

Speaker Bio

With a PhD in statistical astrophysics, David J. Corliss is a Data Science leader in the automotive industry with a focus on emerging technology and building high-performing analytic teams. He leads a team of data scientists at OnStar Insurance, part of General Motors Financial.

Corliss serves on the Data User Advisory Committee of the U.S. Bureau of Labor Statistics, chaired the 2022vConference on Statistical Practice from the American Statistical Association (ASA), and is the author of “Stats4Good,” a monthly column for the ASA’s Amstat News.

Dr. Corliss is also the founder of Peace-Work, a volunteer cooperative of statisticians and data scientists applying statistical methods to support community service organizations and data-driven advocacy.



Machine Learning for Industry: The Road to Success

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Great Lakes Data and Analytics Summit
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Machine Learning for Industry: The Road to Success

1. Benefits of AI and ML: Top Use Cases
2. Understanding the Technology
3. Culture and Governance
4. Driving Adoption of ML and AI
5. Keys to Success

Benefits of AI and ML: Top Use Cases

Great Lakes Data and Analytics Summit

Smart Processes with ML and AI can...



Lower Cost



Increase Efficiency



Detect Defects



Reduce Downtime



Predict Maintenance

Top ML / AI Use Cases: **Classification**

- **Overview:** identifies a set of characteristics for dividing records into groups, with the members of each group similar to each other
- **Applications:** defect detection, identifying skill level of employees
- **Advantages:** based on previous measured outcomes with little human bias, supervised or unsupervised
- **Potential Pitfalls:** Rare outcomes need a lot of records to identify, often works best in tandem with human action, should be updated as conditions change

Top ML / AI Use Cases: Classification

Classification Example: Defect Detection

AI defect detection system UVeye launched in February 2020

In a photo tunnel, ML screens the image for defects in real time, human follow-up

Originally developed in Israel to detect security threats on vehicles

This particular solution adopted by Volvo, Honda, Toyota, Daimler, Skoda



Photo Credit: Media.volvocars.com

Top ML / AI Use Cases: **Regression**

- **Overview:** identifies a set of characteristics that predict a result and calculates an estimate for the predicted value
- **Applications:** defect root cause, machine performance, stock management
- **Advantages:** well-established and reliable, known by pretty much all data scientists, many different applications are now in use
- **Potential Pitfalls:** good for a quick start but more advanced methods often work better, includes some assumptions restricting where it can be used

Top ML / AI Use Cases: Regression

Regression Example: Cause of Failure

BASF Polyurethane dashboard skin – model predicts adhesion to substrate

Material, plant, and other data used to developed model predicting failure rate

Key factor in part failure was found to be humidity: too high => less adhesion

Implemented by major supplier for an OEM – in this case, BASF for Ford



Photo Credit: David J Corliss

Top ML / AI Use Cases: **Optimization**

- **Overview:** maps out all possible permutations of a process and measures each one to find the most efficient
- **Applications:** increasing production line efficiency, reducing manufacturing cycle time and material cost, supply chain optimization
- **Advantages:** Optimization problems can be very difficult to solve without advanced analytics methods
- **Potential Pitfalls:** needs a lot of time and computer resources, sometimes finds a good but not very best solution, few data scientists know it well

Top ML / AI Use Cases: Optimization

Optimization Example: Paint Shop Scheduling

Schedules vehicles going through paint shop to minimize environmental impact

Defines an Objective Function for every schedule subject to a set of constraints to find an optimal solution

Developed by university professor for new environmental regulations in China

Published in an open-source journal



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Top ML / AI Use Cases: **Neural Networks and Deep Learning**

- **Overview:** computer algorithms pass data through layers of decision-making cells that mimic human neurons; Deep Learning uses more layers
- **Applications:** many applications in predictive analytics, especially complex systems, multiple sensors, text analysis, and recommendation engines
- **Advantages:** works well for difficult predictions and often used to improve existing models, good for big data
- **Potential Pitfalls:** model results can be hard to understand or explain, can be subject to hidden biases – these can result in concerns from

Top ML / AI Use Cases: Neural Networks and Deep Learning

Neural Network Example: Logistics Robots

BMW Partnered with Nvidia to develop logistics robots for Just In Time application

Neural Net enables robots to know when to get more parts, sort them, and navigate the plant to delivery, reducing line down time

These bots trained by ML are autonomous vehicles running inside the plant



BMW / Nvidia Smart Transport Robot Photo Credit: Nvidia

Understanding the Technology: Overcoming Challenges and Avoiding Common Failures

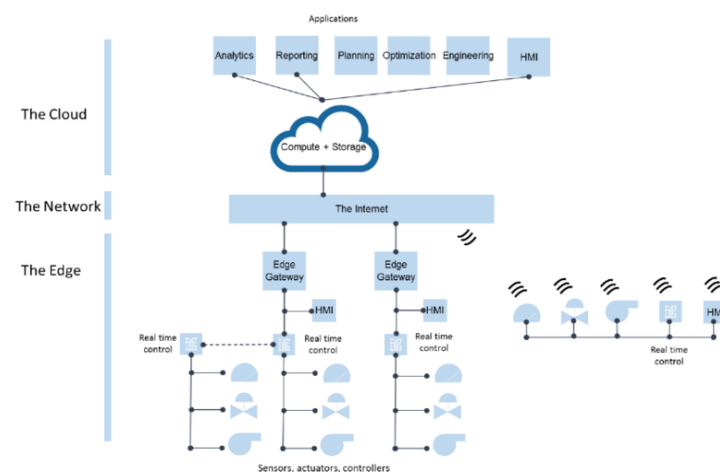
Understanding the Technology: Overcoming Challenges and Avoiding Common Failures

An Interconnected World

For a manufacturing operation to work, the people, the part, and the machine need to come together



Photo Credit: Nissan



Paul McLaughlin, Rohan McAdam, CC BY-SA 4.0

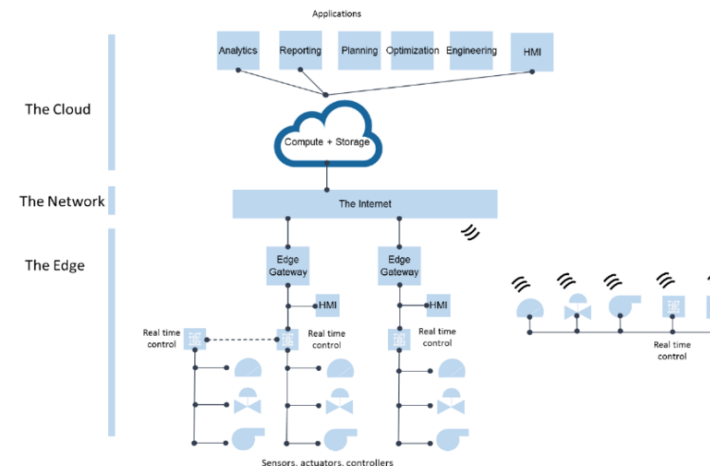
ML and AI needs constant connection between all three

=> Strong communication infrastructure is required

Understanding the Technology: Overcoming Challenges and Avoiding Common Failures

Cyber Security Risks

An interconnected world creates opportunities for intrusion



Some recent ransomware victims



RENAULT



Security issues to address include

proprietary information, data breaches, internal security, air gap, ransomware, restoration time

=> Consult an expert in cyber security, check suppliers

Understanding the Technology: Overcoming Challenges and Avoiding Common Failures

The Challenge of Constant Change

The speed of change continues to increase



Algorithm improvements are released constantly... with new software updates and machines capable of learning, operations can change every day

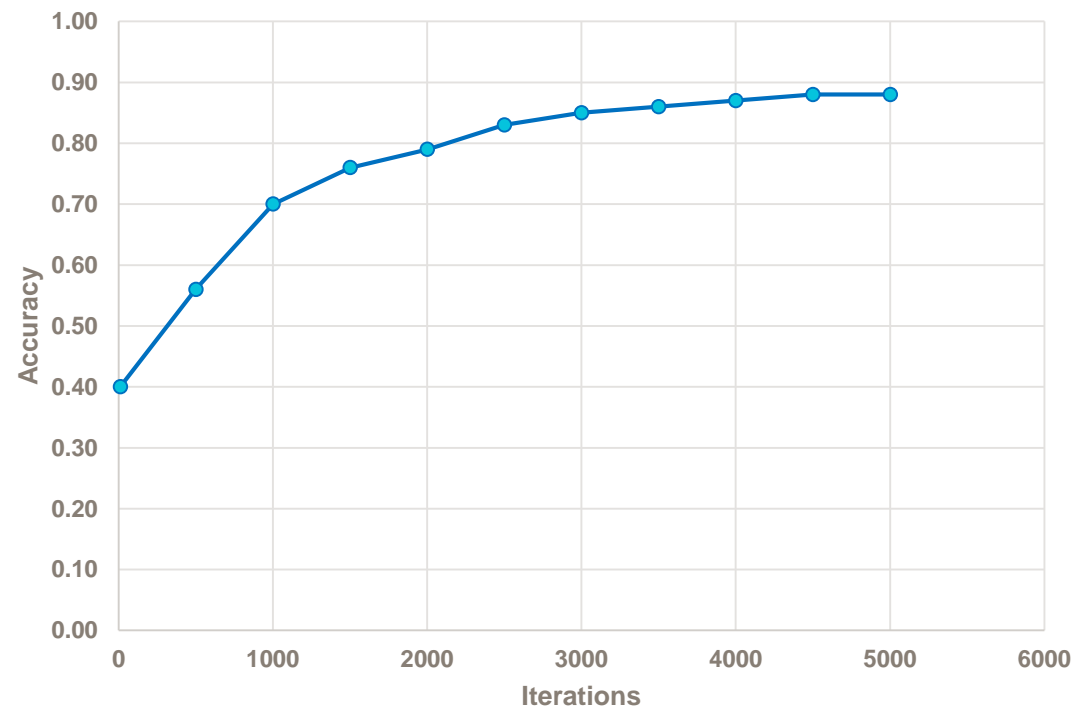
=> Flexible infrastructure needed to support rapid change

Understanding the Technology: Overcoming Challenges and Avoiding Common Failures

Overcoming the Technological Challenges

Guiding Principle: Change as a Way of Life

ML Algorithm Learning Curve



To meet the challenges of implementing ML and AI to their greatest benefit, we must learn to learn and change like the algorithms do: every single day!

Culture and Governance: Developing an AI Mindset

Culture and Governance: Developing an AI Mindset

CI/CD: A New Paradigm

AI and Machine Learning are more than a technology

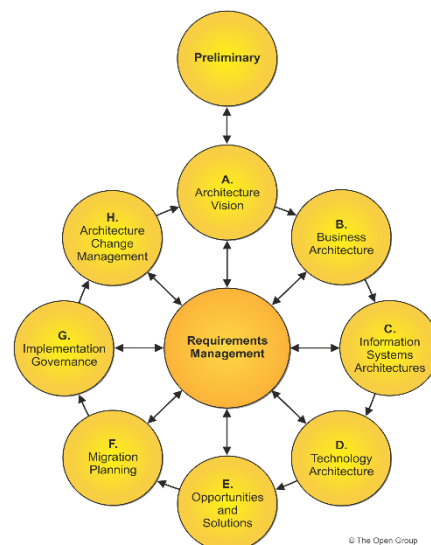


Image Credit: The Open Group



Image Credit: Curtis Palmer / 2.0 Generic (CC BY 2.0)

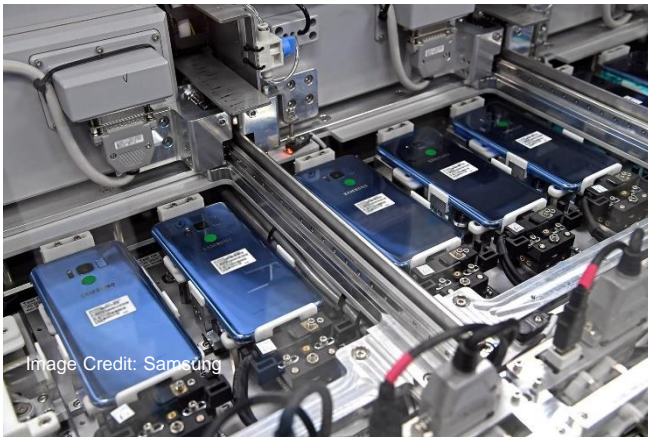
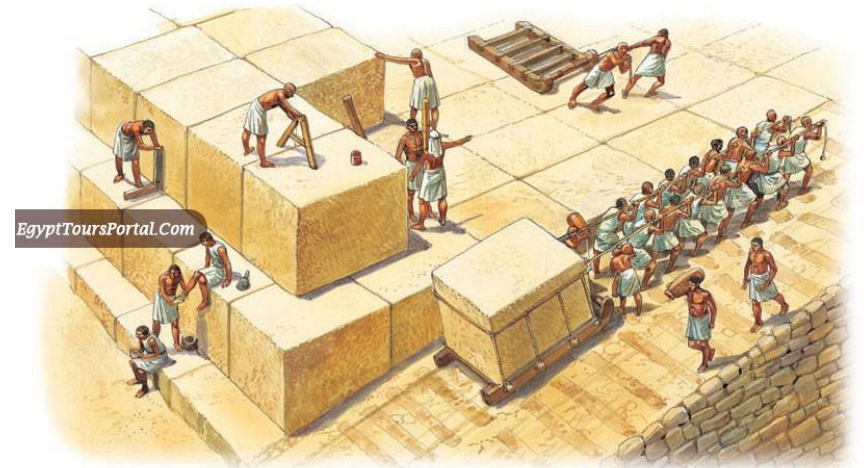
It's also a mindset, an iterative process for problem solving and development

=> An ML / AI mindset includes Continuous Integration / Continuous Delivery

Culture and Governance: Developing an AI Mindset

Work Culture

Traditional Processes: manual, little technology, resistant to change



Modern Processes: automated, latest technology, embracing change

=> Successful use of ML and AI is as much cultural as technical

Culture and Governance: Developing an AI Mindset

Culture: Developing an AI Mindset

Guiding Principle: Continuous Evolution

To Do

Week of June 6

- Deploy and validate v4.6
- Test v4.7
- Develop v4.8
- Create MVP v.9
- Technical req's v4.10
- Business Req's v4.11

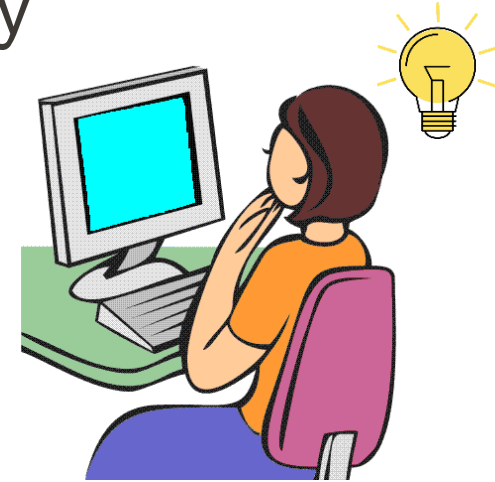
***Machine Learning and AI
thrive best under an agile
paradigm of constant
incremental change***

Driving the Adoption of ML and AI Throughout the Organization

Driving Adoption of ML and AI Throughout the Organization

Advancing the Technology

Start small by selecting a few good Proof of Concept projects



It's also a mindset, an iterative process for problem solving and development

=> Commit to do something each week to evolve towards greater understanding and usage of ML and AI

Driving the Adoption of ML and AI Throughout the Organization

Driving Acceptance

Find Champions to secure executive buy-in and drive adoption among their peers



Align performance reviews and rewards with learning and production implementation of ML and AI

**=> Strive to make ML and AI *normative*
- an ordinary part of everything you do**

Driving the Adoption of ML and AI Throughout the Organization

Driving Adoption of ML and AI

Guiding Principle: Trust Leads the Way



[Un ragazzo chiamato Bi](#) - CC BY-SA 2.0

ML and AI don't need to be perfect: they need to be better than a person doing the same job.

Adoption moves at the speed of trust

Keys to Success

Driving the Adoption of ML and AI Throughout the Organization

Keys to success with AI and ML in Automotive Manufacturing

Guiding Principle: AI is a faithful servant but a terrible master



Data Driven



Make ML and AI work for you, not the other way around. Stay flexible and embrace a culture of constant change in the quest for excellence!

Questions

Thank you.



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