

A Study on Impact of Deep Learning on Korean Economic Growth Factor

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Abstract

This paper deals with studying strategy about impact of deep learning (DL) on the factor of Korean economic growth. To study classification of impact factors of Korean economic growth, we suggest dynamic equation of microeconomy and study methods on economic growth impact of deep learning. Next step is to suggest DL model to dynamic equation with Korean economy data with growth related factors to classify what factor is import and dominant factors to build policy and education. DL gives an influence in many areas because it can be implemented with ease as just normal editing works and speak including code development by using huge data. Currently, young generations will take a big impact on their job selection because generative AI can do well as much as humans can do it everywhere. Therefore, policy and education methods should be rearranged as new paradigm. However, government and officers do not understand well how it is serious in policy and education. This paper provides method of policy and education for AI education including generative AI through analysing many papers and reports, and experience.

Keywords: *Deep learning, Korean economy growth, Economic growth factors, Economy.*

1. Introduction

Nowadays, many areas are using deep learning (DL) to develop a new paradigm on how to do it and how much to use it for their business as well as industry after unveiled ChatGP 4.0 in March 2023. The reports say its impact is over the steam of the 1700s. AI tools developed by many is giving an impact on everything and everywhere in our community. The technology of this technology is not so difficult, but its impact is serious. Therefore, many companies and countries have a strong strategy to develop or how to use AI. Basically, Deep Learning technology based on supervised learning, unsupervised learning, and reinforcement learning to train facts using data, its model is also not difficult to understand technology. However, its impact is a very huge and is changing social as well as the paradigm of our society. AI has an influence on art, image, audio, music, and similar content. Of course, we cannot predict how much more do they have capabilities with continuously in the future. However, at least now, we see its power in impact. Of course, a number of organizations are attempting to develop a new model. They like to have an initiative advantage in economy and or capture knowledge property through solving customer services.

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DL-AI model is rapidly increasing for everywhere because a new generation of user-friendly tool (Generative AI: Chat GPT) is useful for texts, images, and videos. About economic effect of DL, many predict the ramifications of generative AI such as automation by deep learning, heighten labor productivity by deep learning, higher education, and higher wages occupations. That is, a new revolutionary deep learning lead economic growth with the new content, AI collaboration swells, lifelong learning, and tasks. Its impact is wide and more profoundly in occupations such as content writers, translators, customer servers, marketing, legal professionals, document analyzer and makers, graphic designers, architects, artists, image generators, and visual content manipulation. Some analyzers worry about its impact on all sorts of jobs and creativity that were previously thought to be human creativity and reasoning such as writing, drawing, analysis, music. However, its impact starts from everywhere. Herein, what will deep learning technology and its applications impact on the economy in the future? Basically, DL has an ability with human-like automation and is a big power engine for economic growth and job changing. The first aim of his paper is to provide study strategies on how DL and related technologies will impact on Korean economic growth and is to predict what factors will give an influence on Korean economic growth through analyzing and reviewing reports and papers. It is very important to understand and decide on how and what we have to do business, education, and decide milestones because of current confusion social and technological paradigm. The second aim is to offer policy decision materials for government and official organizations or businessman because of almost case will be replaced by this deep learning-based technologies. We must understand situation because economic growth factor will be changed from the traditional factors in the future.

2. Prior research

2.1 Methodological Status of Deep Learning

AI technology has a very strong trigger role to develop new AI and has initiative in AI areas. There are several models and related DL and based apple. Many applications are developing and it is changing for our economic growing pattern and job changing. This paper provides current economic impact of deep learning technologies and its application.

2.2 Prior case of Deep Learning

This AI technology has a very strong motivation to develop new economy and job by a new idea. Figure. 1 shows the timeline of deep learning development. We can see on how competition is struggle from this figure. It means the event of DL is quite big impact on economic area and job changing. In case of ChatGPT-4 (Sanuj Bhatia, March 2023) as one of DL model, it has different parameter such as, positional parameter (it is function is to understand the order of words in sentence), learned parameter (which is making an accuracy of learning through weights and bias tuning), hyper-parameters (Definition of the overall model structure and model behaviour), and model configuration parameters (definition of the number of layer and nodes in each layer). The number of parameters in a language learning model means a measure of model capacity for learning and complex understanding. That is, a language model with more parameters can learn more detailed and nuanced illustrates of language. So, it allows model to generate more accurate and human-like sentence. However, it needs a vast amount of computing power and energy.

Figure. 2 illustrates why language recognition can understand well word and sentence. There are some reports (MIT review, 2021) that generative AI will change such as jobs (especially, a leading expert on the impact of technology) and GAI (Generative AI) will give a big influence on education and expertise. Basically, the DL will change many things such as word conversion, image transfer (image to text or vice versa),

storytelling, image combining (protection against fraud or fake), and others. Therefore, there is able to happen large-scale unemployment. It means that economic leading factors will be changed from the traditional ways. They can say about this, that replacement of job will be some social issues or problems unemployment. Despite this worry about deep learning, AI developers will continue to provide human-like capability AI by their creation. And the other hand, using these related technologies, they can improve the productivity of their workforce, and many reports predict that DL will extend trillions of dollars in economic growth. Because a majority of the economy is developed and boosted by knowledge and its related combination in the 4th wave.

Technologies depend on how to use this technology to transform businesses and make life as we did in the earlier revolution. It is, so far, just a little bit better to do the task because of the young age of AI. However, it will increase efficiency and productivity. It also will allow us to create new ideas and processes to develop for customers.

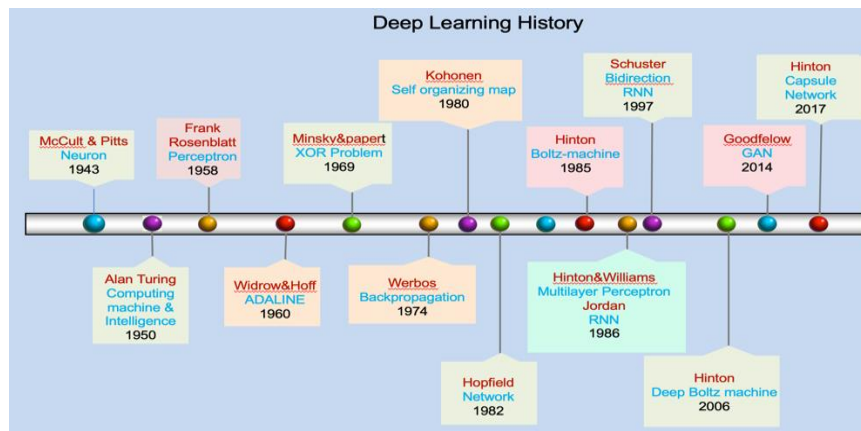


Figure 1. DL stage, source: MIT review, 2021

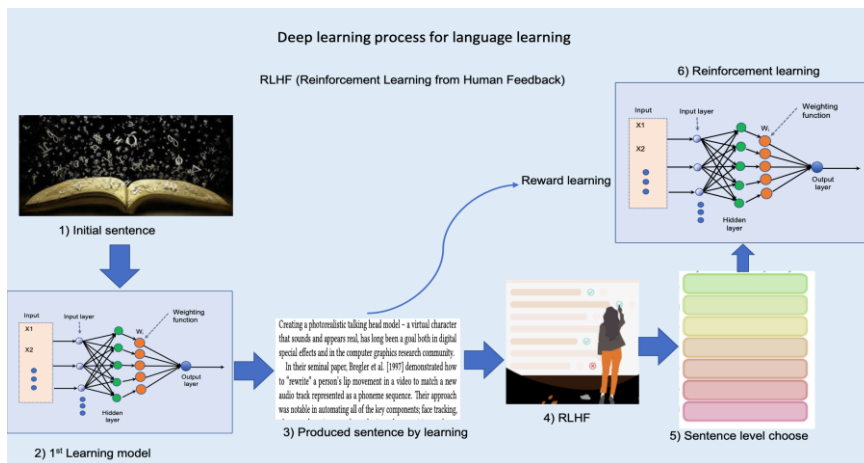


Figure 2. Learning process of language sentence, source: MIT review, 2021

1) Microsoft AI

MS also developed a natural language model to learn by using machine learning, DL for natural language understanding. It is designed to human conversation by understanding your question or question. This technology can do well cover letters and resume, creating list, describe arts, write code, summarize

content, song lyrics, and similar contents using stored data. It means this technology have the capability to lead the most updated information and economic growth.

2) Meta

Meta developed a new model for language recognition and it can be trained easier because it is a smaller parameter than another model. It will give an impact on society.

3) Google Platform

The google developed DL a decade for part by the convergence of new algorithms and architectures and in the last 10 years, AI and ML models have become bigger and more sophisticated. They're deeper, more complex, with more parameters, and trained on much more data, resulting in some of the most transformative outcomes in the history of machine learning. Google has continued to invest heavily in ML efficiency for efficient architectures, raining efficiency, data efficiency, and inference efficiency. By using these models increasingly in production and business applications, the efficiency and cost reduction has gone from a minor consideration to a primary constraint. Figure. 3 shows the model of Google.

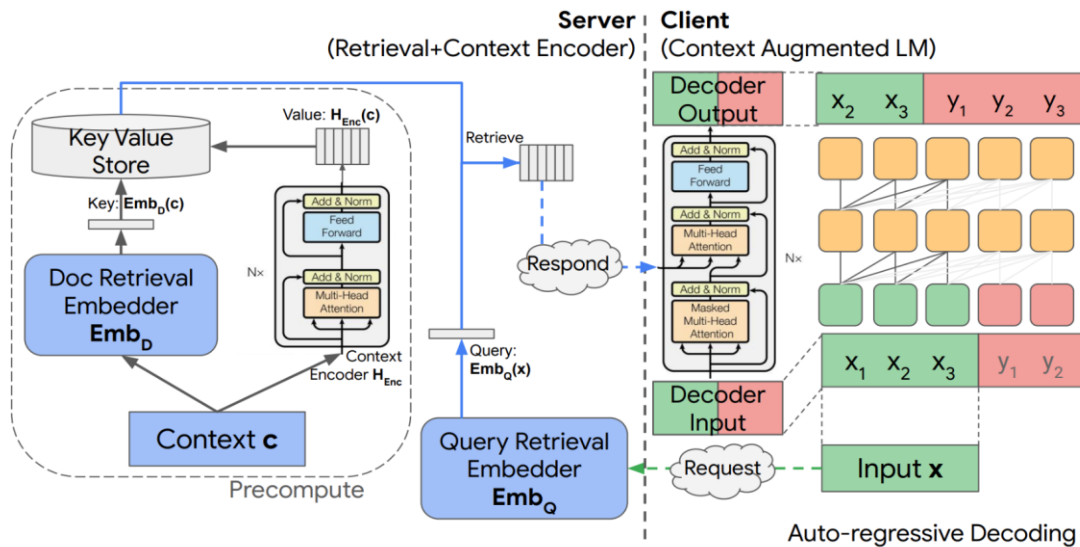


Figure 3. The DL structure of Google, source: Author own

3. Economic Effects of DL

3.1 Economic Growth Leading of Generative AI Techniques

As we mentioned earlier, many companies are developing generative AI for application models (Appl) as well as basic models, related technologies, and coding methods. Therefore, its impact on economic areas increases. Generative AI tools the marketing, art, industries, medical, and biotech as well as prediction and simple application, translation using GAN, transformer functions, and variational auto-encoders. When generative AI is inserted into robots, its results have much more impact on economic growth. Figure. 4 shows how generative AI can give an impact on everywhere. How it is. First impact is closer technology and engineering and second influence will education, health, smart city, and others.

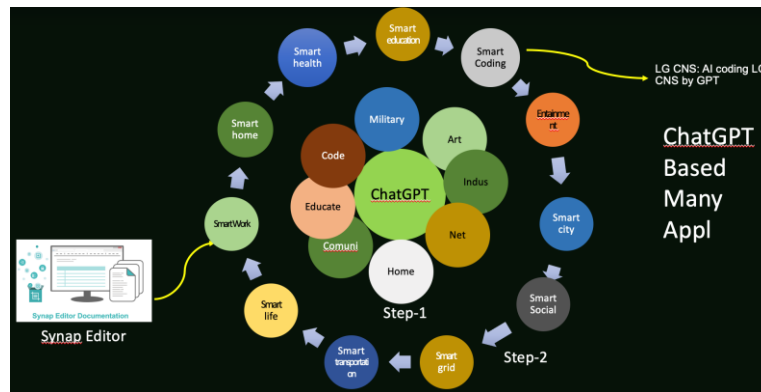


Figure 4. Comparison MS, Google, and Meta of ChatGPT, source: Author own

3.2 Areas

Developer and Technology areas : The S/W developer and high-tech developer area will paradoxically be one of the most risk or challenging job because of ChatGPT's good information and guidance for developing. Everyone must continuously work and update on their job areas (it is a skill). Without doing that, you will not have advantages for your works because DL will do general work and guidance. DL will collect data easily for the market and researchers have to use their knowledge to analyze the market for the customer through social media for developers and analyzers. Then, DL will provide for you to understand various aspects such as the emotional makeup of users, political preferences, cultural choices, religious convenience, education level, local (region), etc. Now, deep learning-generated content is not allowed in official organizers. However, these trends stimulate a good social media strategy and will be allowed officially. Therefore, there will be risks and challenges in jobs of expertise and developer, jobs with a lack of creator, jobs of analytical skills, repeatable jobs, and traditional methods using simple skills as well as low-wage jobs. Of course, the economic leading factor will change.

Creator and Designer: Basically, a human has an idea that novelists and art, composers are unique for humans as well as the creators and designers such as interior designers and outdoor designers, picture drawers, novel creators, and storytellers. However, these jobs will be impacted by DL because it will make good overview conception and detailed thing. Especially, DL can use huge data and will make it immediately easier than humans. By using unsupervised and supervised or reinforcement learning, generative AI processes enormous amounts of data to generate its own outputs by using network computing. Generative AI's abilities also go over human computing speed and high-quality content. Through generative AI, computers can predict the most relevant patterns to input, allowing them to output corresponding content. During the training, a limited number of parameters are given to the generative AI models, enabling them to make their own conclusions and highlight features present in the training data. However, to get the most out of generative AI, human involvement is still essential, and that is both at the start and end of the training. It means creators and novelists will not be leading as economic growth impacts.

Arts: Artists such as music composition, drawing, and interior designers will be influenced by Generative AI. That is, AI is now frequently used in creative methods such as images, drawing, and using image data. AI-generated visuals of art models can be trained on a large number of paintings and later be used to generate new ones with similar features and slight variations in style. For instance, when we want our AI to produce similar materials to Leonardo Da Vinci, we just provide it with as many paintings of Da Vinci as possible. The model's memory functions take the characteristics of Leonardo Da Vinci's painting from painting to reproducing similar

works. We can reproduce many ideas and materials that generate text, produce music, etc. through the same works. Another advantage of generative AI is that we change the feature we get to another one of the images and modify the different styles or specific areas of the image. This occurs when the generative AI model copies the characteristics and aesthetic of your preferred painting and gives you an alternative version. It can also work with rough sketches or wireframes and offer a finalized version of the design.

Gaming: Generative AI can give many advantages to video games because generative AI easily gives levels of customer, dialogue patterns, entertainment areas. Generative AI can make new story through data-based experiences for players. Game's scenario can be developed by generative AI for game developers to train their generators to produce images according to the particular model of their games. Generative AI can give impacts for job pattern and economic growth factor.

Healthcare: Generative AI provides services for healthcare and medical to treatment idea and solution on time because generative AI has an analysis function and for healthcare applications such as MRI scans, CT, X-ray. Because generative adversarial networks (GANs) have a very powerful learning to create fake versions of underrepresented data, it can be used in training and developing a model. It means generative has powerful influences on healthcare.

Sound generation: Generative AI has function to classify audio data and musical genres or human voices. With this function, generative AI can transform from one genre to another one such as rock into classical music, and vice-versa. Generative AI-driven software engine generates new music, composition, making use of gestures, motions, codes, and much more. Generative AI will change music society patterns.

Media and advertising: Basically, generative AI can create and modify content through stored data. So, generative AI can change the media industry. It will change marketing technique. Generative AI can make better understanding for consumer level.

Generative AI and Policy: With the emerging of generative AI, many countries have policy and strategy for AI initiative. The market size of U.S. DL suggested by market research.

Major investments by Top 5: Figure 5. shows the market size of generative AI. Apple's stock price increased by 36% in 2023. The company's growth was largely driven by solid earnings for a consumer slowdown. Microsoft's stock price rose by 37% in 2023. The company's growth was supercharged by the excitement over generative AI, a technology to which Microsoft has close ties. Alphabet, the parent company of Google, saw its stock price increase by 39% in 2023. Like Microsoft, Alphabet's growth was fueled by the hype around generative AI. Amazon's stock price grew by 44% in 2023. The company's growth was largely driven by remarkably solid earnings that de ed earlier expectations for a consumer slowdown. Nvidia, a leader in AI and graphics processing units, saw a massive surge in its stock price by 159% in 2023. The company's growth was driven by the excitement over AI-related advancements.

Global Market Size & Job Patterns: The potential benefits of the AI are to transform technology by using confusion and speed up to developing terms. Deep learning AI also can easily estimate productivity growth using wide and huge data. It will give an impact on widespread adoption and add trillions of dollars a year to global economic output as shown in Figure 5.

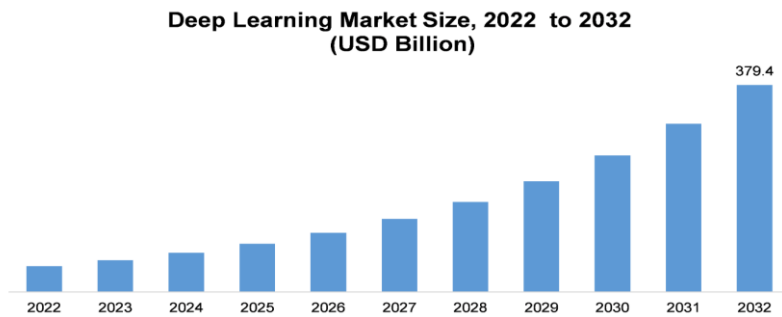


Figure 5. Global market size of DL, source: Gartner, Hype Cycle for Emerging Technologies, 2023.

For example, Turkish economic patterns as one of example by deep learning. This material strongly says why we should study by deep learning impact. This result is comparing graph through DL and the classical methods. It shows the market position of generative AI. This Figure shows generative AI is positioned on the peak of hype cycle for emerging technologies, 2023. It means that generative AI already has saturation position even it developed in March 2023 and we can understand well what we have to and how we have to create new opportunities and innovate new business.

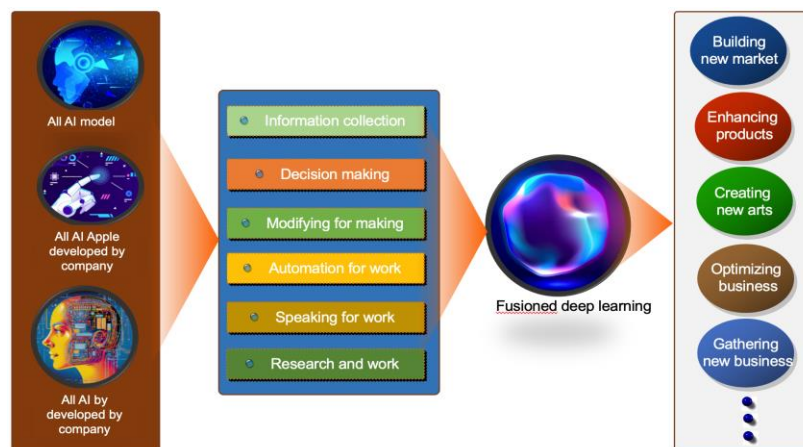


Figure 6. Future impact by all AI, Source: Author own

Figure 6. shows future impact by generative AI through combined AI, the traditional work space, and deep learning. It presents on how impact will give areas by deep learning-based technology will be popular application and will take tasks from millions of employees higher than jobs have been diminished by only factory or warehouse robots. It means so-called knowledge workers and white-collar professionals will feel more pain because of these fusion technologies based on generative AI. Applications of generative AI ready to penetrate into business, medical, legal documents, art, design, and so on. Many startups of generative AI develop chatbots system as well as generators for text, computer code, images, video, design, voice and music. Illustrators, healthcare workers, actors, educators, legal researchers, office workers and drug-company technicians could be the first occupations threatened with this new form of this AI. AI can play a crucial role using data-driven decisions and taking effective action. Research estimates that generative AI adoption in marketing reveals the potential saving of 40% of the average workday. McKinsey's latest research estimates that generative AI and related technologies have the potential to absorb 60-70% of employees' time today.

4. Research strategies and methods for analysis of factors influencing Korean economic growth based on generative AI-based emerging technologies

4.1 Formula Equation Analysis

This paper reviews many materials about the market position of generative AI and situation as well as basic technology, impacting factors. The issue is to obtain how we have to and what we have to have a solution for economic growth. To obtain this question, this paper suggests research schedule as shown in Figure. 8. At this point, this paper will not show all research results because of generative AI model is so many and something is not correct. However, its technology has a big power for impacting economy and this paper open how it has strategy.

$$m^k = m^{k-1} + \arg \min_{h \in h} \left\{ \sum_{i=1}^n \left(y_i - m^{k-1}(x_i), h(x_i) \right) \right\} \quad (1)$$

First step is to make a proof dynamic equation suggested in this paper through validated data and the traditional simulation method as shown in equation (1). Because the traditional already was shown in several methods and papers like equation (1). This equation is already proven by the classical analysis method and we can believe on how its impact on economy. This paper's first aim is to establish dynamic equation to search (find) elements (factors) of the impact of Korean economic growth by generative AI and define why it impact on economy growth factor of through simulation by using equation (2).

$$(\alpha_1, \beta_1) = \arg \min_{\alpha, \beta} \sum_{i=1}^n \left(y_i - \alpha - \beta^T X_i \right)^2 \quad (2)$$

Equation is just assumption equation to analysis of DL impact by deep learning method. Therefore, we modify and correct this equation through study in the future. This paper builds the dynamic equation microeconomic and prepare data to input and proof how it is correct through comparing with the traditional method by using deep learning. Second step is to tune this dynamic equation for generative AI to application. Till this step is just to prove dynamic equation. Third step is to build deep learning structure or so AI model to learn dynamic equation. Basically, there are so many data and parameters to influence on economy growth. With the traditional, it is not easy to study and we have to change parameter whenever we study and it is not correct sometimes. This paper suggests automatic simulation method by AI and we have to develop new model for simulation. Fourth step is to totally suggest deep learning based study model and structure for DL impact of Korean economy growth.

4.2 Empirical Suggestion

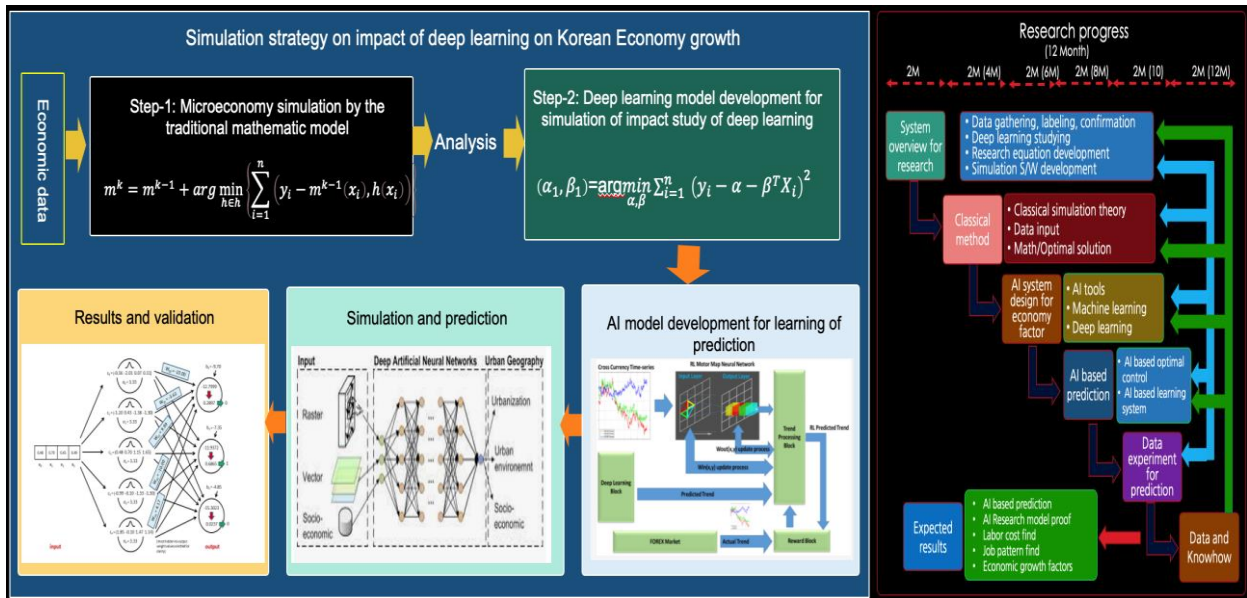


Figure 7. Research strategy for Korean growth factor and impact by all AI, source: Author own

Figure 7. is not limited to research equations to develop depending on your idea. However, this paper just provides as one of example of deep learning's impact on economic growth. And the research progress strategy for the Korean economy growth factor and the impact of all AI. So, terms are one of example. Depending on your situation, you can have 2 or 3 years instead of Month(M). There are many things you can utilize. The application of all AI and research methods is showSo we have to develop a research method according to the situation. Propose research strategies is supporting strategy for Korean economy. The strategy is not complete. So this paper suggests that it should be modified to suit your purpose.

5. Conclusions

This study reviews various reports and papers on the impact of AI on the South Korean economy, aiming to provide insights for strategies and policy formulation. Based on the current review, it is evident that the influence of AI is significant, necessitating policy adjustments and educational reforms for future readiness. At this juncture, accurately predicting how AI will influence the leading factors of the South Korean economy is challenging due to limited data and simulations. However, research is needed to investigate and classify the factors influencing the economy and understand how they translate into economic considerations. In summary, prior studies emphasize that generative AI can foster economic growth, potentially leading to a substantial increase in global GDP annually. Nevertheless, it is anticipated that certain industries and occupations may undergo changes, resulting in disruptions to some jobs. Despite the projected substantial investment in AI by 2030, reaching up to 1% of the U.S. GDP, the potential for utilization is vast. All AI and research methods mentioned in the paper serve as guidelines, and adapting suitable research methods according to future circumstances is imperative. Ultimately, this study proposes current strategies and methods while highlighting the need for ongoing modifications for a more comprehensive understanding and effective response to AI. The paper underscores the necessity of adjustments based on the paper's objectives and contextual factors, facilitating a more accurate and efficient approach to addressing the challenges and opportunities presented by

AI in the future.

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