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DIGITAL TRANSFORMATION, COOPERATION AND GLOBAL INTEGRATION IN THE NEW NORMAL

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TABLE OF CONTENT

APPLICATION OF TECHNOLOGY AND BIG DATA IN THE FIELDS OF FINANCE, ACCOUNTING AND AUDITING IN THE CONTEXT OF GLOBALIZATION

BANK RUN AND SILICON VALLEY BANK	1
Lam Dang Xuan Hoa, Ho Minh Khoa, Huynh Vo Nhat Linh	1
BIG DATA AND INTELLECTUAL PROPERTY RIGHTS.....	14
Le Thi Minh, Vo Trung Hau	14
THE EFFICIENCY OF THE INTERNAL CONTROL SYSTEM IN RISK MANAGEMENT AT THE NAM A COMMERCIAL JOINT STOCK BANK	23
Truong Thanh Loc, Tran Ngoc Thanh.....	23
VIETNAM - AUSTRALIA ECONOMIC AND TRADE COOPERATION IN THE NEW NORMAL: OPPORTUNITIES AND CHALLENGES FOR VIETNAMESE INVESTORS.....	30
Nhu Nguyen Phuc Quynh*, Anh Nguyen Thi Nguyet, Duy Nguyen Anh	30
IMPACTS OF CREDIT GROWTH AND CREDIT RISK ON THE PROFIT OF VIETNAM JOINT STOCK COMMERCIAL BANKS	43
Dao Le Kieu Oanh*, Tran Thi Huong Ngan	43
FACTORS AFFECTING CUSTOMERS' DECISIONS TO USE E-BANKING AT JOINT STOCK COMMERCIAL BANKS IN HO CHI MINH CITY	57
Nguyen Duy Khanh ¹ , Pham Quoc Tham ²	57
HOW CHINA_USA POLITICAL TENSIONS AFFECT STOCK MARKET RETURN OF CHINA AND THE USA? A QUANTILE VAR CONNECTEDNESS APPROACH	70
Hao Wen Chang ¹ , Tsangyao Chang ² and Mei-Chih Wang ³	70
BANKING HUMAN RESOURCES BEFORE THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE AI	92
Nguyen Huynh Chi.....	92
IMPROVE THE QUALITY OF TRAINING THROUGH IMPROVEMENT OF STUDENT TESTING AND ASSESSMENT – CASE IN ACCOUNTING BRANCH, UNIVERSITY OF ECONOMICS AND FINANCE	102
Thuy Thi Ha	102
ACTIVITIES OF DIGITAL TRANSFORMATION IN VIETNAMESE COMMERCIAL BANKS: AN OVERVIEW DURING THE COVID-19 RECOVERY PERIOD.....	109
Nguyễn Thị Quỳnh Châu, Đào Lê Kiều Oanh	109
OPPORTUNITIES AND CHALLENGES FOR VIETNAM IN ATTRACTIVE FDI IN GLOBAL MINIMUM CORPORATE TAX IMPLEMENTATION	117
Ngo Hoang Thong	117

IMPACTS OF STATE OWNERSHIP AND BUSINESS CHARACTERISTICS ON TAX AVOIDANCE: EVIDENCE IN VIETNAM.....	128
Huyen Ngoc Nguyen, Thanh Dan Bui	128
RUSSIA'S IMPACTS AND SCENES ON BEING BANNED FROM SWIFT	143
Lam Dang Xuan Hoa ¹ , Phan Ngoc Anh ²	143
THE ROLE OF ACCESS TO FINANCE AND THE ENTREPRENEURIAL INTENTION OF YOUNGERS IN THE SOUTHWESTERN PROVINCE, VIETNAM.....	151
Vu Truc Phuc*, Nguyen Dang Hat, Nguyen An Phu, Dao Le Kieu Oanh	151

DIGITAL ECONOMY IN VIETNAM, TRENDS AND POTENTIABILITY

DEVELOPING SMART HOME MODEL FOR APARTMENTS IN HO CHI MINH CITY BASED ON INTERNET OF THINGS (IoT) TECHNOLOGY	182
Dang Thanh Thuy ¹ , Nguyen Thanh Dien ²	182
TRANSPARENCY OF ACCOUNTING INFORMATION OF CONSTRUCTION ENTERPRISES IN HO CHI MINH CITY – CASE STUDY OF APPLICATION OF ACCRUAL ACCOUNTING	193
Truong Thanh Loc ^{1*} , Pham Thi Yen Nhi ²	193
FACTORS AFFECTING THE QUALITY OF FINANCIAL STATEMENTS OF MANUFACTURING ENTERPRISES IN HO CHI MINH CITY	207
Truong Thanh Loc [*] , Dang Nguyen Tuong Han, Nguyen Ngoc Mai Phuong, Nguyen Thi Quynh Huong	207
THE CRITICAL FACTORS OF COLLEGE STUDENTS' INTENTION TO USE METAVERSE TECHNOLOGY FOR SUBJECTS RELATED TO IMPORT-EXPORT LEARNING	221
Van Thuy Nguyen Ho, Chau The Huu, Luan Thanh Nguyen [*]	221
CONSUMER PERCEPTION ABOUT THE SUSTAINABILITY COMMITMENT OF LUXURY BRANDS IN VIETNAM AND CHINA MARKETS.....	233
Tran Minh Tu ¹	233
INFLUENCE OF WOM AND EWOM IN MAKING DECISION BUYING GOODS	247
Doan Anh Tu ¹ , Kim Phi Rum ² , Nguyen Pham Hai Ha ³	247
DIGITAL ECONOMY AND DEVELOPMENT POTENTIAL IN VIETNAM.....	257
Hoang Thi Chinh, Nguyen Hoang Phan	257
BLOCKCHAIN APPLICATION IN MODERN LOGISTICS: INTERNATIONAL EXPERIENCE AND SOME RECOMMENDATIONS FOR VIETNAM	266
Nguyen Nu Tuong Vi.....	266
FACTORS AFFECTING THE DEVELOPMENT OF THE DIGITAL ECONOMY IN VIETNAM	272
Vo Tien Si	272
LEGAL FRAME FOR THE OPERATION OF THE REAL ESTATE BUSINESS UTILIZING THE BLOCKCHAIN PLATFORM IN VIETNAM.....	284
Le Thi Khanh Linh.....	284

DIGITAL TRANSFORMATION – COOPERATION – GLOBAL INTEGRATION IN BUSINESS

FACTORS INFLUENCING BUSINESS ACCEPTANCE OF INDUSTRY 4.0 TECHNOLOGY APPLICATIONS IN DONG NAI PROVINCE.....	291
Thanh-Thu Vo*, Minh-Huong Tang.....	291
DIGITAL ORIENTATION, INNOVATION CAPABILITY AND FIRM PERFORMANCE: A PROPOSAL RESEARCH MODEL	298
Nguyen Van Hau	298
PREDICTION OF STUDENT'S BEHAVIORAL INTENTION TO USE SMART LEARNING ENVIRONMENT: A COMBINED MODEL OF SELF-DETERMINATION THEORY AND TECHNOLOGY ACCEPTANCE	309
Nguyen Thi Hai Binh ¹ , Dao Y Nhi ² , Nguyen Thanh Luan ³ , Dang Quan Tri ⁴	309
THE PEDAGOGICAL IMPACT OF GRAMMARLY ON EFL WRITING COMPETENCY: AN EMPIRICAL INVESTIGATION IN HIGHER EDUCATION CONTEXT.	323
Nguyen Thi Hong Lien ¹ , Nguyen Truong Gia Minh ² , Nguyen Ngoc Vu ^{3*}	323
FACTORS AFFECTING PURCHASING DECISION OF THE YOUTH ON TIKTOK	336
Ngoc Pham ¹ , Thanh Cong Tran*.....	336
FACTORS AFFECTING OCCUPATIONAL SAFETY BEHAVIORS OF WORKERS DIRECT PRODUCTION AT CU CHI POWER COMPANY.....	345
Minh Luan Le, Thi Trang Tran.....	345
CORPORATE SOCIAL RESPONSIBILITY AND EMPLOYEES' ORGANIZATIONAL CITIZENSHIP BEHAVIOUR.....	355
Nguyen Xuan Hung ¹ , Ha Le Thu Hoai ¹ , Nguyen Huu My Truc ^{2&3} , Pham Tan Nhat ^{2&3}	355
THE INNOVATION CAPACITY - THE ROLE OF LEADERS OF SMALL AND MEDIUM ENTERPRISES IN HO CHI MINH CITY, VIETNAM.....	365
Huynh Nhut Nghia	365
PEOPLE'S THOUGHTS ON THE IMPACT OF ARTIFICIAL INTELLIGENCE ON BUSINESS	376
Ton Nguyen Trong Hien, Bui Tuyet Anh	376
FACTORS AFFECTING BRAND SWITCHING INTENTION IN THE CONTEXT OF HIGHER EDUCATION IN VIETNAM	382
Ly Dan Thanh, Nguyen Phu Quoi, Tran Hoang Nam, Vo Hong Son, Nguyen Ngoc Thuy Tien	382
ENHANCE THE DIGITAL COMPETITIVENESS	398
Tran Quang Canh, Hoang Thi Chinh.....	398

ASSESSING PATIENT SATISFACTION (BRAND) AFTER THE COVID-19 PANDEMIC AT THU DUC CITY HOSPITAL.....	408
Nguyen Hoang Dung ^{1*} , Nguyen Huynh Bao An ² , Van Phuong Trang ²	408
INDUSTRIAL AND HUMAN RESOURCES FORM THE FOUNDATION FOR BINH DUONG'S SUSTAINABLE ECONOMIC DEVELOPMENT	408
Hoang-An Nguyen	417
IMPACT OF ORGANIZATIONAL FAIRNESS ON THE EMPLOYEES' KNOWLEDGE SHARING IN TRAVEL AND TOURISM ENTERPRISES IN HO CHI MINH CITY	426
Le Thi Nhu Quynh ^{1,2} , Le Thi Giang ² , Truong Quang Dung ¹	426
THE EFFECT OF PERSONAL MOTIVATION ON THE TACIT KNOWLEDGE SHARING BEHAVIOR OF 5-STAR HOTELS' EMPLOYEES IN HO CHI MINH CITY	440
Le Thi Giang, Nguyen Bach Hoang Phung.....	440
DIGITAL COMPETITIVENESS AND OPERATIONAL EFFICIENCY OF ENTERPRISES IN THE DIGITAL ERA: THE CASE OF VIETNAMESE ENTERPRISES	453
Diep Nguyen Thi Ngoc ^{1*} , Canh Quang Tran ² , Anh Bach Hoang Ngoc ¹	453
FACTORS INFLUENCING PARENTS' SELECTION OF PRIVATE PRESCHOOLS IN THU DUC CITY	466
Thi-Trang Tran ¹ , Thi-My-Dung Pham ² , Thi-Bich-Diep Le ^{1*}	466

RECOVERY COMMUNICATIONS IN THE TOURISM AND HOSPITALITY INDUSTRY AFTER THE COVID-19 PANDEMIC

DEVELOPING A SPIRITUAL TOURISM DESTINATION IMAGE MEASUREMENT SCALE OF AN GIANG	474
Nguyen Vuong Hoai Thao ¹ , Nguyen Quyet Thang ²	474
PROSPECTS OF VIRTUAL REALITY TOURISM APPLICATION IN VIETNAM TOURISM PROMOTION	487
Nguyen Thi Hong Ha, Pham Thi Huong Giang.....	487
PERSONALIZATION TRAVEL TRENDING IN HO CHI MINH CITY IN THE CONTEXT OF POST COVID-19	497
Duong Bao Trung.....	497
IMPACTS OF MEDIA ON CUSTOMERS' DECISION TO CHOOSE FOOD AND BEVERAGE SERVICES POST THE COVID-19 PANDEMIC	511
Nguyen Thi Bich Van	511
DIGITAL TRANSFORMATION APPLICATION TO PROMOTE THE RECOVERY AND DEVELOPMENT OF INBOUND TOURISM IN HO CHI MINH CITY	521
Tran Trong Thanh	521
VIETNAM TOURISM AFTER COVID-19 PANDEMIC	527
Nguyen Hoang Phan ¹ , Hoang Thi Chinh ²	527
NAVIGATING THE EVOLVING LANDSCAPE OF SOCIAL MEDIA DATA MINING AND PRIVACY	537
Pham Thai Hien	537
THE CORRELATION BETWEEN STUDENT SELF-REPORTED GENERAL WELL-BEING AND PERCEIVED SUPPORT FROM FRIENDS, TEACHERS, AND UNIVERSITY	545
Virginia Kelsey ¹ , Đặng Thị Mai Ly ^{2*} , Nguyễn Anh Khoa ² , Nguyễn Văn Tường ²	545

DIGITAL VERSUS NON- DIGITAL

PROVIDING CONVENIENCE TO CUSTOMERS IN THE DIGITAL MARKETING ERA: OBSERVATIONS FROM COMMERCIAL BANKS IN HO CHI MINH CITY	556
Nguyen Quang Trung	556
VIRTUAL REALITY: AN INNOVATIVE TOOL IN TOURISM EXPERIENTIAL MARKETING	564
Thanh Nguyen Ngoc Le ¹ , Khuong Thanh Nguyen ²	564
THEORETICAL CONCEPTS OF STRATEGIC POSITIONING FOR PLACE BRANDING: A CASE STUDY OF DONG THAP PROVINCE	580
Phan Bao Giang.....	580
LITERATURE REVIEW ON THE IMPACT OF DIGITAL MARKETING ON VIETNAM'S SMALL AND THE MEDIUM BUSINESS ENTERPRISES (SMEs)	587
Lê Kim Nguyên *	587

CHALLENGES FACED BY TEACHERS IN NON-TRADITIONAL EDUCATION

PROPOSE AN ONLINE TEACHING COMPETENCE SCALE FOR UNIVERSITY LECTURERS

.....	596
Duong Thi Kim Oanh*, Dang Thi Dieu Hien	596

EXAMINE USAGE OF LEARNING MANAGEMENT SYSTEMS (LMSS) BY FACULTY
STAFF AT UNIVERSITY OF ECONOMICS (UEF) AND FINANCE WITH EXPANDED
TECHNOLOGY ACCEPTANCE MODEL (TAM).....

Ha Truong Minh Hieu, Ngo Minh Hai*, Mach Tran Huy.....	608
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DIGITAL TRANSFORMATION AN INDISPENSABLE EVOLUTION FOR SUSTAINABLE CORPORATES

FACTORS AFFECTING THE APPLICATION OF STRATEGIC MANAGEMENT ACCOUNTING AT MANUFACTURING ENTERPRISES IN BINH DUONG PROVINCE	618
Truong Thanh Loc ^{1*} , Nguyen Thi Thanh Truc ²	618
HRM DIGITAL TRANSFORMATION: TAKING A ROAD OF SUCCESSION PLANNING ..	629
Trương Phan Hoàng Anh, Giang Ngọc Anh.....	629
THE IMPLICATION OF CONTACTLESS SERVICE AS A TOOL TO IMPROVE CUSTOMER REVISIT INTENTION	640
Linh, Nguyen Duy Yen*	640
TOURISM BRAND LOVE IN THE DIGITAL AGE: THE ROLE OF ONLINE TOURIST EXPERIENCES, TOURIST-BRAND RELATIONSHIP QUALITY AND SUSTAINABILITY	651
Thanh Nguyen Ngoc Le	651
CONDUCTING FOCUS GROUPS IN CROSS-CULTURAL SCHOLARSHIP OF TEACHING AND LEARNING (SoTL): A COMPARATIVE CASE STUDY	662
Punithan Moganathas ¹ , Jenny Hill ² , Andy V.-M. Kok ² , Matt Barr ² , Ruffin Relja ^{2*} , Philippa Ward ² , Duong Tran Quang Hoang ³ , Quynh Phuong Tran ³	662
LEVERAGING DIGITAL TRANSFORMATION FOR SUSTAINABLE CORPORATE EVOLUTION IN VIETNAM	677
Nguyen, Tan Dat ¹ , Le, Dinh Thang ²	677

INFORMATION TECHNOLOGY AND APPLICATIONS

FB-PROPHET MODEL FOR TIME SERIES FORECASTING IN SALES	691
Thanh Cong Tran	691
USING AI CODE IN C# PROGRAMMING	698
Nguyen Ha Giang.....	698
DETERMINANTS OF CONTINUANCE USAGE INTENTION OF MOBILE FOOD ORDERING APPLICATIONS (MFOAS) AMONG VIETNAMESE USERS: THE MEDIATING ROLE OF E- SATISFACTION	705
Lam Hoang Phuong ^{1*} , Nguyen Thi Kim Lien ² , Tien Hung Nguyen ³ , Vinh Long Nguyen ⁴	705
DECODING MARKETING INSIGHT: INSIGHT FROM OUTSIDE.....	718
Hoàng Thị Hằng, Trần Thành Công*	718
DIGITAL DISRUPTION AND DATA SECURITY: HOW FINTECH IS RESHAPING BANKING ...	724
Hoàng Văn Hiếu, Trần Ngọc Thiên Ngân.....	724

TRENDS AND ISSUES IN ENGLISH LANGUAGE EDUCATION AND RESEARCH

EFL LEARNERS' ATTITUDES AND LEARNING ENGAGEMENT IN COMMUNICATIVE GAME-BASED GRAMMAR TEACHING	736
Nguyen Thi Thanh Huyen ¹ , Tran Quoc Thao ²	736
APPROACHES TO TEACHING L2 LISTENING:.....	749
CLOSING THE GAP BETWEEN REAL-LIFE AND CLASSROOM-BASED LISTENING	749
Luu Thi Mai Vy	749
DEFINING ROLES OF STUDENT ENGAGEMENT IN THE 21ST CENTURY LANGUAGE CLASSROOM	755
Ho Xuan Tien, Duong My Tham.....	755
EFL STUDENTS' ATTITUDES AND LEARNING INVESTMENT IN PORTFOLIO - BASED ENGLISH WRITING LEARNING: A LITERATURE REVIEW	763
Ly Gia Huy ¹ , Tran Quoc Thao ²	763
EXPLORING EFL LEARNER IDENTITIES IN PROJECT-BASED LANGUAGE LEARNING AT A HIGH SCHOOL IN AN GIANG PROVINCE	774
Nguyen Hong Thien ¹ , Tran Quoc Thao ²	774
THE VALUES OF SYNTACTIC COMPLEXITY IN ACADEMIC WRITING: A LITERATURE REVIEW	791
THE ISSUE OF AMBIGUITY IN THE ENGLISH LANGUAGE.....	801
Nguyen Dinh Tuan	801
RESEARCH PERSPECTIVES ON JUNIOR HIGH SCHOOL EFL STUDENTS' MOTIVATION IN ENGLISH LANGUAGE LEARNING	812
Huynh Thanh Nhon ¹ , Tran Quoc Thao ²	812
EXPLORING THE INFLUENCE OF WRITING ANXIETY ON VIETNAMESE ESL UNDERGRADUATES' WRITING PERFORMANCE: A QUANTITATIVE STUDY.....	821
Nguyen Ngoc Nguyen, Nguyen Hoang Phan.....	821
THE APPLICATION OF THE “FLIPPED CLASSROOM” MODEL IN TEACHING ENGLISH IN THE VIETNAMESE UNIVERSITY EDUCATION ENVIRONMENT	838
THE USE OF RESOURCE MANAGEMENT STRATEGIES IN EFLFLIPPED CLASSROOMS	847
Nguyen Quynh Thao Vy ^{1,*} , Duong My Tham ²	847
INSIGHTS INTO ENGLISH MAJOR STUDENTS' USE OF PHRASAL VERBS IN ACADEMIC WRITING.....	860
Do Thi Thanh Thuy, Tran Quoc Thao	860

LAW IN THE CONTEXT OF INTERNATIONAL INTEGRATION

LEGALISING INTELLECTUAL PROPERTY INFRINGEMENTS IN RUSSIA – A WAR TACTIC IN THE CONTEXT OF RUSSIA’S INVASION OF UKRAINE.....	869
Bui Thi Hong Ninh*	869
MODEL OF ASSET REGISTRATION WORLDWIDE AND LESSONS FOR VIETNAM IN IMPROVING ASSET REGISTRATION LAWS.....	880
Vu Anh Sao ^{1,2} , Nguyen Thi Xuan Mai ²	880
LEGAL ISSUES ARISING FROM THE DEVELOPMENT, IMPLEMENTATION, AND USE OF ARTIFICIAL INTELLIGENCE (AI) - INTERNATIONAL EXPERIENCES AND LESSONS FOR VIETNAM	887
Le Hoang Minh Huy*, Nguyen Thi Thu Ha, Dao Trong Duc, Ky Dieu Linh, Bui Thi Thuy Linh, Nguyen Nam Trung.....	887
SOUTH KOREA’S EXPERIENCES ON PROPERTY REGISTRATION LAW - LESSONS FOR VIETNAM	896
Vu Anh Sao, Pham Huynh Bao Oanh.....	896
THE RISE OF REMOTE WORK: LEGAL CHALLENGES AND IMPLICATIONS FOR EMPLOYMENT LAW IN VIETNAM	903
Nguyen Thi Xuan Mai ¹ , Nguyen Thi Ngoc Loan ²	903
CHALLENGES AND RECOMMENDATIONS FOR THE LEGAL FRAMEWORK IN THE EMERGING AGE OF ARTIFICIAL INTELLIGENCE.....	910
Nguyen Thi Thu Trang	910
THE IMPACTS OF GLOBAL MINIMUM TAX ON FOREIGN DIRECT INVESTMENT (FDI) CORPORATIONS IN VIETNAM.....	921
Trần Ngọc Thanh ¹	921
CROSS-BORDER E-COMMERCE ACTIVITIES AND TAX MANAGEMENT ISSUES	933
Le Huynh Phuong Chinh, Ngo Thi Khanh Linh, Pham Ngoc Lan Anh.....	933
EXPERIENCE IN KOREA AND CHINA ON TAX MANAGEMENT FOR CROSS-BORDER E-COMMERCE ACTIVITIES	941
Duong Anh Son ¹ , Tran Vang Phu ²	941
LEGAL PERSPECTIVE ON REGULATIONS RALATED TO PERSONAL INCOME TAX WHEN EARNING INCOME THROUGH E-COMMERCE PLATFORMS IN VIETNAM, TAKING THE CASE OF INDIVIDUALS DOING BUSINESS THROUGH TIKTOK APPLICATION.....	946
Nguyen Duc Tri ¹ , Hoang Minh Châu ²	946
THE COMPATIBILITY ON THE SCOPE OF MUTUAL LEGAL ASSISTANCE (MLA) IN CRIMINAL MATTERS AND THE CONDITIONS OF REFUSAL MLA IN CRIMINAL MATTERS BETWEEN VIETNAMESE LAW AND INTERNATIONAL TREATIES WHICH VIETNAM HAS SIGNED.	956

Pham Huynh Bao Oanh.....	956
TAX POLICY FOR E-COMMERCE OF COUNTRIES IN THE WORLD AND RECOMMENDATIONS TO VIETNAM.....	967
Nguyen Thanh Minh Chanh, Ha Thi Van Anh, Pham Lam Tam Nhu	967
LEGAL REGULATIONS FOR ENTERPRISE OBLIGATIONS TO PROVIDE INFORMATION ON E-COMMERCE PLATFORM	974
Truong Kim Phung*, Nguyen Hoang Chuong	974
“ROBOT TAX” – RECOMMENDATIONS FOR VIETNAM.....	981
Gian Thi Le Na, Pham Phuong Doanh.....	981
WTO APPELLATE BODY REFORM IN THE CONTEXT OF ESCALATING GEOPOLITICAL TENSIONS.....	988
Nguyen Nam Trung.....	988

USING AI CODE IN C# PROGRAMMING

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Abstract:

Recently, the appearance of ChatGPT, a generating AI application tool, has been widely used and has attracted a lot of attention from the technology world. The application of ChatGPT has spread across different industries because the ability to answer the results is considered useful and the completion level of the results is very high. Based on ChatGPT's answer, users can adjust, add and expand to get the content they want without having to spend a lot of time and effort. Within the framework of the article, we will cover the aspect of leveraging the ChatGPT tool for programmers, software developers, or software engineers. The illustrative examples use C# language and other programming languages, ChatGPT also handles the same results. Making good use of this support tool will help build computer programs faster, saving programmers' effort. Especially for new programmers, you can take advantage of ChatGPT to better support your work.

Keywords: *ChatGPT, computer programming, C# programmer, AI Code.*

1. Introduction

In recent years, the explosion of applications using artificial intelligence platforms has brought about very positive effects. Previously, AI applications focused on specialized and specialized activities, serving groups and organizations, but today, AI has made strong development steps and crept into all human activities, can be likened to an extended arm, an extra brain for a person.

One of the AI applications that is known and widely used by the public in recent times is ChatGPT, an intelligent chatbot that can answer questions in many different fields and the results are evaluated by users. High. ChatGPT can generate content on demand and human descriptions of a certain field.

Within the framework of the article, ChatGPT applications will be presented to support programming work, accompanied by illustrative examples for each application. The selected programming language is C# (ChatGPT can answer all popular programming languages today). In addition, the article also gives some comments on the advantages and limitations of using this tool to support programming.

2. AI, Generative AI, ChatGPT and applications

Artificial Intelligence (AI) is an area of computer science and technology that deals with the development of computer solutions and algorithms to help computers learn and make decisions on their own human. The main goal of artificial intelligence is to create intelligent computer systems capable of solving complex problems and making decisions based on information provided or gathered.

To achieve this goal, AI researchers must build mathematical models and algorithms to solve problems such as image recognition, natural language processing, data analysis, forecasting, decision support, and many other applications. This includes finding the most suitable approach to process input data, building machine learning models, and training these models through machine learning algorithms and techniques, deep learning, and more.

Artificial intelligence is widely applied in many fields, from applications such as facial recognition, autonomous vehicles, and financial investment advice to the fields of health, statistics, military, communication, education, and many other industries.

Generative AI is an area of artificial intelligence that focuses on creating new content, not limited by original training data. Using generative models such as Generative Adversarial Networks (GANs) or Variational Autoencoders (VAEs), generative AI can generate images, music, text, and other content, based on input data.

In GANs, two neural network models interact, one called the generator model and the other called the discriminator model. The generative model tries to generate new samples from the training data, while the discriminant model tries to distinguish between the samples generated by the generative model and the real ones from the training data. The two models will interact with each other through the training process to create new samples of better quality.

In VAEs, an encoder model is used to convert the input data into a latent space, and then a decoder model is used to convert points in this latent space into new output data. Once trained, the model learns to generate new data based on the basic characteristics of the training data.

With its ability to create new and diverse content, generative AI has been used in a wide variety of applications, including photo and video production in the media and entertainment industries, creating newspaper content, and creating new content. and even new product designs. However, the use of generative AI also poses some challenges, including issues of ethics and the quality of the generated content.

2.1. What is ChatGPT?

ChatGPT is a group of AI applications in the direction of generating AI. Specifically, ChatGPT is a large automated language model trained by OpenAI, based on the Transformer Network's GPT (Generative Pre-trained Transformer) architecture, and has dimensions up to millions of parameters. This model has the ability to read and understand the content of the input text, then give an answer or generate new text based on the context and available information.

ChatGPT is trained on a large amount of data from various sources on the Internet, including English and other languages. With the ability to automatically learn from data and improve quality over time, ChatGPT can answer questions, solve problems, and provide the information requested by users naturally and smartly.

ChatGPT has many practical applications, including support for chatbots, online conversations, customer support, education and research support, and many more.

Features of ChatGPT

Answer questions: ChatGPT can answer users' questions on a variety of topics, including history, science, entertainment, culture, business, and more.

Create new content: ChatGPT can generate text snippets, from product descriptions to longer articles, or even essays, letters, and more.

User interaction: ChatGPT can interact with users and answer their questions, discuss with them different topics, or give advice on something.

Language translation: ChatGPT can translate documents into many different languages, helping users to read and understand information from other languages.

Synthesize information: ChatGPT can aggregate information from different sources and help users save time searching for information.

Make predictions: ChatGPT can make predictions about future events or trends based on available data.

2.2. Applications

Education: ChatGPT can assist teachers/lecturers and students/students in teaching and learning. For example, ChatGPT can answer students' questions or guide teachers in lesson planning.

Health: ChatGPT can assist medical professionals in diagnosing diseases or providing medical information to users. For example, ChatGPT can answer questions related to disease symptoms, provide nutritional advice or guide users to perform exercises.

Business: ChatGPT can assist businesses in consulting products, services or managing customer care. For example, ChatGPT can answer questions about products, pricing, or warranties, or help customers with questions.

Communication: ChatGPT can assist journalists or media in writing articles, finding information, or providing information to readers. For example, ChatGPT can generate descriptions of an event or give advice to readers.

Scientific research: ChatGPT can assist researchers in finding information, analyzing data, or generating reports. For example, ChatGPT can search for scientific articles related to a specific topic or generate descriptive snippets of data.

History, society, current affairs: can aggregate information in ChatGPT database, and information on the Internet. In addition, the system can answer questions about general knowledge, providing simple explanations of complex in-depth concepts.

Other areas of synthesis: Giving advice on certain topics; Summarizing long paragraphs; Translating text into different languages.; Helps with language learning by providing definitions and examples of words and phrases; Creates personalized content, such as emails and social media posts; Creates music and art based on user input and preferences.

It can be said that ChatGPT's knowledge base is quite extensive, trained from big data, from many different sources, and updated regularly. So the ability to meet user requirements is quite good.

3. ChatGPT application in programming

Through part 2, ChatGPT has the ability to support many different fields, from general to specialized in certain narrow areas. In part 3, we will focus on presenting applications of ChatGPT to support computer programming. For each of the following application sections, only some typical and basic examples are given. From these examples, programmers can completely apply to similar and more complex situations. Just as ChatGPT's capabilities are not limited to computer programming languages, programmers can ask for any arbitrary computer language.

3.1 Generating source code

ChatGPT can understand and interpret the needs of programmers using its natural language processing skills and provide corresponding code snippets. When it comes to repetitive tasks or boilerplate code, this can save programmers a lot of time.

An example chatGPT generates source code at the request of the programmer as shown in Figure 1.

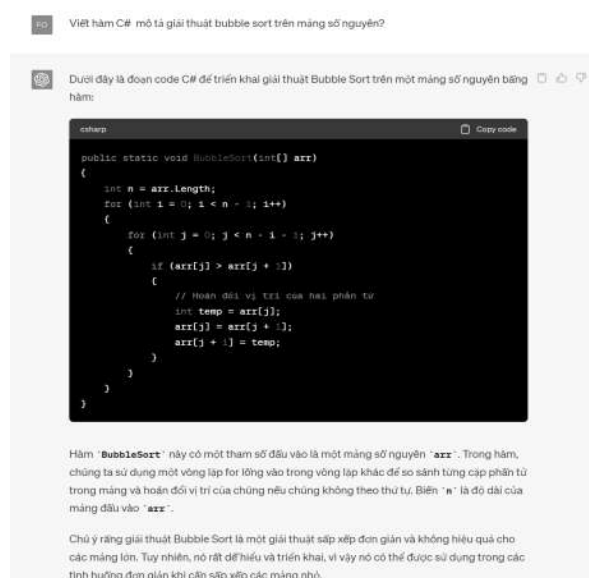


Figure 1. Generating code on demand.

In the example, users can ask questions in Vietnamese language and the answering system is also in Vietnamese, including the source code of the sample function and a very detailed and easy to understand function explanation.

3.2 Find bugs or refactor the source code

In addition to generating source code according to the user's discretion, the system can help find errors or restructure the program code to be more compact.

In the example in Figure 2, the user enters a question and a program segment, and ChatGPT will answer and edit the source code.



Figure 2. Fixing the bugs

In the above source code, there is a mistake by the programmer, so the program execution is only about to decrease, not increase as expected. ChatGPT detects this error and explains it in detail and then recommends more accurate source code.

An example is followed in Figure 3, giving ChatGPT a correct but not optimal program and the system has given the optimized source code very neatly and explained very clearly.



Figure 3. Optimizing the source code.

3.3 Writing the documentation

ChatGPT has the ability to read and understand source code and perform documentation writing for that source code. This is a very useful feature that saves a lot of time for programmers.

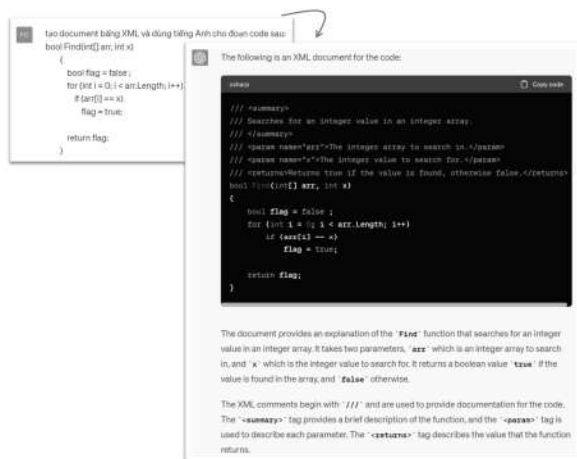


Figure 4. Generating documentations

For Visual Studio C#'s XML Documentation tool, only the framework can be generated, and the interpretation content must be filled in by the programmer. ChatGPT can parse and understand the source code and generate XML Documentation that describes the exact function and meaning of each component of the function in the above program.

3.4 Writing the test cases

In the illustrative example (Figure 5), the user will ask the system to write a test case to find the error of the program segment. And the system specified the error and gave the test case of the error case.



Figure 5. Test cases.

It can be said that generating test cases for the program is a very necessary job in the program testing phase. This is also quite a time-consuming and labor-intensive job, so using ChatGPT can improve the efficiency of the testing phase of software development.

3.5 Creating sample data

When running a program test, the programmer needs some sample data to run and test the functions. ChatGPT can be used to generate data patterns based on the provided source code.

Tạo 10 bộ dữ liệu dạng bảng cho lớp sau:

```
public class Student {
    public int Id { get; set; }
    public string Name { get; set; }
    public int Age { get; set; }
    public string Address { get; set; }
    public string Phone { get; set; }
}
```

Id	Name	Age	Address	Phone
1	John Smith	20	123 Main St	555-555-1234
2	Jane Doe	22	456 Elm St	555-555-5678
3	Alex Brown	19	789 Oak St	555-555-9012
4	Mary Black	21	246 Maple St	555-555-3456
5	Tom Green	18	369 Pine St	555-555-7890
6	Kim Lee	23	678 Cedar St	555-555-2345
7	Max Smith	20	910 Birch St	555-555-6789
8	Ann White	22	753 Acorn St	555-555-4234
9	Ben Brown	19	852 Cherry St	555-555-5678
10	Amy Green	21	147 Walnut St	555-555-9012

Figure 6. Sample data.

Depending on the needs of using test data, the programmer can describe more details so that ChatGPT can create the test data set exactly as the programmer wants.

4. Some comments about using ChatGPT in programming

Some of the advantages of using ChatGPT in programming support are as follows:

1. Quickly support repetitive jobs, thereby saving programmers' time and effort.
2. With the ability to analyze and understand the program segment, ChatGPT can help improve the quality of the program through code improvement, debugging, and other suggestions for optimization.
3. Combining search and information synthesis intelligently, so it will help a lot in programming. Instead of using a regular search engine, you can use ChatGPT for more optimal results.
4. The ability to support all current programming languages is the strength of ChatGPT.

However, besides the advantages, the quality of the answer also depends on many factors, such as the complexity of the question, the way the question is asked, and the additional or guiding information. so that ChatGPT can quickly approach answering in the desired direction of the user. In addition, when receiving results from ChatGPT, programmers also need to add or adjust the content to be more complete, or more accurate to the requirements of the programmer.

5. Conclusion

In the article, we have presented the basic parts of the ChatGPT application, an artificial intelligence generator, that have been widely applied in recent times. This focus on introducing ChatGPT applications for programmers, these applications will help improve work efficiency and save programmers' time and effort. In the framework of the article, we have only presented the basic applications, and the tests are not many. In the future, we will continue to study deeply the applications of ChatGPT for different stages in the software development process.

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