VIETNAM DATATHON 2023

K27_1

IKEA CHATBOT PROPOSAL

November 2023

TEAM 153 - K27_1

CONTENT

INTRODUCTION

Whether done in-person or online, shopping has become an essential aspect of daily living in the modern world. Artificial intelligence is being used extensively to improve the customers' shopping experiences.

However, consumers often struggle to find and choose products that suit their needs and preferences due to the diversity and abundance of product information. This is particularly relevant to furnitures.

01 **Problem**

Recognizing that immersing in data might result in a time-consuming and inefficient buying experience for customers. We have made the decision to implement an intelligent chatbot that uses an artificial intelligence model inside the framework of the Minimum Viable Product (MVP) in order to solve this issue in a flexible and effective manner.

02 **Minimum Viable Product - MVP**

MVP, a strategy emphasizing a minimal version for user testing, reduces risks and conserves resources. Building an e-commerce chatbot MVP offers opportunities to enhance user experience, optimize customer searches, and develop the e-commerce ecosystem.

PROBLEM STATEMENT

DEFINE PROBLEM

Customers often face difficulties while finding and choosing products from thousands options when they shop online.

Due to the inconvenience and long-drawn-out, there is an surged need to build chatbots that can effectively offer items to customers and handle their inquiries.

PAIN POINTS

- Issues with Natural Language Processing
- Ineffective interaction and lack of customer experience
- Limitation in the functionality of product recommendation.

The proposed chatbot must be both a useful tool and a devoted partner.

CURRENT LANDSCAPE

Many rivals in the chatbot and e-commerce market provide comparable services, like:

Other big online retailers (eBay, Amazon, etc.)

Advanced chatbots with AI built on different platforms

SOLUTION OVERVIEW

To tackle the challenge of developing an powerful chatbot for IKEA, we propose an AI solution based on natural language processing (NLP) that utilizes the Long Short-Term Memory (LSTM) model. The goal of this approach is to use strong and adaptable language processing abilities.

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This method utilizes the benefits of algorithms, and AI models in:

Natural Language rocessing (NLP)

Understanding, analyzing client inquiries and questions; providing precise answer or information to improve interaction and communication with users

Long Short Term Memory (LSTM)

Deep learning neural network structure, built for flexible natural language processing, the chatbot can "remember" details from past conversations and use it to response intelligently and logically

Optimizing & Continiuous learning

Utilizing optimization techniques & continuous learning to update and enhance the model, the chatbot becomes smarter and responsive to user needs

SOLUTION OVERVIEW

By combining these techniques and models, this method offers new capabilities to meet business needs such as:

Advanced and natural interactions

The limitless potential chatbot extends beyond Q&A functionality, allowing users to visually search for products by drawing. Provide an online shopping experience akin to interacting with a salesperson

Continuous learning

The chatbot quickly adapts to changes in user behavior and new business requirements over time

Strong personalization capability

Using user-provided data, continuously enhancing predictions and replies, and enhancing the user shopping experience.
Update & upgrade easily, reducing maintenance time and costs.

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METHODOLOGIES

Creating a system that process and communicate using natural language, such English, using models based on natural language processing (NLP)

METHODOLOGIES

Model: LSTM (Long Short Term Memory)

Input:

- Training Set: Entire data from *ikea_products_snapshot_data.csv*
- Sequence Length: Number of words in the "*short_description*" column

LSTM Network Architecture:

- Hidden Layers: 1-2 hidden layers with 50-100 computational units in each layer
- Memory Unit: Retaining context across time steps

Output:

- Predicting remaining attributes: category, price,... from the input context

Training: Using Gradient Descent algorithm to update weights, minimizing errors
Evaluation: Comparing predicted results with actual values to measure accuracy

RESULT:
The chatbot responds to user questions based on context and interactive content

TECHNIQUE

Programming languages: Python

Models: Deep Learning (RNN - LSTM), NLP

Libraries: TensorFlow, Keras, PyTorch, scikit-learn, OpenAI

Tools: Jupyter Notebook, Google Colab

METHODOLOGIES

Components and modules of the model

Data Processing:

- Clean, preprocess the raw data by removing noise/errors
- Split data into train, validation and test sets

Hidden Layer:

- Map discrete inputs like words into dense numeric vectors

Encoder:

- Use RNN to process the input sequence, extracts representations

Attention Mechanism:

- Focuse on the most relevant parts of the input for the question

Decoder:

- Generates output using encoder representations and attention

Output Layer:

- Projects decoder output to output vocabulary size

Loss Function:

- Measures predictions and targets

Optimization:

- Trains the model using gradient descent to minimize loss

Evaluation:

- Metrics like accuracy on test set to check model performance

CORE FUNCTIONALITY

- The chatbot suggests related products within the dataset
- Developing a drawing feature to suggest related images based on the information provided about the customer's product preferences
- The chatbot features item classification (category) and recommends related products

Example: If the product is a bed, suggests related items in the bedroom category

PERFORMANCE METRICS

KEY METRICS

Conversion rate: The percentage of users performing desired actions (adding to cart, making a purchase,...)

User count: The volume of visits, downloads

User experience: Satisfaction level, usability based on feedback, reviews

Operational efficiency: Error rate, average operational time

Collect Data and Metrics

Track user interactions, response times with measurement tools and record it

Analyze Quantitative Data

Calculate KPIs (conversion rates,..) from user behavior, compare with the set targets

User Testing and Feedback

Test usability, conduct user interviews, feedback for quality assessment

Measure System Performance

Response time, error rate, operational time. Monitor system logs

A/B or Multivariate Testing

Compare the performance of different versions to optimize KPIs

Measure System Performance

Specify if the first goals and feedback gathering have been met or not

TIMELINE ROADMAP

step 1

Supplement related knowledge

Understand chatbots, NLP methods and OpenAI library to explore basic function

step 2

Indentify the chatbot's sight

Spotting the context and purpose of the chatbot, listing vital features and setting criteria for evaluating its quality

step 3.1

Craw needed data

Identifying necessary data sources, utilizing a tool for web or API data crawling, storing the obtained data, and ultimately the desired training dataset would obtain with over 3000 observations

step 3.2

Collect and filter data

Gathering data relevant to the chatbot context. Data preprocessing involves conducting broad filtering, refining content,... Final processed dataset is ready for training

TIMELINE ROADMAP

step 4

Train model

Selecting an apt model architecture, training on the dataset, evaluating and fine-tuning the model. Expected model capable of natural language interaction with an accuracy exceeding 90%

step 5

Design user interface

Creating a visually appealing and user-friendly interface, integrating the trained chatbot, resulting in a both friendly and responsive interface

step 6

Test improvement process

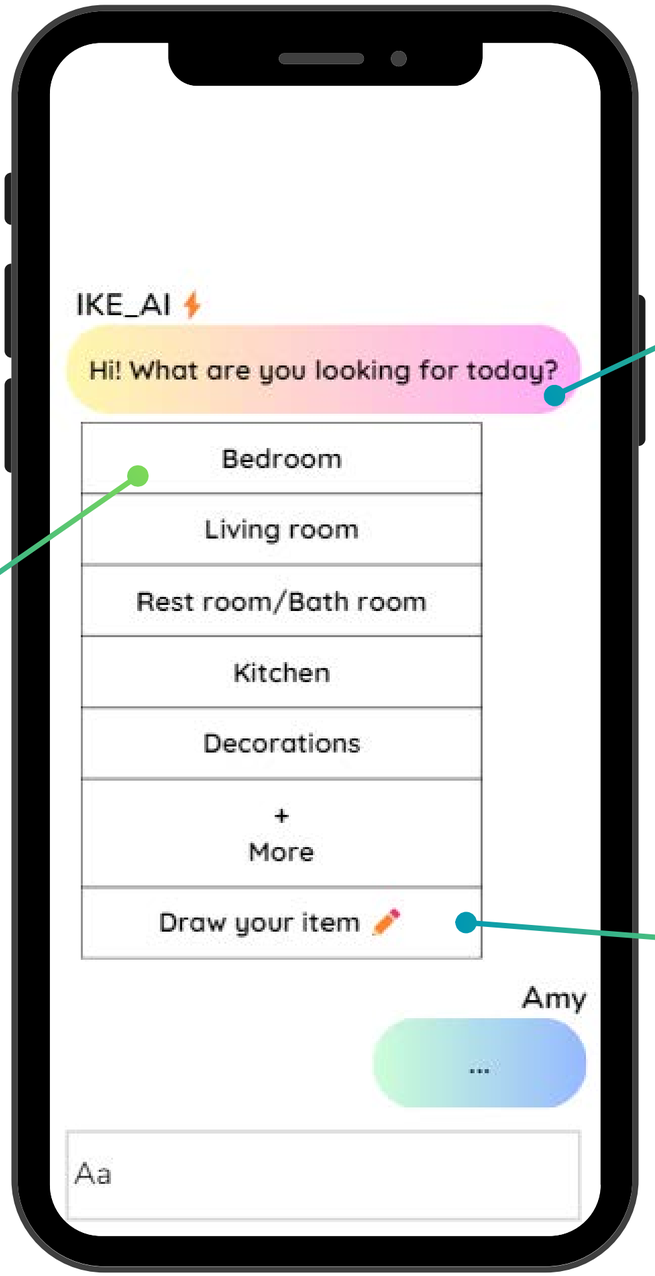
Testing the functionality and usability of the product, collecting user feedback, and continuously improving and upgrading the chatbot to ensure ongoing learning

step 7

Deploy and Monitor

Deploying the product into a real-world environment, monitoring its performance, continuing improvements until the chatbot is perfected and ready for use

USER INTERFACE

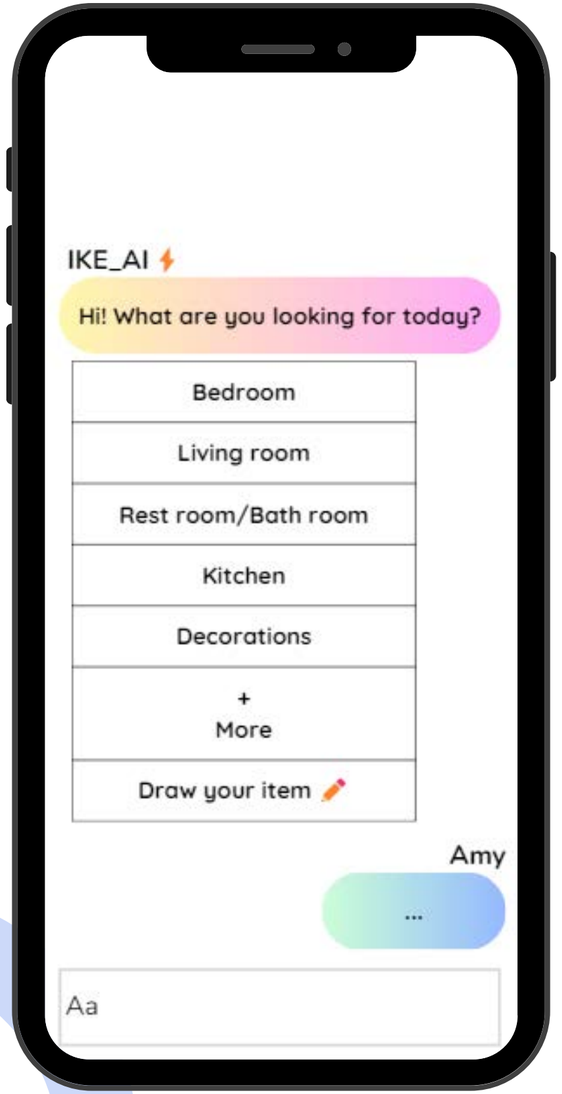


friendly greeting
to start a conversation

interactive category list
customers choose the option they need

draw your ideal furniture

USER INTERFACE



User Initiation

User starts a conversation with the chatbot

1

User Query

User poses a query/expresses a need (recommendations, or assistance with the shopping process)

2

Natural Language Processing (NLP)

Extracting intent and key details from the natural language, processing the user's input

3

Clarification and Customization

Seeks clarification/additional details to refine recommendations, ensuring a more personalized and accurate response

4

Feedback and Improvement

Prompt the user for feedback to enhance future interactions

5

LIMITATIONS & FUTURE ENHANCEMENTS

Weaknesses

The lack of information in the current dataset, including values for depth, height, and weight of IKEA furniture products

Solved by testing scenarios of replacing missing values with the following:

Limitations

- Lack of exploration of technologies for creating a database using the Python language
- Limitations in accurately identifying drawings, lack of understanding image information leading to undesired products

Solution

- The average value of attributes within the same category
- Removal of observations containing missing values
- The median value of the dataset
- Obtaining values from observations with similar attribute specifications

Future enhancement

- Exploration of 3D Modeling
- Collaboration with Experts
- Advanced Technology Integration
- Enhanced Data Collection and Processing

CONCLUSION

Overall

- **AI-Powered Assistance:**
  - Leveraged NLP and LSTM model
- **Enhanced User Experience:**
  - Streamlined online shopping by intelligently understanding and responding to user needs
- **Flexibility and Adaptability:**
  - Implemented flexible data processing and embraced a continuous learning MVP strategy
- **Continuous Improvement:**
  - Incorporated user feedback and optimization techniques for ongoing model refinement

Value proposition of the MVP

- Stands as a smart assistant addressing limitations of conventional chatbots
- Efficient Problem Resolution
- User-Friendly Interface

Potential Impact and Benefits

- Improves conversion rates, enhances customer satisfaction, and optimizes business operations
- Data-driven Insights
- Competitive Advantage
- Brand Loyalty

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THANK YOU

FOR YOUR KIND ATTENTION

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