Artificial Intelligence - Opportunities, Challenges, Possibilities

SYLLABUS

INSTRUCTOR INFORMATION:

Instructor: Dr. Jennie Hwang

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Availability: Between 3:00 PM to 5:00 PM ET USA. Leave a message anytime.

PROGRAM DESCRIPTION

Taught by the International Hall of Famer of Women in Technology and the author of several ground-breaking, globally-used books on electronics manufacturing and reliability, who holds the record of solving the reportedly toughest reliability and production issues, and has served as Chair of the Artificial Intelligence Committee of Department of Defense Command and Control Study/National Academies and Chair of the review panel of the National Artificial Intelligence Institute of NSF.

Considering the transformative capacity of AI technologies, this course covers an up-to-date and holistic overview, systematically and hierarchically. It offers panoramic views of AI to capitalize on its benefits and maximize on-the-job efficiency, effectiveness, and enterprise growth. The course also highlights what it takes to achieve AI with trust and justified confidence.

Integrated with an array of use cases, tips, and recommendations, the key components behind AI technologies including Machine Learning (ML), Deep Learning (DL), Neural Networks (NN), Internet of Things (IoT), Digital Twins, Large Language Models (LLMs), Small Language Models (SLMs), Edge AI, data quality and management, and ChatGPT-led Generative AI boom will be highlighted. Uses cases in key manufacturing functions – product design, quality assurance, procurement, supply chain - will be illustrated.

Prompt engineering in applying and understanding LLMs and prompt techniques and approaches to maximizing their use will be outlined. The impact of AI on engineering and related jobs will be illustrated.

The course maps out the AI landscape, including nuanced perspectives and the current and future of AI development/deployment. It will illuminate the “possible” AI future in near and far terms, including Artificial General Intelligence vis-à-vis the human brain and mind. It demystifies notions and enlists the essentials for winning in the AI era.

There are no required prerequisites - join us to enhance your knowledge and have fun!

LEARNING AND PERFORMANCE OBJECTIVES

Dr. Jennie Hwang (Chair of the Artificial Intelligence Committee of DoD/National Academies and Chair of the Review Panel of NSF National Artificial Intelligence Institute, as well as a pioneer and long-standing leader in Surface Mount Technology/Manufacturing and lead-free electronics implementation) brings broad-based information to this course. The course provides working knowledge and an integrated overview to help make informed decisions about how to navigate into the future of AI, suitable to all who are interested in staying knowledgeable for professional fulfillment including designers, researchers, managers, production, quality and reliability professionals, executives, and business decision-makers; also designed for those who desire broad-based information with holistic perspectives on AI.

The objectives of this four-hour course are:

- To provide up-to-date, broad-based information with holistic perspectives on AI.
- To help make informed decisions about navigating the AI era.
- To help understand foundational components behind AI technology including Machine Learning (ML), Deep Learning (DL), Neural Networks (NN), Internet of Things (IoT), Digital Twins (DT), Large Language Models (LLM)
- To help stay in the core knowledge zone and leverage AI as a virtuous tool to maximize on-the-job efficiency and proficiency as well as business profitability and productivity.

COURSE STRUCTURE

- Instructor and participants meet online twice per week from the comfort of their own home.
- Participants can view recorded online sessions to review course content and class discussions.
- Participants apply key concepts to create a real-world design from concept to completion.
- All required materials are included in the course.
- Course materials are accessible 24/7 on the new IPC Edge Learning Management System.
- The course can be accessed on virtually any device with an Internet connection and major web browser, including Chrome, Firefox, Safari, Edge, and Internet Explorer.

SUPPLEMENTAL MATERIALS

- Jennie S. Hwang, "*Artificial Intelligence - Opportunities, Challenges, and Possibilities – A Prelude*," I-Connect007 - SMT magazine – October 2023.

- Jennie S. Hwang, "*Artificial Intelligence – Part 2 – Fundamental Technologies*," I-Connect007 - SMT magazine – April 2024.

- Jennie S. Hwang, "*Artificial Intelligence – Part 3 -LLMs, SLMs, and Foundation Models*," I-Connect007 - SMT magazine – October 2024.

- Jennie S. Hwang, "*Artificial Intelligence – Part 4 - Prompt Engineering*," I-Connect007 - SMT magazine – January 2025.

- Jennie S. Hwang, "*Artificial Intelligence – Part 5 - Brain, Mind, Intelligence,"* I-Connect007 - SMT magazine – April 2025

COURSE SCHEDULE

WEEK 1

In this 4-hour course, you will learn and be updated on the following topics:

- Backdrop & diverse perspectives on AI
- Current state of AI – global race, AI chips
- AI - six pillars
- AI – trust, justified confidence
- AI hierarchy – Machine Learning, Deep Learning, Neural Network, Digital Twin, Internet of Things – nuggets, use cases
- Generative AI, OpenAI – ChatGPT-4 (+) – nuggets, tips
- AI - prompt engineering – tips and recommendations
- AI - impact on jobs
- Enterprise opportunities – examples
- Data – quality, management
- Edge AI, private AI
- Global leaders & competitiveness – examples, risk-mitigation
- AGI - Artificial General Intelligence
- Brain, mind → intelligence
- Future of AI – near, far
- Concluding remarks

ASSIGNMENT:

Participants are to bring further questions and issues for discussion.

ABOUT THE INSTRUCTOR – DR. JENNIE S. HWANG

An International Hall of Famer of Women in Technology, Dr. Hwang has provided solutions to the most challenging and toughest issues in production yield and high-reliability products, covering commercial and military applications.

Dr. Hwang, a long-standing pioneer in SMT manufacturing and lead-free implementation, is the author of seven internationally-used textbooks and 750+ publications; a featured speaker in innumerable international/national events; has received numerous honors/ awards; on the Board of NYSE Fortune 500 companies and various civic, government, and university boards and

committees (e.g., DoD - Globalization Committee, DoD - Forecasting Future Disruptive Technologies Committee; National Materials & Manufacturing Board; Board Chair of Army Science and Technology; and NIST Technical Assessment Board). She is Chair of the Artificial Intelligence Committee of DoD/National Academies; Chair of the National Laboratory Assessment Board; Chair of the Assessment Board of Army Research Laboratory; Chair of the Assessment Board of Army Engineering Centers; and Chair of the panel of the National Artificial Intelligence Institute of NSF.

Her formal education includes the Harvard Business School Executive Program; and four academic degrees in Metallurgical Engineering and Materials Science, Physical Chemistry, Organic Chemistry, and liquid Crystal Science (Ph.D. M.S., M.S., B.S.).

She has held senior executive positions with Lockheed Martin Corp. and CEO of International Electronic Materials Corp., among others. She is also an invited distinguished adj. Professor of Engineering School of Case Western Reserve University and serves on the University's Board of Trustees. Further Info: www.JennieHwang.com