**Detailed Flask Text Summarization Explanation**

This code represents a comprehensive Flask web application for text summarization. Let me break down its key components and functionality in detail:

**Core Functionality**

The application allows users to:

1. Register and log in to personal accounts
2. Summarize text from various sources:
   * Uploaded files (TXT, PDF, DOCX)
   * Web URLs
   * YouTube video transcripts
   * Direct text input
3. View, format, translate, and export summaries
4. Interact with a chatbot for assistance

**Technical Architecture**

**Framework and Libraries**

* **Flask**: The core web framework
* **SQLAlchemy**: Database ORM for user and summary data storage
* **NLTK**: Natural Language Toolkit for text processing and summarization
* **BeautifulSoup**: For web scraping URL content
* **PyPDF2 & python-docx**: For parsing PDF and DOCX files
* **youtube\_transcript\_api**: For extracting YouTube video transcripts
* **deep\_translator**: For translation functionality
* **FPDF**: For PDF generation

**Database Models**

1. **User**: Stores user information (username, email, hashed password)
2. **Summary**: Stores summaries with metadata (title, original text, summary text, source type, compression ratio, creation date)

**Text Summarization Algorithm**

The app uses an extractive summarization approach based on:

1. Sentence tokenization
2. Creating a similarity matrix between sentences
3. Applying PageRank algorithm to rank sentence importance
4. Selecting top sentences based on compression ratio
5. Reordering sentences to maintain original flow

def generate\_summary(text, num\_sentences=5):

# Tokenize text into sentences

# Create similarity matrix

# Rank sentences using PageRank

# Select top sentences

# Reorder sentences to maintain flow

# Return joined summary

**Key Features**

**Multi-Source Text Extraction**

* File extraction (TXT, PDF, DOCX)
* Web page scraping
* YouTube transcript extraction
* Direct text input

**Summary Formatting Options**

* Plain text
* Bullet points
* Paragraphs

**Export Capabilities**

* TXT format
* PDF format with language support
* DOCX format with language support

**Translation**

The app includes translation functionality using Google Translator:

* Handles text chunking for long text
* Provides fallback to auto language detection
* Preserves formatting

**Chatbot Integration**

The application includes a simple chatbot feature that responds to user queries about the summarization process.

**Security Features**

* Password hashing with bcrypt
* Session management
* User permission checks for summary access
* Secure file handling with sanitized filenames
* Content size limitations

**User Flow**

1. User registers/logs in
2. Selects text source and compression level
3. System extracts and summarizes text
4. User can format, translate, export or save summary
5. Summaries are stored for later access in the dashboard

**Performance Considerations**

* File uploads limited to 16MB
* Translation API handling with chunking for long texts
* Temporary file cleanup after processing
* Database relationship optimization

This application represents a sophisticated text summarization tool with multiple input sources, processing options, and export capabilities while maintaining security and user account management.