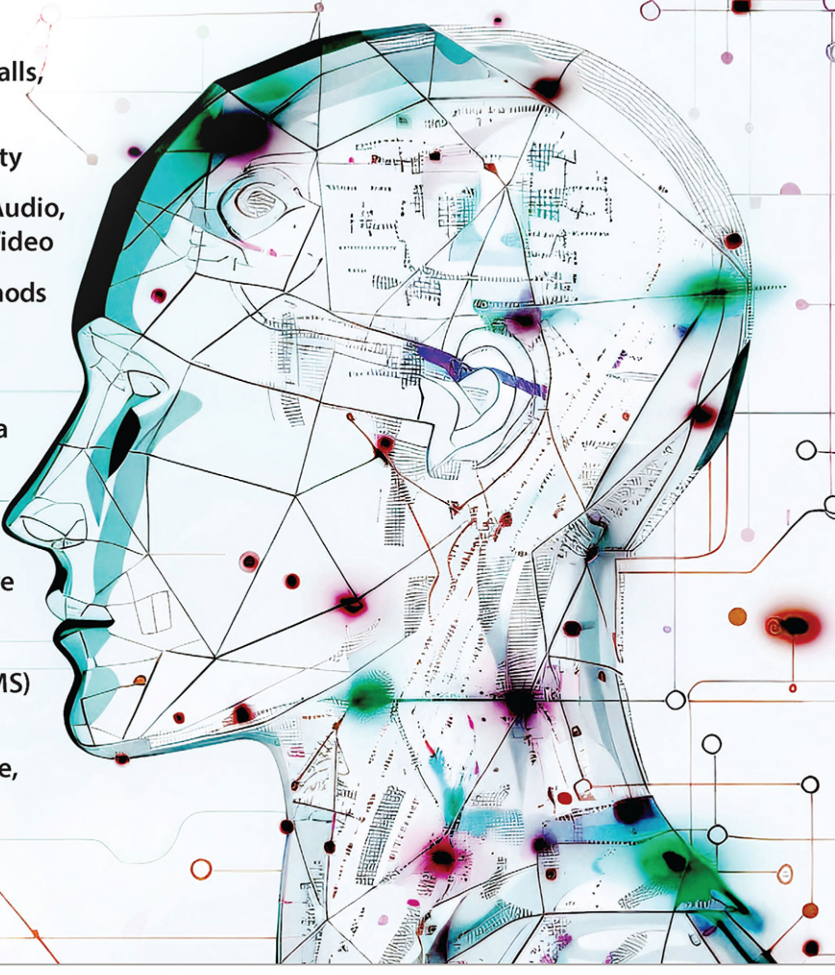
DEITEL® DEVELOPER SERIES

FIFTH EDITION

Java for Programmers *with* Generative AI



- GenAI Prompt Engineering, API Calls, 600 GenAI Exercises
- ChatGPT, Gemini, Claude, Perplexity
- Multimodal: Text, Code, Images, Audio, Speech-to-Text, Text-to-Speech, Video
- Generics: Collections, Classes, Methods
- Functional Programming: Lambdas & Streams
- JavaFX: GUI, Graphics, Multimedia
- Concurrency: Parallel Streams, Virtual Threads, Structured Concurrency, Scoped Values, Concurrent Collections, Multi-Core
- Database: JDBC, SQL, SQLite
- Java Platform Module System (JPMS)
- Objects Natural: Java API, String, BigInteger, BigDecimal, Date/Time, Cryptography, ArrayList, Regex, JSON, CSV, Web Services
- JShell for Python-Like Interactivity

PAUL DEITEL • HARVEY DEITEL

Generative AI Innovations in *Java for Programmers, 5e*

Fully Coded GenAI Case Studies

Chapter 19 presents the following **code examples that interact with OpenAI's APIs**: **Text Summarization**, **Sentiment Analysis**, **Accessible Image Descriptions**, **Language Detection & Translation**, **Java Code Generation**, **Named-Entity Recognition & Structured Outputs**, **Speech-to-Text**, **Text-to-Speech**, **Image Generation**, **Creating Closed Captions for a Video**, **Moderation**.

GenAI Prompt Exercises

We fed the complete list of all the book's **approximately 600 genAI exercises** (a 100+ page PDF) to **ChatGPT**, **Gemini**, **Claude** and **Perplexity**, asking them to categorize the kinds of things we do in those exercises. Next, we fed their categorized lists to the four genAIs, asking them to summarize the summaries, and we chose the best one—**Claude** in this case:

- **Code Generation and Implementation**—Writing new Java programs from specifications. Implementing specific features, algorithms and APIs. Creating test programs and practical applications. Generating solutions for basic and advanced tasks.
- **Code Refactoring and Enhancement**—Modernizing code. Improving code structure, readability, and maintainability. Converting between different approaches while maintaining functionality. Improving performance.
- **Educational Content**—Creating tutorials, exercises, and learning materials. Further exploring complex concepts. Developing programming exercises. Writing comprehensive documentation and guides.
- **Technical Analysis**—Analyzing code behavior and feature implementations. Comparing different approaches, tools, and frameworks. Evaluating trade-offs in design decisions. Breaking down complex technical concepts.
- **Best Practices and Standards**—Implementing coding standards and design patterns. Addressing security considerations. Optimizing performance. Following Java development best practices.
- **Technology Evaluation**—Comparing libraries, tools, and frameworks. Assessing the pros and cons of different approaches. Making informed technology choices. Exploring new features and updates.
- **Debugging and Error Handling**—Finding and fixing syntax and logical errors. Implementing exception handling. Improving fault tolerance. Preventing common pitfalls.
- **API and Library Integration**—Working with Java APIs and external libraries. Understanding API features and capabilities. Implementing integration techniques. Creating API documentation and tutorials.
- **Real-world Applications**—Developing practical use cases and industry applications. Creating interactive applications (GUIs, games, multimedia). Implementing real-world scenarios. Building sample projects.
- **Performance Optimization**—Analyzing and improving performance. Optimizing resource usage. Conducting benchmarks. Implementing efficiency improvements.
- **Creative Development**—Building multimodal applications. Creating visualizations. Generating test scenarios and sample data. Developing unique use cases.

GenAI API-Based Java Programming Exercises

Chapter 19, Building API-Based Java Generative AI Applications, suggests challenging project exercises like creating genAI multimedia apps that can debate one another and using genAIs to build and solve crossword puzzles. We fed the 94 exercises into the genAIs, asking for a categorized summary of them, then summarized the summaries. Here's what **Claude** produced:

- **Multimodal Applications**— Building comprehensive tools that combine text, image, audio, speech and video capabilities. Creating integrated experiences like interactive books. Developing multimedia educational content.
- **Text-Based Applications**—Document processing (indexing, summarization, exploration). Creative writing (stories, poetry, debates). Language tools (translation, tone rewriting). Professional document creation (resumes, presentations). Structured outputs.
- **Image Processing Applications**—Generative art and design (logos, fashion, floor plans). Technical visualization (UML diagrams). Image analysis and recognition.
- **Audio and Music Applications**—Speech processing (transcription, voice cloning). Music generation (MIDI, Magenta AI). Multilingual audio applications. Podcast and audio content analysis.
- **Educational Tools**—Programming tutors (Java, coding exercises). Subject-specific learning aids (math). Course content creation. Interactive educational experiences.
- **Gaming and Puzzle Applications**—Puzzle generators and solvers. Interactive game development.
- **Video**—Investigating and experimenting with generative AI video creation tools.
- **Chatbot Development**—Character-based chat experiences. Specialized domain experts.
- **Research and Analysis Tools**—Medical applications (researching drug discovery and personalized medicine). AI capability exploration. Text detection and analysis. Educational research.
- **Creative Applications**—Children's book creation. Interactive storytelling. Artistic content generation. Creative writing.
- **Practical Tools and Utilities**—Document generators. Translation services. Content summarizers. Professional tools (resume filters, presentation creators).

Java for Programmers: with Generative AI

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