PHM18
Philadelphia, Pensylvenia
Sept. 24 – 28, 2018

PHM Applications Deployment

PHM18

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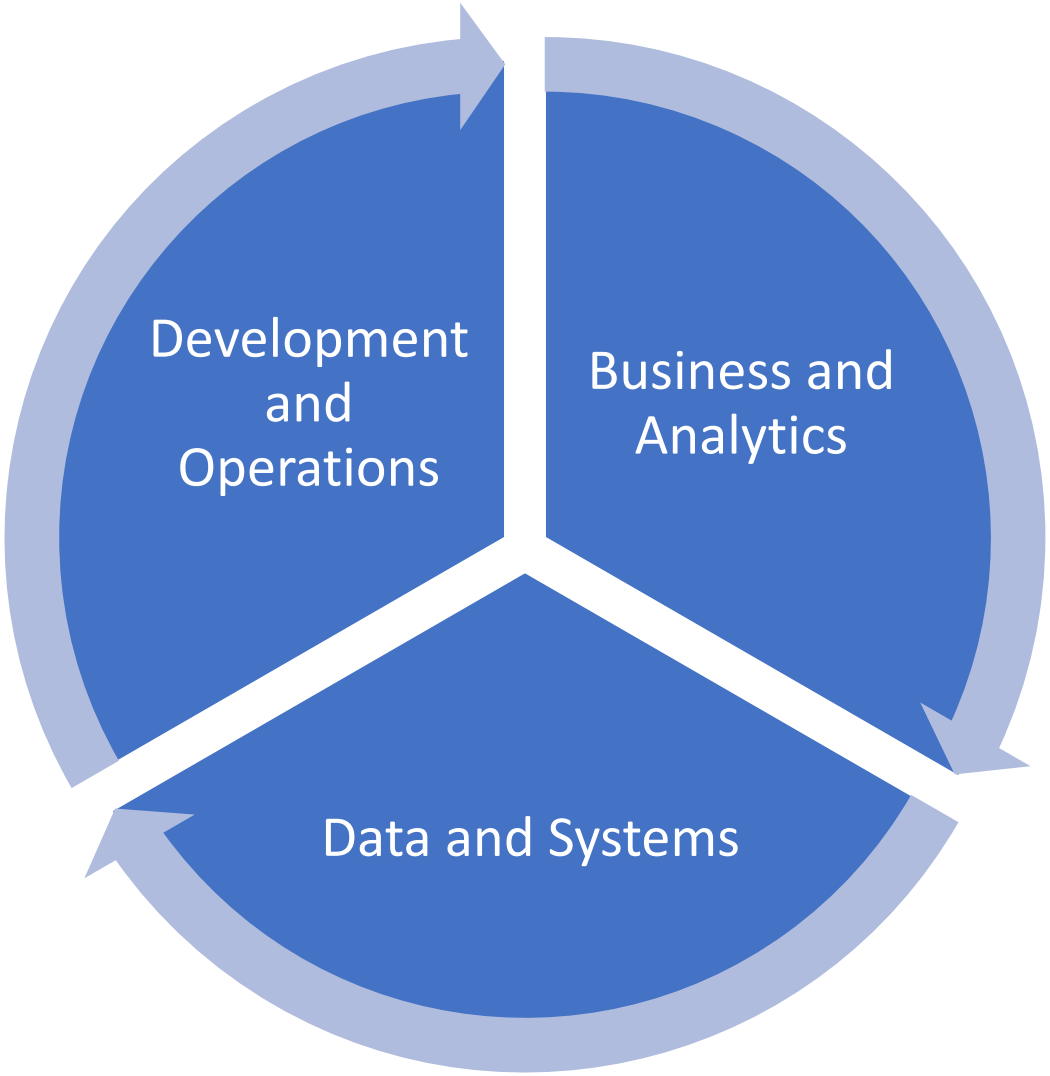

System approach for PHM applications deployment

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Topics to discuss:

- Environment for Remote Monitoring and Diagnostic
- Feedback-loops build into applications
- Alert scenarios – with or w/o human intervention
- Cycle time – implementation time
- Monitoring and manageing sets of models at the production-level

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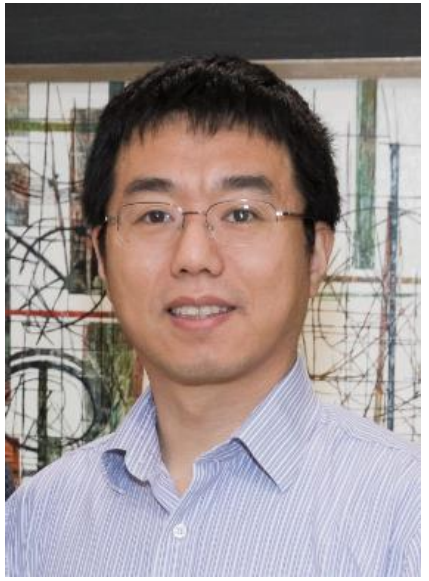
Panelists:

- **Xinyu Du**, Senior Researcher Vehicle Health Management Group, General Motors Global R&D
- **Kathy Elliott**, Performance Capability Manager, Defense at Rolls-Royce
- **Jayant SEN GUPTA**, Data Science Research Project Leader @ Airbus Central R&T, Airbus
- **Adam McElhinney**, Vice President Data Science, Uptake
- **Sven Pörschmann**, Manager Analytics & Data Solutions, Lufthansa Technik AG
- **Glen Shaffer**, Executive Manager Global Services Organization-Prognostics, GE Transportation

PHM Applications Deployment Panel

- Xinyu Du

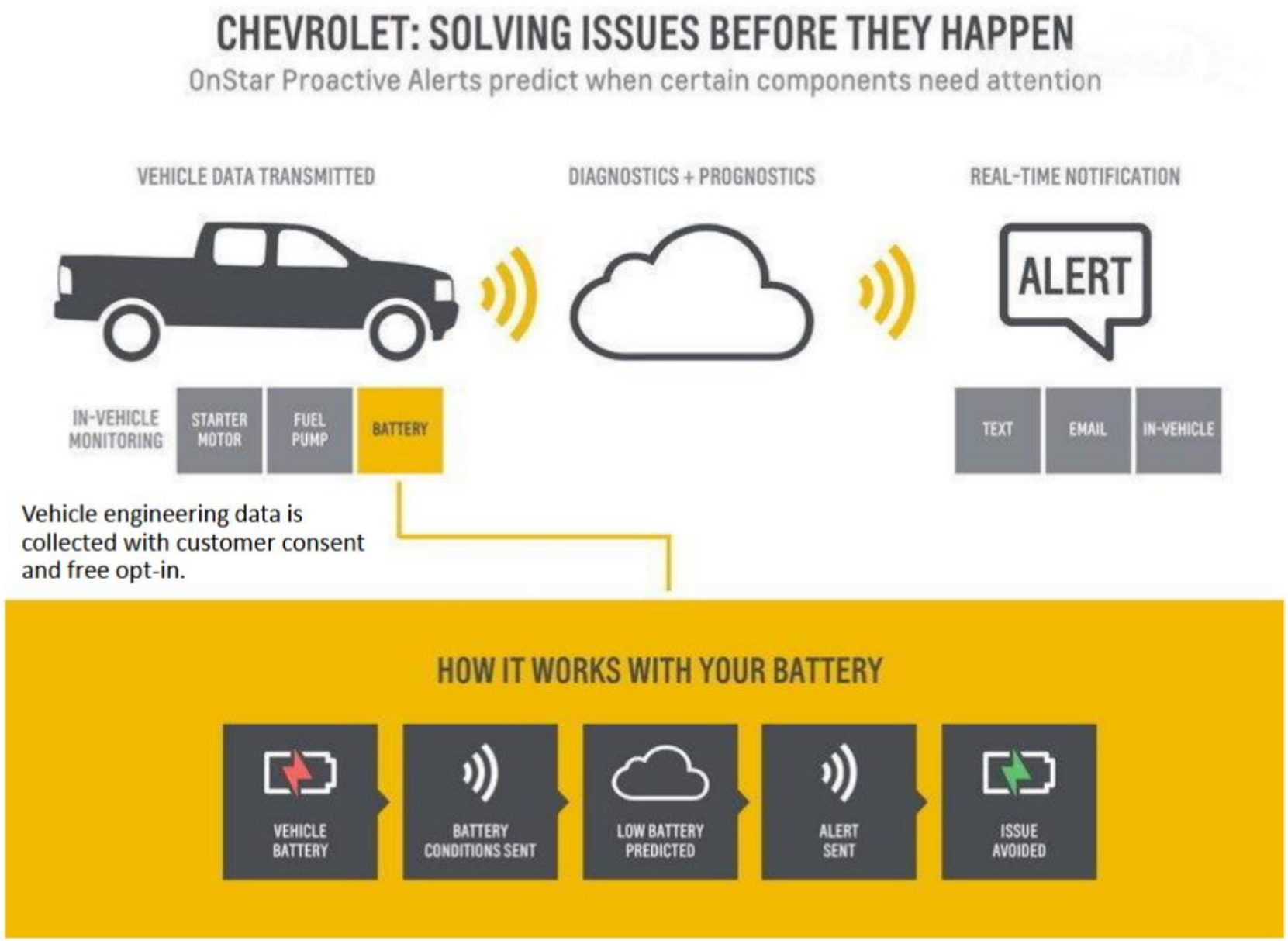
Xinyu Du



- Senior Researcher at Vehicle Health Management Group, Vehicle Systems Research Lab, General Motors Global R&D
- Have 36 Patents (Applications), 7 GM Internal Inventions and 35 Publications
- Experiences in Automotive PHM: Battery, Starter, Controller Area Network, Electronic Control Unit, Brake, Steering and Suspension System.
- The Boss Kettering Award Recipient from General Motors (2015) and INFORMs award (2016) for his contribution in Integrated Starting System Prognosis.
- Associate Editor for *IEEE Access* and *Journal of Intelligent and Fuzzy Systems*
- Ph.D. in Electrical Engineering from Wayne State University, USA

OnStar Proactive Alert Service

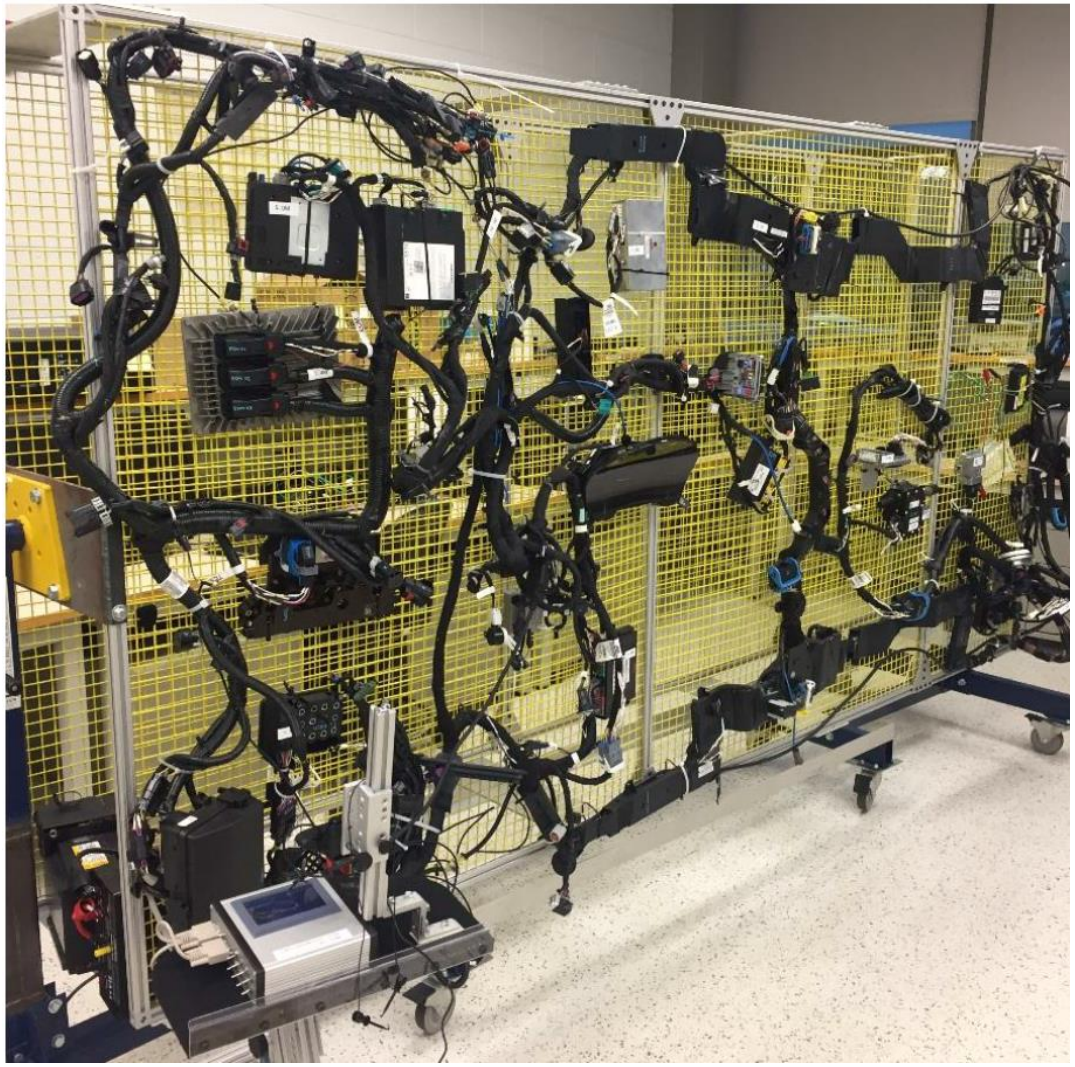
Big data is the key to verify the PHM application and validate the deployment



ECU Network Diagnostics and Prognostics

1. ECU Lost Fault Detection
2. Wire Open Detection (*When*)
3. Wire Open Localization (*Where*)
4. Wire Open Isolation (Which)
5. Wire Short Detection/Isolation
6. ECU Floating Ground Detection/Localization
7. ECU Ground Offset Detection/Localization/Prognostics
8. CAN Reversed Wire Detection/Isolation/Localization
9. Two-Terminators Loss Isolation

Good hardware-in-the-loop (HIL) bench and thorough Design Failure Mode and Effect Analysis (DFMEA) are important to reduce the verification time.



Kathryn Elliott
Performance Capability Manager, Defense Sector
Rolls-Royce Corporation

- 30+ years gas turbine engine OEM experience (System Performance)
- Global Lead SME for In-Service Performance
- Chair, SAE E-32 Aerospace Propulsion Systems Health Management Standards Committee
- EHM Capability Development for Corporate, Regional, & Unmanned Applications

Kathryn Elliott
Performance Capability Manager, Defense Sector
Rolls-Royce Corporation

Regional Airlines
1600 Engines in Service
60+ Million Flight Hours
70 Operators
Embraer E-135/140/145

Business/Private Jet
1400 Engines in Service
10 Million Flight Hours
450 Operators
Embraer 650 Legacy, Legacy+
Cessna Citation X, Citation TEN

Military UAV
1 operator
Northrup Grumman Global Hawk

PHM Applications Deployment

Jayant SEN GUPTA (Airbus)

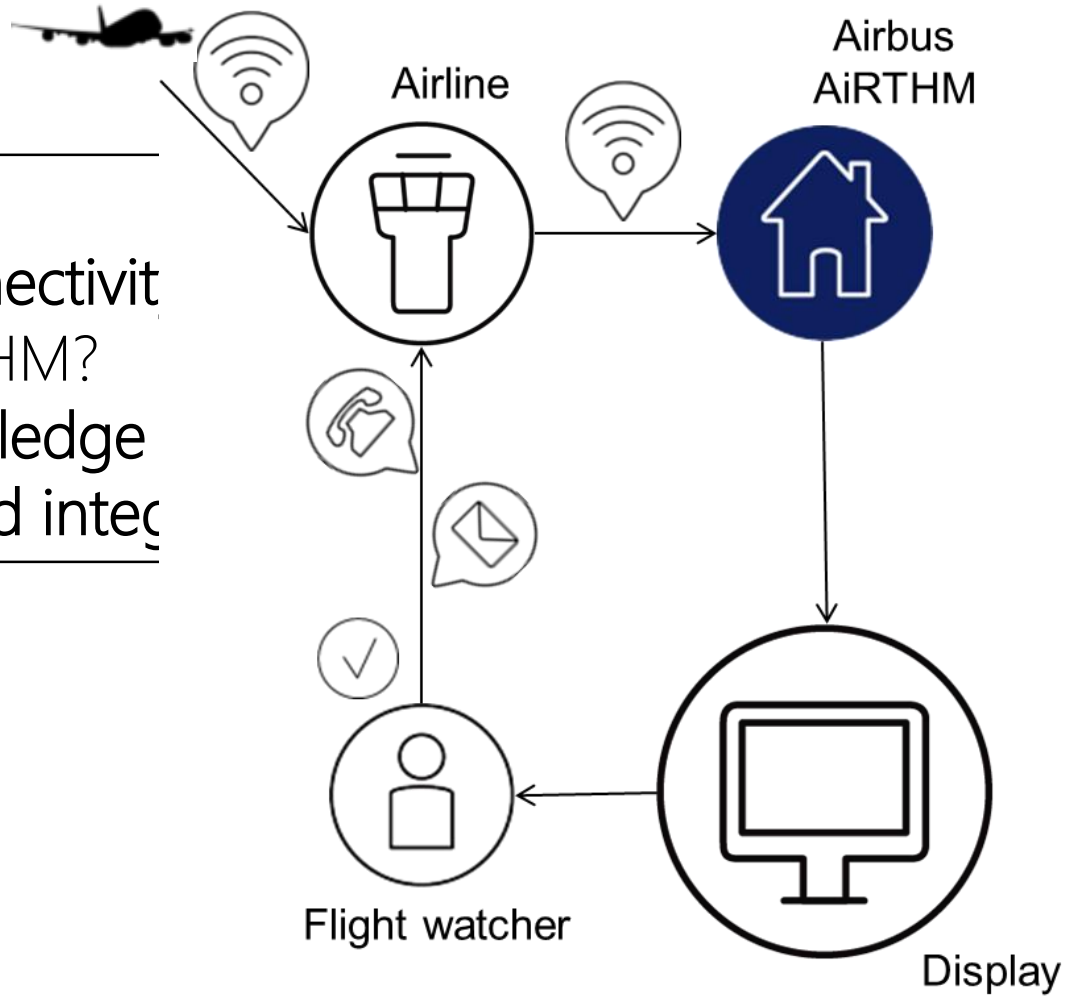
Personal involvement in PHM

- Education
  - MSc. Ecole Polytechnique
    - PhD ENS Cachan (computational mechanics)
- Research activities
  - Formalization of PHM
  - What method/algorithm depending on available information?
  - Development of a prognostics module (OSA-CBM)
  - Methods to define health indicators (mostly data-driven)
- Business activities
  - Integration of prognostics module into PHM service
  - Organization of transverse teams to operate, improve such service
  - Contribution to development of analysis tools used in service

PHM deployment for a fleet of aircraft

Aircraft design

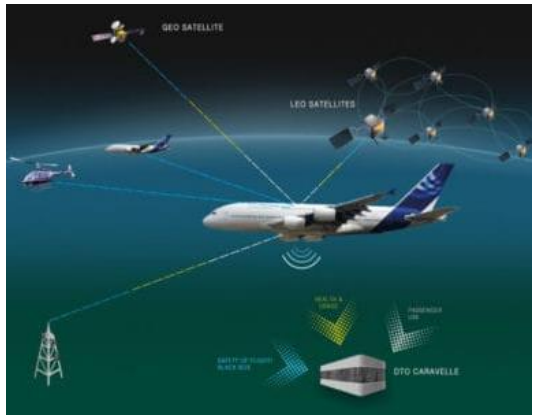
- Put sensors?
- Prepare connectivit
- Design for PHM?
- System knowledge
- Flight test and integ



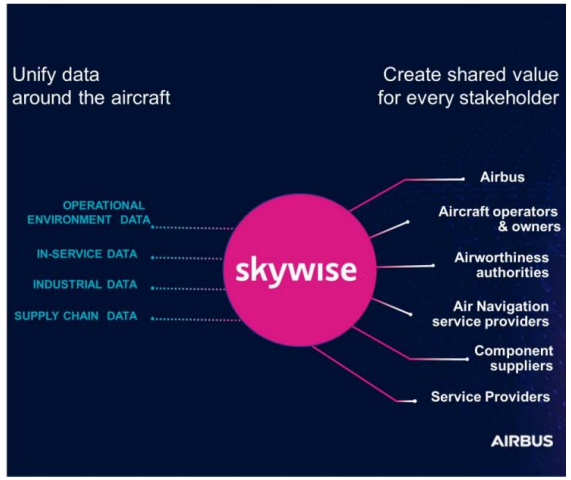
Aircraft operations

- Collect data (sensors, missions, e maintenance logs…)
- Learn from data
  - Investigate problems
  - Define normal behaviours
  - Aggregation levels?
- Capture knowledge
- Provide useful advice to custome
  - Human-in-th
  - Automated c
  - No false pos
- Capture customer feedback

Good practices for algorithms/models deployment



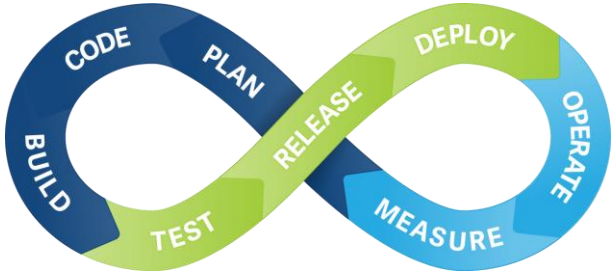
Connected fleet



Collaborative environment

Customer centric

Co-located team



Continuous integration

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Transforming Industries

Adam McElhinney

adam.mcelhinney@uptake.com

Chief of Machine Learning & AI Strategy at Uptake

Adjunct Professor, Illinois Institute of Technology

MORE ABOUT ME

- MS Statistics, University of Illinois at Chicago
- President, Chicago Chapter American Statistical Association
- Illinois Technology Association 2018 Technologist of the Year
- 3 patents issued, 15 applied

I AM PASSIONATE ABOUT

- Machine learning
- Open source software
- STEM education
- Cooking
- Hiking

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UPTAKE
Uptake is the leading
AI software provider for
industrial companies.

Our differentiated portfolio

150B
data points ingested per month

1,300+
models deployed

1.2B
hours of operating data

55,000+
failure modes

<2
minutes to deploy a trained model

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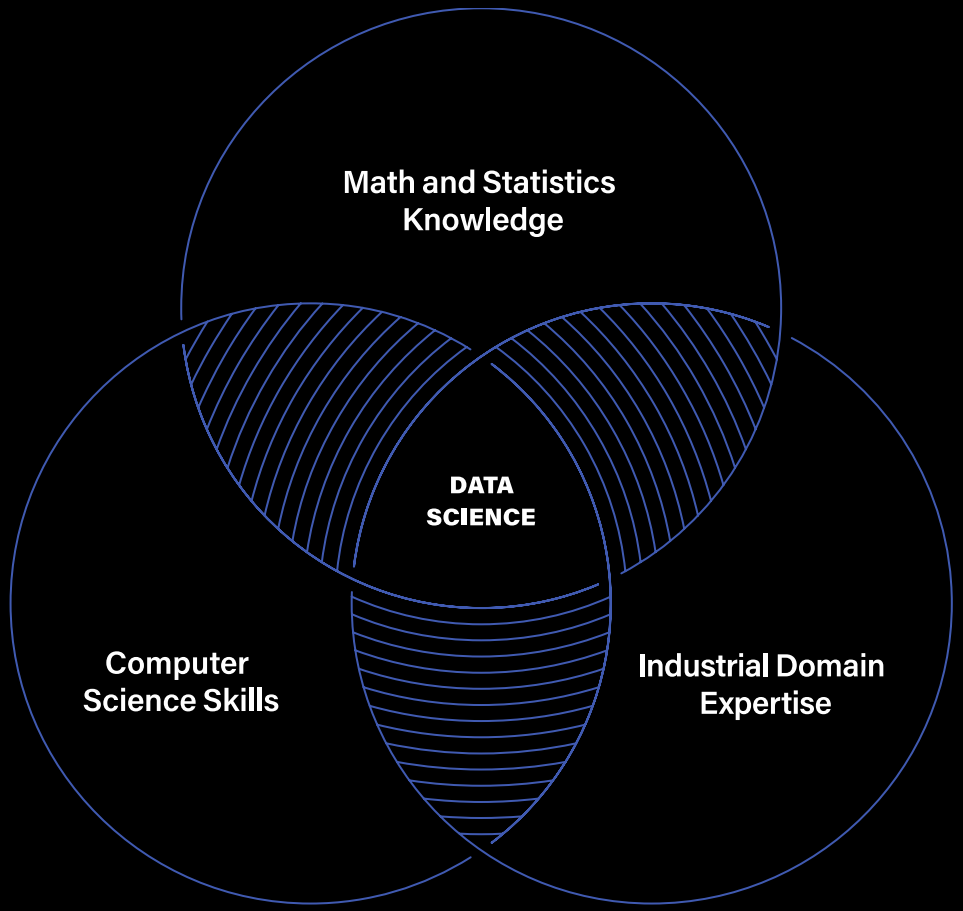
My team



150+
combined issued patents or patents filed listing our data scientists as inventors

80+
published academic paper

4
Kaggle competitors

70+
team members

Varied backgrounds including engineering, statistics, finance and neuroscience

—

Former employees from NASA, Google and Facebook

—

Creators of multiple open source projects (e.g. uptasticsearch, pkgnet, updraft, cran-server) and contributions to others (e.g. Julia, numpy, LightGBM).

—

Founding scientists and patent writer for SmartSignal

—

Advisory network including top universities such as Carnegie Mellon, UTK, Yale, and University of Chicago

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What we do

PRODUCT DEVELOPMENT & CONFIGURATION

Team assigned to specific verticals

Deploying features for those products into production

Gaining subject matter expertise

PLATFORM DEVELOPMENT

General purpose “Data Science Engines”

Distributed Industrial AI platform

ONBOARDING OF NEW INDUSTRIES & CUSTOMERS

Analytics translation

Mapping to Uptake Platform

Value measurement

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What you should ask me about

Machine learning

Distributed computing

Software development

Open source software

Scaling data science teams

Hybrid physics and ml prognostics

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PHM
FROM IDEA TO 24/7

Digital ↔ Physical Connection

Identify Pains

Partner

Data Ownership

Customer Centricity

Reliability

PHM

Digitize the Industry

Digitize the Core

MVP

Agile

Automation

Fulfillment

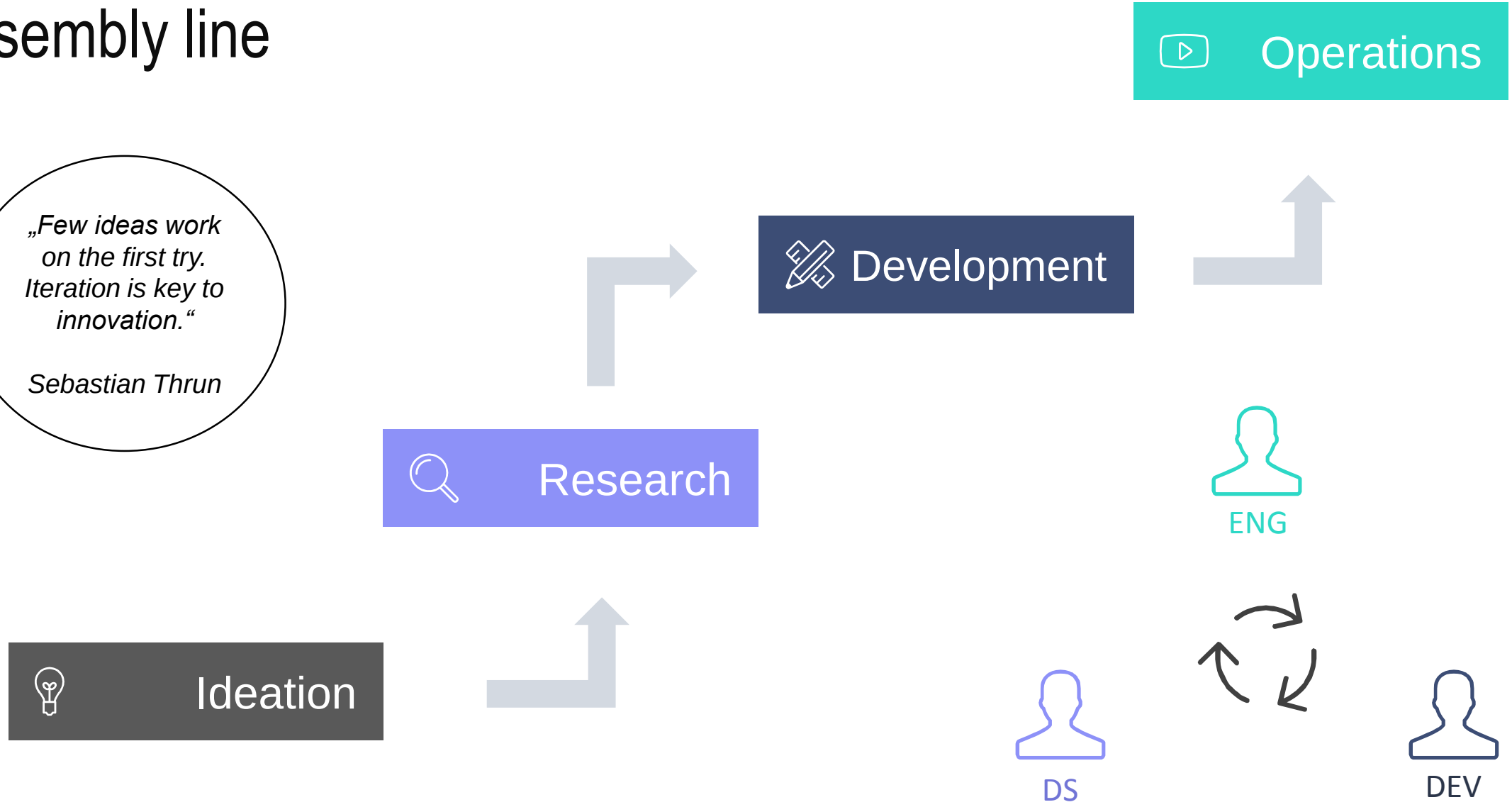
DevOps

Availability

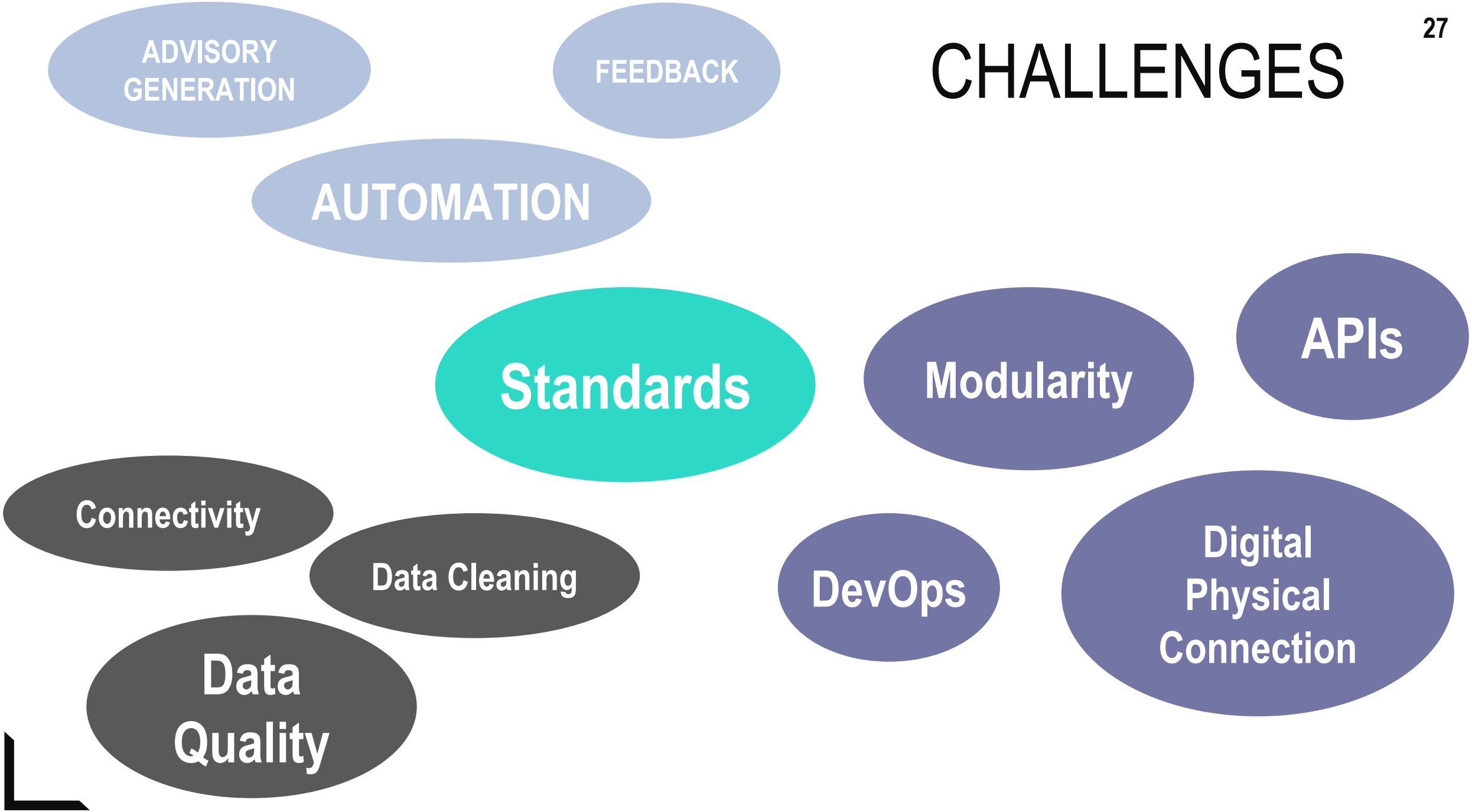
Our PREDICTOR assembly line

„Few ideas work on the first try. Iteration is key to innovation.“

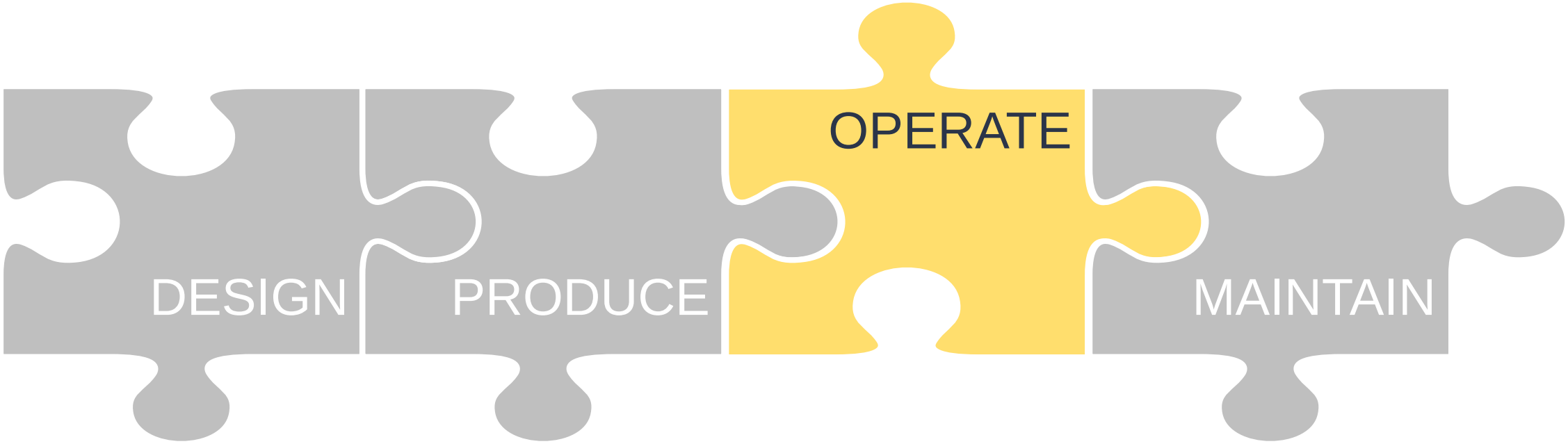
Sebastian Thrun



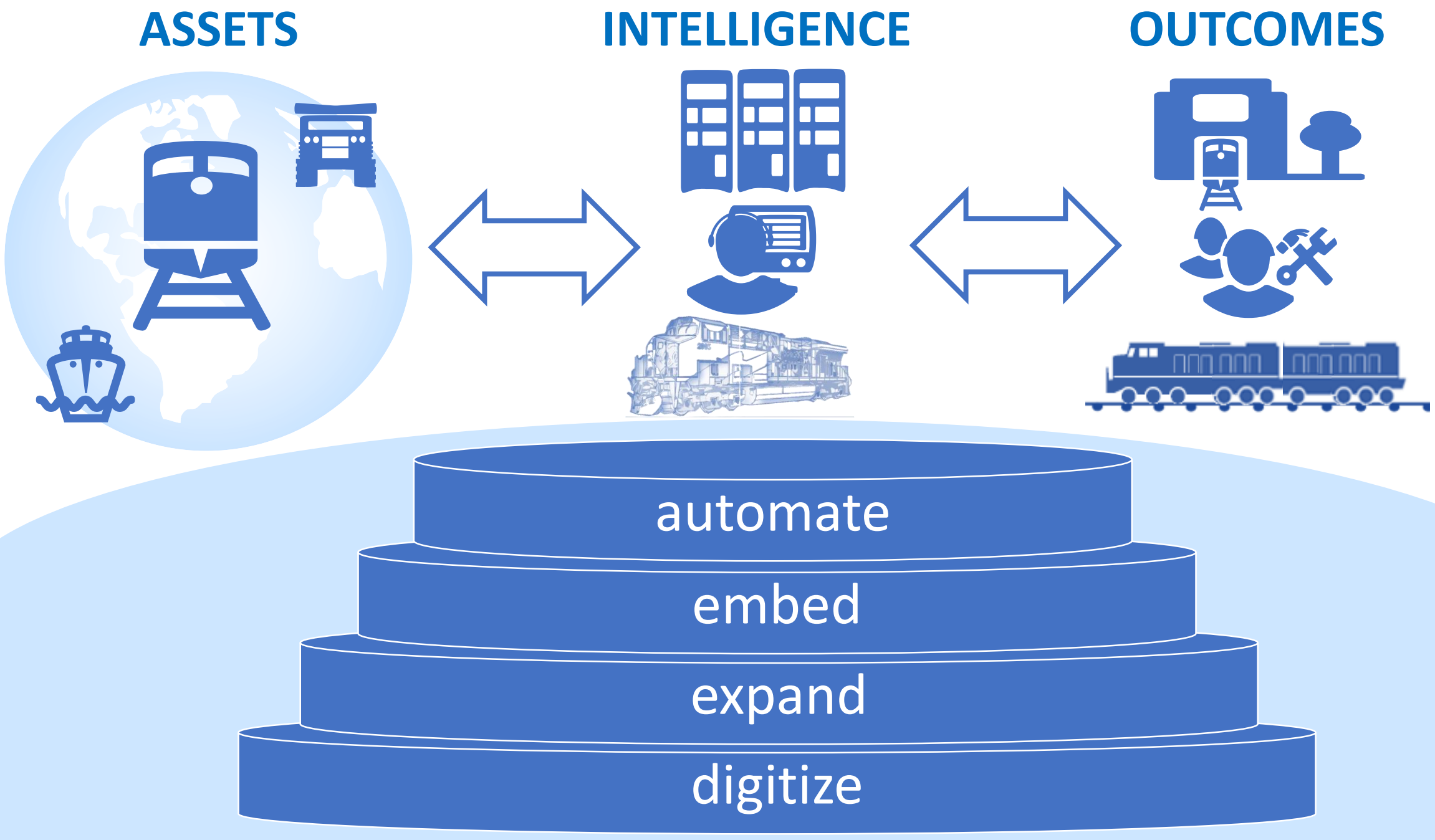
CHALLENGES


ADVISORY GENERATION
FEEDBACK
AUTOMATION
Standards
Modularity
APIs
Connectivity
Data Cleaning
DevOps
Digital Physical Connection
Data Quality

Keep Flying!



Let‘s shape the
future of aviation
TOGETHER


ASSETS
INTELLIGENCE
OUTCOMES
automate
embed
expand
digitize

phmsociety

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