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The challenge for the teams is to provide a scalable solution that enables accelerated AV/ADAS development for automakers and their suppliers, by supporting data ingestion to detect scenes, visualize data, and testing use cases.

https://www.canva.com/design/DAF-B0F300U/LPj8ZyTn0iron6qP5-vaFg/edit?utm_content=DAF-B0F300U&utm_campaign=designshare&utm_medium=link2&utm_source=sharebutton

(reference LIst)
https://docs.google.com/document/d/1nfxyRicvFTCGzY4-ZlYmp-hRyOh_SSyG1rStJiJbOdQ/edit?usp=sharing

AWS Case study bg info
(powerpoint) https://www.canva.com/design/DAF-B0F300U/LPj8ZyTn0iron6qP5-vaFg/edit?utm_content=DAF-B0F300U&utm_campaign=designshare&utm_medium=link2&utm_source=sharebutton

- AppleCarPlay Variant : Have the customer's Amazon/Apple profile be saved in a usb/Plug-in device.

Aziyah

Questions for Meredith Shaw (AWS Case Study Coach)

1. When presenting our case study, what level of knowledge should we assume the audience has on autonomous vehicles? (Do we re-educate them on the 6 levels? What about vocab, like LiDar, car parts, etc?)
   Assume they know levels, using vocab/jagran comfortably is a benefit
2. Should we address this as a direct pitch to companies? Or is this the creation of a strategy to be pitched by others (i.e pitching to a board of directors)
   “We work backwards from customers” assume we are pitching to a customer
3. For this strategy development should we assume a budget of some sort or are resources unlimited? (Especially in the building out infrastructure portion)
   Choose a customer, and you
4. By when would we be looking for results? Would an implementation timeline be beneficial in this instance?
5. What are the results? People supporting the plan or the plan being put in action?

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Industry adoption plan, how are we going to sell it, demonstrate subject matter understanding, and presentation.

6. How in-depth do we need to go into our idea? (Ex. Safety Precautions, Market Impact, Company Infrastructure, etc.)
7. What would a normal budgeting cycle look like? Who is your customer?
   6 to 8 people,
8. Roadmap piece/ design cycle
9. What does infrastructure mean in this sense?
   Cloud infrastructure, physical infrastructure, roads, electric charging ports asically anything that autonomous vehicles would have interaction with.
10. Can we create a partnership plan to borrow technology
   Partnership with companies outside of AWS are going to be KEY, just make sure
they aren't using google or
11. Can you give more clarification on the “Field programmability for the systems will require careful evaluation of product” obstacle and how can this obstacle possibly affect our product?
12.

*Buzz word: Generative Ai
*Version control will be a big focus when dealing with software solutions
* Define your version of Autonomy
* What needs to become legal if idea is outside of current laws
*Look up “Maven” as a concept
*”Fleet Management”
“”Look up cloud computing related to autonomy
*Cloud computing data fluctuates
*Marketing and pricing are really important: How are you going to get people to buy? Check out the aws page
*How will we address updates?
* Recognize what's legal now and what may become legal later, acknowledge that.

* Recommended points: who's your customer, their problem, how is aws helping with the solution.
* Consider autonomous ridesharing potential.
* Mayven? Private 5g networks? Fleet management?

*Look at Apple CarPlay
*usb: has profiles.

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Judges:

- Keith
- Scott -high knowledge
- John - high knowlegde
- Adewale Omoniyi (Security Lead) *Low knowledge
- Kimberly
- michael

Things to Research

1. **The 6 Levels of Vehicle Autonomy Explained | Synopsys Automotive**
2. Thermographic camera - Wikipedia
3. Radar - Wikipedia
4. Lidar - Wikipedia
5. Ultrasound - Wikipedia
6. Sonar - Wikipedia
7. Global Positioning System - Wikipedia
8. Odometry - Wikipedia
9. Inertial measurement unit - Wikipedia (IMU)
10. Control system - Wikipedia
11. Sense - Wikipedia (Sensory Information)
12. Automated driving thats already in place (Lvl 0 - No automation. Lvl 1 - Cruise control, lane assist, auto ebrake. Lvl 2 - tesla autopilot, cadillac super cruise. Lvl 3 - Audi Traffic Jam Assist, Mercedes Drive Pilot, Volvo Pilot Assist. Lvl 4 - ??. Lvl 5 - ??.)
13. Sensor fusion - Wikipedia
14. Stereopsis - Wikipedia
15. Bayes' theorem - Wikipedia, Simultaneous localization and mapping - Wikipedia,

Trends/ Statistics

1. **Global Autonomous Vehicle Market:**
    - In 2019, there were approximately 31 million cars with some level of automation worldwide.
    - By 2024, this number is expected to surpass 54 million
    - The global autonomous car market is projected to grow significantly, reaching nearly 62 billion U.S. dollars by 2026
2. **Projected Sales of Autonomous Vehicles:**

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- From 2019 to 2030, the projected sales of autonomous vehicles worldwide are expected to reach millions of units
- By 2024, new car sales will be influenced by different levels of autonomy

Note to self

- When addressing incentives, I think ecology is a big one. The world is concerned about the health of the Earth and I think it would be beneficial if this can affect that area.
- I noticed level 2 and 3 look very similar, whats the real difference between them?
- There are 4 of us and 7 research categories, maybe divvy that up for timesake

- Product Idea: A usb/plug-in software that connects users to our citywide infrastructures (parking garages, traffic cameras, building cameras). The infrastructure would be stand alone without wifi, possibly connected to telephone towers (to combat the issue of connectivity long range). Users CANNOT access this info for security reasons. However, cars do share information between each other for safety reasons.
- Plug-in profiles paired to car(s). (works similarly to sport cars with profile keys) Restrictions on places, avoid highways/bridges if desired,
- Product Idea: App (Tracks usb, estimates time, explains route)
- Can be utilized in any car with autonomous technology

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Obstacles

<u>Strength -</u>

- the time needed to turn over the existing stock of vehicles from non-automated to Automated, (Possibly partner with Hyundai, BMW, VW,)
- A car's computer could potentially be compromised, as could a communication system between cars. (Just TAKE THE PLUG-IN OUT)
- Artificial intelligence is still not able to function properly in chaotic inner-city environments. (added infrastructure)
- Avoidance of large animals requires recognition and tracking, and Volvo found that software suited to caribou, deer, and elk was ineffective with kangaroos. (Training; Sensors recognize the difference between live beings, inanimate objects, moving cars, and still cars).
- Current road infrastructure may need changes for automated cars to function Optimally (Traffic light camera, etc)
-

<u>Weaknesses</u>

- Budget
- Timeline (Adding infrastructure to each city would take time. Start with most efficient cities.)

<u>Opportunities</u>

- the implementation of a legal framework and consistent global government regulations for self-driving cars
- resistance by individuals to forfeiting control of their cars (Just take it out if youre take scared)
- Autonomous cars may require high-definition maps to operate properly. Where these maps may be out of date, they would need to be able to fall back to reasonable behaviors.
- Competition for the radio spectrum desired for the car's communication. (Rely on cell tower communication and added infrastructure that only communicates with itself and its users.)

<u>Threats</u>

- Disputes over liability, (Who is responsible for accidents)
- concerns about safety
- Susceptibility of the car's sensing and navigation systems to different types of weather (such as snow) or deliberate interference, including jamming and spoofing. (Utilize provided car sensors and added product functionalities, cars will

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be able to use other cars' feedback and weather to determine decisions and routes to take.

Questionables

• Field programmability for the systems will require careful evaluation of product development and the component supply chain. (Adding into our scheduled release, take time to test in small towns)

• potential for a long period of humans and autonomous vehicles sharing the roads,

• Validation challenge of Automated Driving and need for novel simulation-based approaches comprising digital twins and agent-based traffic simulation. (CARLA, a popular driving simulator, integrates with the VIVAS framework. This framework generates diverse and complex driving scenarios for A.D.S (Automated Driving Systems) validation.)

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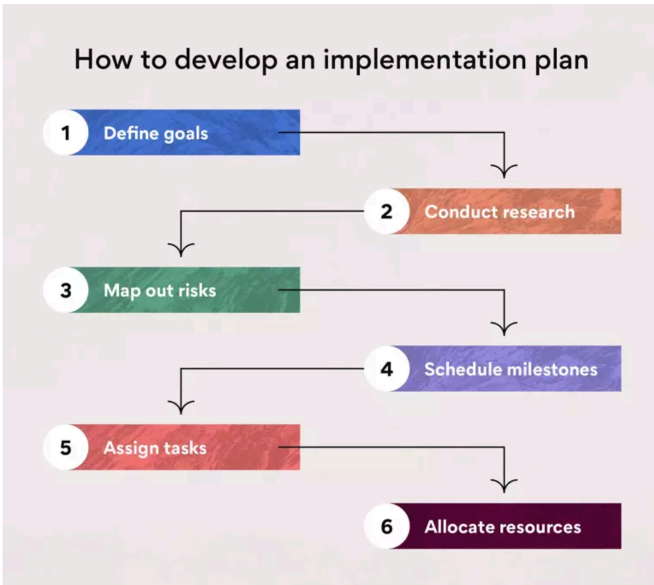
Implementation Plan



1. Define Goals
    - Physical Creation of Plugin
    - Software development of plugin
    - Additions to infrastructure (city by city or level by level)
2. Conduct Research
    a. Previous infrastructure of cities
    b. A.I. development for Autonomous vehicles
    c. Current and Future technologies concerning Autonomous vehicle modification/utilization
    d. Technology of Profile Keys
    e. Utilization of Deep Racer to crash test courses of faulty A.I.
3. Map out risks
    a. Refer to Obstacles
4. Schedule Milestones
    a.
5. Assign Tasks
    a.
6. Allocate resources
    a. DeepRacer
    b. JohnDeer Technologies (A.I., sensing technologies)
    c. Bluetooth Technologies

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Terrie

AWS and AI Technology

- Investment in AI: Investment in AI technologies continues to rise. In 2020, global AI investment reached over $40 billion, with significant contributions from various sectors including healthcare, finance, and automotive industries.
- AWS AI Adoption: AWS has witnessed increasing adoption of its AI services. In 2021, AWS reported over 10,000 customers using its AI and machine learning services, with an increasing number of enterprises leveraging AI to enhance their operations and customer experiences.
- AI Driving: The autonomous driving industry is rapidly evolving. As of 2021, over 60 companies globally were actively developing autonomous vehicle technology, with investments exceeding $80 billion.
- Data Volume in AI Driving: Autonomous vehicles generate vast amounts of data. A single autonomous car can generate up to 4 terabytes of data per day, including sensor data, camera footage, and mapping information.
- Safety Concerns and Regulations: Safety remains a primary concern in AI driving technology. As of 2021, various regulatory bodies worldwide have been working to establish guidelines and standards for autonomous vehicles to ensure safety and compliance with local laws and regulations.
-
- Service Offerings: AWS provides a comprehensive suite of cloud services categorized into various domains such as computing, storage, databases, analytics, machine learning, security, networking, IoT, and more. Each service is designed to address specific business needs and requirements.
- Global Infrastructure: AWS operates a global network of data centers across multiple geographic regions. This global infrastructure enables customers to deploy their applications and services closer to their end-users for lower latency and better performance.
- Security and Compliance: AWS prioritizes security and compliance, offering a wide array of security features and compliance certifications to ensure the protection of customer data. AWS adheres to industry-standard security best practices and undergoes regular audits and assessments to maintain compliance with global regulations.
- Elasticity and Scalability: One of the key features of AWS is its elasticity and scalability. Customers can easily scale their infrastructure up or down based on demand, allowing them to handle spikes in traffic and optimize resource utilization without over-provisioning.

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- Cost Management: AWS provides various tools and services to help customers manage and optimize their cloud costs effectively. These include cost monitoring and reporting tools, budgeting tools, cost allocation tags, and cost optimization recommendations

Three questions:

1. How can auto manufacturers effectively manage and analyze the large sets of video and sensor data required to train and model expected vehicle responses for Advanced Driver-Assistance Systems (ADAS) and Autonomous Vehicles (AV)?
2. What strategies can automakers employ to integrate ADAS capabilities into their vehicles in a competitive market segment while ensuring safety and compliance?
3. What scalable solutions can be implemented to accelerate AV/ADAS development, including data ingestion, scene detection, data visualization, and testing use cases, to meet the demands of the automotive industry?

Task: Link Apple CarPlay to be able to do everyday tasks.

- Grabbing groceries
- Picking children up from school , etc

More stats on automated driving, AWS Based, More graphs. (2-4 Paragraphs). Mapping , Sensing, Path Planning

Automated Mapping:

When talking about Automated Mapping as it relates to Electric Vehicles (EV). EVs are emerging in the 21st century. Apple Carplay can adopt a GIS approach while studying field dynamics to improve the quality of Automated Mapping. Similar to Google Maps, the improved Apple car play can then approach comprehensive street-level, aerial, or satellite views. Satellite/ Aerial Imagery.

Similar systems such as Tesla's Model 3 Owner's Manual:
Mapping Displays can be viewed:
-Satellite imagery
-Traffic Conditions
-Map details
-Nearby charging stages, etc

Who cares about Automated Mapping Mapping?

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- District Network Operators
-Local/ Regional Government
-Automotive Industry
Images:
(Estimating customer trends, Market Insights, Understanding the barriers to widespread adoption).

The process of technology roadmapping entails identifying existing technology gaps, crucial system requirements, and key development milestones for a product. It involves evaluating various pathways to meet requirements, particularly beneficial when facing high-risk elements in product development. This approach allows for the pursuit of multiple paths to fulfill specific requirements, thereby mitigating execution risks. Ideally conducted prior to technological investments or project execution,
technology roadmapping organizes and analyzes critical requirements,
Targets,
Performance metrics
Timeframes to meet product rollout needs within a specified timeframe.

EV Sensing: .

To avoid human error, the use of EV Sensing and an Advanced Driver Assistance Systems (ADAS). By using advanced technology, ADAS can prevent accidents by passively assisting drivers.

How does it work?
AppleCar CarPlay Automated System will use "real-time" vehicle data matched with intelligent routing algorithms tailor to the user's individual needs.

- Map data

The use of map data is important to the use of sensors for EV vehicles. Maps bridge the gap for the automated automobile. Maps offer layers of data that lend human-like context to what the car's sensors are "seeing."

- Camera data

There could be an "implementation of cameras" that can be placed on the vehicle. Technology such as AI can be used along with a sensor fusion to easily identify objects. With the help of image recognition software and sensors, and radards EV's can optimize performance.

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Path Planning:

Automotive manufacturers may use advanced path planning algorithms and sensor fusion techniques to effortlessly integrate ADAS capabilities into their cars, ensuring that both safety and compliance criteria are satisfied. They may distinguish their offers and retain competition in the market sector by stressing ongoing innovation and user-centric design, as well as implementing effective route planning techniques.
Advantages of EV Path Planning
-Efficiency:
Streamlined routes decrease travel time and energy usage, enhancing the overall efficiency of EV trips.
-Convenience:
Drivers can effortlessly find charging stations and schedule charging stops conveniently along their routes.
-Cost-effectiveness:
Having insight into the anticipated charging expenses enables drivers to plan their travel budgets and compare charging alternatives for affordability.
-Decreased environmental footprint:
Effective EV route planning empowers drivers to reduce energy consumption and minimize their environmental impact.

Link:
https://www.synopsys.com/automotive/autonomous-driving-levels.html

Build a Full Stack Apple CarPlay App with Swift and AWS Services | AWS Online Tech Talks

https://aws.amazon.com/blogs/industries/introducing-aws-for-automotive/

https://www.tesla.com/ownersmanual/model3/en_us/GUID-01F1A582-99D1-4933-B5FB-B2F0203FFE6F.html

https://www.youtube.com/watch?v=EiWI5PAtfYA

https://www.gminsights.com/industry-analysis/electric-vehicle-sensor-market

Image #1:

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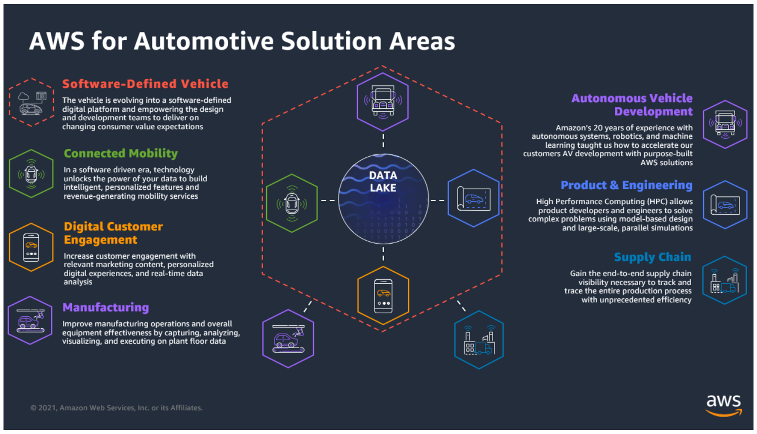

Image #2:

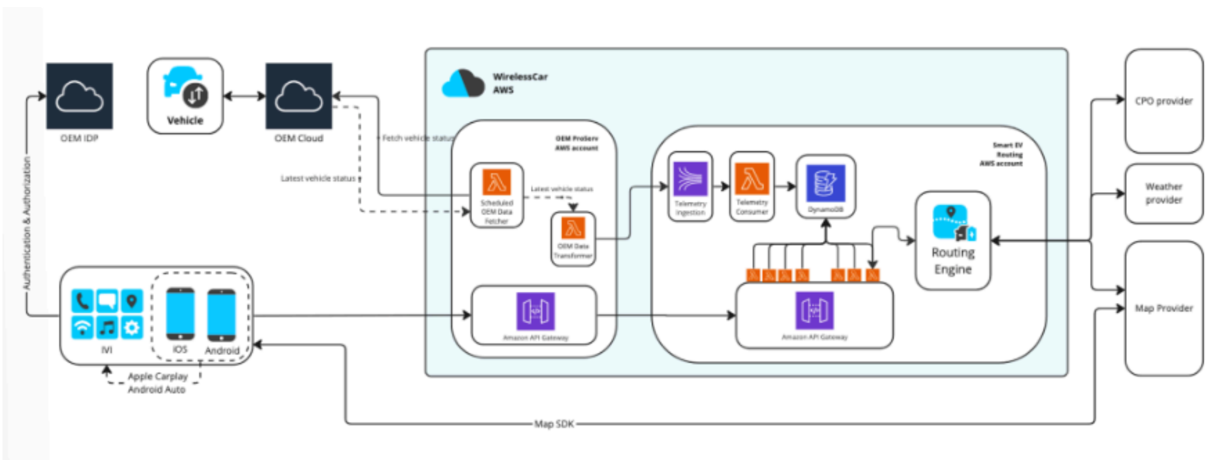

Figure 3: Smart EV Routing architecture diagram

Image #3

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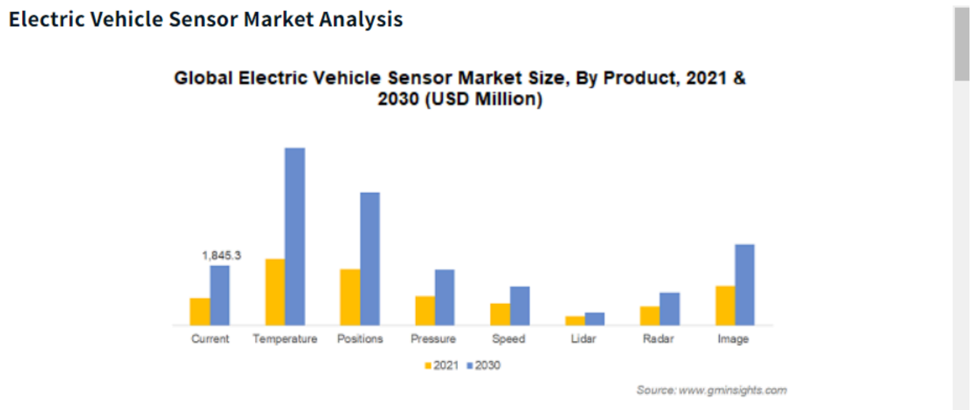

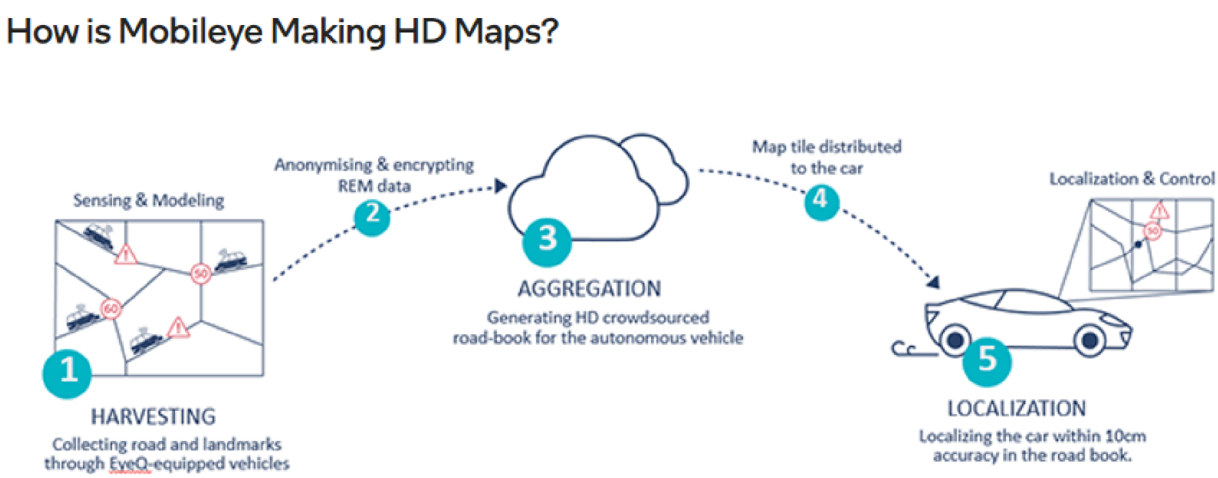

Image #4

Miles

Sensing - [An overview of sensors in Autonomous Vehicles - ScienceDirect](#)
[Introducing AWS for Automotive – Accelerating digital transformation across the auto industry | AWS for Industries (amazon.com)](#)

- LiDAR: LiDAR sensors are commonly used in autonomous vehicles. They measure distances using laser pulses and create detailed 3D maps of the surroundings. LiDAR helps detect obstacles and provides accurate depth information.

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- Radar: Radar sensors use radio waves to detect objects and measure their speed. They are particularly useful for tracking moving objects, such as other vehicles or pedestrians. Radar complements LiDAR by providing information about relative velocities.
- Cameras: Cameras play a crucial role in autonomous driving. They capture visual data and help the vehicle recognize objects, signs, and lane markings. In clear weather conditions, cameras provide detailed images of the surroundings, aiding in identifying vehicles, pedestrians, and cyclists.
- Camera Types: Autonomous vehicles use a suite of cameras pointing in all directions. For instance:
- Waymo employs several sets of high-resolution cameras to provide a 360-degree view of the vehicle, optimized for long-range visibility in both daylight and low-light conditions.
- GM's Cruise AV utilizes 16 cameras to detect and track pedestrians, cyclists, traffic lights, and free space.
- Uber employs a system of cameras mounted on its sensor pod for comprehensive 360-degree coverage.
- Producers: Major automotive suppliers like Continental, Denso, and Magna, along with specialized suppliers like Mobileye (owned by Intel), contribute to camera technology development.
- Cost: While cameras are currently used for level one and level two autonomous features, predictions suggest that their cost for levels 3 through 5 of driving automation will remain reasonable.
- Reliability and Robustness:
    - Designing reliable and robust smart sensors for accurate measurements is challenging.
    - Manufacturers face difficulties in achieving precision and reliability.
- Wireless Sensor Networks (WSNs):
    - Handling faulty and unreliable communication errors in WSNs is a major challenge.
    - Key issues in WSNs include:
        - Selection of appropriate hardware and infrastructure.
        - Sensor calibration, deployment, and programming.
        - Synchronization among sensors.
- Calibration:
    - Calibrating sensors before use is a complex task.
    - Ensuring accurate measurements requires precise calibration.

- LiDAR Sensors:
    - LiDAR sensors lack color information in perceived data.
    - Point Cloud Data is often fused with other sensor data using fusion algorithms.

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- Coarse resolution limits LiDAR's suitability for object recognition.
- Radar Sensors:
  - Radar sensors have limitations due to their coarse resolutions.
  - They are not ideal for object recognition applications.
- Climate Impact:
  - Adverse weather conditions affect sensor performance.
  - Sensors must function reliably under varying climates.
- Automotive Radar:
  - Used in passenger vehicles for advanced driver assistance systems (ADAS), such as adaptive cruise control and blind spot detection.
  - Primarily applicable to driving automation levels 0-2.
  - Traditional auto parts suppliers like Continental, Bosch, and Denso supply OEMs with automotive radar.
  - Waymo employs a 360-degree radar system to track road users' speed around the vehicle.
  - GM's Cruise AV uses three types of radar (total of 21) as a complement to LiDAR for low-light object detection.
  - Uber ATG has eight radar sensors distributed around the vehicle.
  - Other companies like Auto X, Ford, and Mercedes Benz Drive Pilot also utilize radar for various purposes.

Remember that these sensors work together to provide a holistic view of the environment, ensuring safe and reliable autonomous driving.

Mapping - [HD Maps for Autonomous Vehicles: Challenges & Solution | Intellias Blog]
[FEATURE: Map-based navigation for autonomous vehicles | ADAS & Autonomous Vehicle International]

- HD maps are different from traditional maps, as they provide high-precision and real-time data about the road environment, such as lane markings, traffic signs, curves, gradients, and obstacles.
- HD maps are essential for autonomous driving, as they enhance the capabilities of onboard sensors and ADAS, improve reaction speed and decision-making, and increase passenger comfort and experience.
- HD mapping faces some challenges, such as:
  - Large pools of data: HD maps require collecting and processing huge amounts of data from various sources, which demands high computing power and storage capacity.

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    - Real-time data streaming: HD maps need to be updated constantly to reflect dynamic road changes, which requires high-speed bandwidth and low latency.
    - High costs: HD maps are expensive to create and maintain, as they involve using specialized equipment and labor.
    - Lack of common standards: HD maps are produced by different providers in proprietary formats, which hinders data compatibility and interoperability.
  - Possible solutions to these challenges, such as:
    - Cloud-based navigation platforms: These platforms integrate map collection, aggregation, and maintenance features in the cloud, providing scalable and reliable HD mapping services.
    - Computer vision technology: This technology uses cameras and deep learning to capture and analyze high-resolution 3D images of the road, reducing the need for other sensors and survey fleets.
    - NDS (Navigation Data Standards): This is an initiative to create a global standard for in-vehicle navigation, ADAS, and e-horizon systems, ensuring data quality and integrity for HD maps
  -

- There are three phases for HD map production: make, maintain, and mass-build
  - Make: creating the first version of HD maps for all highways across major regions4
  - Maintain: keeping the maps up to date using low-cost, vehicle-independent hardware and part-time drivers
  - Mass-build: designing and implementing a crowdsourcing solution that uses production vehicles' sensor data to update the maps

Path Planning -

AWS- [Introducing AWS for Automotive – Accelerating digital transformation across the auto industry | AWS for Industries (amazon.com)]

- AWS for Automotive:
  - An initiative by Amazon Web Services (AWS) to provide cloud-based services and solutions for the automotive industry1.
  - Aims to address challenges related to software-defined vehicles, connected mobility, autonomous driving, and digital customer engagement.

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- Software-Defined Vehicle:
  - Focuses on developing software-centric platforms for vehicles.
  - Key components include centralized compute, continuous integration/continuous deployment (CI/CD), security, data management, and machine learning (ML).
- AWS IoT FleetWise:
  - A new service that collects, transforms, and transfers vehicle data to the cloud in near-real time.
  - Enables monitoring and analysis of fleet data for operational insights.
- BlackBerry IVY:
  - A co-developed edge platform for accessing and managing vehicle data.
  - Facilitates data integration, analytics, and insights at the edge.
- Connected Mobility:
  - Focuses on building intelligent, personalized features and mobility services using data.
  - Enables seamless connectivity between vehicles, infrastructure, and users.
- Connected Mobility Solution (CMS):
  - A reference architecture to accelerate connected vehicle development and deployment2.
  - Addresses challenges related to data interoperability, security, and scalability.
- Autonomous Mobility:
  - Supports full-scale autonomous vehicle (AV) development.
  - Collects, ingests, stores, and analyzes AV data for decision-making.
- Autonomous Driving Data Lake (ADDL) Solution:
  - Provides a single source of truth for storing, cataloging, and searching AV data3.
  - Essential for managing large volumes of AV sensor data.
- Digital Customer Engagement:
  - Helps deliver relevant marketing content, personalized experiences, and real-time data analysis4.
  - Enhances customer engagement and satisfaction.
- Supply Chain:
  - Enables end-to-end tracking and tracing of the production process.
  - Optimizes demand planning, purchasing decisions, and environmental impact.
- Manufacturing:
  - Connects and manages machines and systems in manufacturing plants.
  - Improves quality, efficiency, and reduces downtime and costs.
- Product Engineering:
  - Accelerates design turnaround times and engineering development.

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- Derives valuable insights for product improvement.

<u>Kyla</u>

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Software Training

Overcoming the validation challenge in creating fully autonomous cars requires a multifaceted approach. Here are some strategies:

1. **Diverse Scenario Generation**:
   - Create a comprehensive set of driving scenarios that cover various conditions, including edge cases and rare events.
   - Consider factors like weather, road conditions, traffic density, and unexpected obstacles.
   - Leverage machine learning techniques to automatically generate diverse scenarios.

2. **Coverage Metrics and Criteria**:
   - Define clear coverage criteria for testing. These criteria guide scenario selection.
   - Metrics could include coverage of different road types, weather conditions, and interactions with pedestrians and other vehicles.
   - Use tools like **formal methods** to ensure exhaustive coverage.

3. **Simulation-Based Testing**:
   - Invest in high-fidelity simulators that accurately model the vehicle dynamics, sensors, and environment.
   - **Digital twins** play a crucial role here. These virtual representations allow testing in controlled environments.
   - Simulate complex scenarios involving multiple agents (cars, pedestrians, cyclists) to evaluate system behavior.

4. **Scenario Catalogs and Libraries**:
   - Maintain a catalog of representative scenarios. These can be shared across the industry.
   - Collaborate with other stakeholders to create standardized scenario libraries.
   - Include scenarios that challenge the system's decision-making capabilities.

5. **Hybrid Testing**:
   - Combine simulation-based testing with real-world testing.
   - Use **test tracks** and closed environments for controlled experiments.
   - Real-world testing provides insights into system behavior under unpredictable conditions.

6. **Data-Driven Validation**:
   - Collect data from real-world driving experiences.
   - Use this data to validate simulations and improve the accuracy of digital twins.
   - Machine learning models can learn from real-world data to enhance system performance.

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7. **Human-in-the-Loop Testing**:
   - Involve human safety drivers during testing.
   - Gradually reduce their intervention as confidence in the system grows.
   - Human feedback is invaluable for identifying corner cases.

8. **Regulatory Collaboration**:
   - Work closely with regulatory bodies to establish safety standards.
   - Collaborate on validation methodologies and requirements.
   - Ensure alignment with existing automotive safety regulations.

9. **Continuous Learning and Adaptation**:
   - Autonomous systems should learn from their experiences.
   - Implement online learning algorithms to adapt to changing environments.
   - Regularly update the system based on new data and insights.

10. **Industry Collaboration and Benchmarking**:
    - Share best practices and collaborate with other companies and research institutions.
    - Participate in benchmarking challenges (e.g., **DARPA Urban Challenge**, **CARLA Autonomous Driving Challenge**).
    - Learn from each other's successes and failures.

Remember that overcoming the validation challenge is an ongoing process. As technology evolves, so must our validation approaches. Collaboration, innovation, and rigorous testing will pave the way for safe and reliable autonomous vehicles.

Training A.I.

Certainly! When it comes to enabling vehicles to achieve full autonomy, **Amazon Web Services (AWS)** offers a range of solutions and services that can be leveraged by automotive manufacturers and developers. Let's explore some relevant options:

1. **AWS DeepRacer**:
   - **Overview**: AWS DeepRacer is a cloud-based 3D racing simulator that allows developers to experiment with reinforcement learning (RL) for autonomous driving.
   - **Features**:

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        - **Simulator**: Build and train RL models in the AWS DeepRacer 3D racing simulator using Amazon SageMaker.
        - **Real-world Deployment**: Deploy your trained model onto a physical AWS DeepRacer car for real-world testing.
        - **Global Racing League**: Compete in the world's first global autonomous racing league.
    - **Benefits**:
        - **Scalable Infrastructure**: AWS provides petabyte-scale data processing, storage, and management capabilities.
        - **Simplified Data Management**: Efficient data management throughout the development platform.
        - **Tool Chain Compatibility**: Connect data lakes and complex tool chains seamlessly.
        - **Accelerated Time to Market**: Streamlined validation and reduced development time[1].
2. **AWS Connected Vehicle Solution**:
    - **Overview**: This reference implementation provides a foundation for connected vehicle services, autonomous driving, electric powertrains, and shared mobility.
    - **Features**:
        - **Connected Vehicle Services**: Enables seamless communication between vehicles and the cloud.
        - **Autonomous Driving**: Supports AV development and transformation.
        - **Electric Powertrains**: Addresses the unique requirements of electric vehicles.
        - **Shared Mobility**: Facilitates shared mobility services.
    - **Benefits**: Provides a robust architecture for scaling and accelerating new feature development[2].
3. **AWS Autonomous Mobility Solutions**:
    - **Overview**: AWS offers purpose-built services and solutions for ADAS and AV development.
    - **Capabilities**:
        - **Data Collection and Ingestion**: Efficiently collect and ingest vehicle data.
        - **Data Labeling and Anonymization**: Prepare labeled data for training.
        - **Model Development and Training**: Train machine learning models.
        - **Simulation and Verification**: Simulate AV behavior and verify performance.
        - **Workspace Management (MLOps and DevOps)**: Manage development environments.
    - **Benefits**: Scalable infrastructure, simplified data management, tool chain compatibility, and accelerated time to market[3].
4. **Collaboration with BMW**:

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- AWS collaborates with BMW to develop customizable cloud software for managing data from connected vehicles.
- Leveraging AWS compute, generative AI, IoT, machine learning, and storage capabilities, this cloud-based system accelerates the delivery of highly automated BMW vehicles[45].

Remember that achieving full autonomy involves a holistic approach, including data processing, model training, simulation, and real-world deployment. AWS provides the tools and infrastructure needed to accelerate this journey toward autonomous mobility. 🚗🌟

Source: [132]

Presentation Outline

Title Slide

- Introduce the topic: “Scalable Plugin for Autonomous Vehicles: Unlocking Urban Infrastructure”
- Include relevant logos and project identifiers.

Introduction

1. **The Challenge**:
    - Explain the need for a plugin that bridges existing autonomous vehicles with urban infrastructure.
    - Highlight the importance of scalability and seamless integration.
2. **Our Solution**:
    - Introducing the concept of the plugin.
    - Emphasize its role in granting access to city infrastructure (traffic cameras, parking garages, etc.).

Plugin Architecture

1. **Components**:
    - Describe the key components of the plugin:
        - **Hardware Interface**: How the plugin physically connects to the vehicle.

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        - **Software Stack**: Layers for communication, data processing, and interaction with infrastructure.
        - **Security Measures**: Ensuring data privacy and authentication.
2. **Integration Points**:
    - Discuss how the plugin integrates with existing autonomous software.
    - Highlight compatibility with various vehicle models.

Data Collection and Ingestion

1. **Traffic Cameras**:
    - Explain how the plugin collects data from city traffic cameras.
    - Discuss real-time streaming and storage.
2. **Parking Garages**:
    - Detail data collection from parking facilities.
    - Address challenges related to different garage systems.

Data Processing and Analytics

1. **Scene Detection**:
    - Describe algorithms for identifying relevant scenes (e.g., intersections, pedestrian crossings).
    - Explain how the plugin processes this information.
2. **Map Development**:
    - Discuss creating dynamic maps based on infrastructure data.
    - Enable precise localization for autonomous vehicles.

Use Cases and Benefits

1. **Enhanced Navigation**:
    - Showcasing real-time traffic updates and optimized routes.
    - Reducing congestion and travel time.
2. **Parking Assistance**:
    - Guiding vehicles to available parking spots.
    - Improving parking efficiency.
3. **Safety Alerts**:
    - Notifying drivers of potential hazards (e.g., road closures, accidents).
    - Enhancing overall safety.

Scalability and Deployment

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1. **Cloud Integration**:
   - Explain how the plugin communicates with our cloud infrastructure.
   - Discuss scalability for multiple cities.
2. **Over-the-Air Updates**:
   - Highlight the ability to remotely update the plugin.
   - Ensure continuous improvement and feature enhancements.
   -

Conclusion

1. **Impact**:
   - Recap the benefits of our plugin for autonomous vehicles.
   - Envision a future where urban infrastructure seamlessly supports autonomous mobility.
2. **Next Steps**:
   - Discuss pilot deployments and collaboration with automakers.
   - Invite questions and feedback.

Remember, our plugin bridges the gap between autonomous vehicles and city infrastructure, making urban mobility smarter and more efficient. 🚗🌆

Source: [1][2][3]

How it works

- Used on newer model cars with autonomous features (this will be your Mercedes Benz S class 2024 drive pilot, audi a8, honda legend, tesla autopilot, and more.
- Plugs into the OBD II port (similar to software like progressive snapshot, allstate drivewise, etc.) Source

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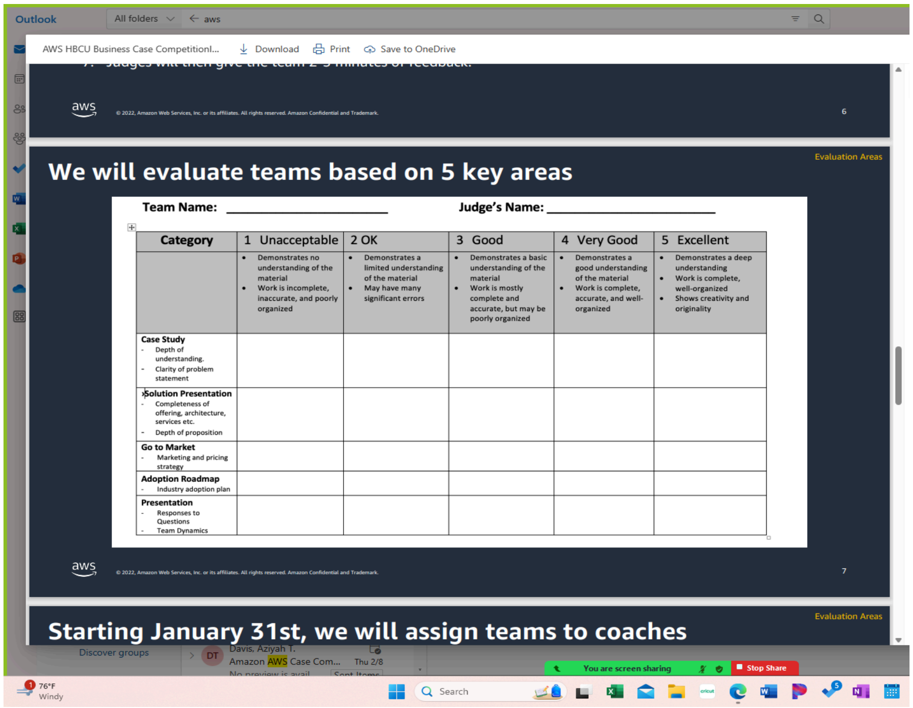

Team Name: ______________________ Judge's Name: ______________________

Category	1 Unacceptable	2 OK	3 Good	4 Very Good	5 Excellent
	• Demonstrates no understanding of the material • Work is incomplete, inaccurate, and poorly organized	• Demonstrates a limited understanding of the material • May have many significant errors	• Demonstrates a basic understanding of the material • Work is mostly complete and accurate, but may be poorly organized	• Demonstrates a good understanding of the material • Work is complete, accurate, and well-organized	• Demonstrates a deep understanding • Work is complete, well-organized • Shows creativity and originality
Case Study - Depth of understanding. - Clarity of problem statement					
Solution Presentation - Completeness of offering, architecture, services etc. - Depth of proposition					
Go to Market - Marketing and pricing strategy					
Adoption Roadmap - Industry adoption plan					
Presentation - Responses to Questions - Team Dynamics					