

StudyBot: Your AI Study Revolution

Making studying more efficient and
engaging

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Welcome to StudyBot: The Future of Smart Learning

- What if studying could be smarter, faster, and more personalized?
- Meet StudyBot: Your intelligent study companion
- Transforming how students learn and prepare for exams



Project Components:

1. Automate educational content collection
2. Generate intelligent, adaptive flashcards
3. Classify learning materials by difficulty



The Technology Behind StudyBot

- Powered by Python programming language
- Web scraping with BeautifulSoup and Selenium
- Machine learning using Torch and Transformers
- Natural Language Processing (NLP) using Bloom's Taxonomy



- Retrieve educational content
- Clean and preprocess text data
- Parsing with AI
- Generate study materials
- Classify difficulty
- Present materials by difficulty

Web Scrapping: Content Collection Strategy

- Gather educational content from reliable online sources
- Extract questions and answers across different subjects
- Ensure ethical data collection practices
- Comply with website usage policies



AI Parsing: Content Creation Strategy

- Using data collected from the web scraper, AI will summarize and create questions
- Ensure appropriate prompting of the model



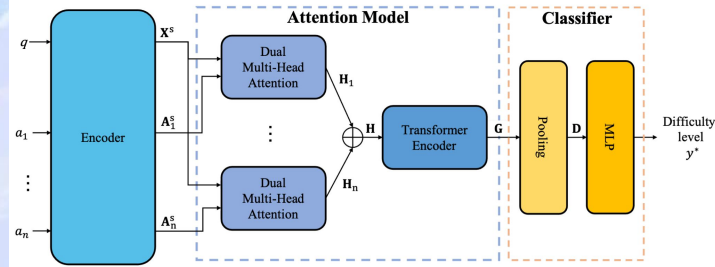
Flashcard Generation Process

- Automatically create study cards from collected content
- Sort flashcards by difficulty level
- Provide targeted learning experience
- Customize study materials instantly



Machine Learning: Smart Difficulty Classification

"Question Difficulty Estimation Based on Attention Model for Question Answering"



Encoding Question Components

Each question and its associated information components are first encoded using BERT:

$$X_p, X_s = \text{BERT}(q)$$

$$A_p^i, A_s^i = \text{BERT}(a_i)$$

where:

- X_p and A_p^i are the pooled representations (corresponding to the $[CLS]$ token).
- X_s and A_s^i are the sequence representations for the entire question (q) and its components (a_i).

Bi-Directional Attention using DUMA

The dual multi-head co-attention (DUMA) is applied to model the relationship between the question and each information component:

$$H_i = \text{DUMA}(X_s, A_s^i)$$

where:

$$H_i = \text{Fuse}(\text{MHA}(X_s, A_s^i, A_s^i), \text{MHA}(A_s^i, X_s, X_s))$$

- $\text{MHA}(Q, K, V)$ represents multi-head attention, which computes an attention matrix between queries (Q), keys (K), and values (V).
- The Fuse function (concatenation) merges the bi-directional attention outputs.

Inter-Information Relationship using Transformer Encoder

After computing bi-directional relationships, a Transformer encoder captures interactions among different components:

$$G = \text{TransEncoder}(H)$$

where:

- H is the concatenation of all H_i .
- The Transformer Encoder applies multi-head self-attention to capture relationships across all components.

- Presents an attention-based model to estimate the difficulty of questions in QA tasks. It improves on previous models by incorporating dual multi-head attention (DUMA) and self-attention (Transformer Encoder) to better capture relationships between a question and its information components.
- I plan to further improve this model with NLP using blooms taxonomy.
- I will use BERT as the pretrained model

The final difficulty score y^* is predicted using a multi-layer perceptron (MLP) classifier:

1. Pooling (e.g., max-pooling) is applied to G :

$$D = \text{MaxPooling}(G)$$

2. MLP classifier predicts the difficulty level:

$$y^* = \text{MLP}(D)$$

The model is trained using cross-entropy loss.



LEVEL 1
Child

LEVEL 2
Teen

LEVEL 3
College Student

LEVEL 4
Grad Student

LEVEL 5
Expert



Machine Learning: Smart Difficulty Classification

- Use Bloom's Taxonomy as a classification framework
- Categorize questions from basic recall to advanced analysis
- Adaptive learning experience
- RACE datasets

5 Levels

MACHINE LEARNING



BLOOM'S TAXONOMY DIGITAL PLANNING VERBS					
REMEMBERING	UNDERSTANDING	APPLYING	ANALYZING	EVALUATING	CREATING
Copying Defining Finding Locating Quoting Listening Googling Repeating Retrieving Outlining Highlighting Memorizing Networking Searching Identifying Selecting Tabulating Duplicating Matching Bookmarking Bullet-pointing	Annotating Tweeting Associating Tagging Summarizing Relating Categorizing Paraphrasing Predicting Comparing Contrasting Commenting Journaling Interpreting Grouping Inferring Estimating Extending Gathering Exemplifying Expressing	Acting out Articulate Reenact Loading Choosing Determining Displaying Judging Executing Examining Implementing Sketching Experimenting Hacking Interviewing Painting Preparing Playing Integrating Presenting Charting	Calculating Categorizing Breaking Down Correlating Deconstructing Linking Mapping Mind-Mapping Organizing Appraising Advertising Dividing Deducing Distinguishing Illustrating Questioning Structuring Integrating Attributing Estimating Explaining	Arguing Validating Testing Scoring Assessing Critiquing Commenting Debating Defending Detecting Experimenting Grading Hypothesizing Measuring Moderating Posting Predicting Rating Reflecting Reviewing Editorializing	Blogging Building Animating Adapting Collaborating Composing Directing Devising Podcasting Wiki Building Writing Filming Programming Simulating Role Playing Solving Mixing Facilitating Managing Negotiating Leading

- High school and college study preparation
- Subject-specific learning tools
- Personalized education platforms
- Professional certification study aids



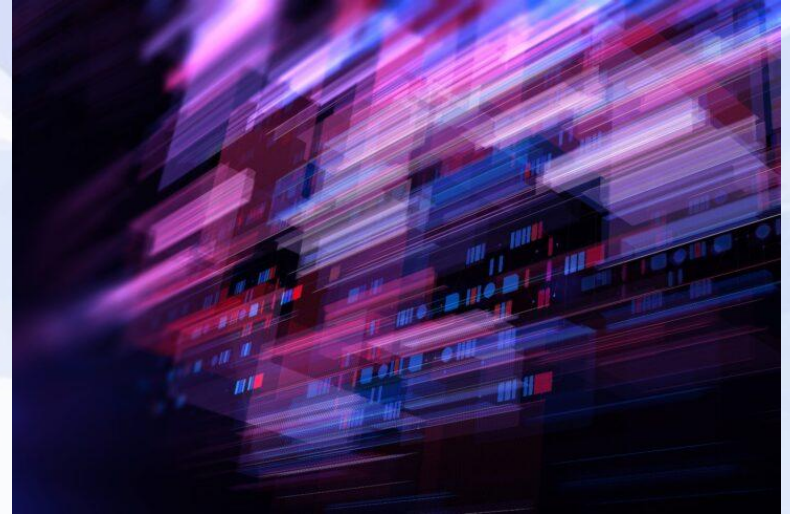
Technical Challenges

- Managing diverse content sources and ensuring credibility
- Math
- Ensuring classification accuracy
- Minimizing processing time



Future Expansion Possibilities

- Advanced difficulty metrics
- Real-time content updates
- Cross-platform compatibility
- Individual customization for question order



Your Learning, Transformed



- StudyBot: More than just a tool
- Personalized learning experience
- Intelligent, adaptive study companion
- Empowering students through technology

Get Involved: Next Steps

- Provide feedback
- Contribute to development
- Share your study challenges
- Help shape the future of learning
- Probing Question: How would you improve StudyBot?