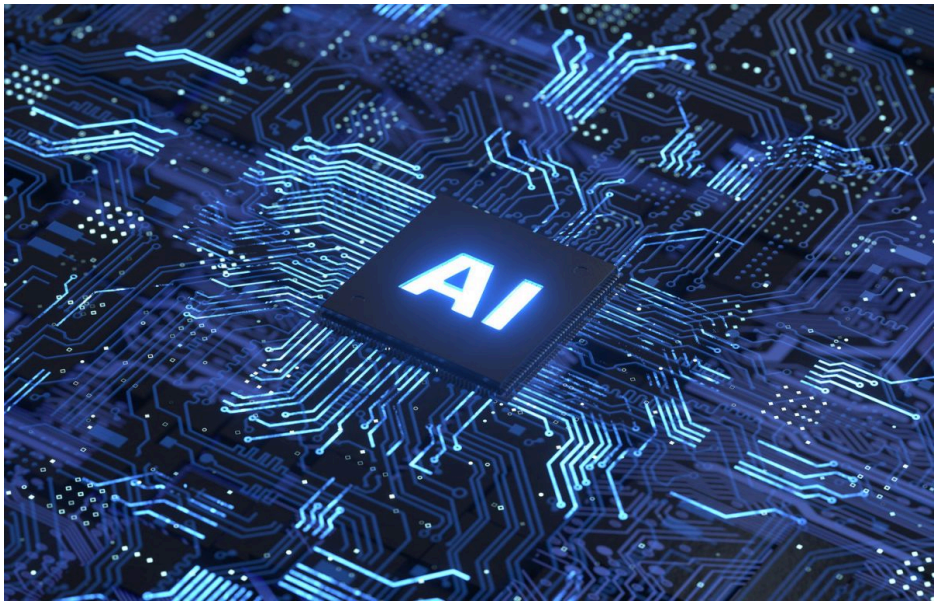
Quantum Leap: NVIDIA's Semiconductor Revolution

Thomas Jefferson Model United Nations Conference

TechMUN XXXII



High School Specialized Committee

Co-Chairs: Ishan Ajwani & Gia Irudhayanathan

Specialized Director: Anmol Karan

Thomas Jefferson High School for Science and Technology

April 11th - 12th, 2025

Esteemed Delegates,

Welcome to the Quantum Leap: NVIDIA's Semiconductor Revolution committee at TechMUN XXXI this April! We're excited for a weekend of lively debate and unique solutions.

In regards to the types of delegates we're looking for, we want individuals who can bring creativity to the table and make a real impact, both in their speeches and while collaborating with fellow delegates. Leadership matters, but we're more interested in leaders who can inspire collaboration, especially across alliances, and fresh ideas. This conference is your chance to think outside the box and come up with innovative solutions that can shape the direction of the committee. Don't be afraid to take calculated risks and explore new approaches.

No matter your background or experience level, our goal is to make sure TechMUN XXXII is a conference you'll remember. If you have any questions don't hesitate to contact us at nvidiatechmun2025@gmail.com Let's make this conference a memorable experience filled with creativity and teamwork!

Best regards,

Ishan Ajwani, Gia Irudhayanathan, and Anmol Karan

Topic 1: The AI Chip Divide

Background:

Artificial Intelligence (AI) is revolutionizing industries, from healthcare to finance, and its capabilities are increasingly tied to specialized AI chips that power machine learning models. At the forefront of AI chip development is NVIDIA, whose graphics processing units (GPUs) have become the backbone of AI computation. However, as AI continues to shape the global economy, control over AI hardware has emerged as a critical geopolitical and economic issue. The global AI chip market is currently dominated by a few key players: NVIDIA, AMD, Intel, and emerging competitors like Google (with its Tensor Processing Units, or TPUs) and China-based firms such as Huawei and Biren Technology. NVIDIA, in particular, has established itself as the undisputed leader, with its CUDA software ecosystem creating a near-monopoly over AI model training and deployment. As AI advances, concerns grow over whether NVIDIA's dominance will exacerbate the technological divide between nations and corporations or whether it will fuel innovation that benefits all.

Current Situation:

In recent years, NVIDIA has solidified its leadership in AI hardware, with its GPUs and AI accelerators powering major AI models such as OpenAI's GPT series. However, this dominance raises concerns about accessibility and competition. Many AI companies, startups, and even national governments find themselves dependent on NVIDIA's hardware and software, leading to fears of a widening gap between those with access to cutting-edge AI technology and those without.

At the national level, the U.S. government has restricted the export of advanced AI chips to China, citing national security concerns. This has prompted China to accelerate domestic AI

chip development, investing heavily in companies like SMIC and Huawei to create competitive alternatives. Meanwhile, European nations and other governments have begun exploring policies to secure AI chip supply chains and reduce reliance on U.S. companies. Additionally, private companies and research institutions face challenges in acquiring the necessary AI hardware due to high costs and supply chain constraints. The concentration of power in the hands of a few corporations raises questions about whether AI chip development should remain in the domain of private companies or if governments or international bodies should play a more significant role in ensuring fair access.

At the core of this issue is the increasing dependence on AI chips, which are not only expensive but also restricted by supply chain limitations. Countries without their own AI chip production rely on imports, making them vulnerable to trade restrictions, sanctions, or geopolitical conflicts. If only a few companies and nations control access to these critical components, AI development could become an exclusive tool of economic and military superpowers, leaving developing nations and smaller businesses struggling to keep up. The question remains: should AI chip production be regulated to ensure fair access, or should competition naturally drive innovation and distribution?

Possible Solutions:

One approach to addressing the AI chip divide is increasing investment in diverse AI chip manufacturing. Governments could provide funding and incentives for alternative AI chipmakers to foster a more competitive market. By supporting companies developing specialized chips, such as Google's TPUs or startups working on AI-specific architectures, the reliance on a single dominant player like NVIDIA could be reduced, leading to a more balanced ecosystem.

Another potential solution is the regulation of AI hardware access. Policymakers could introduce measures that ensure equitable distribution of AI chips, preventing a scenario in which only the wealthiest corporations or nations control access to this critical technology. This could involve setting quotas, creating an AI hardware licensing system, or encouraging international cooperation to establish fair distribution frameworks. Encouraging the development of open-source AI hardware initiatives could also be transformative. Just as open-source software has democratized AI development, an open-source approach to AI chip design could make the hardware more accessible and customizable. Organizations such as RISC-V are already promoting open-source processor architectures, and expanding similar efforts into AI chips could break down barriers to entry for smaller companies and researchers. Governments may also consider antitrust regulations to prevent monopolistic behavior in the AI chip industry. If NVIDIA's dominance continues unchecked, regulators might impose stricter policies, such as requiring interoperability standards, breaking up certain business units, or limiting exclusive software-hardware integration. Such measures could encourage competition while ensuring that innovation remains a priority.

Finally, national AI chip programs could serve as a long-term strategy for countries looking to secure their AI hardware supply. Nations could invest in domestic semiconductor production, reducing reliance on foreign AI hardware and mitigating risks associated with geopolitical tensions. The U.S., China, and the European Union have already begun taking steps in this direction, but further collaboration and investment will be necessary to achieve self-sufficiency in AI chip production.

Questions to Consider:

- Will NVIDIA's continued dominance create an irreversible technological divide, or will competition and innovation catch up?
- Should AI chip development be controlled by private corporations, governments, or an international regulatory body?
- Would antitrust regulations against NVIDIA encourage a more competitive market, or would they hinder technological progress?

Helpful Links:

https://www.britannica.com/technology/artificial-intelligence

https://www.nvidia.com/en-us/

https://www.forbes.com/sites/forbestechcouncil/2023/05/10/ai-chip-war-the-global-race-for-artificial-intelligence-dominance/

https://www.techrepublic.com/article/ai-chip-shortage-global-supply-crisis/

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"Artificial Intelligence," Encyclopaedia Britannica, https://www.britannica.com/technology/artificial-intelligence(accessed March 3, 2025).

NVIDIA Corporation, "Company Overview," https://www.nvidia.com/en-us/ (accessed March 3, 2025).

Reuters, "NVIDIA and US-China Chip Restrictions," https://www.reuters.com/technology/nvidia-chips-us-china-restrictions-2023/ (accessed March 3, 2025).

Forbes Tech Council, "AI Chip War: The Global Race for Artificial Intelligence Dominance," https://www.forbes.com/sites/forbestechcouncil/2023/05/10/ai-chip-war-the-global-race-for-artificial-intelligence-dominance/ (accessed March 3, 2025).

Topic 2: The Quantum Security Crisis

Background:

Just like the Industrial Revolution, digital computers, the Internet, and AI, quantum computing represents a paradigm shift in modern technology; one with the ability to revolutionize how we approach various fields like materials science and computer systems. However, while the potential of quantum computing may be endless, it also presents a particularly concerning risk to modern encryption. Nearly all browsers, operating systems, messaging apps, and even cryptocurrencies that you and I use rely on cryptography algorithms such as RSA and ECC. These algorithms guarantee security by utilizing "the difficulty of factoring the large composite number formed by the product of two prime numbers – a widely recognized difficult computational problem." (SecureW2) To brute force such an encryption, a classical computer would take somewhere in the order of millions of years, while with a quantum computer, it has been estimated that it would take only around 104 days ("Quantum Computers Could Crack Encryption Sooner Than Expected with New Algorithm"). It is clear that even the most advanced of modern cryptography algorithms could be rendered obsolete by quantum powered computers, which would leave data, national defense, and global stability extremely vulnerable.

The problem largely concerns companies and research institutions that are developing quantum chips, especially big tech corporations like IBM, Google, and NVIDIA ("Quantum Computing Companies"). These companies aspire to innovate quantum technology capable of solving previously unsolvable problems, yet risk mass decryption that puts secure communications, financial transactions, and classified government data in danger. If either state-sponsored or independent malicious actors manage to obtain these advanced decryption

tools before countermeasures are made, catastrophic consequences impacting billions could follow.

Current Situation:

Companies all around the globe are undoubtedly pushing harder for “quantum supremacy,” with over $44.5 billion being invested annually, a number projected to double in the next decade. Google’s Willow chip “performed a standard benchmark computation in under five minutes that would take one of today’s fastest supercomputers 10 septillion (that is, 1025) years — a number that vastly exceeds the age of the Universe” ("Meet Willow, Our State-of-the-Art Quantum Chip"), while IBM has made their 127-qubit quantum systems free to use by the public ("IBM Quantum Computing"). Governments are also pouring large sums of money into quantum research, hoping to gain an edge in both computing and cybersecurity. Quantum computers are not yet capable of decrypting modern algorithms, but the innovation of companies like Google and IBM is advancing at a rapid rate. In fact, the expert consensus is that around 2030, they could become powerful enough to break essentially all current encryption systems. (Parker). Because of this, governments and cybersecurity organizations are now developing post-quantum cryptography standards which will act as countermeasures to the power of quantum computing. The National Institute of Standards and Technology (NIST) has already begun picking new encryption algorithms that are quantum-resistant.

However, this approach doesn’t account for the “harvest now, decrypt later” strategy, which is a current concern that hackers or foreign intelligence agencies may already be collecting vast amounts of encrypted data in anticipation of future quantum decryption. Even if quantum computers cannot yet break encryption, sensitive financial, military, and personal information

stored today could become vulnerable within the next decade. This creates a race between quantum computing advancements and the development of quantum-resistant encryption, forcing governments and tech companies to act before quantum technology renders current cybersecurity measures obsolete. Complicating matters further is the question of responsibility. Should companies pioneering quantum chips be held accountable for ensuring their technology is not weaponized? Should governments impose restrictions on quantum research to prevent potential misuse? Or would such restrictions hinder scientific progress and economic competition in an emerging technological field?

Possible Solutions:

One approach to this problem is the rapid development of post-quantum cryptography, as attempted by the NIST. Governments and private sector leaders will need to collaborate to create new encryption standards capable of securing data even against quantum threats. Regulation is another approach that could be taken to solve this issue. Governments might choose to restrict the development and distribution of quantum chips, which would ensure they do not fall into the wrong hands. However, this could also limit innovation and anger large tech corporations. Other strategies include international cooperation and strict ethical and security standards. These are only a few approaches to the complex issue that is quantum security, and ultimately a good solution will require extensive collaboration and a unique perspective to tackle this issue.

Questions to Consider:

- Should governments enforce restrictions on quantum chip development to prevent unauthorized decryption of sensitive data?

- How can global institutions prepare for a post-quantum cybersecurity landscape, and who should lead these efforts?
- Should corporations like NVIDIA be responsible for ensuring their quantum chips are not misused for cyber warfare?

Helpful Links:

- https://www.informationweek.com/cyber-resilience/what-s-new-and-worrisome-in-quantum-security-
- https://www.forbes.com/councils/forbestechcouncil/2024/10/01/in-the-race-for-quantum-security-crypto-agility-is-key/
- https://www.quantum.gov/security/

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"Quantum Computing Companies." BlueQubit, https://www.bluequbit.io/quantum-computing-companies. Accessed 17 Mar. 2025.

"Meet Willow, Our State-of-the-Art Quantum Chip." *Google*, https://blog.google/technology/research/google-willow-quantum-chip/. Accessed 17 Mar. 2025.

"IBM Quantum Computing." *IBM*, https://www.ibm.com/quantum. Accessed 17 Mar. 2025.

Parker, Edward. "When a Quantum Computer Is Able to Break Our Encryption, It Won't Be a Secret." *RAND Corporation*, 13 Sept. 2023, https://www.rand.org/pubs/commentary/2023/09/when-a-quantum-computer-is-able-to-break-our-encryption.html. Accessed 17 Mar. 2025.

Dossier

Note: All characters listed are real figures who are related to events that might transpire during committee.

Howard Lutnick (U.S. Secretary of Commerce)
As the head of the U.S. Department of Commerce, Lutnick plays a central role in shaping policies that govern trade, technology, and economic growth. His influence extends to semiconductor supply chains, export controls, and technological competitiveness, making him a key voice in discussions on international trade regulations and innovation incentives.

Andrew N. Ferguson (Chair of the U.S. Federal Trade Commission)
Leading the FTC, Ferguson is responsible for ensuring fair competition and enforcing antitrust laws, particularly in the technology sector. His role is crucial in addressing concerns about monopolistic practices, market consolidation, and the regulatory challenges of AI and semiconductor advancements.

Jin Zhuanglong (Chinese Minister of Industry and Information Technology)
Overseeing China's industrial and technological development, Jin Zhuanglong is instrumental in guiding the country's semiconductor policies and AI advancements. His presence in the committee reflects China's strategic interests in securing semiconductor self-sufficiency and maintaining global competitiveness in high-tech industries.

Margrethe Vestager (European Commissioner for Competition)
As the EU's chief enforcer of competition laws, Vestager has been at the forefront of antitrust actions against major tech firms. Her perspective will be critical in ensuring that the semiconductor and AI industries remain competitive, preventing monopolies and safeguarding European economic interests.

J.W. Kuo (Taiwanese Minister of Economic Affairs)
Representing Taiwan, a global leader in semiconductor manufacturing, Kuo plays a vital role in shaping economic policies that impact the supply chain of AI chips. With Taiwan's dominance in chip fabrication through TSMC, his insights are essential for discussions on global supply stability and trade relations.

Shri Ashwini Vaishnaw (Indian Minister of Electronics and Information Technology)
Vaishnaw oversees India's rapidly growing tech sector, digital infrastructure, and semiconductor initiatives. As India positions itself as a key player in electronics manufacturing, his role in the committee will focus on fostering domestic semiconductor production and ensuring equitable access to advanced technologies.

Maksut Shadaev (Russian Minister of Digital Development, Communications, and Mass Media)
Responsible for Russia's digital infrastructure and technological policies, Shadaev provides a perspective on how AI and semiconductor developments align with national interests in cybersecurity, communications, and state-controlled technological advancements.

Paul Chichester (Director of the U.K. National Cyber Security Centre)
As a cybersecurity expert leading the UK's national defense against cyber threats, Chichester's role in the committee will emphasize protecting AI infrastructure, semiconductor supply chains, and critical data from cyberattacks and foreign espionage.

Israel Katz (Israeli Minister of Defense)
Overseeing Israel's defense and security strategies, Katz brings expertise in military applications of AI and quantum computing. His presence ensures discussions include national security concerns, cybersecurity threats, and the role of semiconductor technologies in modern warfare.

Muto Yoji (Japanese Minister of Economy, Trade, and Industry)
As the head of Japan's economic policies, Muto Yoji is responsible for maintaining Japan's leadership in semiconductor innovation and trade. His insights are critical in navigating economic partnerships and securing Japan's role in global semiconductor supply chains.

Yoo Sang-Im (South Korean Minister of Science and ICT)
Leading South Korea's initiatives in AI, semiconductors, and digital communications, Yoo Sang-Im provides expertise on Korea's role as a technological powerhouse. His contributions will focus on advancing semiconductor research, balancing trade interests, and strengthening digital policies.

Amandeep Singh Gill (UN Under-Secretary-General for Technology)
Representing the UN's interests in technological sustainability and global cooperation, Gill ensures that AI and semiconductor developments align with ethical guidelines and equitable access. His presence promotes international dialogue on AI governance and responsible technological progress.

Jensen Huang (CEO of NVIDIA)
As the co-founder and CEO of NVIDIA, Huang has played a transformative role in the AI and semiconductor revolution. His leadership in GPU and AI chip innovation positions him as a crucial figure in discussions on computing power, AI acceleration, and industry growth.

Lisa Su (CEO of AMD)
Leading one of the most competitive semiconductor companies, Su has driven AMD's advancements in high-performance computing and AI-driven processors. Her perspective on competition, innovation, and supply chain resilience will be pivotal in shaping semiconductor policies.

Michelle Johnston (CEO of Intel)
As the head of Intel, Johnston oversees one of the world's largest semiconductor manufacturers. Her contributions to the committee will focus on AI hardware, chip security, and maintaining the U.S.'s leadership in semiconductor production.

Sundar Pichai (CEO of Google)
Under Pichai's leadership, Google has spearheaded AI innovations through its cloud computing and deep-learning research. His participation in the committee will highlight AI's role in shaping global economies and the ethical considerations surrounding AI-powered technologies.

Satya Nadella (CEO of Microsoft)
Nadella has positioned Microsoft as a leader in AI, cloud computing, and enterprise solutions. His contributions will address the impact of AI on business, security, and the workforce, emphasizing responsible AI deployment.

Elon Musk (CEO of xAI and Tesla)
A controversial yet influential entrepreneur, Musk leads companies at the forefront of AI (xAI), electric vehicles (Tesla), and space exploration (SpaceX). His input will challenge traditional perspectives on AI's future, automation, and its impact on industries beyond semiconductors.

Sam Altman (CEO of OpenAI)
Altman heads OpenAI, one of the most advanced AI research organizations. His participation will bring insights into AI safety, ethics, and the future of artificial general intelligence (AGI).

Arvind Krishna (CEO of IBM)
As the leader of IBM, Krishna focuses on AI, quantum computing, and cloud technologies. His expertise in these fields will contribute to discussions on quantum threats to encryption and AI's enterprise applications.

Tim Teter (Chief Legal Officer of NVIDIA)
As NVIDIA's top legal executive, Teter ensures the company's compliance with global regulations and intellectual property laws. His role in the committee will be essential in navigating international trade policies and legal challenges surrounding semiconductor patents.

C.C. Wei (CEO of TSMC)
At the helm of the world's most advanced semiconductor manufacturing company, Wei plays a critical role in global chip supply chains. His contributions will shape discussions on supply resilience, technological sovereignty, and future chip manufacturing trends.

Sabrina Meng (Rotating Chairman of Huawei)
As a leader within Huawei, Meng oversees the company's telecommunications and semiconductor strategies. Her participation will highlight China's ambitions in AI, 5G, and semiconductor self-sufficiency.

Young Hyun Jun (CEO of Samsung Electronics Device Solutions Division)
Heading Samsung's semiconductor division, Jun brings expertise in memory and logic chip production. His insights will influence debates on AI chip efficiency, supply chains, and South Korea's role in semiconductor advancements.

Bruce Schneier (Cybersecurity Expert & Cryptographer)
A leading voice in cybersecurity, Schneier specializes in cryptographic security and AI safety. His expertise will contribute to discussions on securing semiconductor supply chains, protecting AI models from adversarial attacks, and ensuring ethical AI development.

Alex Stamos (Former Facebook CSO & Cybersecurity Consultant)
As a former Chief Security Officer at Facebook, Stamos has deep insights into securing AI infrastructure and protecting against cyber threats. His participation will be critical in addressing concerns about AI-powered cyber warfare and digital espionage.

Hao Li (Deepfake & AI Manipulation Expert, CEO of Pinscreen)
Li is a pioneer in AI-driven deepfake technology and digital manipulation. His insights will shape discussions on AI-generated misinformation, the ethics of synthetic media, and countermeasures against AI-driven deception.

Dawn Song (Professor at UC Berkeley, AI & Security Researcher)
A renowned AI and security expert, Song specializes in adversarial machine learning and privacy-preserving AI. Her role in the committee will highlight vulnerabilities in AI models and methods to secure them against manipulation.

Stuart Russell (AI Safety Researcher, Professor at UC Berkeley)
Russell is a leading researcher in AI alignment and safety. His contributions will emphasize the risks of advanced AI systems, ethical considerations in AI governance, and ensuring AI remains beneficial for humanity.

Mikko Hyppönen (Chief Research Officer at WithSecure, Cybersecurity Expert)
A veteran cybersecurity expert, Hyppönen has decades of experience in cyber threats and malware research. His insights will be essential in addressing AI-driven cyberattacks and protecting AI-powered critical infrastructure.

Gary Marcus (AI Ethics Advocate & Professor at NYU)
A vocal critic of unchecked AI development, Marcus argues for responsible AI governance and regulatory frameworks. His role will focus on ethical AI deployment, avoiding bias in AI systems, and ensuring transparency in AI research.

Kate Crawford (AI Researcher & Co-founder of AI Now Institute)
Crawford specializes in AI's societal impacts, including bias, discrimination, and ethical concerns. Her participation will center on AI's role in amplifying social inequalities and the need for better governance.

Timnit Gebru (Founder of DAIR, AI Bias Researcher)
A former Google AI researcher, Gebru has been a leading voice in exposing bias in AI systems. She will advocate for increased accountability in AI model development and equitable representation in AI-powered technologies.

Zachary Arnold (Policy Researcher at the Center for Security and Emerging Technology)
Arnold studies national security implications of AI and emerging technologies. His contributions will focus on how AI and semiconductor advancements impact global power dynamics and military strategies.

Marietje Schaake (Former EU Parliament Member & AI Policy Expert)
Schaake has worked extensively on AI policy, privacy, and tech regulation in the European Union. Her perspective will be vital in ensuring balanced AI policies that promote innovation while protecting civil liberties.

Rumman Chowdhury (CEO of Humane Intelligence, AI Ethics & Bias Expert)
Chowdhury's work focuses on making AI systems accountable and fair. She will advocate for AI auditing mechanisms, regulatory oversight, and safeguards against algorithmic discrimination.

Kai-Fu Lee (AI Investor & CEO of Sinovation Ventures)
As a former Google China executive and AI venture capitalist, Lee has deep knowledge of China's AI ecosystem. His participation will highlight China's role in AI entrepreneurship, investment strategies, and technological self-reliance.

Fei-Fei Li (Professor at Stanford, AI Researcher & Former Google Cloud AI Lead)
A pioneer in deep learning and computer vision, Li's expertise is crucial in shaping discussions on AI's real-world applications, from healthcare to robotics.

Demis Hassabis (CEO of DeepMind)
As the co-founder of DeepMind, Hassabis has driven major breakthroughs in AI, including AlphaFold and reinforcement learning. His insights will focus on AI's transformative potential and its long-term impact on scientific discovery.

Yoshua Bengio (AI Pioneer, Professor at University of Montreal)
Bengio is one of the “godfathers of deep learning.” His contributions will emphasize AI safety, ethics, and the future trajectory of artificial intelligence research.