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Artificial Intelligence Property Buyers Agent

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Abstract

Artificial Intelligence (AI) plays an increasingly important role in various industries. Recent developments in AI have seen significant enhancements in its capabilities. It is essential for actuaries to stay informed about AI applications to remain competitive and effective in their roles. The integration of AI into the real estate market has the potential to transform the property buying process. While traditional models typically rely on historical data and basic statistical techniques, AI models can collect information from various sources and then develop a deep level of insight based on the input data. This research explores the feasibility of AI property buyer agent using the Reasoning and Acting (ReAct) agent model. In particular, the study aims to integrate various data into recommendations, such as recent auction records, economic indicators, and neighbourhood characteristics. Lastly, the research includes a proof-of-concept website, which can recommend the property based on selected factors and automatically generate a property insights research report according to user's preference. The research aims to provide insights into how AI can help in the property buying process and to enhance decision-making processes for users through more accurate, comprehensive and personalised insights.

Key words: Artificial Intelligence (AI), AI Property Buyer Agent, Reasoning and Acting (ReAct) agent, Property Recommendation

1. Introduction

Artificial Intelligence (AI) is playing an increasingly critical role across a wide range of industries, with recent developments significantly expanding its capabilities and potential applications.

Purchasing property is one of the most significant financial decisions an individual can make, with long-term implications for personal financial well-being and retirement planning. Selecting the right property requires thorough data analysis and a deep understanding of local market conditions. However, most home buyers and investors lack the necessary knowledge, resources, or time to make fully informed decisions. While some seek help from buyers agents for assistance, the high upfront commissions (often ranging from $10,000 to $30,000) are cost-prohibitive for many. Furthermore, the commission-based remuneration model for buyers agent introduces potential conflicts of interest, with no guarantee that a buyer's agent will act solely in the client's best interest.

This paper proposes an AI buyers agent, an intelligent property selection tool that offers objective, data-driven recommendations at an accessible cost. The AI buyers agent is trained on a wide range of information sources and leverages Large Language Models (LLMs) and the ReAct (reasoning and acting) to interact with users, extract their preferences, and recommend suitable suburbs and properties.

The paper is structured as follows:

- Section 2 summarises the market demand for buyers agents and the need for better alternatives.
- Section 3 describes the data sources and development of the AI model.
- Section 4 provides an overview of the AI methodology and system architecture.
- Section 5 presents the applications and showcases the product prototype.
- Section 6 concludes with a discussion on future research and commercial potential.

Disclaimer:

The AI buyers agent developed in this paper is intended solely for illustrative and research purposes. It is designed to showcase the potential of AI in property selection and analysis. It is not intended for commercial use or public distribution. We respect the intellectual property and data usage policies of any underlying sources (Listed in Data Section). This paper does not provide financial advice, property recommendations, or any other form of advice. The authors and the AI system are not liable for any decisions made based on the outputs described herein.

2. Market Demand and AI Solutions

2.1 Property Buying Journey

The following flowchart illustrates the end-to-end property buying journey and compares the services provided by human and AI property buyers agents:

	Human Property Buyers Agent	AI Property Buyers Agent	Comment
1. Define Goals and Preferences	✓	✓	
2. Research and Suburb Recommendation	✓	✓	
3. Property Filtering	✓	✓	Seller agents can provide walkthrough videos on request
4. Physical Inspections	**Partial** Also rely on other professionals for physical inspections	✗	Property managers can offer this service for free or a small fee, in return for future business
5. Negotiations	✓	✗	AI Property Buyers Agent can provide an estimate of market value and other points to assist negotiations
6. Due Diligence (e.g. Legal, Building & Pest Inspections)	✗	**Partial**	Those are provided main by third-party professionals e.g. solicitors, licensed building inspectors etc.

2.2 Additional Observations for the Comparison:

Traditional human buyers agents usually conduct property inspections personally for local properties. For interstate or regional property purchases, traditional agents often rely on third-party representatives to provide service. Similarly, investors using the AI property buyers agent can also engage a third-party to conduct physical inspections.

In regional areas, property managers often provide the property inspection service at no cost in exchange for managing the property after purchase. In metropolitan areas, the service is typically available for a modest fee of around $100 to $200 per property. Property managers often have aligned incentives with buyers; they are motivated to help secure a high-quality investment that will be easy to lease, ultimately benefiting both parties.

Human expertise remains essential for the inspections, negotiations and due diligence steps. These processes often require professional judgment, coordination, and interpersonal skills that are best handled by experienced professionals such as solicitors, building inspectors, and other buyer representatives. Nevertheless, the AI buyers agent can play a valuable role in the due diligence process. Through photo processing and image-to-text conversion, it can help identify potential issues such as visible defects, outdated fixtures or signs of neglect and assist in reviewing property-related documents. This support enables buyers to make more informed decisions.

2.3 Limitations of the Traditional Approach:

The traditional process of searching for and evaluating properties is often time-consuming, complex, and overwhelming particularly for first-time or inexperienced buyers. While most property listing websites provide comprehensive information, they do not provide recommendations on suburbs or properties. Property buyers need to keep manual records of the property details to compare properties.

With an overload of information, much of it conflicting or misleading, buyers can struggle to distinguish between sound advice and marketing spin. Additionally, professional selling agents are well-trained in persuasion techniques and may exploit buyer emotion and inexperience, putting buyers at a disadvantage during negotiations.

Property investors are often restricted to their local areas due to a lack of knowledge, confidence, or time to research opportunities in other regions or states. Becoming well-informed requires weeks or even months of research, and buyers may still fall victim to common misconceptions about property value, leading to suboptimal decisions and long-term financial consequences.

To address these issues, some buyers engage buyers agents, but this solution introduces new problems. In addition to the high upfront costs, choosing a reliable agent has it own challenges. There is no assurance that the agent will act solely in the client's best interests rather than prioritising their commissions. Concerns over unethical behaviour in the industry have been raised by professional bodies such as the Real Estate Buyers Agents Association of Australia (REBAA), which has warned about the risks posed by underqualified and self-interested agents that lead to overpaying for properties and jeopardise buyers' financial wellbeing.

2.4 Benefits of AI Property Agent:

AI property agents offer a compelling alternative. Leveraging vast datasets, Large Language Models (LLMs), and the Reasoning and Acting (ReAct) framework, the AI buyers agent engages with users, extracts their preferences, and recommends properties and suburbs that align with their needs. AI property buyer agent primarily supports the first three steps of the property buying process and provide partially helps in the fourth step.

Compared to traditional human buyers agents, AI agents offer several key advantages:

- **Objectivity** – Recommendations are based solely on data and market analysis, free from personal bias.
- **Buyers' best interest** – Unlike commission-based human agents, AI agents are designed to act in the buyer's best interest.
- **Affordability** – The cost of using an AI buyers agent is significantly lower, making it more accessible to a broader population.
- **24/7 Availability** – AI agent is not limited by the working hours, and it is always available to provide service.
- **Scalability** – AI agent can handle a large number of customers at the same time.
- **Flexible use of data** – AI agent allows user to define the input data, including market statistics and professional opinions.

Given the limitations of traditional property research methods and the time-consuming nature of the process, AI-driven solutions offer a faster, more objective, and cost-effective alternative. As such, there is a growing market demand for AI property buyers agents. These systems address key pain points in the property purchase process, enhance decision-making, and most importantly, provide a smoother, faster, and more efficient buying experience.

3. Data and Model Framework

3.1 High-level approach

One of the key advantages of AI property agent is its ability to connect multiple data sources to generate comprehensive, context-aware recommendations.

Comprehensive property-related data is integrated into a central database. These sources may include property listings, government planning databases, flood zone maps, demographic statistics, historical sales data and infrastructure project updates. By combining that diverse information from different sources, the AI property buyer agent can offer insights far beyond traditional search tools.

Additionally, AI property agent can tailor property recommendations for owner-occupiers and investors. While investors may prioritise metrics such as rental yield and vacancy rates, homebuyers tend to focus on factors like location, building quality, distance to schools and workplaces.

This data-driven, personalised approach enables more informed and confident decisions for investors or home buyers. It can also save time and improve efficiency of the process.

3.2 Data Source

Property related data is sources from Australian property data website (https://www2.microburbs.com.au/). Specifically, the following data by each suburb (8759 suburbs) are collected and built in for our database for modelling purpose:

- Rental yield
- Distance to CBD
- Vacancy rate
- Historical 3-year and 10-year growth
- Annual growth forecast
- Stock on market
- Month of inventory
- Public housing %
- Welfare reliance
- Unemployment rate
- Median household income

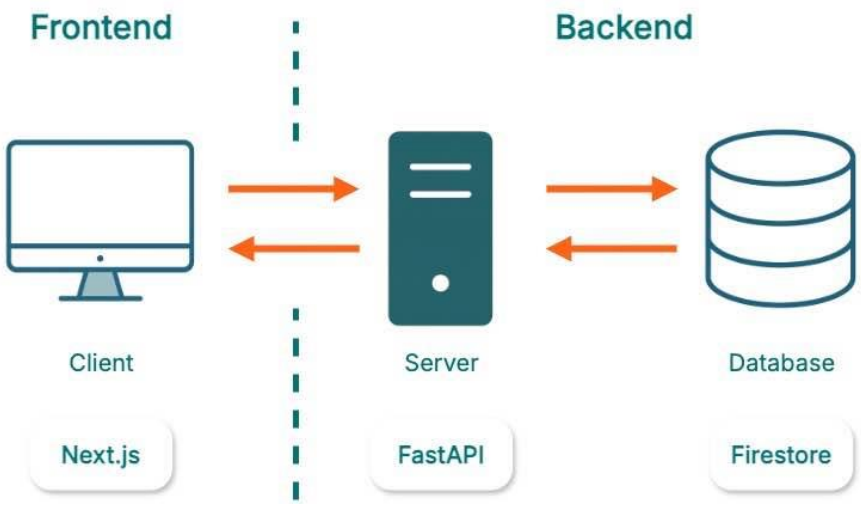
The above information is the key investment property metrics. Other data providers include the following:

- Property and market information: https://www.view.com.au
- Map, boundary and zone data: https://geoscape.com.au
- Address information: https://data.gov.au/data/dataset/geocoded-national-address-file-g-naf
- Sold information: https://www.property.com.au/
- Mobile coverage: https://www.accc.gov.au/by-industry/telecommunications-and-internet
- Planning information: https://mapprod3.environment.nsw.gov.au/arcgis/rest/services/Planning/EPI_Primary_Planning_Layers/MapServer

3.3 Model Development

3.3.1 AI Model Architecture

The AI Property Agent model is structured around a frontend-backend architecture, ensuring seamless integration between user interaction and backend processing.



3.3.2 Overview of the concept:

The frontend AI encompasses the visual elements that users engage with directly. Built using JavaScript, it handles user interaction, input collection, and the display of AI-generated results. To enhance the user experience, a chatbot is embedded within the frontend, enabling real-time communication and support.

The backend AI focuses on the core functionality of the system. This includes AI algorithms, data processing, workflow management, and business logic. Implemented in Python, the backend leverages the Google Gemini large language model. It is responsible for reasoning, decision-making, and task execution.

When a user submits a query, the frontend collects and transmits the input to the backend. The backend processes the request, generates the appropriate response, and returns it to the frontend, where it is displayed to the user in real time.

A database supports the system by storing all relevant data, including conversation histories, property details, user preferences, and other contextual information, enabling personalised and consistent interactions.

3.3.3 Benefits of Front-end and Back-end Separation:

Adopting a frontend-backend separation brings practical benefits for long-term maintenance and growth.

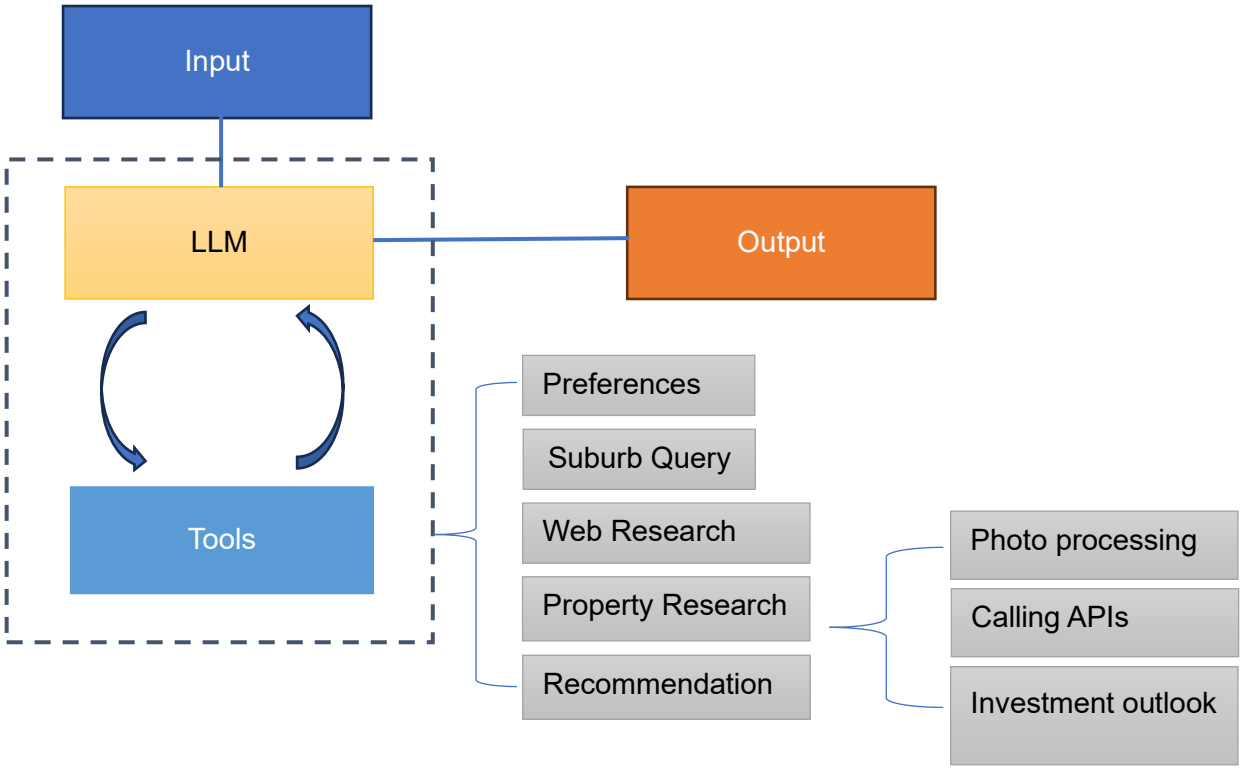
- **Structure Independence:** This approach allows the frontend and backend to evolve independently, so changes in the user interface or business logic can be made without disrupting the other.
- **Cross-Platform Deployment:** The backend can be reused across multiple platforms, such as web applications, mobile apps, or third-party Application Programming Interface (API) integrations, which enhances the system's overall scalability and prepares it for future expansion or team collaboration.
- **Future-proofed design:** This structure promotes modular and flexible development, making it easier to introduce new features incrementally and maintain a clean, scalable codebase.

4. Methodology

4.1 ReAct Agent Framework

The AI buyers agent is built on the ReAct Agent[1] Framework, which integrates "reasoning and acting" (ReAct) to combine chains-of-thought reasoning with the use of external tools. This framework enhances the ability of Large Language Model (LLM) to manage complex tasks and make informed decisions.

The following is the ReAct workflow adopted by the AI buyers agent:



[1] https://www.ibm.com/think/topics/react-agent#:~:text=A%20ReAct%20agent%20is%20an,decision%2Dmaking%20in%20agentic%20workflows.

The agent leverages an LLM to interpret language, engage in conversations, and perform various tasks. To enable autonomous operation where the agent can make decisions and execute tasks without continuous human oversight, the system is structured around two core components: the **LLM Node** and the **Tool Use Node**.

- The **LLM Node** serves as the central orchestrator. It plans the workflow, determines when tool usage is required, and selects the appropriate tool based on the input. It is capable of self-planning and dynamically deciding the next steps.
- The **Tool Use Node** is triggered by explicit commands from the LLM. Once a tool is executed, the results are fed back into the LLM, which incorporates them into its reasoning before generating a response for the user.

Depending on the nature of the user query, the agent intelligently selects and sequences tools to produce a tailored response. The following tools are currently integrated into the agent's workflow:

- **Preferences Tool** – Extracts and refines user preferences through conversation.
- **Suburb Query Tool** – Analyses and recommends suburbs based on the user's specified criteria.
- **Property Research Tool** – Processes listing photos, calls APIs, and evaluates planning potential and investment outlook.
- **Web Research Tool** – Gathers and summarises relevant information from the internet, serving as an intelligent advisor.
- **Recommendation Tool** – Suggests suitable properties aligned with the user's preferences.

This ReAct-based architecture enables the AI buyer agent to operate in a flexible, context-aware, and goal-oriented manner, providing a more intelligent and responsive user experience.

4.2 Benefits of ReAct

The table below highlights the benefits of ReAct agent structure compared to a traditional workflow. By mimicking human-like independent reasoning, ReAct agents better understand user intent. They deliver more accurate and context-aware answers, ultimately enhancing user satisfaction.

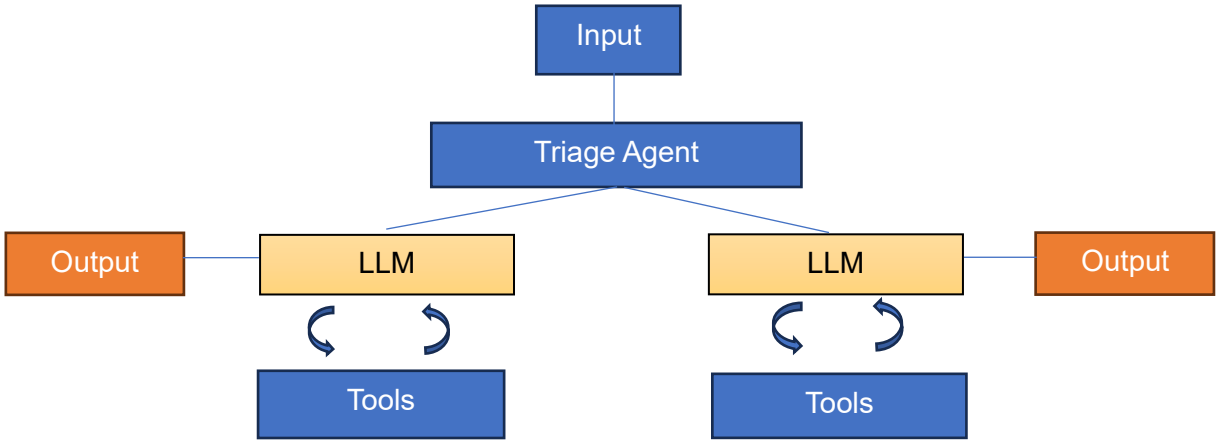
Key Areas	ReAct Agent Structure	Traditional Workflow
1. Workflow	Integration of both reasoning and actions	Predefined sequence of actions
2. Tool Integration	Dynamic tools selection to produce optimal response	Designate one tool in each action step
3. Error Handling	Capable of revising actions when a tool call fails	Tool call failure terminates the process
4. Flexibility	Ability to skip unnecessary steps to produce required results	Requires completion of all steps to obtain the final results

4.3 Agent Framework Extension - Multi-agent LLM

At the time of preparing this paper, ongoing work is being conducted to explore the use of alternative AI agent structure. This is an extension to the ReAct agent in the Section 4.2.

A multi-agent large language model architecture is designed to separate tasks among specialised agents, with each agent responsible for one or more distinct functions. At the core of this system is a triage agent, which acts as the initial point of contact. It receives all user inputs, classifies the query, and dynamically assigns the task to the most appropriate agent.

The following diagram shows how multi-agent large language model works:



The workflow is divided into two specialised agents:

- **Property Research & Recommendation Agent** – Handles tasks related to property searches, evaluations, and recommendations based on user preferences.
- **Suburb & General Query Agent** – Responds to questions related to suburbs, infrastructure, lifestyle factors, and general information.

Each agent leverages dedicated tools to retrieve relevant data, applies reasoning, and produces a structured response. The triage agent then compiles and presents the final output to the user.

This multi-agent structure enhances operational efficiency and enables more context-sensitive and accurate responses. By aligning tasks with specialised agents, the system offers a more streamlined and personalised user experience.

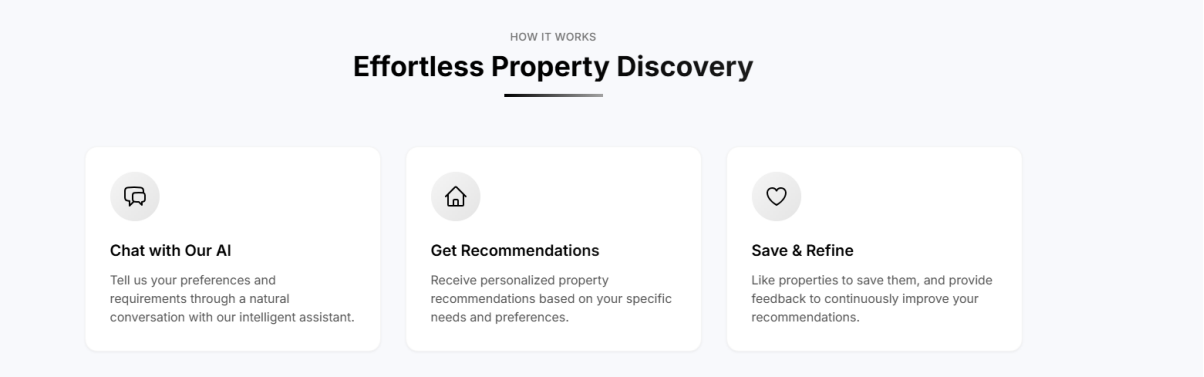
5. Application and Product Showcase

The following section illustrates how AI can support the first three steps of the property buying process: setting goals and preferences, research and suburb recommendation, and property filtering.

5.1 Website

A frontend website serves as the main platform for user interaction with the AI property agent. It offers three core features designed to streamline the property discovery process:

- **Chat** – Share your preferences and requirements through a natural conversation with an intelligent assistant
- **Chat Agent** – Share your preferences and requirements through a natural conversation with an intelligent assistant.
- **Get Recommendations** – Receive personalised property suggestions tailored to your specific needs and preferences.
- **Save & Refine** – Save your favourite properties and provide feedback to continuously improve future recommendations.



5.2 Extract User Preference

The AI buyer agent uses an LLM to extract user preferences through interactive questioning and response validation. The agent aims to capture key preferences such as:

- Location: Sydney
- Budget: Up to $2m
- Distance to CBD: 20km
- Type of property: Houses and townhouses
- Preferred financial measure: Capital growth, Rental yield or a balance between the two
- Other preferences: Vacancy rates, job growth, economic resilience, infrastructure, population growth.

The use of conversational, chat-style interactions creates a more engaging and user-friendly experience, helping buyers feel that the AI agent is acting as a personalised assistant rather than a machine. This approach increases user comfort and encourages active participation in the property research process.

To address potential ambiguity, the AI agent includes a clarification function that ensures preferences are accurately captured. For instance, a query like “buying property in Sydney” may be vague, as “Sydney” could refer to the Central Business District or the broader metropolitan region. The agent will ask follow-up questions to clarify the request and refine the search accordingly.

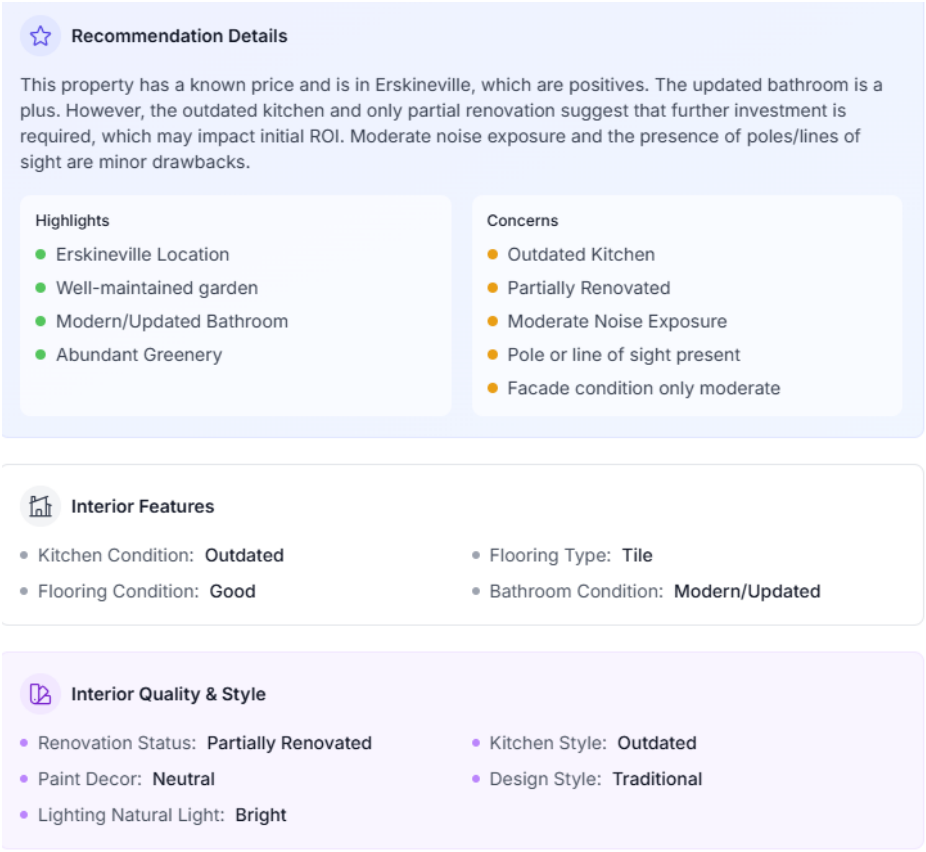
5.3 Recommend suburbs and properties

After extraction of user preferences, the AI property agent conducts research using both its in-house database and online sources to recommend suitable suburbs and properties.

The AI buyer agent supports users through three main modes of assistance:

- **Specific suburb or property enquiry:** Provide detailed information on a particular suburb or property.
- **Suburb recommendation:** Recommend suburb based on user preferences.
- **Property recommendation:** Once a buyer has narrowed down their search to one or more preferred suburbs:
    - Recommends three properties based on the buyer’s preferences,
    - Provide key details including potential capital growth, rental yield, and interior and exterior features in a summary table.

Additionally, the AI property agent can generate a report that summarises key property insights tailored to the prospective buyer’s needs. The report provides suburb and property recommendations based on the multiple data sources and various analytic processes. An example of this report is shown below.



Defect Assessment

- General Disrepair: Absent
- Structural Damage: Absent
- Roof Gutter Damage: Absent
- External Cracks: Absent

Investment Metrics

- Rental Yield: 2.81%
- Capital Gain: +12.97%
- Weekly Rent: $1179.426229508197
- Estimated Price: $2,182,416.667

Planning Information

- Is Heritage: No
- Flood Risk: No
- Landslide Risk: No

5.4 Photo Processing and Image Recognition

Using property listing photos and satellite images, the AI buyer agent applies image processing techniques to extract additional property information, including interior and exterior design features, kitchen and bathroom styles and conditions, signs of maintenance needs or defects, and potential for future extensions or subdivision. This enriched data plays a crucial role in the research and recommendation step.

Most importantly, the AI buyer agent significantly improves efficiency by analysing and summarising insights from large volumes of images across multiple properties, saving considerable time for buyers.

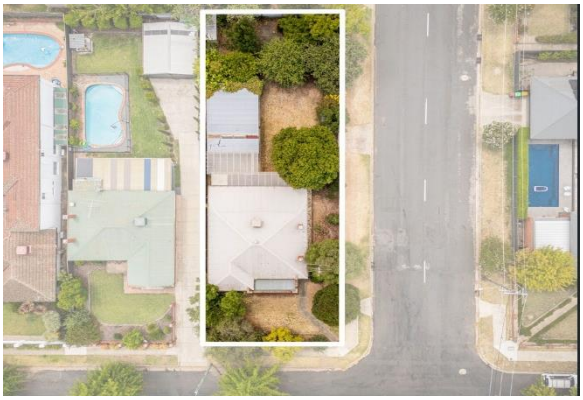
The example below demonstrates the AI property agent's photo processing capability. By analysing images from a property listing website[2], the AI can generate a summary table that highlights key features and insights for the property.

Sample picture 1
Note: from realestate.com

Sample picture 2
Note: from realestate.com

[2] https://www.realestate.com.au/property-house-nsw-east+albury-147530200?sourcePage=rea%3Abuy%3Asrp-map&sourceElement=listing-tile

Sample picture 3
Note: from realestate.com



Sample picture 4
Note: from realestate.com

Summary of the property based on image processing (using ChatGPT o4):

Category	Condition Summary	Recommendation
Kitchen	Modern with white cabinets, dark countertops, black tiled backsplash, built-in oven (possibly dishwasher), wooden floors.	No work needed – move-in ready
Bathroom	White tiled walls (bath/sink area), white sink with storage, bathtub, mirrored cabinet.	Cosmetic renovation recommended
General Concerns	• Minor wall and ceiling cracks visible • External pergola and latticework are aged • Some weathering and wear around exterior structures	Building inspection to confirm structure; minor repairs
Planning Potential	• Large backyard with side access • Flat block with space for granny flat, extension, or outdoor upgrades • Existing shed and carport	Explore STCA for extension or second dwelling

The summary table aligns with insights obtained from a human analysis of the property's images. In this example, it helps prospective buyers develop a clearer and more comprehensive understanding of the property. While there are some minor concerns, such as potential wall issues and the need for bathroom renovations, this property presents strong growth potential, including the opportunity for extensions or building a second dwelling. This information enables buyers to make more informed and confident decisions.

In summary, AI property buyers agent's imaging processing ability can support both property recommendation and due diligence steps. AI agent can generate a summary report to identify key issues and recommend next steps of actions.

6. Opportunities and Further Research

This paper demonstrates the feasibility of adopting AI property buyer agents. An AI-driven property buyer agent can leverage up-to-date market information to deliver faster, more cost-effective, and unbiased solutions that act in the best interests of property buyers.

However, it is important to note that the analysis presented in this paper is based on market data available at the time of the research. Future enhancements include:

- Adopting a multi-agent structure and comparing with ReAct model.
- Comparing the performance of different types of AI models from the same provider, including general-purpose models, diluted models and research models.
- Comparing the performance of different large language models from various providers, including OpenAI, Google and Shanghai AI Lab. This includes both the quality of the conversations, recommended output, speed and cost considerations.

6.1 Potential use in banking and insurance industry

AI property buyer agents have potential applications in bank valuation processes and property underwriting for home insurance. Traditional property valuations rely heavily on manual inspections and are subjective to human judgment, making the process time consuming and results inconsistent between assessors. AI property agents could help to reduce the risk of valuation errors and improve efficiency and consistency in the valuation results. In insurance underwriting, AI property agent will be able to help with more precise premium pricing, potentially improve claims outcomes, and enhance the overall customer experience.

6.2 Considerations for market potential

Further research is recommended to explore the market potential of AI buyers agents.

Key areas of further research:

- Define the core product value proposition:
- Clearly articulate the benefits and differentiators of the AI buyers agent.
- Identify target users:
  Determine target users, including individual homebuyers, real estate investors, and property professionals.
- Establish strategic data partnerships:
  Partner with third-party providers and ensure data is properly used
- Develop a product pricing strategy:
  Explore various pricing models for both direct users and property agents, including subscription fees and commissions.
- Legal and regulatory compliance:

  Ensure compliance with consumer protection, data privacy, and relevant financial services regulations