

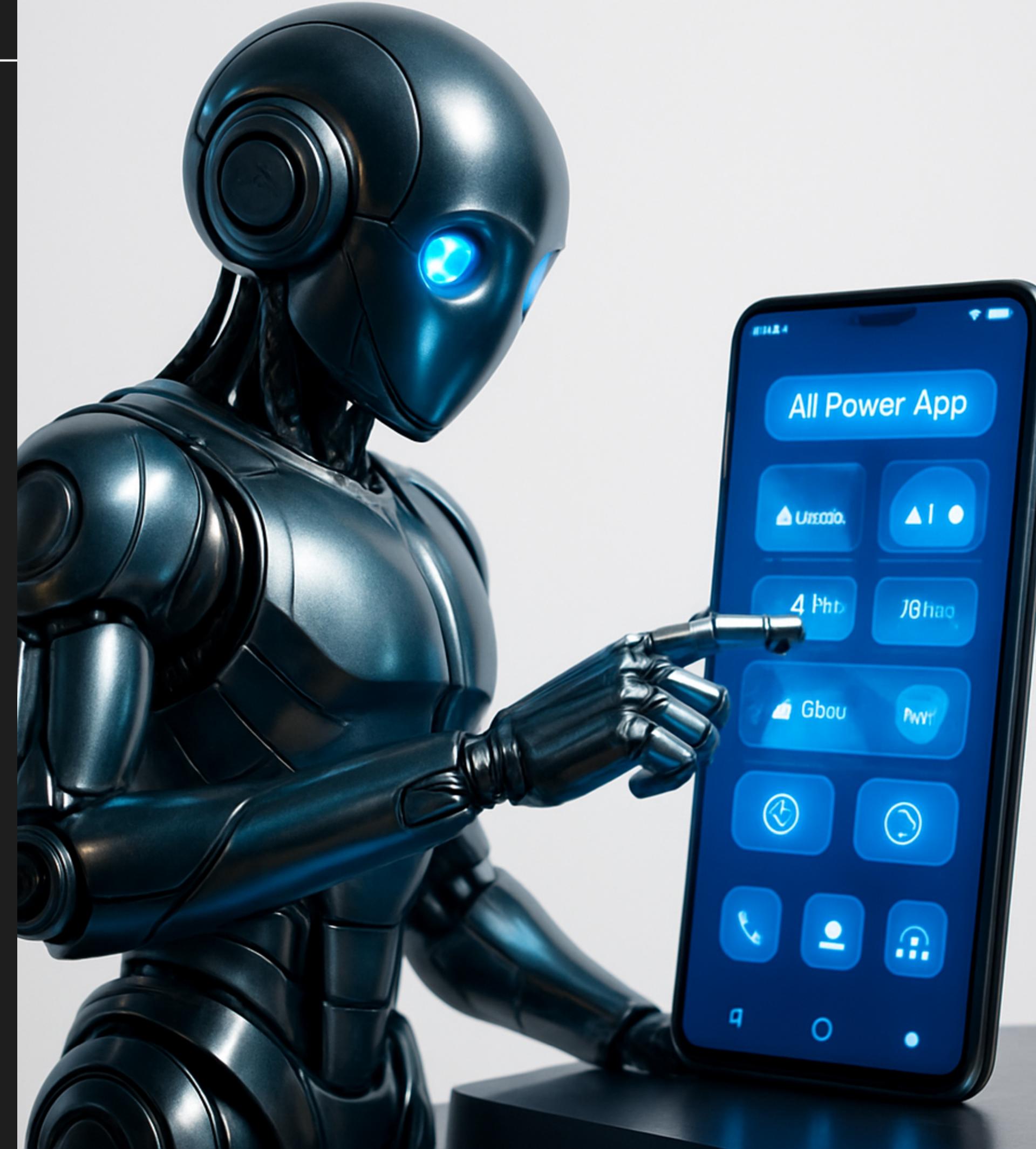
DevFest 2025

AI on the Edge: On-Device Machine Learning with Flutter & TensorFlow Lite

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Flutter



AI on the Edge

Understanding Local AI Processing

Local Processing

Running AI algorithms directly on devices enhances performance. It reduces latency by minimizing data transfer, leading to faster responses and a smoother user experience for applications.

Enhanced Privacy

With AI operating locally, sensitive user data never leaves the device. This ensures greater privacy and security, making it ideal for applications that handle personal information.

Offline Capability

AI on the edge allows applications to function without internet connectivity. This is crucial for users in remote areas or situations where stable network access is unavailable.



AI Can Be Fast

Emphasizing speed and efficiency benefits

Speedy Operations

AI on-device processes can dramatically **reduce latency**, allowing for quick response times that enhance user experiences in applications like face unlock and real-time translations.

Enhanced Privacy

Running AI directly on devices means sensitive data never leaves the user's device, ensuring that privacy remains intact while still delivering intelligent insights and features.

Offline Functionality

Many AI applications can operate without an internet connection, making them reliable in various environments, such as remote areas, where consistent connectivity may not be available.





TensorFlow Lite



- 01 TensorFlow Lite enables **efficient on-device** machine learning.
- 02 Optimized for mobile, it supports **cross-platform** integration.
- 03 Its lightweight framework allows for **real-time inferencing** on devices.



Demo 1

Real-Time Image Classification Overview

TFLite Plugin

The tflite_flutter plugin enables developers to integrate TensorFlow Lite models seamlessly within Flutter applications, enhancing mobile experiences with powerful on-device machine learning capabilities for real-time tasks.

Inference Flow

Inference flow involves preparing the input, running the model, and retrieving the output. This process is optimized for mobile devices, ensuring quick and efficient results for users on the go.

Code Example

The following code snippet demonstrates implementing real-time image classification in a Flutter app, showcasing how to load the model and handle image input for accurate predictions.

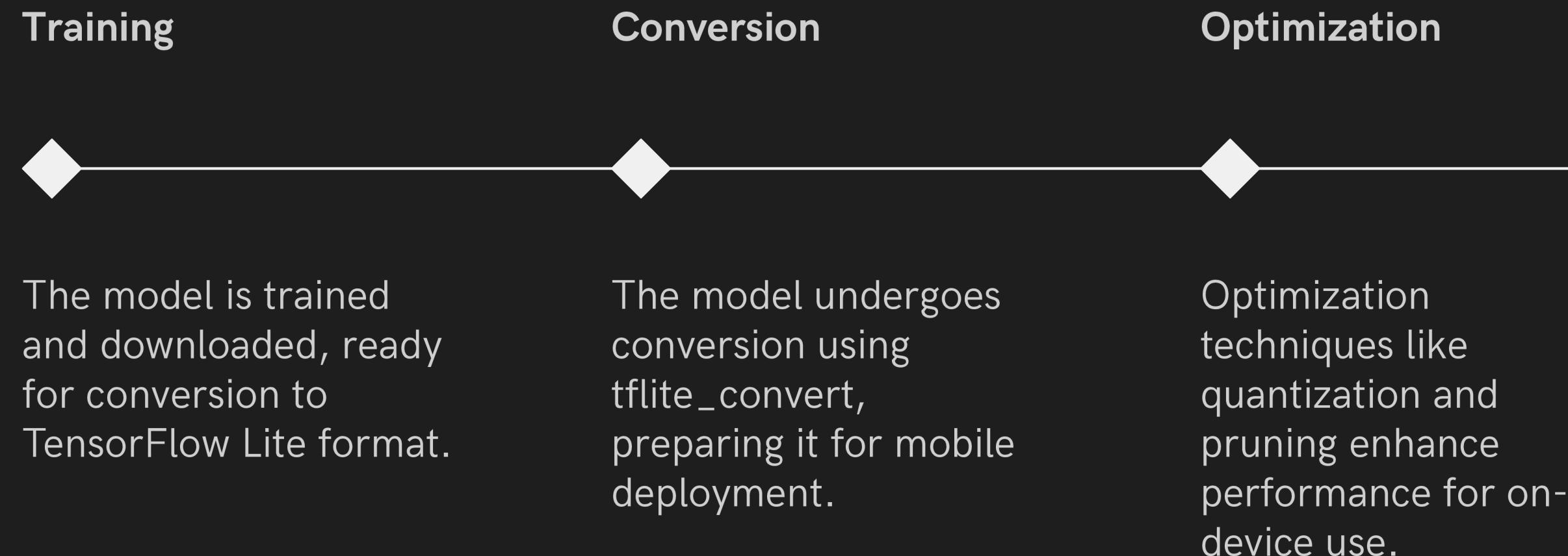
Live Classification Results

This page showcases the **real-time capabilities** of our image classification app. Users can view live results, with confidence levels updating dynamically, demonstrating the effectiveness of on-device AI solutions powered by TensorFlow Lite and Flutter for seamless experiences.





Model Conversion Workflow

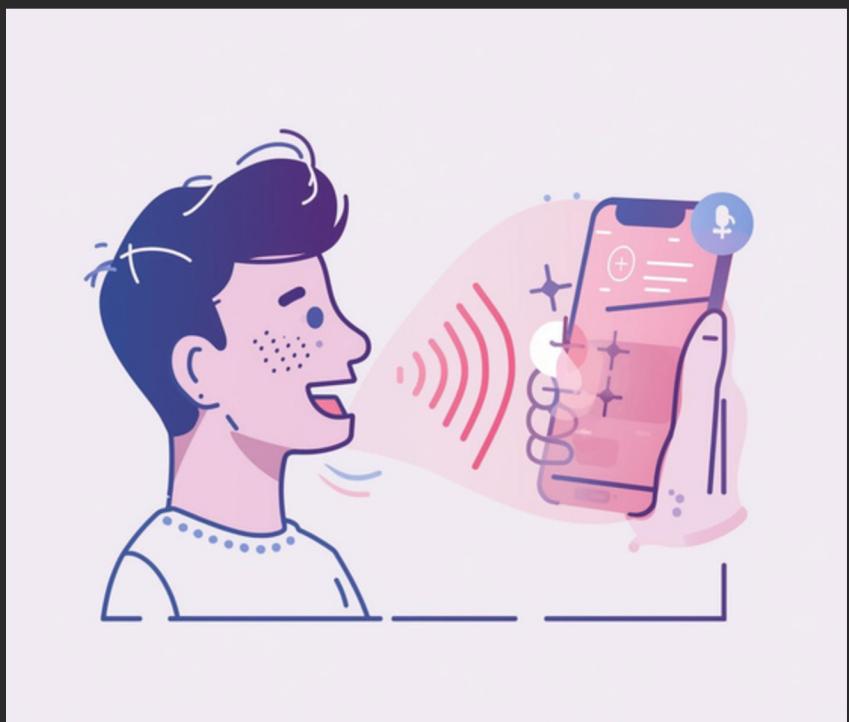


Gesture and Voice Recognition Features



Gesture Recognition

Enables intuitive control through **simple hand movements**.



Voice Recognition

Provides a seamless experience through **spoken commands**.

Optimization Techniques for Mobile AI

Quantization

Reduces model size and speeds up inference by converting weights from float to integer formats.

Hardware Acceleration

Leverages specialized hardware features like GPUs and TPUs to enhance processing speed and efficiency.

Isolate Inference

Separates AI tasks into dedicated threads, ensuring smoother performance and reduced latency during inference.



Essential Tools for AI Development



`tflite_flutter`

The core plugin for seamless TensorFlow Lite integration.

TensorFlow Hub

A platform for sharing and discovering pre-trained models.

Teachable Machine

A user-friendly tool for easy model training and deployment.

Key Takeaways

Cloud

AI without dependency on the cloud

Models

Start with image/audio models for ease

Synergy

Flutter with TFLite enhances performance

Privacy

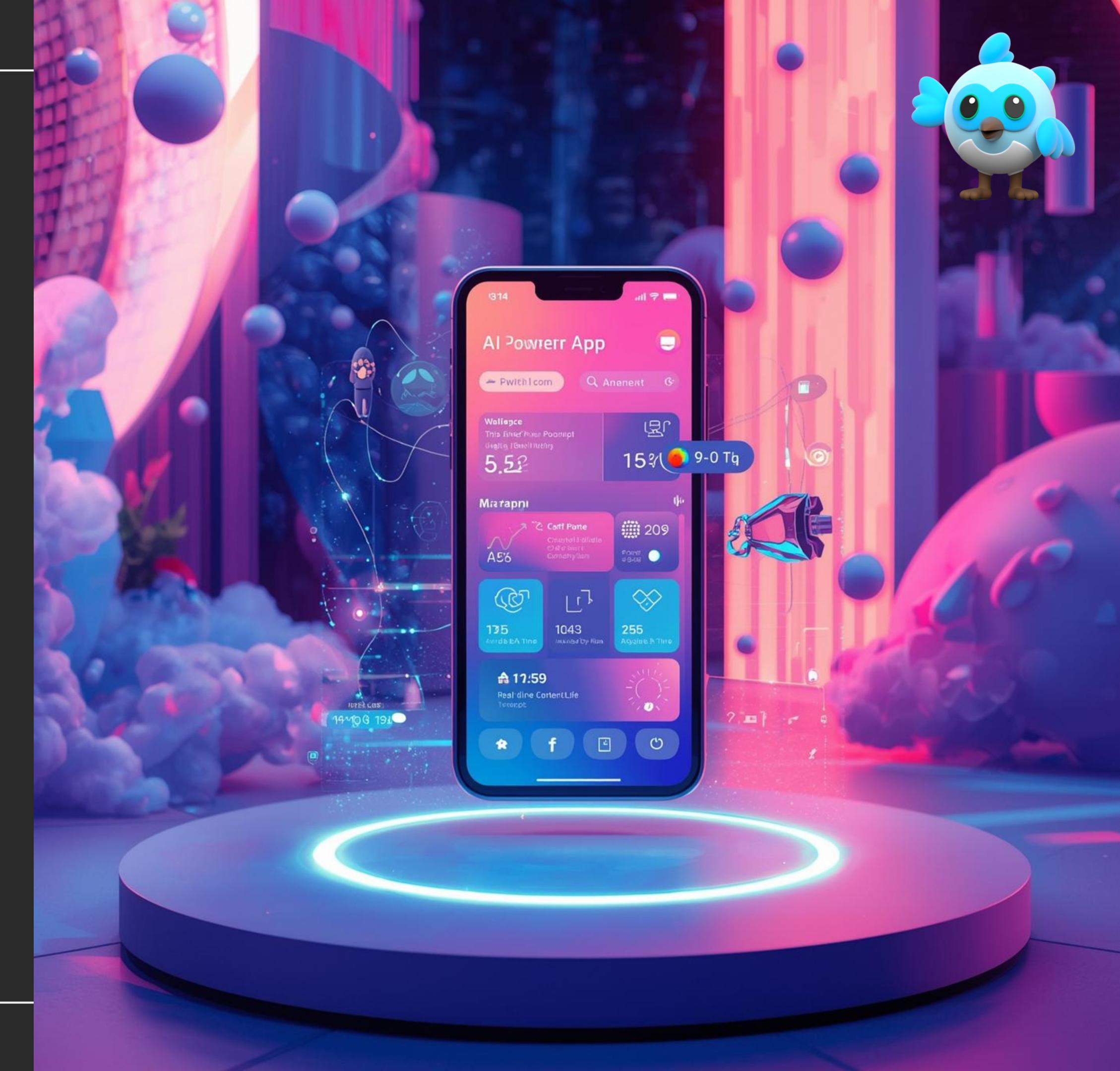
Focus on user privacy with local AI



Let's Build Smarter Apps

Future of AI

Embrace the power of AI by creating innovative Flutter applications. **Leverage on-device machine learning** for a faster, more private, and offline experience for users everywhere.





Q&A Session

Thank You

We appreciate your interest! Feel free to reach out for more information.



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