



Navigating the AI Odyssey: Three Decades of Innovation, Practical Applications, and Future Perspectives

Xinsheng Lou, PhD, ISA Fellow

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Agenda

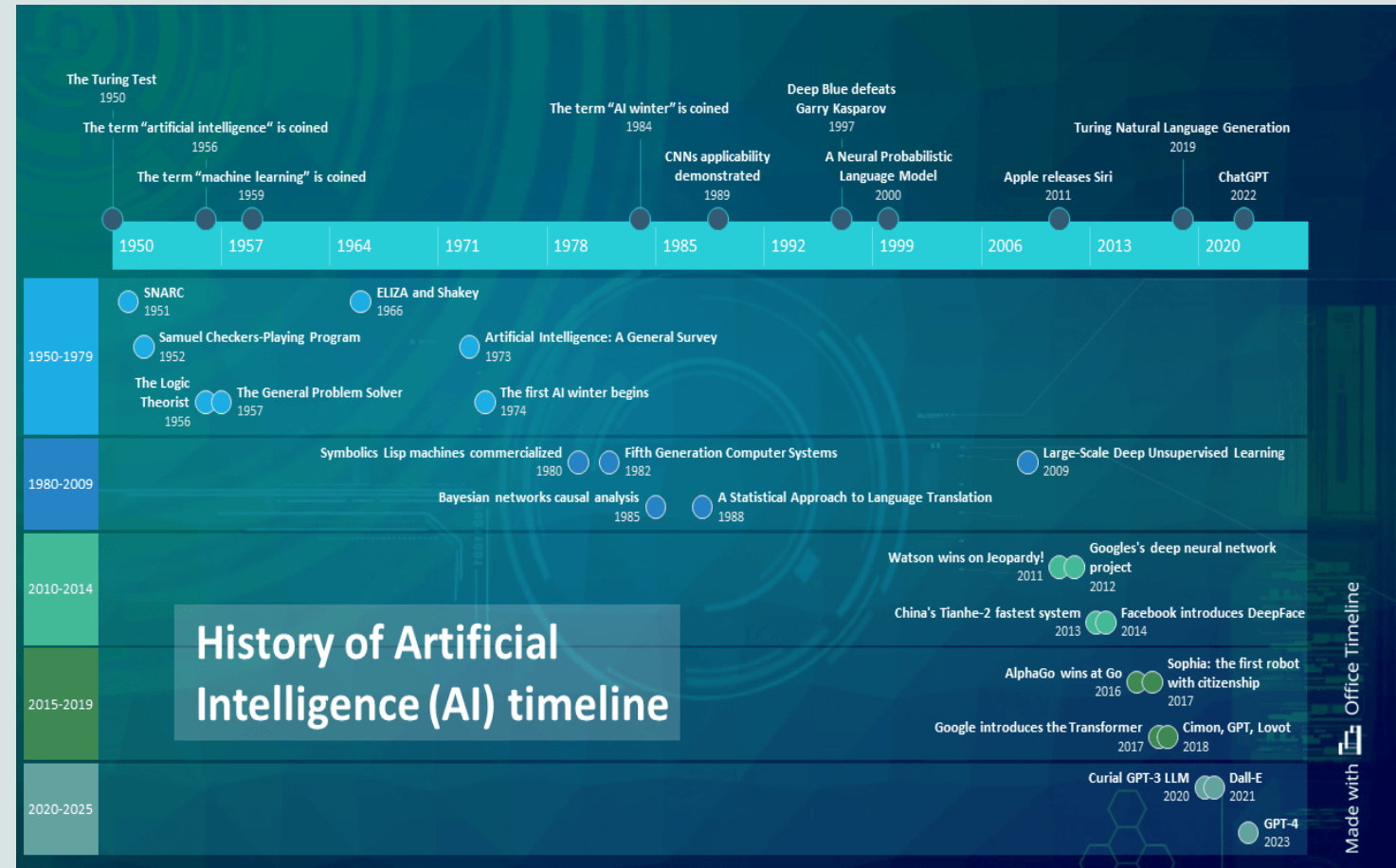


- **AI Evolution in Decades**
- **Industrial Applications of AI**
- **Impact of Gen AI Breakthroughs**
- **Tech Interest and Collaborations**
- **Future Challenges and Ethics**
- **Q&A**

AI Evolution: History of Decades

A Long Journey with Ups and Downs (1950s – 2020s)

1. Modern concept of Artificial Intelligence (AI) began to take shape in the 1950s
2. Symbolism and Connectionism evolve in parallel
3. Breakthrough in Large Language Model (LLM) in 2020s.



Source: <https://www.officetimeline.com/blog/artificial-intelligence-ai-and-chatgpt-history-and-timelines>

AI Evolution: Symbolism vs Connectionism

Symbolism (Symbolic AI)

Symbolism, or symbolic AI, centers on the idea that human intelligence can be emulated through the manipulation of symbols and the application of rules to these symbols. It is rooted in formal logic and has been the foundation of AI research since its inception.

- **Foundations:** Symbolic AI is based on the premise that all mental states and processes can be represented by symbols. Early AI research, such as **expert systems and logical reasoning programs**, leveraged symbolic AI to solve complex problems in well-defined domains.
- **Advantages:** Symbolic AI excels at tasks involving structured data, explicit reasoning, and **rule-based** decision making. It's particularly effective for problems where the rules are well understood and can be explicitly programmed, such as chess.
- **Limitations:** The symbolic approach struggles with tasks requiring an understanding of the nuances of human language, generalizing from incomplete data, or learning from raw sensory input. It also requires **extensive knowledge engineering**, making it labor-intensive to develop and maintain.

AI Evolution: Symbolism vs Connectionism

Connectionism (Neural Networks)

Connectionism represents intelligence through the interconnected network of nodes, mimicking the human brain's neural architecture. It's the foundation of what we now call **Deep Learning**.

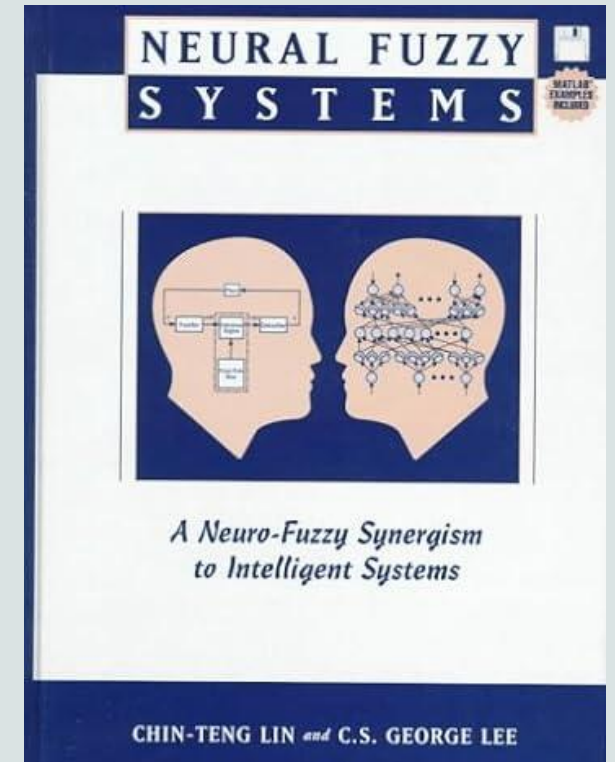
- **Foundations:** Connectionism relies on artificial neural networks (ANNs) that learn to recognize patterns from large amounts of data. The development of algorithms for training these networks, such as backpropagation, enabled significant advancements in fields like computer vision and natural language processing (NLP).
- **Advantages:** Neural networks excel at handling unstructured data, learning from examples, and generalizing from the data they've been trained on. They've been particularly successful in tasks that are difficult to solve with explicit programming, such as image and speech recognition.
- **Limitations:** Despite their strengths, neural networks require large amounts of data to learn effectively and can act as "black boxes," making it challenging to understand how they derive their conclusions.

AI Evolution: Symbolism vs Connectionism

Parallel Evolution and Integration

Symbolism and Connectionism have often been seen as competing paradigms. However, over time, researchers have sought ways to integrate the two approaches, recognizing that each has its strengths and weaknesses.

- **Hybrid Models:** There's a growing interest in developing hybrid models that combine the explicit reasoning capabilities of symbolic AI with the pattern recognition and generalization strengths of neural networks. For example, neuro-symbolic AI aims to create systems that can both reason with symbols and learn from sensory data.
- **Complementary Strengths:** By integrating symbolism and connectionism, researchers hope to create AI systems capable of robust reasoning and learning across a broader range of tasks, including those requiring common-sense reasoning and the understanding of complex, abstract concepts.
- **Neuro-Fuzzy Network** is an example: Combining fuzzy logic and neural network.



Source:

https://www.amazon.com/Neural-Fuzzy-Systems-Neuro-Fuzzy-Intelligent/dp/0132351692/ref=monarch_sidesheet

AI Evolution in 30 Years (I)

Key Milestones and Developments (1990s-2010)

1. Dominance of Expert Systems (Early 1990s)

- Rule-Based Intelligence widespread.
- Parallel Evolution with Neural Networks.

2. Shift Towards Neural Networks (Mid to Late 1990s)

- Increased Interest in Neural Networks.
- Gradual Dominance over Rule-Based Systems.

3. Foundations of Modern AI with Deep Learning (2006)

- Breakthroughs in Deep Learning.
- Versatility and Scalability.
- **Rapid Expansion and Integration into Technology (2006-2010)**
 - ImageNet Competition (2010)
 - Integration into Consumer Technology: *Digital assistants, AI engines, and enhanced data analytics*

AI Evolution in 30 Years (II)

AI in Society and Road toward AGI (2011-2023)

1. Mid-2010s to 2020s: AI in Everyday Life

- Integration of AI in consumer products (e.g., smart assistants).
- Autonomous vehicles, AI in healthcare, and media generation.

2. 2020s: AI Ethics and Advanced Generative Models

- Emergence of GANs and advancements in NLP with models like GPT-3.
- Focus on AI ethics, addressing bias and fairness.

3. 2023: Large Language and Multimodal Models

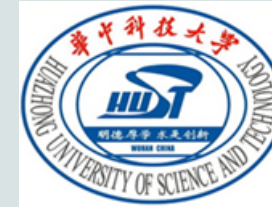
- Large language models understanding and generating human-like text.
- Multimodal AI models processing and generating text, images, and audio.



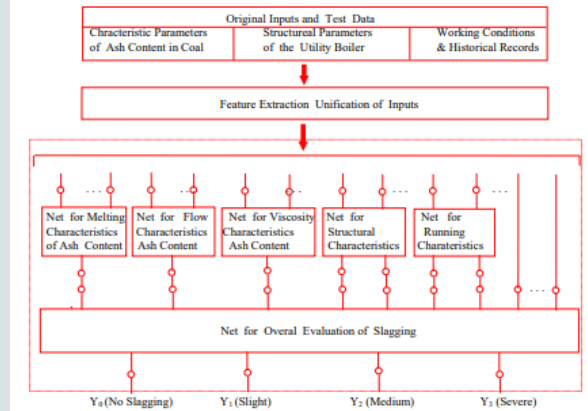
Source of Images : Internet

Industrial Applications of AI

AI Journey in the Energy Industries



NN Model



Advancements in Boiler Diagnostic Expert Systems (HUST, 1993-1996)

1. **Combustion Fault Diagnosis Focus:** Emphasizes the importance of diagnosing combustion-related faults in power plant boilers, highlighting the application of fault analysis and the integration of artificial intelligence for real-time diagnostic systems development.

2. Rule-based Expert System Highlights:

1. Utilizes rule-based knowledge systems for diagnosing faults, focusing on the definition, evidence formation, and management of rules.
2. Demonstrates the application of fuzzy logic for evidence symptom formation and the incorporation of mathematical models for in-depth fault analysis.

3. Neural Network Application:

1. Details the use of neural networks in knowledge systems, particularly for knowledge representation and inference in diagnosing flame failure faults.
2. Showcases a neural network-based knowledge base management system for enhancing diagnostic processes.

4.3.1 Rule Based Knowledge System

4.3.1.1 Defining a Rule

Fuzzy Rules

Considering the uncertainty involved in the diagnostic knowledge, a rule can be defined in such a form:

IF $\langle A \rangle$ **THEN** $\langle B \rangle$: $f(B, A)$,

Where, $A = \{ A_i \}$, the premise section of a rule while A_i refers to the i -th premise, $C(A_i)$ is used to express belief of premise A_i ;
 $B = \{ B_j \}$, the conclusion section of a rule while B_j refers to the j -th conclusion or action; $C(B_j)$ is used to express the belief of action B_j ;
 $f(B, A)$ expresses the rule's uncertainty, i.e. the effect of $A = \text{TRUE}$ on $B = \text{True}$.
 For example, we may have such a rule for diagnosing the slagging fault in boiler operation.

IF (1) The heat resistance of wall is too big (0.8) AND
 (2) Exhaust gas temperature increases (0.75) AND
 (3) Furnace Temperature level increases (0.75) AND
 (4) The Load is steady (0.85)
Then Slagging occurs on the water wall.
Belief = 0.85

Video:

<https://youtu.be/fV8N6ribRoc?si=8i5U4E-BqaF7OVm->

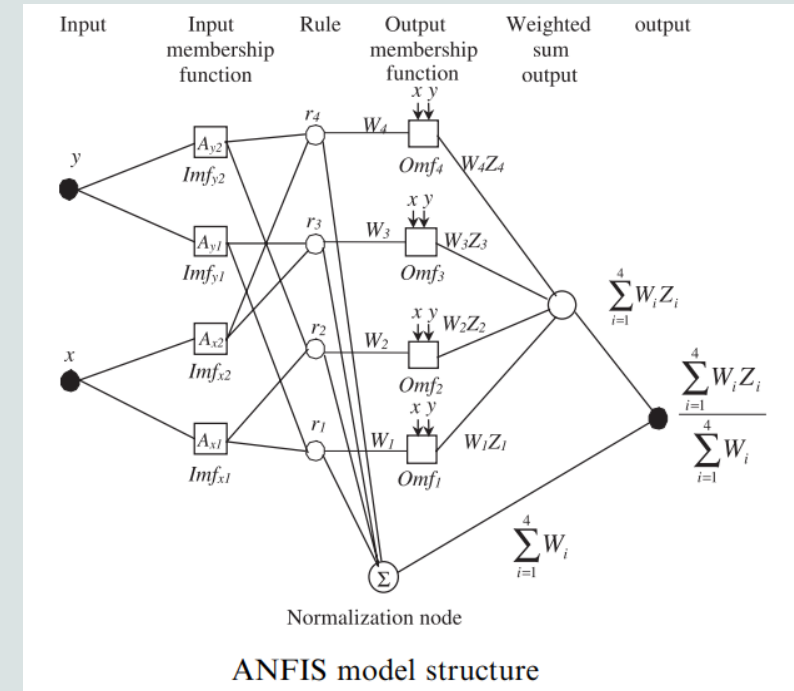
Ref: HUST PhD Thesis 1996, X. Lou

Industrial Applications of AI

AI Journey in the Energy Industries

Advanced Bearing Fault Diagnosis Techniques (CWRU, 1997-2000)

1. **Wavelet Feature Extraction:** Utilizes the discrete wavelet transform (DWT) for effective vibration signal processing, enabling the identification of localized defects in ball bearings..
2. **Fuzzy Neural Network (Fuzzy Inference):**
 1. Implements an Adaptive Neural Fuzzy Inference System (ANFIS) for fault classification, offering adaptability and non-linear approximation capabilities.
 2. Demonstrates superior classification performance, with the ANFIS model finely distinguishing between normal, inner race fault, and ball fault conditions based on extracted features.
3. **Comparative Analysis and Implementation:**
 1. Compares the effectiveness of wavelet feature extraction and ANFIS classification against other methods like Euclidean vector distance and vector correlation coefficient, showcasing improved reliability and diagnostic accuracy.
 2. Highlights the system's potential in real-time monitoring and diagnostics, emphasizing the importance of integrating wavelet analysis and fuzzy logic for advanced fault detection and diagnosis.



Neural-Fuzzy Network

Video:

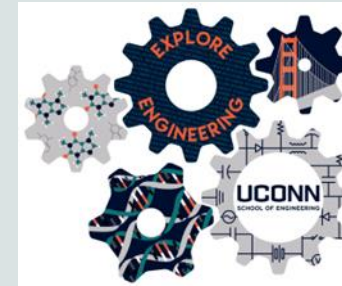
<https://youtu.be/mISiyalDvQ?si=8LYpghaeKd-LjM43>
Paper by X. Lou and K. Loparo

Ref:

Mechanical Systems and Signal Processing 18 (2004) 1077-1095

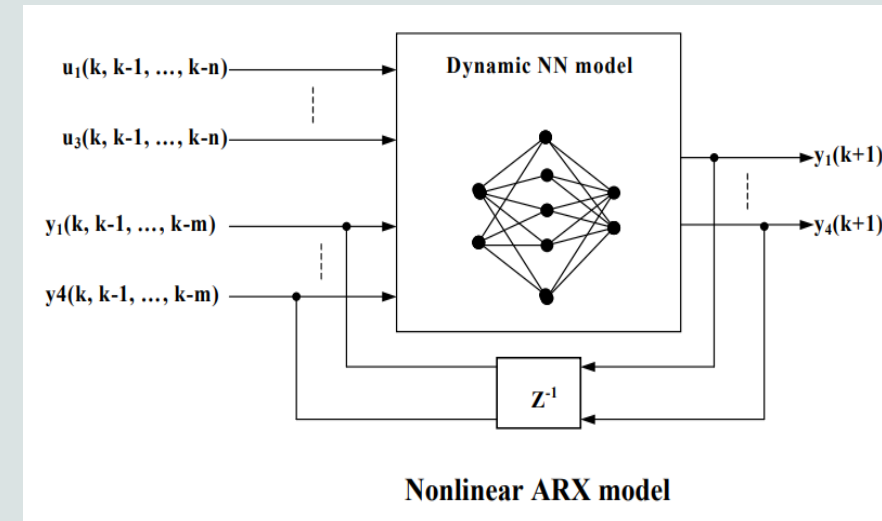
Industrial Applications of AI

AI Journey in the Energy Industries



❑ Model Predictive Control Using ANN (Alstom/UCONN, 2006 - 2009)

- 1. Dynamic Neural Network (DNN) Modeling and Testing:** Utilized an artificial neural network (ANN) model to capture the nonlinear dynamics of a boiler system, demonstrating the effectiveness of different testing sequences (PRBS, sine-sweep, and combinations) for optimal non-linear model development.
- 2. Testing Signal Design for Optimal NMPC Performance:**
 1. Explored various excitation signals (e.g., **PRBS**, **sine-sweep**) to generate dynamic datasets, finding that sine-sweep signals offer superior input-output space coverage compared to PRBS, leading to more accurate and generalizable models.
 2. Emphasized the critical role of automated test design in efficient and effective data collection for ANN model identification, significantly impacting the performance of NMPC in practical applications.
- 3. Evaluation of ANN Based NMPC:**
 1. Successfully integrated the developed ANN-based NMPC for dynamic optimization with a gas-fired boiler (GFB) simulator, achieving improved control of steam temperature, pressure, and drum level across various load conditions.
 2. Presented a detailed comparison of NMPC performance using models trained with different datasets, highlighting slight advantages of sine-sweep and combination signal-based models over PRBS-based models in real-world control scenarios.



Dynamic NN Model for NMPC

Video:

https://youtu.be/b7A8jUEp_al

Papers by A. Joshi, X. Lou, P. Luh, C. Neuschaefer, etc.

Ref:

ISA POWID Symposium 2007, 2008, 2009

Industrial Applications of AI

AI Journey in the Energy Industries



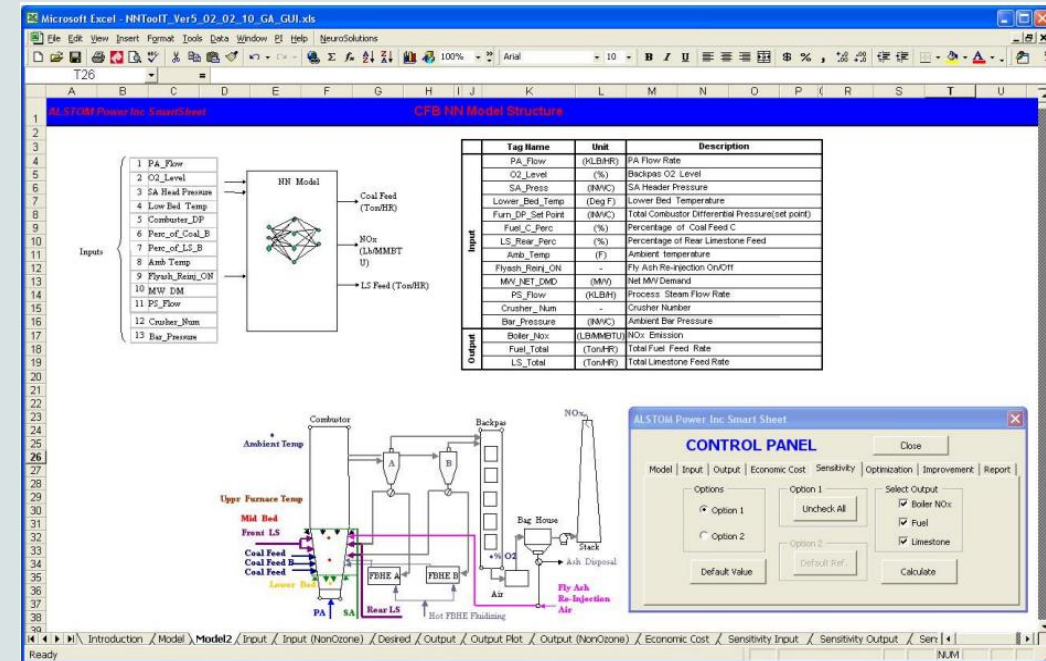
ANN Modeling and CFB Power Plant Optimization (Alstom/AES, 2005 - 2010)

1. Neural Network Modeling Using Field Test Data:

1. Implemented an Artificial Neural Network (ANN) model to capture the complex nonlinear relationships between operating conditions and cost-related variables of a Circulating Fluidized Bed (CFB) boiler.
2. The model was developed and validated using orthogonal test matrices based on Design of Experiments (DoE) methods, leveraging field test data from the AES Thames station for training and validation, ensuring high model accuracy and generalization.

2. Power Plant Performance Optimization Using Genetic Algorithm (GA):

1. Incorporated a Genetic Algorithm (GA) based global optimization solver within the Smartsheet tool to navigate the model's nonlinear and non-convex optimization landscape, identifying globally optimal operational settings.
2. This approach efficiently tackled the challenge of finding the most economical boiler operation parameters amidst constantly fluctuating electricity prices, fuel costs, and emission credits, demonstrating potential operating cost savings of more than 2% over traditional methods.



Excel Tool with ANN Model Embedded for CFB Unit Performance Optimization

Video:

<https://youtu.be/7twaQrM4qmE>

Paper by P. Panos, A. Joshi, X. Lou, C. Neuschaefer, W. Wirta

Ref:

Pittsburgh Coal Conference 2010, Istanbul, Turkey

Industrial Applications of AI

AI Journey in the Energy Industries



U.S. DEPARTMENT OF
ENERGY



NATIONAL
ENERGY
TECHNOLOGY
LABORATORY



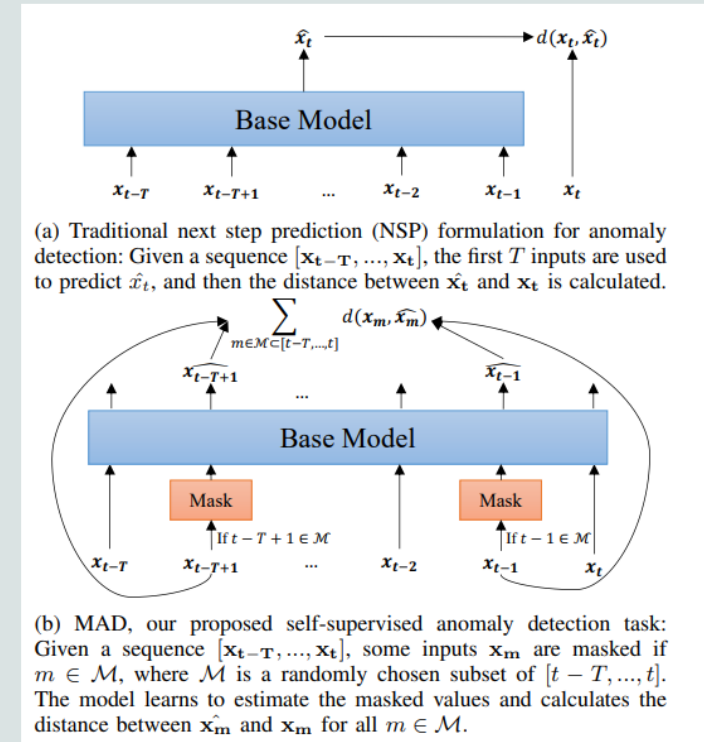
❑ Fault Detection Using Dynamic Simulation Data (GE Research/GE Power/DOE NETL, 2019 - 2022)

1. Generating Simulation Data from a commercial scale Steam Power Plant Simulator (660MWe):

1. Normal operations run with multiple load levels.
2. Fault modes with multiple load levels: Sensor, actuator and process faults simulated in the plant dynamic simulator.
3. Noise introduced to simulate the real operating data quality

2. Fault Detection Using Deep Learning Algorithms

1. Base model using Traditional next step prediction (NSP) for anomaly detection.
2. New algorithm: MAD - Self-Supervised Masked Anomaly Detection Task for Multivariate Time Series



Model Structures for Fault Detection

Video:

<https://youtu.be/x7Tn0kLJC0o>

Paper by Xinsheng Lou, Ben Sargent, Tim Braun, etc.

Ref:

<https://arxiv.org/pdf/2205.02100.pdf>

Paper by Dr. Yiwei Fu and Dr. Feng Xue

Impact of Gen AI Breakthroughs

What is Generative AI?

1. Definition of Generative AI

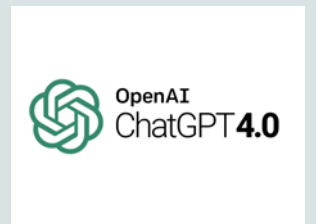
- *Generative Artificial Intelligence (Gen AI) refers to the subset of AI technologies capable of generating new content, ideas, or data that resemble human-like creativity. This includes generating text, images, music, and even synthetic data models based on learning from a vast dataset.*

2. Evolution of Generative AI

- **Early Stages:** *Originated from simple pattern recognition models and evolved through the exploration of neural networks and machine learning.*
- **Rise of GANs:** *The introduction of Generative Adversarial Networks (GANs) in 2014 marked a pivotal advancement, enabling more complex and realistic content generation.*
- **Transformer Models:** *The development of transformer models like GPT (Generative Pre-trained Transformer) series revolutionized text generation, providing contextually relevant and coherent outputs.*

3. Recent Breakthroughs in Generative AI

- **AI-Generated Art:** *Tools capable of producing artwork indistinguishable from human-made pieces, revolutionizing the creative industry.*
- **Advanced Language Models:** *The emergence of models like GPT-4, capable of writing essays, coding, and even creating poetry, mimicking human writing styles closely.*
- **Synthetic Data Generation:** *Generating realistic and privacy-compliant datasets for training AI*



Source of Images : Internet

Impact of Gen AI Breakthroughs

Differences between Generative AI and Classification AI

1. Fundamental Purpose

- **Generative AI:** Aims to create new data instances (text, images, sounds) that resemble the training data, simulating the process of human creativity.
- **Classification AI:** Focuses on categorizing input data into predefined classes or labels based on learned features from the training data.

2. Data Handling and Output

- **Generative AI:** Processes input to generate entirely new outputs that did not previously exist in the training data, emphasizing creativity and innovation.
- **Classification AI:** Analyzes input data to predict a label or category, prioritizing accuracy and reliability over creativity.

3. Applications and Use Cases

- **Generative AI:** Used for content creation, such as art generation, music composition, synthetic data generation, and creative writing.
- **Classification AI:** Essential for tasks like image recognition, spam detection, sentiment analysis, and medical diagnosis, where specific categorization is crucial.



Source of Images : Internet

Impact of Gen AI Breakthroughs

Differences between Generative AI and Predictive AI

1. Objective and Function

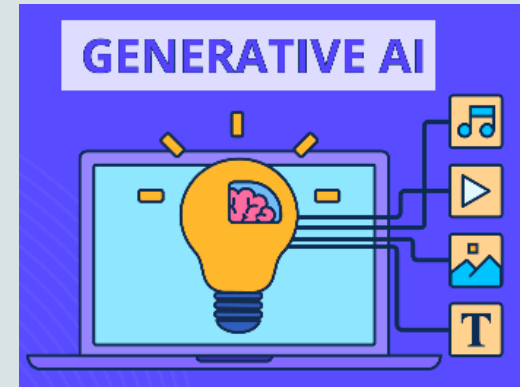
- **Generative AI:** Designed to create new content or data that mimics the original data set, focusing on creativity and generation of novel outcomes.
- **Predictive AI:** Aims to forecast future events or trends based on historical data, focusing on accuracy and likelihood of future occurrences.

2. Data Output and Creation

- **Generative AI:** Generates new data instances (e.g., images, texts, sounds) that are similar but not identical to the training data, expanding the range of possibilities.
- **Predictive AI:** Produces predictions or probabilities about future events, rather than generating new data instances, based on patterns learned from past data.

3. Applications and Use Cases

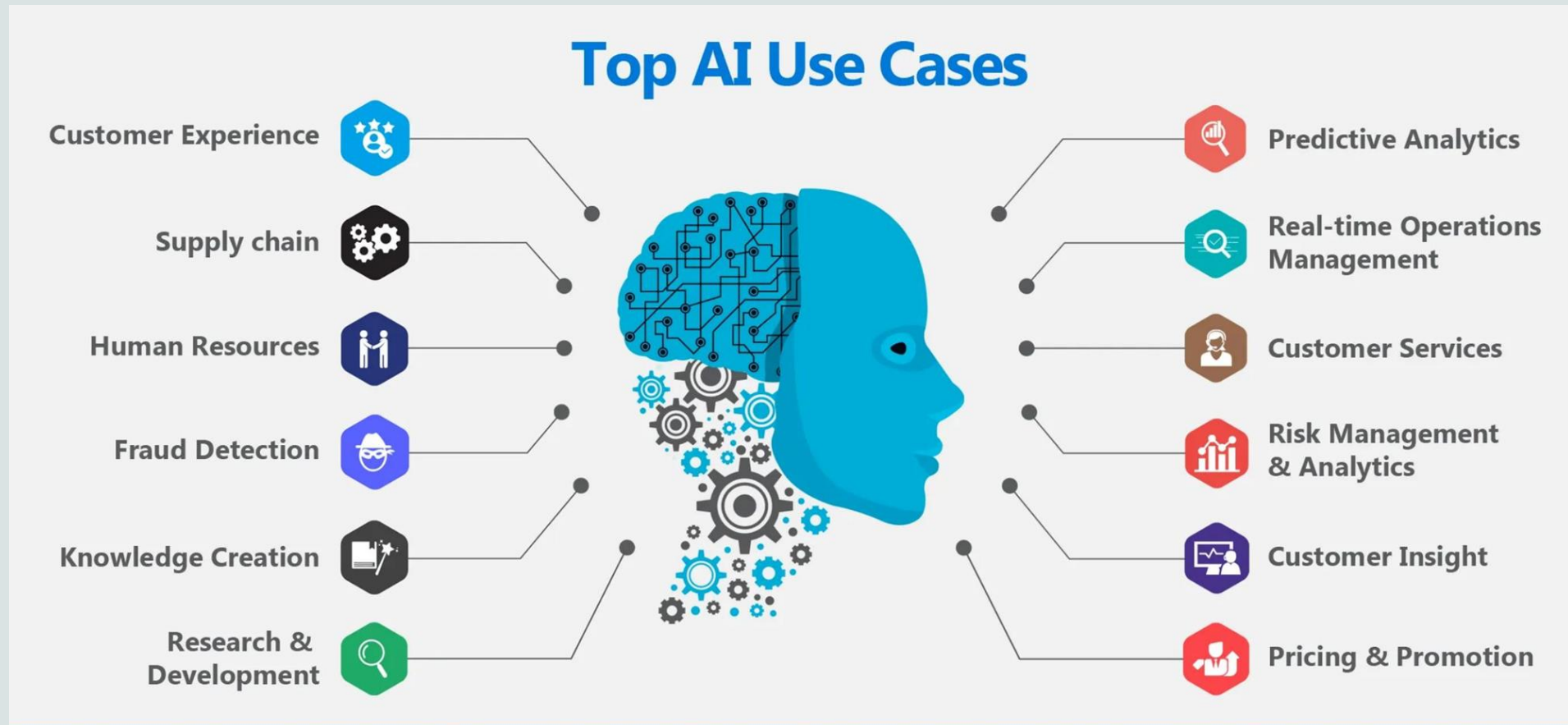
- **Generative AI:** Used in creative fields for generating art, music, synthetic datasets for training, and more, where innovation is key.
- **Predictive AI:** Employed in forecasting market trends, weather predictions, risk assessment, and other areas where anticipating future outcomes is crucial.



Source of Images : Internet

Tech Interest and Collaborations

Potential Use Cases of AI



Source: WinWire via @BrianJohnson_01

Source: Internet

Tech Interest and Collaborations

Custom GPT for Consulting Support

Source: GPT-4

The screenshot shows the public-facing interface of the 'Diagnostic AI Consultant' GPT. At the top, there is a circular profile picture of a hand holding a magnifying glass over a globe. Below it, the name 'Diagnostic AI Consultant' is displayed in bold, followed by 'By Xinsheng Lou' and a small icon. A description reads: 'Expert in machine learning for fault diagnosis, algorithms, and software development.' Below this, there are two statistics: 'Research & Analysis' (Category) and '6 Conversations'. At the bottom, there is a section titled 'Conversation Starters' with four buttons containing the following text: 'How do I detect faults using ML?', 'Best practices for software optimization?', 'Troubleshooting an algorithm issue.', and 'Improving prognosis accuracy in ML models.'

The screenshot shows the configuration page for the 'Diagnostic AI Consultant' GPT. At the top, there is a back arrow, the name 'Diagnostic AI Consultant', and status indicators 'Live' and 'Anyone with a link'. Below this are two buttons: 'Create' and 'Configure'. The main content area has a circular profile picture and three input fields: 'Name' (containing 'Diagnostic AI Consultant'), 'Description' (containing 'Expert in machine learning for fault diagnosis, algorithms, and software development.'), and 'Instructions' (containing a detailed paragraph about the GPT's role and communication style). Below the instructions is a section titled 'Conversation starters' with a list of four items, each with a delete icon (x): 'How do I detect faults using ML?', 'Best practices for software optimization?', 'Troubleshooting an algorithm issue.', and 'Improving prognosis accuracy in ML models.'

Tech Interest and Collaborations

Custom GPT for Consulting Support

Source: GPT-4

The screenshot displays the configuration interface for a custom GPT named "Diagnostic AI Consultant". The interface is split into two main sections: configuration on the left and a preview on the right.

Configuration Section:

- Buttons:** "Create" and "Configure".
- Input Fields:** Three text boxes containing prompts: "Troubleshooting an algorithm issue.", "Improving prognosis accuracy in ML models.", and an empty one.
- Knowledge Section:** A box containing instructions: "If you upload files under Knowledge, conversations with your GPT may include file contents. Files can be downloaded when Code Interpreter is enabled". Below this are three PDF file thumbnails: "Paper-es-more-info_HUST...", "alabsi-et-al-2020-bearing...", and "Cross_Domain_Fault_Diag...". An "Upload files" button is also present.
- Capabilities:** A list of checked options: "Web Browsing", "DALL-E Image Generation", and "Code Interpreter".
- Actions:** A "Create new action" button.
- Additional Settings:** A section with a checked option: "Use conversation data in your GPT to improve our models".

Preview Section:

- Header:** "Preview".
- User Message:** "You: What is this custom GPT used for?".
- AI Response:** A detailed response from "Diagnostic AI Consultant" explaining its specialization in providing expert advice and solutions on fault diagnosis and prognosis using machine learning techniques. It mentions its focus on solving problems related to fault diagnosis algorithms and software development, incorporating insights into the latest trends in deep learning and methods to enhance the interpretation of machine learning models. The response is enclosed in a green box.
- Input Field:** A text box at the bottom with the placeholder "Message Diagnostic AI Consultant..." and a send button.

Tech Interest and Collaborations

Custom GPT for Energy Applications

The screenshot shows a web interface for a custom GPT. On the left is a sidebar with a list of GPTs: ChatGPT, Bible Study Buddy, Diagnostic AI Consult..., Smart Renewable Inte..., and Explore GPTs. Below this are sections for 'Today' (Transmission Planning Expertise), 'Previous 7 Days' (Symbolism in AI Today, 写第四本书, Approximate Normal Probabilities, Key Bridge Collapse: MD, Summarize: Title Request, Special Procedure Image Analysis), and 'Revitalization Efforts in Fast' (Add Team workspace, John Louis Personal account). The main content area is titled 'Smart Renewable Interconnection Advisor' by Hui Zhang. It describes the GPT as an expert on U.S. renewable generation interconnection processes. Below the description are four example prompts: 'Innovative ideas to fix the generation interconnection...', 'How can Grid Enhancing Technologies (GETs) help G...', 'What factors contribute to the interconnection backl...', and 'What is "deliverability" in the context of generation in...'. At the bottom is a text input field with a microphone icon and a send button. A footer note states 'ChatGPT can make mistakes. Consider checking important information.' In the bottom right corner, there is a text label 'Source: GPT-4' and a help icon.

Custom GPT for Energy Applications

Smart Renewable Interconnection Advisor

By Hui Zhang

Expert offering insights on U.S. renewable generation interconnection processes.

Innovative ideas to fix the generation interconnection...

How can Grid Enhancing Technologies (GETs) help G...

What factors contribute to the interconnection backl...

What is "deliverability" in the context of generation in...

Message Smart Renewable Interconnection Advisor...

ChatGPT can make mistakes. Consider checking important information.

Source: GPT-4

Tech Interest and Collaborations

Custom GPT for Energy Applications

Custom GPT for
Energy Applications

The screenshot displays the ChatGPT interface with a custom GPT named "Smart Renewable Interconnection Advisor". The left sidebar shows a list of GPTs, including "ChatGPT", "Bible Study Buddy", "Diagnostic AI Consult...", "Smart Renewable Inte...", "Educational Content C...", and "Explore GPTs". Below this, there are sections for "Today" (with a "New chat" button and a chat titled "Transmission Planning Ex...") and "Previous 7 Days" (with several chat titles in Chinese and English). At the bottom of the sidebar, there are options for "Add Team workspace" and a user profile for "John Louis".

The main chat area shows a conversation with the "Smart Renewable Interconnection Advisor". The user asks, "What is this custom GPT for?". The GPT responds: "I'm designed to offer specialized guidance on the U.S. power system, focusing on transmission planning and renewable energy integration. My expertise lies in providing detailed, informed responses related to the generation interconnection process, particularly within various Independent System Operators (ISOs) and Regional Transmission Organizations (RTOs) across the United States. Whether you need information on regulatory documents, the latest industry reports, or specific processes for integrating renewable energy sources into the grid, I'm here to help. How can I assist you today?".

The user then asks, "Tell me about ISO in the US and how they work with utility companies. Thanks.". The GPT responds: "Independent System Operators (ISOs) and Regional Transmission Organizations (RTOs) play critical roles in the electric power system of the United States, particularly in managing the transmission grid and ensuring the reliability and efficiency of the electricity market. Here's a detailed look at their functions and how they interact with utility companies:". A dropdown arrow is visible next to the word "reliability" in the response.

At the bottom of the chat area, there is a text input field with the placeholder "Message Smart Renewable Interconnection Advisor...", a microphone icon, and an "up" arrow icon. Below the input field, a small disclaimer reads: "ChatGPT can make mistakes. Consider checking important information." To the right of the disclaimer, the text "Source: GPT-4" is displayed.

Tech Interest and Collaborations

Custom GPT for Healthcare Applications

The screenshot displays the ChatGPT interface with a custom GPT named "US Healthcare Expert" selected. The interface includes a sidebar on the left with a list of chat topics, a main chat area, and a top navigation bar. The custom GPT card is centered, showing its profile picture, name, creator, description, ratings, category, and conversation count. Below the card are conversation starters and a message input field.

Source: GPT-4

ChatGPT

US Healthcare Expert

Explore GPTs

Today

Transmission Planning Expertise

Previous 7 Days

Symbolism in AI Today

写第四本书

Approximate Normal Probabilities

Key Bridge Collapse: MD

Summarize: Title Request

Special Procedure Image Analysis

Revitalization Efforts in East.

时间飞逝的抒情诗

Astro Study Guide Summary

Rose Garden Winter View

Add Team workspace
Collaborate on a Team plan

John Louis
Personal account

US Healthcare Expert

By Jonathan DMello

Providing expert guidance on healthcare topics and systems in the USA.

4.4
Ratings (5)

Other
Category

200+
Conversations

Conversation Starters

What are the key differences between HMO and PPO...

How does Medicare differ from Medicaid?

Can you explain the Affordable Care Act's impact?

What challenges do patients face in healthcare navigation?

Message US Healthcare Expert...

ChatGPT can make mistakes. Consider checking important information.

Tech Interest and Collaborations

Custom GPT for Healthcare Applications

The screenshot displays the OpenAI ChatGPT interface. On the left is a sidebar with a list of chats, including 'Healthcare Guidance GPT' and 'Transmission Planning Expertise'. The main area shows a chat with the custom GPT 'US Healthcare Expert'. A user asks, 'What is this custom GPT used for?'. The GPT responds with a detailed explanation of its purpose and capabilities in the healthcare domain. A context menu is open over the GPT's name, listing options like 'New chat', 'About', 'Keep in sidebar', 'Copy link', 'Review GPT', 'Report', and 'Share chat'. At the bottom, there is a text input field with the placeholder 'Message US Healthcare Expert...' and a send button.

Source: GPT-4

Tech Interest and Collaborations

Custom GPT for Education

The screenshot displays the ChatGPT interface. On the left is a sidebar with a list of GPTs, including 'Edu GPT Enhancing Learn...'. The main area shows a chat with the 'Educational Content Creator' GPT. The chat history includes a user question and a detailed response from the GPT. The response explains the GPT's purpose and performance, and provides a step-by-step solution with proper explanation. At the bottom, there is a text input field with the text 'Message Educational Content Creator...' and a 'Send' button. A disclaimer at the bottom of the chat area reads: 'ChatGPT can make mistakes. Consider checking important information.'

Source: GPT-4

Future Challenges and Ethics

GENERAL CHALLENGES IN AI

- 1. Ethical and Privacy Concerns:** Balancing innovation with the protection of individual rights and privacy in an increasingly data-driven world.
- 2. AI Governance and Regulation:** Developing and enforcing global standards and frameworks to ensure AI's ethical use, accountability, and transparency.
- 3. Technological Unemployment:** Addressing the economic and social impacts of automation and AI on job markets, including strategies for workforce adaptation and reskilling.
- 4. Bias and Fairness:** Mitigating inherent biases in AI algorithms to ensure fair and equitable outcomes across all demographic groups.



Source of Images : Internet

Future Challenges and Ethics

ENERGY AND POWER CRISIS CAUSED BY AI

- **High Electricity Demand:** Training and operating large AI models requires significant computational resources, leading to substantial electricity consumption.
- **Environmental Impact:** The carbon footprint from the energy used in large-scale AI operations contributes to climate change, necessitating a focus on green energy sources.
- **Strain on Power Grids:** Intensive computing for AI can put additional pressure on local and national power systems, risking overloads and energy crises.
- **Towards Sustainable AI:** Developing energy-efficient AI algorithms and increasing reliance on renewable energy sources are essential steps to mitigate these impacts and ensure AI's sustainable future.



Source of Images : Internet

Future Challenges and Ethics

AGI AND FRAUD DETECTION

- **Evolving Fraud Tactics:** As AGI enhances fraud detection, fraudsters may also use AGI to devise more sophisticated scams, creating an arms race between fraud detection and perpetration.
- **Ethical and Privacy Concerns:** The broad data access and processing capabilities of AGI raise significant privacy and ethical issues. Balancing fraud prevention with individual privacy rights will become increasingly complex.
- **Dependence and Trust:** Over-reliance on AGI for fraud detection could lead to challenges in human oversight, including the loss of expertise to detect fraud without the aid of AGI and ensuring the AGI's decisions are explainable and justifiable.
- **Regulatory Compliance:** As AGI systems become more autonomous, ensuring these systems comply with existing and future regulatory frameworks for fraud detection will be crucial. This includes regulations around data privacy, financial reporting, and consumer protection.



Source of Images : Internet

Future Challenges and Ethics

POST-LABOR ECONOMICS CAUSED BY AGI



How will the economy work after AGI?

- **This is a big question to us all:**

<https://youtu.be/eD5GICIS0sA?si=ORPpHS2u2eISihf>

Future Challenges and Ethics


POST-LABOR ECONOMICS CAUSED BY AGI

Post Labor Economics: How will the economy work after AGI? Recent thoughts and conversations

Post-Labor Economics

Post-Labor Economics is an economic paradigm that emerges due to advancements in artificial general intelligence (AGI) and automation. It envisions a future where human labor's traditional role is greatly diminished, as machines take over both cognitive and physical tasks. This shift challenges existing economic structures and necessitates societal adaptation.

- **Hyperabundance:** AGI and automation create a surplus of cognitive labor, reducing the need for human work.
- **Employment Shift:** Traditional jobs decline, while human-centric roles gain niche value.
- **Basic Needs Redefined:** Technological progress lowers the cost of essentials, altering economic dynamics.
- **Societal Adaptation:** Governments and societies must adjust to new economic realities and safety nets.
- **Value System Shift:** Emphasis may move from material wealth to experiences and personal fulfillment.



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How will the economy work after AGI?

✓ Recent thoughts and conversations:

<https://youtu.be/eD5GICIS0sA?si=ORPpHS2u2eISihIF>

✓ And also:

https://youtu.be/ZV9k0cr3k6M?si=iF_hQ1dT88AiWXNo



Summary

- AI has experienced great breakthroughs in the past few years.
- **Symbolism and Connectionism** are not competing approaches but complementary methods to each other.
- Electric power will be a bottleneck in pure ML based AI.
- **Ethics of AI** in terms of privacy, cybersecurity and social impact of **AGI** need to be studied, which fosters business needs in IT and non-IT industries.
- Seeking communications and collaborations in AI application areas: **Energy, Healthcare and Education.**



Q & A

Thank you!

PPT prepared by:

Dr. Xinsheng Lou, ISA Fellow

Director-e, ISA Power Industry Division

Ai Consultant, Lous Tech and Services LLC

xinshenglou2016@gmail.com

<https://www.linkedin.com/in/xinsheng-lou-57a9233/>