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The Current State of AI Implementation within the APEC Region for COVID-19 Mitigation

Virtual Event | 9-11 May 2023

APEC Policy Partnership for Science, Technology and Innovation

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Executive Summary

The COVID-19 pandemic is rapidly disseminating and has garnered the attention of decision-makers, scholars, and investigators. The COVID-19 pandemic has significantly impacted the global economy and posed a significant risk to human health and well-being. Scientists globally are making significant strides in addressing the current pandemic, which is characterized by a high incidence of fatalities and cases that continue to emerge on a daily basis. Apart from the pursuit of a vaccine and therapy for COVID-19, there is a significant emphasis on mitigating the spread of the virus through the implementation of suitable interventions aimed at flattening the curve. The remarkable contribution of healthcare professionals working on the front lines, diligently providing care to affected individuals, will be documented in historical records.

Artificial Intelligence (AI) has played a role in addressing the global COVID-19 pandemic. The present study investigates the manifold applications of AI technologies that have been utilized to mitigate the COVID-19 pandemic. Additionally, the report highlights the pivotal contribution of AI research in this unprecedented crisis, particularly in the Asia-Pacific Economic Cooperation (APEC) region. The compendium encompasses a compilation of COVID-19-related data sources that are amenable to scholarly investigation. The investigation of AI's potential and enhancement of its efficacy and potency in combating the pandemic has been comprehensively scrutinized. The purpose of this study is to provide a comprehensive overview of the current state of AI applications to both experts in the field and the public. The aim is to encourage the use of AI in combating the COVID-19 pandemic, as well as any potential future pandemics.

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A. Introduction

The COVID-19 pandemic has had a significant and extensive influence on the global community, resulting in severe disturbances to economic and social structures and widespread morbidity and mortality. In light of the worldwide menace presented by the virus, Artificial Intelligence (AI) has emerged as a valuable asset in combating the pandemic. AI has emerged as a crucial tool in facilitating decision-making processes and bolstering public health initiatives, owing to its ability to handle copious amounts of data and produce valuable insights. AI is a pivotal factor in the development of effective treatments, as it aids in identifying high-risk areas, predicting disease spread, and optimizing supply networks.

In addition to its pivotal applications, AI is transforming the provision of healthcare services through the facilitation of virtual care, thereby mitigating the potential for additional virus transmission. AI is utilized in the medical field to assist healthcare providers in diagnosing patients, evaluating symptom severity, and determining appropriate treatment plans through the application of machine learning algorithms and natural language processing techniques. The incorporation of AI within healthcare systems is imperative in expediting the mitigation of COVID-19, as it possesses the capacity to function with speed and precision, thereby aiding in the containment of the virus and ensuring the protection of public health.

The application of AI in the combat against COVID-19 surpasses the prompt healthcare reaction. The utilization of AI-driven technologies is being implemented in the endeavor of contact tracing, facilitating the detection and communication of potentially exposed individuals to the virus. Through the examination of data from diverse sources, including mobile applications, wearables, and surveillance systems, AI algorithms possess the ability to effectively detect potential infection hotspots and notify individuals to take appropriate measures. This technological advancement not only assists in mitigating the transmission of the virus, but also furnishes significant perspectives for policymakers and public health officials, empowering them to make knowledgeable determinations to protect communities.

Moreover, the significance of AI's role in the advancement of vaccines and therapies cannot be underestimated. AI algorithms are utilized in the drug discovery procedures to scrutinize extensive datasets and detect potential therapeutic candidates, thereby expediting the research and development timeline to a great extent. AI has a crucial role in expediting the identification of effective treatments and potentially saving numerous lives by simulating the behavior of molecules and predicting their efficacy. The incorporation of AI within the pharmaceutical sector exhibits significant potential for tackling forthcoming health emergencies through the establishment of a structure that facilitates prompt reaction and creativity.

To conclude, the COVID-19 pandemic has underscored the essential significance of AI in addressing worldwide health emergencies. AI has demonstrated its significance as a crucial partner in the battle against the virus, owing to its capacity to handle large amounts of data and offer valuable insights, aid in virtual healthcare delivery, support contact tracing initiatives, and expedite the development of treatments. The ongoing global struggle with the pandemic has

prompted a growing interest in the integration and advancement of AI technologies. These developments have the potential to improve our preparedness and response capabilities, ultimately contributing to the protection of public health and the well-being of societies worldwide.

B. Background

Applications of Artificial Intelligence (AI) based on deep learning, machine learning, and neural network models are being employed as quick fixes for COVID-19 prediction and detection [1-2]. AI systems can identify COVID-19 using chest scans and can replace conventional thermometers in public mass screening programs. These AI-powered systems are remotely observable and manageable. AI tools can identify COVID-19 hazards, such as identifying patients who will experience lung damage or severe respiratory issues, helping hospitals make the most of their limited resources by giving priority and care to patients who need to care right away.

A significant problem during the epidemic, in addition to the health and economic issues (e.g. in [3]), has been the enormous development of bogus news. By examining millions of sources, deep learning plus graph theory can be utilized to identify bogus news. Additionally, communities can be informed in real-time via real-time interaction about limits, guidance, and guidelines to avoid COVID-19 hotspots using AI-based Apps with geolocation monitoring capabilities.

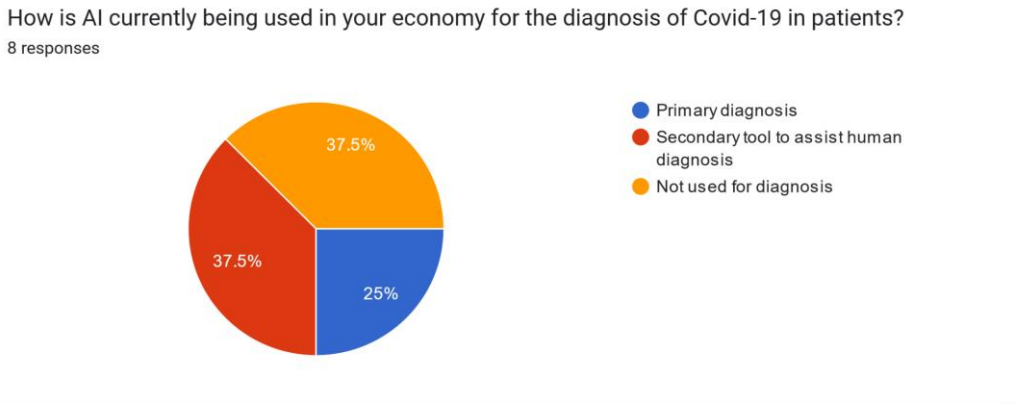
Research in [4-6] details some notable AI contributions to the COVID-19 encounter:

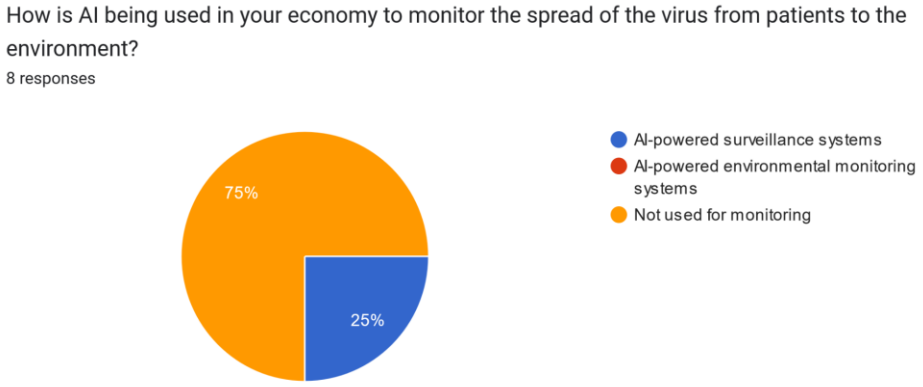
1. People's Republic of China: COVID-19 prediction using neural network called COVNet in CT diagnosis [4],
2. Canada: A deep CNN dubbed COVID-Net for CT diagnosis [4],
3. Hong Kong, China; and Thailand: The real time RT-PCR assay [4],
4. India: Aarogya Setu, a mobile phone app that traces contamination using mobile phone GPSs and Bluetooth to collect data on whether a person has come into contact with a COVID-19 patient [4],
5. Saudi Arabia: COVID-19 detection fuzzy analytic hierarchy process (AHP) Deep learning-based convolutional CNN [4],
6. Hong Kong, China; Singapore; and Thailand: Conversational AI services on COVID-19 vaccine confidence and acceptance [5],
7. Indonesia: AI-based telemedicine [6].

C. Pre-workshop Report

The objective of this project is to identify, analyze and promote innovative solutions to the current state of AI implementation for mitigation of COVID-19 pandemic within the APEC region, information of the uses of AI technology adoption in diagnosing and monitoring the spread of COVID-19 virus at the micro level (from patient to the environment) and at the macro level (potential for mass transmission). This survey seeks to collect information related to the current status of the use of AI technology in each economy for diagnosing COVID-19 in patients, monitoring the spread of the virus from the patient to the environment (multiple levels), and large-scale transmission. This online survey is a benchmark on the relevant levels of AI development and implementation for COVID-19 mitigation in member economies.

The survey was collected from APEC economy, and the returned answers were from the following economies: Australia; Brunei Darussalam; Canada; Chile; The Russian Federation; and Viet Nam. There are several key pictures that can be drawn from the survey results, as follows:





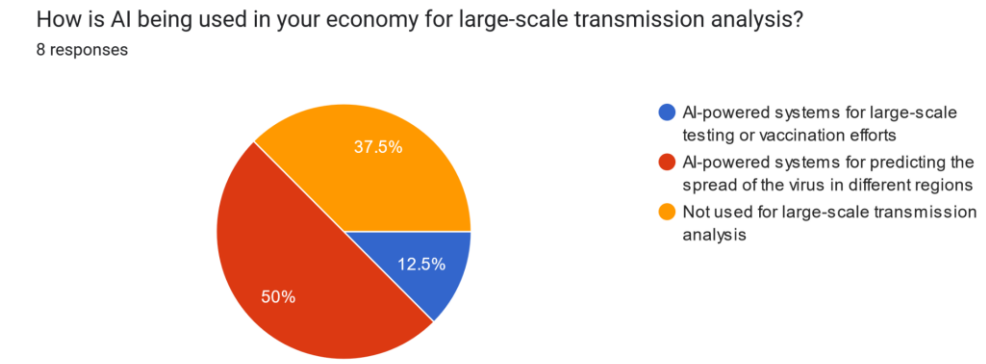


Fig.1 AI usages for COVID-19 mitigation

a. In several APEC economies, AI is mainly used as a primary and secondary tools for assisting human diagnosis, as shown in Fig. 1. On the other hand, AI was rarely used for monitoring the spread of the virus and for large-scale transmission analysis.

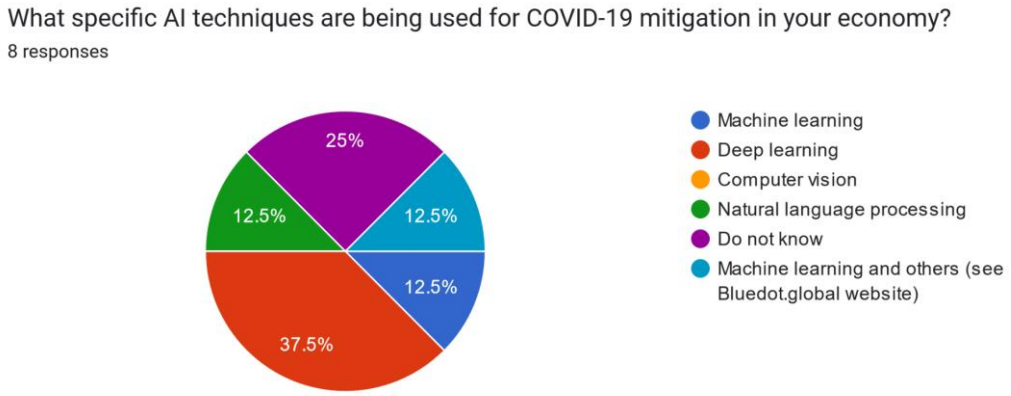


Fig.2 AI techniques used for COVID-19 mitigation

b. APEC Economies mainly utilizes Deep Learning as AI tools for COVID-19 mitigation, as shown in Fig. 2. It is inline with the current state-of-the-art academic research on COVID-19, e.g. [1-3].

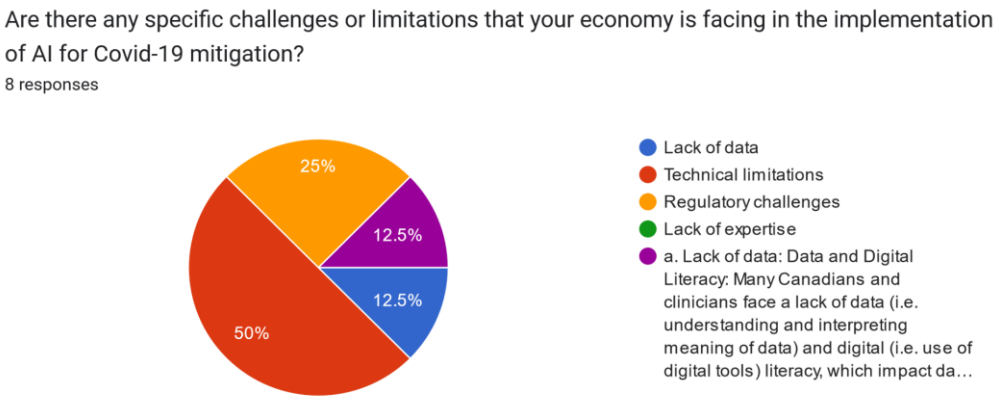


Fig.3 Challenge for implementation AI for COVID-19 mitigation

c. There are widespread problems and hurdles for implementing AI in COVID-19 mitigation in APEC economies as shown in Fig. 3. Nevertheless, technical limitations and regulatory challenges become the main problem of AI implementation.

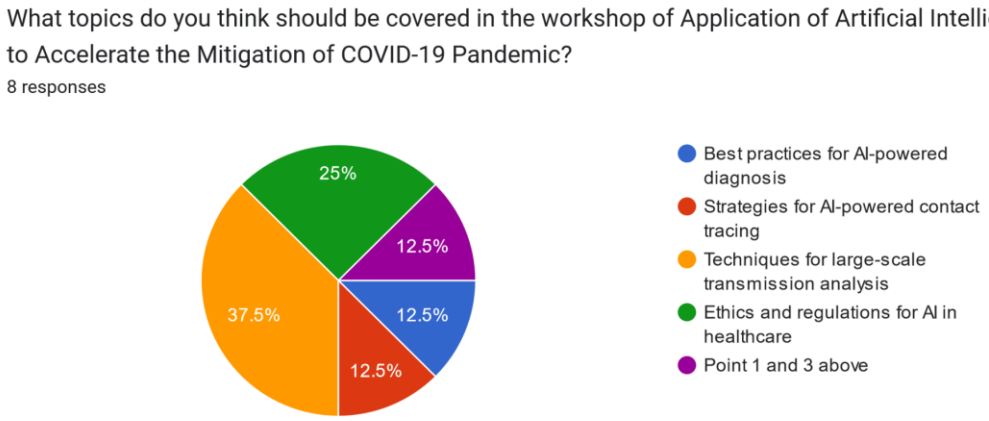


Fig.4 Topic suggestions for workshop on AI for COVID-19 mitigation

d. As the consequence of the survey result in Fig. 1, Fig. 4 suggests the main topics for the workshop to cover the shortage of AI implementation, i.e. large-scale transmission analysis. In addition, discussions on ethic and regulation for AI in healthcare become a hot topic for the workshop.

In summary, several APEC economies had implemented AI for COVID-19 pandemic mitigation in various ways, which is inline with academic reports mentioned in the background section. More comprehensive results and statistics of the survey can be accessed at http://ugm.id/AICovid19APEC.

D. Virtual Workshop Summary

Implementation of workshop:

- The event was held VIRTUALLY:
  - Date : 9-11 May 2023 (Tuesday to Thursday)
  - Time : 09.00-12.00 (GMT +7)
  - Location : KS Gatot Subroto Auditorium
- Number of speakers and panelists: 19 speakers and panelists (**12 men and 7 women**);
- Speakers and panelists distribution: 1 from Australia; 1 from Brunei Darussalam; 1 from Chile; 3 from Hong Kong, China; 10 from Indonesia; 1 from Malaysia; 1 from The Russian Federation; 1 from Thailand;
- Participants registered online: 139 participants.

The focus of the workshop centered on the utilization of Artificial Intelligence (AI) to expedite the mitigation of the COVID-19 pandemic. It is our contention that through collaborative efforts and the adoption of innovative concepts, a more robust society can be established in the aftermath of the pandemic, one that is advantageous to all member economies of the Asia-Pacific Economic Cooperation (APEC).

The workshop participants engaged in a central discourse regarding the significance of AI in addressing pandemic situations, such as the recent COVID-19 outbreak. It is acknowledged that the advent of AI has brought about a significant transformation in the digital realm, leading to the creation of a virtual world that can be interconnected to enhance the standard of living in the physical world. The emergence of COVID-19 and its subsequent worldwide spread have created a notable opportunity for the utilization of AI, given its superior capacity for expeditious data processing and interpretation. The optimization and development of the field have been emphasized as a crucial necessity for APEC economies to derive greater benefits from effectively managing critical situations, such as a pandemic.

Furthermore, it is acknowledged that a substantial amount of knowledge exists regarding the importance of policy development and implementation. In order to optimize the efficacy of mitigation policies, an AI-based approach can be employed to model the impact of said policies. This can be followed by a simulation of the policies, which would yield a more scientifically informed assessment. This approach can be instrumental in arriving at well-informed decisions. There are prevalent disease patterns that can be utilized to facilitate preparation for disease control and prevention. Consequently, the utilization of simulation techniques will engender greater confidence in these endeavors.

The analysis of risks can be conducted through the processing of large datasets derived from the public without infringing on concerns related to privacy. One additional aspect of policy development tools pertains to the utilization of a sandbox environment for testing AI, particularly with regard to ensuring ethical compliance prior to implementation.

In order to expeditiously implement the AI-based policy, we suggest fostering cooperation and collaboration among various entities, including governmental authorities, research and development institutions, universities, associations, industries, hospitals, and start-up companies. Collaboration can be

established among specialized hospitals such as academic hospitals, regional clinic hospitals, oncology clinics, and patient societies at the district level.

The discourse also encompassed the crucial element of discerning the optimal methodologies for integrating AI at different tiers, including the practical, strategic, and policy levels. At the policy level, it is evident that obtaining public endorsement from governmental or authoritative entities is crucial to socializing domestic policies aimed at mitigating the transmission rate of COVID-19 among citizens. Furthermore, at the policy level, there is a recognition of the necessity for cooperation and collaboration among various stakeholders, including the government, academia, companies, societies, and the press. From a strategic standpoint, the implementation of AI can be utilized to provide support for tracking and monitoring purposes pertaining to the health of the public and healthcare professionals. The utilization of AI-based methodologies can be extended to the development of knowledge-expanding systems, thereby enhancing the efficacy of decision-making processes in the context of pandemic mitigation efforts.

The practical application of AI implementation can be leveraged in diverse medical contexts to combat viral infections. The optimization of image processing techniques has the potential to enhance the efficiency of medical diagnosis. This can be achieved through the utilization of advanced technologies such as machine learning and deep learning algorithms, which can facilitate the interpretation of medical images such as X-rays and CT scans. While the involvement of human radiologists remains integral, the integration of AI technology has demonstrated a reduction in the time required for case resolution.
In addition to its diagnostic capabilities for COVID-19, the implementation of AI can also be leveraged for pharmaceutical applications. An additional utilization of AI is the development of chatbot applications, which effectively address the constraints of counselors and healthcare professionals while simultaneously expanding the scope of individuals who can be assisted.

We possess knowledge regarding the utilization of mobile applications that are dependent on AI techniques for the purpose of decision-making and management. The proliferation of these applications has transcended domestic boundaries, fostering mutual interest among neighboring economies. In the context of pandemic mitigation, the regulation of border-crossing activities can be improved through the implementation of AI in the analysis of relevant big data and pattern recognition. Finally, the workshop emphasized the importance of collaborative efforts among APEC economies in order to optimize the benefits of AI in the context of pandemics. It is believed that the capabilities acquired during the COVID-19 pandemic will enhance future mitigation efforts in the event of any potential pandemics. Henceforth, it may be deemed plausible to contemplate a notion of cooperative vaccine development amidst our respective economies, given that it can be fortified by the utilization of AI technology, specifically Gene Analysis and Vaccine Effectiveness Analysis, at both the micro and macro levels. Collaboration is an essential aspect of the prompt detection of COVID-19 and the development of risk assessment strategies. It is equally significant as monitoring or tracking COVID-19 suspects or patients. The aforementioned topics have exhibited significant progress within the field of economics, and their advancement can be further enhanced through collaborative efforts. In order to facilitate collaboration efforts aimed at mitigating the effects of the pandemic, it is imperative that our economies reach a consensus on the implementation of data sharing protocols and all associated considerations. Given that pandemic mitigation has assumed global

significance, it is no longer confined to regional or local spheres of influence. Collaboration plays a crucial role in the development and implementation of AI. The efficacy of AI in disease prevention may be insufficient. The necessity of collaboration is evident.

To conclude, this workshop has furnished us with invaluable insights into policy development and implementation, as well as best practices shared at the policy, strategic, and practical levels. The implementation of a sandbox is also deliberated as a means to adhere to ethical considerations in the deployment of AI. These commodities have the potential to foster mutually beneficial collaboration among our economies, thereby expediting the containment of the pandemic and enhancing our readiness for future emergency situations, such as pandemics, in the Asia-Pacific region. It is recommended that all member economies of APEC actively participate in the implementation of the ideas and recommendations that were deliberated during this workshop in a collaborative effort towards a more promising future.

Post Workshop Reports: This section presents a thorough examination of the feedback garnered from participants of the workshop, highlighting the subsequent key findings:

1) The participants expressed a consensus that the workshop objectives were effectively delineated. The enhanced clarity facilitated the synchronization of their expectations and facilitated effective engagement throughout the event.
2) The attainment of objectives was unanimously acknowledged by participants, thereby demonstrating the efficacy of the workshop.
3) The workshop effectively addressed pertinent issues, as evidenced by the relevance and timeliness of the agenda items and topics covered.
4) Content Organization: The organization of the workshop content was found to be highly effective, as it was well-structured and presented in a manner that facilitated comprehension and ease of navigation.
5) The participants expressed their appreciation for the attention given to the gender inequality issues during the workshop, which resulted in a more inclusive and comprehensive event.
6) The commendable level of preparedness exhibited by the presenter, coupled with their extensive knowledge on the subject, received high acclaim from participants, thereby fostering an environment conducive to effective learning.
7) The participants expressed that the materials provided during the workshop were perceived as beneficial and valuable in terms of reinforcing the workshop's content and serving as a resource for future reference.
8) Time Allocation: The participants expressed that the duration of the workshop was adequate, suggesting that the event was well-organized and effectively implemented.
9) The majority of the comments expressed positivity, commending the effective organization of content, the preparedness of the presenter, and the relevance of the topics discussed. Several participants proposed the implementation of additional workshops that specifically target sub-topics, with the aim of fostering a more comprehensive comprehension.
10) Workshop Relevance: The participants expressed a high degree of relevance of the workshop to their respective roles and economies, suggesting that the workshop had a significant and wide-ranging impact.
11) Relevance Explanation: The participants expressed that the workshop topics

were closely aligned with their professional duties and difficulties, resulting in significant advantages.

12) Workshop Achievements: The workshop effectively conveyed essential information and facilitated meaningful conversations regarding the subjects. The networking opportunity provided was also acknowledged as a noteworthy accomplishment.
13) Capacity building was reported by the participants as a notable outcome of the workshop, as they acquired valuable skills and knowledge that could be effectively utilized in their respective roles.
14) Pre-Event Knowledge Level: The participants' level of knowledge prior to the event exhibited variation, with a majority indicating a moderate comprehension of the subject.
15) Post-Event Knowledge Level: After the workshop, participants exhibited a discernible augmentation in their knowledge and skills, thereby confirming the efficacy of the event.
16) Explanation of Knowledge Level: The participants in the study attributed their enhanced knowledge and skills to several factors, including the comprehensive content, the presenter's preparedness, and the engaging discussions that took place during the session.
17) The participants aim to apply the skills and knowledge acquired from the workshop in order to enhance their respective economies. This may involve various activities such as formulating novel policy initiatives, conducting workshops, and devising strategic work plans.

Future Actions by APEC: It was proposed by participants that APEC should prioritize the establishment of a connection between the outcomes of the workshop and subsequent actions undertaken collectively or individually by the economies involved. Although there were variations in the specific procedures followed, there was a general agreement to prioritize ongoing education and the practical application of acquired knowledge.

Suggestions for Workshop Enhancement: Several participants have proposed recommendations to enhance future workshops. These suggestions include augmenting the duration dedicated to networking and discussions, as well as integrating a greater number of real-life examples and case studies into the presentations.

In general, the workshop proved to be successful as participants acquired significant knowledge and skills. The feedback and suggestions offered will be of great value in terms of strategizing and enhancing forthcoming workshops.

E. Conclusion and Recommendation

In brief, the utilization of Artificial Intelligence (AI) in combating the COVID-19 pandemic has been groundbreaking, providing invaluable perspectives, augmenting healthcare, and mitigating the impact of the outbreak. Consequently, it is evident that AI holds significant potential for addressing global health concerns, such as potential pandemics. Governments and organizations within the Asia-Pacific Economic Cooperation (APEC) region have demonstrated their support for the advancement and implementation of AI technology, recognizing its significant contribution in the battle against the COVID-19 pandemic.

Through collaborative efforts aimed at sharing data and best practices, the member economies of APEC have enhanced their ability to respond to the epidemic and bolstered their support for public health initiatives. The aforementioned endeavors prioritize the significance of allocating resources towards the development of AI for forthcoming times and demonstrate the potential for global collaboration in tackling worldwide health issues. It is evident that AI will play a pivotal role in fostering a more robust and sustainable future, particularly as the world endeavors to recuperate from the ramifications of the COVID-19 pandemic. The utilization of AI for expediting COVID-19 mitigation efforts within the Asia-Pacific Economic Cooperation (APEC) region serves as a model for the potential application of AI in tackling worldwide health concerns and augmenting the well-being of populations in other regions. Overall, AI development will improve the quality of collaboration between government, academicians, companies, societies, and press in mitigating a pandemic in the future.

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