



ICT Training Center

Il tuo partner per la Formazione e la Trasformazione digitale della tua azienda



Note

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page, providing a template for writing or drawing. There are no margins, text, or other markings on the paper.

SPRING AI

GENERATIVE ARTIFICIAL INTELLIGENCE CON JAVA

Simone Scannapieco

Corso avanzato per Venis S.p.A, Venezia, Italia

Novembre 2025

Note

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page, leaving small margins at the top and bottom. There are no vertical margin lines, and the paper is otherwise completely blank.



This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on the right side, suggesting it's resting on a surface.

- ## Interfaccia per recupero documenti

3 / 15

Note

[illegible]

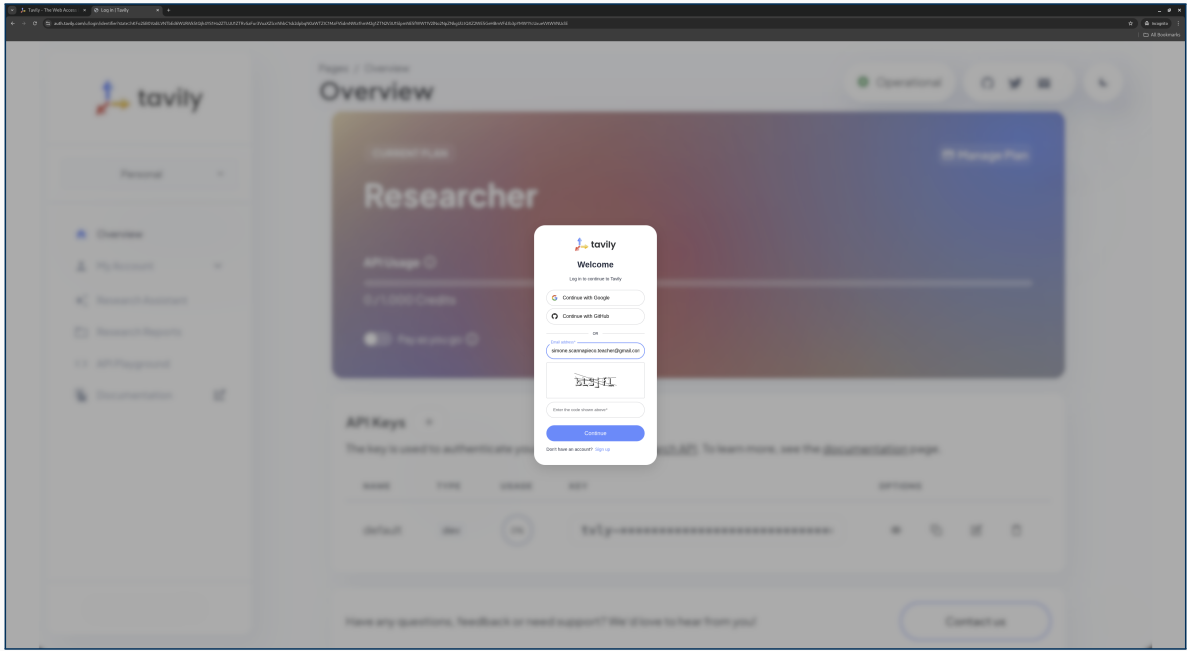
- 1 Creazione *account* Tavily e API key
- 2 Modifica variabili di ambiente
- 3 Creazione implementazione *document retriever* tramite *web search*
- 4 Modifica configurazione RAG
- 5 Modifica interfaccia e implementazione servizio
- 6 Modifica proprietà applicativo
- 7 Test delle funzionalità con Postman/Insomnia

[illegible]

Note

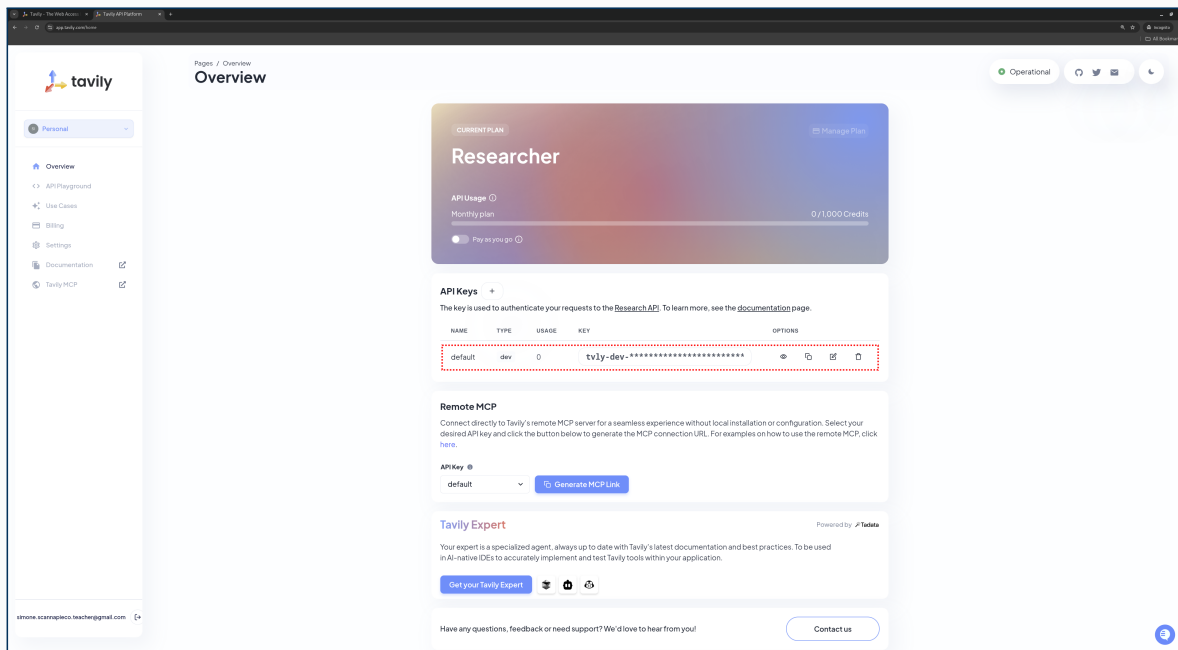
This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

2



This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

3



Note

[illegible]


```
{
  // Use IntelliSense to learn about possible attributes.
  // Hover to view descriptions of existing attributes.
  // For more information, visit: https://go.microsoft.com/fwlink/?linkid=830387
  "version": "0.2.0",
  "configurations": [
    {
      "type": "java",
      "name": "Current File",
      "request": "launch",
      "mainClass": "${file}"
    },
    {
      "type": "java",
      "name": "DemoApplication",
      "request": "launch",
      "mainClass": "it.venis.ai.spring.demo.DemoApplication",
      "projectName": "demo",
      "env": {
        "GOOGLE_AI_API_KEY": "...",
        "HUGGING_FACE_HUB_TOKEN": "...",
        "TAVILY_SEARCH_API_KEY": "..."
      }
    }
  ]
}
```

Note

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for handwriting practice. There are no margins, text, or other markings on the paper.

```
{
  "java.configuration.updateBuildConfiguration": "interactive",
  "java.test.config": {
    "env": {
      "GOOGLE_AI_API_KEY": "...",
      "HUGGING_FACE_HUB_TOKEN": "...",
      "TAVILY_SEARCH_API_KEY": "..."
    }
  }
}
```

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on the right side, suggesting it's resting on a surface.

```
package it.venis.ai.spring.demo.rag;

...

public class WebSearchDocumentRetriever implements DocumentRetriever {

    private static final Logger logger = LoggerFactory.getLogger(WebSearchDocumentRetriever.class);

    private static final String TAVILY_API_KEY = "TAVILY_SEARCH_API_KEY";
    private static final String TAVILY_BASE_URL = "https://api.tavily.com/search";
    private static final int DEFAULT_RESULT_LIMIT = 5;
    private final int resultLimit;
    private final RestClient restClient;

    public WebSearchDocumentRetriever(RestClient.Builder clientBuilder, int resultLimit) {
        Assert.notNull(clientBuilder, "clientBuilder cannot be null");
        String apiKey = System.getenv(TAVILY_API_KEY);
        Assert.hasText(apiKey, "Environment variable " + TAVILY_API_KEY + " must be set");
        this.restClient = clientBuilder
            .baseUrl(TAVILY_BASE_URL)
            .defaultHeader(HttpHeaders.AUTHORIZATION, "Bearer " + apiKey)
            .build();

        if (resultLimit <= 0) {
            throw new IllegalArgumentException("resultLimit must be greater than 0");
        }
        this.resultLimit = resultLimit;
    }
}
```

Note

[illegible]

Document retriever via web search - II

```

..
@Override
public List<Document> retrieve(Query query) {
    Assert.notNull(query, "query cannot be null");
    String q = query.text();
    Assert.hasText(q, "query.text() cannot be empty");

    TavilyResponsePayload response = restClient.post()
        .body(new TavilyRequestPayload(q, "advanced", resultLimit))
        .retrieve()
        .body(TavilyResponsePayload.class);

    if (response == null || CollectionUtils.isEmpty(response.results())) {
        return List.of();
    }

    List<Document> docs = new ArrayList<>(response.results().size());
    for (TavilyResponsePayload.Hit hit : response.results()) {
        // Map each Tavily hit into a Spring AI Document with metadata and score.
        Document doc = Document.builder()
            .text(hit.content())
            .metadata("title", hit.title())
            .metadata("url", hit.url())
            .score(hit.score())
            .build();
        docs.add(doc);
    }
    return docs;
}

@JsonNaming(PropertyNamingStrategies.SnakeCaseStrategy.class)
record TavilyRequestPayload(String query, String searchDepth, int maxResults) {}
...

```

Note

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

```
...
record TavilyResponsePayload(List<Hit> results) {
    record Hit(String title, String url, String content, Double score) {}
}

public static Builder builder() {
    return new Builder();
}

public static class Builder {
    private RestClient.Builder clientBuilder;
    private int resultLimit = DEFAULT_RESULT_LIMIT;

    private Builder() {}

    public Builder restClientBuilder(RestClient.Builder clientBuilder) {
        this.clientBuilder = clientBuilder;
        return this;
    }

    public Builder maxResults(int maxResults) {
        if (maxResults <= 0) {
            throw new IllegalArgumentException("maxResults must be greater than 0");
        }
        this.resultLimit = maxResults;
        return this;
    }

    public WebSearchDocumentRetriever build() {
        return new WebSearchDocumentRetriever(clientBuilder, resultLimit);
    }
}
}
```

Note

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

```
package it.venis.ai.spring.demo.config;

import it.venis.ai.spring.demo.rag.WebSearchDocumentRetriever;

...

@Configuration
public class RAGConfig {

    ...

    @Bean
    public RetrievalAugmentationAdvisor webSearchRetrievalAugmentationAdvisor(RestClient.Builder restClientBuilder) {

        return RetrievalAugmentationAdvisor.builder()
            .documentRetriever(WebSearchDocumentRetriever.builder()
                .restClientBuilder(restClientBuilder).maxResults(1).build())
            .build();
    }
}
```

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page, leaving small margins at the top and bottom. There are no vertical margin lines, and the paper is completely blank except for the lines.

```
package it.venis.ai.spring.demo.services;

import it.venis.ai.spring.demo.model.Answer;
import it.venis.ai.spring.demo.model.QuestionRequest;

public interface RAGService {

    public Answer getGeminiRAGAnswer(QuestionRequest request);

    public Answer getOllamaRAGAnswer(QuestionRequest request);

    public Answer getOllamaWebSearchRAGAnswer(QuestionRequest request);

}
```

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

```
package it.venis.ai.spring.demo.services;

...

@Service
@Configuration
public class RAGServiceImpl implements RAGService {

    ...

    private RetrievalAugmentationAdvisor webSearchRetrievalAugmentationAdvisor;

    public RAGServiceImpl(
        @Qualifier("geminiChatClient") ChatClient geminiChatClient,
        @Qualifier("ollamaChatClient") ChatClient ollamaChatClient,
        @Qualifier("ollamaMemoryChatClient") ChatClient ollamaMemoryChatClient,
        @Qualifier("geminiVectorStore") VectorStore geminiVectorStore,
        @Qualifier("ollamaVectorStore") VectorStore ollamaVectorStore,
        @Qualifier("geminiRetrievalAugmentationAdvisor") RetrievalAugmentationAdvisor geminiRetrievalAugmentationAdvisor,
        @Qualifier("webSearchRetrievalAugmentationAdvisor") RetrievalAugmentationAdvisor webSearchRetrievalAugmentationAdvisor) {

        this.geminiChatClient = geminiChatClient;
        this.ollamaChatClient = ollamaChatClient;
        this.ollamaMemoryChatClient = ollamaMemoryChatClient;
        this.geminiVectorStore = geminiVectorStore;
        this.ollamaVectorStore = ollamaVectorStore;
        this.geminiRetrievalAugmentationAdvisor = geminiRetrievalAugmentationAdvisor;
        this.webSearchRetrievalAugmentationAdvisor = webSearchRetrievalAugmentationAdvisor;
    }

    ...
}
```

Note

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.


```
package it.venis.ai.spring.demo.controllers;

...

@RestController
public class QuestionController {

    ...

    @PostMapping("/ollama/ask/rag")
    public Answer getOllamaRAGAnswer(@RequestBody QuestionRequest request) {

        return this.ragService.getOllamaRAGAnswer(request);

    }

    @PostMapping("/ollama/ask/rag/web-search")
    public Answer getOllamaWebSearchRAGAnswer(@RequestBody QuestionRequest request) {

        return this.ragService.getOllamaWebSearchRAGAnswer(request);

    }

}
```

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on the right side, suggesting it's resting on a surface.

Branch: 11-spring-ai-gemini-ollama-rag-web-search

Note

[illegible]