Java Me Smarter

Unleashing AI Power with Quarkus

KubeCon | CloudNativeCon

THE LINUX FOUNDATION OPEN SOURCE SUMMIT | AI_dev Open Source GenAI & ML Summit

China 2024

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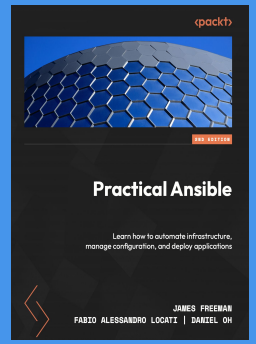

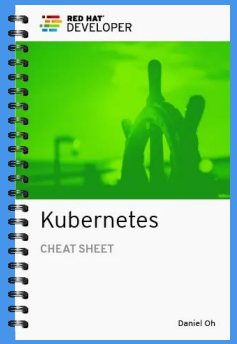

The Journey to Generative AI and LLMs

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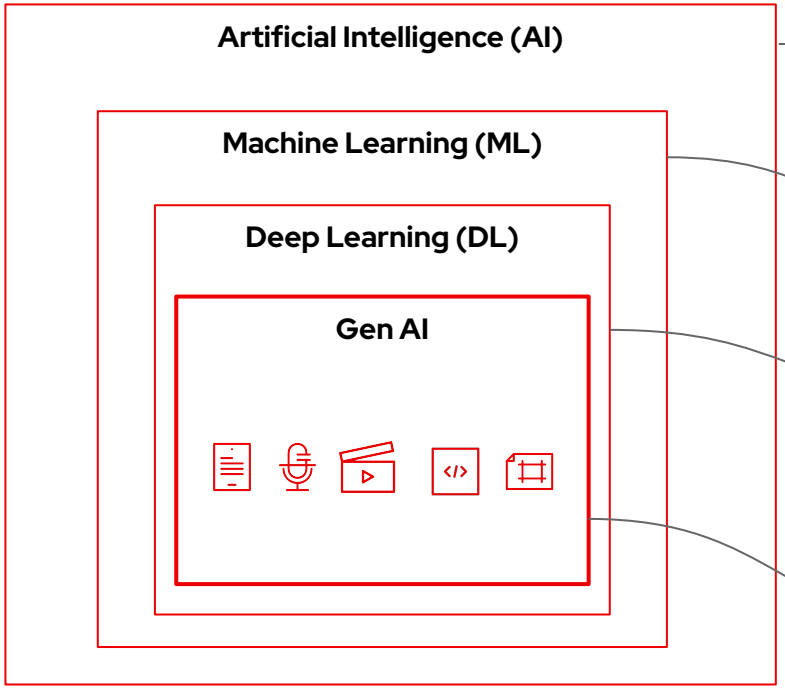
What really is Generative AI?



Artificial Intelligence
A multidisciplinary field of Computer Science that aims to create systems capable of emulating and surpassing human-level intelligence

Machine Learning
A subfield for training computers to learn and make decisions from data, without explicit programming

Deep Learning
A subset from ML involved neural networks enabling complex pattern recognition and analysis from data

Gen AI Learning
Subfield focusing on generating new content such as text, images, code and more

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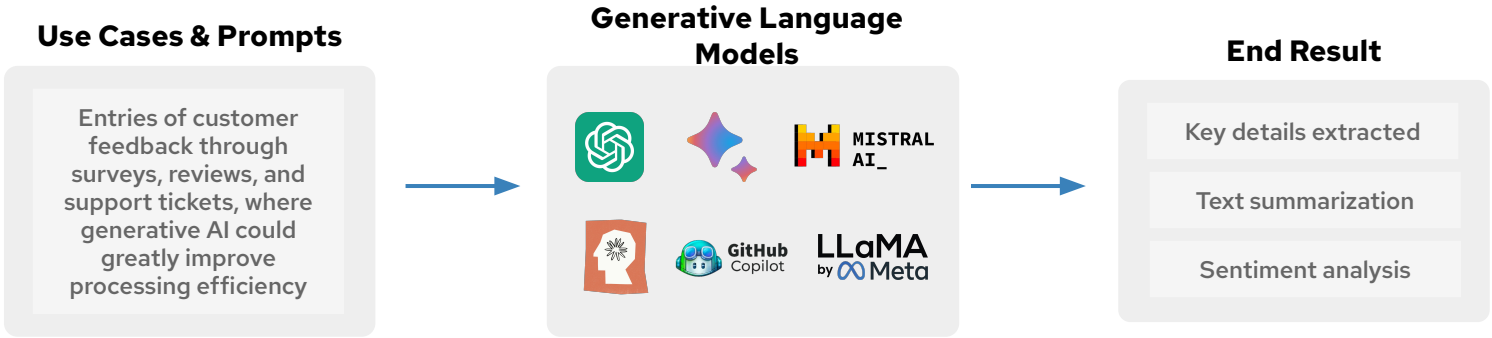
How does Generative AI really work?

Generative AI

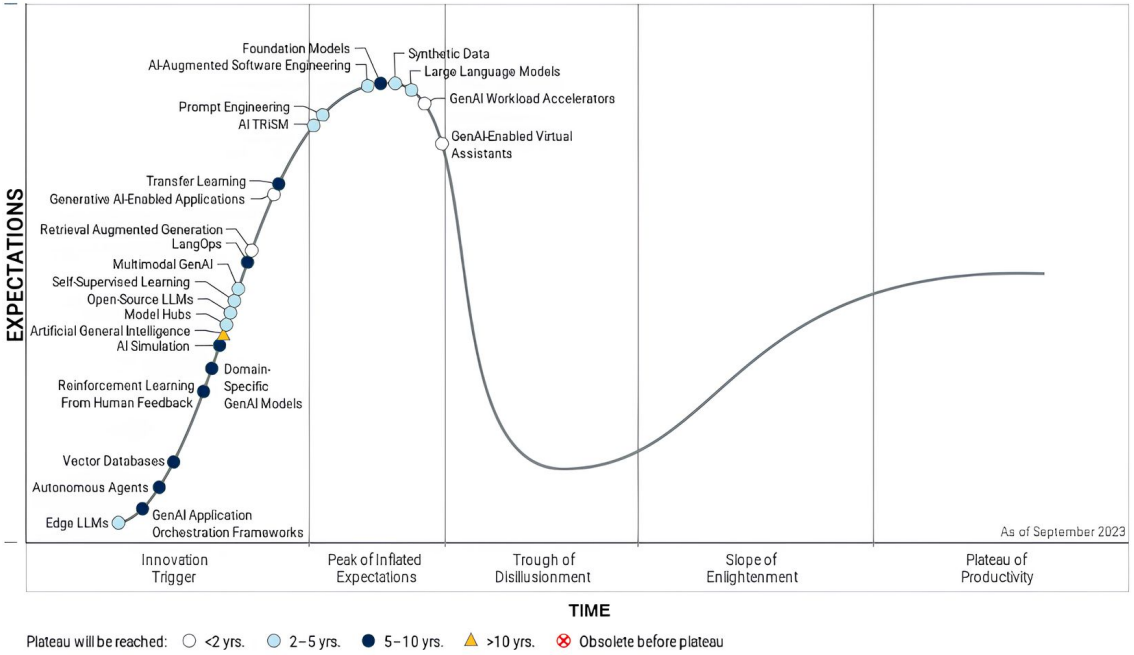
Generative AI utilizes AI models to create text, images, videos, code, or data in response to prompts

LLMs

Large Language Models are a specialized type of AI, trained on massive datasets to generate outputs in natural, conversational language



The AI adoption journey with the rise of Gen AI



Gartner

Gartner

> *More Than 80% of Enterprises Will Have Used Generative AI APIs or Deployed Generative AI-Enabled Applications by 2026.*

https://www.gartner.com/en/newsroom/press-releases/2023-10-11-gartner-says-more-than-80-percent-of-enterprises-will-have-used-generative-ai-apis-or-deployed-generative-ai-enabled-applications-by-2026

The Gen AI Journey for an Application Developer

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The Journey of Adopting Generative AI

Ideation & Prototyping

- Find LLMs
- Try prompts
- Experiment with your data
- Benchmarking

As a developer, how do I **evaluate** models and pick the best one for my use case?

Building & Refining

- Connect to data source
- Exception handling
- Limited fine tuning
- Retrieval-Augmented Generation (RAG)
- Chaining
- Evaluate flows

As a developer, how do I **build** an application with LLMs?

Operationalizing

- Model serving
- Endpoints
- Monitoring
- Integrate with apps

As a developer, how do I **deploy** my application with LLMs?

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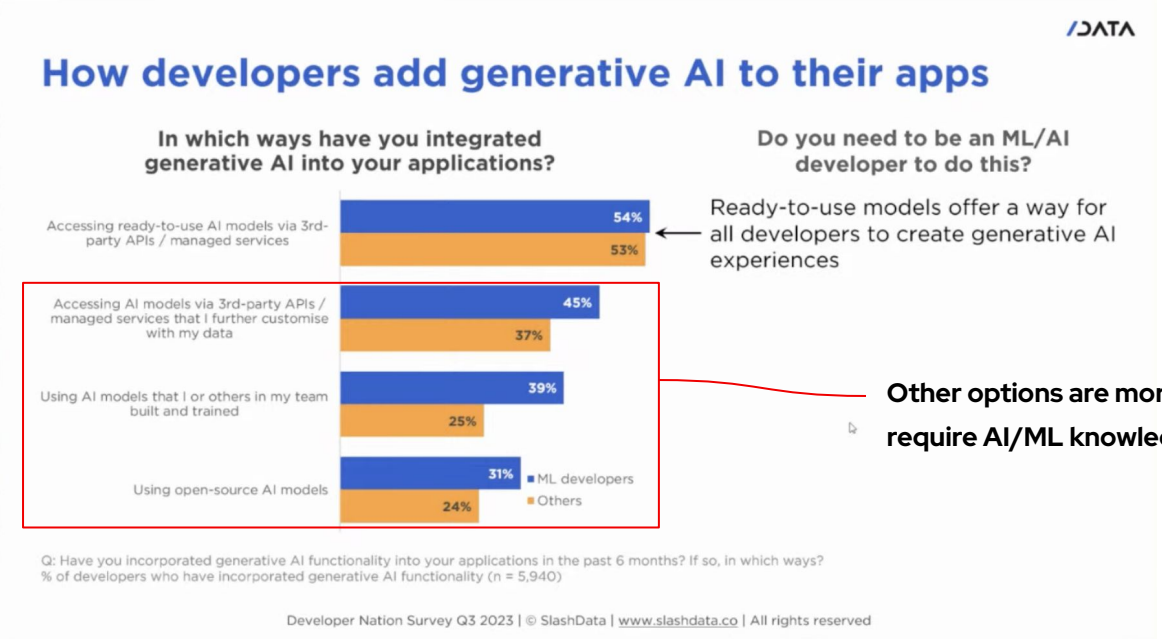
Developer's don't have to be AI/ML experts



AI/ML expertise is not a significant factor for integrating ready-to-use models

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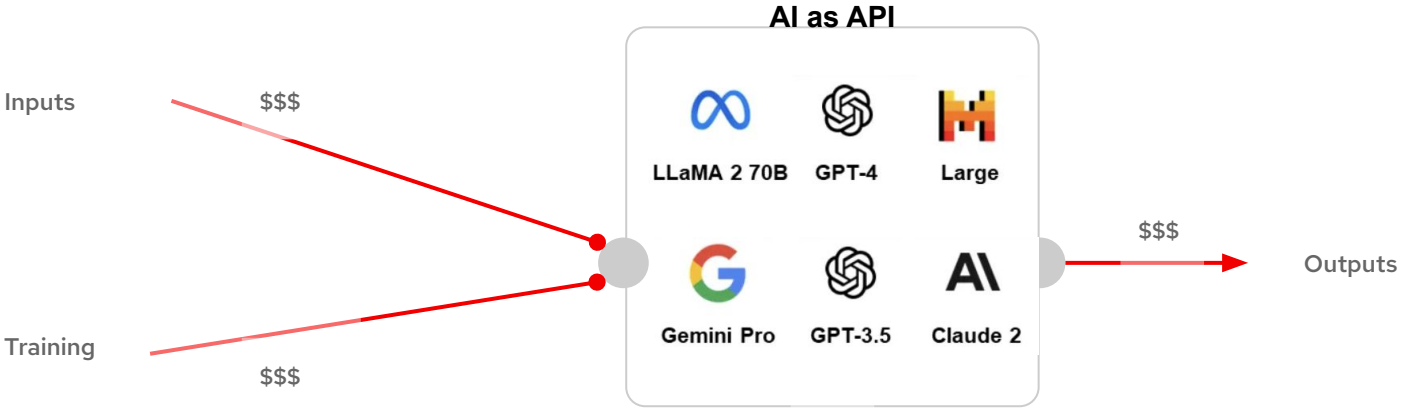
Those APIs are costly... and challenging to test against



$$$


OpenAI pricing

GPT-4

Model	Prompt	Completion
8K context	$0.03 / 1K tokens	$0.06 / 1K tokens
32K context	$0.06 / 1K tokens	$0.12 / 1K tokens

Chat

Model	Input	Output
4K context	$0.0015 / 1K tokens	$0.002 / 1K tokens
16K context	$0.003 / 1K tokens	$0.004 / 1K tokens

InstructGPT

Model	Usage
Ada	$0.0004 / 1K tokens
Babbage	$0.0005 / 1K tokens
Curie	$0.0020 / 1K tokens
Davinci	$0.0200 / 1K tokens

Image models

Resolution	Price
1024×1024	$0.020 / image
512×512	$0.018 / image
256×256	$0.016 / image

Embedding models

Model	Usage
Ada v2	$0.0001 / 1K tokens
Ada v1	$0.0040 / 1K tokens
Babbage v1	$0.0050 / 1K tokens
Curie v1	$0.0200 / 1K tokens
Davinci v1	$0.2000 / 1K tokens

Fine-tuning models

Model	Training	Usage
Ada	$0.0004 / 1K tokens	$0.0016 / 1K tokens
Babbage	$0.0006 / 1K tokens	$0.0024 / 1K tokens
Curie	$0.0030 / 1K tokens	$0.0120 / 1K tokens
Davinci	$0.0300 / 1K tokens	$0.1200 / 1K tokens

Audio models

Model	Usage
Whisper	$0.006 / minute (rounded to the nearest second)

Nebuly

# of tokens used and costs randomly exploded over night

Cost for GPT failed requests:

- Issue from OpenAI side
- Timeout in Application

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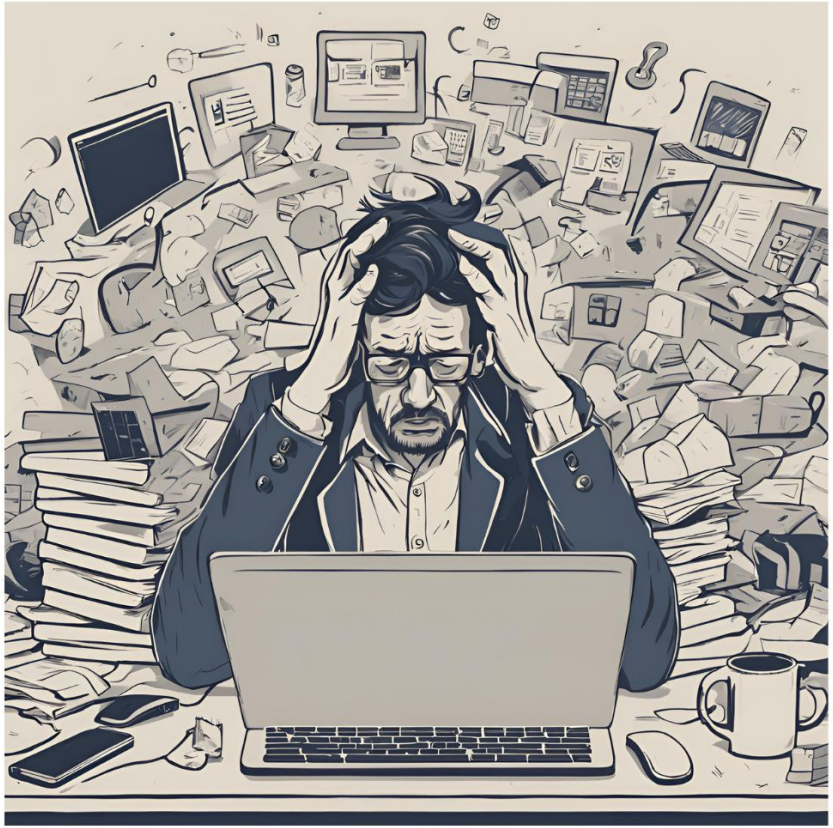
Still Feeling Stuck in a Java Rut?



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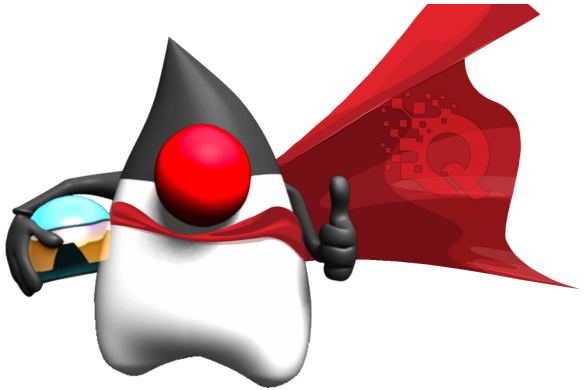
Langchain4j



QUARKUS

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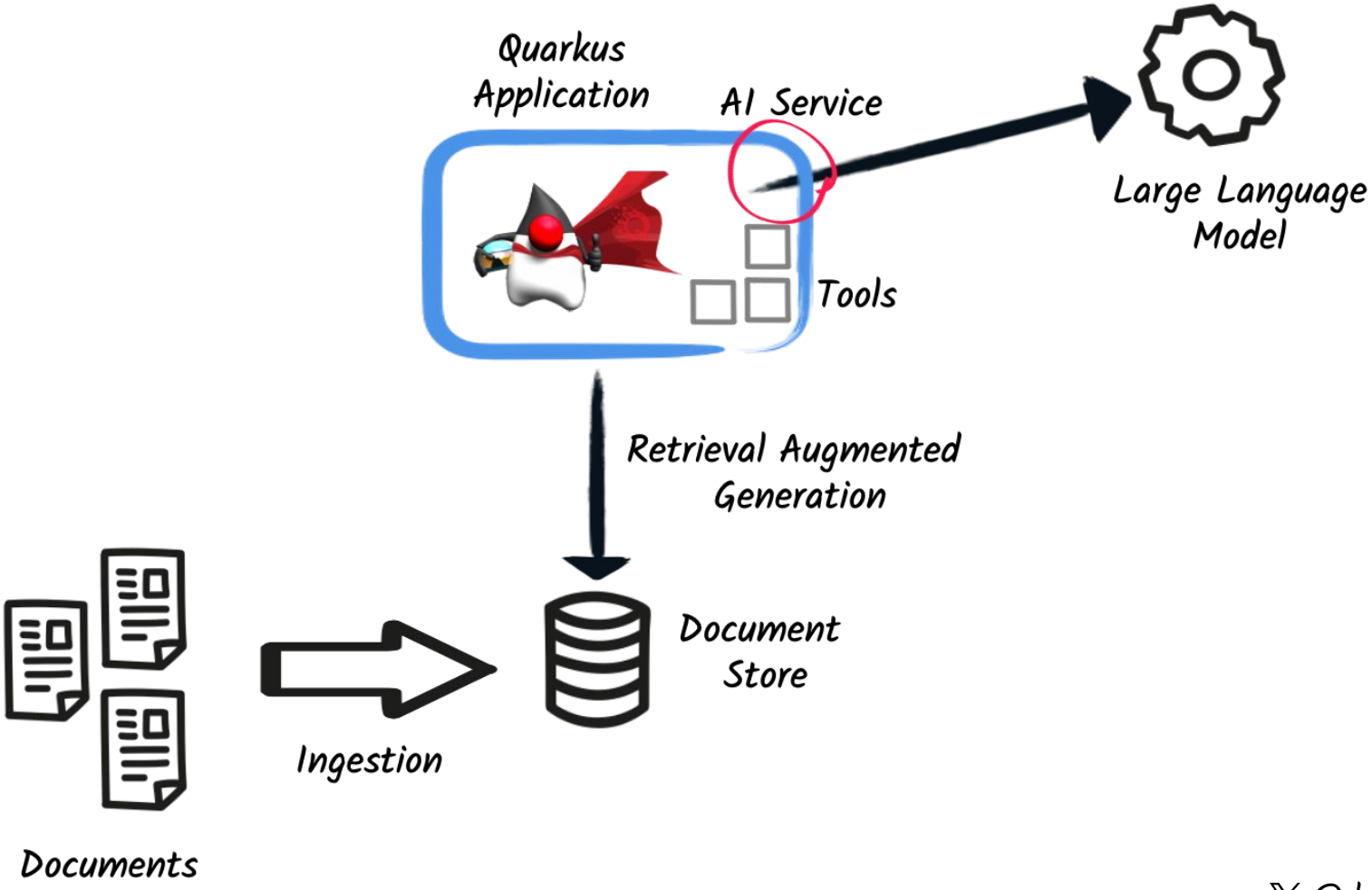
Quarkus
Application
AI Service
Large Language
Model
Tools
Retrieval Augmented
Generation
Document
Store
Ingestion
Documents

```
<dependency>
    <groupId>io.quarkiverse.langchain4j</groupId>
    <artifactId>quarkus-langchain4j-openai</artifactId>
    <version>0.17.0</version>
</dependency>
```






```
package io.quarkiverse.langchain4j.samples;

import dev.langchain4j.service.SystemMessage;
import dev.langchain4j.service.UserMessage;
import io.quarkiverse.langchain4j.RegisterAiService;

@RegisterAiService(
        tools = EmailService.class
)
public interface MyAiService {

    @SystemMessage("You are a professional poet")
    @UserMessage("""
                Write a poem about {topic}. The poem should be {lines}
lines long. Then send this poem by email.
            """)
    String writeAPoem(String topic, int lines);
}
```

DEMO

Agentic AI applications

Prompts

- Interacting with the model for asking questions
- Interpreting messages to get important information
- Populating Java classes from natural language
- Structuring output

Agent and Tools

- Mixing business code with model
- Delegating to external services
- Describing tools in a manner most beneficial to the agent

Embedding Documents (RAG)

- Adding specific knowledge to the model
- Asking questions about supplied documents
- Natural queries

Document Store

- Redis Store
- Chroma Store
- Infinispan Store
- Pinecone Store
- PgVector (PostgreSQL) Store
- In-Process Embeddings
- Loading CSV files
- Neo4j Store

Observability

- Metrics
- Tracing
- Auditing

Red Hat

Advanced Topics

- Fault Tolerance
- WebSockets
- Enabling and Disabling Integrations

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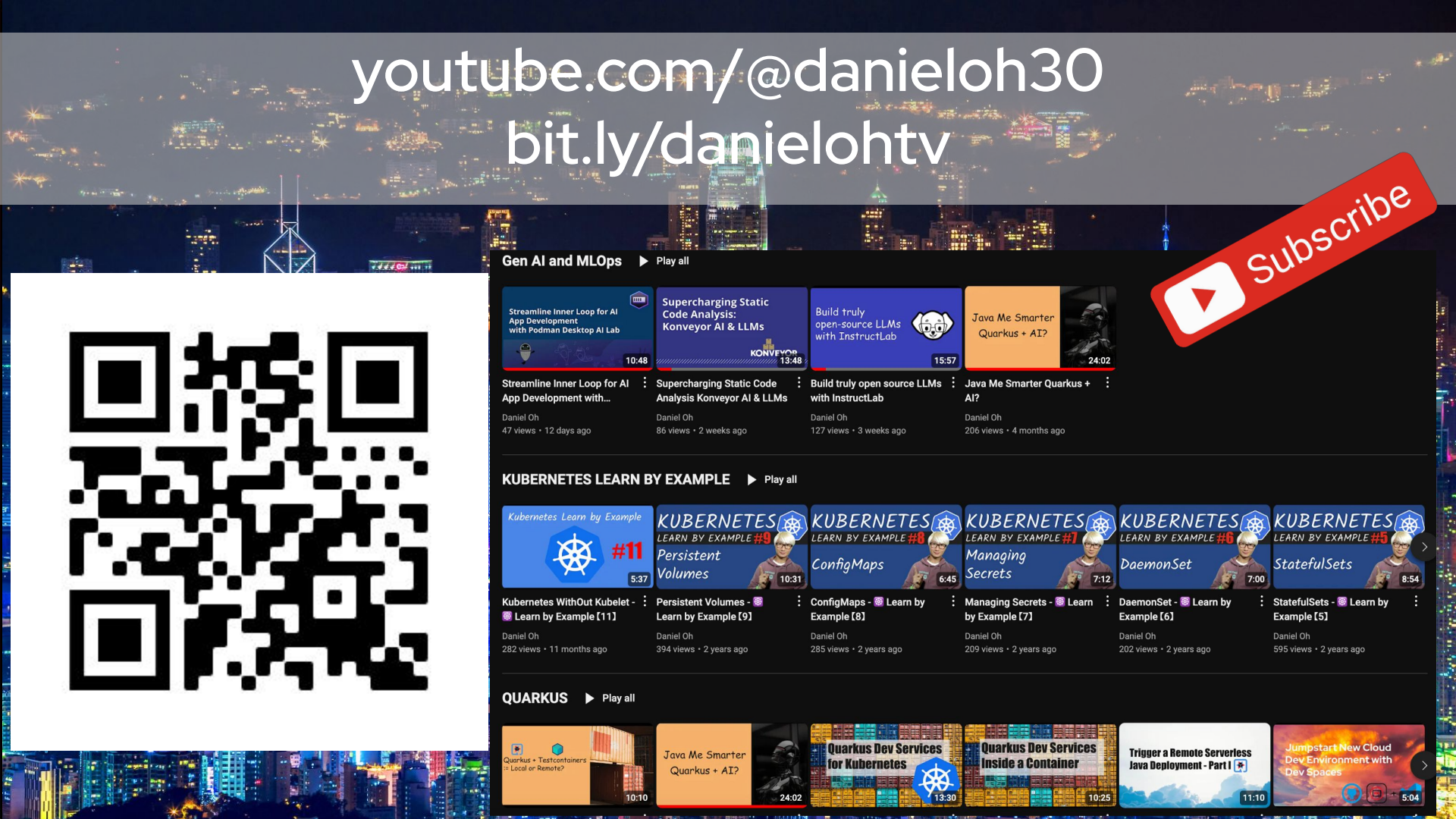
bit.ly/danielohtv



THANK YOU!
QUESTIONS?

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