

Training modules for SMEs - Module 1 "Introduction to Artificial Intelligence and High-Performance Computing"

Contribution ID: 9

Type: **not specified**

Introduction to Artificial Intelligence

Thursday, 13 March 2025 11:10 (40 minutes)

1 Introduction

- 1.1 Artificial Intelligence (AI)
- 1.2 Data Mining and Big Data
- 1.3 History of Artificial Intelligence
 - 1.3.1 Turing's Test (1950)
 - 1.3.2 The Formal Beginning
 - 1.3.3 Early Success
 - 1.3.4 1st AI Winter
 - 1.3.5 Revival
 - 1.3.6 2nd AI Winter
 - 1.3.7 The Rise of Machine Learning
 - 1.3.8 AI in the 21st Century
 - 1.3.9 Current AI Technology
- 1.4 Supercomputers & AI

2 Introduction to Machine Learning

- 2.1 Traditional Programming
- 2.2 Machine Learning Algorithms
- 2.3 Input - Output
- 2.4 Fields of ML/AI
- 2.5 Tabular datasets
- 2.6 Computer Vision

3 Mathematical Models

- 3.1 A fundamental problem
- 3.2 ML Models
- 3.3 Artificial Neural Networks
- 3.4 Training a Model
- 3.5 Newton's Method for Root Finding
- 3.6 Newton's Method for Optimization
- 3.7 In Multiple Dimensions
- 3.8 Fundamental inefficiencies

4 Introduction to Large Language Models

- 4.1 Gödel's incompleteness theorem & Turing's Test
- 4.2 2024 LLMs
- 4.3 Language issues
- 4.4 Semiotics
- 4.5 Word representation
- 4.6 One-hot encoding
- 4.7 Representation of sentences
- 4.8 Vocabulary with N words
- 4.9 Semantic Limitations of One-hot Encoding
- 4.10 Word Embeddings and Distributional Semantics
- 4.11 Training Transformers with Embedded Word Representations
- 4.12 Training and Fine-tuning
- 4.13 Sequences of words
- 4.14 Train Dataset
- 4.15 The Transformer model architecture
- 4.16 Big Data
- 4.17 Model and Token Size
- 4.18 EuroHPC JU Access Call for AI and Data-Intensive Applications

5 Applications

- 5.1 Generative AI
- 5.2 Large Language Models

- 5.3 Computer Vision
- 5.4 Recommender Systems
 - 5.4.1 Timeseries Analysis and Predictions
- 5.5 Black-Box Optimization
- 5.6 Analysis of Scientific Literature
- 5.7 More

- 6 Introduction to Prompt Engineering
 - 6.1 Definition and significance
 - 6.2 Overview of language models
 - 6.3 Fundamentals of Crafting Effective Prompts
 - 6.4 Basic principles of prompt design
 - 6.5 The role of prompts in steering the model's responses
 - 6.6 Common pitfalls
 - 6.7 Ethical Considerations and Best Practices
 - 6.8 Technical Aspects of Prompt Engineering

Presenter: Dr BAKAS, Nikolaos (GRNET)