

AI in Food and Nutrition

Course Code	Title of Course	Credit Hours
HND-226	AI in Food and Nutrition	2(1-1)

Learning Outcomes

Students will be able to:

- Explain the fundamental concepts of Artificial Intelligence and its integration into nutrition and food sciences.
- Identify and describe real-world AI applications that assist in food quality assurance, clinical dietetics, and public health nutrition.
- Use AI-based tools and platforms for dietary assessment, food tracking, and health monitoring.
- Analyze how machine learning and predictive analytics enhance disease risk prediction and personalized dietary planning.
- Evaluate ethical, social, and regulatory challenges of AI use in healthcare and nutrition.
- Demonstrate problem-solving ability by developing AI-informed approaches to improve food and nutritional outcomes.

Course

Contents

Theory:

Foundations of Artificial Intelligence in Health Sciences: definition, history, and evolution of AI, machine learning, deep learning, and neural networks, Artificial Intelligence for health professionals, machine learning, predictive analytics, and digital health ecosystems, digital transformation in food and nutrition systems, nutritional biomarkers, food databases, and structured dietary data, demonstrations using USDA FoodData Central, NutriSurvey, MyFitnessPal, and open-access APIs for food analysis; AI in Clinical and Personalized Nutrition: AI-driven personalization, integration of clinical, lifestyle, and genetic data, applications in clinical nutrition for common pathological conditions (diabetes, obesity, and metabolic syndrome); AI for meal logging: portion estimation, and nutrient analysis using NLP and image recognition, smart devices (glucose monitors and food diaries); Case studies: sports, pediatric, and geriatric nutrition, demonstrations of smart diet analysis using Nutfy, FoodAI, or MyFitnessPal Pro; AI in Food Production, Food Systems, and Safety: smart agriculture and AI in crop monitoring, food processing, quality assurance, and waste reduction, machine learning in food quality control, contamination detection, and shelf- life prediction, computer vision for detecting adulteration, allergens, or spoilage, smart packaging and blockchain for traceability and food authenticity, AI for food waste reduction, and food security monitoring, case studies on AI-based supply chain and

sustainable food systems; AI in Nutritional Assessment and Dietary Planning: use of AI for diet tracking, nutrient analysis, and energy estimation, image recognition for food portion and calorie estimation and the integration of wearable devices and health monitoring systems; AI in Nutrition Research and Data Analytics: AI for data collection, cleaning, and pattern recognition, predictive modeling for health outcomes and dietary behaviors, introduction to data visualization dashboards using Power BI and Tableau., applications of Python or Excel-based AI plugins in nutrition studies; Ethical, Legal, and Professional Issues in AI: ethical considerations in data collection and algorithm bias, patient privacy, informed consent, and data ownership, responsible use of generative AI tools such as ChatGPT and nutrition bots, regulatory frameworks in digital health and AI governance tools; Integration, and Real-World Applications: overview of non-coding AI tools for nutritionists and health professionals, AI data visualization and reporting using Google Sheets AI and Tableau dashboards; Future Trends and Innovations in AI for Nutrition; Nutrigenomics and precision nutrition; AI in public health nutrition and policy-making; AI-based entrepreneurship in dietetics and wellness industries; Emerging AI directions and skill needs for future dietitians.

Practical:

Exploring AI-based nutrition databases: USDA FoodData Central and NutriSurvey; Demonstration of AI diet tracking tools: FoodAI, MyFitnessPal, and CalorieMama; Using ChatGPT for generating nutrition summaries, menu plans, and client education; Image recognition demonstration for portion estimation and nutrient analysis; Predictive modeling exercises using Excel or Google Sheets AI features; Case study on AI applications in hospital dietetics or food safety monitoring; Ethical AI practice involving the identification of bias and misinformation in AI-generated nutrition data; Mini project developing a prototype concept of an AI-assisted nutrition or food innovation solution.

Suggested Readings Text books:

1. Topol, E. (2019). *Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again*. Basic Books.
2. Book Title: Artificial Intelligence in Food Science: Transforming Food and Bioprocess Development Chapters requirement (August 2023) Tanmay Sarka, Anandakumar Holdarai

Reference Readings:

1. National Academies of Sciences, Engineering, and Medicine. (2024). *The Role of Advanced Computation, Predictive Technologies, and Big Data Analytics in Food and Nutrition Research: Proceedings of a Workshop*. The National Academies Press.
<https://nap.nationalacademies.org/catalog/27478/the-role-of-advanced-computation-predictive-technologies-and-big-data-analytics-in-food-and-nutrition-research>
2. Shafik, W. (2024). Artificial intelligence for dietary management. In *Emerging Technologies for Smart Health Management* (pp. 112–135). IGI Global. <https://www.igi-global.com/chapter/artificial-intelligence-for-dietary-management/353796>
3. Bailey, R. L., MacFarlane, A. J., Field, M. S., Tagkopoulos, I., Baranzini, S. E., Edwards, K. M., ... & Stover, P. J. (2024). Artificial intelligence in food and nutrition evidence: The challenges and opportunities. *PNAS nexus*, 3(12), pgae461.
4. Joshi, S., Bisht, B., Kumar, V., Singh, N., Jameel Pasha, S. B., Singh, N., & Kumar, S. (2024). Artificial intelligence assisted food science and nutrition perspective for smart nutrition research and healthcare. *Systems Microbiology and Biomanufacturing*, 4(1), 86-101.
5. Miyazawa, T., Hiratsuka, Y., Toda, M., Hatakeyama, N., Ozawa, H., Abe, C., & Miyazawa, T. (2022). Artificial intelligence in food science and nutrition: a narrative review. *Nutrition Reviews*, 80(12), 2288-2300.