ARTIFICIAL INTELLIGENCE (AI) IN PROFESSIONAL ACCOUNTING EXAMINATIONS: IMPLICATIONS FOR FUTURE CERTIFICATION AND PRACTICE

ICAG AND WACAR RESEARCH REPORT

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ICAG equips professionals across Ghana and the Sub-Region for rewarding careers in accountancy, finance, and management. Through our top-tier educational programs and professional development initiatives, we cultivate our members' financial expertise, business acumen, and digital skills, preparing them to thrive in a dynamic global environment.

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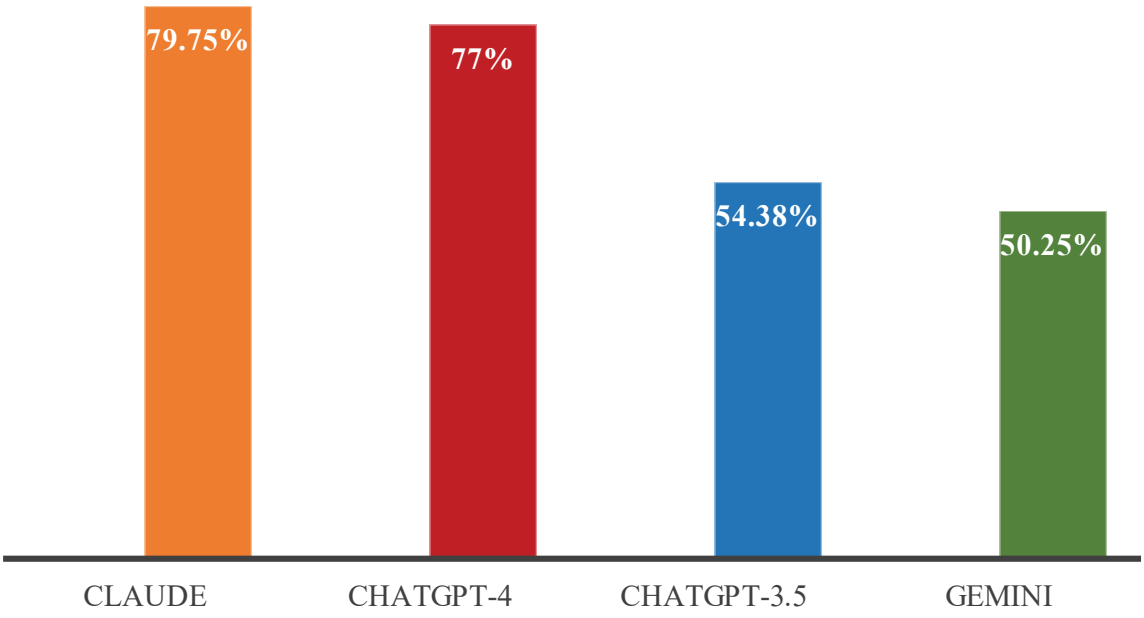
EXECUTIVE **SUMMARY**

The emergence of artificial intelligence in professional domains has raised critical questions about its impact on accounting certification standards. This March 2024 experimental study compares the performance of 5,698 human candidates against four leading AI models (ChatGPT-3.5, ChatGPT-4, Claude 3, and Gemini) across eight professional accounting subjects in the Ghana Professional Accountancy Examination, providing unprecedented insights into AI's capabilities in professional certification.

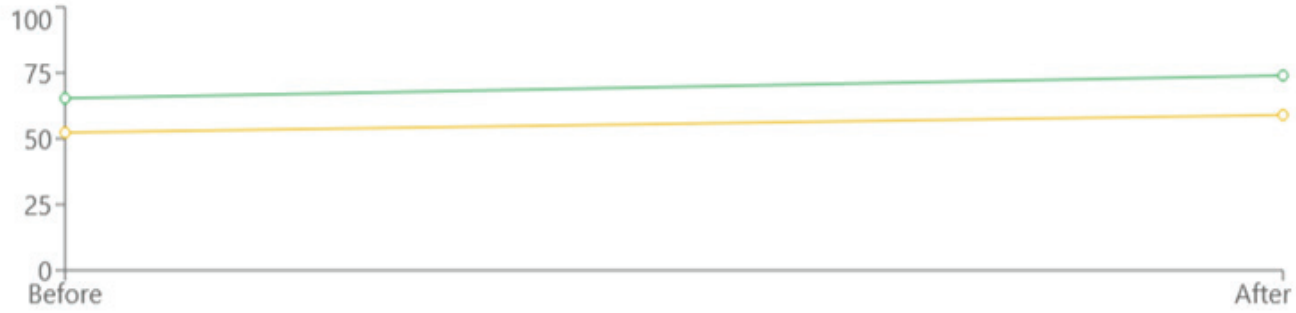
Comparison of the Overall Performance of AI's



Subject-wise Analysis

Level & Subject	Claude	GPT-4	GPT-3.5	Gemini	Human Best
Foundation Level					
Management Accounting (IMA)	88%	85%	82%	80%	76%
Business Management & Information System (BMIS)	94%	92%	100%	85%	83%
Business Law (BL)	74%	60%	55%	52%	67%
Intermediate Level					
Audit and Assurance (AA)	88%	99%	82%	83%	87%
Public Sector Accounting & Finance (PSAF)	85%	82%	75%	72%	78%
Advanced Level					
Strategic Case Study (SCS)	98%	88%	65%	60%	79%
Corporate Reporting (CR)	61%	55%	27%	41%	72%

Impact of Domain-Specific AI Training on AI Performance



Overall Improvement
+8.66% Average performance increase

Strengths of the AIs

- Advanced AI (Claude and ChatGPT-4) consistently outperformed human benchmarks
- 100% score in Business Management (ChatGPT-3.5)
- 99% score in Audit & Assurance (ChatGPT-4)
- Training improved the performance significantly

Weaknesses of the AIs

- Basic AI (ChatGPT-3.5 and Gemini) struggled with Corporate Reporting (27-41%)
- Performance gap in Advanced Level subjects
- Complex financial analysis challenges
- Professional judgment limitations

Key Conclusions

Advanced AI models demonstrate strong capabilities in professional accounting examinations, outperforming human benchmarks in structured tasks. However, performance varies significantly between advanced and basic AI models, particularly in complex subjects requiring professional judgment.

STATEMENT FROM
OUR PRESIDENT

Dear Esteemed Members and Stakeholders,

The Institute of Chartered Accountants, Ghana (ICAG), in its commitment to professional excellence, recently conducted a comprehensive study examining artificial intelligence performance in professional accounting examinations, revealing both remarkable opportunities and challenges for our profession globally.

As President of ICAG, I must emphasize the significance of this ground-breaking study. The examination results demonstrate a transformative development: Advanced AI Chatbots have not only passed but in some cases exceeded human performance in our professional examinations. Initial testing showed overall average scores reaching 79.75% for Claude and 77% for ChatGPT-4, with performance further improving to 79.88% and 80.25% respectively after domain-specific training. While these results demonstrate remarkable technological advancement, they also validate the rigor of our examination system in identifying such capabilities.

In light of these findings, modernizing professional qualifications offers an opportunity to develop enhanced examination and assessment protocols that evaluate comprehensive competencies, while integrating AI literacy into the curriculum. ICAG remains focused on upholding rigorous standards while embracing technological innovation. This includes updating the educational framework to incorporate AI-related skills, preparing future accountants for an AI-enhanced professional environment.

Together, ICAG will shape a future that harnesses AI's capabilities while preserving the essential human elements of the accounting profession.

Mr.Augustine Addo
President, ICAG

STATEMENT FROM OUR **CHIEF EXECUTIVE OFFICER**

As CEO of the Institute of Chartered Accountants, Ghana (ICAG), I can say that the operational implications of our recent AI performance study are significant and require immediate strategic action. Advanced AI systems have demonstrated exceptional capabilities in our professional examinations, particularly in areas like Audit and Assurance (99%) and Strategic Case Study (98%). However, their performance varied significantly in complex areas requiring professional judgment, such as Corporate Reporting.

In addressing the operational implications of our recent AI performance study, which has highlighted the exceptional capabilities of advanced AI systems in certain areas, I can confirm that we have secured comprehensive remote proctoring systems to maintain the integrity of our certification process as we move our professional examinations online from March 2025.

In tandem with the implementation of enhanced examination security measures, we are also developing an AI-aware curriculum framework for professional development. This will ensure our members are equipped with the necessary skills and competencies to thrive in an AI-enhanced professional environment. Additionally, we are establishing clear guidelines for the responsible use of AI in professional practice, which will be crucial in maintaining our rigorous standards while embracing technological advancement.

These measures will ensure ICAG maintains its position as a leading professional body while adapting to technological advancement. We must act swiftly to protect the integrity of our certification process while preparing our members for an AI-enhanced professional environment.

Yours sincerely,

P. Kwasi Agyemang, FCA
CEO, ICAG

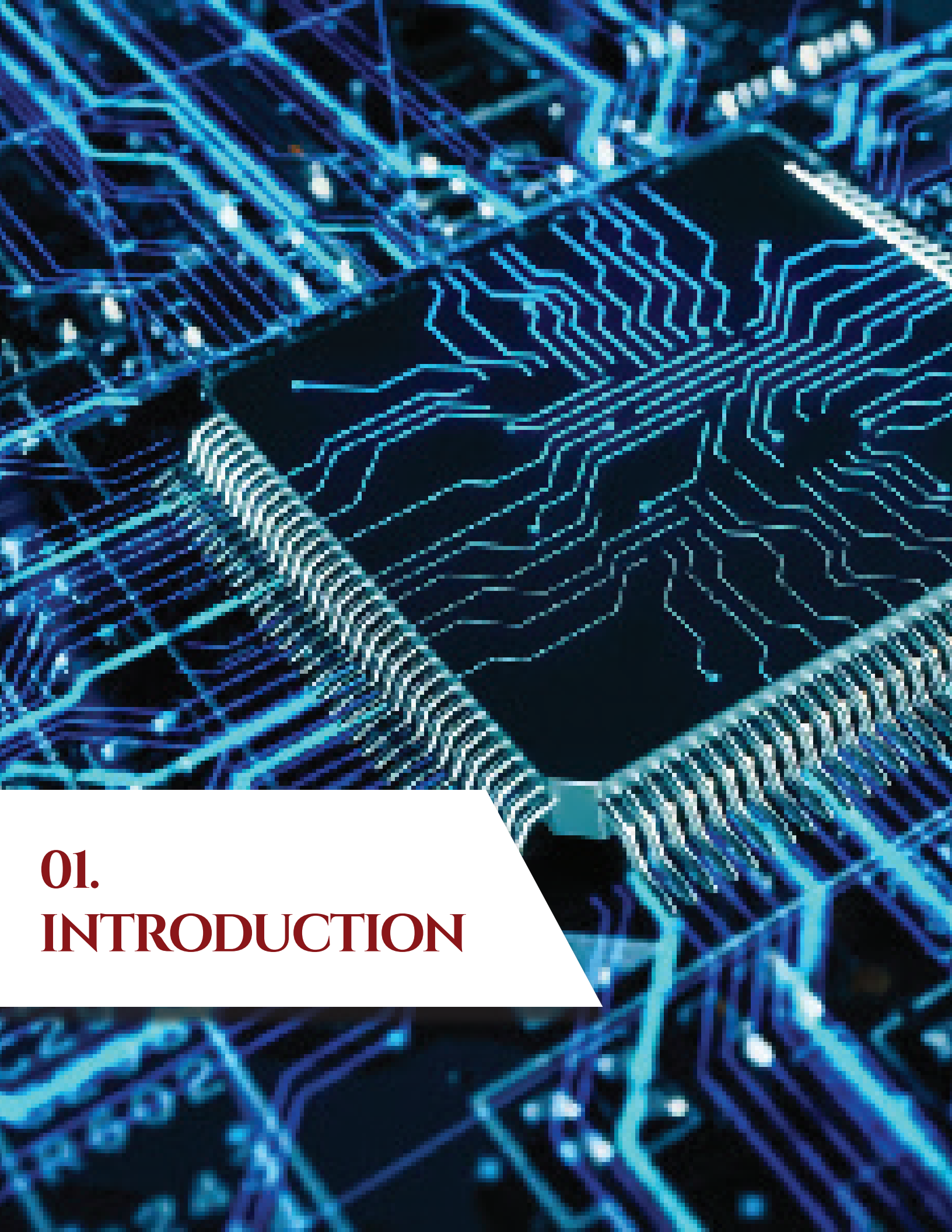
CONTENT

TABLES

FIGURES

ABBREVIATIONS AND ACRONYMS

AA	Audit and Assurance
AI	Artificial Intelligence
ANOVA	Analysis of Variance
BL	Business Law
BMIS	Business Management & Information Systems
ChatGPT	Chat Generative Pre-trained Transformer
ChatGPT-3.5	Chat Generative Pre-trained Transformer Version 3.5
ChatGPT-4	Chat Generative Pre-trained Transformer Version 4
Claude-3	Anthropic's Latest Large Language Model (Version 3)
CR	Corporate Reporting
FR	Financial Reporting
Gemini	Google's Advanced Large Language Model (formerly Bard)
ICAG	Institute of Chartered Accountants, Ghana
IMA	Introduction to Management Accounting
LLM	Large Language Model
ML	Machine Learning
NLP	Natural Language Processing
PSA	Public Sector Accounting
PSAF	Public Sector Accounting and Finance
SCASE	Strategic Case Study
SPSS	Statistical Package for the Social Sciences



01. INTRODUCTION

1.1 Background of the study

The landscape of professional accounting is experiencing unprecedented transformation driven by artificial intelligence (AI) technologies[1]. The emergence of sophisticated AI Chatbots, particularly in natural language processing, has sparked intense debate about their potential impact on professional certification and competency assessment[2]. These technological advances, powered by machine learning algorithms trained on vast datasets, have created increasingly sophisticated AI systems capable of handling complex professional tasks[3]. Recent developments in generative AI have demonstrated remarkable capabilities in understanding and responding to intricate professional queries. Leading platforms such as ChatGPT-4, Claude 3, ChatGPT 3.5 and Gemini can now engage in sophisticated analysis across numerous knowledge domains, including professional accounting[4].

These AI systems show proficiency in interpreting complex questions, applying theoretical knowledge, and generating coherent, context-appropriate responses[5]. The implications of these developments for professional accounting certification are profound. Traditional gatekeeping mechanisms, designed to assess human competency and maintain professional standards, may need re-evaluation in light of AI capabilities[6]. While previous studies have examined AI's performance in multiple-choice accounting examinations[7], there remains a critical gap in understanding how these systems perform in more complex assessment formats, such as essay questions and case studies[8]. The Ghana professional accountancy context provides an ideal setting for examining these challenges. The Institute of Chartered Accountants, Ghana (ICAG) administers a comprehensive three-tier examination system encompassing Knowledge, Application, and Professional levels[9]. This framework tests not only technical proficiency but also higher-order analytical skills and professional judgment, making it an excellent benchmark for evaluating AI capabilities. The complexity of ICAG's examination system, combined with the rapid advancement of AI capabilities, presents a unique opportunity to evaluate the true potential and limitations of AI in professional certification.

1.2 Research Questions

This study therefore addresses three fundamental questions:

1. Can contemporary AI Chatbots (ChatGPT-3.5, ChatGPT-4, Claude 3, and Gemini) successfully navigate and pass professional accounting examination requirements?

2. To what extent does domain-specific training enhance AI performance in professional accounting examinations?

3. How does AI performance compare with human candidates across different examination levels and subject areas?

1.3 Significance of the Study

This study's significance extends beyond mere performance comparison. By evaluating AI capabilities against established professional standards, the study provides crucial insights for regulatory bodies, educational institutions, and professional organizations grappling with technological disruption. The findings inform ongoing debates about examination security, professional certification standards, and the future of accounting education. The novelty of this research lies in its comprehensive approach. Unlike previous studies that focused primarily on multiple-choice questions or theoretical knowledge, we evaluate AI performance across a complete professional examination system, including essay questions, case studies, and practical applications. This approach provides a more nuanced understanding of AI capabilities and limitations in professional certification contexts.

The study's finding contribute to both academic literature and practical policy-making. It offers evidence-based insights for developing examination protocols that maintain professional standards while acknowledging technological advancement. Additionally, the research highlights areas where professional education may need adaptation to emphasize distinctly human capabilities.

This paper proceeds as follows: The next section details our research methodology and experimental design. We then present our findings, followed by a comprehensive discussion of implications for professional certification and education. Finally, we conclude with recommendations for stakeholders and suggestions for future research directions.

02. METHODOLOGY

2.1 Research Design and Context

This experimental study evaluated the performance of AI Chatbots in professional accounting examinations compared to human candidates[1]. The research was conducted during the March 2024 Ghana Professional Accountancy Examination, administered by the Institute of Chartered Accountants, Ghana (ICAG). The study incorporated four leading AI Chatbots: ChatGPT-3.5, ChatGPT-4, Claude-3, and Google's Gemini. These systems were selected based on their demonstrated capabilities in handling complex queries and generating detailed responses[4]. The examination covered multiple levels of the ICAG curriculum, encompassing foundation courses such as Introduction to Management Accounting (IMA), Business Management & Information Systems (BMIS), and Business Law (BL). The intermediate Level 2 curriculum evaluated specialized proficiencies through courses including Audit and Assurance (AA) and Public Sector Accounting and Finance (PSAF), focusing on practical applications and technical competencies. At the advanced Level 3, Strategic Case Study (SCASE) and Corporate Reporting (CR) provided a platform for assessing sophisticated analytical capabilities and professional judgment in complex business scenarios.

2.2 Experimental Procedure

The experimental design consisted of three distinct phases. The initial phase involved testing the AI systems in their baseline state, with examination questions input verbatim from the ICAG examination[6]. The second phase introduced domain-specific training using accounting textbooks and past examination materials, followed by subsequent testing[7]. The final phase comprised a comparative analysis between AI performance and human candidate results. To ensure methodological rigor, several control measures were implemented. All AI systems were configured with identical response parameters (temperature = 0.5) to maintain consistency. AI-generated responses were transcribed into standard examination booklets and randomized with human candidates' answers for blind marking. This approach eliminated potential grading bias and ensured objective evaluation.

2.3 Data Analysis Framework

The statistical analysis utilized Excel and SPSS software platform. Performance metrics included mean scores and pass rates based on ICAG's 50% threshold, with statistical significance tested through paired t-tests and ANOVA at a 5% significance level. This analytical framework enabled robust comparison between different test groups while maintaining statistical validity. The research methodology adhered to strict ethical protocols, ensuring data confidentiality for human candidates and maintaining transparent reporting standards. This comprehensive approach facilitated a thorough evaluation of AI capabilities in professional accounting examination contexts while upholding research integrity.

03.
RESULTS

3.1 Overview of Key Findings

The study revealed significant patterns in how AI systems perform in professional accounting examinations compared to human candidates. The results demonstrate both the capabilities and limitations of current AI technology in professional certification contexts.

3.1.1 Student Performance Analysis

The examination results from 5,698 students revealed critical performance insights across the three professional levels. Level 2's Audit and Assurance emerged as the strongest performing subject with a mean of 57% (range: 14-87%). In contrast, Level 3 examinations demonstrated the highest complexity, with Strategic Case Study showing significant variation (range: 2-79%, mean: 37%) and Corporate Reporting presenting similar challenges (range: 0-72%, mean: 39%). This pattern clearly indicates increasing difficulty from Level 1 to Level 3, with passing rates declining as professional complexity increases. Detailed performance metrics for all subjects are presented in Figure 1.

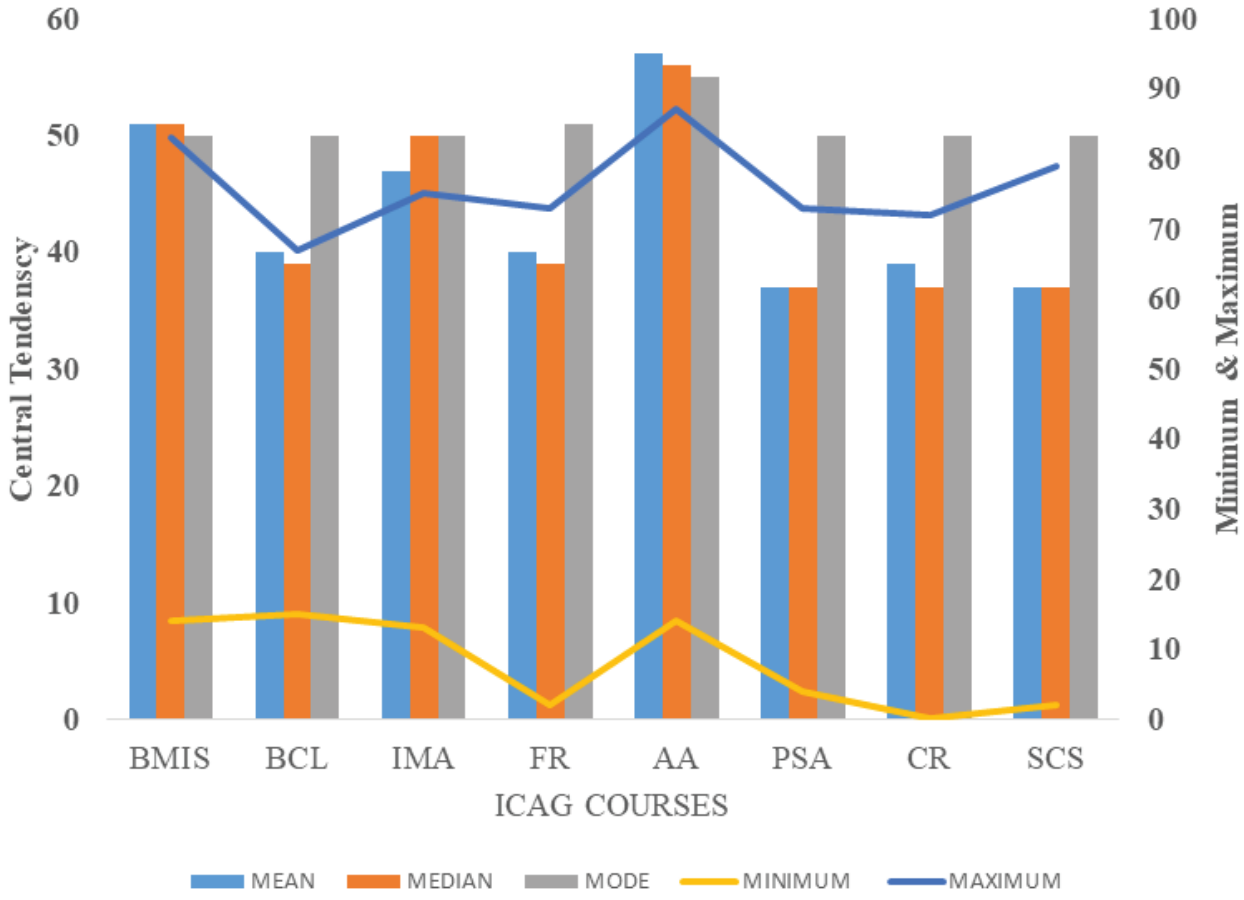


Figure 1: Descriptive statistics of Students performance

3.1.2 Untrained AI Performance Versus Human Candidates

The examination results showed that advanced AI systems performed remarkably well in the professional accounting examinations. Claude emerged as the top performer with a score of 79.75%, while ChatGPT-4 followed closely with 77%. These scores are particularly noteworthy when compared to the human top performers, who averaged 72.25%. The more basic AI models also managed to meet the minimum requirements, with ChatGPT-3.5 achieving 54.38% and Gemini reaching 50.25%. It is significant that all AI systems tested met the minimum passing requirement of 50%, with the advanced models notably outperforming human candidates.

3.1.3 AI Performance After Domain-Specific Training

The implementation of domain-specific training yielded notable improvements in AI performance across all models. ChatGPT-4 demonstrated the highest improvement, reaching 80.25% (a 3.25% increase), while Claude maintained strong performance at 79.88% (a 0.13% increase). The basic AI models showed more substantial gains, with ChatGPT-3.5 improving to 59.38% (a 5% increase) and Gemini achieving 59% (an 8.75% increase). Significantly, all AI models maintained performance above the 50% certification threshold after training, with advanced models continuing to exceed human benchmarks of 72.25%.

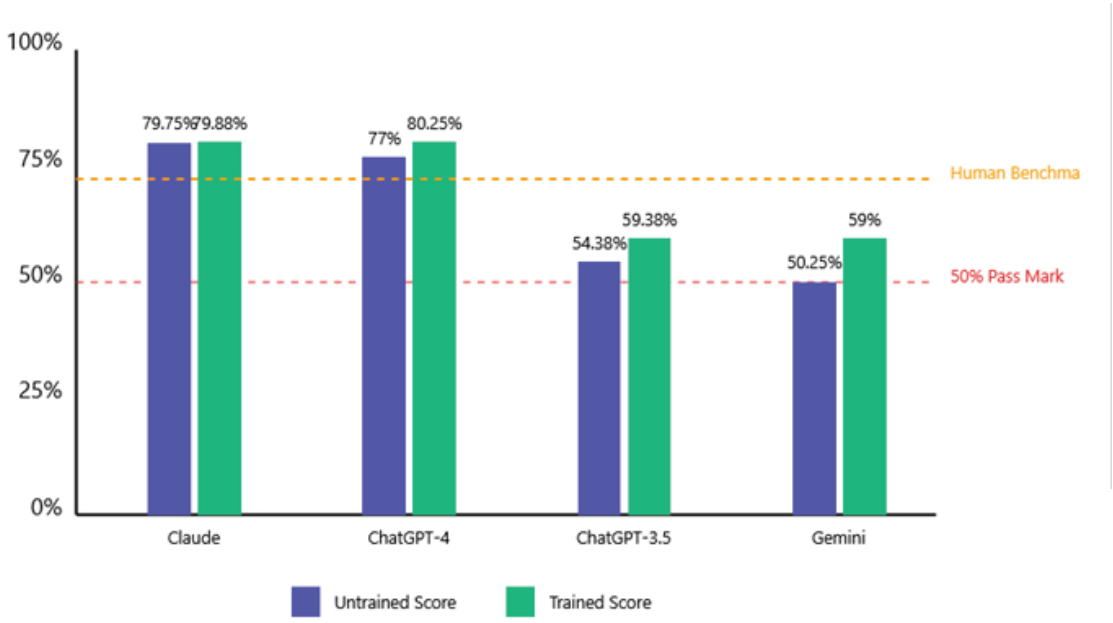


Figure 2: **AI Performance Before and After Training**

3.1.4 Subject-Specific Performance of Untrained AI

The performance analysis across key professional accounting subjects revealed significant patterns in AI capabilities. The Strategic Case Study examination at Level 3 demonstrated exceptional AI analytical abilities, with Claude achieving 98% and ChatGPT-4 scoring 88%, both substantially exceeding the human best score of 79%. This performance highlighted AI's strong capability in analyzing complex business scenarios and formulating comprehensive recommendations.

In Audit and Assurance, ChatGPT-4 showed remarkable proficiency by scoring 99%, significantly above the human best score of 87%. Claude maintained strong performance at 88%, while both ChatGPT-3.5 and Gemini achieved respectable scores of 82% and 83% respectively. These results indicated robust AI capabilities in understanding audit methodology and risk assessment principles.

Financial Reporting presented more nuanced results. While Claude maintained strong performance with 84% and ChatGPT-4 achieved 68%, the margin of superiority over human performance (best score

73%) was notably smaller. This pattern suggested that complex financial reporting scenarios, particularly those requiring professional judgment and interpretation of accounting standards, presented greater challenges for AI systems.

Business Management & Information Systems demonstrated AI's strength in theoretical frameworks, with ChatGPT-3.5 achieving 100% and ChatGPT-4 scoring 92%. These scores, compared to the human best score of 83%, indicated superior AI capability in understanding and applying management principles and information systems concepts.

Corporate Reporting at Level 3, however, revealed significant limitations in AI capabilities. The human best score of 72% exceeded most AI performances, with only Claude (61%) and ChatGPT-4 (55%) managing to pass the threshold. ChatGPT-3.5 and Gemini struggled considerably with scores of 27% and 41% respectively. These results highlighted the challenges AI faces in complex financial analysis requiring deep contextual understanding and professional judgment.

Business Law assessments revealed more balanced competition between AI and human capabilities. Claude led with 74%, followed by the human best score at 67%, while ChatGPT-4 achieved 60%. This distribution suggested that legal reasoning and statutory interpretation created a more level playing field between AI systems and human expertise.

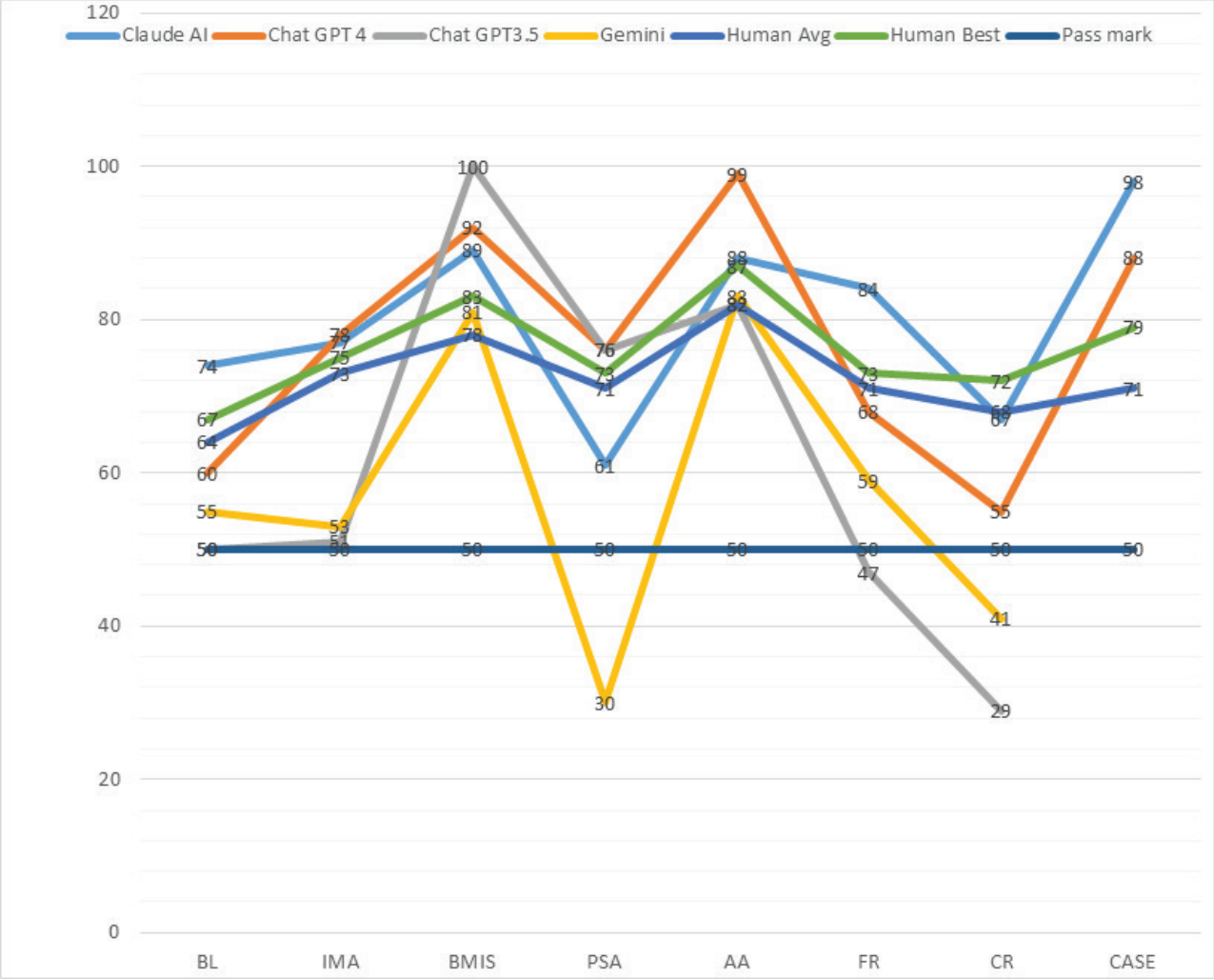


Figure 3: Model Performance for Human (best score), Human (average score) with four untrained AI models compared with the pass mark

3.1.5 Impact of Domain-Specific AI Training on Subject-Specific Performance

The introduction of domain-specific training revealed significant variations in AI performance across key professional accounting subjects. After training, ChatGPT-4's overall performance improved to 80.25%, while Claude maintained a steady performance at 79.88%. The most notable improvements were observed in basic AI models, with ChatGPT-3.5 and Gemini both reaching approximately 59% from their initial scores of 54.38% and 50.25% respectively.

In Strategic Case Study, the advanced AI systems showed more calibrated responses post-training. Claude's performance adjusted to 80% from its initial 98%, while ChatGPT-4 maintained strong performance at 78%, suggesting a shift toward more professionally aligned responses. Audit and Assurance results showed similar standardization, with both ChatGPT-4 and Claude achieving 93%, indicating more consistent and measured responses compared to their initial varied performances of 99% and 88%. Financial Reporting revealed the challenges of training impact on complex subjects. Claude's performance adjusted to 77% from 84%, while ChatGPT-4 maintained 73%, aligning more closely with human best scores. However, Corporate Reporting continued to challenge basic AI models, with ChatGPT-3.5 and Gemini achieving only 29% and 37% respectively, highlighting the limitations of training in areas requiring sophisticated professional judgment.

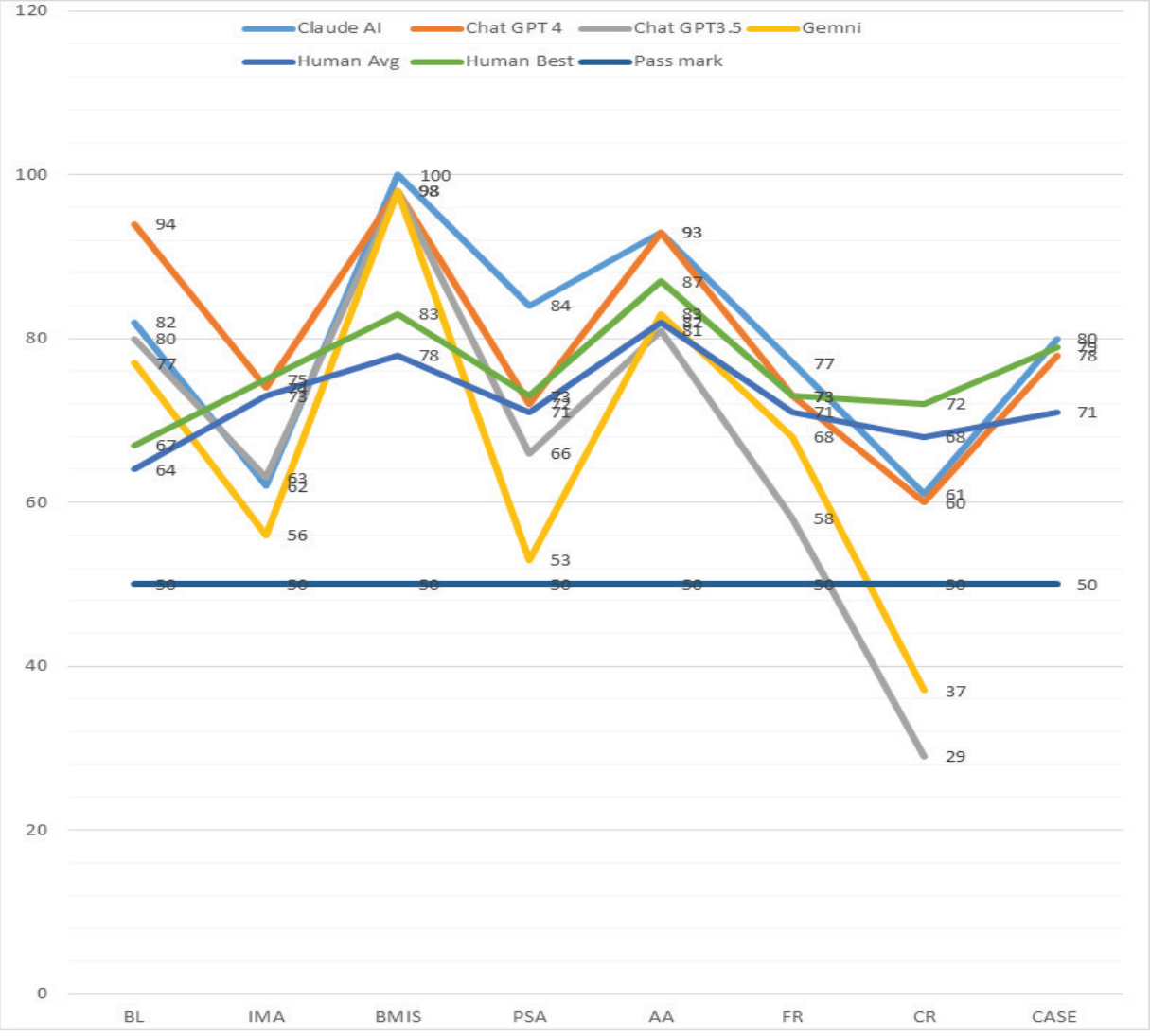
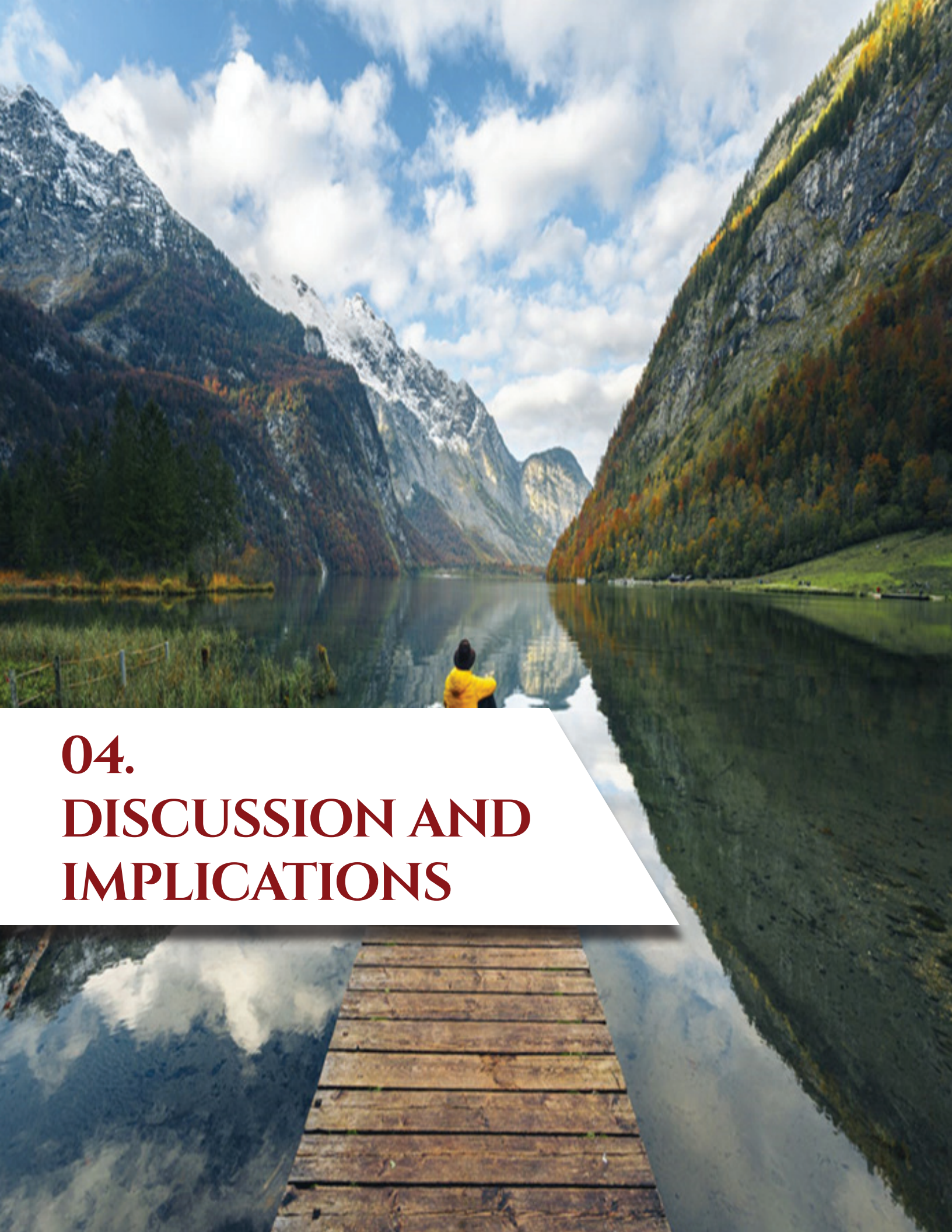


Figure 4: Model Performance for Human (best score), Human (average score) with four trained AI models compared with the pass mark

3.2 Statistical Analysis

The training impact analysis yielded significant statistical results. A paired t-test analysis produced a t-value of -1.825, with a one-tailed p-value of 0.039. The mean score of trained AI (74%) proved higher than untrained AI (65.34%), with variances of 321.86 and 403.33 respectively. The lower variance in trained AI performance indicates more consistent results after training. These statistics ($t(28) = -1.825$, $p = 0.039$) confirm that domain-specific training significantly improved AI performance at the 95% confidence level. The negative t-value (-1.825) indicates that the trained AI scores were systematically higher than untrained scores, while the p-value below 0.05 demonstrates that this improvement was not due to random chance. The statistical evidence supports the conclusion that domain-specific training effectively enhanced AI performance across the examination components, with particular effectiveness in standardizing performance as indicated by the reduced variance.

Table 1: T-test: Paired two samples for means		
Mean	69.55172	74
Variance	403.3276	321.8571
Observations	29	29
Pearson Correlation	0.767323	
Hypothesized Mean Difference	0	
Df	28	
t Stat	-1.82517	
P(T<=t) one-tail	0.039331	
t Critical one-tail	2.46714	



04.
DISCUSSION AND IMPLICATIONS

4.1 Key Implications for the Accounting Profession

4.1.1 Professional Standards and Examination Framework

The ability of AI systems to pass professional examinations necessitates fundamental changes in assessment methodology and professional standards. Professional bodies must re-evaluate traditional assessment methods to better distinguish human expertise from AI capabilities. This transformation requires comprehensive changes across several dimensions.

First, examination security protocols must be significantly enhanced. The implementation of remote proctoring systems needs to incorporate advanced monitoring technologies and biometric verification methods. Enhanced restrictions on electronic devices near examination centers must be accompanied by signal detection and prevention systems. Physical security measures should be complemented by digital safeguards that can detect AI-assisted responses.

The legal and regulatory frameworks must evolve to address these new challenges. This includes developing specific guidelines for acceptable AI use in professional settings, establishing clear boundaries between human and AI-assisted work, and creating enforcement mechanisms for maintaining examination integrity. Professional bodies must also consider the international implications of these frameworks, ensuring consistency across different jurisdictions.

Furthermore, assessment criteria need redevelopment to focus on uniquely human capabilities. This includes designing questions that test contextual understanding, professional judgment, and ethical decision-making in complex, unprecedented situations. The certification process should incorporate elements that specifically evaluate a candidate's ability to appropriately use and validate AI outputs while maintaining professional skepticism.

4.1.2 Educational Evolution and Professional Development

The integration of AI demands significant transformation in accounting education and professional development approaches. This evolution must occur at multiple levels to ensure comprehensive preparation for an AI-enhanced professional environment.

Educational institutions must fundamentally redesign their curricula to incorporate both AI awareness and enhanced focus on distinctly human skills. This includes developing practical training modules that simulate real-world scenarios where AI and human judgment must work in tandem. Case studies should be updated to include AI-related ethical dilemmas and decision-making scenarios that require sophisticated professional judgment.

Professional development programs must evolve beyond traditional technical training. New modules should focus on AI literacy, including understanding AI capabilities, limitations, and appropriate use cases. Programs should emphasize skills in areas where AI currently shows limitations: complex decision-making in uncertain environments, ethical judgment in unprecedented situations, and the application of professional skepticism when reviewing AI-generated outputs.

The development of AI-human collaboration skills requires particular attention. Training programs should include practical exercises in working alongside AI systems, validating AI outputs, and making professional judgments that incorporate both AI insights and human expertise. This includes developing frameworks for effective delegation of tasks between human professionals and AI systems.

4.1.3 Implementation and Ethical Considerations

The practical implementation of AI systems presents complex technical and ethical challenges that require careful consideration across multiple dimensions.

Professional bodies must establish comprehensive standardized protocols for AI implementation. These protocols should address technical specifications, quality control measures, and performance monitoring systems. They must also include guidelines for regular validation and testing of AI systems to ensure consistent performance across different professional contexts.

Data security and confidentiality protection require sophisticated technical solutions. This includes developing encryption standards for AI-processed data, establishing secure channels for data transmission, and creating protocols for data access and retention. Professional bodies must also address the ethical implications of AI systems accessing sensitive client information and establish clear guidelines for maintaining client confidentiality in an AI-enabled environment.

Support frameworks for small and medium practices require particular attention. This might include developing shared AI resources or platforms that smaller firms can access cost-effectively. Professional bodies should consider establishing AI resource centers that provide technical support, training, and implementation guidance scaled to different practice sizes. Financial assistance programs or subsidized access to AI resources might be necessary to ensure equitable access across the profession.

The ethical framework must also address the potential impact of AI on professional independence and objectivity. Guidelines must be established for maintaining professional skepticism when working with AI systems and for ensuring that reliance on AI does not compromise professional judgment. This includes developing protocols for documenting AI-assisted work and maintaining transparency about the use of AI in professional services.

5.0 CONCLUSION

5.1 Conclusion

This research demonstrates that AI systems exhibit significant capabilities in professional accounting examinations, with advanced models like Claude and ChatGPT-4 surpassing average human performance. However, the varied performance across different examination areas—excellence in systematic analyses like Audit and Assurance but limitations in complex areas like Corporate Reporting—highlights the continuing importance of human expertise. Domain-specific training further enhanced AI performance, suggesting potential for targeted development.

The findings indicate that the future of accounting will involve a symbiotic relationship between human professionals and AI systems. While AI excels in processing and analyzing standardized information, human expertise remains crucial for complex decision-making, professional judgment, and ethical considerations. The challenge ahead lies in adapting professional standards, education, and certification processes to harness AI capabilities while maintaining rigorous professional competence. This adaptation requires enhanced examination security protocols, evolved educational frameworks, and appropriate regulatory standards to ensure the integrity of professional certification in an AI-enabled environment.

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