

Autonomous Cars and Justice Courts: The Future

7:00

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1

How does the law react to tech?

2

1

New Transportation Code Chapter
552A

- Regulations regarding the operation of personal delivery and mobile carrying devices.

3

What are Personal Delivery and Mobile Carrying Devices?

Robots that transport cargo.

- "Mobile carrying device" = actively monitored by someone who is within 25 feet of it.
- "Personal delivery device" = automated driving technology, supported/supervised remotely by someone.

4

Must Follow Rules of the Road Pedestrian Laws

- These devices are not considered vehicles.
- They can be driven on sidewalks and hike/bike trails.
- They must comply with Rules of the Road laws applicable to pedestrians (TC Ch. 552).
 - Unless the provision cannot by its nature apply to the device.
 - If these laws are violated, you could see the cases in your courts.

5

Additional Laws That Must Be Followed

- Must yield the right-of-way to all other traffic, including pedestrians.
- Must not unreasonably interfere with or obstruct other traffic, including pedestrians.
- If operated at nighttime, must display the lights required by Ch. 552A.
- Must comply with any applicable regulations adopted by a local authority (as allowed by this chapter).
- Must not transport hazardous materials in a quantity requiring placarding by the Hazardous Materials Transportation Act.

6

Additional Laws That Must Be Followed

- Must be monitored or controlled by the operator.
- Must be equipped with a braking system that enables the device to come to a controlled stop.
- May only be operated:
 - On the side of a roadway or the shoulder of a highway at a speed of not more than 20 miles per hour; or
 - In a pedestrian area at a speed of not more than 10 miles per hour
 - Max speed can be limited to 7-9 mph by a local authority within its jurisdiction if 10 mph would be unreasonable or unsafe for an area.

7

Additional Laws That Must Be Followed

- Mobile Carrying Devices
 - Must remain within 25 feet of the operator while the device is in motion.
- Personal Delivery Devices
 - Must be equipped with a marker that clearly states the name and contact information of the owner and a unique identification number.
 - Can only be operated by a business entity and must be monitored/controlled by a person that is an agent of that business entity.
 - The business entity must maintain an insurance policy that includes general liability coverage of not less than \$100,000 for damages arising from the operation of the device.

8

Who is Responsible?

Personal delivery devices

- Business is considered the operator unless the agent of the business operating it does so outside of the scope of their employment, in which case the agent is the operator.
- A person is not considered the operator just because they request a delivery/service or dispatch the device.

Mobile carrying device

- The person operating it is considered the operator.

9

Criminal Liability and Autonomous Cars

- What are some issues with having the business be criminally liable?
- In an autonomous car scenario, who would likely be criminally liable?

10

POLL

- Do you think cases involving autonomous cars in 2025 will be:
 - Mostly civil
 - Mostly criminal
 - About a 50/50 mix

11

What is a Tort?



Something that is NOT a breach of contract but a party can recover money for under civil law



Generally, damage to someone's property or economic harm/bodily injury to the person



Purpose: Deter wrongful conduct, make injured parties whole

12

Keep in Mind

- Self-represented litigants may not know the legal term for their cause of action. They don't have to know the "magic words." Your job is to determine what happened and award damages if appropriate.
- Many behaviors can be punished civilly, criminally, or both. (For example, the O.J. Simpson case) Again, it is not up to you to decide if the person should pursue a civil case or if a prosecution should occur. Process the case that has been filed with you. Do not advise someone what to file or whether to file.

13

Intentional Torts vs. Negligence

- There are two main categories of tort cases.
- **Intentional torts** are actions that a party does on purpose (or sometimes recklessly) that cause damage to property or injury to a person.
- **Negligence** is when a party causes damage or injury, not on purpose, but instead by not being careful enough with the actions they take (or fail to take).

14

POLL

- Do you think most civil cases involving autonomous cars in 2025 will be:
 - Intentional torts
 - Negligence

15

Negligence

16

What is Negligence?

- Negligence is a very common cause of action in justice court (even though many of the people filing the cases may not know to use that word.)
- At its base level, a negligence cause of action is saying that the defendant caused injury to the plaintiff by either:
 - Doing something that they shouldn't have done, **or**
 - Failing to do something that they should have done.

17

Negligence – The Elements

1. The defendant had a legal **duty** to act in a certain way toward the plaintiff.
2. The defendant **breached** that duty.
3. The breach **caused** injury to the plaintiff.

18

Negligence Element 1 - Duty

- Duty can be created by a relationship between the parties.
 - For example, attorney-client, accountant-client, parent-child.
- A **general duty** exists to use **ordinary care** to avoid **foreseeable risk** of injury to others.
- There is **not** a general duty to provide aid or protect others, unless there is a special relationship.
- Civil and criminal laws create statutory duties as well.
 - You have a duty to stop at a red light.

19

Negligence Element 2 - Breach

In each situation where a person has a duty to another, they have what is called a **standard of care**. If they fail to meet this standard, they have **breached** their duty.

Normally, the standard is “ordinary care”, which is what an “ordinary prudent person” would have done (or not done) in that situation.

20

Negligence Element 2 - Breach

- Situations where a different standard other than “ordinary care” may apply include:
 - Potential breach by a “**professional**” such as an attorney or a physician.
 - The professional is held to the standard of an **ordinarily prudent professional** would have done in that situation, rather than a non-professional.
 - **Common carriers and handlers of dangerous commodities** are also held to a higher standard of care.

21

Negligence Element 2 - Breach

When determining what an “ordinary prudent person” would do, the defendant’s age, experience, intelligence, and knowledge are taken into consideration.

Violation of a statute is considered “**negligence per se**”, meaning the act is negligent on its face.

The defendant may be able to provide a defense to this by showing that it was necessary to violate this law – for example, speeding to rush someone having a heart attack to the hospital.

22

Negligence Element 3 – Causation

- In negligence cases, the breach must be the **actual or proximate cause** of the plaintiff's injury.
- As discussed before, there is a two-part test for proximate cause:
 - **Cause-in-fact** – If the negligence was a substantial factor in the injury and whether the injury would have otherwise occurred. – “**but for**” test discussed earlier
 - **Foreseeability** – A person of ordinary intelligence should have anticipated the danger caused by the negligence.

23

Defenses to Negligence Include:

Contributory Negligence by Plaintiff	Release Agreement	Assumption of the Risk (hit by a foul ball)
Act of God	Unavoidable Accident	Limitations

24

Statute of Limitations – Tort Cases

- The statute of limitations in a tort case (both intentional torts and negligence) is two years.
- The statute in some cases does not start running until a party is aware or should have been aware of the tort.
- If the case is outside the statute of limitations, the plaintiff cannot have a judgment, even if the defendant doesn't bring that up, and even if the defendant never appears.

25

Available Damages – NEGLIGENCE

Compensatory Damages (personal injury and property damage)	Punitive/ Exemplary Damages (Gross Negligence only)	Court Costs/Post- Judgment Interest (available in all cases).
Pre-Judgment Interest (personal injury or property damage cases only, <u>not on</u> <u>economic damage cases</u>)	Attorney's Fees are <u>not available</u> in negligence cases.	

26

Punitive or Exemplary Damages

- These are damages that are awarded, not to compensate the plaintiff, but instead to **punish**, or make an **example** out of, the defendant.
- Goal is to punish the defendant for its bad action, as well as deter any future parties from engaging in the same bad behavior.
 - Notable examples include McDonald's being forced to pay punitive damages in the "hot coffee" case and Ford being forced to pay punitive damages when they knew of the Ford Pinto explosion danger.

27

Damage
Calculation
Issues –
PUNITIVE
DAMAGES

Punitive damages are available if the defendant acted with **malice** (intent to harm the plaintiff) or **gross negligence** (defendant was aware of an extreme degree of risk but disregarded that risk)

How do you decide what amount of punitive damages is appropriate?

How much is sufficient to punish the defendant for what they did, and put other actors on notice that they should not engage in that behavior?

28

14

Damage Calculation Issues

- CONTRIBUTORY NEGLIGENCE

- In **negligence** cases, the finder of fact (judge or jury) must assign a percentage of responsibility to each party.
- If the plaintiff is more than 50% responsible, they recover \$0, due to what is called **contributory negligence**.
- If the plaintiff is less than 50% responsible, they recover against the defendant the percentage of their damages that the defendant is responsible for.
 - So if damages are \$5,000 and the jury finds the defendant 40% responsible and the plaintiff 60%, how much does the plaintiff get? What if, instead, the defendant is 60% responsible?

29

Compensatory Damages – Property Damage

- In **both negligence and intentional tort cases**, a party may seek to recover compensatory damages for property damage. These damages can include:
 - Valuation Damages
 - Market Value
 - Replacement Value
 - Sentimental Value
 - Repair Damages
 - Loss-of-Use Damages

30

Damage Calculation Issues – Personal Property

- How to calculate sentimental value?
 - Similar to pain/anguish, the plaintiff offers testimony and the **finder of fact** decides what an appropriate and reasonable value would be.
 - Generally unavailable for common household goods or clothing.
 - Available on items such as heirlooms, rare items, or irreplaceable items such as pictures, etc.
- How to decide what measure to use out of market value, replacement value, or repair costs?
 - Generally, the lowest value that still makes the plaintiff **whole**, placing them back where they were before the tort happened.

31

- Imagine if I took this glass and smashed it against the wall while teaching a live class. The Omni Southpark scoops up all the pieces and sends them to a world-famous glass craftswoman in Florence, Italy. She reconstitutes the shards back into this glass, good as new.
- The Omni files suit against me for the cost of this service, \$8,500.
- Reasonable and fair? Why or why not? What is a better measure of damages?

32

Compensatory Damages – Personal Injury

- In **both negligence and intentional tort cases**, a party may seek to recover compensatory damages for personal injury. These damages can include:
 - Physical pain (past and future)
 - Mental anguish (past and future)
 - Disfigurement or physical impairment
 - Medical expenses
 - Loss of earning capacity
 - Loss of consortium (love & protection) – unlikely in justice court

33

Pain & Suffering / Mental Anguish?

Yes, you CAN award pain and suffering and/or mental anguish damages.

These damages are very difficult to accurately gauge and put a number on.

- Each **finder of fact (judge or jury)** may find a different answer on the same facts.

34

Pain & Suffering

The idea is to compensate the person for the pain they endured.

- Medical bills cover economic damages, but not the actual pain. In a personal injury situation, if the victim didn't get medical treatment, their only actual damages are the pain they suffered.

How to decide how much?

- How much would someone have to be paid to willingly endure the pain?
- You can look at the other damages in the case to get a feel for what the person endured (broken glasses, stitches, etc.)
- The person can testify as to the pain they suffered.

monoDrive

Autonomous Vehicle Verification, Validation, and Responsibility

Brad Null - monoDrive

Texas Justice Court Training Center Webinar

February 2nd, 2021

LIDAR and RADAR simulation

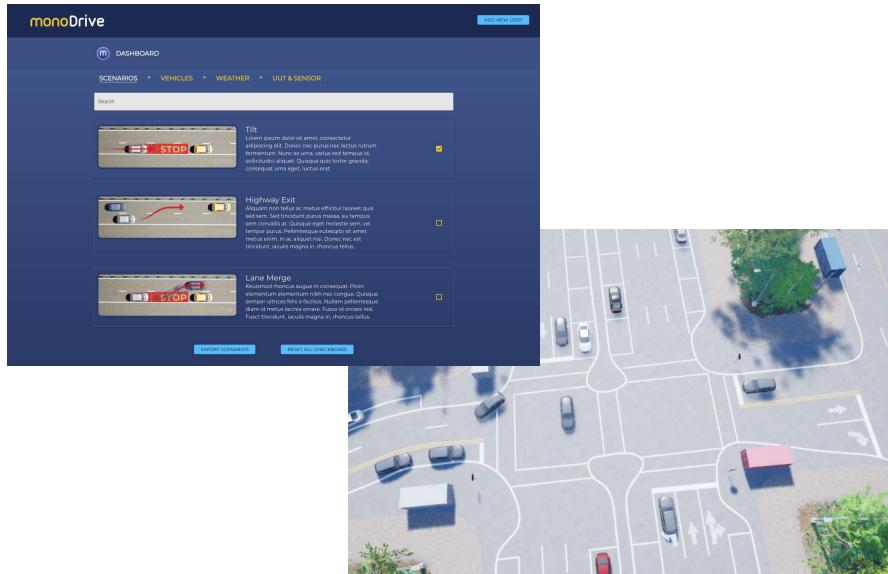
Road Sign Recognition

Object Recognition

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Introduction

- monoDrive Mission Statement: “Making autonomous driving safe” - monodrive.io
- monoDrive High Fidelity Simulation Software
 - Automating vehicle testing, validation, verification
 - Accelerating artificial intelligence algorithm development
- monoDrive Real-to-Virtual Hardware Kit - Real world data collection and conversion



Automated Vehicle Technologies

- Advanced Driver Assistance System (ADAS) - Aids driver by automating specific functions
 - Automatic Cruise Control (ACC), Automatic Emergency Braking (AEB), Lane Keep Assistance System (LKAS)
- Automated Driving System (ADS) - Capable of full autonomous driving
 - Waymo Taxi, Tesla Full Self Driving (FSD)



Levels of Autonomy

0

No Autonomy

Driver responsible for all vehicle operations - No Advanced Driver Assistance Systems (ADAS)

1

Driver Assistance

Requires driver's full attention - Some braking and accelerating or steering controlled by ADAS

2

Partial Automation

Requires driver's full attention - Braking, accelerating and steering controlled by ADAS

3

Conditional Automation

Conditionally does not require driver's attention - Automated Driving System (ADS) can take full control, but requires driver's readiness

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High Automation

Vehicle can perform all operations - ADS can operate vehicle without driver in **optimal** conditions. Driver can optionally control

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Full Automation

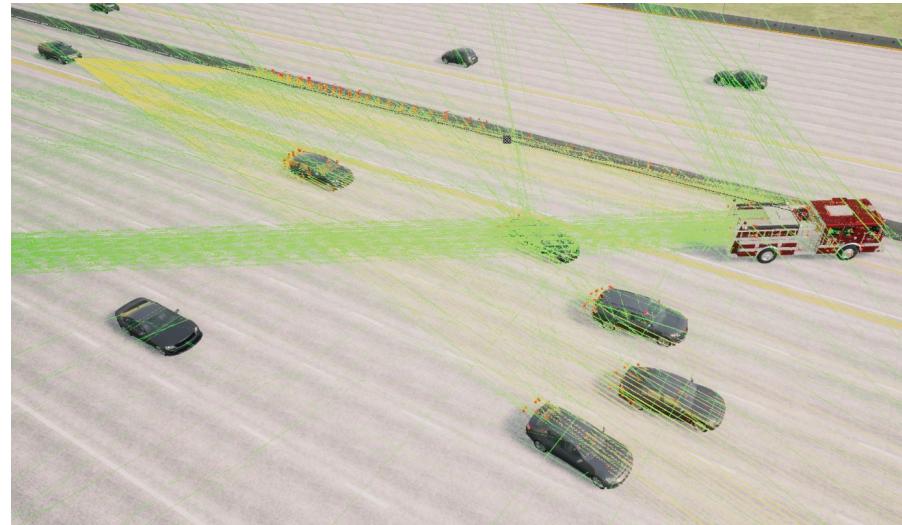
Vehicle can perform all operations - ADS can operate vehicle without driver in **all** conditions. Driver can optionally control

Autonomy

Driver's Responsibility

ADAS/ADS vs. Human Drivers

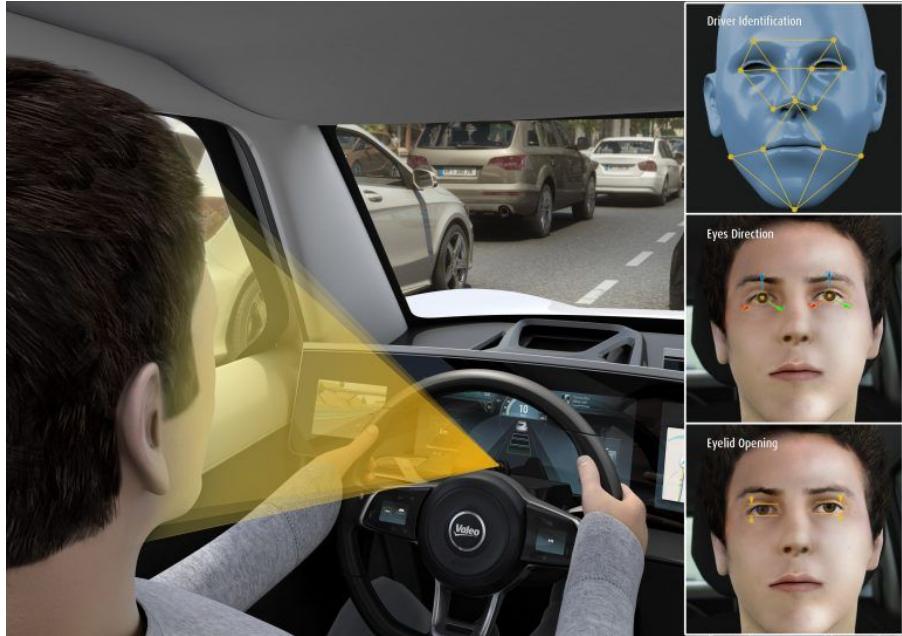
- Forward Collision Detection Source: National Safety Council
 - **50% reduction** in rear-end crashes
- Lane Keep Assist
 - **11% reduction** in side-swipe crashes
- Blind Spot Detection
 - **14% reduction** in lane-change crashes
- Backing Collision Avoidance
 - **78% reduction** in crashes while driving in reverse
- With these improvements in safety, trust in the system needs to be gauged



monoDrive Simulator's Sensor Tracing

ADAS Distracted Driving Mitigation

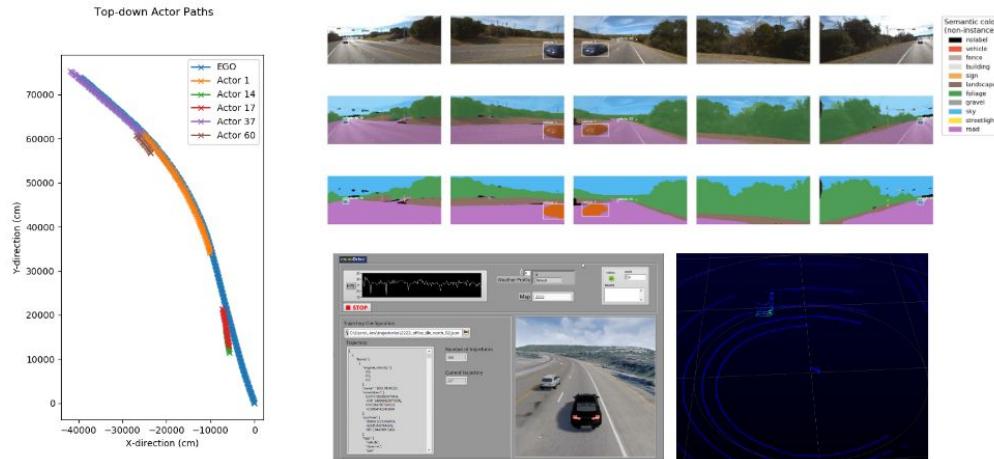
- ADAS features lead to increased likelihood of distracted driving
 - ADAS need to be up front with level of **trust** in the system
- Passive Driver Attention Monitoring
 - LKAS requires steering input at certain intervals
 - Braking and cruise control systems alert with beeping
- Active Driver Attention Monitoring
 - Facial feature detection for driver alertness



<https://www.valeo.com/en/driver-monitoring/>

AI Developer Responsibility

- Artificial Intelligence Algorithms can be “black box” and difficult to debug
 - Ample data necessary to adequately train algorithms
- AI Developers rely on **real-world data**
 - Data can be sparse, young companies can rely on small data sets
- Maintaining and improving data for training is imperative
 - No industry-wide way for validating models and performance
 - Lots of innovation here
- Models must be **tested** for efficacy
 - Real-world performance assessment is necessary
 - Simulation performance accelerates this validation



monoDrive Software Suite Validating AI Model Performance

Vehicle Manufacturer Responsibility

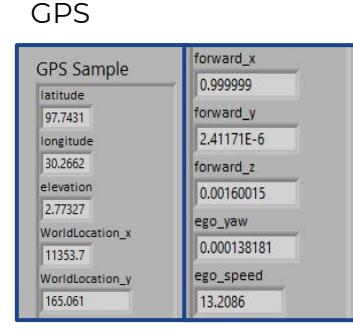
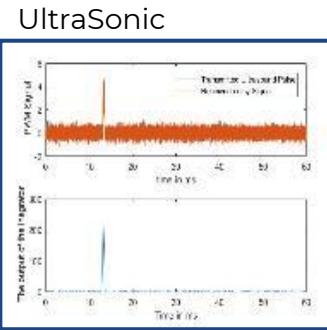
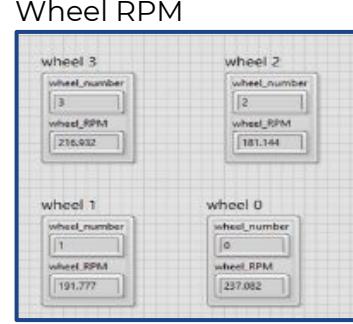
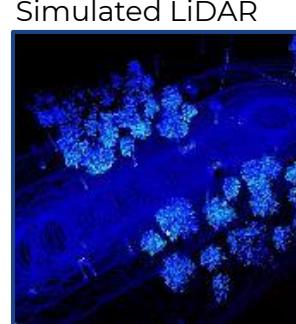
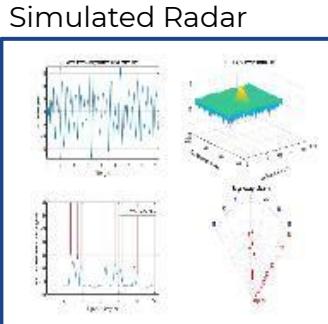
- Many **established car makers** are moving slowly into autonomous vehicle space
 - ADAS is primary focus
 - ADS always seems 5 to 10 years away
 - Rely heavily on “Tier 1” suppliers to provide sensors and automation
- **Tesla** is an exception to most car makers
 - Building much of the autonomy from the ground-up
- Is the responsibility for ADAS, ADS performance on the integrator (i.e. the car maker) or the component supplier?



<https://www.forbes.com/sites/bradtempleton/2020/10/23/teslas-full-self-driving-is-999-there-just-1000-times-further-to-go/?sh=442024032ba6>

Tier 1 Supplier Responsibility

- Tier 1 suppliers provide integrators with **sensors** for autonomy
 - Radar, LiDAR, GPS, etc.
 - Sensors can provide raw **data** to integrator
- Some Tier 1 suppliers are moving towards **autonomy out-of-the-box**
 - Integrated ADAS and even ADS (Tesla Full Self Driving as a service)
 - Algorithm performance embedded into devices
- Do ADAS and ADS failures trace back to sensor suppliers performance analysis?



Samples from some of monoDrive's Simulated Sensor Suite

Verification and Validation

- Artificial Intelligence independent **verification and validation of algorithms**
 - Verifying model performance continuously
 - Validating performance after new algorithms and data are added
- Real-world testing
 - **European New Car Assessment Programme** for standardizing testing of ADAS and ADS performance
- Batch automated **simulation testing** for continuous performance assessment
 - Far less expensive than real-world testing
 - Repeatable
 - Scalable

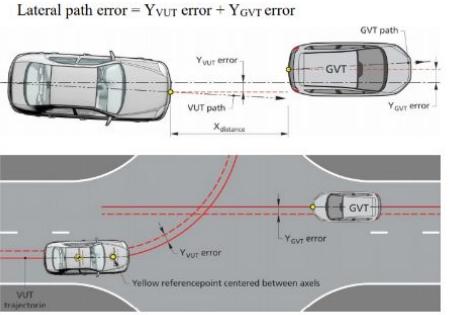


Figure 3-2: Lateral path error

European New Car Assessment Programme
<https://cdn.euroncap.com/media/53188/euro-ncap-s-first-step-towards-scenario-based-assessment-by-combining-aeb-and-aes.pdf>

monoDrive Scenario Batch Manager

Future of Autonomy

- Full self driving seems right around the corner
 - The corner is always going to be 5 to 10 years away
 - Need ways of **incrementally improving**
- Vehicle ownership may become a thing of the past
 - Vehicle's as a service (Uber, Waymo, Lyft)
- Autonomous delivery services
 - Likely much closer than passenger cars



<https://nuro.ai/product>