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**ARTIFICIAL INTELLIGENCE (AI)
BOOT CAMP**

Patent and Trade Secret Protection for Inventions that Use AI

December 8, 2022

David V. Sanker, Ph.D. and Jenn Wang, Ph.D.



Presenters



Andrew J. Gray IV



David V. Sanker, Ph.D.



Jenn Wang, Ph.D.

Morgan Lewis



Presentation Overview

- Background in Artificial Intelligence (AI)
- Patents, Trade Secrets, and Strength/Weakness
- General Rules for Selecting Patents or Trade Secrets for Protection of AI technology
- Detection of Infringement or Misappropriation
- Additional Considerations

Background in Artificial Intelligence (AI)

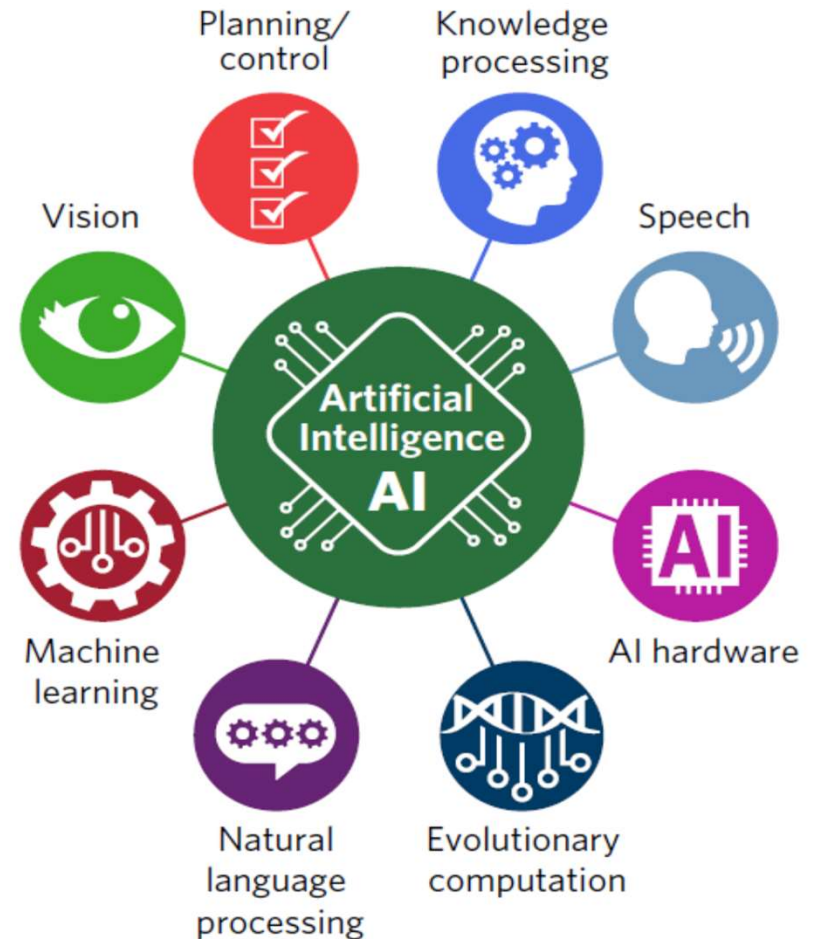
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Background in Artificial Intelligence

The term “Artificial Intelligence” is very broad.

Most inventions that use AI are using machine learning, so the presentation today focuses on machine learning.

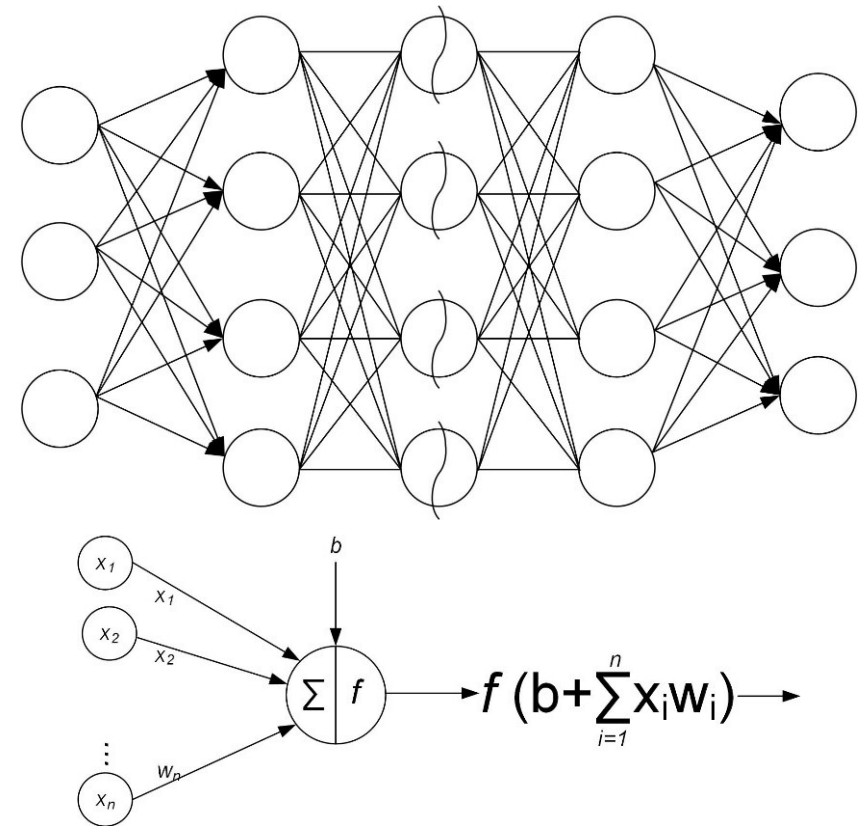
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Background in Artificial Intelligence – Neural Network (NN)

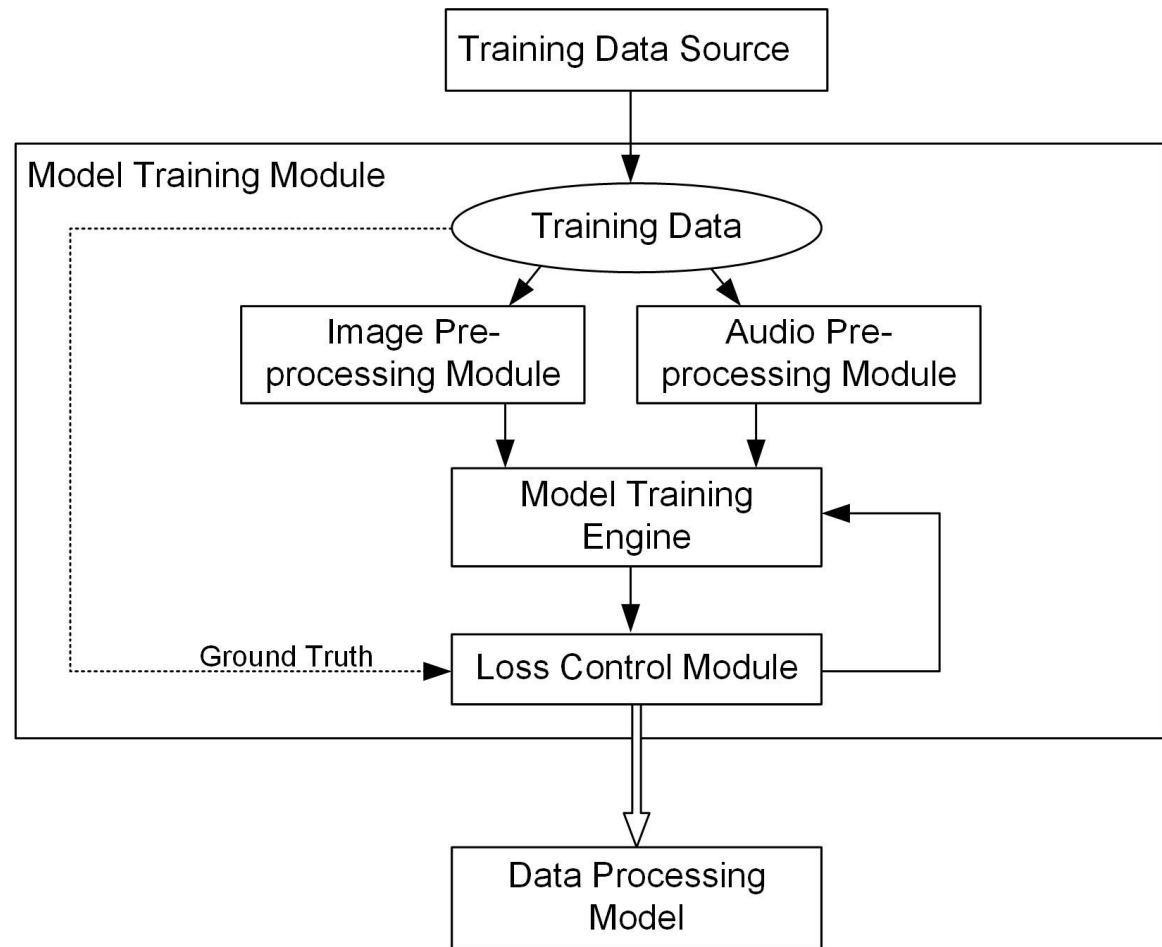
- Types of NNs: (abstract idea)
 - ❑ Multilayer Perceptron (MLP)
 - ❑ Convolutional Neural Network (CNN)
 - ❑ Recurrent Neural Network (RNN)
 - ❑ Others: Perceptron, Feed Forward Neural Network, Radial Basis Functional Neural Network, LSTM – Long Short-Term Memory, Sequence to Sequence Models, Modular Neural Network
- Applications: (non-abstract idea)
 - ❑ Image, Audio, Video, Text Processing
 - Autonomous Driving
 - Extended reality (augmented reality)
 - Real time translation
 - ❑ Prediction and forecasting (weather, stock market)

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Background in Artificial Intelligence - Training

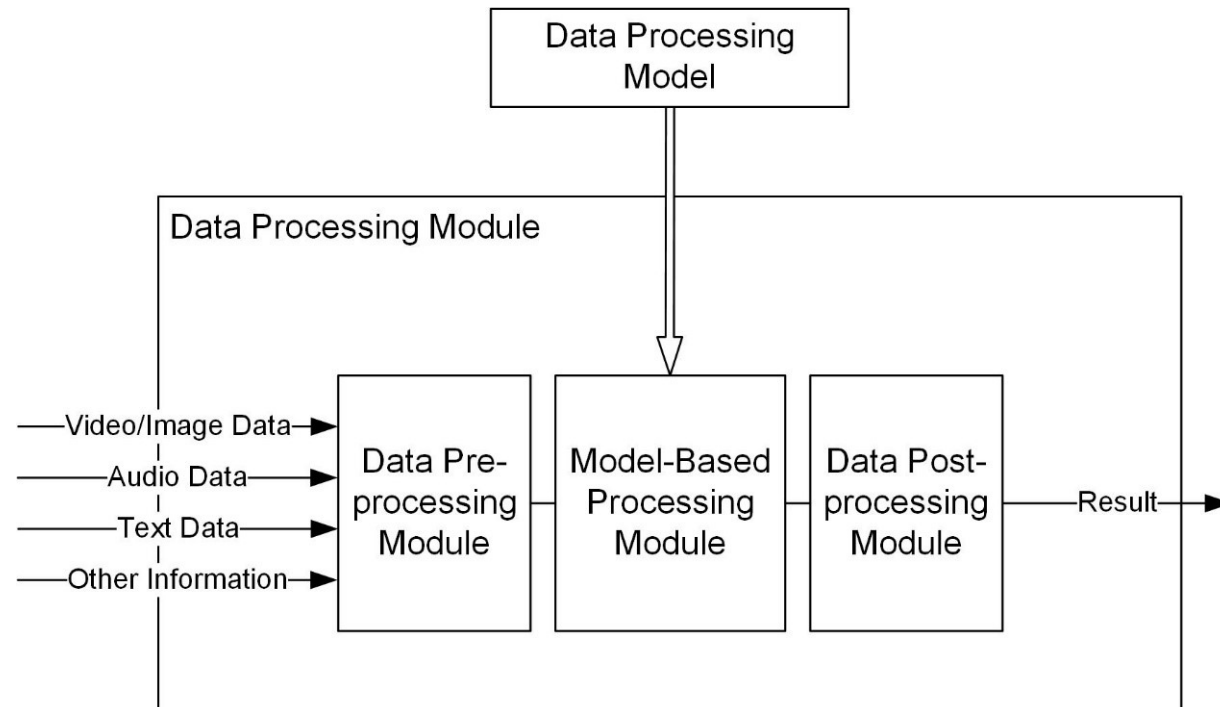
- Takes place on (1) a server, (2) electronic device, or (3) both
- Supervised, semi-supervised, or unsupervised training
- Examples of inventive ideas that achieve efficient training and accurate NN model:
 - **Training data augmentation**
 - Special loss function
 - Ground truth management
 - Model pruning and quantization



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Background in Artificial Intelligence - Inference

- Takes place on (1) an electronic device, (2) a server, or (3) both
- Examples of inventive ideas:
 - Input data structure (e.g., 3 successive images or a sequence of images, or an image + keywords extracted from a prior audio item)
 - Data pre-processing (e.g., divide an input into tiles)
 - Novel application of a type of NN model in a specific context
 - Modification of NN for a context (e.g., skip connection redefined for U-Net)
 - Pull out intermediate data of NN to add additional cross-channel processing
 - Data post-processing (e.g., combine with the input image before processing with an output layer, or organize translated text adaptively)



Patents, Trade Secrets, and Strength/Weakness

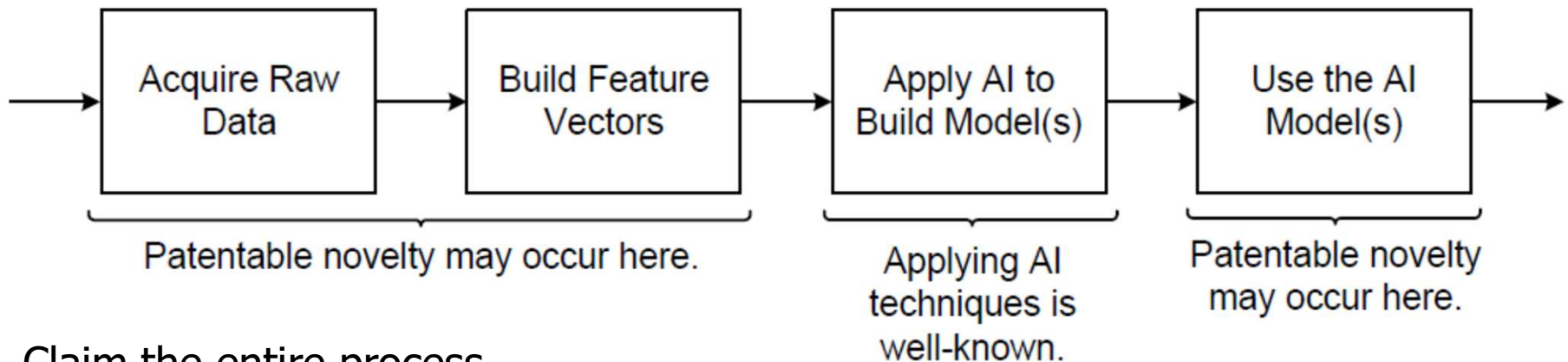
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Patenting Inventions that use AI

“How can I patent my invention when I am using existing Artificial Intelligence tools?”

You patent the overall process, not just the AI.

Inventions That Use AI – Simplified Framework



- Claim the entire process
- Focus on inventive aspects (input data, data preprocessing, deep learning model, output data, or post processing). Sometimes, novelty involves multiple aspects in a correlated manner.
 - Focus on one of the most inventive aspects in the independent claim.
 - Address details on other inventive aspects individually in dependent claims.

Background in Patents

1. Section 101 – Patent Eligibility (*Alice Corp. v. Cls Bank Int'l*)

- Many inventions are being rejected for being allegedly directed to an “abstract idea”
 - ❑ Step 1. Is the claim directed to any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof?
 - ❑ Step 2A. Is the claim directed to a law of nature, a natural phenomenon, or an abstract idea? (Judicial Exceptions)
 - ❑ Step 2B. Does the claim recite additional element that amount to significantly more than the judicial exception?
- Show how the invention “improves another technology or technical field, improves the functioning of the computer itself, or adds a specific limitation other than what is well-understood, routine, conventional activity in the field or unconventional steps that confine the claim to a particular useful application.”
- **Patent applications should be closely tied to an application context (e.g., autonomous driving or image processing).**

Background in Patents

2. Section 102 and 103 – Novelty

- At this point, the tools of AI are well-known, and it is fairly obvious to apply AI almost everywhere.

3. Section 112 – Sufficiently Definite

- The claims need to be supported by the specification and figures.
- The claims have to be sufficiently clear.
- Some examiners reject “machine learning model” as being indefinite. However, this can usually be resolved by removing the phrase “machine learning model.” This actually makes the claims broader.

Background in Trade Secrets

What is protectable as a trade Secret?

- 18 U.S.C. § 1839(3) defines “trade secrets” broadly as “all forms and types of financial, business, scientific, technical, economic, or engineering information, including patterns, plans, compilations, program devices, formulas, designs, prototypes, methods, techniques, processes, procedures, programs, or codes, whether tangible or intangible, and whether or how stored, compiled, or memorialized physically, electronically, graphically, photographically, or in writing.” But only if:
 - (A) the owner thereof has taken reasonable measures to keep such information secret; and
 - (B) the information derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable through proper means by, another person who can obtain economic value from the disclosure or use of the information.

Background in Trade Secrets

What is protectable as a trade Secret?

- Trade secret protection is theoretically unlimited in time, and does not require any government approval. Protection can continue as long as the information is kept secret.
- Even when a company takes strict measures to keep information secret, trade secret protection can be lost due to reverse engineering or independent derivation by others.

Protection of AI using Patents

Patent - Advantages (+)

Patentee gets a monopoly for an extended period.

Patents provide security against reverse engineering.

Patents provide security against independent development.

Patent assets are easier to quantify for potential investors (M&A, licensing).

Patent assets provide defensive advantages against litigation risks, cross-licensing, or patent trolling/hoarding.

Patent - Disadvantages (-)

Patenting process requires investment. It could be expensive to secure patent assets.

Patent applications require significant disclosure of technology.

AI technology develop quickly. Patented technology may be obsolete quickly. Patentees need to file patent applications consistently to catch up with the development.

AI patents may be difficult to enforce (e.g., because infringement is hard to detect).

Some AI patents are difficult to obtain.

Protection of AI using Trade Secrets (TS)

TS - Advantages (+)

TS have a low cost to “create” and can be less expensive to keep for an unlimited period.

TS do not require significant disclosure of technology.

AI technology develop quickly without impacting the cost and value of the TS.

TS protection may be available for **IP that is ineligible for patent protection** (e.g., raw data, extracted features, training sets, and inventions made by AI).

TS - Disadvantages (-)

TS do not provide security against reverse engineering.

TS do not provide security against independent development. TS holders can be sued for patent infringement even if the patented invention is conceived and practiced after the TS.

TS require constant diligence and measures to keep confidentiality, which may incur business cost and sometimes conflict with business needs.

AI trade secrets may be difficult to enforce (e.g., because misappropriation is hard to prove).

TS assets are difficult to quantify for potential investors (M&A, licensing).

TS assets do not provide defensive advantages against litigation risks, cross-licensing, or patent trolling/hoarding.

General Rules for Selecting Patents or Trade Secrets for Protection of AI technology

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General Rules for Selecting Patents or Trade Secrets

1. Is there an invention?

- Determination of what is “patent-eligible” can depend on the assigned Examiner.
- Trade secrets should be used to protect IP that is ineligible for patent protection and include raw data, extracted features, training sets, or inventions made by AI.
- If the human contribution is just input data to AI, trade secrets should be used.
 - Example 1: Use an AI system to formulate a metal alloy, starting from an initial specified composition.
 - Example 2: Use an AI system to formulate an integrated circuit (IC) chip based on a supplied sample.

General Rules for Selecting Patents or Trade Secrets

2. Will the invention be publicly visible? (Detectability)

- If people can see the invention, then patent protection is the only option (e.g., a software user interface).
- Reverse engineering is completely legal, so even if the invention is encapsulated in a device (such as a chip used in a smart phone), good engineers and good testing equipment can generally uncover the invention.

General Rules for Selecting Patents or Trade Secrets

3. How easy is it to detect infringement?

- This question generally addresses the same issue as visibility, but expressed in a different way.
- If it is too difficult (or impossible) to identify infringement (even with reverse engineering of potentially infringing products), then a patent would not have much value.
- Infringement evidence can be acquired during litigation discovery, but it could be very costly to pursue litigation only to find there is no infringement.

General Rules for Selecting Patents or Trade Secrets

4. Are non-AI concepts an “Abstract Idea”?

- After the Supreme Court decision in *Alice v. CLS Bank* (2014), Examiners routinely reject patent claims under 35 U.S.C. § 101, asserting that the claims are not even eligible for patent protection.
- Some Examiners reject claims as “Abstract Ideas” even when the claims recite novel, non-obvious, technical inventions.
- Look for technical details and features that are not routine.

5. Can AI invention be reverse engineered or independently developed?

- If so, the invention should be protected by patent applications.

AI Cannot Be an “Inventor” Yet (1)

- AI technology can create new products or processes with little or no human help.
- US patent law is directed to inventions made by humans.
 - Per [35 USC § 100\(f\)](#), “The term ‘inventor’ means the individual or, if a joint invention, the individuals collectively who invented or discovered the subject matter of the invention.”
 - Per [35 USC § 101](#), “Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.”
- The Federal Circuit finally settled this issue—affirming decisions of the US Patent and Trademark Office (USPTO) and Eastern District of Virginia that an AI system cannot be an inventor.
- Courts in the United Kingdom and Australia are aligned with US courts on this issue, and it is reasonably expected that other jurisdictions will reach the same conclusion.

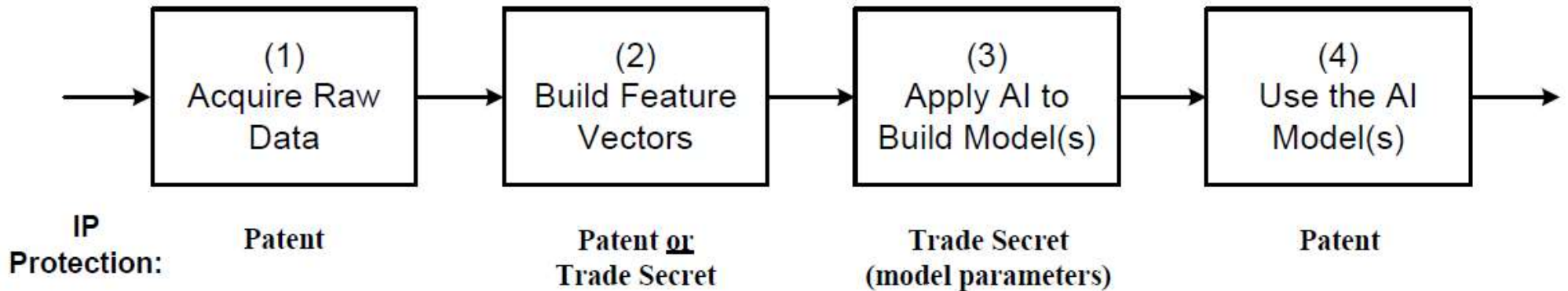
AI cannot Be an “Inventor” Yet (2)

- Current patent laws would need to be modified before AI systems can be designated as inventors.
 - (1) address assignments and declarations, such as allowing a human surrogate to sign assignment and declaration documents on behalf of an AI inventor
 - (2) replace “person having ordinary skill in the art [PHOSITA]” with “ordinary skill in the art [OSITA]” for description requirement and for non-obviousness requirements.
- There may be increased pressure to accommodate AI inventors, but legislative bodies, such as US Congress, are likely to be slow.
- **In the meantime, for AI-created new products or processes, either use trade secret protection or else make sure there is at least one human inventor.**

Should Model Training Be Patented?

- Model training may be novel by (1) applying a new loss function, (2) augmenting application-specific training data, (3) applying techniques to avoid labeling training data, (4) selecting training data to avoid overfitting, and so on.
- If model training is implemented on a server, it would be difficult to detect infringement.
- Patent applications are often filed to protect model training techniques.
 - Some indications can be observed from the final deep learning process or model to guess what unique trainings have been done.
 - This area is simply strategically important. Many publications are going on in this area. Patent applications normally accompany these publications. Also, there is some long-term value for licensing as well.
 - Sometimes, the same training techniques may be applied by a client device to update a machine learning model locally.

Protection Based on Where the Novelty Occurs



- If the novelty is the specific raw data elements, it is difficult to keep as a trade secret.
- If the novelty is the construction of calculated features, it is more likely that the calculation can be kept secret.
- If the novelty is in the use of the AI models (e.g., a user interface), it is typically visible, so trade secret protection is generally not possible.

A Hybrid Approach in Some Cases

What can you do when the choice between patents and trade secrets is not clear?

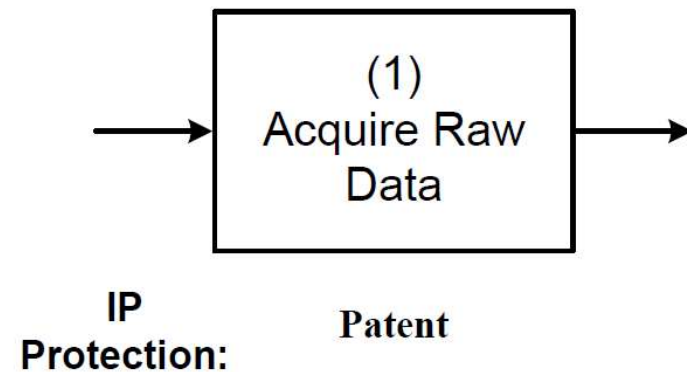
- If the protection is desired just in the United States, prepare and file a patent application, including a non-publication request.
- Continue to protect the invention as a secret.
- At some point in the future (e.g., when the patent application is allowed), decide which protection is better. This is typically 2 – 3 years, which can be enough time to get better information.

Detection of Infringement or Misappropriation

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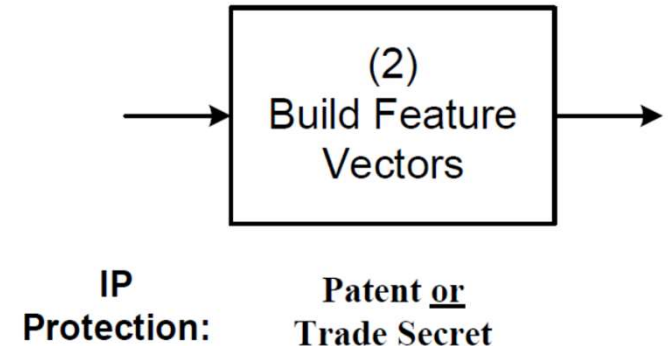
Detecting Infringement or Misappropriation

- When a patent protects the novel raw data elements:
 - Detecting infringement is typically straightforward because the inputs used by infringers are visible.



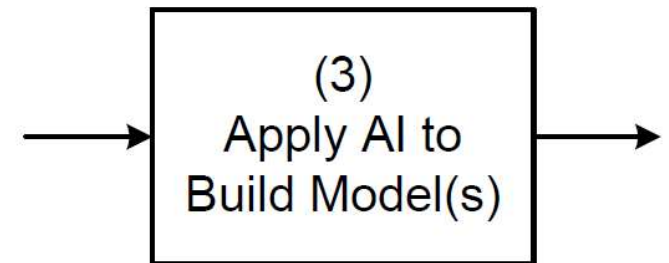
Detecting Infringement or Misappropriation

- When patent or trade secret protection covers some “creative” features calculated from the raw data:
 - It may be difficult to establish infringement or trade secret misappropriation because calculations may be hidden. This is particularly true if the calculations are performed “in the cloud” or other location not directly accessible.
 - Indirect evidence may be necessary to form the basis for a legal complaint.



Detecting Infringement or Misappropriation

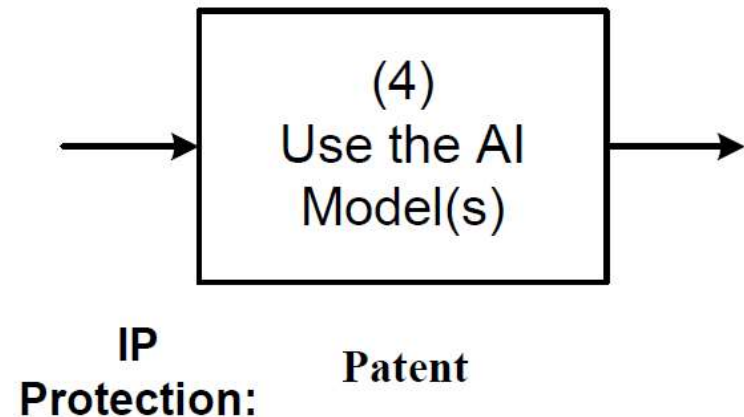
- When trade secret protection covers the constructed AI model (e.g., weights for nodes in a neural network):
 - A trained AI model is valuable, so it can be kept as a trade secret. A competitor is likely keeping their AI models secret too, so proof of misappropriation will generally require discovery.
 - Indirect evidence may be necessary to form the basis for a legal complaint.



IP
Protection: Trade Secret
(model parameters)

Detecting Infringement or Misappropriation

- When a patent covers use of AI output:
 - The usage of AI output is generally visible, so it is usually not difficult to establish infringement



Additional Considerations

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Limits on Trade Secret Protection of “Black Boxes”

- Given enough inputs/output to a black box, testing may reveal what is occurring inside the black box.
- For example, early physicists did not know the interior structure of atoms. However, they were able to determine the structure by blasting enough atoms with high speed particles and observing the results.
- If competitors can discern what you are doing by processing enough inputs and outputs, trade secret protection is at risk.

Worst Case Scenarios for Trade Secret Protection

1. A competitor figures out the trade secret using reverse engineering and/or black box testing. They are able to use the invention freely.
2. A competitor independently develops the same invention, and files a patent application. Even though the competitor was later, you did such a good job protecting your trade secret that your work is not available as prior art. The competitor gets an issued patent and may sue you.
3. A competitor figures out your trade secret by reverse engineering and/or black box testing, and improves on it. The competitor files a patent application on the improved system. It is a useful improvement that you would like to use. Because you have no patent (and no trade secret protection at this point), you have a weak bargaining position to license the improvement.

Other Issues for AI Inventions

1. How does AI affect obviousness analysis (e.g., what is the level of “ordinary skill in the art” when there are advanced AI tools and inventors)?
2. How are patent offices going to adapt to the increasing use of AI? For example, could trade secret protection avoid patent office uncertainty?
3. What constitutes “reasonable measures” to maintain secrecy? Could black box testing combined with an AI system figure out your invention?

How About Protecting Data Instead of an Invention?

- Phrasing the question as “Patents vs. Trade Secrets” assumes that the greatest value is the AI process. That is not always true.
- A system that uses AI may not be patentable. It may be obvious what type of data to use, how to apply the AI, and how to use the output of the AI.
- As a practical matter, it may be impossible to protect a system as a trade secret. If usage of the system allows users to see the inputs and outputs, the system is not very secret.

How About Protecting Data Instead of an Invention?

- In some cases, the best protection is to keep the training data as a Trade Secret.
- Protecting your training data is particularly important when there is substantial work in the first box of the framework. It may take a lot of time and effort to collect and/or classify the raw data.
- The training data is used to build the AI models, so the training data itself is not publicly visible during subsequent usage.
- The training data can be supplemented over time, giving you the opportunity to retrain the machine learning model. You can reuse your secret data.

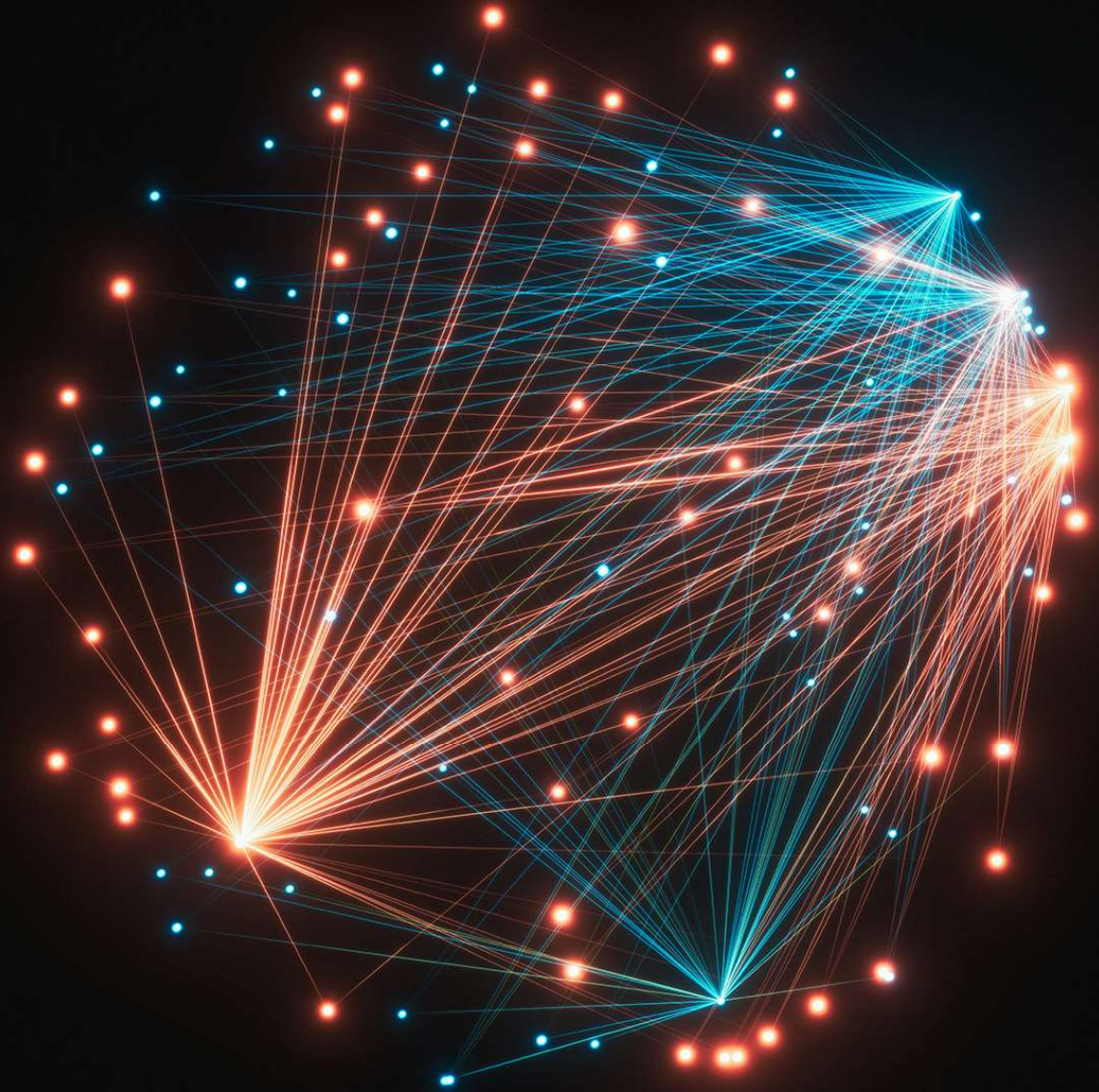
How About Protecting Data Instead of an Invention?

- In some cases, you can keep the model data as a Trade Secret. A trained machine learning model is just a bunch of parameters.
- Protecting the model data is possible regardless of patentability and regardless of whether it is feasible to protect the process as a trade secret.
- One downside risk is reverse engineering the data for the AI models using enough “black box” testing.

Protection of AI Technology using Copyright

- Copyright law affords protection for AI-related software and data (e.g., training images or certain compilations of data)
 - Copyrights on source code can prevent others from: (1) reproducing the source code verbatim to use or distribute to others; (2) reproducing the source code in a different computer language; or (3) (in some circumstances) reproducing features of the source code (such as structure or non-functional features of the source code), even if not copied verbatim from the protected source code.
- A qualifying work is automatically protected by copyright once it has been created. A software developer obtains exclusive right to the software code, for example, the moment the source code is written.
 - The Copyright Act requires registration with the U.S. Copyright Office to enforce a copyright against others.

Questions?



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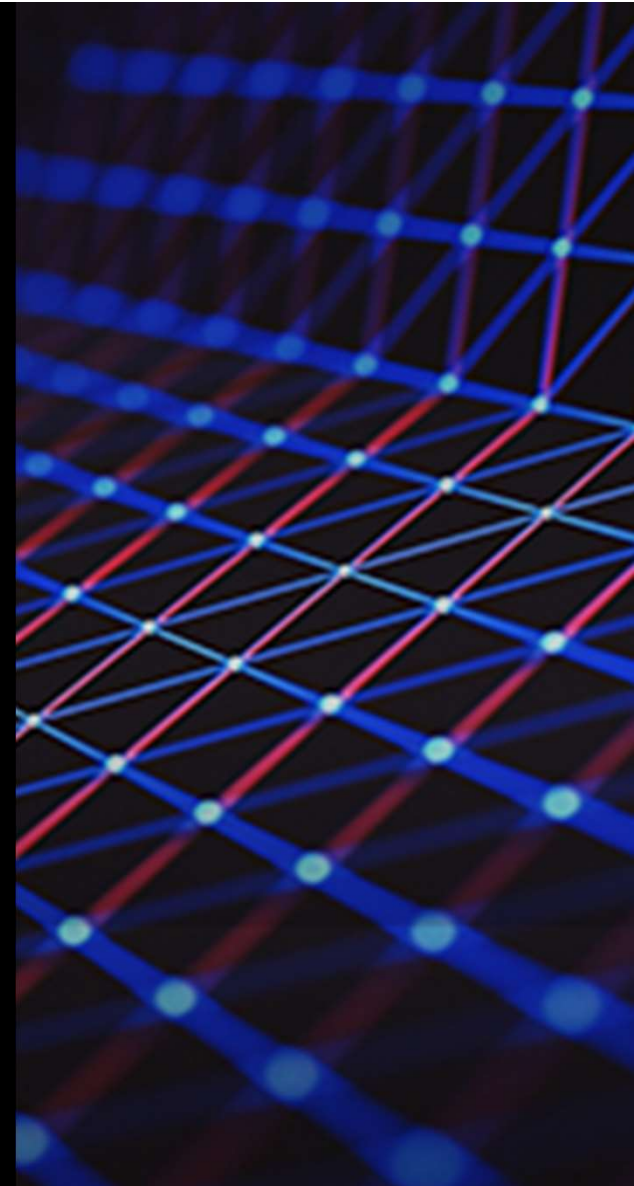
Coronavirus COVID-19 Resources

We have formed a multidisciplinary **Coronavirus/COVID-19 Task Force** to help guide clients through the broad scope of legal issues brought on by this public health challenge.

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To help keep you on top of developments as they unfold, we also have launched a resource page on our website at www.morganlewis.com/topics/coronavirus-covid-19

If you would like to receive a daily digest of all new updates to the page, please visit the resource page to [subscribe](#) using the purple "Stay Up to Date" button.



Biography



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Serving as the leader of the firm's semiconductor practice and as a member of the firm's fintech and technology industry teams, Andrew J. Gray IV concentrates his practice on intellectual property litigation and prosecution and on strategic IP counseling. Andrew advises both established companies and startups on AI, machine learning, Blockchain, cryptocurrency, computer, and Internet law issues, financing and transactional matters that involve technology firms, and the sale and licensing of technology. He represents clients in patent, trademark, copyright, and trade secret cases before state and federal trial and appellate courts throughout the United States, before the US Patent and Trademark Office's Patent Trial and Appeal Board, and before the US International Trade Commission.

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Biography



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Drawing on 12 years of experience in software development and database architecture, David V. Sanker, Ph.D., works with clients to build strong patent portfolios in a variety of areas, including artificial intelligence (AI), machine learning, natural language processing, data visualization software, large-scale database architecture and storage infrastructure, data analytics software, and touchscreen technology. As AI tools have become widely available, inventions that use AI have become an increasing portion of his work, including inventions in industrial automation and life sciences.

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Biography



Jianbai "Jenn" Wang, Ph.D.

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Jianbai "Jenn" Wang, Ph.D., has technology development and patent law experience in many hardware and software fields. Jenn has prosecuted patents covering the areas of microelectronic fabrication, digital and analog circuit design, microcontrollers, signal processing, sensors and actuators, memory systems, computer architecture, image processing, data visualization, software applications, and artificial intelligence. Jenn has also worked on a number of IP due diligence projects involving complex technology. She is fluent in Chinese and English.

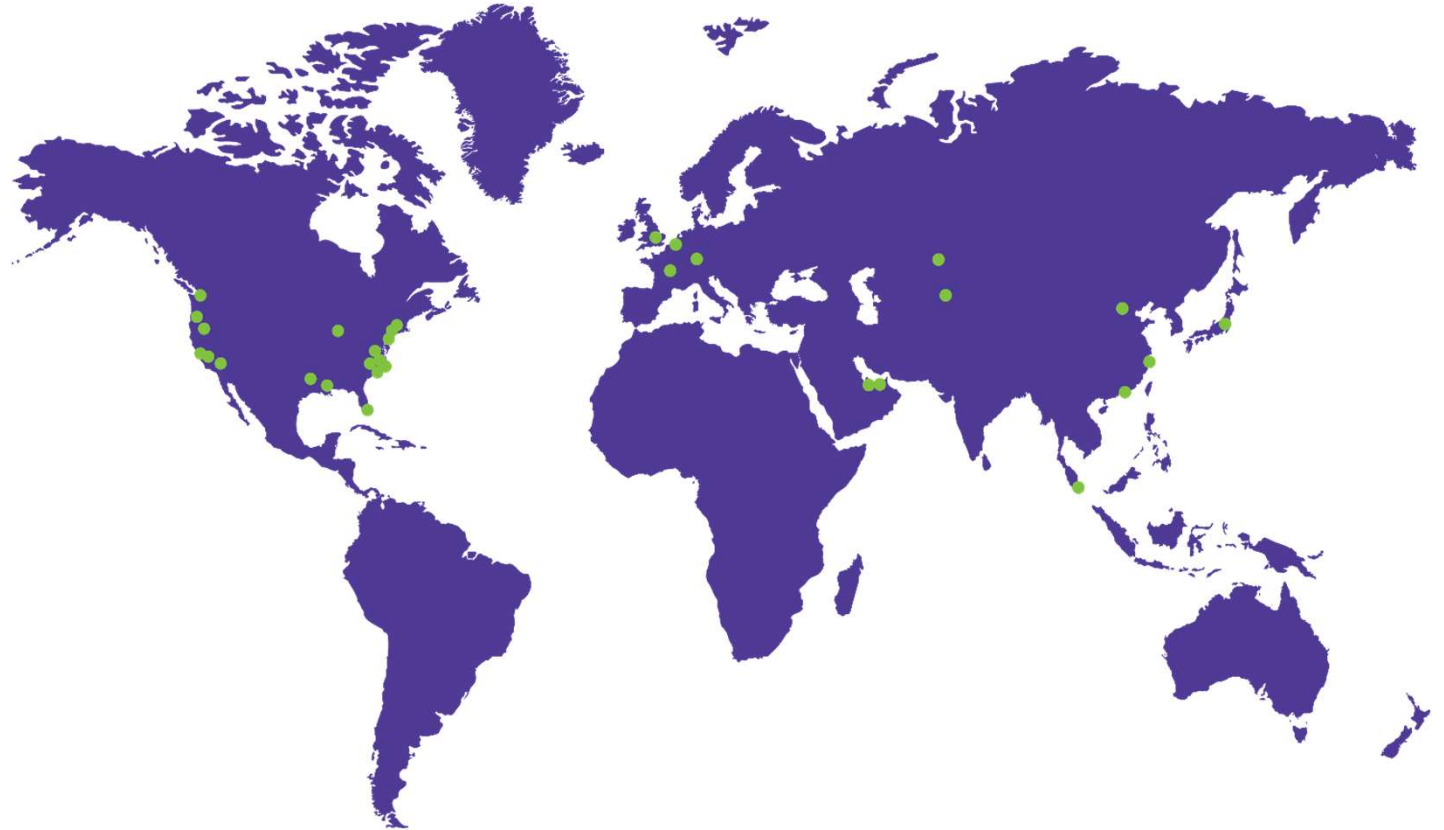
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Our Global Reach

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