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Doing More with Less: Employing AI for Automation and Business Productivity

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Abstract: ***This article examines the transformative potential of artificial intelligence (AI) in automating and enhancing productivity for small businesses, particularly those in the contracting service sector. While larger corporations have rapidly adopted AI to streamline operations and communication, smaller businesses often lag due to resource constraints and apprehension about new technology. Through a review of current literature and a case study conducted at Pennsylvania Western University California, the article highlights how AI-driven tools—such as automated scheduling, chatbots for customer communication, invoicing automation, and inventory tracking—can bridge the digital divide, reduce administrative burdens, and allow business owners to focus on core service delivery. The findings suggest that with proper implementation and user training, even micro-enterprises can leverage AI to expand their reach, improve efficiency, and maintain high-quality customer interactions without significant increases in workload.***

Keywords: AI Lead Generator, Design Dashboard, Measurement Quality Service, Customer Support, Database Modeling, Online line review

I. INTRODUCTION

Artificial intelligence is no longer in its infancy. It is now a feature in almost every program and application. Businesses are at the cusp of adoption of a wide variety of tools. As AI technology leaps forward, rapid development and implementation naturally results in growing pains. Businesses must discover the full benefits of what AI can do and then determine how to achieve these results to overcome the learning curve. The businesses that will succeed in this new era are those that understand AI's capabilities and use them to automate and streamline processes. AI is not meant to replace human interaction, but it can maximize those interactions to ensure peak productivity and communication. The use of AI to manage business relations, customer communications, and automate data reporting has increased in larger corporations, but smaller businesses—in this study, contractors that offer plumbing, electric, HVAC, renovation, or other services—are slower to adopt new technology and continually to manage their business on paper or by manually entering information into a system. This leads to a distinct disadvantage in a business that relies on effective lead qualification, timely responses to customer inquiries, and efficient scheduling. This is evident through a review of current literature around the topic as well as a case study presented by students at Pennsylvania Western University California (PennWest) on the possible use of AI within a scheduling and communication platform designed to work as a virtual assistant. This study will show how machine learning can benefit small businesses to reach a larger audience without increasing workload.

II. MACHINE LEARNING AND THE GIGO PRINCIPLE

AI has the ability to increase productivity, save costs, and improve decision making no matter the size of the business .Training AI users is as necessary as training the AI programs. The adage "Garbage in, garbage out," remains true, and is a good rule of thumb to remember when considering prompt language. A bit of planning on the front end can then save a large number of hours each week in repetitive tasks. Tishtykbayeva et al (2023) point out that smaller businesses may have difficulty implementing AI systems, "since smaller companies sometimes lack the resources and technical expertise necessary to develop and operate such technology." They also may be wary of these new systems, because "if a plumber or contractor misses a phone call, they lose a job, whereas losing an interaction with a bad AI would cost the plumber his reputation" (Rathore 2025). However, if they can implement AI-driven automation, these small companies can bridge the "digital divide" that separated "large organizations with dedicated marketing departments from owner-operated micro-enterprises" (Ibid).

This case study explores how beneficial AI can be particularly for extremely small businesses. A small business such as a plumbing contractor often operates with just one or two full-time employees, typically the owner and perhaps an apprentice or another skilled worker.

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Without any office help, these individuals are responsible not only for performing plumbing jobs but also for handling scheduling, customer communications, invoicing, and managing supplies. This hands-on approach can be both rewarding and challenging, as the business relies heavily on multitasking and effective time management to deliver quality service while ensuring the administrative side of operations does not fall behind.

In the scenario of a small business such as a plumbing contractor with limited staff and no dedicated office help, AI can assist with a range of tasks to streamline operations and improve efficiency. For example, AI-powered scheduling tools can automatically manage appointments and send reminders to customers, reducing the risk of missed jobs. AI chatbots can handle customer inquiries, provide instant responses, and even assist with invoicing by generating and sending bills after service is completed. Additionally, AI can help track inventory levels, manage supply orders, and organize communication records, allowing business owners to focus more on service delivery and less on administrative burdens.

1) Automating appointment scheduling and reminders
2) Managing customer communications through AI chatbots
3) Generating and sending invoices
4) Tracking inventory and supplies
5) Organizing and storing communication records
6) Providing insights for business decision-making based on data analysis

By leveraging these AI capabilities, small business owners can reduce their administrative workload, ensure timely customer engagement, and make better-informed decisions, all while maintaining high-quality service delivery.

There are two levels of AI interaction. “Weak or narrow AI” is created to carry out certain automated tasks (ex. automatically sending a report for outstanding balances to accounting at the end of the week) versus “strong or general AI,” which trains the machine to “carry out activities that would ordinarily require human intellect, such as comprehending natural language, seeing patterns, and making judgment calls” (Tishtykbayeva et al 2023).

Here’s where the importance of good prompting or programming comes in. For quality leads, good definitions ensure “the system’s ability to filter and focus on prospects that truly match the desired criteria, reducing false positives” (Kaplan et al 2025). Traditional approaches to this might use a point system to rank possible leads. Through a supervised learning task, AI can be shown how to “decide lead vs. non-lead” using keywords and the proposed customer profile against the “ideal customer profile (ICP)” (Ibid.). Data quality is important in this stage, as poor data quality may lead to “results that are skewed or erroneous” if inputs are not “reliable, pertinent, and current” (Tishtykbayeva et al 2023). The key to good AI—in all segments of the population—is “trusted and easy-to-use environments supported by the technology vendors [that] will not depend upon the complexity of the algorithms used; it will depend upon the ease of use” (Rathore 2025). Using already-developed options may be the key to the learning curve, as “transparent and interpretable AI models would not only foster trust among users but also help marketers understand the underlying mechanisms of AI-generated content, enabling better decision-making and strategy development” (Nair et all 2023).

Incorporating AI is an important step that helps small businesses compete with larger companies or national chains. Mesir (2019) showed that “AI initiated a better decision-making strategy in business based on data analysis and interpretation,” allowing retailers to market in a variety of ways. These included the ability to:

a) Collect contact information for promotions, reminders and other marketing communications based on online browsing and previous purchases
b) Dynamic price adjustment in response to internet-browsing data and most selling preferences.
c) Sync email lists and create segmented customer categories for targeted marketing.
d) Identify weaknesses in sales performance and techniques to suggest training in a product/operation or specific language.

With a choice of affordable tools, a small business can essentially outsource its marketing needs.

III. CREATING CUSTOMIZED DASHBOARDS

Why would a company consider a dashboard to replace their current organization system? By inputting all the data into a system, the business then gains access to insights from the data that may not be apparent when it is stored in another method. A live construction project, for example, “highlights the challenges experienced with multi-source data integration and the translation of information into knowledge that drives decisions and deployment of timely corrective measures” (Murguia et al 2022). A dashboard “aligns performance metrics, digital tools and processes, and data analysis techniques in a consistent approach to interpret performance-related data and understand key issues” that supports decision making and improves performance (Ibid).

Delys in companies' adoptions of new technologies are often due to a lack of understanding of real needs and challenges the business faces that could be addressed with IT solutions, and then the criteria needed to find a proper solution (Lasni &Boton 2022). Dashboards are a user-friendly solution because data can be consolidated into a visual display that highlights the essential takeaways in a way that is easily understood by the user because the effectiveness of any dashboard lies in implementation of the insights in decision making. (Maheshwari & Janssen 2014) Design principles included in a customized app include:

1) Using existing data sources to select and customize metrics
2) Linking metrics to performance and procedures
3) Viewing a visual summary of performance to monitor, analyze and assess at a glance
4) Data interpretation
5) Analyzing improvement options
6) Learning and growth (Ibid).

But businesses don't need to develop all these features from scratch. There are plenty of options on the market that can help in a plug-and-play method, depending on the size of the business. One such productivity tool is Monday.com, which is an all-in-one-platform with an easy-to-use interface that adapts to the business's needs with an app-based approach, giving the business the "building blocks" to customize the platform. (Manko 2022). AI has taken these capabilities further by increasing efficiency of search of search operations, increasing quality of decisions, penetrating data to identify interconnectedness, and using "Intelligent Agent technology to help the decision maker do routine work according to the style and behavior of the decision maker at work" (Mesir 2019). Digital technology can be especially helpful in contractor management to organize work efficiently, boost productivity, and promote economic growth, while addressing problems that many contractors face, such as attendance records/tracking hours on a job, scheduling, and claim requests. Also cited in one study was the durability of paper records that became illegible over time (Nasiruddin et al 2024). Sales templates that can be customized will typically capture most of the necessary elements, as they address "business operation, attribute list, visualization, and dashboard capabilities" (Noonpakdee et all 2018). Alio succinctly defines the need for these dashboards: "Properly designed, developed, and deployed strategic dashboards can cut through clutter, provide incisive strategic insight, improve decision-making, and enhance both alignment and implementation performance." The adoption and implementation of digital technologies enhances competitiveness (Landman et al 2024), but it also benefits the consumer. One of the challenges to homeowners is finding available, reputable contract workers to complete a project. Single-owner small businesses are more likely not to have an advanced marketing and networking strategy. By embracing digital solutions, these small businesses can use e-commerce strategies and reach a larger customer base (Jadhav & Kalita 2019). As Ozmec et al (2015) point out, when smaller businesses cannot compete with the price of larger companies, they must rely on "good customer relations and personal contact" (Ozmec et al 2015). Small businesses turn to networking to find a competitive advantage. Collins-Gibbins and Meriläinen determined that "more than 80% of business comes typically from word-of-mouth recommendations, direct networking and referrals." Tan et al (2023) outlines the way consumers can benefit from a higher quality of worker as well as find transparency in pricing when standard prices for common household jobs are implemented.

In the following case study, a dashboard, which is offered as an app, solves the following issues identified by Rathore (2025):

a) Behavioral Factors (building trust with the customer)
b) Technology Factors (system quality, accuracy, integration capabilities)
c) Organization Factors (resources)
d) Performance Outcomes (conversion rate, response time, revenue impact)

IV. CASE STUDY

PennWest encourages students to participate in Capstone Projects: a culminating academic project that integrates knowledge and skills from their major to solve a real-world problem. In the 2025-2026 school year, two students took on a real problem that contractors face: they often lose business due to communication challenges. Based on one of the student's recent experience, they identified a problem that many organizations in the service industry face on a daily basis. In these very small operations, contractors may not be able to offer 24/7 availability or cannot answer their phone while they work. Lack of time/availability and lack of communication leads to a perception of poor customer service and eventual loss off clietns/revenue. The students designed a web-based platform designed as a virtual assistant for contractors and their clients that addresses the organization issues within the field regarding scheduling availability to boost productivity and revenue. This scalable system with core features like a scheduling assistant, waitlist, service area verification, and rough estimates. (See Figures 1-3 for a view of the app screens).

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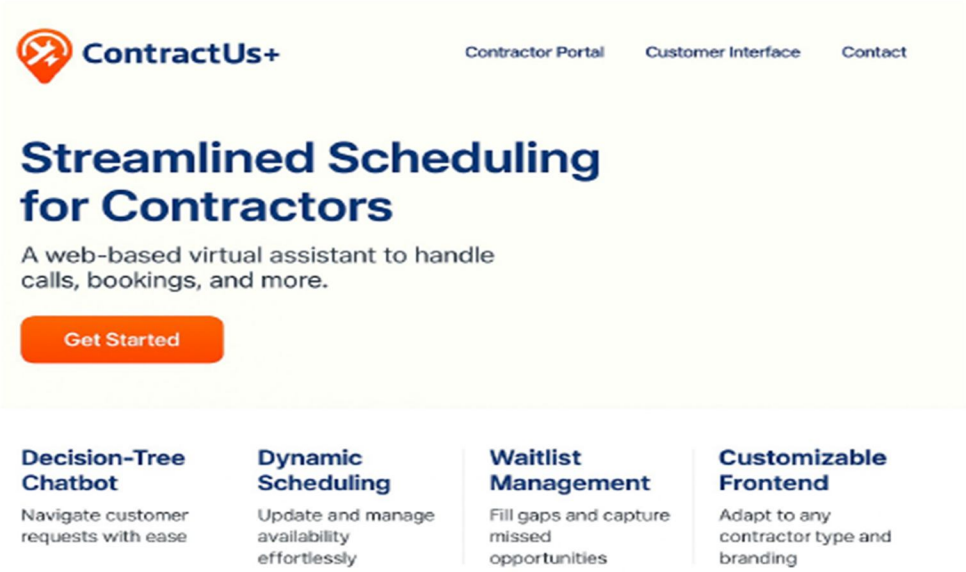
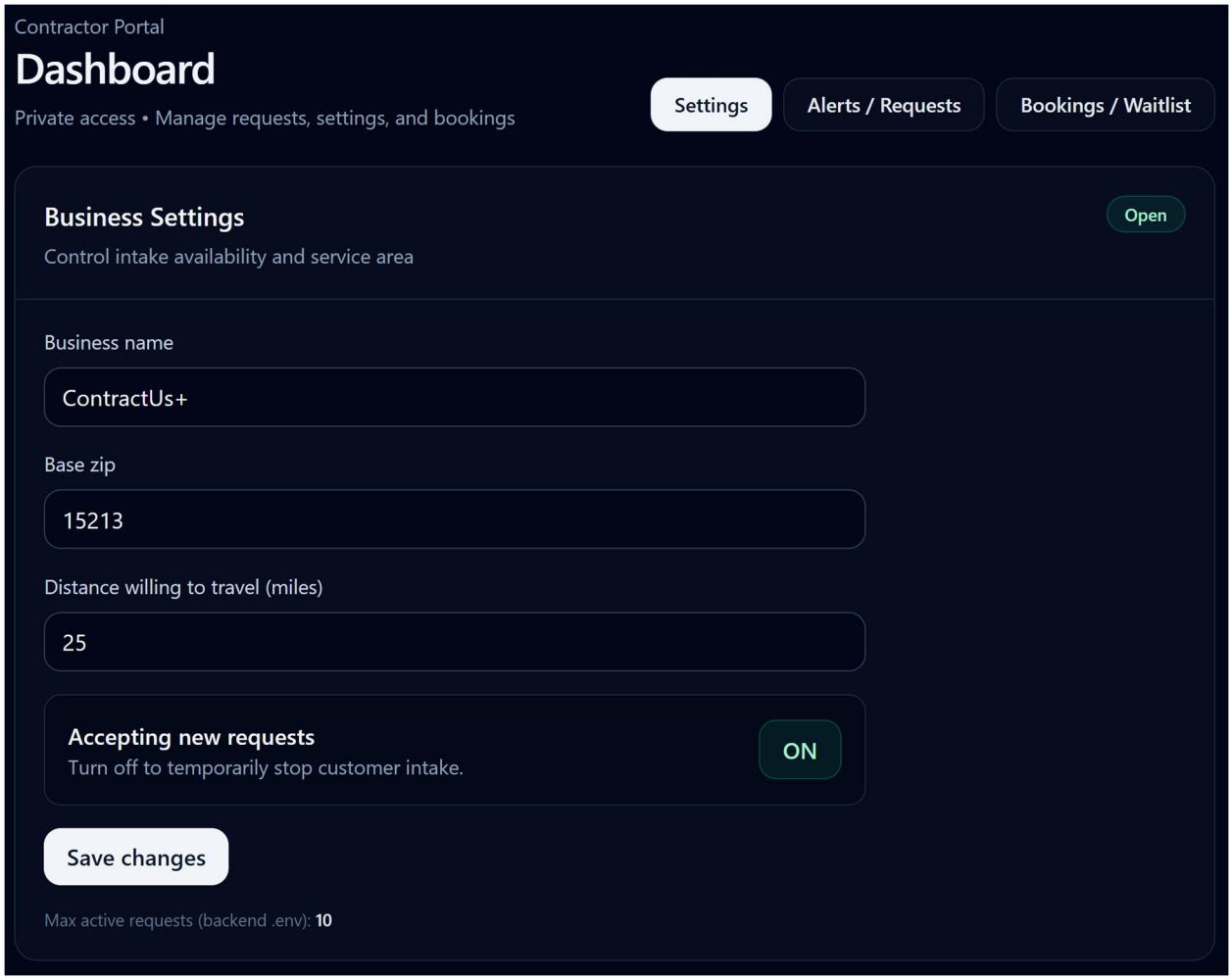
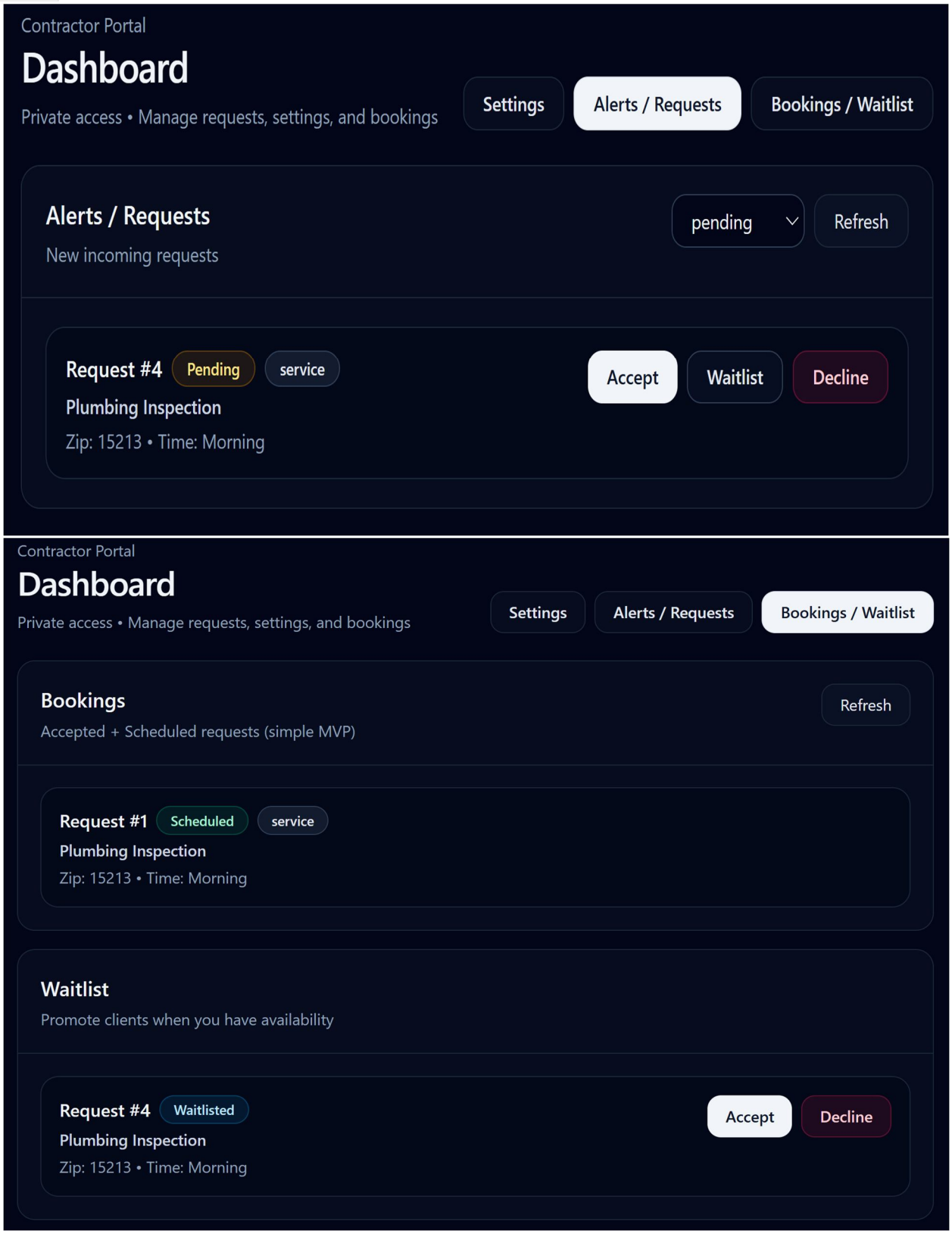


Figure 1. Landing page mockup for contractors and customers. Each client will have a personalized interface for their respective company that includes all contracts and their initial availability days. Style, color scheme, and logos can be customized.



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Figures 2-4. Contractor Portal. These images demonstrate the portal in development. Within the portal, contractors can list the services offered, find a repository of customer information, and manage calls, requests, appointments, and waitlist clients.

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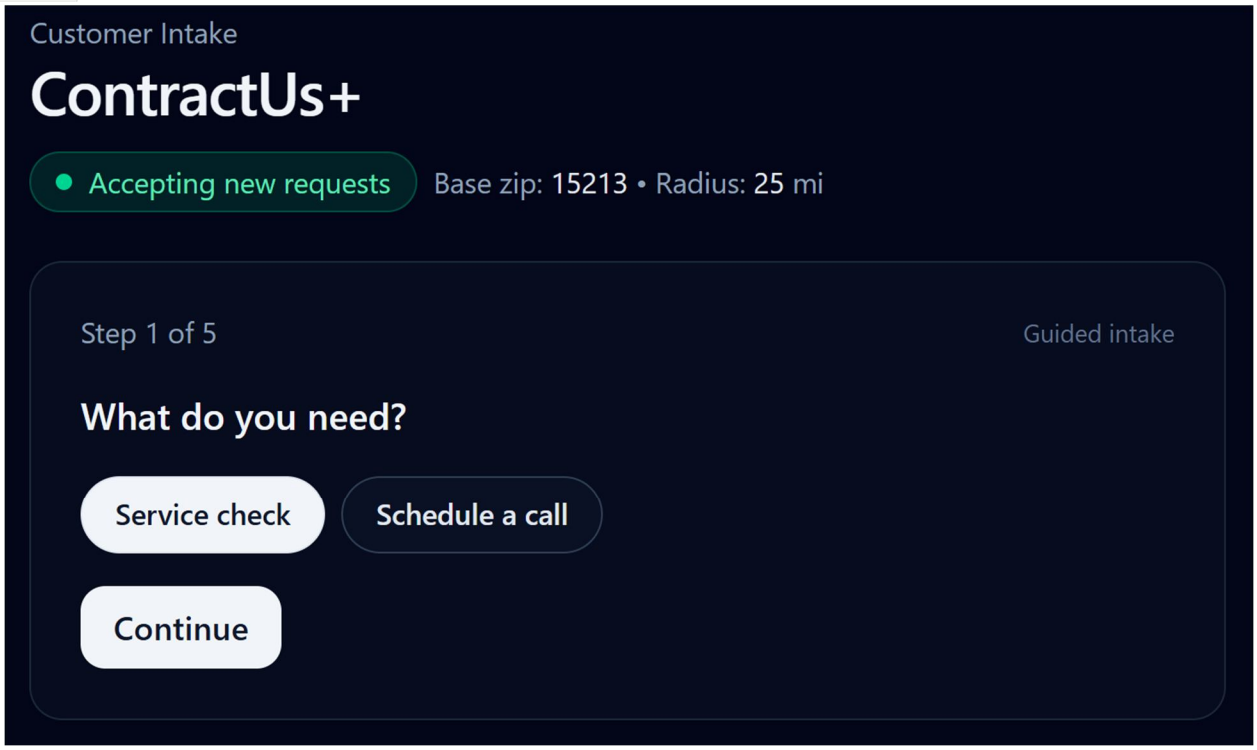


Figure 5. Customer Interface. The planned chatbot-guided interface allows customers to view services, get rough cost estimates, and schedule calls and service check, or join the waitlist.

Their solution was a web-based scheduling and communication platform designed to help contractors better manage their appointments, service areas, and customer interactions, which they named ContractUs+. The system functions like a virtual assistant to automate booking, estimates, and waitlist features. The ContractUs+ model demonstrates how an app can be built from the ground up to reflect the features contractors would need. If this is offered commercially, contractors would be able to download the app, input their information, and start using it, without the backend development for a customized solution.

The contractor-customer scheduling system was designed and built using React, Vite, Flask and PostgreSQL to streamline communication and reduce missed business opportunities. Full system diagrams including Data Flow Diagrams, an ERD, and a Topology Diagram, map out backend processes, database relationships, and hosting architecture. A guided decision-tree chatbot allows customers to schedule appointments, upload images, join waitlists, and receive service estimates, and dynamic scheduling, real-time notifications, and waitlist management improve contractor efficiency and customer experience.

V. PLANS FOR COMPLETING THE PROJECT

To fully complete ContractUs+, frontend and backend expansions are needed to make all major features production ready. This involves finishing the contractor dashboard, improving the chatbot's flow, tightening database relationships, and making sure notifications work consistently. The OpenAI API will be integrated more deeply so that the estimation engine can provide smarter and more personalized estimates based on what the customer describes and any images they upload. The user interface will be evaluated to ensure it feels modern and professional. Testing will happen in multiple layers. The website itself will be tested to ensure all user flows on both the contractor and customer sides to make sure pages load correctly, data submits properly, and the UI behaves as expected. Chatbot prompts and branching logic will be analyzed to ensure customers are always guided to the right places. For the database, entity relationships will be tested based on the ERD to confirm that foreign keys, constraints, and joins behave correctly, especially for appointments, waitlist entries, and requests. On the backend, endpoint tests will confirm that the Flask API sends and receives the correct JSON data. The estimation engine will be given different types of inputs to determine if the returned estimates are reasonable. Finally, real-time notifications and scheduling updates will be tested to ensure that contractors get updates instantly. User acceptance testing will help validate whether real people can use the system without confusion, and stress testing will check how well the app performs with many requests at once.

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ContractUs+ is an example of how technology can solve real-world problems and AI can give small businesses additional resources that help them communicate with customers and manage workflow.

VI. CONCLUSION

In summary, the ContractUs+ Capstone Project exemplifies the potential for digital solutions to transform the way small contractors interact with customers and manage their businesses. By integrating advanced scheduling, communication, and AI-driven estimation features, dashboard systems directly address common pain points faced by contractors and streamline operations for greater efficiency. As small businesses realize the real-world value of AI, it will pave the way for broader adoption of smart tools in the trades.

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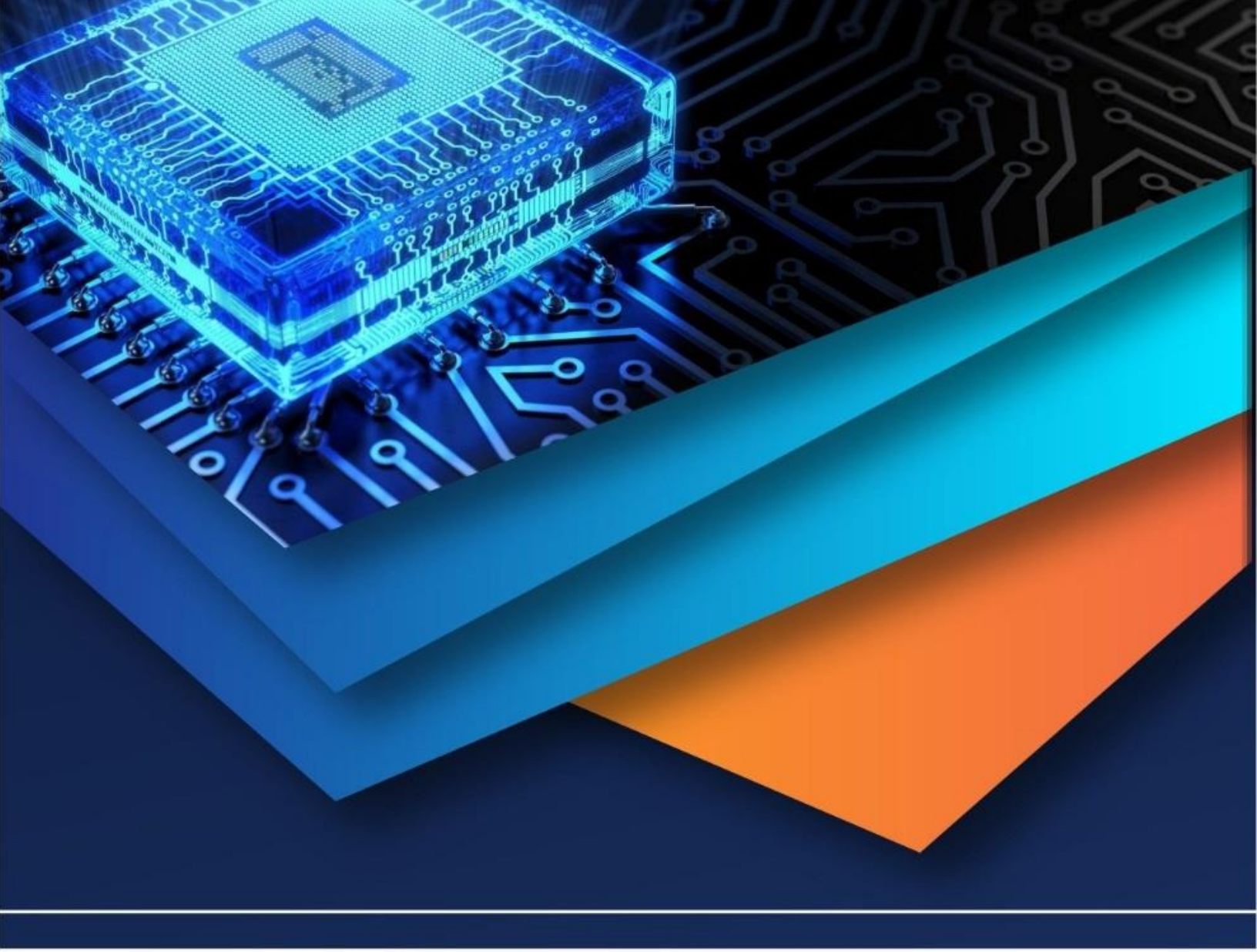
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