

MATLAB EXPO 2017

How to build an **autonomous** anything

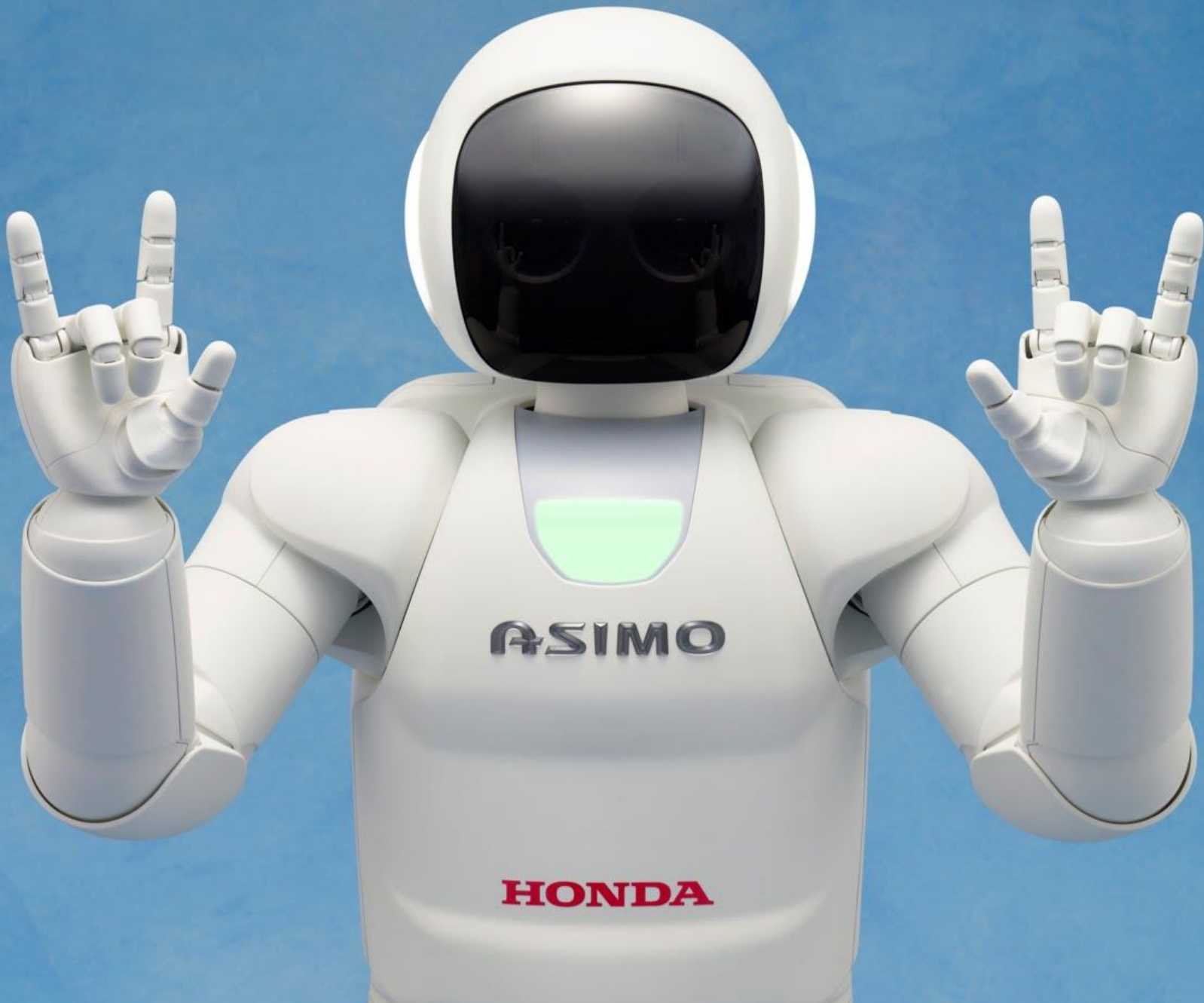
Jason Ghidella
Simulink Platform Marketing Manager
MathWorks



Autonomous

IONIQ

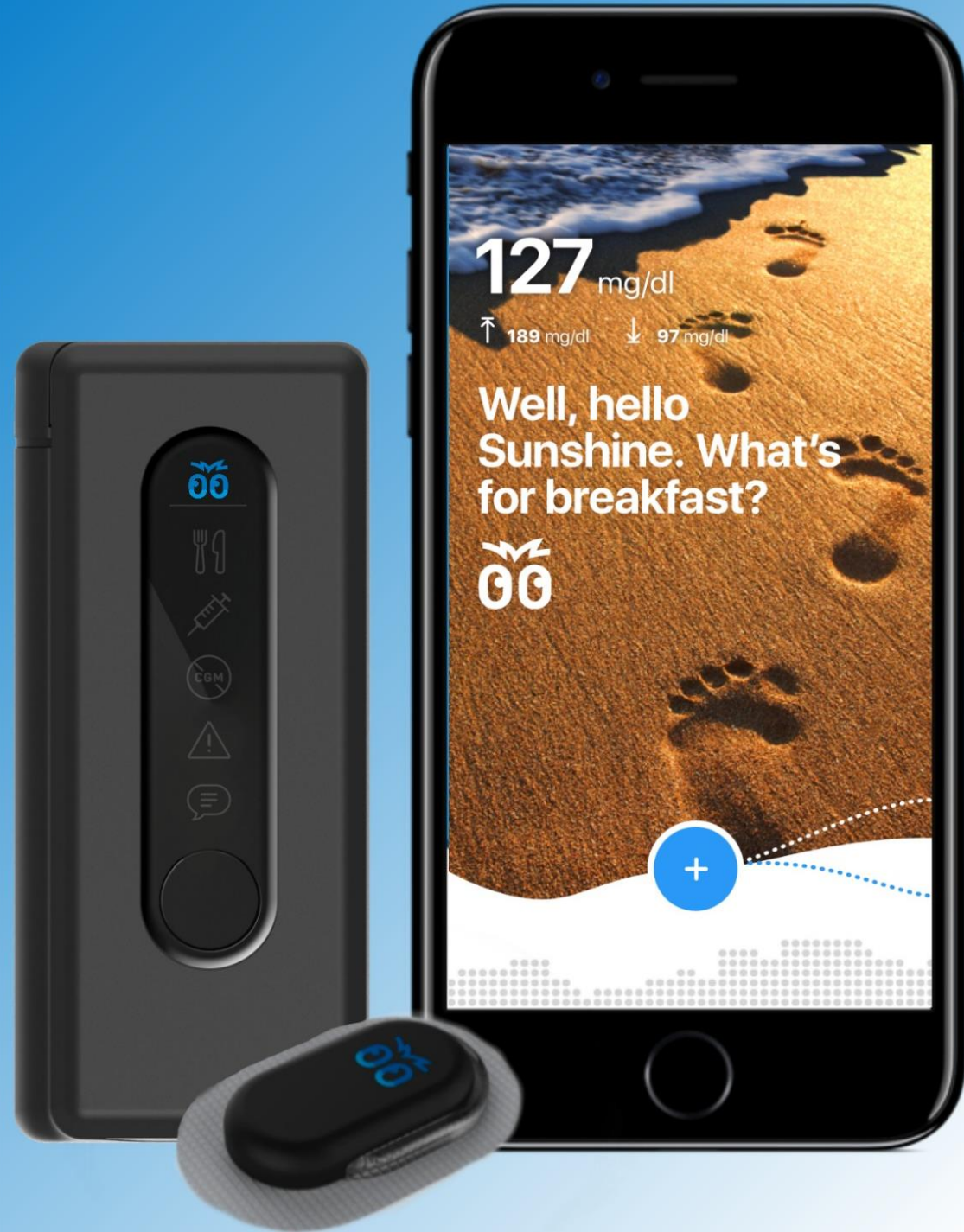
HYUNDAI











127 mg/dl

↑ 189 mg/dl ↓ 97 mg/dl

Well, hello
Sunshine. What's
for breakfast?

00



Autonomous Technology

Autonomous Technology

Having the power for self-governance

Autonomous Technology

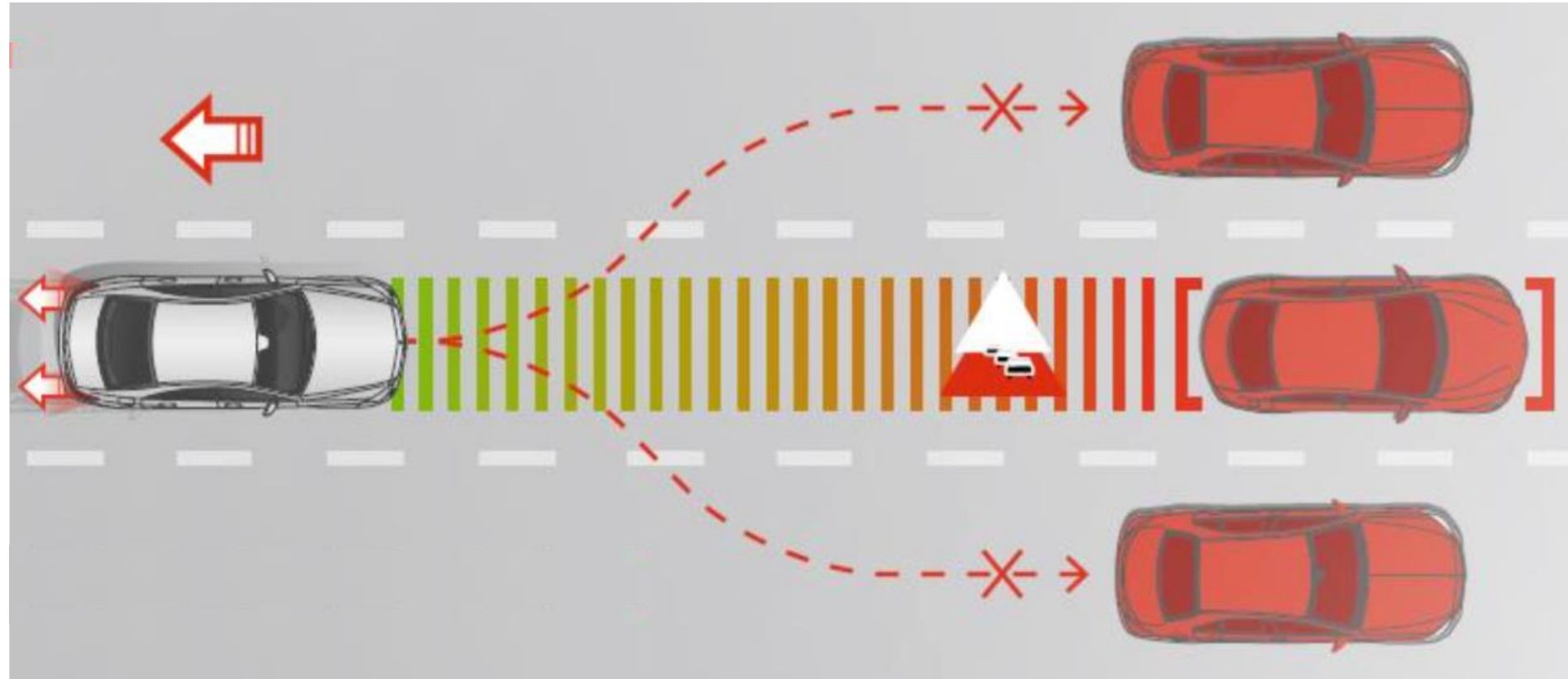
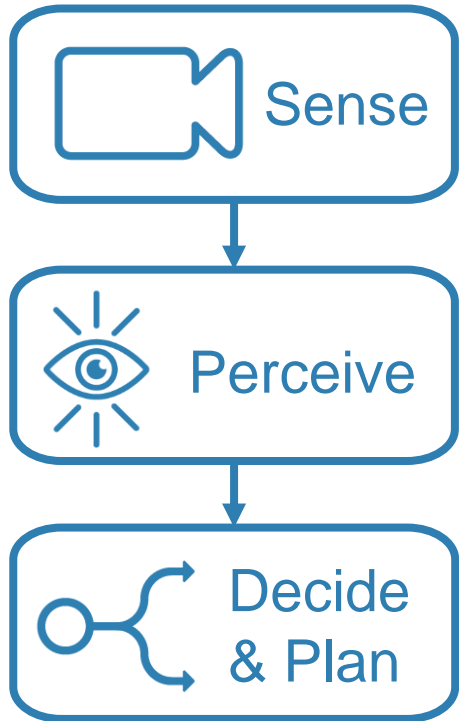
*Provides the ability of a system to act **independently** of direct human control under **unrehearsed** conditions*



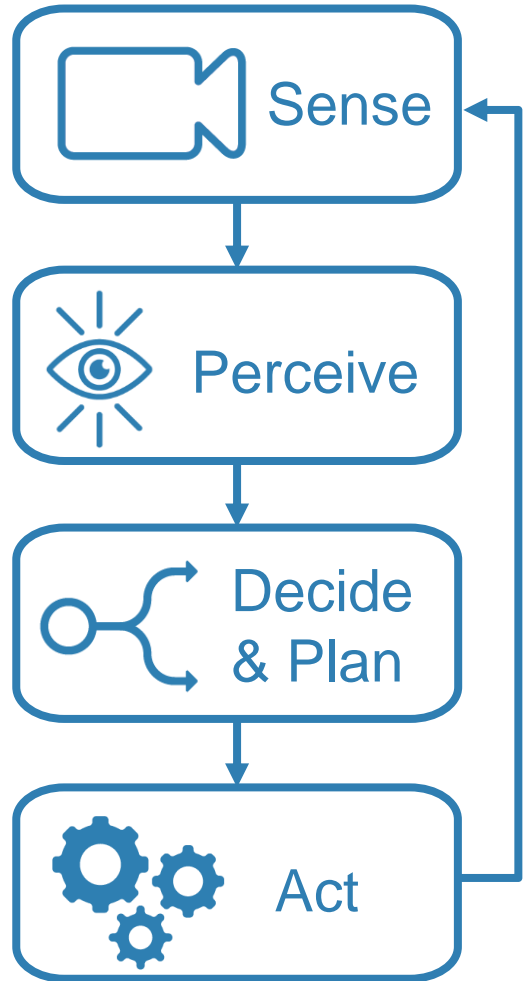
Capabilities of an Autonomous System



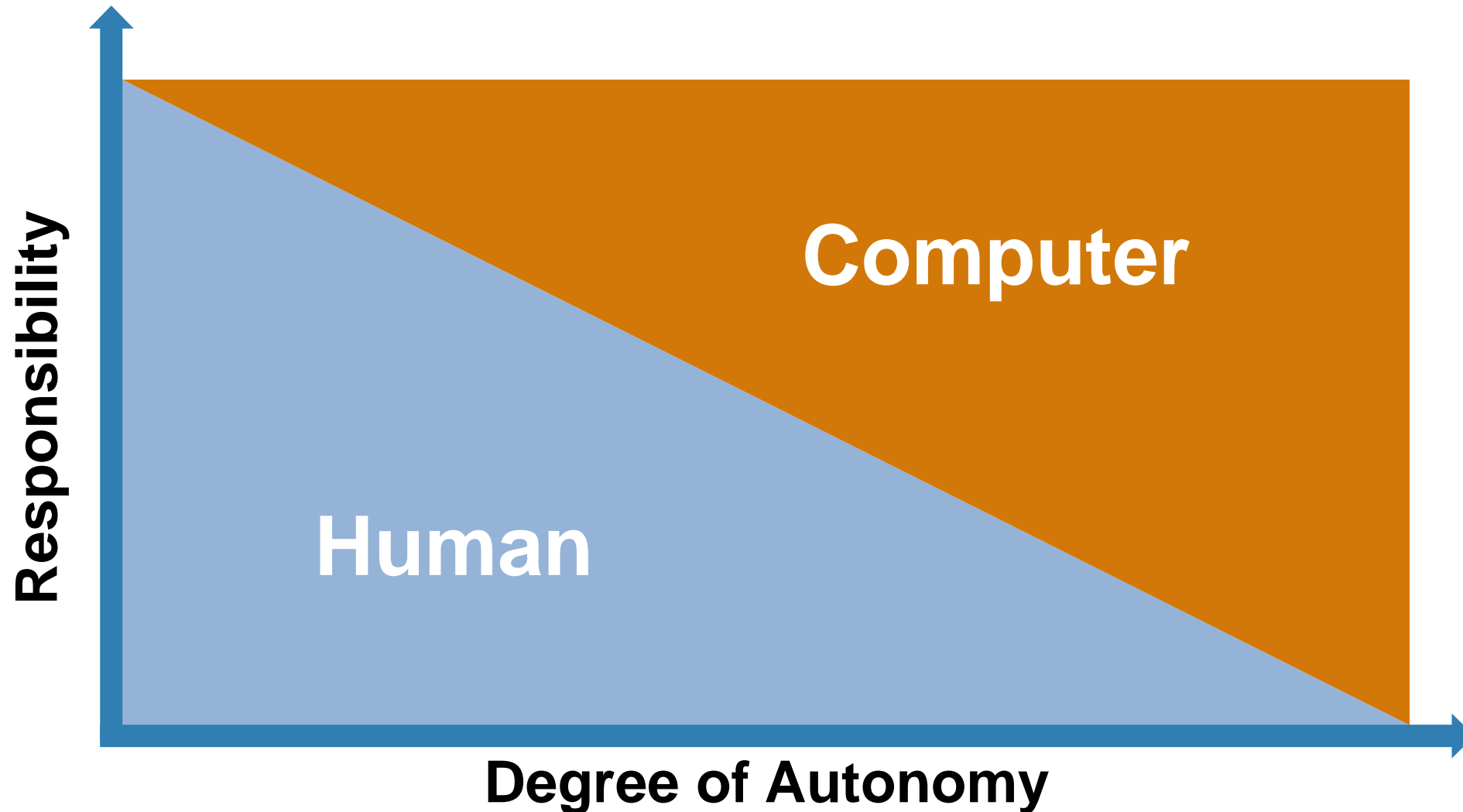
Capabilities of an Autonomous System

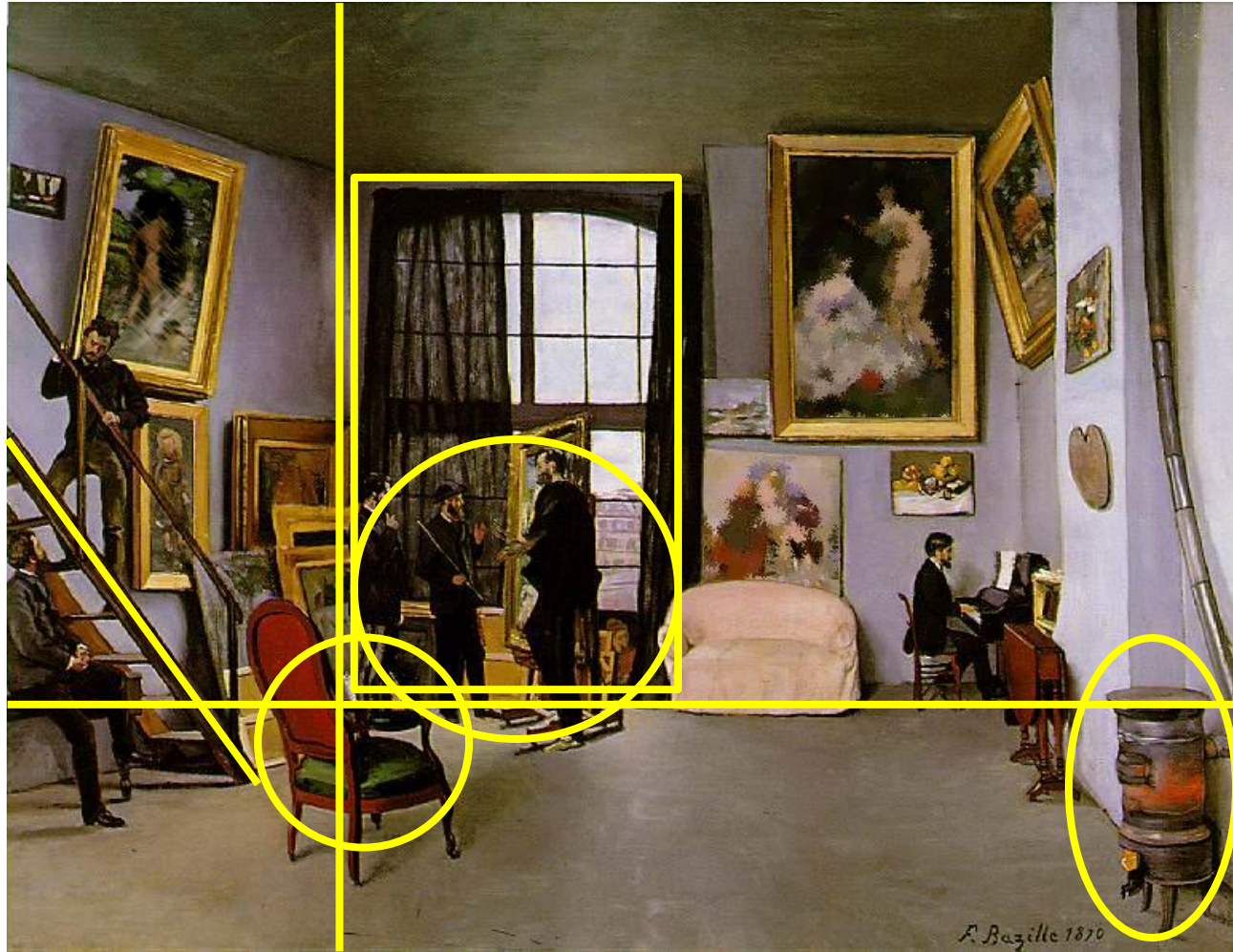


Capabilities of an Autonomous System



Autonomous Technology Transfers Responsibility to Computers





Bazille's Studio
Bazille 1870



Shuffleton's Barbershop
Rockwell 1950

Autonomous Artistic Style Classification

Rutgers University

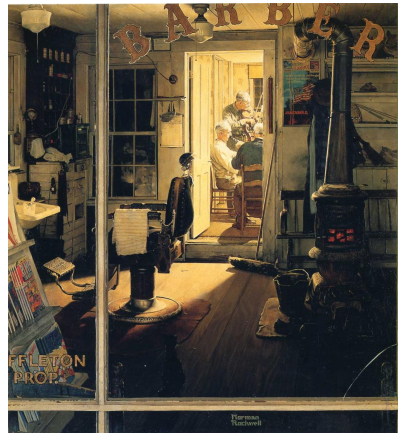
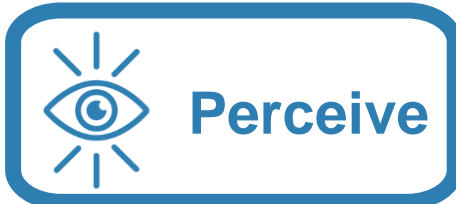
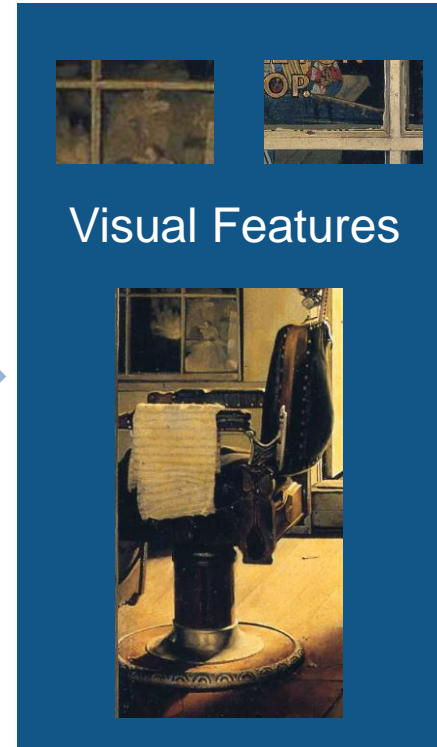


Image
Feature
Extraction



Machine
Learning
Classification



Style:
Regionalism



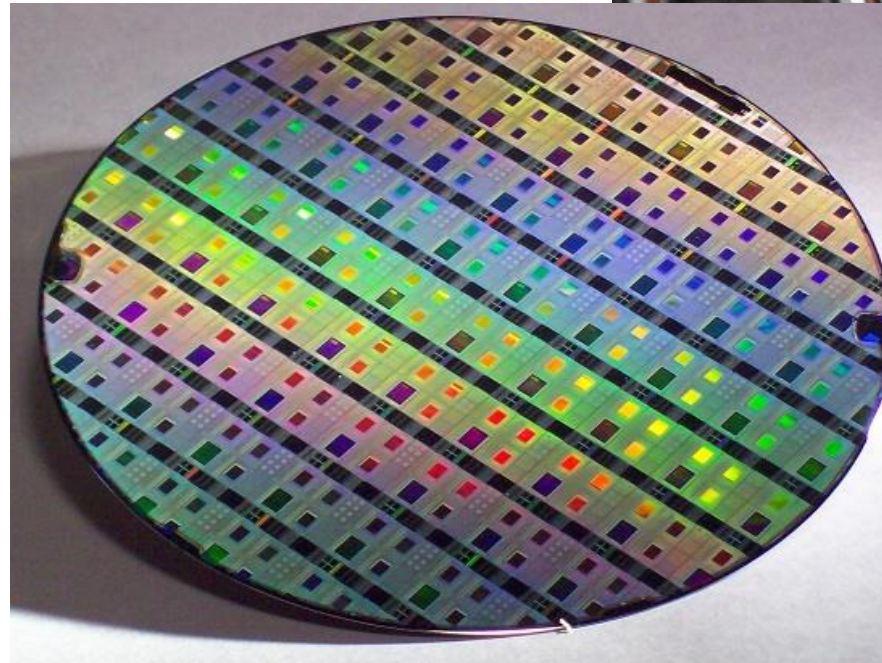
Genre:
Interior



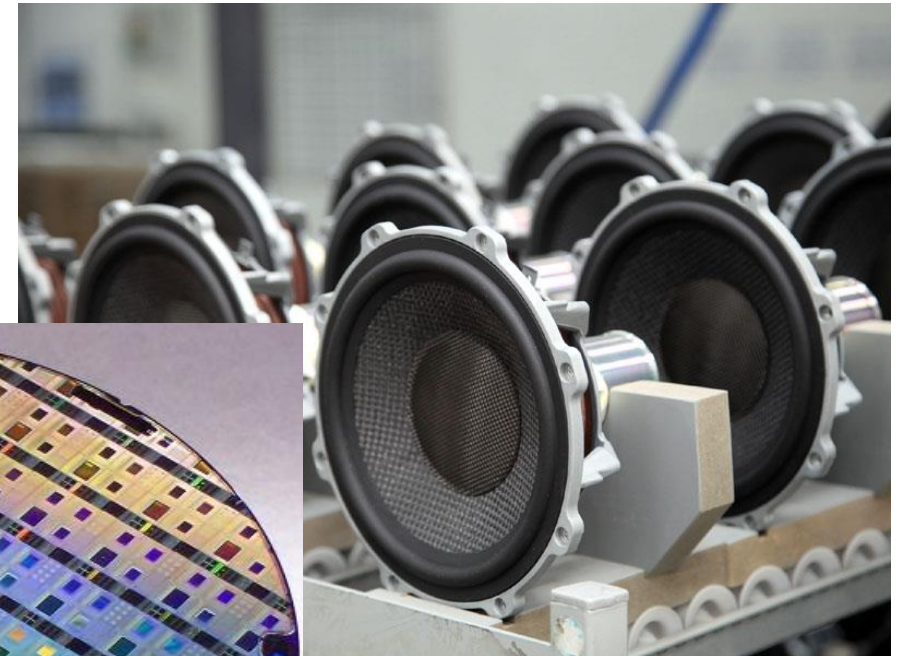
Artist:
Rockwell

Where to add autonomy with perception?

- Analyze more data
- Reduce bias
- Reduce variability
- Save time
- Improve performance



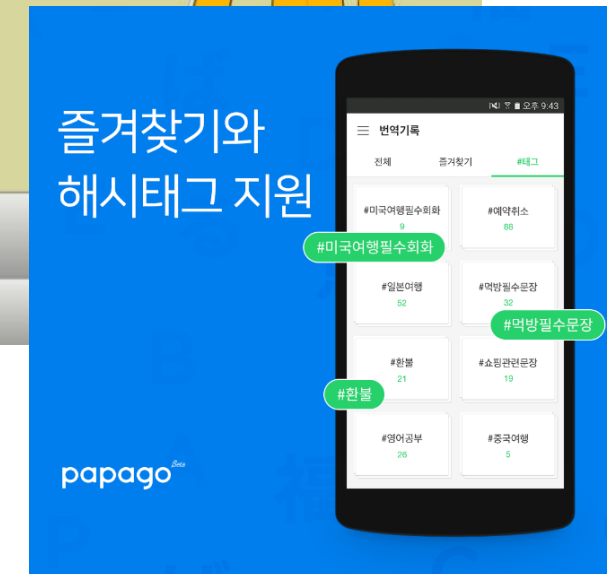
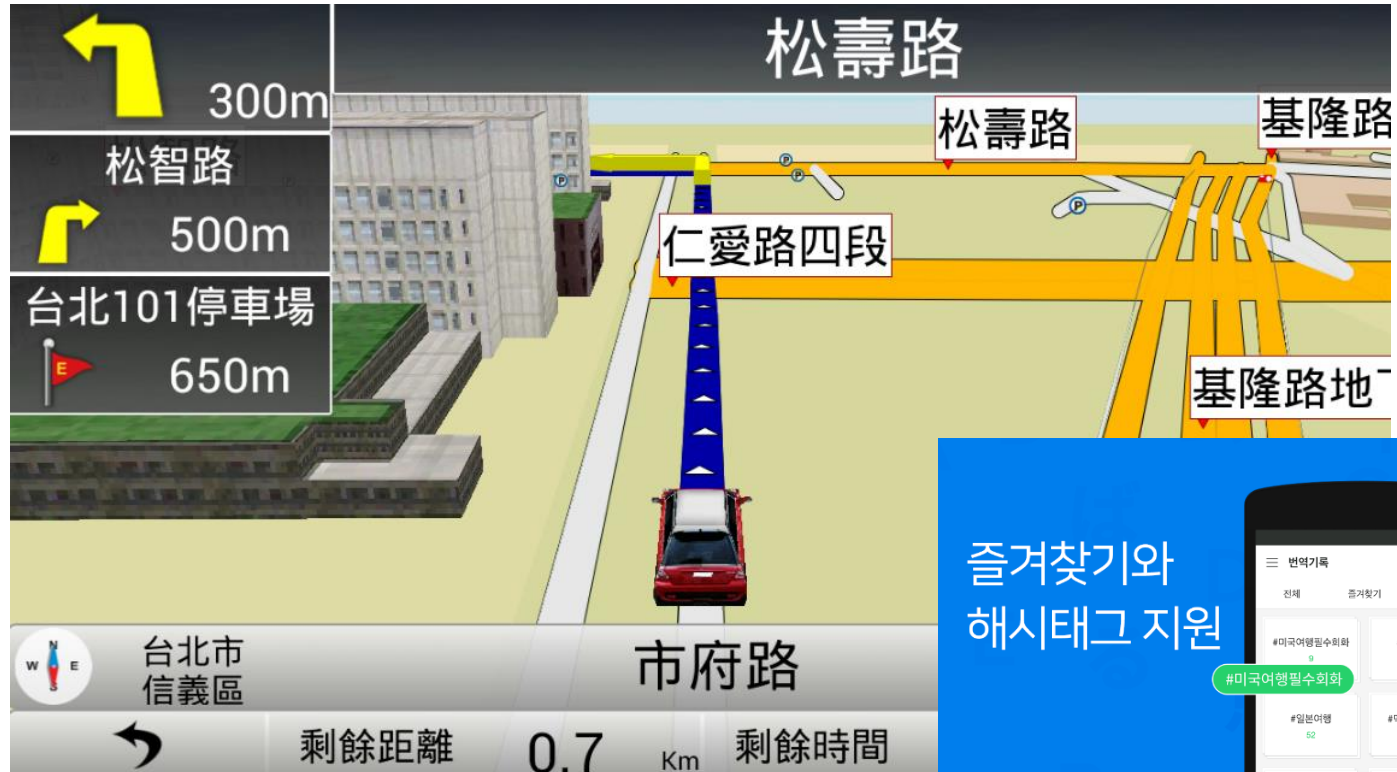
Virtual Semiconductor
Manufacturing Calibration



Determine
Loudspeaker
Quality

Where to add autonomy with perception?

- Analyze more data
- Reduce bias
- Reduce variability
- Save time
- Improve performance



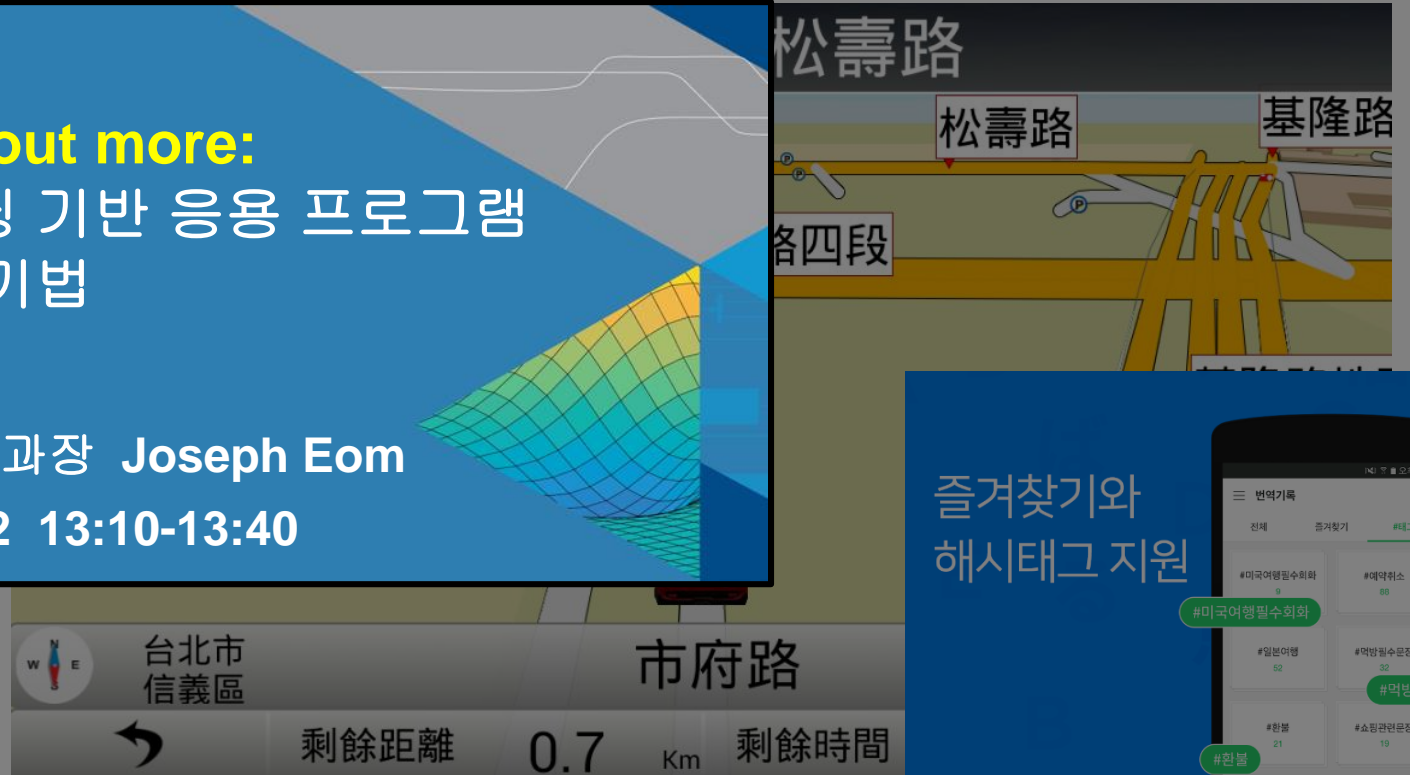
Where to add autonomy with perception?

- Analyze more data
- Reduce bias
- Reduce variability
- Save time
- Improve performance

Find out more:

딥러닝 기반 응용 프로그램
작성 기법

엄준상 과장 Joseph Eom
Track 2 13:10-13:40





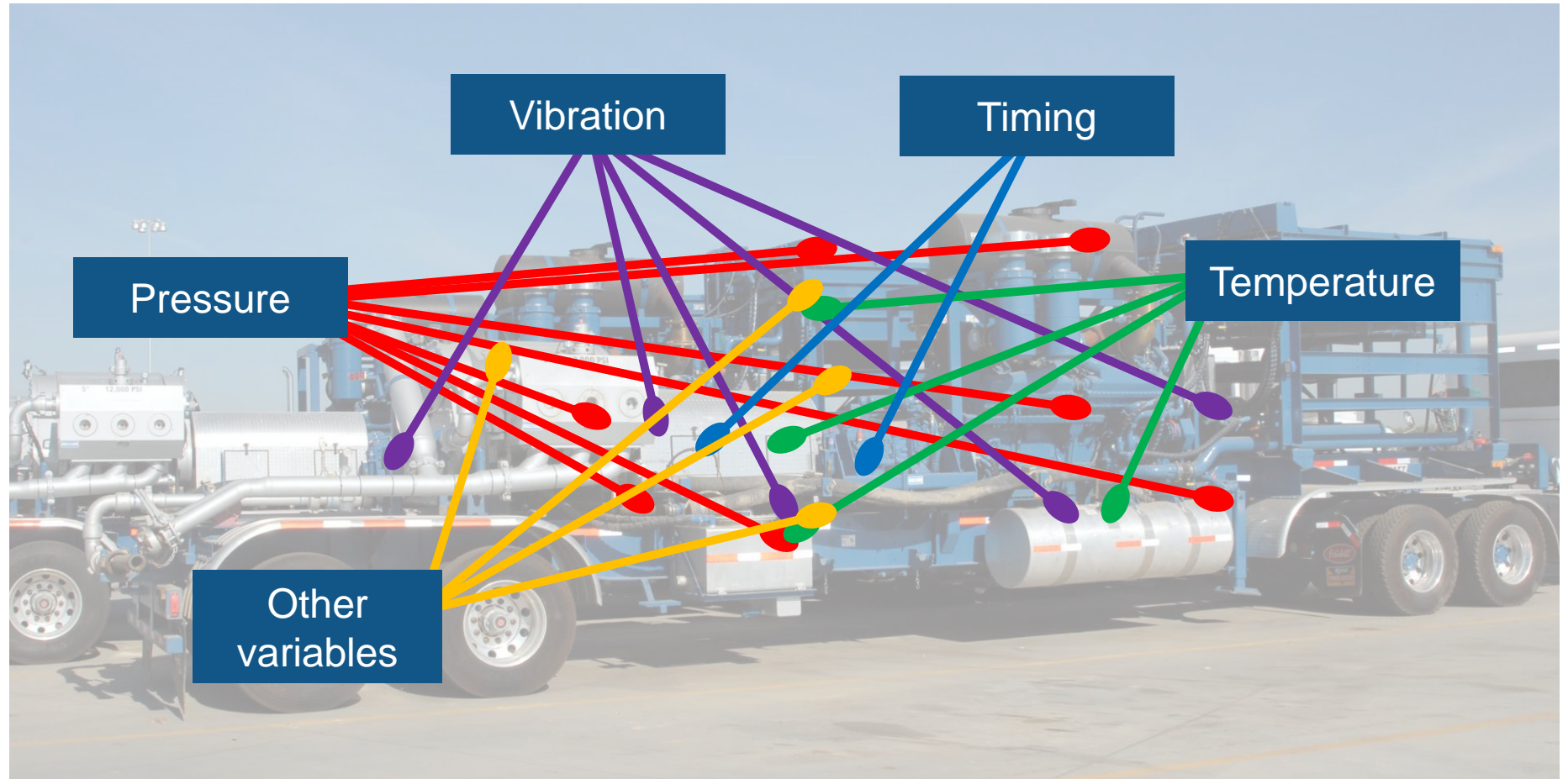
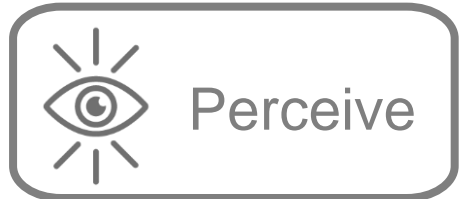




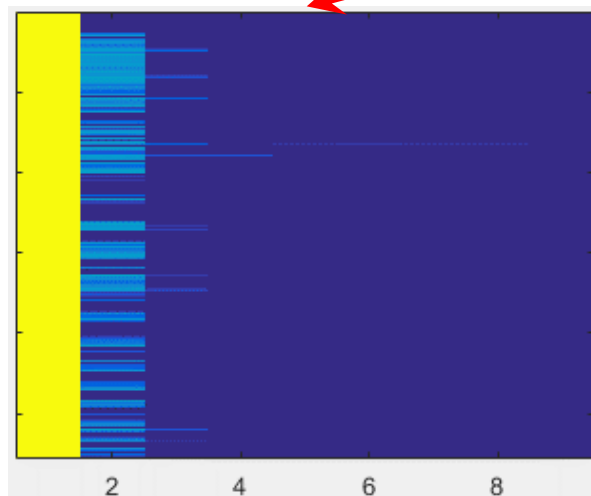
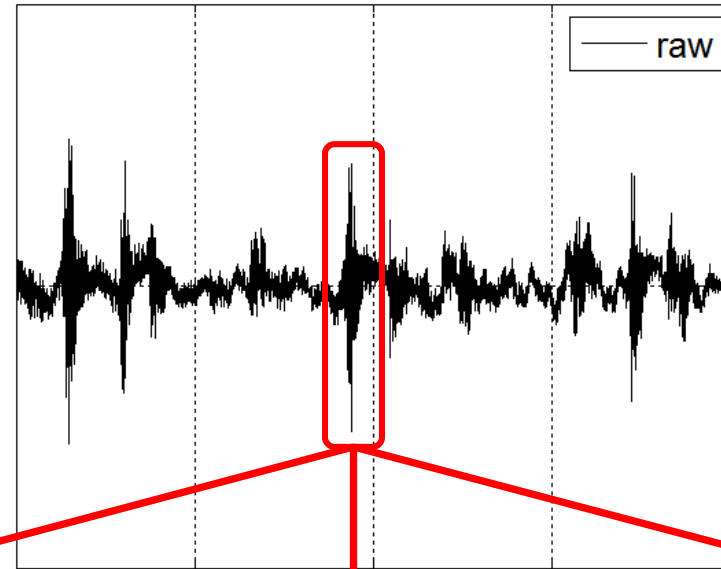
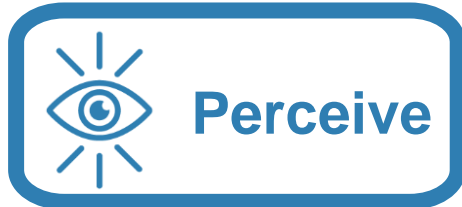


Autonomous Service for Predictive Maintenance

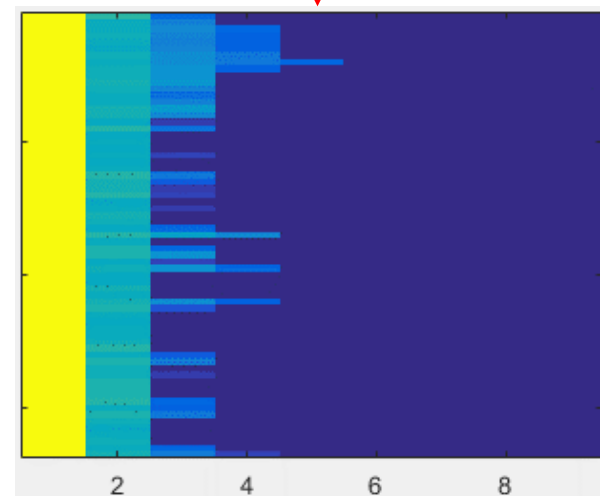
Which sensor values should they use?



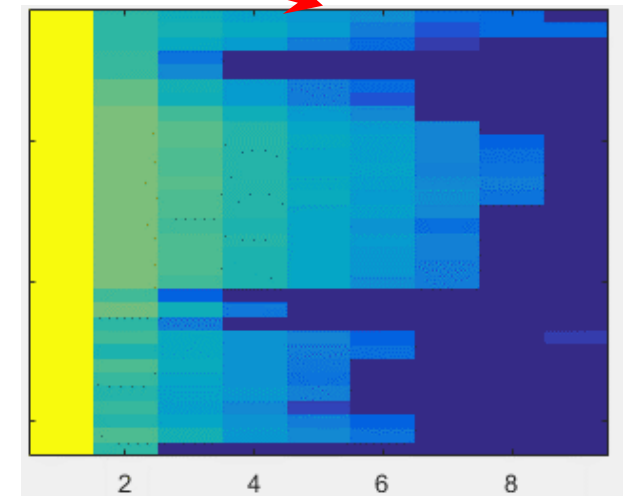
Autonomous Service for Predictive Maintenance



Normal Operation



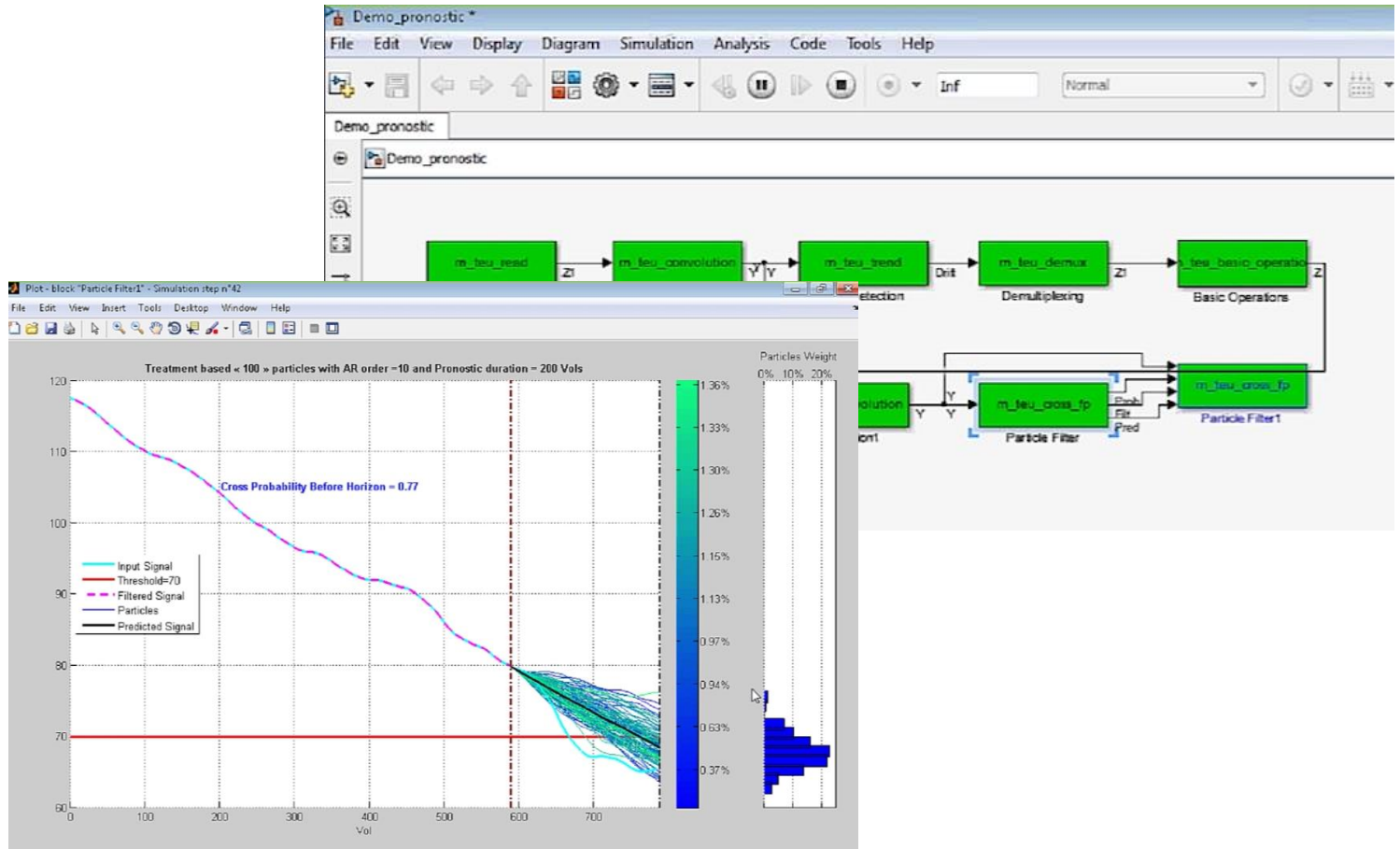
Monitor Closely



Maintenance Needed

What are the best predictors?

- Data
- Models



Jet Engine Monitoring

What are the best predictors?

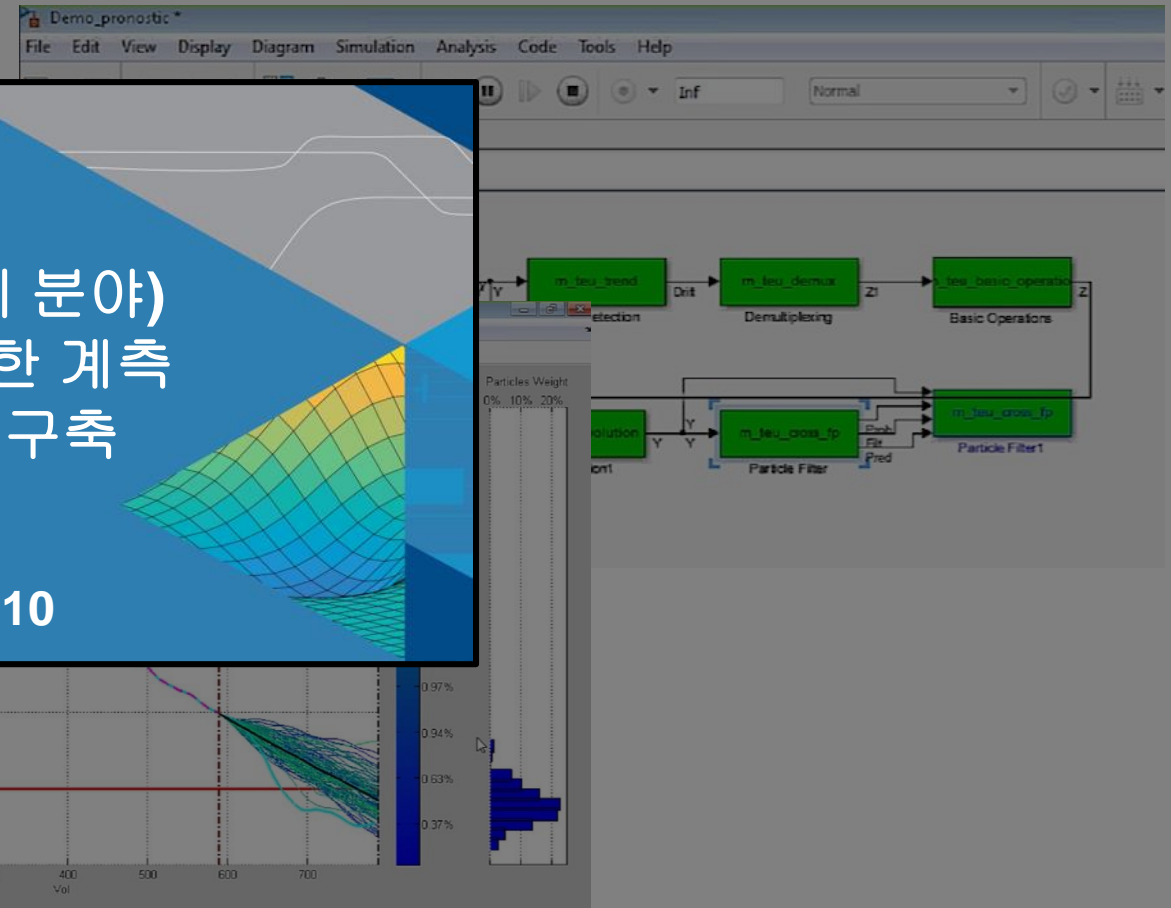
- Data
- Models

Find out more:

[고객사례](반도체 분야)
MATLAB을 이용한 계측
 공정 분석 시스템 구축

SK하이닉스

Track 2 15:40 – 16:10



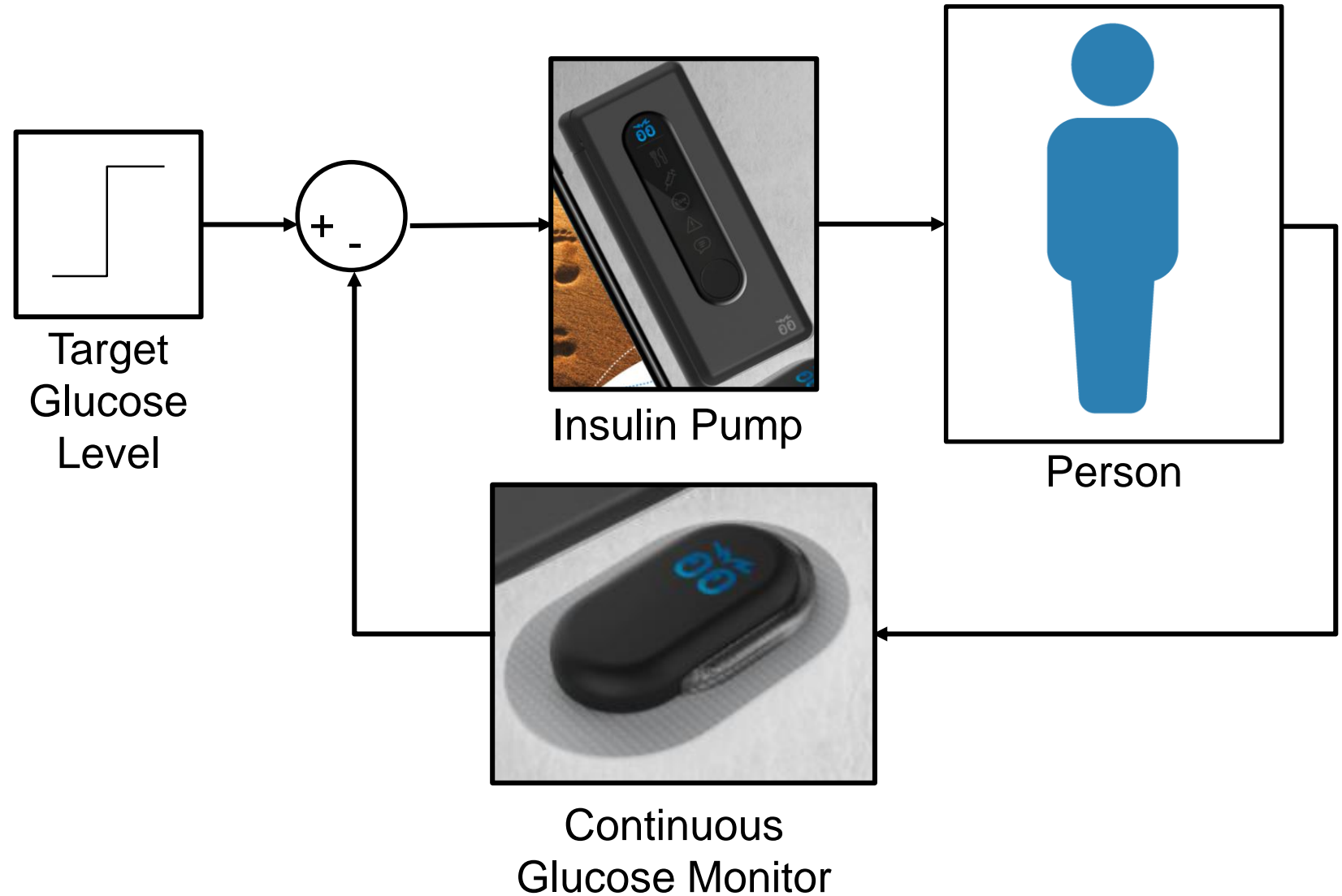
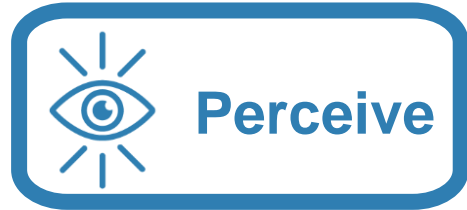
Jet Engine Monitoring

Autonomous Glucose Level Management



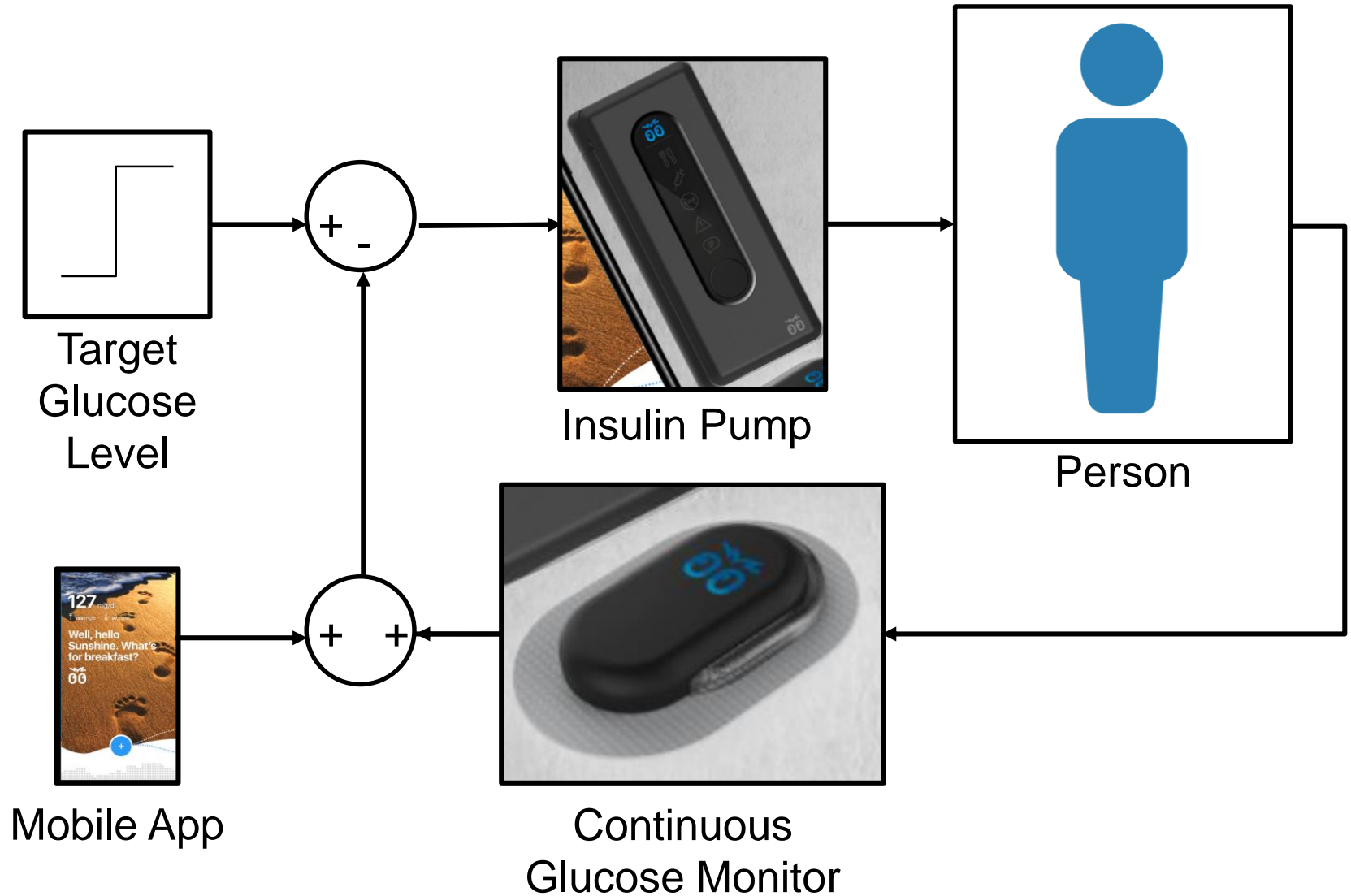
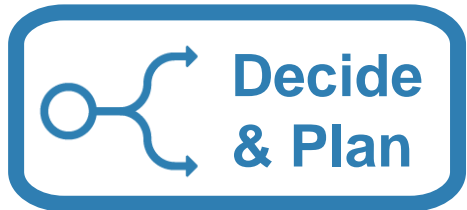
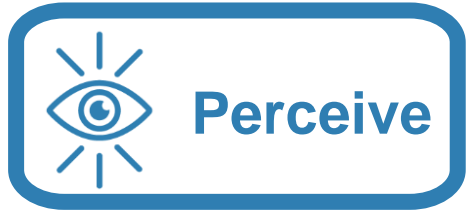
Autonomous Glucose Level Management

Bigfoot Biomedical



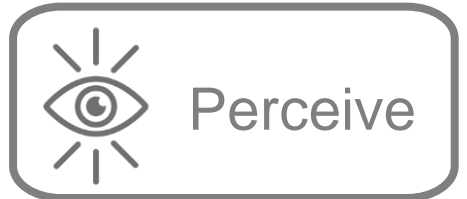
Autonomous Glucose Level Management

Bigfoot Biomedical

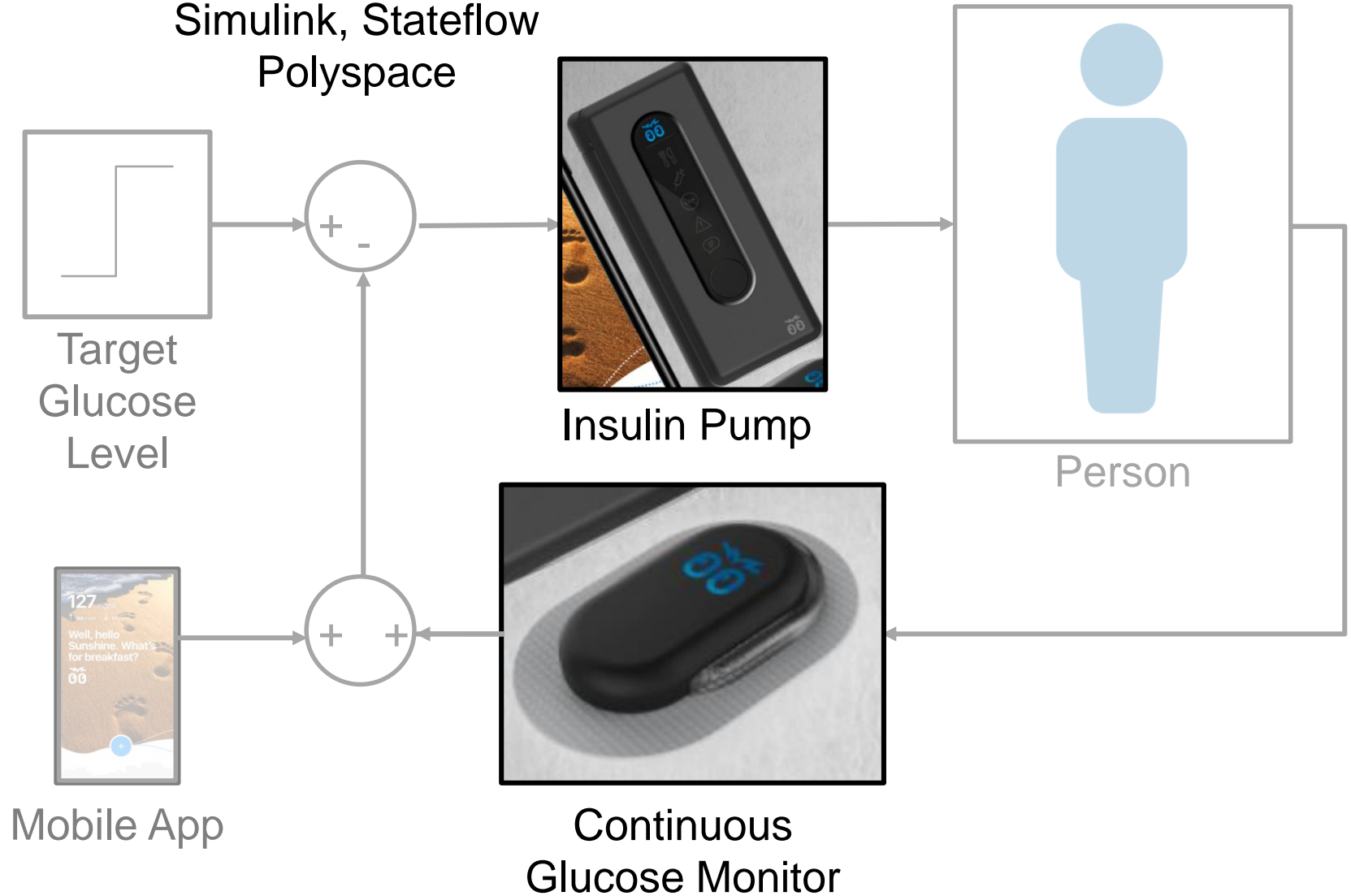


Autonomous Glucose Level Management

Bigfoot Biomedical

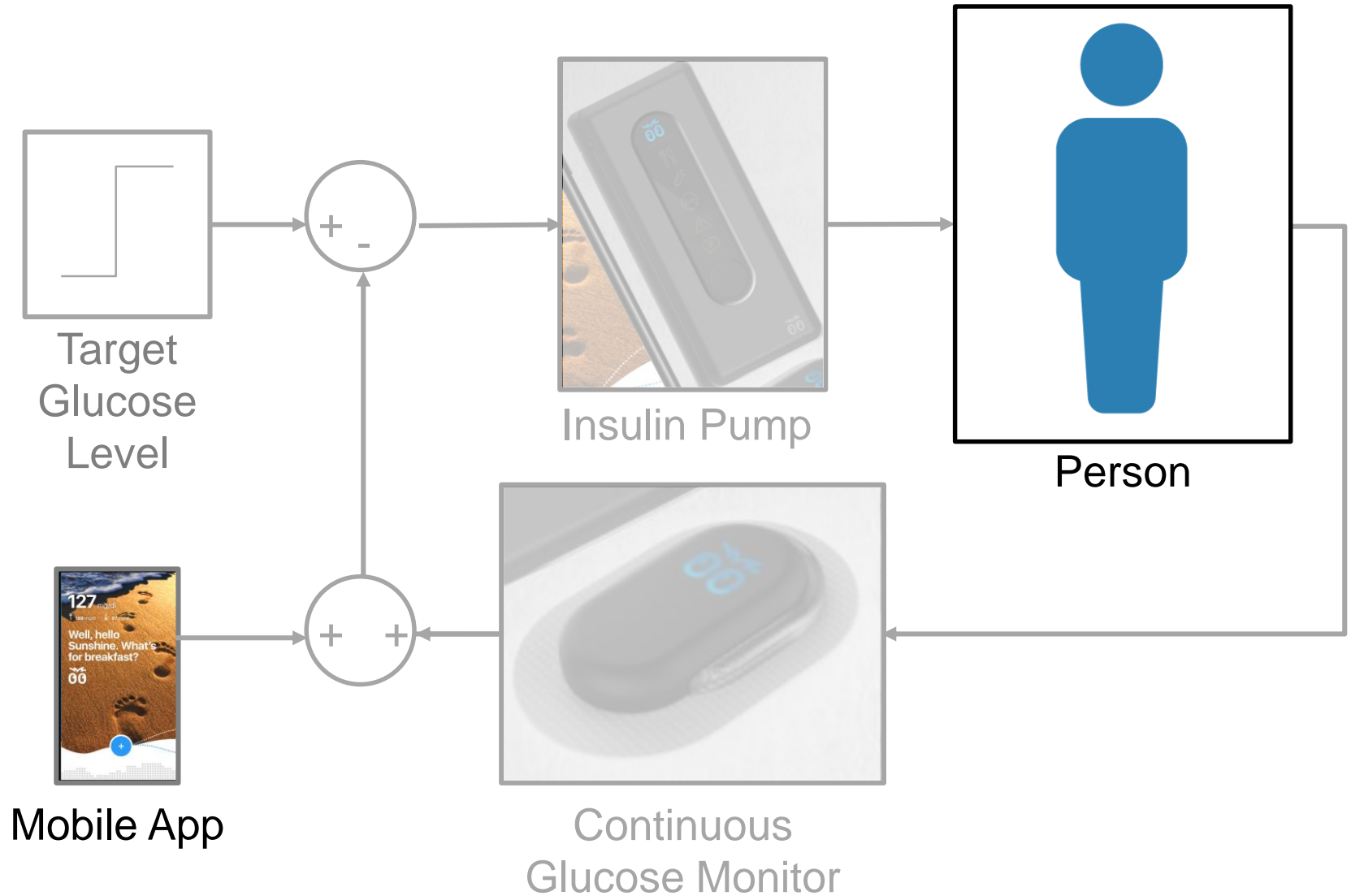
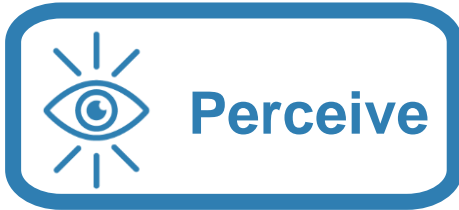


Virtual Lab
Simulink, Stateflow
Polyspace



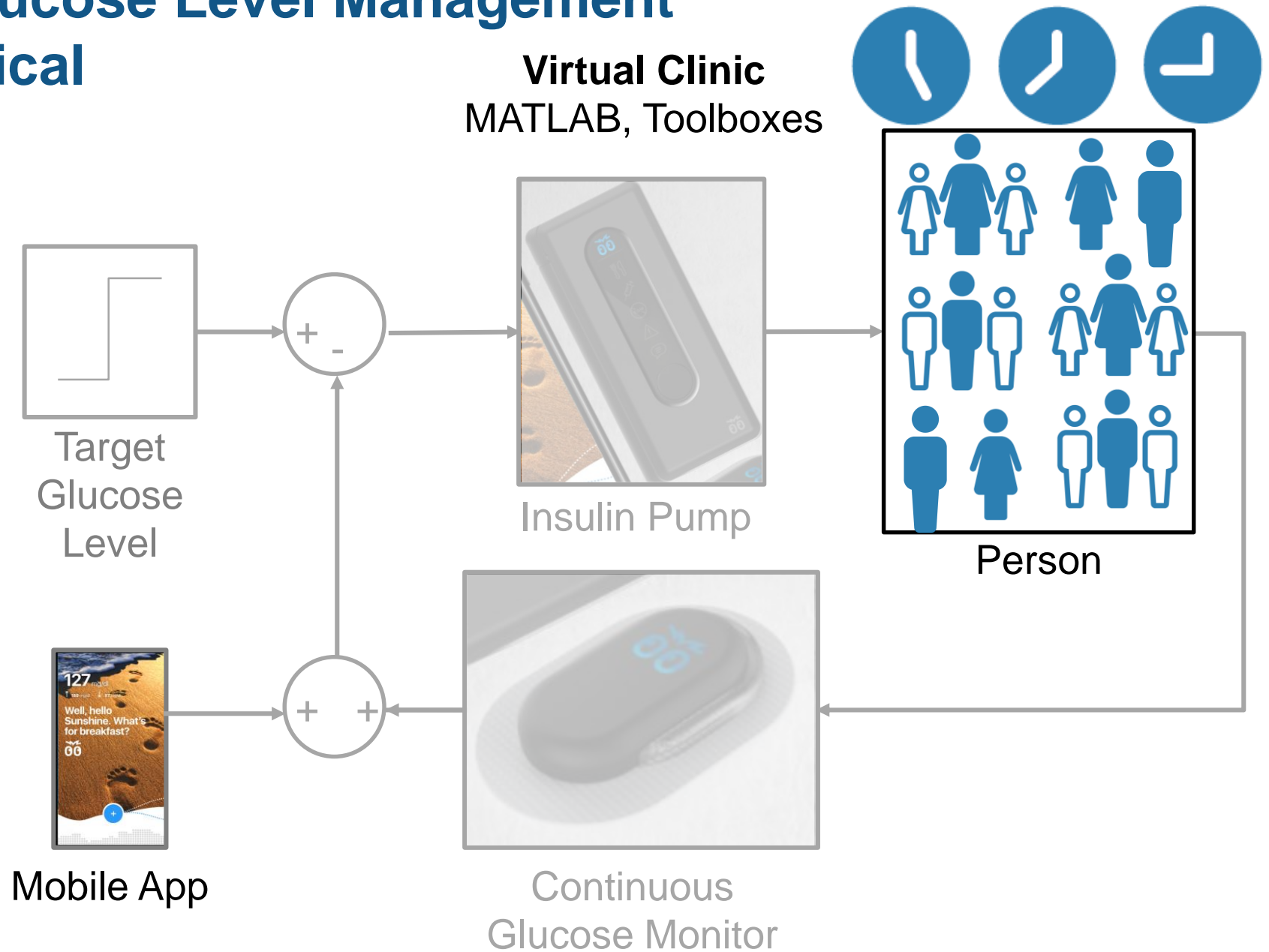
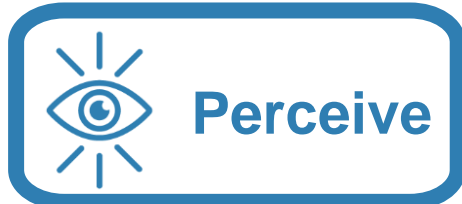
Autonomous Glucose Level Management

Bigfoot Biomedical



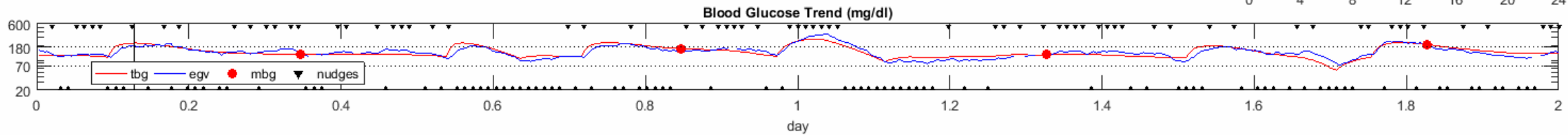
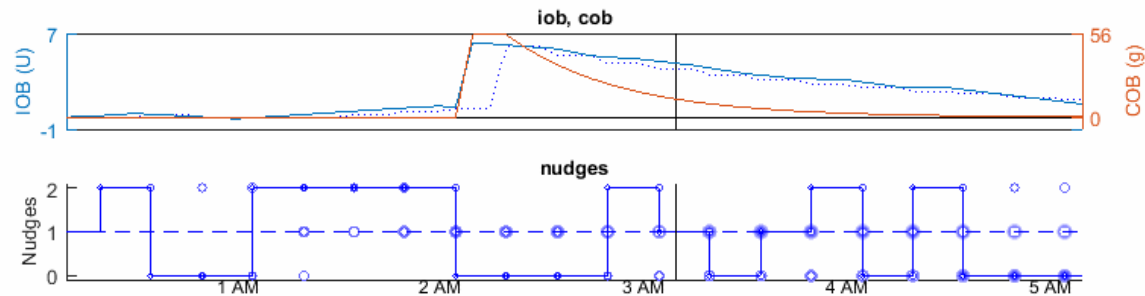
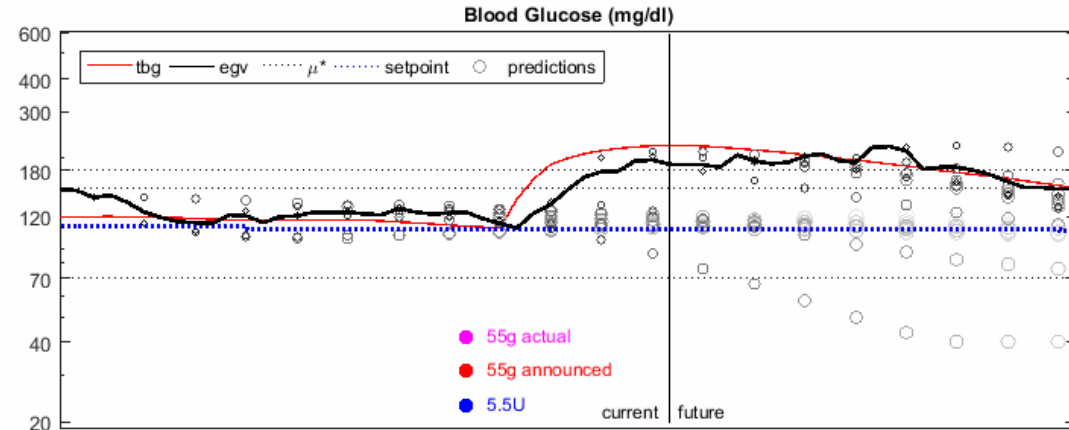
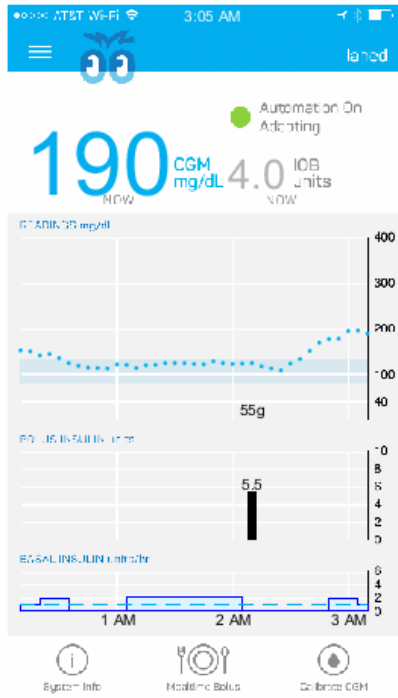
Autonomous Glucose Level Management

Bigfoot Biomedical



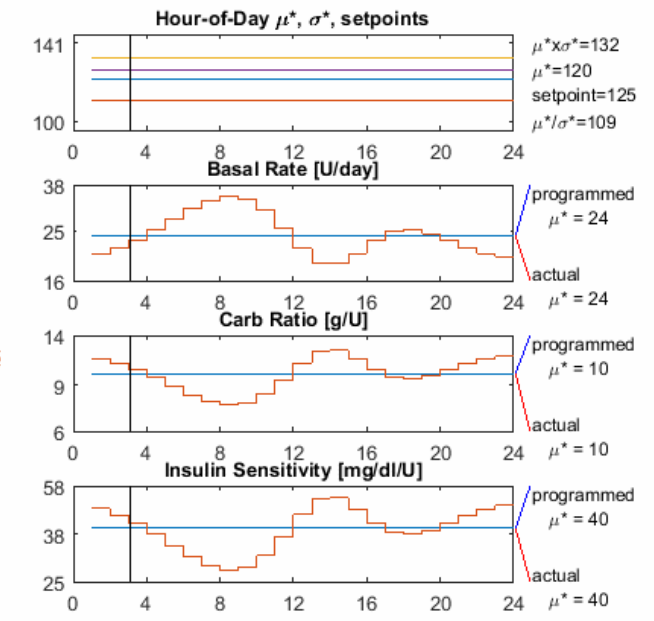
Virtual Clinic

Generating data through simulation



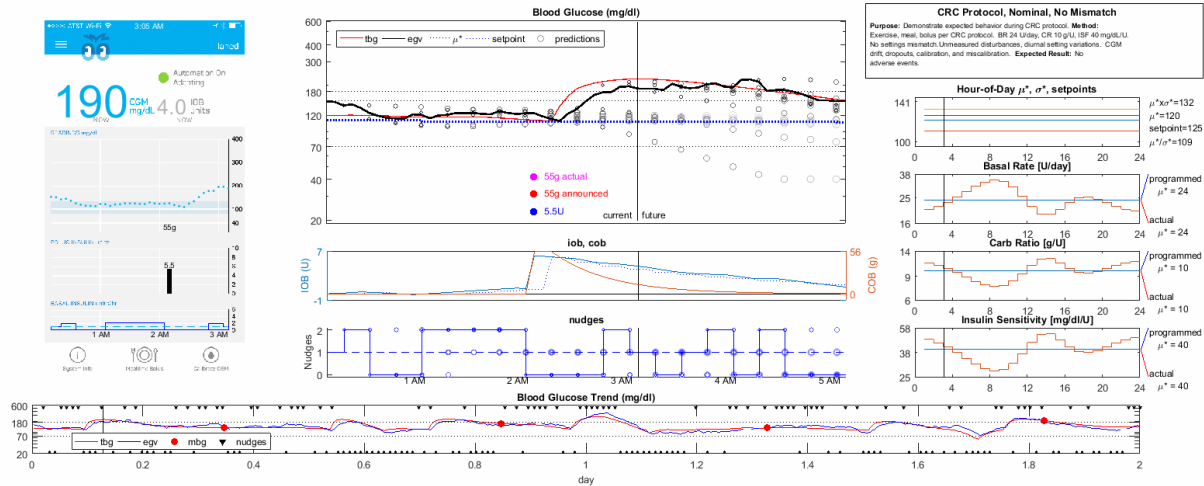
CRC Protocol, Nominal, No Mismatch

Purpose: Demonstrate expected behavior during CRC protocol. **Method:** Exercise, meal, bolus per CRC protocol. BR 24 U/day, CR 10 g/U, ISF 40 mg/dL/U. No settings mismatch. Unmeasured disturbances, diurnal setting variations. CGM drift, dropouts, calibration, and miscalibration. **Expected Result:** No adverse events.



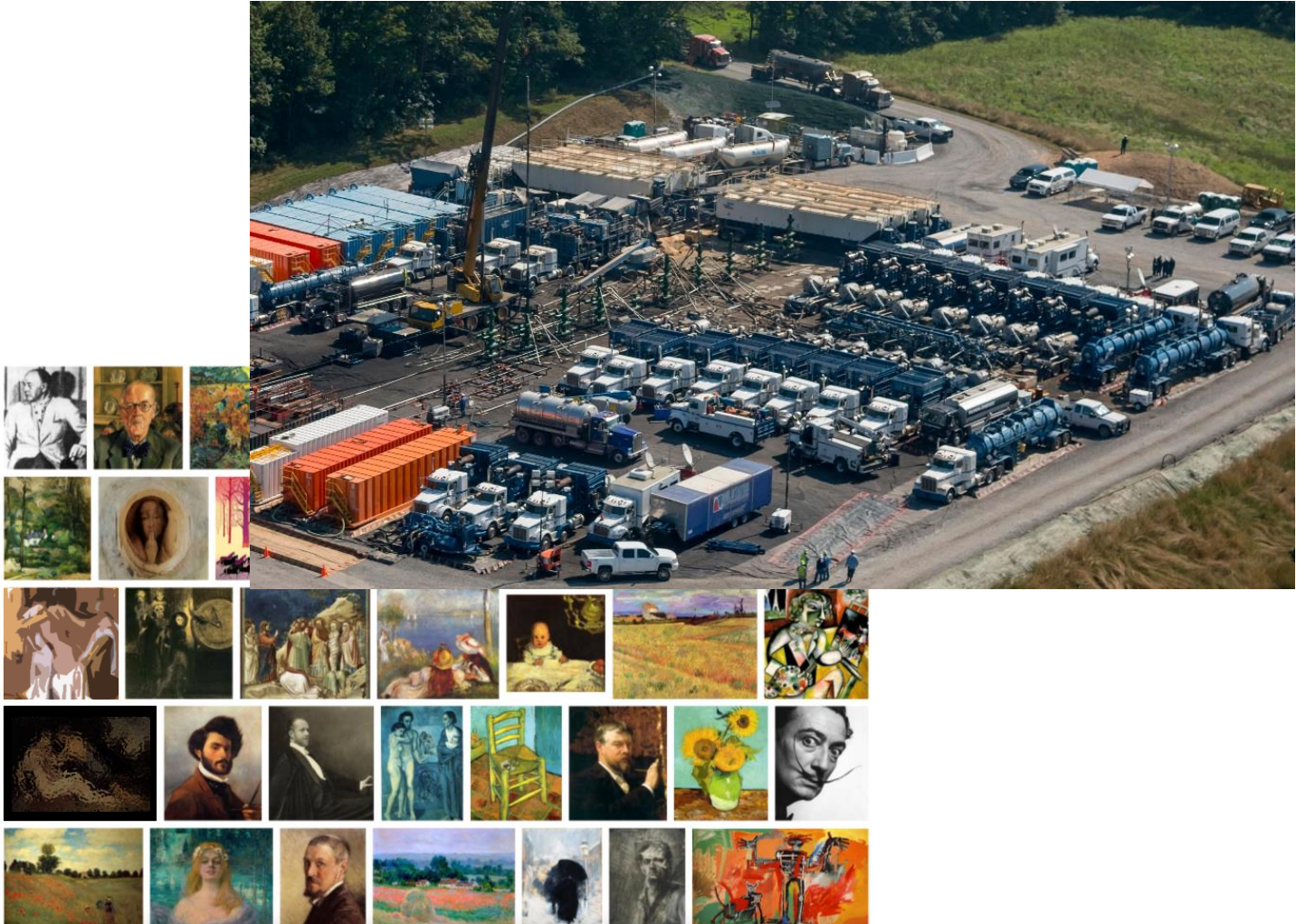
Virtual Clinic

Scaling computations to simulate 50 million patients a day



Where will you get your data?

- Simulation
- Public repositories
- In the lab
- In the field
- Internet of Things (IoT)



Where will you get your data?

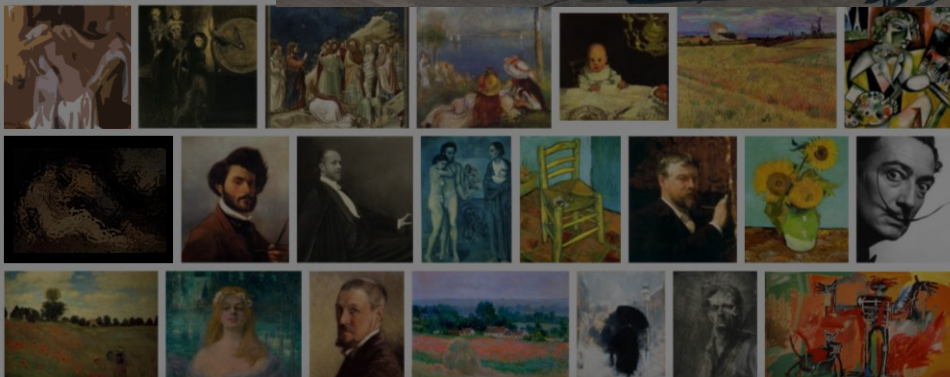
- Simulation
- Public repositories
- In the lab
- In the field
- Internet of Things (IoT)

Find out more:

[고객사례] 통계 및
기계학습을 이용한
생체물리정보 기반 퇴행성
신경계 질환 예측

(주)제이어스 전진홍 박사

Track 1 16:20 – 16:50



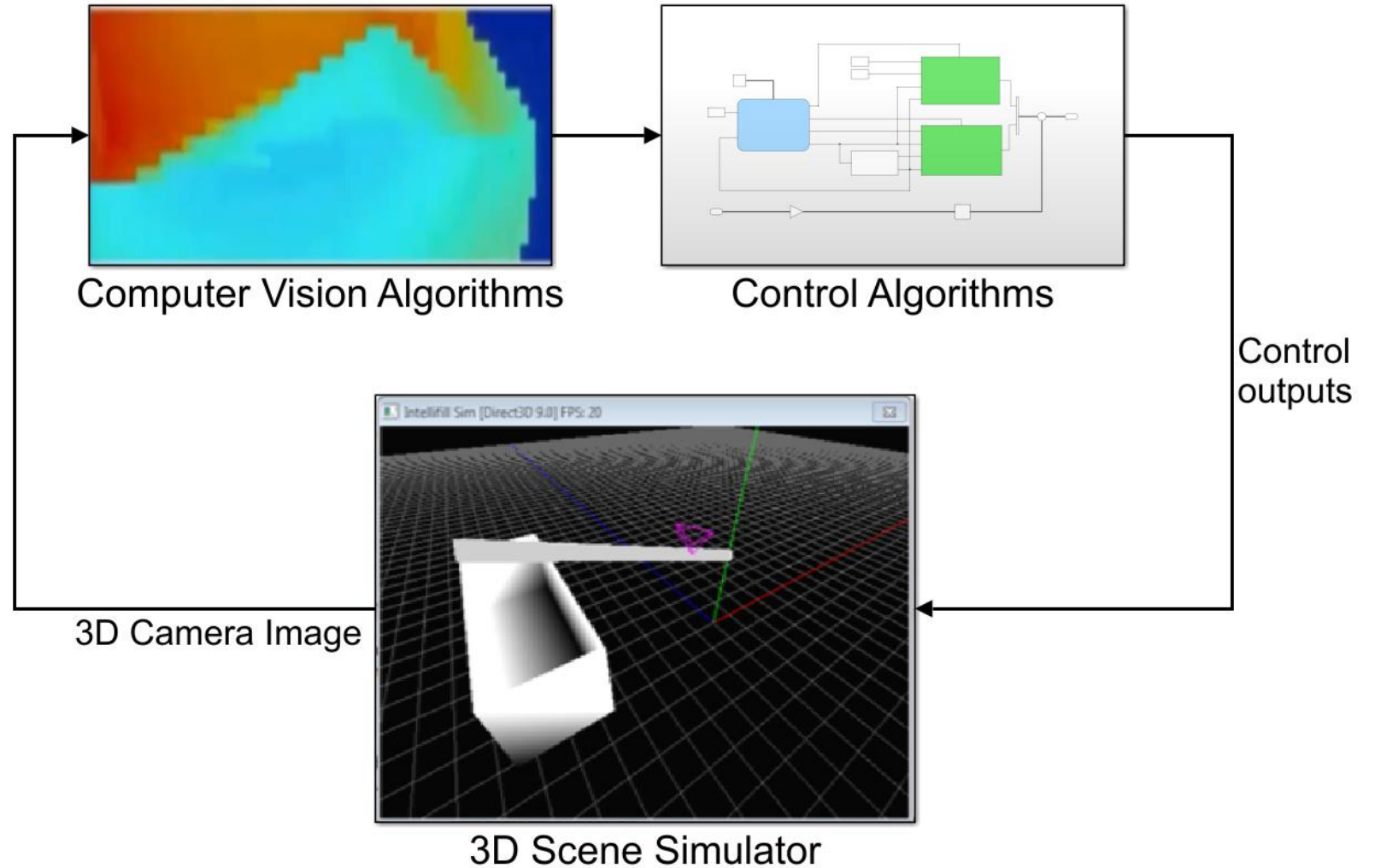


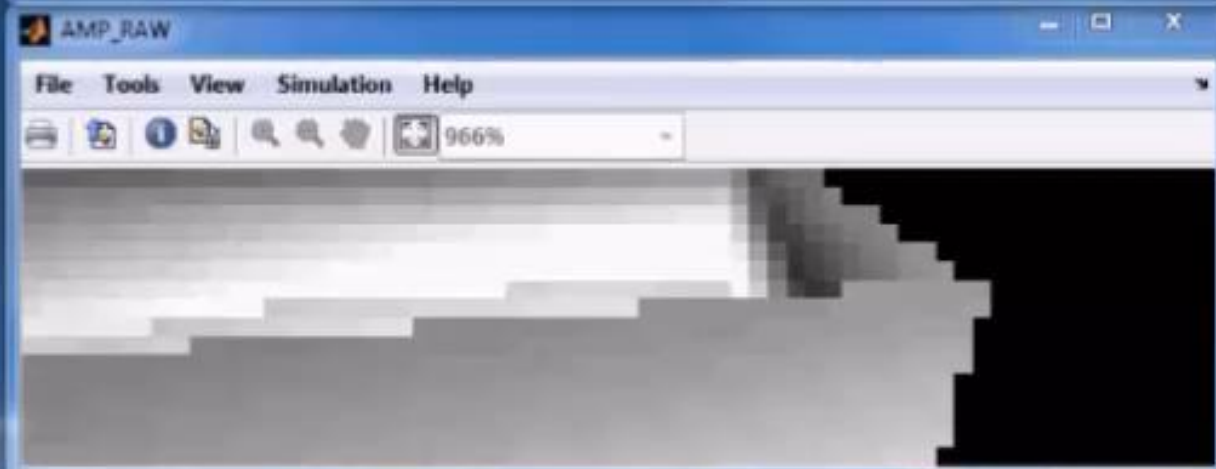
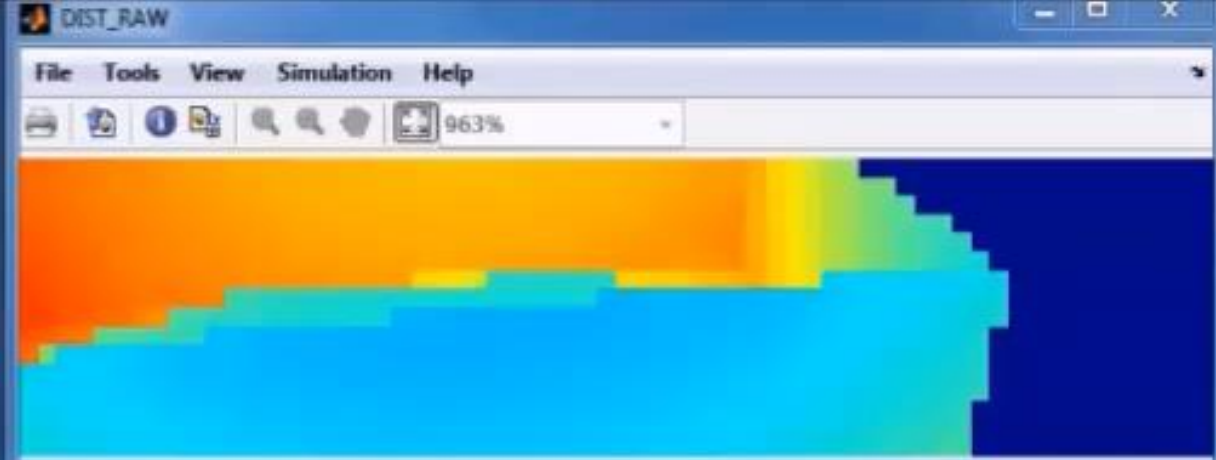
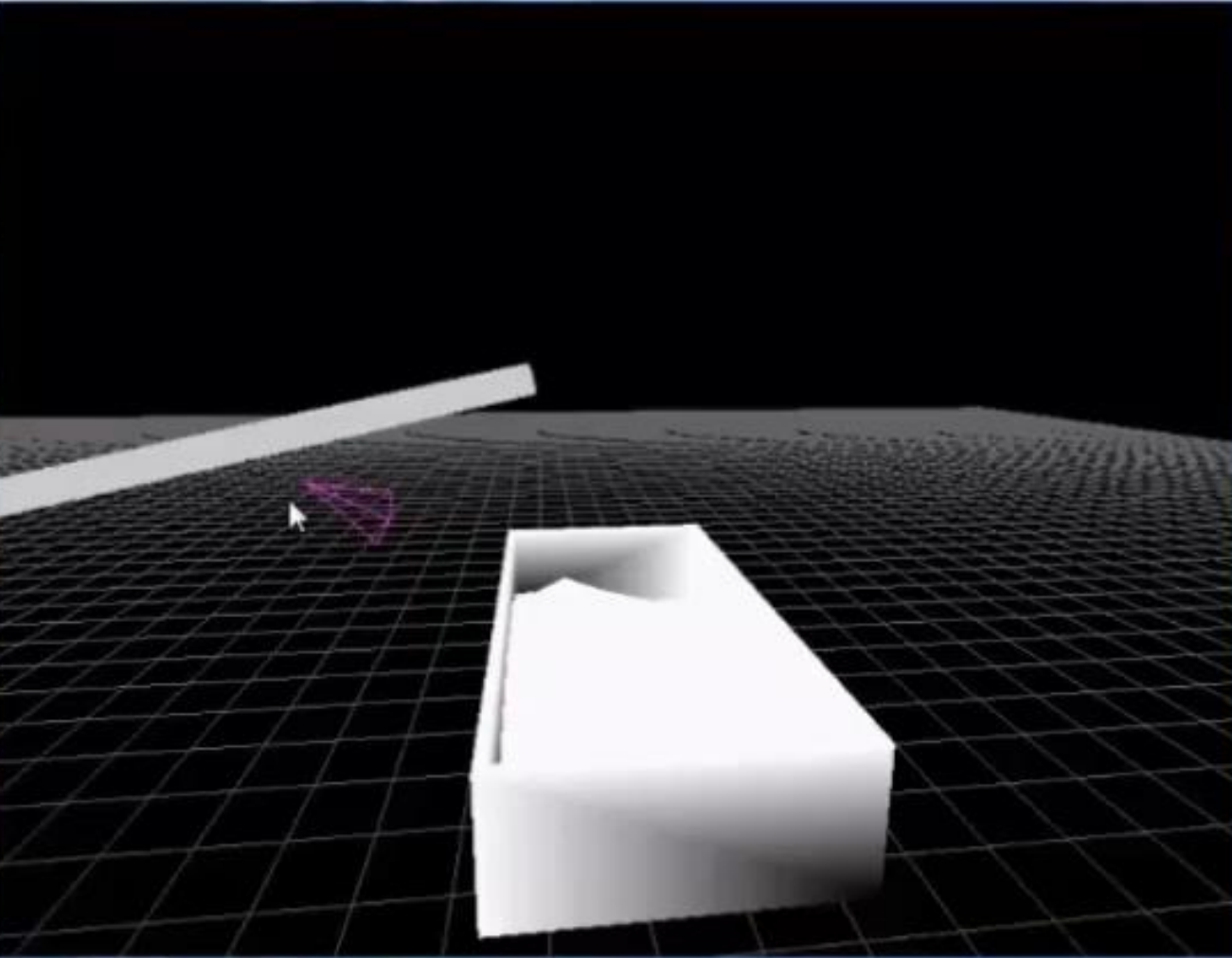


Autonomous Trailer Filling

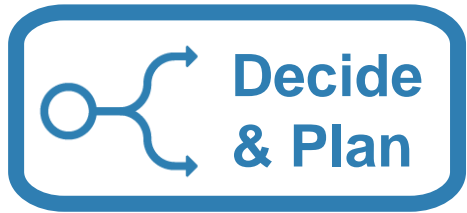
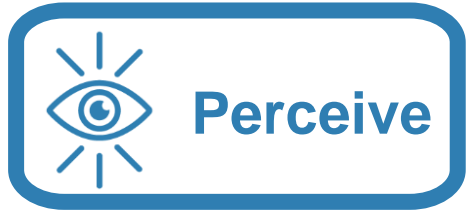


Autonomous Trailer Filling





Autonomous Trailer Filling



3D Camera



Computer vision and controls algorithms

Embedded Platform
MPC5121e



- User Input
- Visualization

CAN

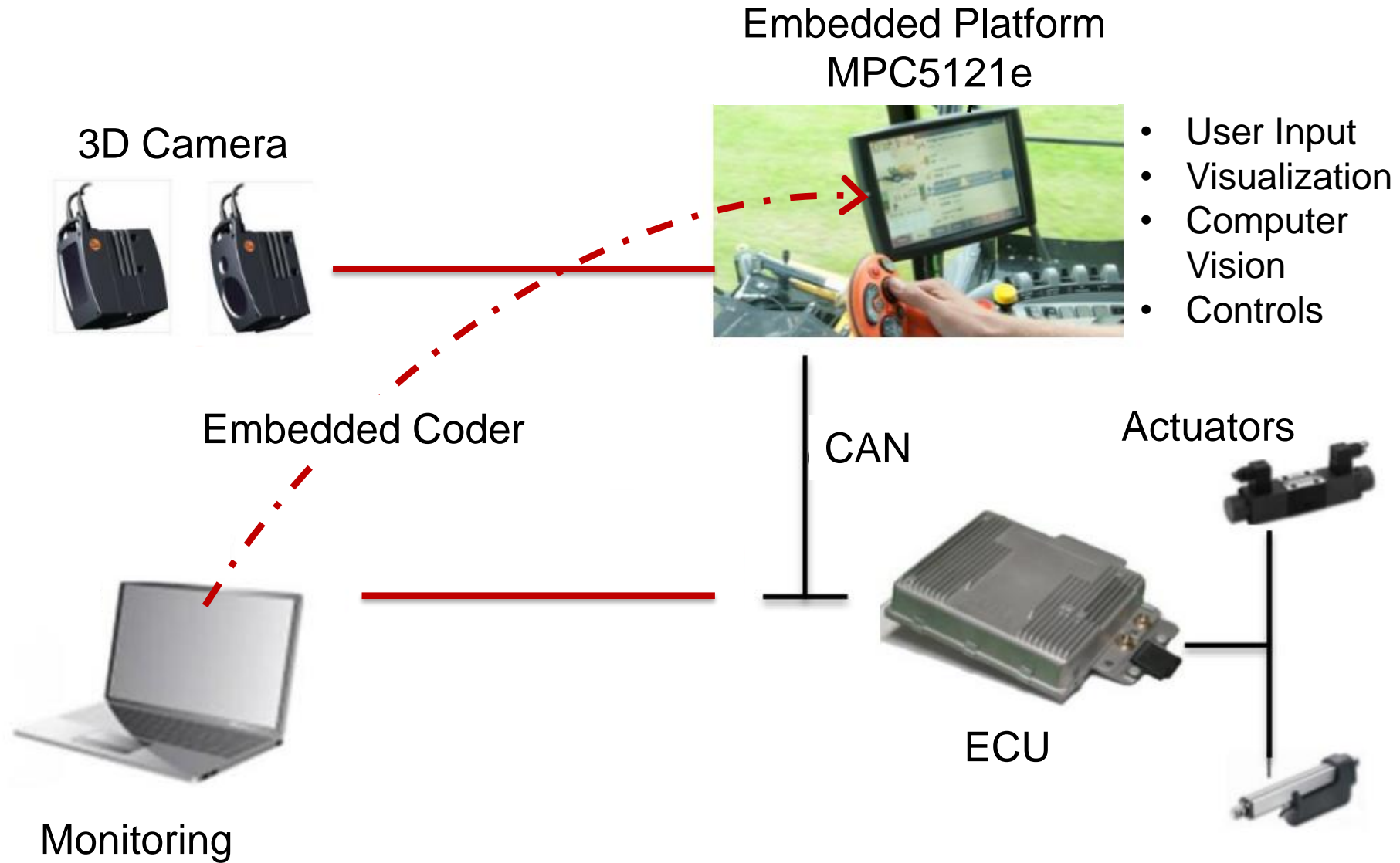
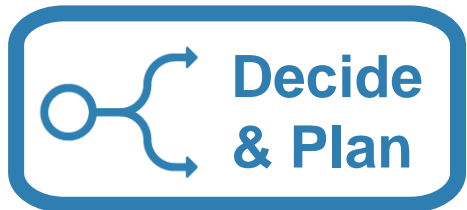
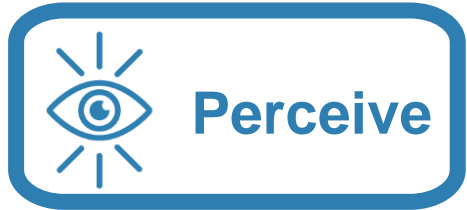
Actuators



ECU

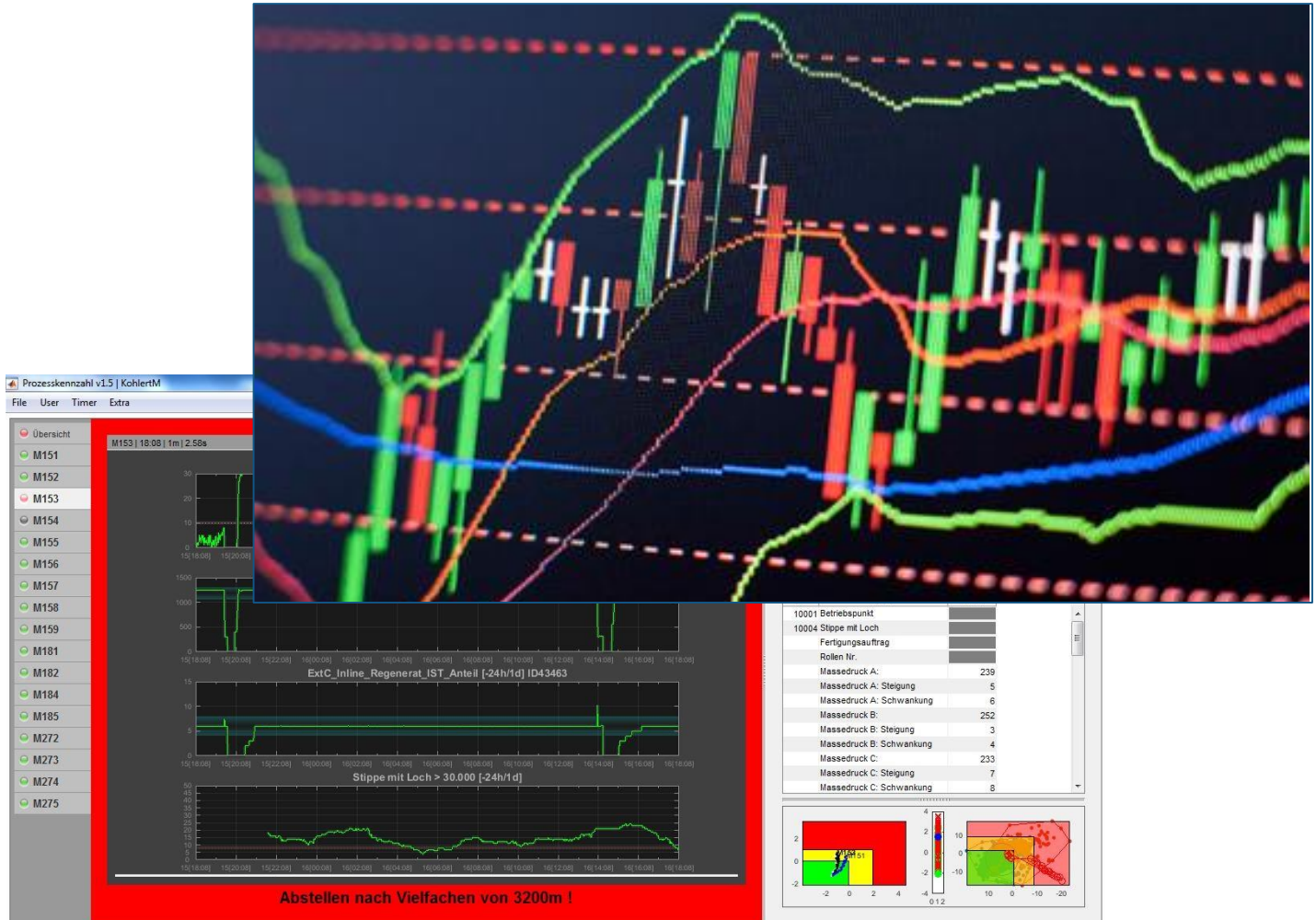


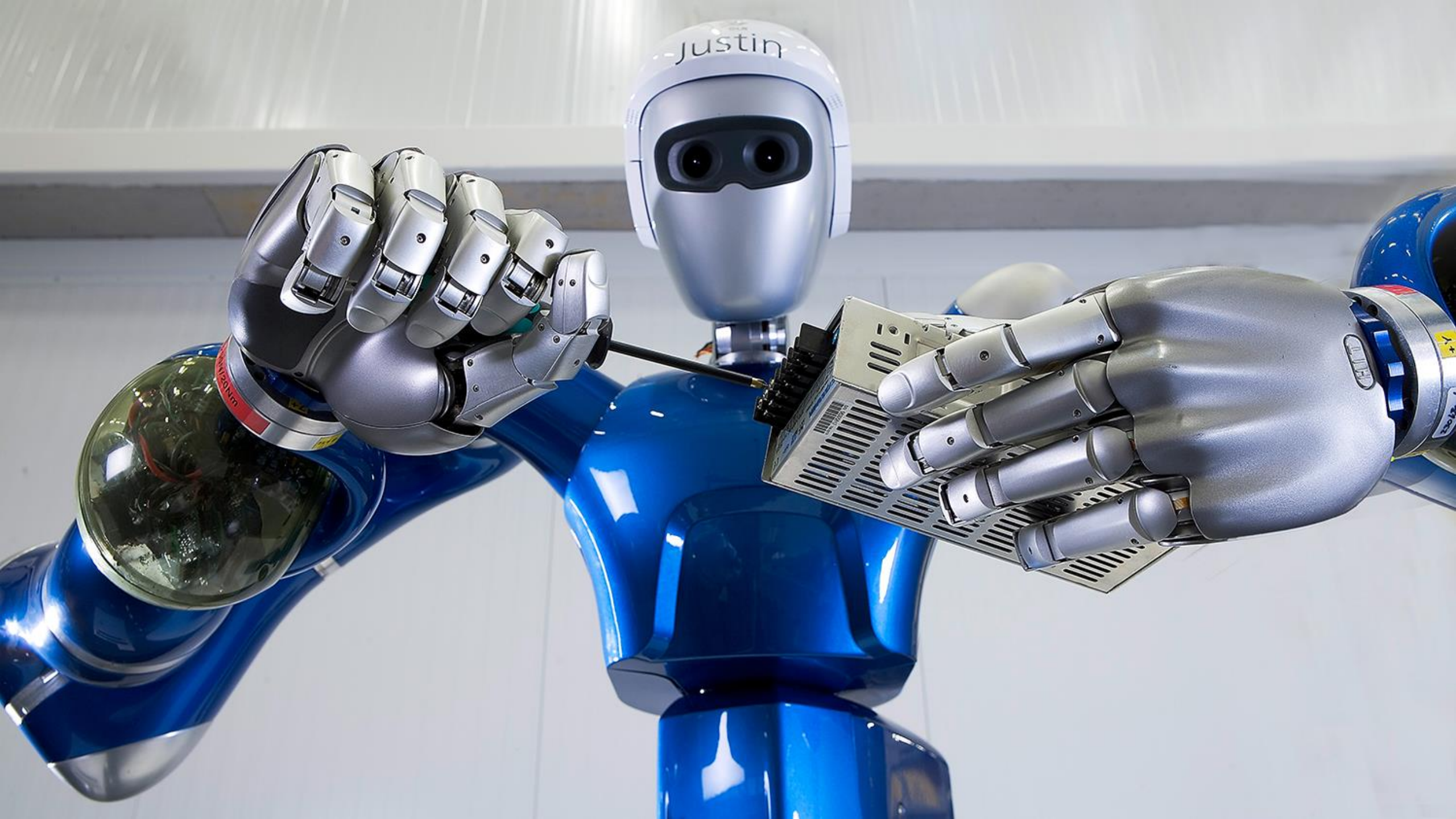
Autonomous Trailer Filling



How will you put it into production?

- Embedded Systems
- IT Systems
- Desktop Apps









How to build an autonomous anything

Focus on Perception

- Look for autonomy in creative places
 - Do more than manually possible
-

Use the Best Predictors

- Data-driven
 - Model-driven
-

Get the Right Data

- Reduce to actionable data
 - Take advantage of Big Data
 - Use simulation to supplement available data
-

Flow to Production

- Address the architecture
- Leverage Model-Based Design for embedded
- Automate integration with enterprise IT systems

What is *your*
autonomous anything?

MATLAB Expo 2017

시간	일정				
09:40-09:50 (10)	환영사				
09:50-10:20 (30)	매스웍스코리아 이종민 대표이사 고객 기초연설 : 제4차 산업혁명과 MATLAB을 통한 대학교육의 혁신				
10:20-10:50 (30)	수원대학교 이남식 제2차학 위원장 MathWorks 기초연설 : How to Build an Autonomous Anything				
10:50-11:20 (30)	Jason Ghidella 이사 R2016b와 R2017a를 중심으로한 새로운 기능				
11:20-11:40 (20)	이영준 부장				
	휴식 및 부스관람				
	Track 1	Track 2	Track 3	Subtrack 1	Subtrack 2
	신호처리, 컴퓨터비전 그리고 무선 기술	엔지니어링 데이터분석 및 애널리틱스 솔루션	모델 기반 설계를 통한 임베디드 시스템 개발	Tech Talk Special 1	Tech Talk Special 2
11:40-12:10 (30)	컴퓨터 비전의 최신 기술 (Deep Learning, 3D Vision, Embedded Vision)	빅데이터 처리 및 머신 러닝 기법	다중 센서 기반 자율 시스템의 모델 기반 설계 및 개발		
	김중남 차장	엄준상 과장	이제훈 차장		
12:10-13:10 (60)	Lunch				
13:10-13:40 (30)	위상 배열 레이더를 위한 시스템 설계	딥러닝 기반 응용 프로그램 작성 기법	[고객사례]Active Seat Belt 제어로직을 이용한 AEB 제동시나리오 승객거동해석	Simscape Power Systems를 이용한 전력전자 설계 및 시뮬레이션	MATLAB 라이브 에디터 소개
	Rick Gentile	엄준상 과장	현대모비스	강효석 과장	송완빈 대리
13:40-13:50 (10)					
13:50-14:20 (30)	[고객사례]신호분석시스템 개발 사례	엔터프라이즈 시스템에서의 빅데이터 애널리틱 애플리케이션 구축을 위한 MATLAB 기능	Simscape를 이용한 메케니컬 설계 와 멀티도메인 시뮬레이션 통합	Polyspace 제품군을 활용한 MISRA C:2012 가이드라인 및 실행시간 오류 검사	Simulink를 이용한 손쉬운 AUTOSAR 코드 구현
	LIG넥스원	성호현 차장	강효석 과장	유용출 과장	김종현 부장
14:20-14:30 (10)					
14:30-15:00 (30)	신호처리 어플리케이션을 위한 전처리 설계 및 특징 추출 방법	Internet of Things(IoT) 를 위한 애널리틱 개발 및 적용	고 신뢰성 시스템을 위한 모델 기반 설계에서의 검증	Automated Driving 툴박스 소개	비디오 프로세싱 서브시스템의 설계 및 하드웨어 타겟팅 기법
	Rick Gentile	성호현 차장	이영준 부장	이제훈 차장	정승혁 과장
15:00-15:40 (40)	휴식 및 부스관람				
15:40-16:10 (30)	5G 무선통신 시스템 설계	[고객사례](반도체 분야) MATLAB을 이용한 계측 공정 분석 시스템 구축	Simulink와 Embedded Coder를 이용한 최적 코드 생성		
	김중남 차장	SK하이닉스	김종현 부장		
16:10-16:20 (10)					
16:20-16:50 (30)	[고객사례]통계 및 기계학습을 이용한 생체물리정보 기반 퇴행성 신경계 질환 예측 (주)제이머스 전진홍 박사	MATLAB 과 Simulink 기반 병렬 컴퓨팅 기법	[고객사례]모델 기반설계 및 AUTOSAR 적용한 BMS 솔루션 개발		
		정승혁 과장	LG화학 조원태 부장		
16:50-17:00 (10)	경품 추첨				

