

Automotive Applications of Artificial Intelligence

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Topics

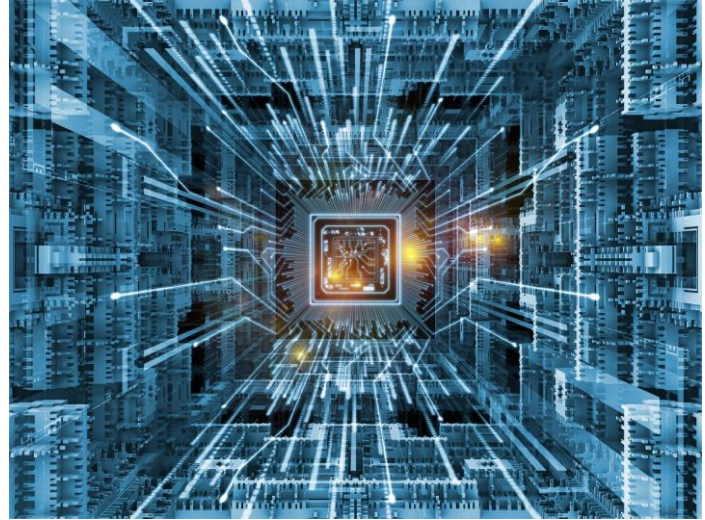
- › **Essential Background**
- › **Acceleration of AI Breakthroughs**
- › **Impact of AI at Continental**
 - › Importance, Scope, Examples
- › **The Road Ahead**
 - › Timelines and Transformation
- › **Key Takeaways**



Essential Background on Artificial Intelligence

What makes it different?

- › **AI** is concerned with creating methods for machines to perceive and reason at “human level” of competence
- › A machine is only as smart as the knowledge it has, and how it uses that knowledge to solve hard problems – usually in very limited domains
- › AI depends on different kind of software: pattern-directed, not sequential. Machine learning accelerates pattern recognition, especially for perception.
- › **AI has met or exceeded human performance on many tasks that even trained experts find difficult**



Artificial Intelligence: Waves of Applications

- › AI research has been making mostly quiet and steady progress since the 1950's
- › **1st Wave:** Breakthroughs in knowledge-based systems; first large scale applications ('90s)
- › **2nd Wave:** Accelerating progress in robotics, natural language, reasoning ('00s)
- › **3rd Wave:** Breakthroughs in autonomous robotics, machine learning, and more ('10s -)

Machines are beginning to sense and perceive (“see”, “hear”)
They know how their actions change things (“grounded in the world”)

=> Enables application of numerous mature AI reasoning techniques

AI Technology at Continental

- › **Computer vision** and **machine learning** methods are moving quickly into products
- › Innovations presented at the Frankfurt IAA auto show, Conti Innovation Showcase at Brimley, MI and at CES in January
- › Much more technology is in the pipeline! AI expertise and the number of internal applications of AI at Continental is growing
- › **AI is learning to see the world for driving**
- › **AI is learning to interact with the driver**



CUBE: Continental's Autonomous Urban Mobility Concept Vehicle

AI Impact: Automated Driving & Driver Assist Products

Computer Vision and Machine Learning

Cruising Chauffeur

› New Autonomous Maneuvers

- › Minimal Risk Maneuver
Interchange Navigation & Transit

Smart Cruise Control

› Adapts to Driver Style & Conditions

- › Automatically adjusts following distance based on traffic and driver preferences



AI Impact: Driver Interaction and Security

Computer Vision and Machine Learning

Personalization

› Face & Biometrics Recognition

- › Automatically adjusts vehicle settings;
Extra level of security before starting

Non-Verbal Interaction

› Gesture & Gaze Target Recognition

- › For vehicle commanding; drowsiness
detection; many possible applications



The Importance of AI Technology at Continental

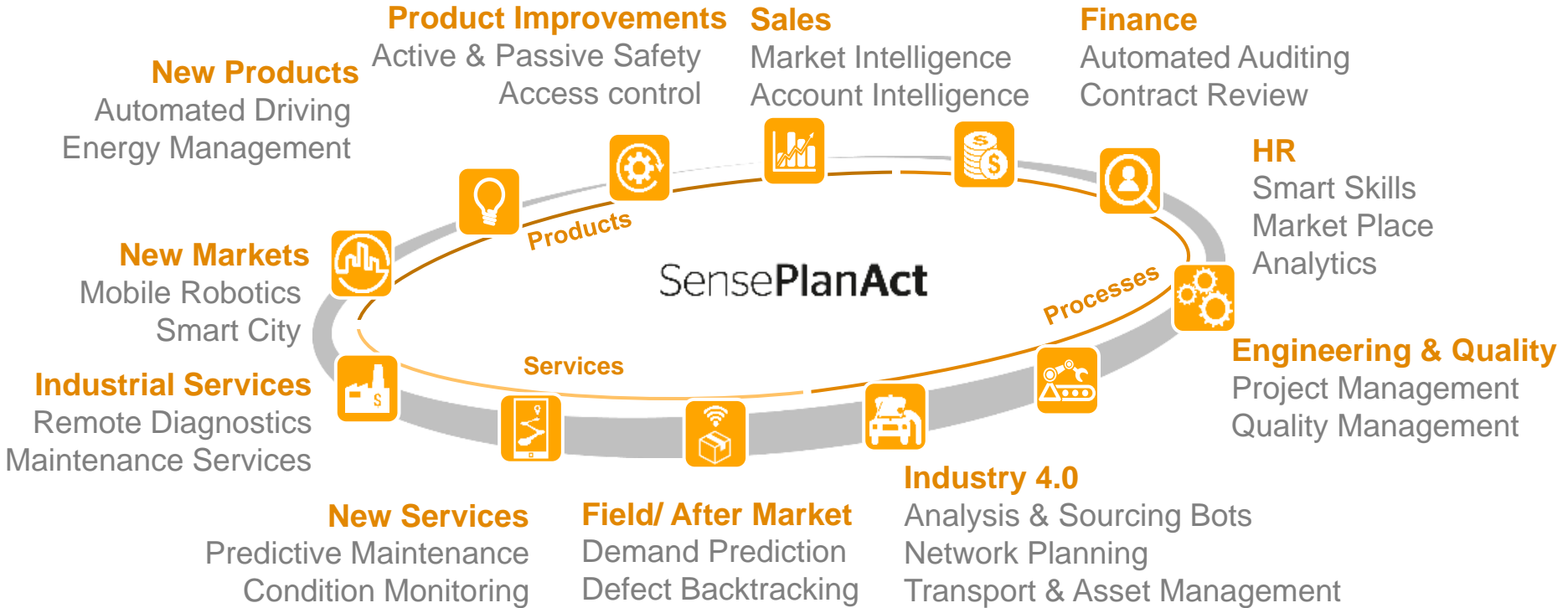
- › Contributes to achieving our #1 goal of no accidents, **VISION:Zero**
- › Enhances our traditional competencies and improves processes
- › Improves and extends our existing products
- › Enables new products and services
- › Extends our reach into adjacent markets



Artificial Intelligence at Continental is Growing

- › 22 different organizations with active interest and requirements for AI
- › 34 locations have AI expertise and are growing
- › A corporate-level AI & Robotics group accelerates AI innovation:
 - › Fosters cross-Division collaboration
 - › Elicits and helps evolve the requirements for AI from the Business Units
 - › Enhances the breadth, depth, and availability of AI expertise
 - › Promotes AI software reuse, methodologies, and shared tools

Vision: Impact of AI Spans the Continental Enterprise



The Road Ahead

**“Prediction is very difficult,
especially about the future.”**

- Niels Bohr, Danish physicist (1885 – 1962)



Timelines for AI Impact on Automotive & Transportation

- › **NEAR TERM:** A steady stream of embedded AI applications; increasing use of mature AI technology to augment existing product line
- › **MID TERM:** Routine use of L5 vehicles for urban commercial transportation (safety driver); L4 capabilities broadly available in new vehicles; Industry and company processes are transforming; emergence of new products
- › **LONGER TERM:** Wide variety of novel, on-demand mobility options for people, goods and services; human-driven cars become largely absent in dense, urban areas; the “SmartCity” optimizes traffic management

It is easy to overestimate the near term impact of a new technology and to underestimate the long term impact

LIMITING FACTORS FOR ADOPTION OF AI

- › Skill set availability
- › Legacy products, processes
- › Real and perceived risks
- › Trust and Safety
- › Rules and Regulations
- › Culture and values

Transformative Potential of Intelligent Vehicles

Internet and Smart Phone

- › All of the world's knowledge available to anyone, anywhere instantly in the palm of the hand
- › Instant communication with anyone, any where, any time
- › Buy and sell almost anything online and have it delivered to any address
- › Highly personalized device that contains your most private information
- › Internet connectivity is a social service



Internet and Intelligent Vehicles

- › Reachable experiences available to anyone based on convenient, inexpensive mobility
- › Pick up and transport almost anything, automatically, on only a few minutes demand
- › Stores and services come to you
- › Vehicles recognize you, know how to make you comfortable, and take you to favorite places
- › Mobility becomes a social service

Key Takeaways

- › AI and other technologies are converging to enable powerful and valuable new applications that people want and will help achieve social goals such as safety
- › All commercial and social sectors will be transformed on a scale equal to or greater than the changes from the Internet and smartphones
- › The automotive sector will have many new business opportunities to be captured by companies that are smart, agile, adaptable, and quick to weather disruptions
- › Continental is well positioned to understand and rapidly adopt new technologies, such as Artificial Intelligence, for innovative new products and services and to do so with the same rigor in engineering for quality and safety that is a foundation of our reputation today

THANK YOU!

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