

# tinyML<sup>®</sup> Foundation

*Enabling Ultra-low Power Machine Learning at the Edge*

**tinyML Summit April 22 - 24, 2024**



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Attracting Tomorrow



## Real-World Success Stories

### Oscar the Sorter

TDK & Doosan – Revolutionizing Recycling Through Automated Streamlined Robotics and No-Code ML Development

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# Hi, We're TDK Qeexo, A Machine Learning Company

TDK Qeexo supports streamlined automated machine learning development and custom AI solutions engineering – enabling industry 4.0 digital transformation in the industrial manufacturing, energy generation, and CPG verticals

**Founded:** 2012

- Spun out of Carnegie Mellon University
- Acquired by TDK Corporation Feb-2023

## **Key Areas of Business:**

- Machine Learning as a Service
  - Qeexo AutoML – fully automated, no-code machine learning platform for embedded devices
- Applications Products (400 million units sold)
  - FingerSense, EarSense, TouchTools
- Engineered AI Services



# What We'll Cover

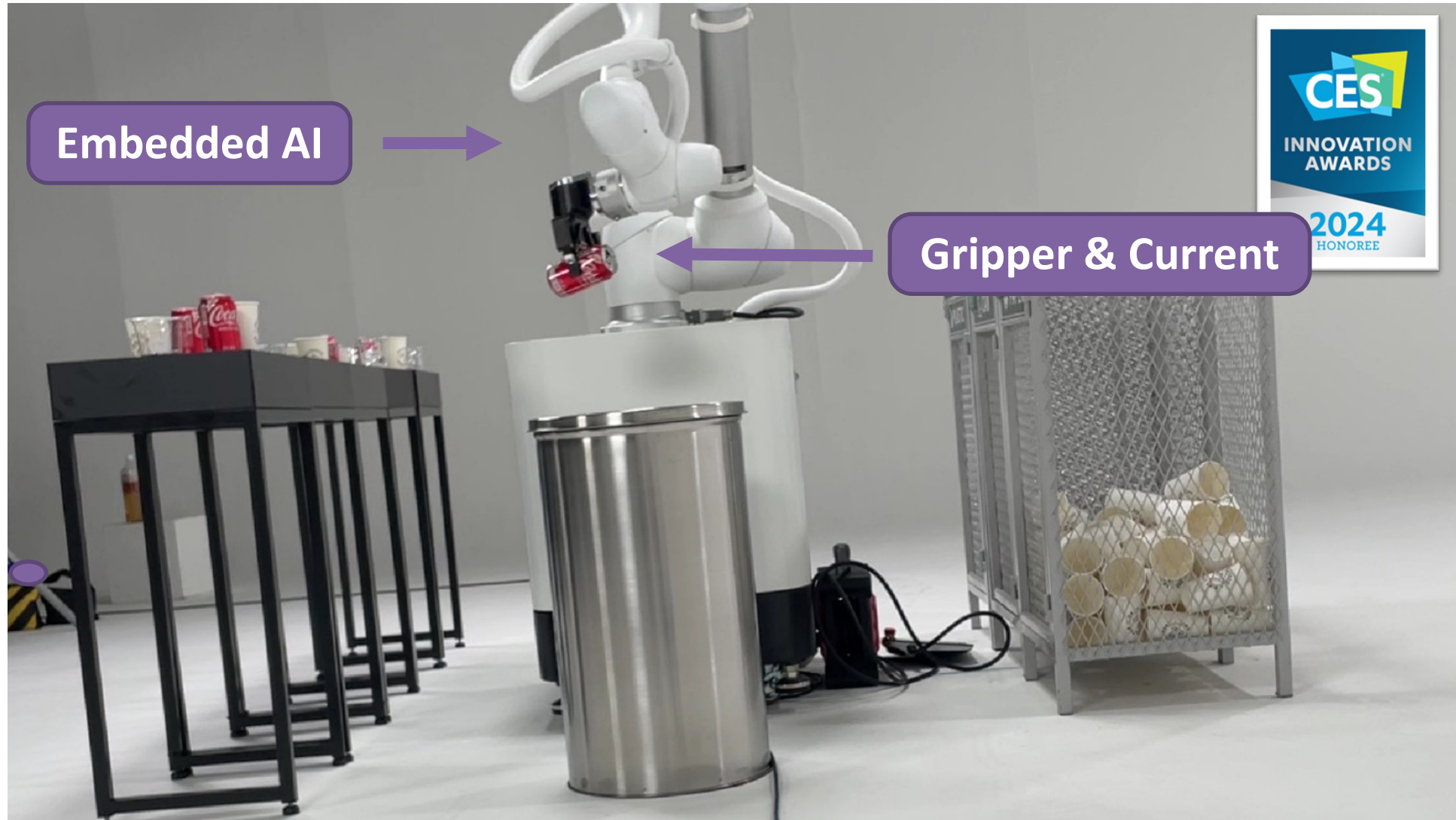
1. The Problem with Recyclable Drinkware and Improper Disposal
2. Introducing Oscar the Sorter
3. Oscar in Action
4. RPA & AI Shared Engineering Challenges
5. Qeexo and Doosan Streamline Development
6. The Future Impact of No-Code Solutions Engineering on AI and RPA

# The Problem With Disposable Drinkware

- World-Wide 600 Billion Paper & Plastic Cups Produced Annually
- In the USA Over 50 Billion Paper Coffee Cups with Lids Discarded Per-Year
- In the UK 1-in-400 Coffee Cups
- 90% of recyclable cafe-ware ends up in AU landfills



# Meet Oscar the Sorter – Champion for the Environment



# Meet Oscar the Sorter – A Champion for the Environment



# Industry Challenges in Robotics & AI Development

## Challenges

- Requires Skilled Experts
- High Effort
- Lack of Standardized Tools
- Not User Friendly
- Slow Development
- Expensive

The need for an efficient, automated approach to solutions engineering exists in both fields



mxnet™

Android™ NNAPI

PyTorch™

Caffe2™

aws

TensorFlow™

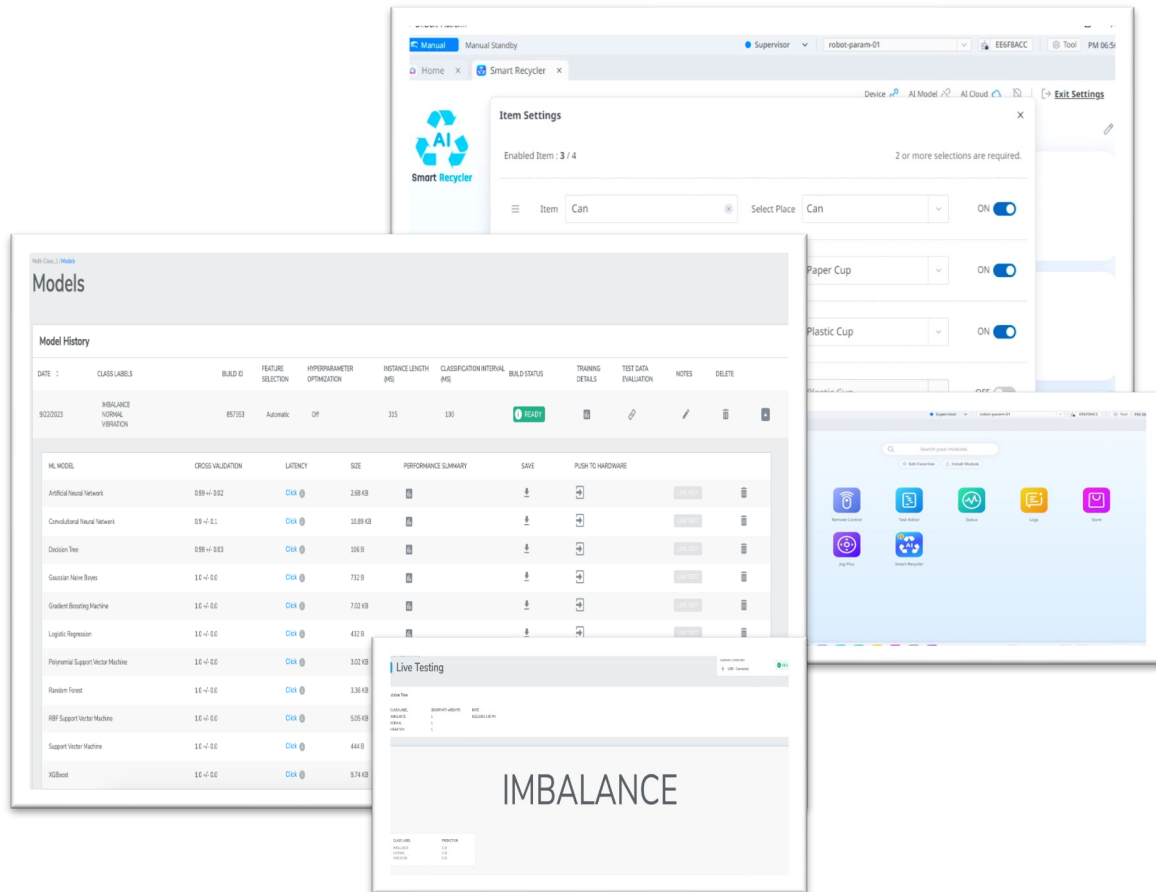
ONNX™

CMSIS-NN



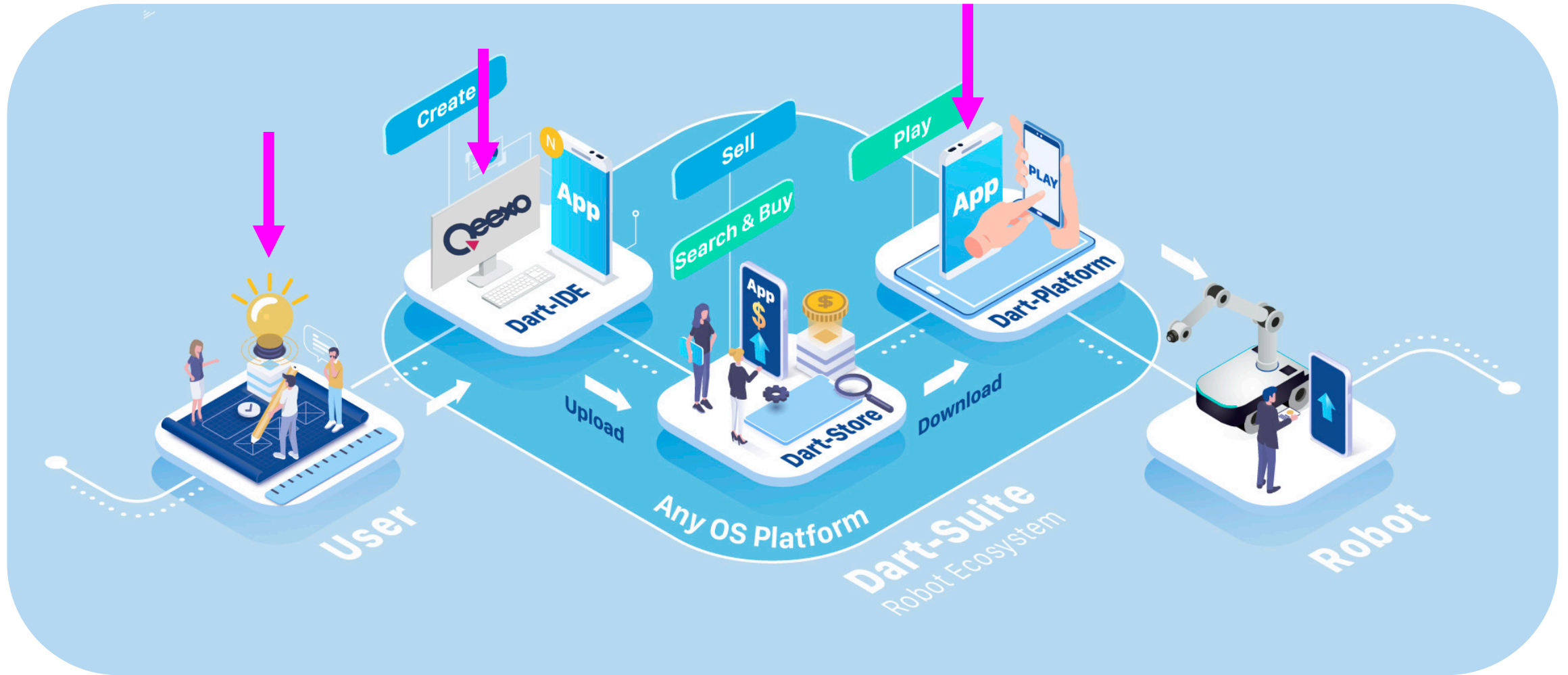
# How Qeexo and Doosan Solve Similar Challenges

Qeexo and Doosan platforms **enable solutions engineering that is faster, more agile, and further reaching** than traditional applications development



- No code, low-touch environments
- Streamlined development
- Fully-automated
- Empowering non-experts and engineers
- Fast and efficient

# Doosan & TDK – Achieving A Shared Vision



## TDK and Dart Suite Enable Development

# Transforming the Future of Solutions Engineering

- Low-touch, no-code solutions have already begun transforming AI and RPA development
- Continued advancements will accelerate innovation and broaden accessibility
- Further evolution will enhance system capabilities
- Solutions engineering transformation

The image displays a development environment with a code editor on the left showing C++ code and error messages. The code includes comments like "Called C++ object pointer is null" and "variable 'functionType' is not initialized". The error messages are from clang-format and clang-tidy. The code editor also shows a file explorer with files like AST.cpp, ABI.cpp, AssemblyItem.cpp, AssemblyItem.h, CommonSubexpressionEliminat, DocStringTagParser.cpp, NameAndTypeResolver.cpp, and test\_isolate\_tests.py.

Overlaid on the code editor is a 'Models' dashboard. The dashboard has a 'Model History' table with columns: DATE, CLASS LABELS, BUILD ID, FEATURE SELECTION, HYPERPARAMETER OPTIMIZATION, INSTANCE LENGTH (MS), CLASSIFICATION INTERVAL (MS), BUILD STATUS, TRAINING DETAILS, TEST DATA EVALUATION, NOTES, and DELETE. The table shows a model with CLASS LABELS 'IMBALANCE NORMAL VIBRATION' and BUILD ID '85753'. Below the table is a table of ML models with columns: ML MODEL, CROSS VALIDATION, LATENCY, SIZE, PERFORMANCE SUMMARY, SAVE, and PUSH TO HARDWARE. The models listed are Artificial Neural Network, Convolutional Neural Network, Decision Tree, Gaussian Naive Bayes, Gradient Boosting Machine, Logistic Regression, Polynomial Support Vector Machine, Random Forest, RBF Support Vector Machine, Support Vector Machine, and XGBoost.

Overlaid on the bottom right of the dashboard is a 'Live Testing' window. It shows a 'Decision Tree' model and a large 'IMBALANCE' text, indicating a test result or error.

# Q&A & Contact

Have Questions? Please ask 😊

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