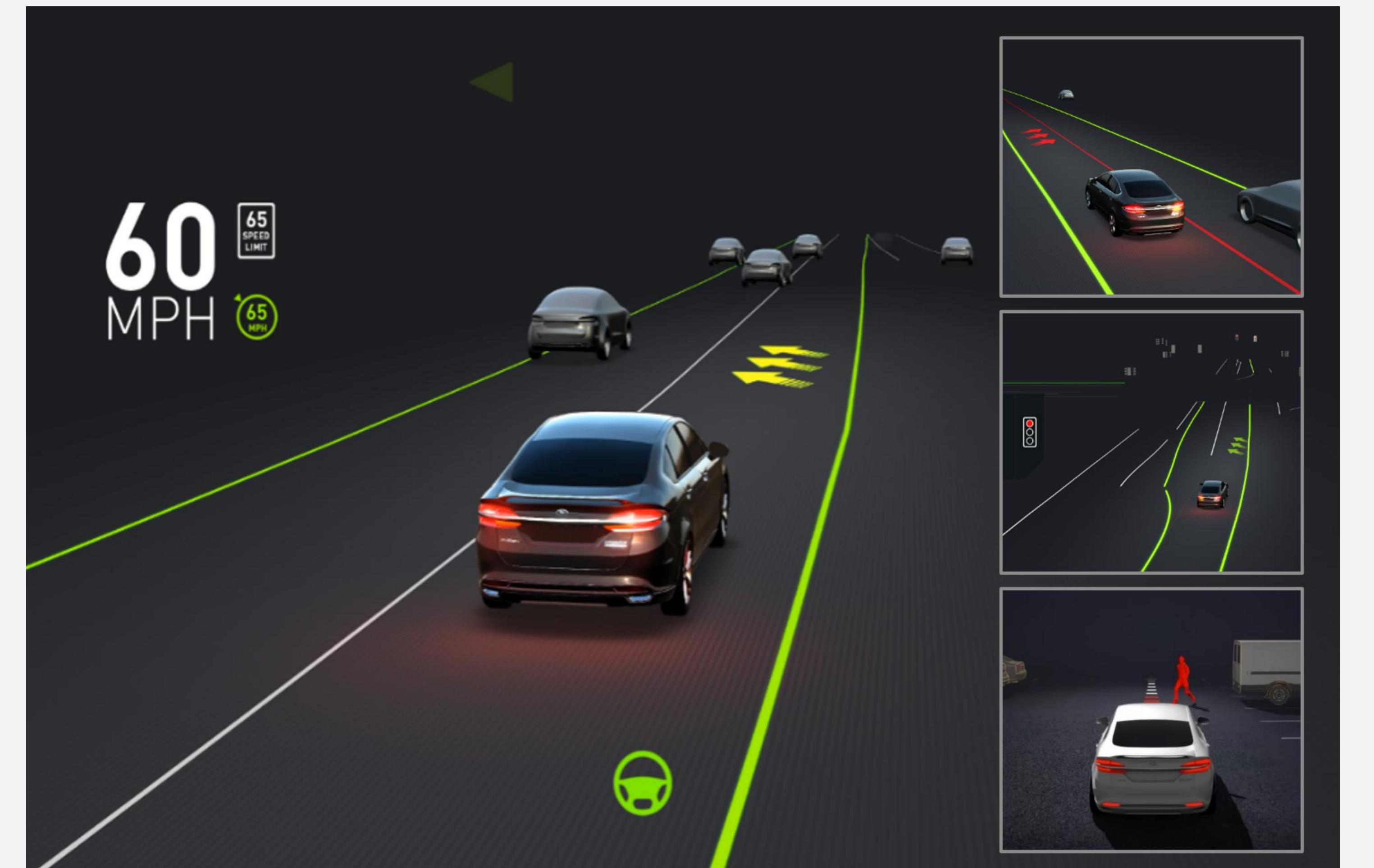
VISUALIZATION



CONFIDENCE VIEW

Showing You What's in the Mind of the Autonomous Vehicle

- Integrates with DRIVE Chauffer to show you what's in the mind of the AV
- Lanes, intersections, lights, and signs
- Vulnerable road users
- Intent of the vehicle in scenarios like crosswalks, roundabouts





3D SURROUND VIEW

Assisting You to Safely Park Your Vehicle

- Camera views, stitched top views, and 3D bowl view
- Augmentations including VRUs, objects around the vehicle and in the driving tube, tire tracks, signs, parking spots and more

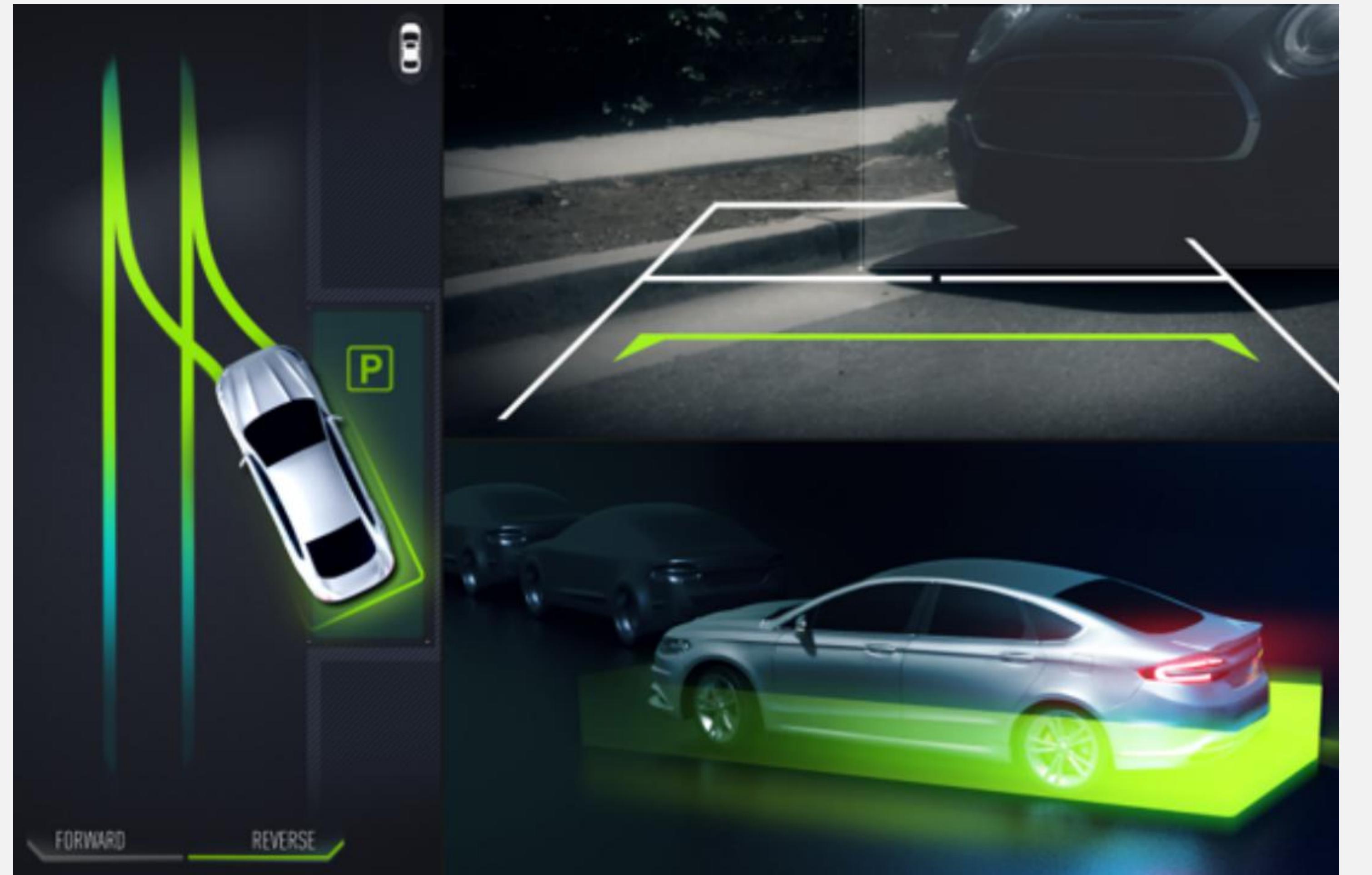




PARKING VR VIEW

Giving You Confidence When Parking Autonomously

- Synthetic view to assist during parking
- Augmentations include lanes, tire tracks, VRUS, parking signs and parking spots and more





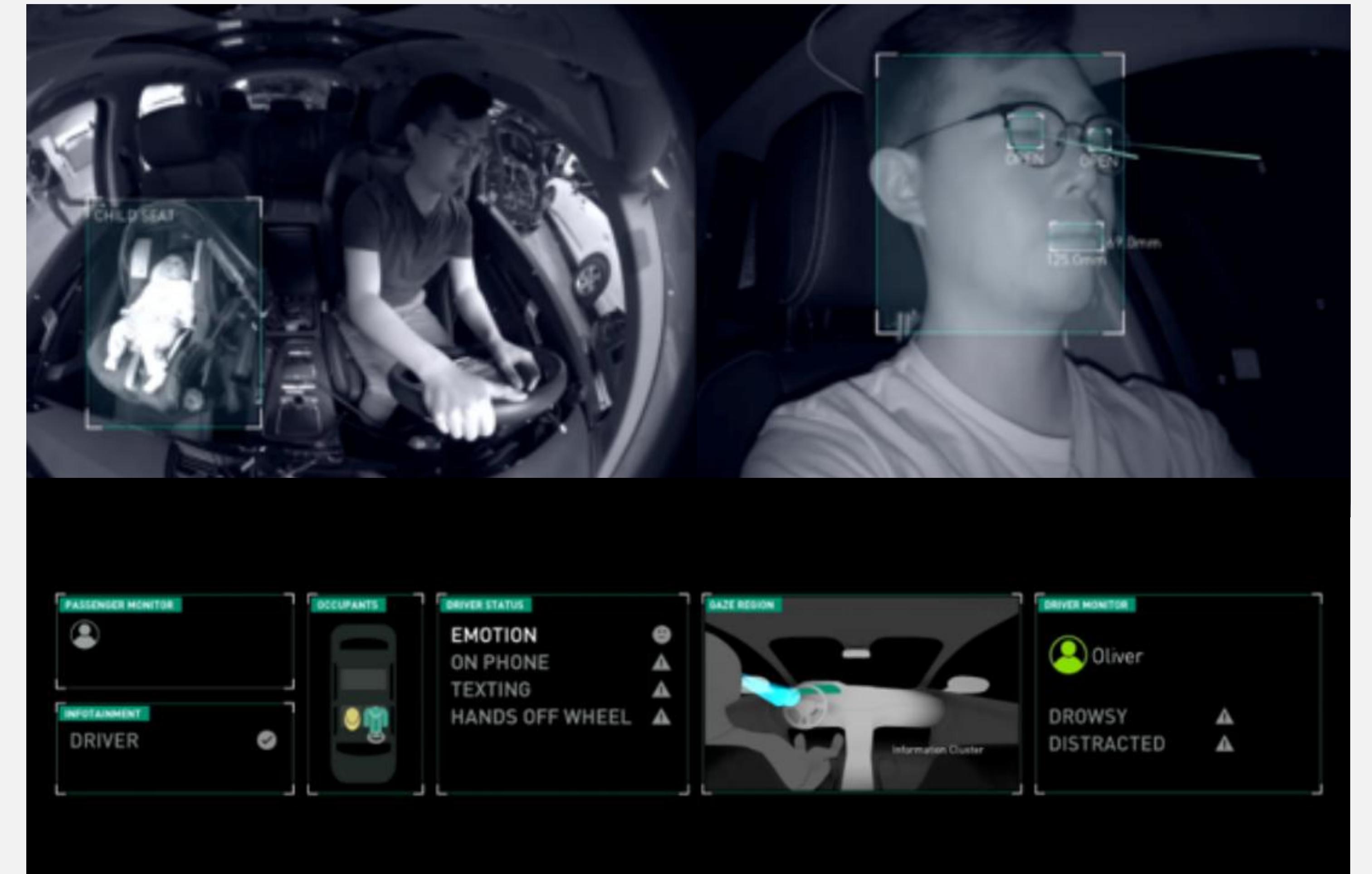
IN-CABIN SENSING



DRIVER MONITORING

Keeps Drivers Safe and Focused on the Road Ahead

- GazeNet DNN tracks gazes by detecting the vector of the driver's eyes and mapping it to the road to check if they're able to see obstacles ahead
- SleepNet monitors drowsiness, classifying whether eyes are open or closed, running through a state machine to determine levels of exhaustion
- Detect whether the driver is properly sitting in their seat to focus on road events





OCCUPANT MONITORING

Detecting Front Passenger and Activities

- ActivityNet tracks driver activity such as phone usage, hands on/off the wheel and driver attention to road events
- Enable features such as child presence detection, pets left behind in the car and more





AI-POWERED VOICE ASSISTANT



AI POWERED VOICE ASSISTANT

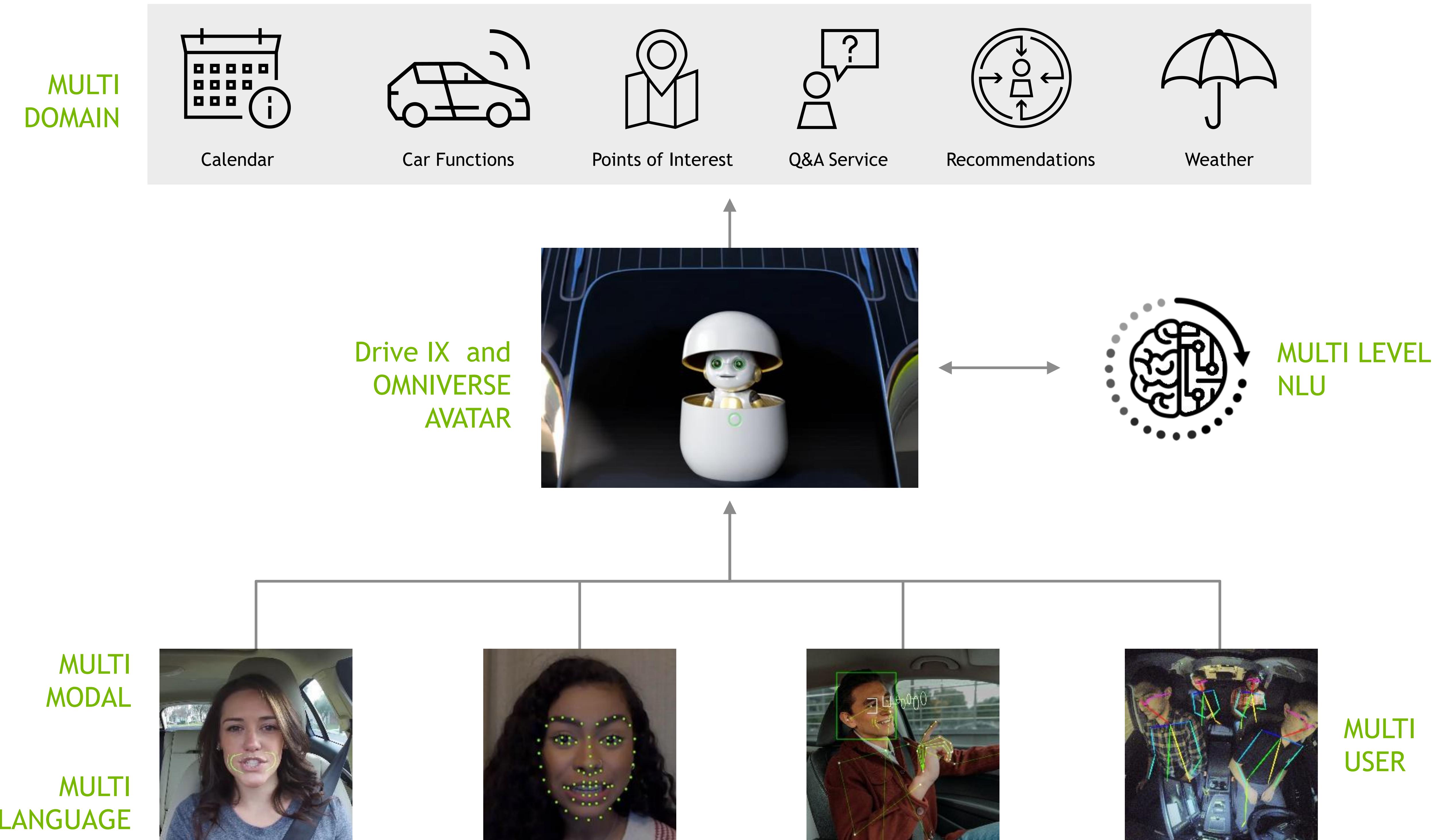
Intelligent Conversational AI avatar to do Your Bidding

- Conversational AI to interact with driver and passengers
- Keeping you informed and entertained
- Enables you to change vehicle settings, provide recommendations, make reservations and more



INTRODUCING DRIVE CONCIERGE

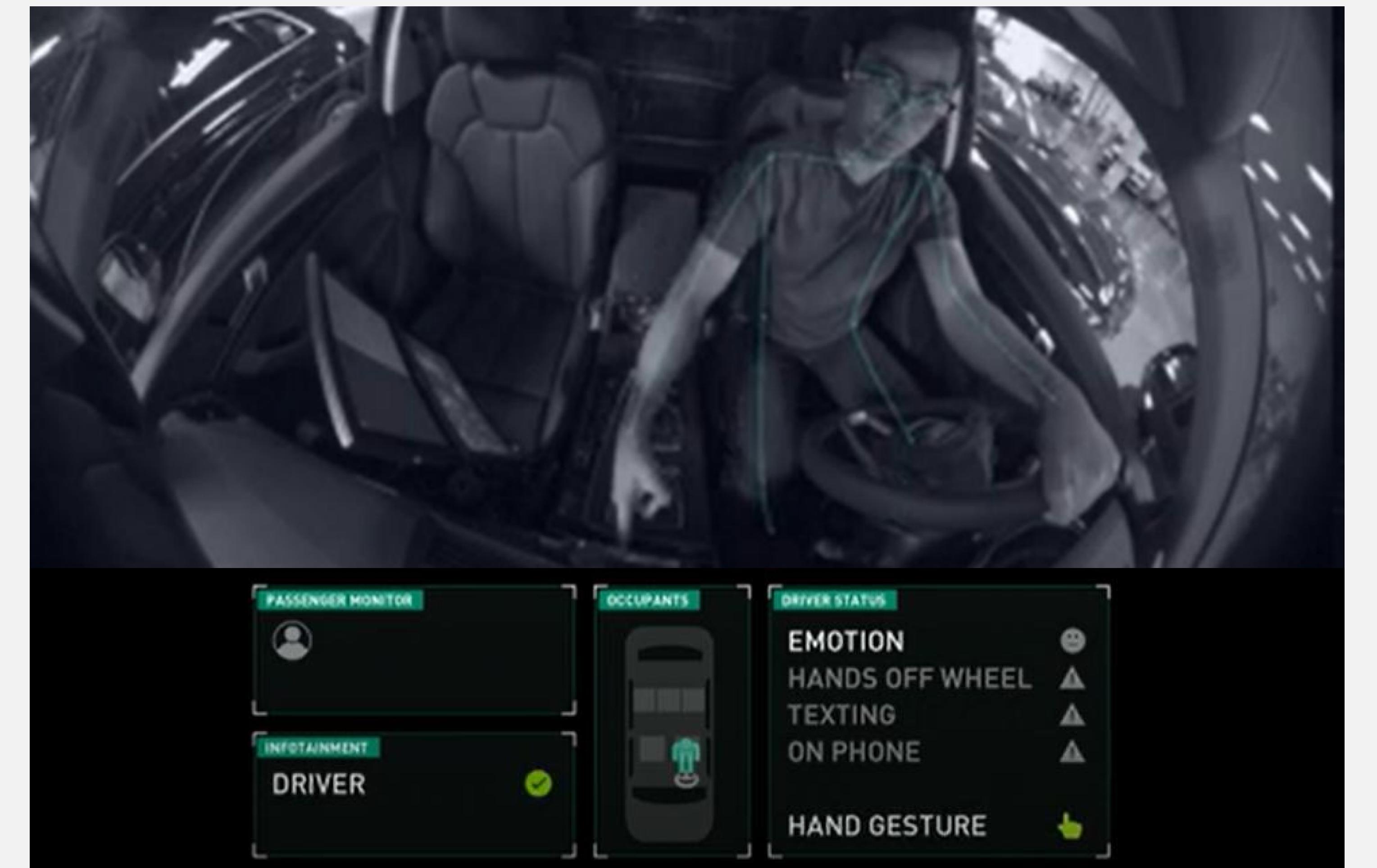
Intelligent Conversational AI Assistant To Do Your Bidding





MULTI MODAL

- Beyond speech, use gestures, emotions and touch to "talk" to the in-car assistant
- “What is that” is resolved both in the speech and the vision domain
- Wave to open the sun-roof is like asking the assistant to “open sunroof”
- Responding to questions from the assistant with nod of head or gestures
- Detect “confusion or frustration” in the facial expressions and offer to help, or change to simpler





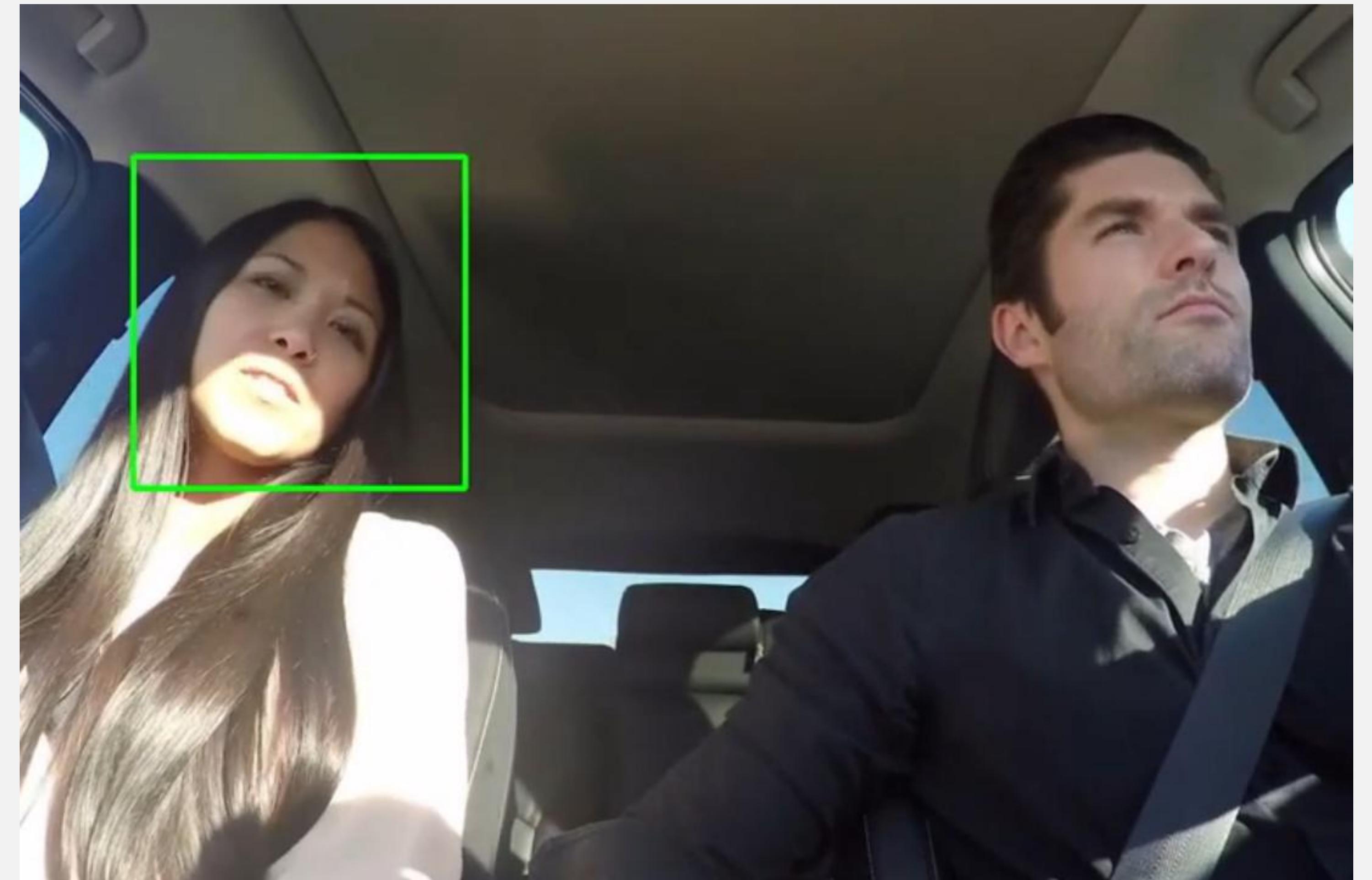
MULTI LANGUAGE

- Riva Automatic Speech Recognition (ASR) takes an input an audio buffer and returns text transcript
- Today Riva ASR understands English, German, Russian, Spanish today, more to come
- Riva Text to Speech (TTS) enables you to synthesize natural sounding speech from text transcripts without any additional information such as patterns or rhythms of speech
- Riva TTS is customizable, retargetable to new voices with only 30min of training. It speaks English today, more to come

A collage of various international greetings and words in different languages, including 'bonjour', 'hello', 'good morning', and 'bon appetit', arranged in a cloud-like pattern.

MULTI USER

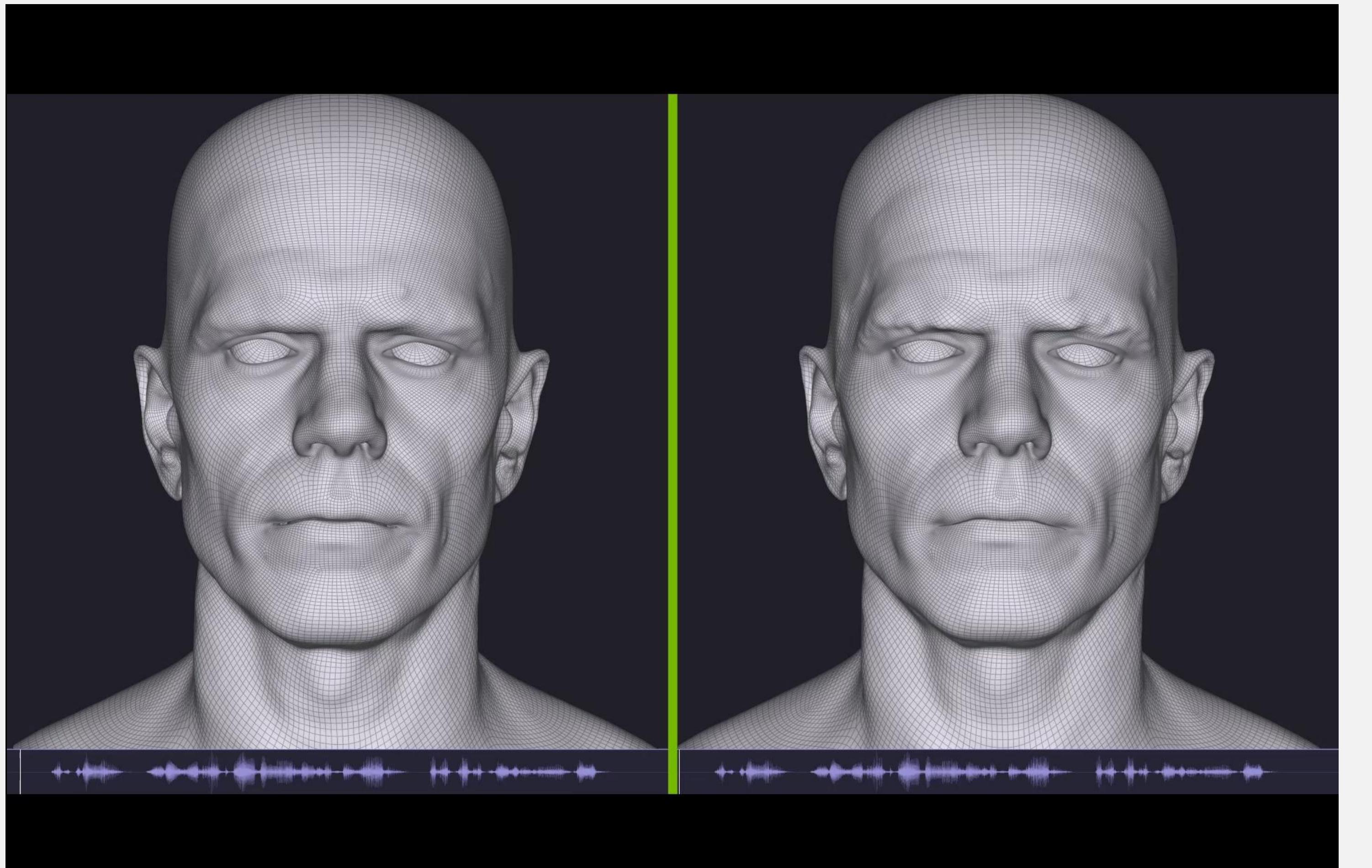
- State-of-the-art context management between vision, speech, text, UI, and touch modalities
- Personalized to each driver and passenger, giving everyone their own personal concierge





OMNIVERSE AVATAR

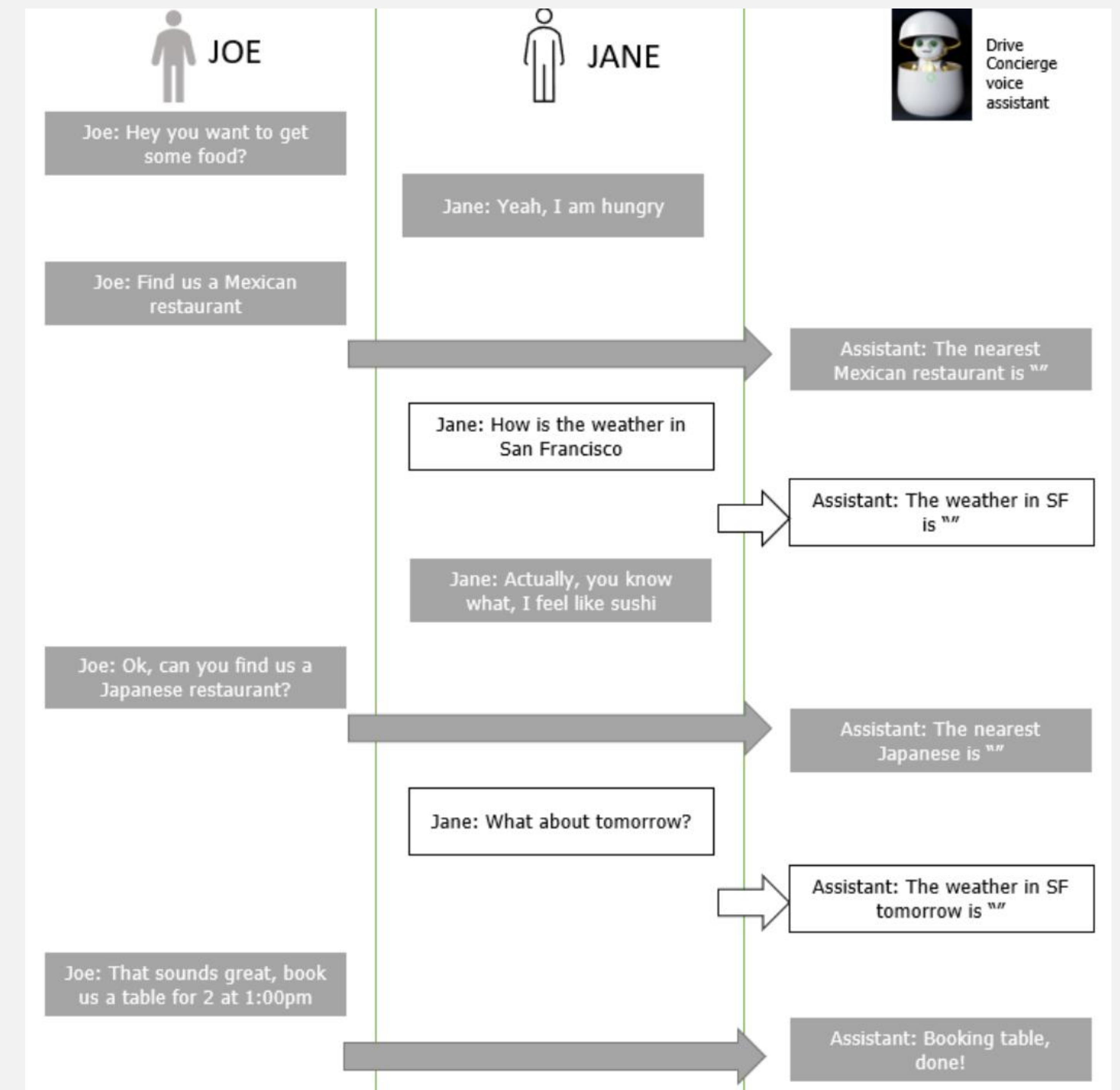
- Virtual assistant platform with immersive user experience with customizable realistic/artistic avatars
- Omniverse avatar leverages Audio2Face SDK to generate AI driven facial animation from single audio track input, spoken dialogue or singing
- Instantly automate facial animation with realistic, believable motion
- Simple adaptation between voices, genders, and languages
- Highly portable approach to animate vastly different facial styles and types





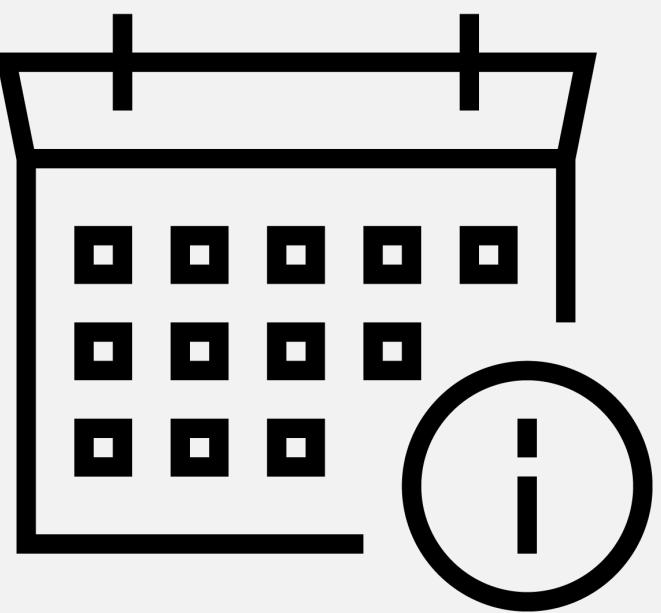
MULTI LEVEL UNDERSTANDING

- Traditional NLU
 - Like Weather, POI
- Zero Shot NLU
 - Get started quickly by adding new domains and intents
 - More on this later..
- Domain Agnostic NLU (uses Megatron-Turing 530B model)
 - Largest Language Model in the world with 530B parameters (3x more parameters)
 - Unmatched accuracy in a broad set of language tasks such as common-sense reasoning and natural language usage

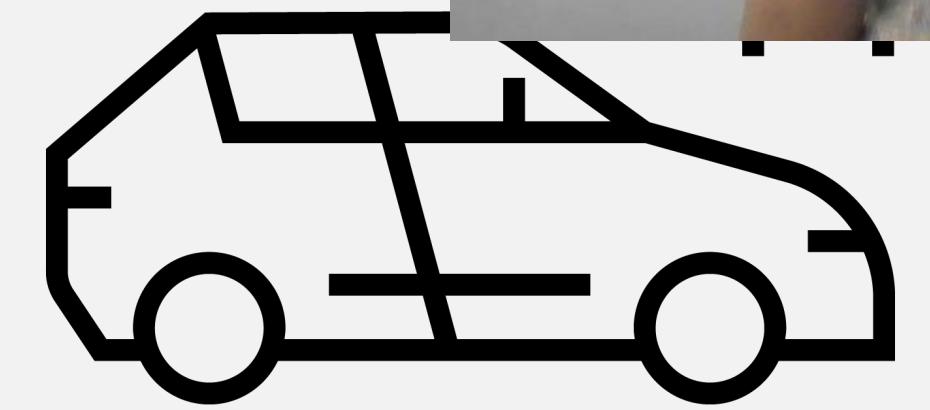


MULTI DOMAIN

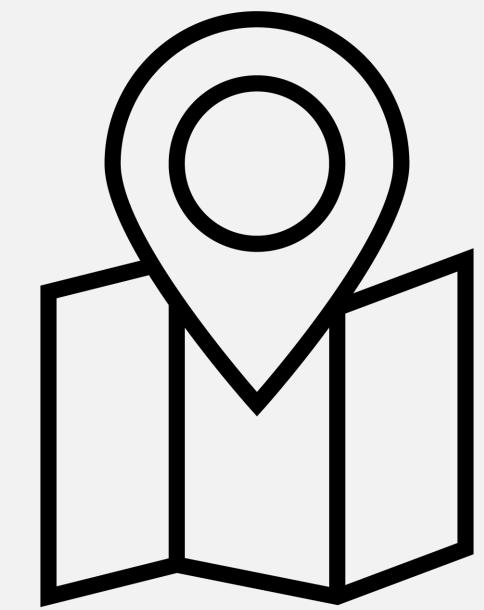
- Multi domain is prevalent in the industry, but personalization and extendibility is key
- Zero shot text classification makes it easy for developers to add new domains and intents to get started with personalizing the in-car assistant
- Easily add new fulfilment services like vehicle functionality (open sun-roof, turn on wipers) or cloud services like movie ticket reservations
- Enhance concierge skills by leveraging existing services ... more on this later...



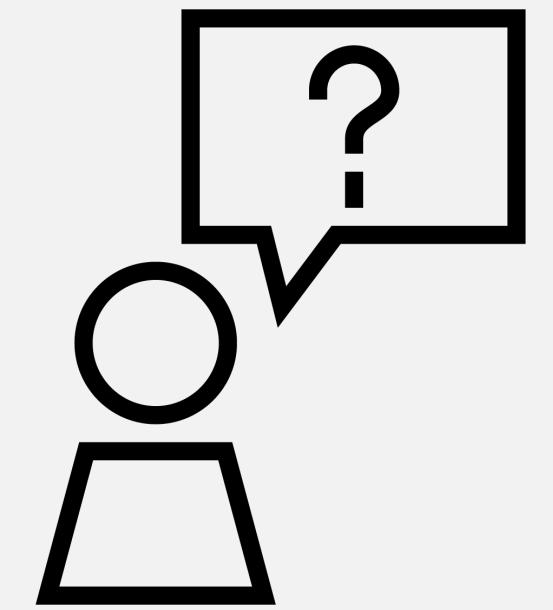
Calendar



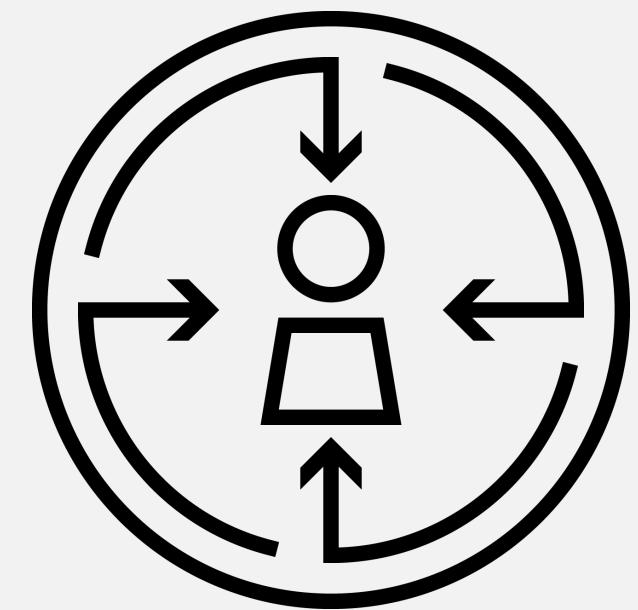
Car Functions



Points of Interest



Q&A Service



Recommendations

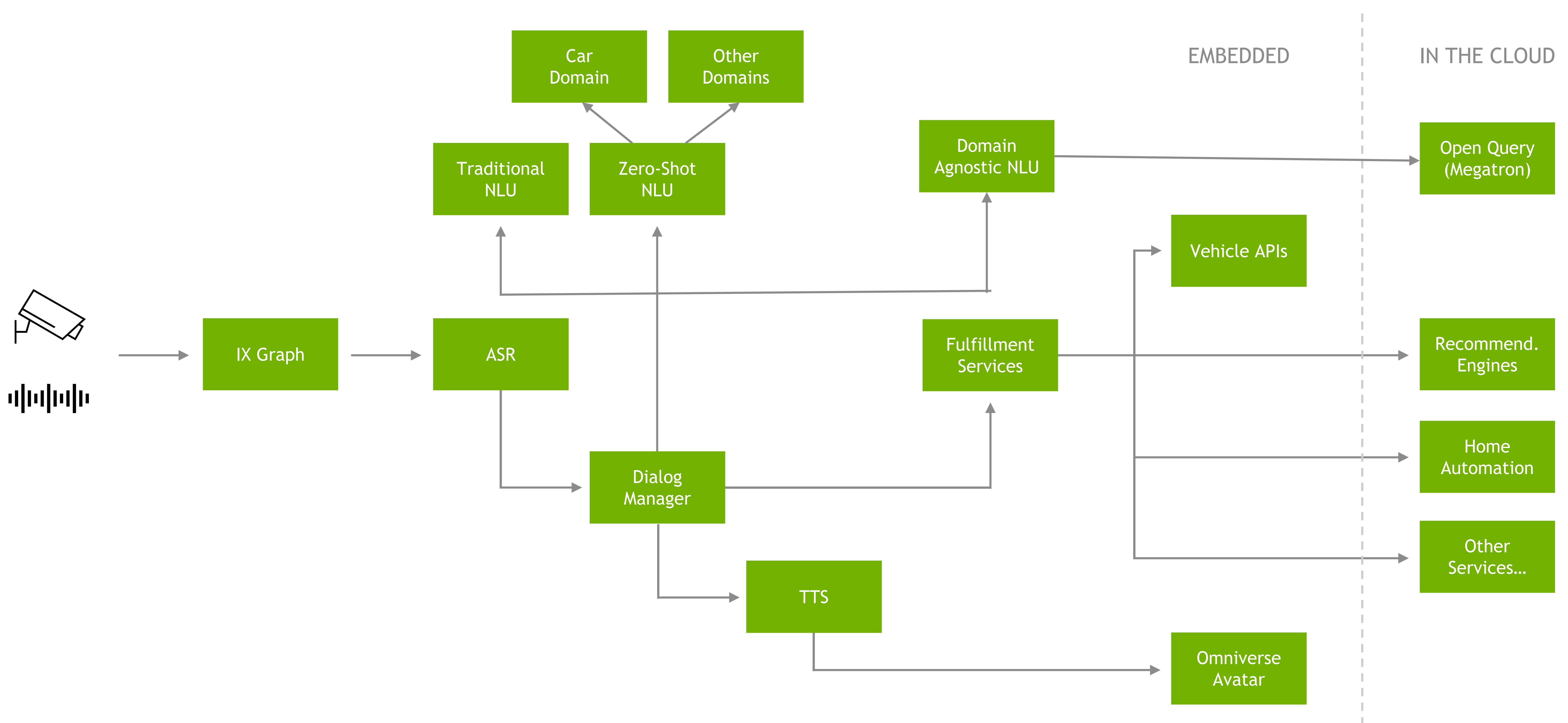


Weather



HIGH-LEVEL ARCHITECTURE (STILL IN PROGRESS..)

Focusing on Conversation AI Powered Assistant



PERSONALIZATION IS KEY



- Speech systems are constantly evolving and need to support **more and more targeted domains**
- Services offered in the car are also constantly evolving based on **what the OEMs want, what their customers want**
- OEMs need the flexibility to **get started out of box**, and **customize** based on their customers' needs
- Let's walk through an example of how developers can personalize Drive Concierge's AI powered voice assistant



EXAMPLE: ADD SUPPORT TO CONTROL
WIPERS IN THE CAR

ADD CAR DOMAIN

- Enable “car” domain_label
- Easily add new intents, in this case wipers, maybe sunroof, radio etc..

```
1  bot: drive_conceirge
2
3  configs:
4    language: en-US
5    fulfillment_init_timeout: 20
6    session_timeout: 1800
7    spell_corrector_confidence: 0.9
8    skip_statements_qna: false
9
10
11 nlu_models:
12   - name: zero_shot
13     url: http://<ip>:7999/zeroshot
14   parameters:
15     domain_labels:
16       car:
17         - "related to car"
18         - "related to wipers"
19       poi: ["related to finding a place"]
20       weather: ["related to weather"]
```





ADD ABILITY TO TURN ON WIPERS

- Conveniently add slots, in this case we need additional information like front or back wipers? What speed?
- Write your own custom fulfilment service that can then run locally or in the cloud to do what the user wants
- In this example we have added integration with vehicle apis to start the wipers at the speed indicated

```
1 domain: car
2
3 configs:
4   confidence_threshold: 0.95
5   shortterm_memory_max_turns: 2
6   shortterm_memory_timeout: 600
7   form_max_loops: 3
8   enable_zero_shot: true
9
10 slots:
11   - name: wiper_location
12     validity:
13       | lookup: ["front", "rear"]
14
15   - name: wiper_speed
16     validity:
17       | lookup: ["slow", "fast"]
18
19 dialogs:
20   - intent: car.wipers
21     zero_shot_labels: ["related to wipers"]
22     action:
23       - zero_shot_slots:
24         | wiper_location: "which location"
25         | wiper_speed: "what speed"
26       - fulfillment: car_fm
27       - response:
28         - text: "{!! fulfillment.enable_wipers} Okay. Turning on {fulfillment.wiper_location}"
29           | wipers with speed {fulfillment.wiper_speed}"
```

ENHANCE CONCIERGE SKILLS

- Fulfilment services can be hosted elsewhere, no need to re-write them or port them
- For e.g. If a developer has a service hosted on an AWS lambda endpoint, we can just define a new fulfilment and point to that endpoint

```
1 bot: drive_concierge
2 |
3 nlu_models:
4   - name: zero_shot
5     url: http://ip:7999/zeroshot
6     parameters:
7       domain_labels:
8         # ...
9         home: ["related to home"]
10    #
11    #
12 fulfillments:
13   - name: aws_home
14     url: http://239hareawr082342432.execute-api.us-east-1.amazonaws.com/prod/door/front/lock
15     instances: 1
```

```
1 domain: home
2
3 slots:
4
5   - name: door_location
6     validity:
7       lookup: ["front", "rear"]
8
9   - name: door_state
10    validity:
11      lookup: ["lock", "unlock"]
12
13 dialogs:
14
15   - intent: home.door
16     zero_shot_labels: ["related to door"]
17     action:
18       - zero_shot_slots:
19         door_location: "which location"
20         door_state: "what state"
21     - fulfillment: aws_home
22     - response:
23       - text: "{!! fulfillment.change_door_state} Okay. I will {fulfillment.door_state}
24         | the {fulfillment.door_location} door."
```





DEMO

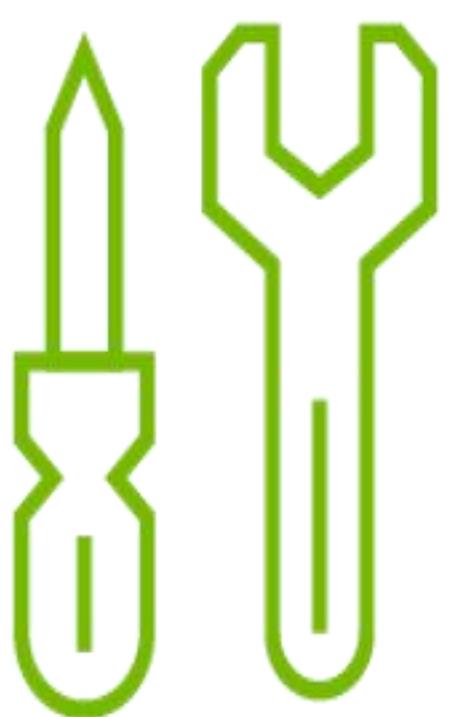
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DRIVE CONCEIRGE WEBPAGE



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DEVELOPER TOOLS



DOCUMENTATION



NVIDIA®