

# HelpMate AI – Policy Assistant using RAG

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## 1. Introduction

Insurance policies are long and complex. Users often struggle to quickly find answers (e.g., grace period, exclusions). This project builds an AI-powered assistant that can read policy PDFs and answer user questions directly from the document with page references.

The goal is to design a Retrieval-Augmented Generation (RAG) pipeline that combines information retrieval and generative AI for precise answers.

## 2. System Architecture

The system follows this flow:

PDF → Text Extraction → Chunking → Embedding → Retrieval → Reranking → LLM Answer Generation

## 3. Methodology

1. PDF Processing – Extract text, clean it, split into sentences, and chunk into ~180 words with overlap.
2. Embeddings – Use all-MiniLM-L6-v2 to convert chunks into numeric vectors.
3. Vector Indexing – Store embeddings in a NumPy/Sklearn index for fast search.
4. Retrieval – Search top-15 most relevant chunks for a given query.
5. Reranking – Use a CrossEncoder to pick the top-3 most relevant chunks.
6. Prompt Building – Insert top chunks into a structured prompt with citations.
7. Answer Generation – Use google/flan-t5-base to generate a final concise answer.

## 4. Implementation Details

Libraries used: sentence-transformers, transformers, scikit-learn, pypdf, diskcache. Caching was implemented for faster re-runs. The system defaults to CPU if GPU is unavailable.

## 5. Results

- Query: What is the grace period for premium payment?

Answer: Grace Period of 31 days is allowed after premium due date. [p.20]

- Query: Who is eligible under this policy?

Answer: A person is eligible after 30 consecutive days of active work with the policyholder. [p.27]

- Query: What are exclusions under this policy?

Answer: Exclusions include self-inflicted injuries, acts of war, drug abuse, and more. [p.35]

## 6. Challenges & Fixes

- Errors with keras 3 → solved by installing tf-keras.
- Missing faiss → switched to scikit-learn cosine similarity.
- Sequence length issues → reduced chunk size & rerank clip length.

## 7. Conclusion

Achievements:

- Built a working RAG pipeline.
- Can answer user queries from PDF with citations.
- Reduces time & effort in reading lengthy policy docs.

Attached all code with snapshots as V2, V3 and V4 versions.

V2 Output Snapshot.

Query: What is the grace period for premium payment?

Top Retrieved (after rerank):

1) [p.20] This policy has been updated effective January 1, 2014 PART II -

POLICY ADMINISTRATION GC 6004 Section B - Premiums, Page 1 Section B - Premiums

Article 1 - Payment Responsibility; Due Dates; Grace Period The Policyholde...

2) [p.20] "Grace Period" means the first 31- day period following a premium due

date. The Group Policy will remain in force until the end of the Grace Period, unless the Group Policy has been terminated by notice as described in ...

3) [p.23] This policy has been updated effective January 1, 2014 PART II -

POLICY ADMINISTRATION GC 6005 Section C - Policy Termination, Page 1 Section C -

Policy Termination Article 1 - Failure to Pay Premium This Group Policy wi...

Final Answer:

The first premium is due on the Date of Issue of this Group Policy. Each premium thereafter will be due on the first of each Insurance Month. Except for the first premium, a Grace Period of 31 days will be allowed for payment of premium.

"Grace Period" means the first 31- day period following a premium due date. The Group Policy will remain in force until the end of the Grace Period, unless the Group Policy has been terminated by notice as described in PART II, Section C.

[p.20] "Grace Period" means the first 31- day period following a premium due date. The Group Policy will remain in force until the end of the Grace Period, unless the Group Policy has been terminated by notice as described in PART II, Section C.

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Query: Who is eligible under this policy?

Top Retrieved (after rerank):

1) [p.27] This policy has been updated effective January 1, 2014 PART III -

INDIVIDUAL REQUIREMENTS AND RIGHTS GC 6006 Section A - Eligibility, Page 2 If a Member's Dependent is employed and is covered under group term life covera...

2) [p.26] This policy has been updated effective January 1, 2014 PART III -

INDIVIDUAL REQUIREMENTS AND RIGHTS GC 6006 Section A - Eligibility, Page 1 PART III - INDIVIDUAL REQUIREMENTS AND RIGHTS Section A - Eligibility Article 1...

3) [p.33] When insurance under this Group Policy replaces coverage under a Prior

Policy, the Period of Limited Activity requirement may be waived for those  
8Dependent spouses' who: (1) are eligible and enrolled under this Group Pol...

Final Answer:

A person will be eligible for Member Life Insurance on the date the person  
completes 30 consecutive days of continuous Active Work with the Policyholder as  
a Member. In no circumstance will a person be eligible for Member Life Insurance  
under this Group Policy if the person is eligible under any other Group Term  
Life Insurance policy underwritten by The Principal. Article 1 - Member Life  
Insurance A person will be eligible for Member Life Insurance on the date the  
person completes 30 consecutive days of continuous Active Work with the  
Policyholder as a Member. In no circumstance will a person be eligible for  
Member Life Insurance under this Group Policy if the person is eligible under  
any other Group Term Life Insurance policy underwritten by The Principal.  
Article 2 - Member Accidental Death and Dismemberment Insurance A person will be  
eligible for Member Accidental Death and Dismemberment Insurance on the latest  
of:

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Query: List the major exclusions.

Top Retrieved (after rerank):

1) [p.17] if the Member is to contribute part of the premium, maintain the  
following participation percentages with respect to eligible employees and  
Dependents, excluding those for whom Proof of Good Health is not satisfactory  
to...

2) [p.14] Terminally Ill A Member will be considered Terminally Ill, for  
Accelerated Benefits, if he or she has experienced a Qualifying Event and is  
expected to die within 12 months of the date he or she requests payment of

Accel...

3) [p.42] Purchase Qualification A Member will qualify for individual purchase if insurance under this Group Policy terminates and: (1) the Member's total Life Insurance, or any portion of it, terminates because he or she ends Active Work or

Final Answer:

[p.15] Terminally Ill A Member will be considered Terminally Ill, for Accelerated Benefits, if he or she has experienced a Qualifying Event and is expected to die within 12 months of the date he or she requests payment of Accelerated Benefits. Total Disability; Totally Disabled A Member's inability, as determined by The Principal, due to sickness or injury, to perform the majority of the material duties of any occupation for which he or she is or may reasonably become qualified based on education, training or experience. Written or Writing [p.42] Purchase Qualification A Member will qualify for individual purchase if insurance under this Group Policy terminates and: (1) the Member's total Life Insurance, or any portion of it, terminates because he or she ends Active Work or

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V3 Output Snapshot:

Query: What is the grace period for premium payment?

Top Retrieved (after rerank):

1) [p.20] This policy has been updated effective January 1, 2014 PART II - POLICY ADMINISTRATION GC 6004 Section B - Premiums, Page 1 Section B - Premiums Article 1 - Payment Responsibility; Due Dates; Grace Period The Policyholder...

2) [p.23] This policy has been updated effective January 1, 2014 PART II - POLICY ADMINISTRATION GC 6005 Section C - Policy Termination, Page 1 Section C - Policy Termination Article 1 - Failure to Pay Premium This Group Policy will...

3) [p.44] A Dependent must apply for individual purchase and the first premium

for the individual policy must be paid to The Principal within 31 days after the date Dependent Life Insurance for the Dependent terminates under this ...

Final Answer:

31 days.

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Query: Who is eligible under this policy?

Top Retrieved (after rerank):

1) [p.26] This policy has been updated effective January 1, 2014 PART III -  
INDIVIDUAL REQUIREMENTS AND RIGHTS GC 6006 Section A - Eligibility, Page 1 PART  
III - INDIVIDUAL REQUIREMENTS AND RIGHTS Section A - Eligibility Article 1...

82) [p.27] This policy has been updated effective January 1, 2014 PART III -  
INDIVIDUAL REQUIREMENTS AND RIGHTS GC 6006 Section A - Eligibility, Page 2 If a  
Member's Dependent is employed and is covered under group term life covera...

3) [p.41] This policy has been updated effective January 1, 2014 PART III -  
INDIVIDUAL REQUIREMENTS AND RIGHTS GC 6010 Section E - Reinstatement, Page 2  
If

coverage for a Member or Dependent terminates because the person is outsid...

Final Answer:

A person will be eligible for Member Life Insurance on the date the person completes 30 consecutive days of continuous Active Work with the Policyholder as a Member. In no circumstance will a person be eligible for Member Life Insurance under this Group Policy if the person is eligible under any other Group Term Life Insurance policy underwritten by The Principal. Article 1 - Member Life Insurance A person will be eligible for Member Life Insurance on the date the person completes 30 consecutive days of continuous Active Work with the Policyholder as a Member. In no circumstance will a person be eligible for Member Life Insurance under this Group Policy if the person is eligible under

any other Group Term Life Insurance policy underwritten by The Principal.

Article 2 - Member Accidental Death and Dismemberment Insurance A person will be eligible for Member Accidental Death and Dismemberment Insurance on the latest of:

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Query: List the major exclusions.

Top Retrieved (after rerank):

1) [p.14] Not included are rest homes, homes for the aged, nursing homes, or places for treatment of mental disease, drug addiction, or alcoholism.

Terminally Ill A Member will be considered Terminally Ill, for Accelerated Benefit...

2) [p.23] fails to maintain the participation percentages requirements of PART II, Section A with respect to eligible employees, excluding those for whom Proof of Good Health is not satisfactory to The Principal; or c. fails to ma...

3) [p.10] This policy has been updated effective January 1, 2014 GC 6002 PART I - DEFINITIONS, PAGE 2 The legally recognized union of two eligible individuals of the same sex established according to law. Civil Union Partner For t...

Final Answer:

Rest homes, homes for the aged, nursing homes, or places for treatment of mental disease, drug addiction, or alcoholism.

V4 Output Snapshot:

Query: What is the grace period for premium payment?

Top Retrieved (after rerank):

1) [p.20] This policy has been updated effective January 1, 2014 PART II -

POLICY ADMINISTRATION GC 6004 Section B - Premiums, Page 1 Section B - Premiums

Article 1 - Payment Responsibility; Due Dates; Grace Period The Policyholder...

2) [p.23] This policy has been updated effective January 1, 2014 PART II -

POLICY ADMINISTRATION GC 6005 Section C - Policy Termination, Page 1 Section C -

Policy Termination Article 1 - Failure to Pay Premium This Group Policy wi...

3) [p.44] A Dependent must apply for individual purchase and the first premium

for the individual policy must be paid to The Principal within 31 days after the

date Dependent Life Insurance for the Dependent terminates under this ...

Final Answer:

The first premium is due on the Date of Issue of this Group Policy. Each premium

thereafter will be due on the first of each Insurance Month. Except for the

first premium, a Grace Period of 31 days will be allowed for payment of premium.

"Grace Period" means the first 31- day period following a premium due date. The

Group Policy will remain in force until the end of the Grace Period, unless the

Group Policy has been terminated by notice as described in PART II, Section C.

The Policyholder will be liable for payment of the premium for the time this

Group Policy remains in force during the Grace Period.

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Query: Who is eligible under this policy?

Top Retrieved (after rerank):

1) [p.26] This policy has been updated effective January 1, 2014 PART III -

INDIVIDUAL REQUIREMENTS AND RIGHTS GC 6006 Section A - Eligibility, Page 1 PART

III - INDIVIDUAL REQUIREMENTS AND RIGHTS Section A - Eligibility Article 1...

2) [p.27] This policy has been updated effective January 1, 2014 PART III -

INDIVIDUAL REQUIREMENTS AND RIGHTS GC 6006 Section A - Eligibility, Page 2 If a

Member's Dependent is employed and is covered under group term life covera...



3) [p.41] This policy has been updated effective January 1, 2014 PART III -

INDIVIDUAL REQUIREMENTS AND RIGHTS GC 6010 Section E - Reinstatement, Page 2  
If

coverage for a Member or Dependent terminates because the person is outsid...

Final Answer:

INDIVIDUAL REQUIREMENTS AND RIGHTS Section A - Eligibility Article 1 - Member  
Life Insurance A person will be eligible for Member Life Insurance on the date  
the person completes 30 consecutive days of continuous Active Work with the  
Policyholder as a Member. In no circumstance will a person be eligible for  
Member Life Insurance under this Group Policy if the person is eligible under  
any other Group Term Life Insurance policy underwritten by The Principal.

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Query: List the major exclusions.

Top Retrieved (after rerank):

1) [p.14] Not included are rest homes, homes for the aged, nursing homes, or  
places for treatment of mental disease, drug addiction, or alcoholism.

Terminally Ill A Member will be considered Terminally Ill, for Accelerated  
Benefit...

2) [p.23] fails to maintain the participation percentages requirements of PART  
II, Section A with respect to eligible employees, excluding those for whom Proof  
of Good Health is not satisfactory to The Principal; or c. fails to ma...

3) [p.10] This policy has been updated effective January 1, 2014 GC 6002 PART I  
- DEFINITIONS, PAGE 2 The legally recognized union of two eligible individuals  
of the same sex established according to law. Civil Union Partner For t...

Final Answer:

Rest homes, homes for the aged, nursing homes, or places for treatment of mental  
disease, drug addiction, or alcoholism.

