# Foundations of Artificial Intelligence Ne Öğreneceğiz?

<http://courses.ncirl.ie/index.cfm/page/module/moduleId/69098>

**Artificial Intelligence Module: Key Topics for AI and ML Developers**

1. **Foundations of Artificial Intelligence**:
   * **Understanding AI**: Definitions and foundational concepts from philosophy, mathematics, psychology, and computing.
   * **Historical Evolution**: Key milestones in the development of AI as a field.
2. **Types of AI**:
   * **Weak vs. Strong AI**: Differentiating between AI designed for specific tasks and AI with generalized human-like intelligence.
   * **Narrow, General, and Super Intelligence**: Exploring the capabilities of different AI levels and their applications.
   * **Classical vs. Statistical AI**: Understanding rule-based systems vs. data-driven approaches in AI development.
3. **Business Applications of AI**:
   * **AI in Business**: Exploring how AI can be applied to solve business problems, improve operations, and drive innovation.
   * **Ethical AI**: Building responsible, explainable, and safe AI systems to ensure ethical compliance.
4. **Intelligent Agents**:
   * **Agent Theory**: Concepts of percepts, actions, goals, and environments.
   * **Types of Agents**: From simple reflex agents to utility-based agents, and how they interact with their environment.
   * **Rationality**: Developing rational agents that act to achieve the best outcome.
5. **Problem Solving by Searching**:
   * **Search Strategies**: Uninformed search strategies (e.g., BFS, DFS) and informed search strategies (e.g., A\*).
   * **Local Search and Optimization**: Techniques like hill climbing and simulated annealing for finding optimal solutions.
   * **Adversarial Search**: Understanding search in competitive environments, such as game playing.
6. **Reasoning and Knowledge Representation**:
   * **Propositional and First Order Logic**: Building systems capable of making logical inferences.
   * **Ontological Engineering**: Structuring knowledge about categories, objects, and their relationships.
   * **Semantic Networks**: Representing knowledge using graphs to facilitate inference and understanding.
7. **Bayesian Networks and Probabilistic Reasoning**:
   * **Quantifying Uncertainty**: Using Bayesian networks to represent and reason with uncertain information.
   * **Inference**: Methods for making predictions using Bayesian networks.
8. **Learning in AI**:
   * **Types of Learning**: Supervised, unsupervised, semi-supervised, and reinforcement learning.
   * **Learning from Examples**: Techniques like regression, classification, and neural networks.
   * **Reinforcement Learning**: Concepts like Markov Decision Processes and value functions to model decision-making.
9. **Recommender Systems**:
   * **Types and Models**: Collaborative filtering, content-based filtering, and hybrid systems.
   * **Challenges**: Addressing issues like scalability, sparsity, and the cold-start problem.
   * **AI in Recommenders**: Implementing AI techniques to improve recommendation accuracy.
10. **Ethical Considerations in AI**:
    * **Data Privacy**: Ensuring the ethical use of data, particularly in sensitive applications.
    * **Bias and Fairness**: Identifying and mitigating biases in AI models.
    * **Explainability**: Making AI systems transparent and understandable to non-experts.
11. **Model Evaluation and Validation**:
    * **Model Assessment**: Using performance metrics like accuracy, precision, recall, and F1-score.
    * **Cross-Validation**: Techniques to ensure model generalization and avoid overfitting.
12. **Advanced AI Techniques and Industry Trends**:
    * **Latest Developments**: Reviewing state-of-the-art AI research and industry applications.
    * **AI in the Cloud**: Overview of cloud AI services (e.g., Amazon Personalize, Google Cloud AI) for building scalable AI solutions.

**Learning Outcomes Mapped to Topics**

* **LO1**: Understanding AI's theoretical foundations and key concepts.
* **LO2**: Analyzing the capabilities and limitations of current AI methods.
* **LO3**: Applying AI principles, models, and algorithms to solve real-world problems.
* **LO4**: Staying updated on the latest industry and research advancements in AI.
* **LO5**: Enhancing communication skills for collaborative AI projects.

**Assessment Overview**

* **Coursework (60%)**:
  + **Formative Assessment**: In-class activities, individual or group discussions to solidify understanding of core concepts.
  + **Project**: Proposing and developing an AI-based application, including business value assessment, ethical implications, and a comprehensive report.
* **End-of-Module Assessment (40%)**:
  + **Terminal Exam**: A two-hour examination assessing theoretical knowledge, practical application, and interpretative skills.

**Essential Skills for AI and ML Developers**

* **Theoretical Knowledge**: Strong understanding of AI principles, logic, and probability.
* **Practical Skills**: Hands-on experience with AI algorithms, model evaluation, and problem-solving techniques.
* **Ethical Awareness**: Ability to identify and address ethical considerations in AI applications.
* **Industry Awareness**: Keeping up with the latest AI trends, tools, and cloud-based services.

# Foundations of Artificial Intelligence Notlar

**Study Notes: Introduction to Artificial Intelligence Week1**

**1. What is Artificial Intelligence (AI)?**

* AI is a branch of computer science focused on creating machines that can perform tasks typically requiring human intelligence.
* **Intelligent Agents:** AI systems designed to perceive their environment and take actions to achieve specific goals (e.g., self-driving cars, Google Assistant).
* **Important Aspects of AI:**
  + **Thinking like humans:** Emulating human cognitive processes.
  + **Acting like humans:** Mimicking human behavior.
  + **Thinking rationally:** Using logic to achieve goals.
  + **Acting rationally:** Taking actions to maximize success.

**2. Data, Information, and Knowledge**

* **Data:** Raw facts and figures, can be numerical or non-numerical.
* **Information:** Processed, organized, and structured data.
* **Knowledge:** Information in context, leading to actionable understanding.

**3. Types of Artificial Intelligence**

* **Based on Capabilities:**
  + **Weak AI (Narrow AI):** Performs a specific task with intelligence (e.g., chess-playing computers, fraud detection).
  + **General AI:** Aims to perform any intellectual task with human-like efficiency. Currently hypothetical.
  + **Super AI:** Surpasses human intelligence with cognitive properties, currently a theoretical concept.
* **Based on Functionality:**
  + **Reactive Machines:** Basic type, no memory, reacts to current scenarios (e.g., IBM’s Deep Blue).
  + **Limited Memory:** Can store past experiences temporarily (e.g., self-driving cars).
  + **Theory of Mind:** Future AI that understands human emotions and social interactions.
  + **Self-Awareness:** Hypothetical AI with consciousness and self-awareness.

**4. The AI Market**

* In 2022, the AI market was valued at USD 454.12 billion.
* Expected to reach USD 2,575.16 billion by 2032 with a CAGR of 19%.

**5. Ireland’s Position in AI**

* Ireland is emerging as a leader in AI, ranked 10th globally and 3rd in Europe.
* A significant percentage of Irish companies use or plan to deploy AI.

**6. Ethical Implications of AI**

* **Environmental Impact:** AI model training emits significant CO2, raising sustainability concerns.
* **AI Ethics:** Responsible AI requires ethical, transparent, and accountable use, avoiding biases and ensuring privacy.
* **Robot Ethics:** Ethical considerations in designing robots, including their impact on humans and society.

**7. Classical vs. Statistical AI**

* **Classical AI:** Focuses on deductive reasoning using rule-based systems.
* **Statistical AI:** Arising from machine learning, focuses on inductive reasoning, identifying patterns from data.

**8. Examples of AI**

* **Classical AI:** Early natural language processing programs like ELIZA.
* **Statistical AI:** Machine learning systems that learn from large data sets (e.g., speech recognition, predictive analytics).

**9. Business Applications of AI**

1. **Market Prediction:** AI analyzes large datasets for stock predictions, sales forecasting, and consumer trends.
2. **Powering Infrastructure:** AI optimizes energy grids, traffic management, and supply chains.
3. **Healthcare:** AI aids in diagnosis, treatment planning, and personalized medicine.
4. **Intelligent Conversational Interfaces:** Chatbots, virtual assistants, and voice-enabled devices facilitate human-computer interaction.
5. **Cybersecurity:** AI enhances threat detection, intrusion prevention, and fraud detection.

**10. Summary**

AI aims to mimic and surpass human intelligence through various capabilities and functionalities. It has wide-ranging applications, from market prediction to healthcare, but also presents ethical and environmental challenges. As the AI market grows, considerations around responsible and sustainable AI development are crucial.