

# Artificial Intelligence: Transforming Industries and Shaping our Future

Troy Hopkins, PCB Carolina  
November 8, 2023



**Connect Tech**

# Agenda

- ▶ Introduction
- ▶ Artificial Intelligence: At The Edge
- ▶ Artificial Intelligence: Transforming Every Industry
  - ▶ Manufacturing
  - ▶ Retail
  - ▶ Smart City
  - ▶ Healthcare
  - ▶ Logistics
  - ▶ Agriculture
  - ▶ Home
  - ▶ Metals & Mining
- ▶ The Hardware: Sensor and Interface types we need to work with
- ▶ Modular Design
- ▶ Discussion

# Who is Connect Tech?



**Connect Tech Inc.**  
Embedded Computing Experts

With 38 years of embedded computing experience, Connect Tech's range of proven technology includes complete embedded systems, carrier boards, thermal solutions, embedded switches, and more.

With **in-house** design and manufacturing services in North America, Connect Tech can provide fast turn-around of custom design services, taking you from development to deployment in record time.

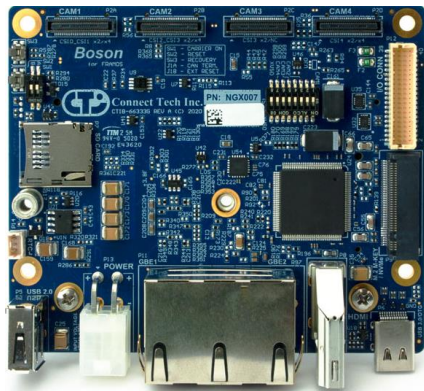
**HEICO®**

In August 2020, Connect Tech was acquired by US based HEICO Corporation. A successful and growing technology-driven company, HEICO is solidly rooted in the aerospace, industrial, defense and electronics markets. HEICO annual revenue is \$2B+ with 10K employees worldwide.

# NVIDIA Jetson Elite Partner



Connect Tech is proud to be an Elite Partner in NVIDIA's Jetson ecosystem. We have production-ready hardware to support all available modules.



# AI at the Edge

- ▶ AI at the Edge, also known as Edge AI is the deployment of AI applications in devices throughout the physical world. It's called "edge AI" because the AI computation is done near the user at the edge of the network, close to where the data is located, rather than sending all data to remote cloud data centers for analysis.
- ▶ Since the internet has global reach, the edge of the network can connect any location. It can be a retail store, factory, hospital or devices all around us, like traffic lights, autonomous machines and phones.

# AI at the Edge – Advantages

This approach has several advantages:

- ▶ Low Latency
- ▶ Privacy and security
- ▶ Bandwidth Efficiently
- ▶ Offline Operation
- ▶ Cost Savings

To enable AI at the edge, developers typically use lightweight AI models and optimized software frameworks that can run efficiently on resource-constrained devices, such as embedded systems, mobile devices, and edge servers. Edge AI is a rapidly growing field, and it plays a crucial role in enabling a wide range of AI-powered applications closer to where the data is generated.

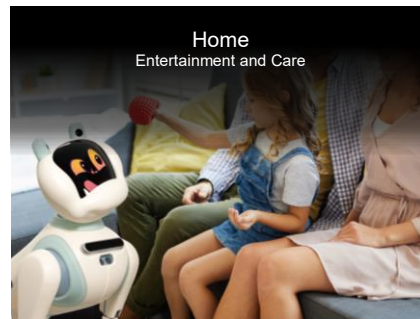
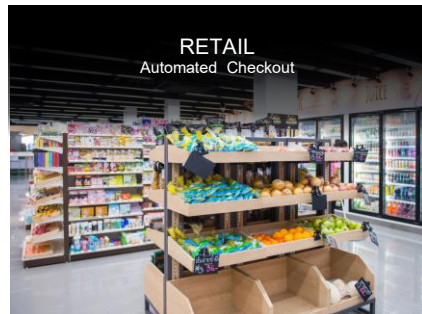
# How does it work?



Source: NVidia

# EDGE AI TRANSFORMS NEARLY ALL INDUSTRIES

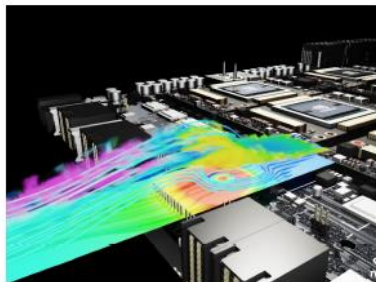
AI could potentially deliver an additional economic output of around US \$13 trillion by 2030





# Manufacturing & Industrials Value Chain Has 4 Pillars

## Product Design & Simulation



- Electronic Design Automation (EDA)
- Computational Fluid Dynamics (CFD)
- Materials Design
- Mechanical/ Electronic Computer Aided Design (MCAD/ ECAD)
- Computational Solid Mechanic (CSM)
- Computational Electromagnetics (CEM)

## Smart Manufacturing



- Quality Inspection & Metrology
- Industrial Digital Twin
- Robotics & Automation
- Process Control & Optimization
- Plant Planning & Commissioning
- Worker Safety & Productivity

## Supply Chain & Transportation



- Routing Optimization
- Demand & Capacity Forecasting
- Materials Handling
- Inventory & Asset Management

## Industrial Field Services



- Predictive Maintenance
- Field Inspection
- Decision Support Services
- Asset Tracking
- Document Analytics
- Customer Communications

*Note: Bolded use cases will have deep dive and sales motion materials.*

# Bringing Agility to Retail

Top 4 segments of AI use cases in retail with the potential of delivering \$1.7t in value

## INTELLIGENT STORES



Asset Protection  
Stockout Alerts  
Planogram Compliance  
Store Analytics

## INTELLIGENT QSRs



Drive Through Speech ordering  
Multi-modal Recommendations  
Production Quality Inspection  
Demand Forecasting  
Queue Management

## OMNI-CHANNEL MGMT



Customer 360/Segmentation  
E-Commerce Recommender Systems  
Hyper-Personalization  
Conversational AI  
Fraud and Cybersecurity

## INTELLIGENT SUPPLY CHAIN



Demand Forecasting  
Digital Twins and Simulation  
Intelligent Warehouses  
Last-Mile Delivery

# Intelligent Stores

## ASSET PROTECTION



Ticket Switching  
Mis-Scanning  
Employee Theft  
Security

## STORE ANALYTICS



Stock-Out and Real-Time Alerting  
Heat Mapping  
Demographic Analysis  
Shopper/Employee Tracking  
Customer Engagement

## AUTONOMOUS SHOPPING



Autonomous Checkout  
Nano Stores  
Smart Cabinets



# Intelligent Quick Service Restaurants (QSRs)

## DRIVE THRU



Drive Through Queue Management

License Plate Recognition (LPR) & pickup

Automated Voice Order Taking (Kiosk/Mobile app)

Multi-modal Recommendations

Exterior Security

## STORE ANALYTICS



Queue /Wait Time Management

Demographic Analysis

Asset Protection/Interior Security

Employee Staffing Forecasting

Personalization & Loyalty

Production Quality Inspection

Product Waste/Spoilage/Food Safety

Sanitation Management

## SUPPLY CHAIN



Demand Forecasting

Day 1 Forecasts for New Stores and Products

Routing Optimization and Last Mile Delivery

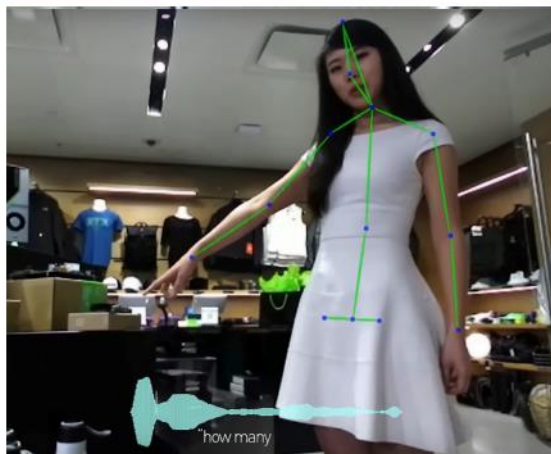
# Omni-Channel Management

## ECOMMERCE/ DIGITAL



AI Product Meta-Tagging & Cataloging  
Personalized Recommendation Systems  
Similar & Complimentary Products  
Visual Search

## CONVERSATIONAL AI



Chatbots  
Virtual Assistants  
Multi-Speaker Transcription

## CYBERSECURITY



Fraud Detection  
Cybersecurity

# Logistics and Supply Chain

- ▶ Real-time monitoring and decision making
  - ▶ Loading dock intelligence
  - ▶ Adaptive speed conveyers
- ▶ Improved inventory management
- ▶ Smart forklifts, autonomous robots
- ▶ Last mile delivery robots and drones
- ▶ Reduced data processing latency
- ▶ Process flow management
- ▶ Compliance and quality monitoring



# Health Care

- ▶ Diagnostics and image analysis
- ▶ Remote patient monitoring
- ▶ Early intervention
- ▶ Wearing device data
- ▶ Telemedicine
- ▶ Personalized treatment plans
- ▶ Remote and underserved areas
- ▶ Hospital/clinic efficiency
- ▶ Accelerated medical research





# Smart City

- ▶ Traffic Management
- ▶ Energy efficiency
- ▶ Waste management
- ▶ Public Safety
- ▶ Infrastructure inspection
- ▶ Environmental monitoring
- ▶ Noise reduction
- ▶ Smart parking, public transport
- ▶ Emergency response planning





# Agriculture

- ▶ Precision crop management
- ▶ Real-time crop monitoring and pest control
- ▶ Livestock health and behavior
- ▶ Smart/autonomous vehicles
- ▶ Weather and climate data analysis for better decision-making
- ▶ Farm automation for labor reduction
- ▶ Predictive equipment maintenance



# Home

- ▶ Companionship
- ▶ Cleaning
- ▶ Cooking
- ▶ Security
- ▶ Home Automation
- ▶ Home Entertainment
- ▶ Personal finance management/budgeting
- ▶ Shopping/inventory management
- ▶ Personalized recommendations



Source: NVIDIA



**Connect Tech**

# Metals & Mining

- ▶ Site selection and precision digging
- ▶ Predictive maintenance
- ▶ Asset optimization
- ▶ Safety and hazard monitoring
- ▶ Environmental Impact reduction
- ▶ Enhanced mineral processing
- ▶ Remote mining operations
- ▶ Geopolitical risk assessment
- ▶ Regulatory compliance tracking



# ► The Hardware – Sensors

- ▶ Temperature
- ▶ Light
- ▶ Proximity
- ▶ Motion
- ▶ Pressure
- ▶ Humidity
- ▶ Accelerometer
- ▶ Gyroscope
- ▶ Magnetometer
- ▶ Infrared
- ▶ Ultrasonic
- ▶ Force
- ▶ Gas
- ▶ Sound
- ▶ pH
- ▶ Image

If it can be sensed, it can be used with AI. Use your imagination at the possibilities in your industry.

# ► The Hardware – Interfaces

- ▶ ADCs
- ▶ I2C, SPI, UART
- ▶ CAN (controller area network)
- ▶ WIFI/BT
- ▶ Ethernet
- ▶ USB
- ▶ CSI (Camera Serial Interface)
- ▶ GMSL (Gigabit Multimedia Serial Link)
- ▶ FPD-Link (flat panel display)
- ▶ PCIe.... the list goes on

Given the types of interfaces used in the development and deployment of AI, a strong understanding of Printed Circuit Board design is critical.



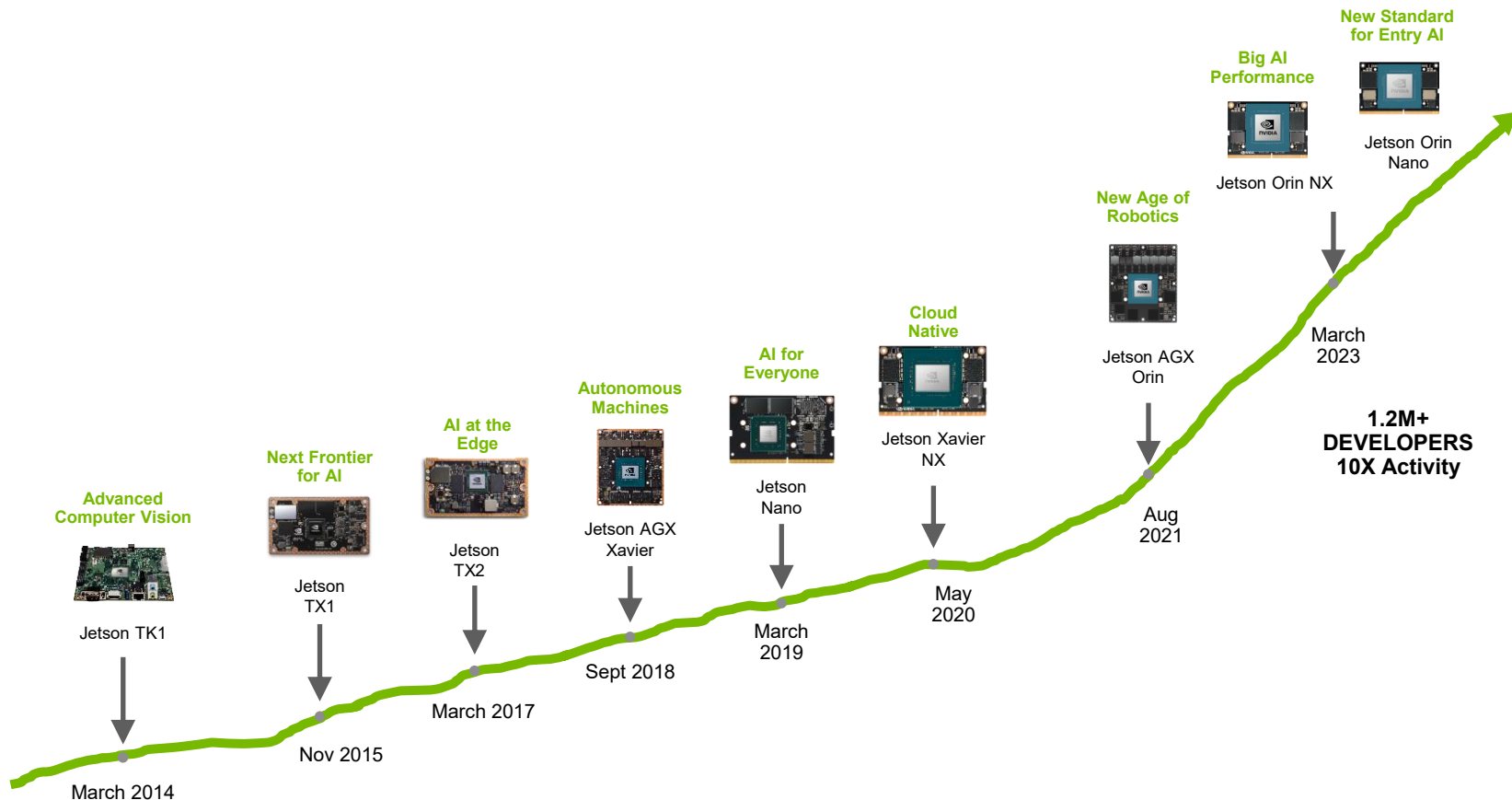
# ► Modular Design

- ▶ Flexibility and Scalability
- ▶ Maintenance and Upgrades
- ▶ Reuse of IP
- ▶ Reduced development time
- ▶ Reduced risk
- ▶ Cost efficient

Connect Tech is a hardware design and manufacturing company that specializes in rugged, small form factor solutions.

In the AI space, we work with Nvidia's by designing carriers and embedded systems around their Jetson product line of System on Modules.

# NVIDIA JETSON POWERING THE NEXT AIOT & ROBOTICS REVOLUTION



# THE JETSON FAMILY

For AI at the Edge and Autonomous Machines

Next-Gen: Jetson Orin

## JETSON Orin Nano 4GB

20 TOPs (INT8)



7 - 10W  
\$199  
45mm x 70mm

## JETSON Orin Nano 8GB

40 TOPs (INT8)



7 - 15W  
\$299  
45mm x 70mm

## JETSON Orin NX 8GB

70 TOPs (INT8)



10 - 20W  
\$399  
45mm x 70mm

## JETSON Orin NX 16GB

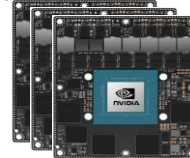
100 TOPs (INT8)



10 - 25W  
\$599  
45mm x 70mm

## JETSON AGX Orin Series

200/275/248 TOPs (INT8)



15- 60W\*\*\*  
32GB/64GB  
\$899/\$1599/\$2149  
100mm x 87mm

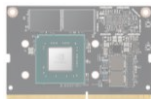
ENTRY

MAINSTREAM

PERFORMANCE

## JETSON NANO

0.5 TFLOPS (FP16)



5 - 10W  
\$99  
45mm x 70mm

## JETSON TX2 NX

1.33 TFLOPS (FP16)



7.5 - 15W  
\$149  
45mm x 70mm

## JETSON TX2 series

1.33 TFLOPS (FP16)



7.5 - 15W\*  
\$399  
50mm x 87mm

## JETSON Xavier NX series

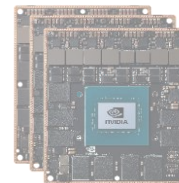
21 TOPs (INT8)



10 - 20W  
8GB/16GB  
\$399/\$499  
45mm x 70mm

## JETSON AGX Xavier Series

32 TOPs (INT8)



10 - 30W\*\*  
32GB/64GB  
\$899/\$1299\*  
100mm x 87mm

Full specs at [developer.nvidia.com/jetson](https://developer.nvidia.com/jetson)

\*TX2i: 10-20W, \$749 \*\* Jetson AGX Xavier Industrial 20W-40W, \$1249 \*\*\* Jetson AGX Orin Industrial (248 TOPs, 15W-75W), Jetson AGX Orin 32GB (200 TOPs, 15W-40W)

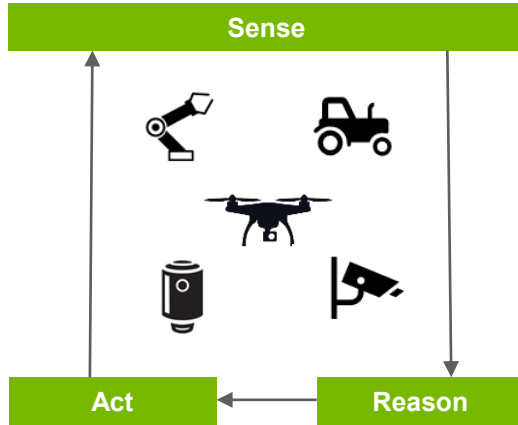


# NVIDIA JETSON

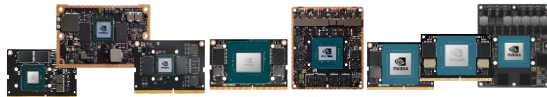
Software-Defined AI Platform

## AI at the Edge

Sensor Fusion & Compute Performance



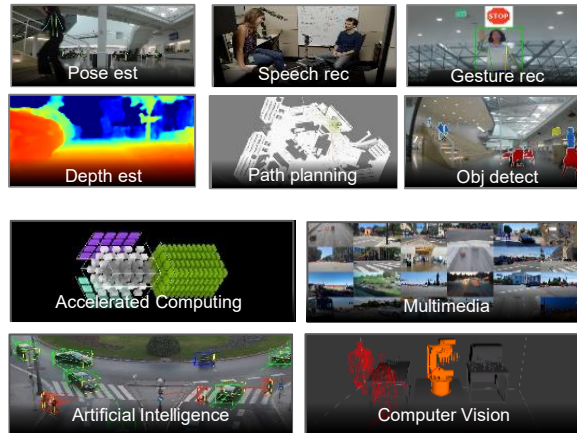
JETSON COMPUTER



Autonomous Machines: The Future of AI | NVIDIA

## SOFTWARE DEFINED

SDK, Design Tools, Libs, GEMs



Jetpack SDK · CUDA · TensorRT · Triton · ONNX · ROS

Jetson Software | NVIDIA Developer

## ECOSYSTEM

Expertise, Time to Market



Jetson Ecosystem | NVIDIA Developer

# NVIDIA's Largest Jetson Partner

Multiple solutions for all modules, off-the-shelf  
**100+ carriers/systems and counting!**



Inference Servers



Edge Devices



Subsystems



Carrier Boards



Adapter Boards



Thermal  
Solutions

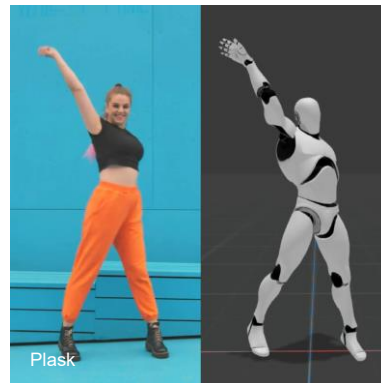
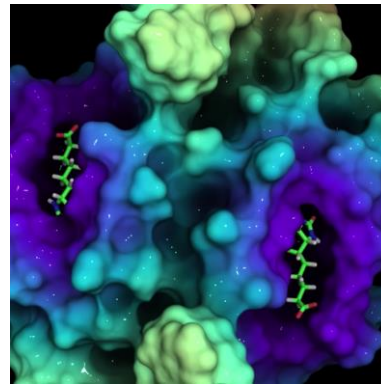
## The In-Person GTC Experience Is Back

Come to GTC—the conference for the era of AI—to connect with a dream team of industry luminaries, developers, researchers, and business experts shaping what's next in AI and accelerated computing.

From the highly anticipated keynote by NVIDIA CEO Jensen Huang to over 600 inspiring sessions, 200+ exhibits, and tons of networking events, GTC delivers something for every technical level and interest area.

Be sure to save your spot for this transformative event. You can even take advantage of early-bird pricing when you register by February 7.

March 18-21, 2024 | [www.nvidia.com/gtc](https://www.nvidia.com/gtc)



# THANKS!

## **Any questions?**

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