

HONQP Gen

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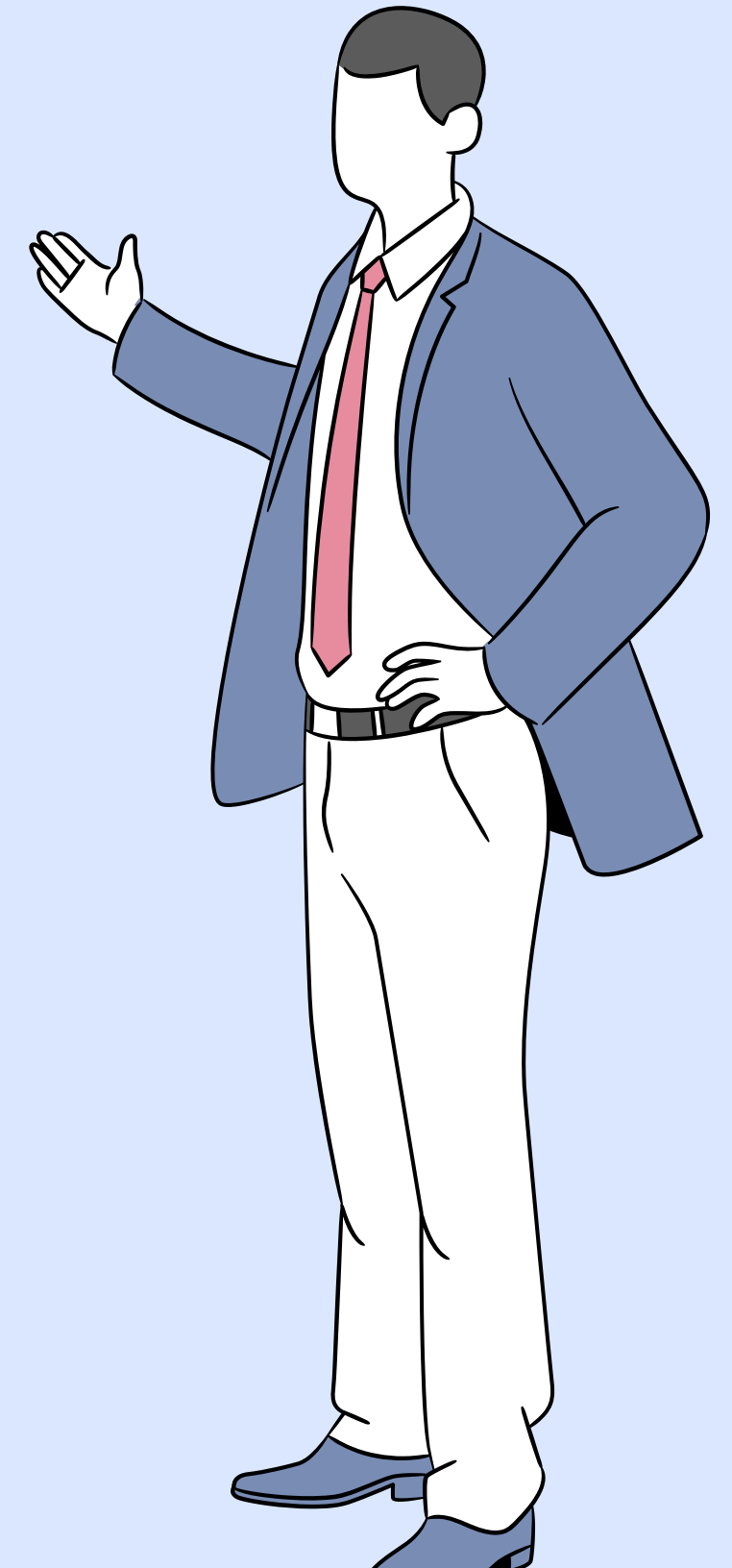
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About the project



HONQPGen is a cutting-edge initiative focusing on automated extraction of comprehensive method insights and intricate class relationships in Java code, optimizing code documentation through sophisticated parsing and analysis techniques.



Today's Agenda



1 Objective

2 Background Research

3 Technology Used

4 Block Diagram

5 Takeaways/Learning Outcomes

6 Output

7 Obstacles

Objective

Method Description Generation

Develop an automatic Java method description generator using Python. It will parse Java source code, extract relevant information about classes, data members, and methods, and with the help of python generate human-readable descriptions.

Class Diagram Creation

Develop an intelligent tool capable of creating detailed class diagrams for Java code, illustrating relationships between classes.

Methodological Evolution: Navigating Challenges from Pre-trained Models to Custom Neural Networks for Java Method Description Generation.

DATASET CREATION

Curated a dataset of 50 Java code samples.

TEXT PROCESSING

Utilized NLTK for tokenization, lemmatization, and stemming to extract relevant information from code snippets.

PRE-TRAINED MODELS EXPLORATION

Explored fine-tuning of pre-trained models (Google T5 Fan Base, BERT from Hugging Face) but encountered challenges due to the unique nature of the problem.

CUSTOM NEURAL NETWORK

Implemented a second approach by building a custom neural network from scratch but RNNs faced accuracy issues attributed to the small dataset size.

Technology Used

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a. Parsing and Analysis:

Utilized libraries:

1. **javalang** for parsing Java code and extracting syntax tree information.
2. **antlr4** for parsing Java code and walking the Abstract Syntax Tree (AST) to gather relevant details

We employed these libraries to analyze the structure and behavior of Java code samples which was created manually, extracting essential information for documentation.

b. Documentation Generation:

Utilized Python libraries:

1. Utilized the docx library in Python for generating structured Word documents.
2. Applied document styling and formatting to present information in a clear and organized manner.

Block Diagram

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Dataset Preparation

Apprised a preprocessed dataset of a certain amount of java code samples.

**Text Processing
(Parsing and Analysis)**

Utilized the JavaLang and ANTLR4 libraries to parse Java code and extract pertinent information from Abstract Syntax Trees (ASTs).

Method Description

Obtained the thorough summary of derived methods from the Python code.

**Word Document
Generation**

Used Python docx library to create a Word document containing class diagram, method names, and detailed derived method summaries.

Takeaways/Learning Outcomes

Gained proficiency in utilizing Python libraries (javalang and antlr4) for parsing Java code and extracting information from the AST.

**Code Parsing and
Analysis**

Developed skills in integrating external libraries seamlessly into the Python workflow for code analysis purposes.

**Integration of
Libraries**

Acquired knowledge and experience in using the docx library to create professional and structured documentation.

**Document
Generation**

Developed problem-solving skills in addressing challenges related to code analysis, ensuring accuracy in method descriptions.

Problem-Solving

Class Diagram Generation

Account

```
+ MIN_BALANCE: double
+ CHARGE_AMOUNT: double
+ account: Account
+ accountNumber: String
+ balance: double
+ transactions: List
+ accountHolderName: String
+ transactionId: String
+ counter: int

+ getAccountNumber(): String
+ getBalance(): double
+ getAccountHolderName(): String
+ getTransactions(): List
+ deposit(amount: double): void
+ withdraw(amount: double): void
+ generateTransactionId(): String
+ transferTo(recipient: Account, amount: double): void
+ displayAccountDetails(): void
```

Bank

```
+ name: String
+ accounts: Map

+ getName(): String
+ getAccounts(): Map
+ addAccount(accountNumber: String, initialBalance: double,
accountHolderName: String): void
+ removeAccount(accountNumber: String): void
+ getAccount(accountNumber: String): Account
+ displayBankDetails(): void
```

Banksystem

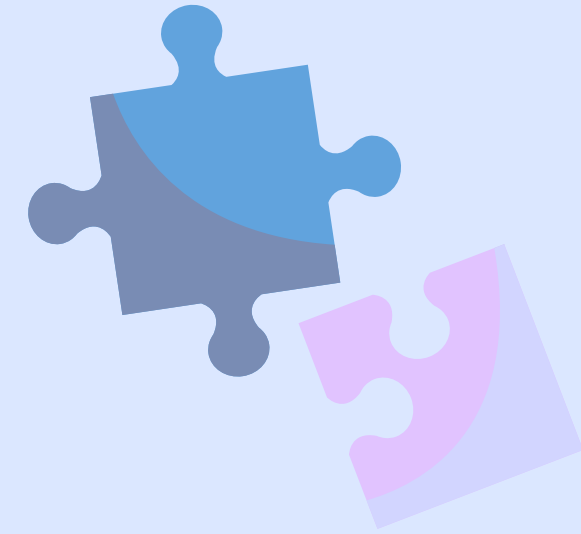
```
+ main(args: String): void
```

Method Description

Method Name: generateTransactionId

- This method auto generates and sets the transactionId.
- The transactionId would be prefixed by the last 3 characters of the accountHolderName in lowercase followed by auto-generated value starting from 1001.
- The auto-generated value would be incremented by one for the next transactionId. Use static variable counter appropriately to implement the auto generation logic.

Obstacles



a. Incomplete Method Descriptions:

Challenge: The current implementation generates descriptions for specific methods, leaving room for enhancement.

Solution: Refining the method description logic to cover a broader range of method patterns, ensuring comprehensive documentation.

b. Class Relationship Identification:

Challenge: The code cannot identify relationships between classes in the generated documentation.

Solution: Investigating and implementing techniques to detect and represent class relationships, including associations, aggregations etc for a more holistic view of the code structure.

THANK YOU