

PROPOSAL NARRATIVE

I. Project Title

Artificial Intelligence Customer Support System

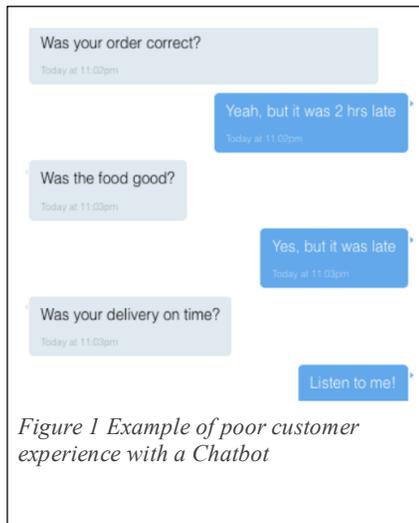
II. Abstract

Customer service is an important aspect to maintain a loyal customer base and to improve profitability for business. Automated customer support systems including Artificial Intelligence (AI) powered chatting bots (Chatbots), have emerged as an alternative to human-based customer support to reduce the labor cost and improve efficiency. However, current Chatbots utilizing Natural Language Processing (NLP) and machine learning are largely focused on processing open-end questions which could lead to inaccurate answers that resulted in poor customer experience. In this project, we are proposing an innovative AI customer support system with a model-based program to provide customers with very high accuracy responses. The model will be developed using the domain knowledge from business; that is, the commonly asked questions will be used to initiate model building; then the crowd-sourcing input data will be processed continuously to update FAQs. The system will be implemented in an online platform that allows users to interact with the program that constrain and guide them to obtain the right answers. Also, the program will deliver instant answers while predict consumer intents and behavior patterns. The deliverables of this project are an online platform and will be tested by several local industries, including food stores, clinics, automated vending, and restaurants, which have agreed to be pilot testers. The interdisciplinary team is from computer science and college of business. We anticipate the commercial adoption of the platform at the end of the project. The results will be disseminated at a national conference.

III. Introduction

Building a loyal base of customers is essential to growing business and improving profitability. Delivering consistent and positive customer service are key to cultivate loyalty and retain customers [1]. However, it is astounding to see many businesses continue to treat the customer poorly, resulting in unhappy customers. Supported by AI and NLP, Chatbots provide conversational interfaces with automated, contextual communications. However, most of the customer service experience by these Chatbots are negative. Customers contact customer service because they couldn't find a solution by themselves; in other words, the problems require knowledge to provide a solution. Most of the Chatbots form conversations based on relatively simplistic templates and decision trees. The complexity of problems makes it even more difficult for the Chatbots to resolve. Moreover, if the user is stuck at a point on the decision tree, Chatbots often fail to react to the user's input, which makes the experience very annoying. One example is shown here in Figure [2]. Therefore, focusing on processing open-end questions which could lead to inaccurate answers

provided by Chatbots is resulted in poor customer experience.



We propose an innovative approach to this problem by introducing a model-based artificial intelligent customer support system, in which a model derived from a continuously enhanced knowledge base will be used to guide the user's interaction with the system. The seed knowledge will be generated by the business experts with domain knowledge, and will be updated as the user's inputs are accumulated. The model based program will "constrain" users into a pre-defined space where only limited questions and answers are available.

This project requires an interdisciplinary approach with students from multiple majors, including computer science, statistics, and marketing

research. Therefore, the interdisciplinary team is from both OCOB and College of Engineering (Computer Science). The team member from OCOB will focus on marketing research and user experience study. The team members from computer science will focus on building the knowledge base, the user interface, and implementation on the web platform.

IV. Objective(s)

We plan to achieve the following objectives in one year:

- (1) Develop a knowledge base (KB) to store and organize the domain knowledge from the industries in the test run (grocery, hotel, and clinic etc.).
- (2) Develop a model-based algorithm to query the knowledge base and retrieve the results.
- (3) Deploy the knowledge base and models in the cloud.
- (4) Validate the customer experience and collect data through test runs.

V. Methodology

This project follows the product development methodology we learned in the engineering curriculum.

- (1) Ideation. The concept of this project originates from the discussions with many local business owners and identified their pain point. After brainstorming, the team decided to use AI to help them improve customer service experience.
- (2) User requirements documentation. The team will have multiple meetings with each business owner and generate a detailed document that incorporate their common requirements of the software.
- (3) Definition of architecture. The architecture should have scalability that can handle future expansions.
- (4) Development of the knowledge base. The domain knowledge from each industry will be incorporated in the knowledge base as the starting point. The knowledge base should be able to capture future inputs by the users.
- (5) Development of the model based algorithm to guide users through the problem-solving steps, with the data retrieved from the knowledge base.

(6) Integration and debugging of the system. The model and knowledge base will be integrated and deployed on the Google cloud platform. Rigorous testing will be performed to debug the system.

(7) Customer validation. The platform will be introduced to each customer to test run and collect data for further improvement.

VI. Timeline

The key milestones and timeline are shown in the Gantt chart below:

Activity	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Project background research	x	x											
Visions and scope document		x	x										
Features, requirements, evaluation criteria document		x	x										
System design and architecture document		x	x										
Prototype and implementation plan		x	x										
Algorithm and modeling development				x	x								
Web app front end development				x	x	x							
Web app back end development				x	x	x							
Beta version of product development						x	x	x	x				
Model validation and evaluation										x	x		
Testing and debugging											x		
Feedback collections, data summary, and dissemination												x	x
Final report													x

VII. Final Products and Dissemination

The full functional final product will a web-based application for two types of users: business users and their customers. First, the web application is designed for business users to login and administrate their accounts. In their accounts, there are a few core functions and features on the dashboard for them to manage the domain knowledge, generate reports, view analytics, and download history of actions for future business planning process. Secondly, customers can interact with model-based program through conversational UI. We will have 5 early business users: California Fresh Market, Envision Optometry, Central Coast Vending, Cal Poly plumbing department, and Cal Poly housing service to validate the model and system. We plan to summarize the results and submit a paper to Journal of ACM.

VIII. Budget Justification

- Travel (total: \$1300):
 - National Automatic Merchandising Association (NAMA) One Show (Mar 21, 2018 – Mar 23, 2018) provides opportunities for students to present innovations in the automated vending industry.
 - Airfare, hotel, meals, transportations for three days: \$1300 for two students.
- Software/software license (total: \$1185):
 - 1-year google cloud service: \$482; 1-year mockups.com service: \$240; 1-year Adobe Creative Cloud All apps: \$240; Apple & Google App developer: \$223
- Contractor service (total:\$2500):
 - After the first consulting with a patent attorney, the potential commercial applications of this project are assessed to be very positive. Therefore, the team would like to pursue patent protection of the project. A patent attorney recommended by Cal Poly entrepreneur program will be used. The contractor service fee will be used to cover the patent searching & filling fees.

Appendix

[1] <https://resources.rosettastone.com/CDN/us/pdfs/The-Loyalty-Effect.pdf>

[2] <https://latenightcoding.co/chatbots-customer-service/>

Proposal Budget

Student Applicant(s):	Jenny Wang, Andrew Engel, Alex Engel
Faculty Advisor:	Prof. Franz J. Kurfess
Project Title: Artificial Intelligence Customer Support System	Requested Endowment Funding
Travel <i>subtotal</i>	\$
Travel: In-state	\$
Travel: Out-of-state	\$1300
Travel: International	\$0
Operating Expenses <i>subtotal</i>	\$
Non-computer Supplies & Materials	\$0
Computer Supplies & Materials	\$0
Software/Software Licenses	\$1185
Printing/Duplication	\$0
Postage/Shipping	\$0
Registration	\$0
Membership Dues & Subscriptions	\$0
Multimedia Services	\$0
Advertising	\$0
Journal Publication Costs	\$0
Contractual Services <i>subtotal</i>	\$
Contracted Services	\$2500
Equipment Rental/Lease Agreements	\$0
Service/Maintenance Agreements	\$0
TOTAL	\$4985