AI: Driving Innovation In Trucking

Can technology advancement enable collaboration?

Current as of Sept 2024

Today's Agenda

- Introductions
- Current State of AI
- AI in business applications
- How AI is being used at PTI
- Opportunities for true collaboration

"EFFECTIVE AI DEPLOYMENT REQUIRES A DEEP UNDERSTANDING OF BOTH THE **BUSINESS NEEDS** AND AND THE TECHNOLOGICAL CAPABILITIES. BRIDGING THIS BRIDGING THIS GAP IS ESSENTIAL FOR UNLOCKING THE UNLOCKING THE TRANSFORMATIVE POWER OF AI."

AI."

-SATYA NADELLA, CEO OF MICROSOFT

What I would like to learn:

What does *collaboration* *mean to you and you and is it achievable?*
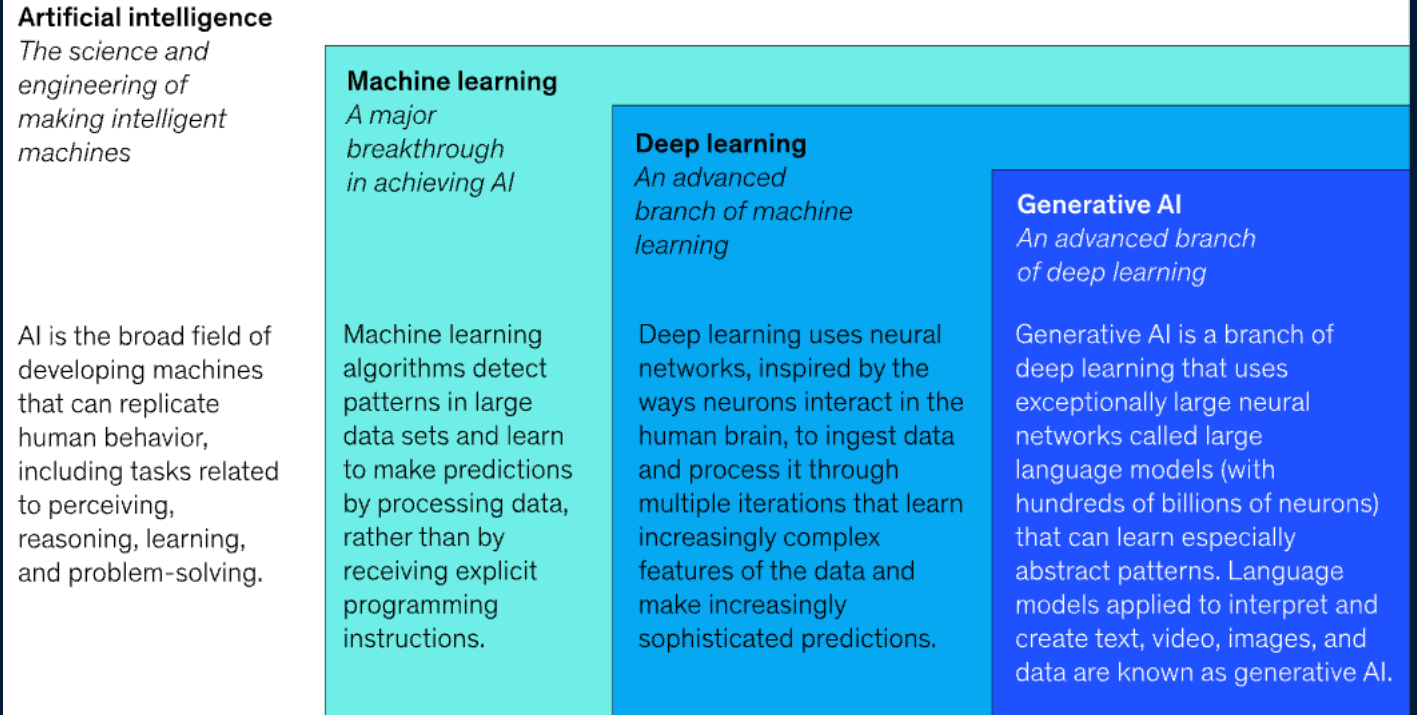
The Rise of the Machines

What is Artificial Intelligence?

(AI) as applying advanced analysis and logic-based techniques, including machine learning (ML), to interpret events, support and automate decisions, and take actions.

Artificial intelligence
The science and engineering of making intelligent machines

AI is the broad field of developing machines that can replicate human behavior, including tasks related to perceiving, reasoning, learning, and problem-solving.

Machine learning
A major breakthrough in achieving AI

Machine learning algorithms detect patterns in large data sets and learn to make predictions by processing data, rather than by receiving explicit programming instructions.

Deep learning
An advanced branch of machine learning

Deep learning uses neural networks, inspired by the ways neurons interact in the human brain, to ingest data and process it through multiple iterations that learn increasingly complex features of the data and make increasingly sophisticated predictions.

Generative AI
An advanced branch of deep learning

Generative AI is a branch of deep learning that uses exceptionally large neural networks called large language models (with hundreds of billions of neurons) that can learn especially abstract patterns. Language models applied to interpret and create text, video, images, and data are known as generative AI.

AI is a powerful technology that can simulate human-like intelligence and perform a wide range of tasks, but it is not a replacement for human creativity and decision-making.

What is A.I. Good At?

Processing and integrating information

AI can process and integrate new information and share knowledge between AI models more effectively than humans.

Repetitive tasks

AI can perform repetitive tasks without getting tired or making mistakes.

Pattern recognition

AI can recognize patterns in data that humans might miss.

Data-driven decision making

Making informed, data-driven decisions by identifying trends and predicting outcomes.

What A.I. is Not

AI is not human-like intelligence

AI lacks true understanding or consciousness. It performs tasks based on data and algorithms.

AI is not perfect

AI systems/models are only as good as the data they are trained on. They can inherit biases or produce incorrect results

AI does not work without human oversight

Human input is crucial in developing and interpreting AI models. AI cannot make moral decisions

A.I. can not replace human creativity

While AI can generate, art, text and music it does not generate with intent or emotion like humans do.

Why now?

1 The computational capacity of computers has increased exponentially, doubling every 1.5 years.

2 Computing efficiency – measuring the energy use of computers – has halved every 1.5 years over the last 60 years.

3 The number of connected devices (IoT) has grown from nearly 0 in 2005 to over 18.8 billion.

Computational capacity of the fastest supercomputers
The number of floating-point operations carried out per second by the fastest supercomputer in any given year. This is expressed in gigaFLOPS, equivalent to 10⁹ floating-point operations per second.

Historical price of computer memory and storage
This data is expressed in US dollars per terabyte (TB), adjusted for inflation. "Memory" refers to random access memory (RAM), "disk" to magnetic storage, "flash" to special memory used for rapid data access and rewriting, and "solid state" to solid-state drives (SSDs).

"If you were plowing a field, which would you rather use? Two strong oxen or 1024 chickens?"

-Seymour Cray, Cray Computing Corporation

With the current state of machine learning and AI, it is the revenge of the chickens.

Over Hyped... Again?

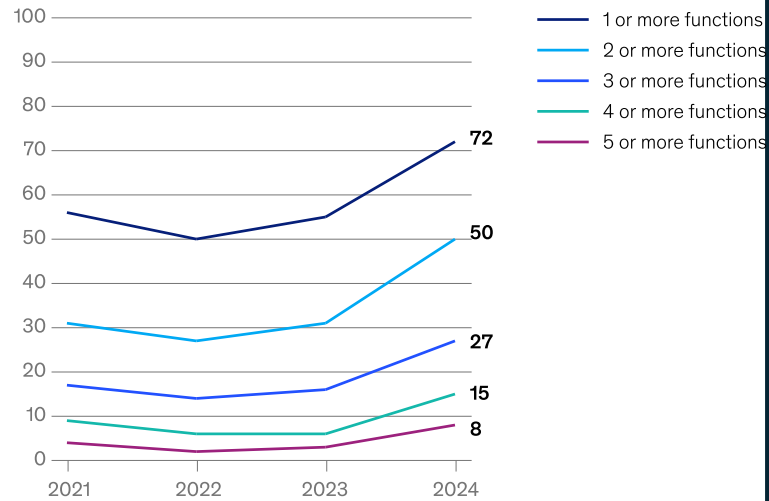## AI HAS A LONG HISTORY OF BEING "THE NEXT BIG THING"...

Popularity

Explosive Growth

New Hopes

Inflated Hype

AI winter II

Birth

AI winter I

1950 1956   1974 1980   1987 1993   Time
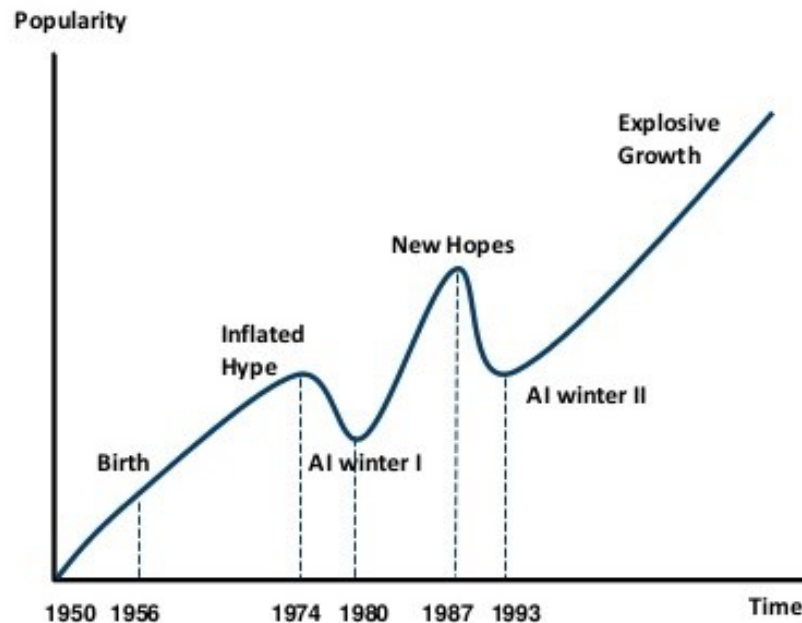
Timeline of AI Development

- **1950s-1960s**: First AI boom - the age of reasoning, prototype AI developed
- **1970s**: AI winter I
- **1980s-1990s**: Second AI boom: the age of Knowledge representation (appearance of expert systems capable of reproducing human decision-making)
- **1990s**: AI winter II
- **1997**: Deep Blue beats Gary Kasparov
- **2006**: University of Toronto develops Deep Learning
- **2011**: IBM's Watson won Jeopardy
- **2016**: Go software based on Deep Learning beats world's champions

Corporate Adoption

Survey findings suggest that organizations are using AI in more business functions now than in previous years.

Business functions at respondents' organizations that have adopted AI,[1] % of respondents

Legend:
- 1 or more functions
- 2 or more functions
- 3 or more functions
- 4 or more functions
- 5 or more functions

2024 values: 72, 50, 27, 15, 8

[1]In 2021, n = 1,843; in 2022, n = 1,492; in 2023, n = 1,684; in early 2024, n = 1,363.
Source: McKinsey Global Survey on AI, 1,363 participants at all levels of the organization, Feb 22–Mar 5, 2024

McKinsey & Company

Respondents most often report generative AI adoption in their marketing-and-sales, product- and service-development, and IT functions.

Respondents' organizations regularly using generative AI (gen AI), by function, % of respondents

34	23	17	16	16	13	12	8	7	6	4
Marketing and sales	Product and/or service development	IT	Other corporate functions	Service operations	Software engineering	Human resources	Risk	Strategy and corporate finance	Supply chain/ inventory management	Manufacturing
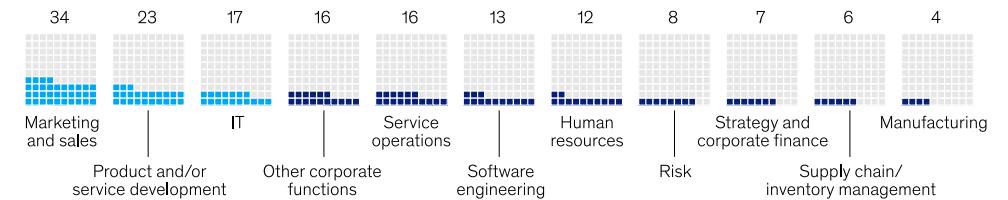
Most commonly reported gen AI use cases within function, % of respondents

Marketing and sales
- 16 — Content support for marketing strategy
- 15 — Personalized marketing
- 8 — Sales lead identification and prioritization

Product and/or service development
- 10 — Design development
- 6 — Scientific literature and research review
- 6 — Accelerated early simulation/testing

IT
- 7 — IT help desk chatbot
- 7 — Data management
- 6 — IT help desk AI assistant[1]
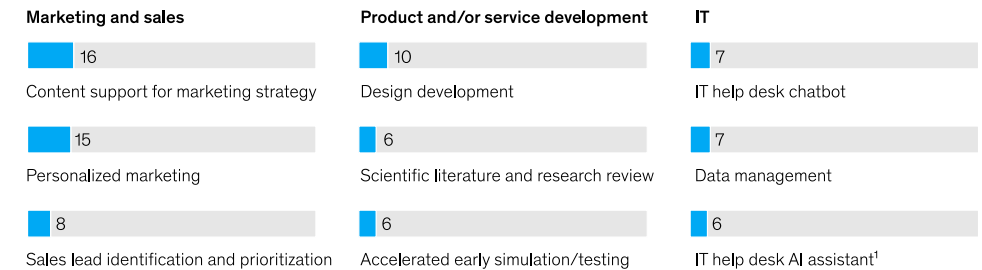
[1]Eg, providing real-time assistance and script suggestions to help desk employees during human-to-human conversations.
Source: McKinsey Global Survey on AI, 1,363 participants at all levels of the organization, Feb 22–Mar 5, 2024

McKinsey & Company

Making AI Work in Applications
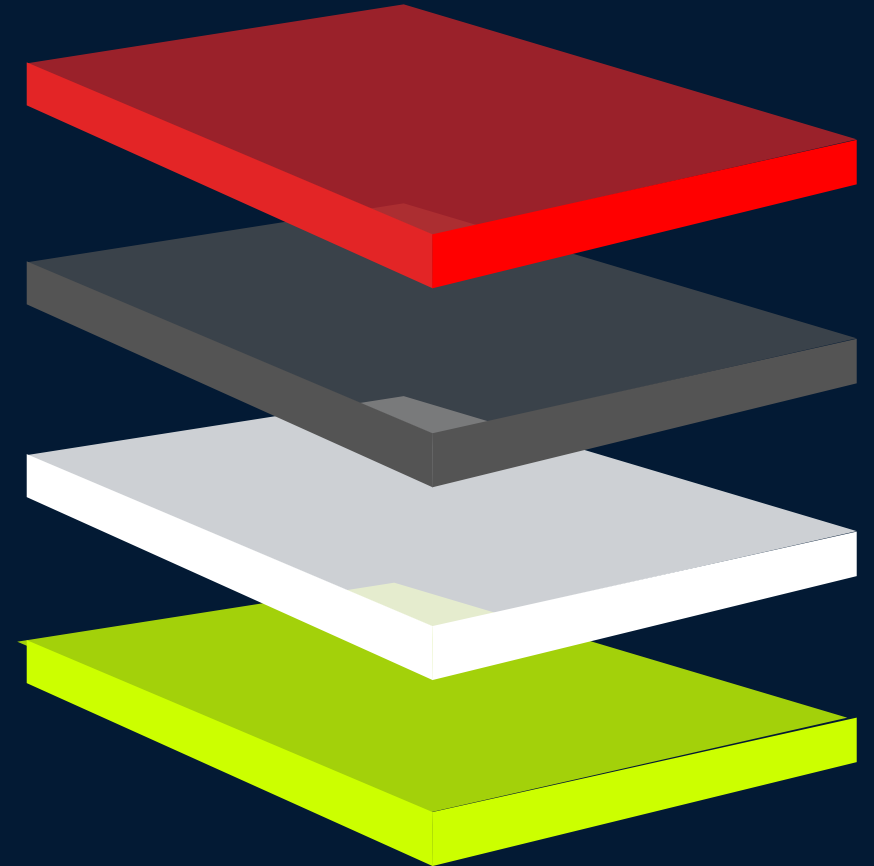
A drastically oversimplified explanation

- Data and specifically data quality is the unsung hero of A.I.

- A person needs to interact with the outputs. They need to be explainable vs. a 'black box.'

User Experience (UX)

Models

Data

Compute

The pace of change will *never be this slow again*

PTI Leading With A.I. Adoption in Trucking

2024 TRANSPORTATION INNOVATION FORUM

HOSTED BY PTI PAPER TRANSPORT

It All Starts with Data (Quality)

- EDI Data Quality

- Contract / Commitment Data
  - Mileages
  - Areas & Zips
  - Volumes (demand forecast)

- ELDs and Telematics

Demand Forecasting

Pattern Recognition

- 21-day demand forecast across all shippers and all lanes including:
  - Date/time of pick-up and delivery
  - Committed or non-committed
  - Miles
  - Revenue
  - Live or preloaded
  - .... And more
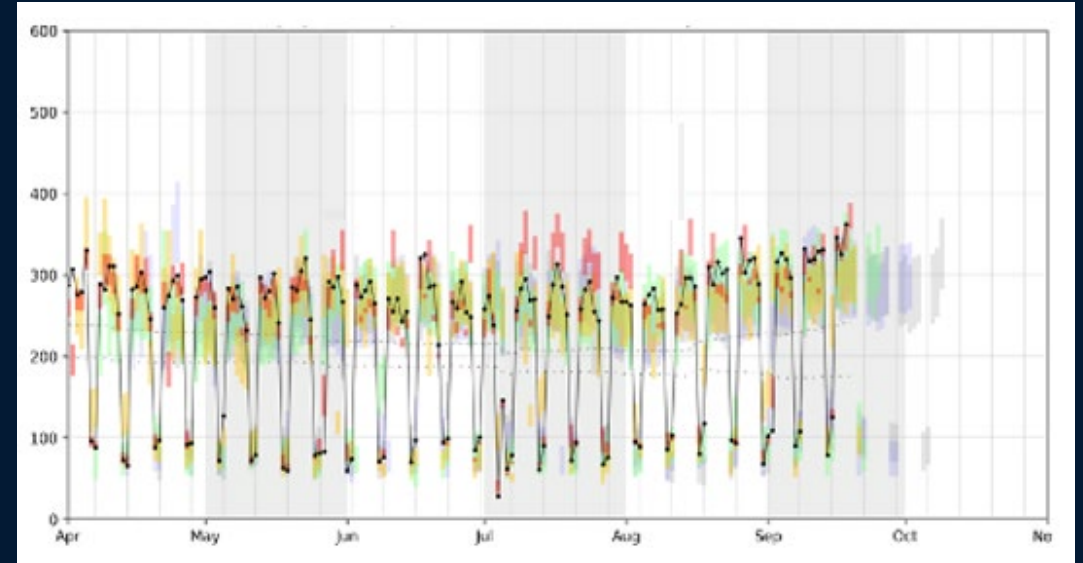
There is no crystal ball into the future, but we can predict the probability of an outcome with confidence.
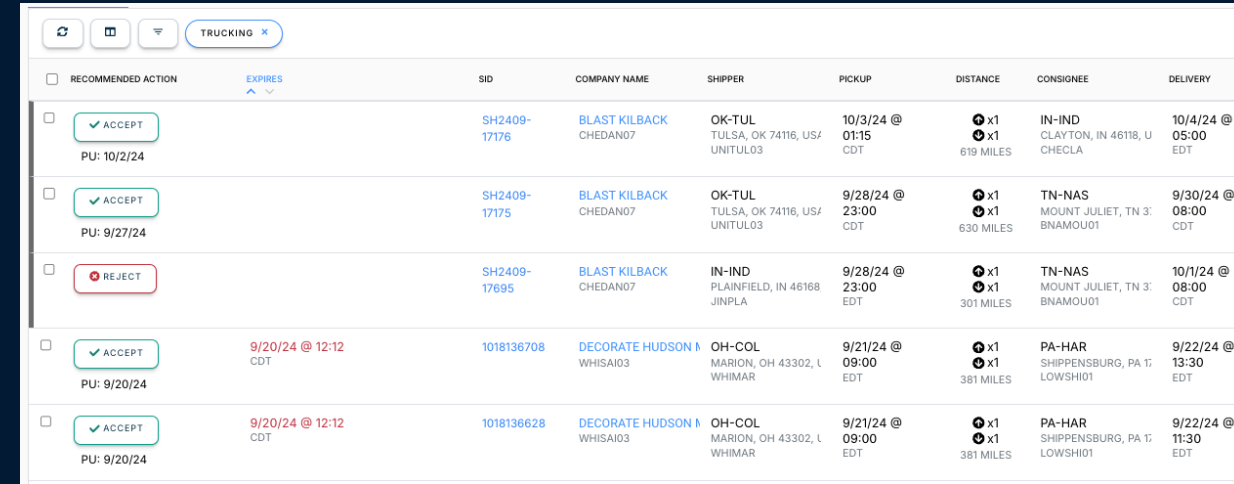
Network Design & Network Reality

2024 TRANSPORTATION INNOVATION FORUM

HOSTED BY

PTi PAPER TRANSPORT
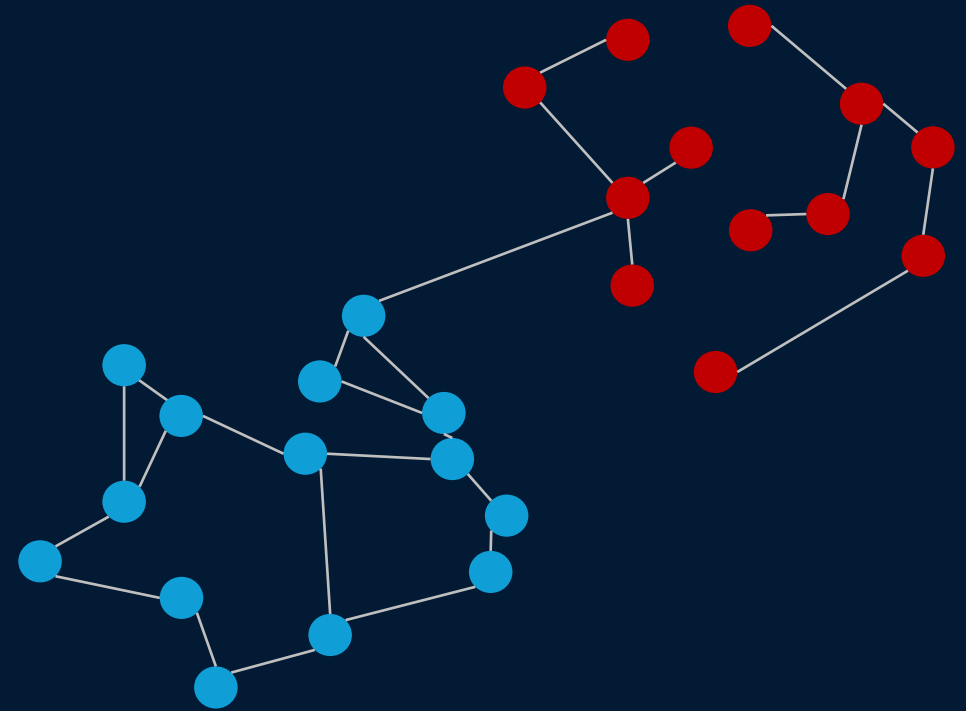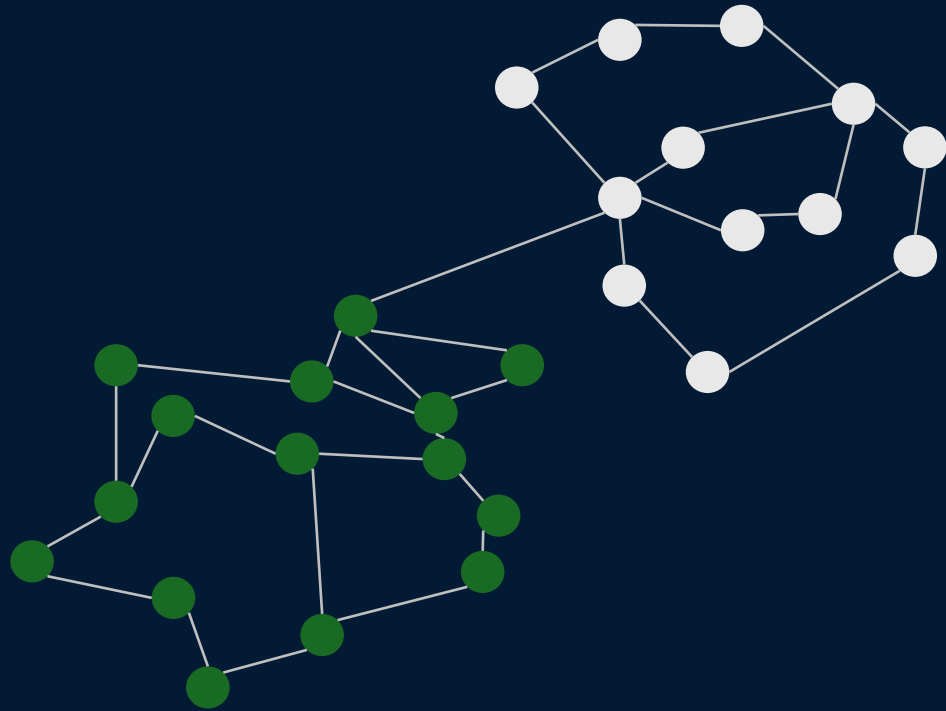
Integrated Decision Making

- Leveraging demand forecast helps models proactively allocate resources throughout the network where future demand will organically be available.

  - Dynamically balancing the network
 - Improving Services
  - Reduces downtime and empty miles

Human-in-the-loop Artificial Intelligence

Increasing Utilization with Location Data

Processing and Integrating Information & Pattern Recognition

By programmatically geocoding every location and every stop event, you can derive location specific learning from geospatial data:

- Dwell times throughout the day
- Overnight parking
- Trailer Pools
- Weigh Stations
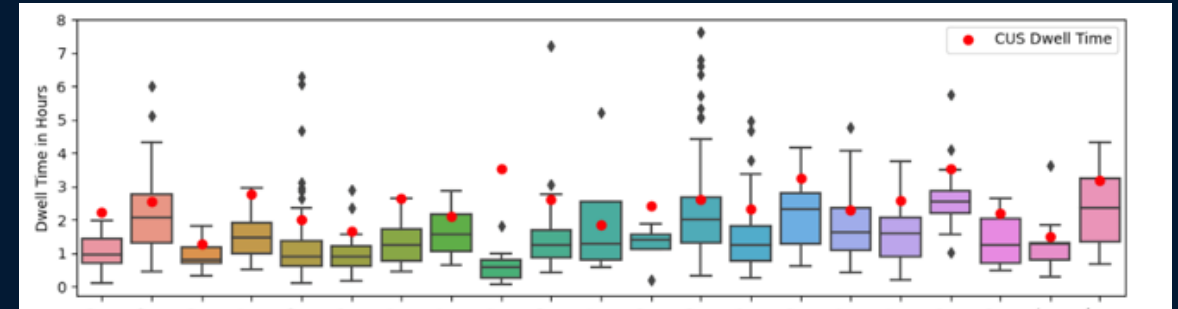
8559813: Lakeland, FL → Orlando, FL										
Completion Time	**Event**	**Location**	**Hours**	**Miles**	**Late**	**Drive**	**Work**	**Cycle**	**Recap 1**	**Recap 2**
9/20 05:59 EDT	Deadhead	Lakeland, FL 338...	00:08	7.8	--	10:51	12:42	30:56	--	--
9/20 05:59 EDT	Arrive At Hook Empty	Lakeland, FL 338...	--	--	--	10:51	12:42	30:56	--	--
9/20 06:29 EDT	Hook Empty	Lakeland, FL 338...	00:30	--	--	10:51	12:12	30:26	--	--
9/20 07:29 EDT	Transit	Orlando, FL 32822	01:00	55.0	--	09:51	11:12	29:26	--	--
9/20 07:29 EDT	Arrive At Drop Empty	Orlando, FL 32822	--	--	--	09:51	11:12	29:26	--	--
9/20 07:59 EDT	Drop Empty	Orlando, FL 32822	00:30	--	--	09:51	10:42	28:56	--	--
9/20 07:59 EDT	Arrive At Hook Preloaded	Orlando, FL 32822	--	--	On time	09:51	10:42	28:56	--	--
9/20 08:59 EDT	Hook Preloaded	Orlando, FL 32822	01:00	--	--	09:51	09:42	27:56	--	--

Asset & Driver Assignment

Processing and Integrating Information & Pattern Recognition

By leveraging ELD data, a driver's work schedule and preferences, along with location data – we can maximize a driver's utilization while getting them home on-time.
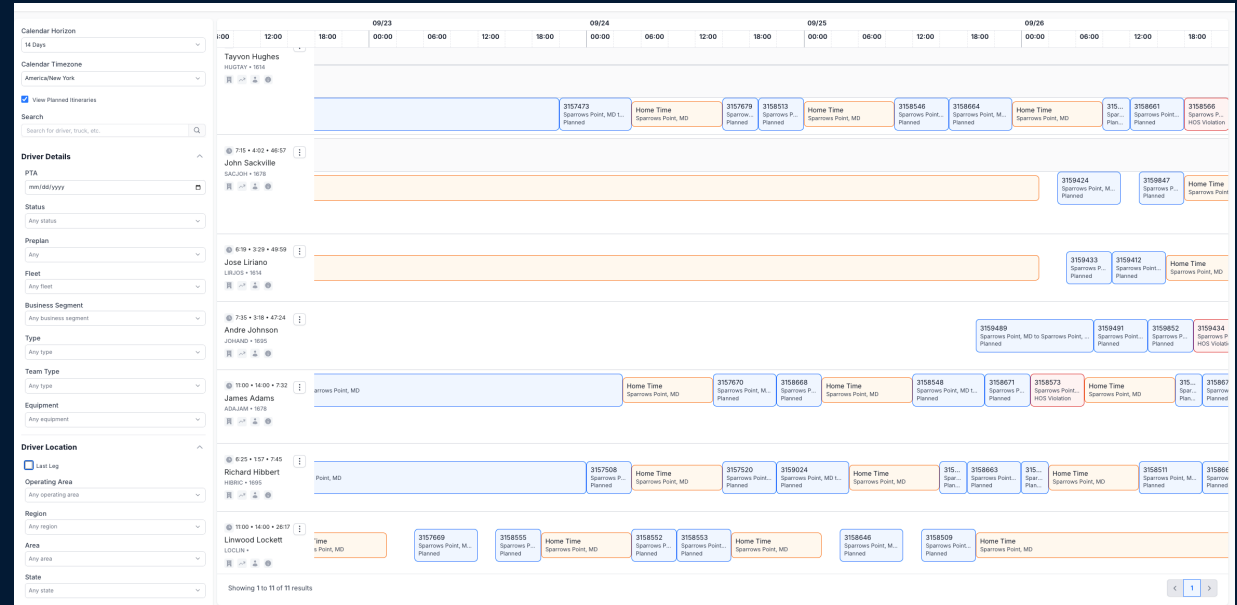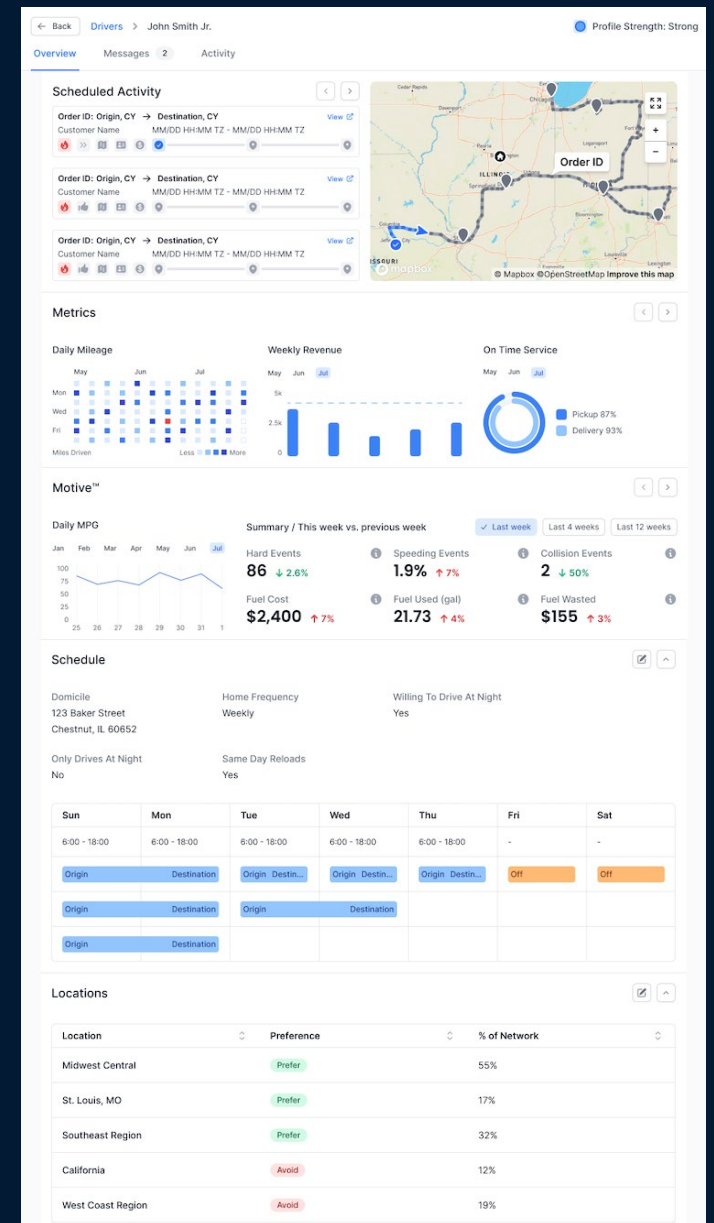

Sample screenshot from an actual PTI customer's optimized dedicated fleet.

Driver Centric Optimization

Every driver has unique attributes and preferences:

- Years of experience

- Certifications

- Work schedule

- Work area

- Desired lanes

- Restricted states and locations

- Income expectations

- Service

- Willingness to drive

Driver Safety and Coaching

Computer Vision

- Help detect single incidents and recurring behaviors from drivers for teachable moments.

- Reduce insurance liability from fraud.

- Alert drivers to help with collision prevention.

[WARNING]
Tailgating Detected

2.0
SECONDS TO COLLISION

Technology Enabled **Collaboration**

What if your carrier knew the driver, the tractor, time, location, and cost of an asset in their network multiple days into the future.

Economics & Collaboration

- Putting data at the center of the conversation (EDI)

- True service metrics

- Reserved & dynamic appointments

- Integrated demand forecasting

- Trucking as-a-service

- Backhaul optimization

- Dynamic Pricing

- Complete visibility to all visible loads

Opportunities

- Putting data at the center of the conversation

- Integrated Demand Forecasting

- Dedicated-As-A-Service

- Dedicated Fleet Backhaul Optimization

- Appointment Scheduling

- Dynamic Pricing
  - Asset-based spot pricing
  - Replacing annual contracts

- Greater Visibility to Available Volumes