[Barriers to adoption of autonomous vehicles](https://www.sciencedirect.com/science/article/pii/S2405844023031821)

* Far from perfect: Fatal crashes with tesla autopilot and uber systems
* Unregulated: Need to develop legislation
* Cargo transportation applications 🡪 level 3 in 2020, level 4 by 2025, level 5 by 2027
  + Level 3 = Can make informed decisions but still require human control
  + Level 4 = Can intervene if things go wrong, basically never require human control
  + Level 5 = fully autonomous. Need zero human control, can drive anywhere no matter the road conditions
  + <https://www.synopsys.com/automotive/autonomous-driving-levels.html>
* Benefits
  + Elders and disabled people – people incapable of driving
  + Lowers traffic congestion
  + Decreases energy/fossil fuel consumption
  + Economic: less accidents, less traffic, people get places faster
  + Correct human errors to reduce crashes – socially responsible action
  + Low income access to transportation – vehicle sharing programs
* Concerns:
  + liability, security, privacy
  + Job replacement: RIP uber and taxis, cargo transportation companies (truck drivers)
* Barriers to implementation:
  + Social
    - Taking jobs from drivers
    - Social inequity (high market entry price for new tech)
    - Low awareness of the advantages of AV’s
    - Learning curve
    - Safety – AV caused crashes/failures (AV’s aren’t perfect)
    - Safety – pedestrians putting their lives in the hands of an AI, fear of AV driving poorly/hitting pedestrian/hitting a car
    - Trust – user’s trust that the AV will operate safely
  + Economic
    - Effect of AV adoption on GDP
    - Price difference between AVs and “normal” vehicles
    - Establishment of infrastructure is expensive
    - New product development cost for manufacturers
  + Environmental
    - If AVs need to have an internet connection, significantly larger amount of radiowaves, increased RF pollution
    - Mass electronics waste and recycling – i.e. tesla battery recycling problem
    - Increasing greenhouse emissions – AV transportation becomes easier, more accessible, and faster: people are less inclined to walk or bike
  + Developing countries-related
    - Infrastructural restrictions
    - Low purchasing power and affordability

Major barriers ranked by experts

1. Inflation Rate
   1. Potential solution: government actions to regulate value of currency
2. Internet bandwidth
   1. Potential solution: develop more robust 5G infrastructure
3. Learning curve
4. Monetary investment from government
5. Price difference between AV’s and conventional vehicles
   1. Potential solution: government regulating prices
6. Infrastructure development time and cost
7. Fear of unsafe interaction with other AVs, conventional vehicles, and people

Growth and adoption:

* Early majority
  + Most new cars have some level of autonomous features such as lane keep assist and adaptive cruise control
  + Vehicles from manufacturers like Tesla are being adopted rapidly. Production has increased exponentially in recent years ([source](https://tridenstechnology.com/tesla-sales-statistics/#:~:text=Year-,Production,-2018)).
  + Moral dilemma: There is hesitation by the public to let a computer take complete control of the vehicle
    - Trolley problem: “adapting societal expectations to moral decision-making driving algorithms” ([source](https://www.tandfonline.com/doi/full/10.1080/01441647.2020.1862355))
    - Very few black and white decisions for the AV to make
    - Where is the line? Not everyone agrees on the correct decision
  + Accountability:
    - Can the AI be held accountable for a roadway accident
    - The manufacturer? The driver?
    - What are the standards