

## NVIDIA-國立清華大學聯合创新中心與高效能計算應用研究計畫

一、計畫目標：NVIDIA-國立清華大學聯合创新中心的成立，旨在促進臺灣人工智慧的研究技術發展和應用及人才培育，透過專業的技術和資源支援，促進臺灣的人工智慧技術發展和應用。本次徵案的主要目的在於鏈結 NVIDIA 的高效能 GPU 運算資源與國立清華大學的跨領域研究團隊，共同推進人工智慧技術在臺灣的發展和應用，期望透過本次徵案能夠加速 AI 應用技術的開發與實現，並同時培育更多人工智慧領域的優秀人才。

### 二、徵案主題：

- 生成式 AI (Generative AI)、數位孿生 (Digital Twin) 相關應用，包含但不限於生成式 AI 與數位孿生於音樂、圖像、金融、法律等領域的應用。
- 大型語言模型 (Large Language Models, LLMs)：大型語言模型相關技術於語音處理與自然語言處理的開發與研究，以及大型語言模型技術在各種實際場景的應用。
- 物理資訊神經網路：開發物理資訊神經網路 (Physics-Informed Neural Network, PINN) 應用於科學計算，將物理學中由主導偏微分方程式 (PDEs) 所描述的因果關係，與 CAE 求解器的模擬數據或觀察數據相結合，適用於流體力學、電磁學等領域。
- 量子計算模擬：進行量子計算模擬研究，例如：協助研究人員在一般計算機上模擬量子系統，以探索量子計算的潛力。
- 藥物發現：藥物開發相關的研究，例如：結合深度學習技術用於藥物分子設計、蛋白質結構預測等面向。
- 智慧醫療：智慧醫療相關的研究與應用，幫助提升診斷和治療效果。
- 其他 NVIDIA 軟體開發工具套件 (SDK) 相關主題<sup>1</sup>：利用 NVIDIA SDK 所提供之技術和工具所開發更多創新應用，以需要大規模運算者為佳。

---

<sup>1</sup> 以下舉例介紹數個 NVIDIA SDK 做為參考：

- NVIDIA NeMo 框架 (<https://www.nvidia.com/en-us/ai-data-science/generative-ai/nemo-framework/>)：該框架專注於語音處理與自然語言處理的眾多方向，以滿足各種實際應用場景的需求。
- NVIDIA BioNeMo (<https://www.nvidia.com/en-us/gpu-cloud/bionemo/>)：該平台結合深度學習技術，用於藥物分子設計、蛋白質結構預測等方面，促進生物技術與藥物研發的交叉合作。
- NVIDIA Modulus (<https://developer.nvidia.com/modulus>)：開發物理資訊神經網路 (Physics-Informed Neural Network, PINN) 應用於科學計算。
- NVIDIA CUDA Quantum (<https://developer.nvidia.com/cuda-quantum>)：協助研究人員在一般計算機上模擬量子系統。
- NVIDIA CLARA (<https://developer.nvidia.com/industries/healthcare>)：醫療相關的研究與應用，用以幫助提升診斷和治療效果。

三、計畫主持人資格：國立清華大學助理教授以上人員，共同主持人沒有資格限制。

四、申請方式：公告日起至 **2024 年 6 月 30 日 23:59PM** 止，請將申請書 (詳見附件檔案) Email 至 (michael\_peng@lsalab.cs.nthu.edu.tw)。

五、審查方式：計畫的審查將會根據三個主要的評估標準進行。

- 高速運算需求和 NVIDIA SDK 的使用：將評估申請計畫對於高效能計算的需求，以及 申請計畫如何在其研究中有效地利用 NVIDIA SDK。將優先挑選需大量 GPU 運算資源之應用研究。
- 計畫影響力：將評估所申請之計畫對於科學、工程、或社會等各個領域將帶來之影響。
- 計畫可行性：將評估所申請之研究計畫是否具實際可行性。例如是否涵蓋可行的實驗設計，是否具備足夠的時間和資源以完成研究等。

本次徵案預計將提供總共五個名額。審查結果預計將在 **2024 年 8 月 31 日** 公告，並公布獲得資助的研究計畫名單。計畫最長 3 個月，建議起始時間晚於 **2025 年 1 月 1 日**。

六、資源補助：每一獲選之研究計畫，將根據其申請書中所陳述的需求以及審查結果，得到最多三個月的計算資源補助，並由 NVIDIA 的專業解決方案架構 (Solution Architect, SA) 團隊提供技術輔導。在整個核心研究計劃的執行期間，SA 團隊將於上班時間提供技術支援。

七、權利義務：

1. 每個研究計畫皆應配合中心要求，協助中心掌握及理解計畫進行的狀況，包括學術研究交流規劃、行程安排、研究進展等。
2. 計畫結束後 2 個月內，需繳交結案報告一份，報告應包含整個計畫的詳細資訊，包括但不限於計畫的目標、方法、實施過程、結果和結論。報告的格式並無特定要求，報告的頁數應以 20 頁為上限。
3. 獲選計畫所產出之研究成果，若於國際會議、學術期刊等發表或於報章雜誌、社群媒體露出，應加註接受本計畫獎助字樣。如果與 NVIDIA SA 團隊進行了合作，則應在論文中將 NVIDIA 團隊列為共同作者。
4. 其他如因中心或 NVIDIA 既有的原始創新技術透過此次計畫而發展的智財權，其歸屬問題，須視雙方貢獻及與中心事先溝通協議的內容議定之。

## NVIDIA Corporation–National Tsing Hua University Joint Innovation Center and High-Performance Computing Application Research Program

1. Background: The establishment of the NVIDIA Corporation–National Tsing Hua University Joint Innovation Center aims to promote the development and application of artificial intelligence research technology in Taiwan and foster talent. The primary goal of this call-for-project is to connect NVIDIA's high-performance GPU computing resources with National Taiwan University's interdisciplinary research teams, jointly pushing forward the development and application of artificial intelligence technology in Taiwan. It is hoped that this proposal can accelerate the development and realization of AI application technologies and simultaneously cultivate more outstanding talent in artificial intelligence.

### 2. Call for Topics:

- Generative AI and Digital Twins Applications: Applications related to Generative AI and Digital Twins, including but not limited to its use in music, computer vision, finance, law, and other areas.
- Large Language Models: Technical developments and research related to large language models in speech processing and natural language processing. Also, the application of large language model technologies in various practical scenarios.
- Physics-Informed Neural Networks: Development of Physics-Informed Neural Networks (PINN) for scientific computation. This integrates the causal relationships described by governing partial differential equations (PDEs) in physics with simulation data from CAE solvers or observational data. Relevant in areas like fluid mechanics and electromagnetism.
- Quantum Computing Simulation: Research in quantum computing simulation, for instance, assisting researchers in simulating quantum systems on classical computers to explore the potential of quantum computing.
- Drug Discovery: Research related to drug development, such as leveraging deep learning for drug molecule design, protein structure prediction, and other aspects.
- Healthcare: Medical-related research and applications, aimed at enhancing diagnostic and therapeutic outcomes.
- Other Topics Related to NVIDIA SDK<sup>2</sup>: Innovative applications developed using the technologies and tools provided by NVIDIA SDK, preferably those requiring large-scale computation.

---

<sup>2</sup> Below are examples introducing several NVIDIA SDKs for reference:

- [NVIDIA NeMo Framework](#): This framework focuses on various directions in speech processing and natural language processing to meet the needs of a wide range of practical applications.
- [NVIDIA BioNeMo](#): This platform combines deep learning techniques for drug molecule design, protein structure prediction, and more, promoting cross-collaboration between biotechnology and drug research.

3. Qualifications for the principal investigator: Assistant professors or higher from National Tsing Hua University. There are no qualification restrictions for co-principal investigators.

4. Application Method: From the announcement date until **Jun. 30, 2024**, please email the application form (see attached file for details) to michael\_peng@lsalab.cs.nthu.edu.tw

5. Review Process: The project review will be based on three main assessment criteria.

- High-speed Computing Demand and Use of NVIDIA SDK: The assessment will focus on the application's requirement for high-performance computing, giving priority to research applications that necessitate extensive GPU computing resources, and how effectively the application plan utilizes the NVIDIA SDK in its research.
- Project Impact: The evaluation will consider the anticipated impact of the application plan on various fields such as science, engineering, or society.
- Project Feasibility: This includes assessing whether the research plan is practically feasible, such as whether there is a feasible experimental design, sufficient time and resources to complete the research, etc.

A total of five places are expected to be offered for this call-for-project. The committee will complete the review process and announce the results by **Aug. 31, 2024**. The project can last up to 3 months, with a recommended start date no earlier than **Jan. 1, 2025**.

6. Resource: Each selected research project will receive up to three months of computational resource assistance, according to the needs stated in its application and the review results. NVIDIA's professional Solution Architect (SA) team will offer technical guidance. During the execution of the entire core research plan, the SA team will provide technical support during business hours. To obtain the usage rights of computing resources, each selected research project must have at least one member become a contractor of NVIDIA. This member will act as the primary contact person between the team and NVIDIA and will be responsible for handling relevant usage rights matters.

7. Rights and Obligations

- Each research project should cooperate as per the NVIDIA Corporation–National Tsing Hua University Joint Innovation Center 's requirements, assisting in understanding and monitoring the project's progress. This includes planning for academic research exchanges, scheduling, and updates on research progress.

---

- [NVIDIA Modulus](#): Developed for applications of Physics-Informed Neural Networks (PINN) in scientific computation.

- [NVIDIA CUDA Quantum](#): Assists researchers in simulating quantum systems on conventional computers.

- [NVIDIA CLARA](#): Pertains to medical research and applications to help enhance diagnosis and treatment outcomes.

- Within two months of the project's completion, a final report must be submitted. This report should encompass detailed information about the entire project, including but not limited to its objectives, methods, implementation process, findings, and conclusions. The report has no specific format, but its length should be at most 20 pages.
- Any research outcomes from the selected project, if published in international conferences, academic journals, newspapers, magazines, or exposed on social media, should include a note acknowledging the support from this program. If a collaboration with the NVIDIA SA team has occurred, they should be listed as co-authors in the publication.
- For intellectual property rights arising from original innovative technologies of the NVIDIA Corporation–National Tsing Hua University Joint Innovation Center or NVIDIA developed through this project, ownership issues will be determined based on the contributions of both parties and the pre-established agreement.