AI and Machine Learning Training for Managers and Analysts

Comprehensive training program on AI and Machine Learning for managers, decision-makers, and analysts. In this class, the participants will:

- start with an introduction to GPT models and ChatGPT, learn to write effective prompts (prompt engineering), get to know OpenAI API, and methods of integrating ChatGPT into their own applications.
- learn how to create their own (company-specific) chatbots.

Next, we'll provide an overview of the most popular Machine Learning models and their applications. We'll work on realistic examples for selected industries, based on which participants should develop an understanding and intuition regarding the usefulness of these solutions for their industries and organizations. We will cover models such as:

- the simplest decision trees and regression,
- recommender systems,
- anomaly detection systems and their application in finance,
- deep neural networks and natural language and image processing.

We will also discuss AI project management in organizations and the Machine Learning project lifecycle. We'll outline the CRISP-ML methodology.

Sometimes, we may not want to or cannot (e.g., for legal reasons) use solutions provided by external clouds and APIs. We will present an example of a large language model that can be implemented in our own infrastructure.

Finally, we will address the ethical and legal aspects of using AI, including topics like privacy issues, regulatory aspects in various countries, and copyright issues.

Our goal is to present selected techniques and models as practically and specifically as possible. Therefore, during our sessions, we will demonstrate models, their operating principles, and algorithm outlines. We will also show example applications and – for those interested – fragments of Python code performing selected tasks. However, **no programming skills are required from the participants**.

We offer two learning modes to choose from:

Evenings (for convenience and the ability to balance classes with participants work): The course lasts 32 hours, comprising eight live sessions of three hours each:

- Classes once a week on **Tuesdays** from **6:00 PM to 9:00 PM**.
- Additionally, for those interested, online consultations with the instructor are held on **Fridays at 6:00 PM** (four sessions of two hours each).

During the optional consultations, the instructor does not introduce new material but is available for you. You can receive help with exercises and problems, get answers to any questions, and review parts of the material. In total, 8 additional hours of consultations are available.

Daytime (for individuals and companies preferring classes during working hours): The course lasts 32 hours, divided into two blocks of two days each.

- Classes from **9:00 AM to 5:00 PM** (typically **Thursday and Friday**).
- The first day of the second block is dedicated to **exercises and consultations**.

On the exercise-consultation day, instructors (similar to the evening sessions) do not introduce new material but focus on solving exercises related to the discussed topics, answering questions and problems, and sometimes addressing additional issues requested by participants during the classes.

Classes are recorded, and if necessary, access to the recordings will be provided.

Course Program

1. **Introduction to AI, language models, and GPT.**
   - A brief history and development of artificial intelligence.
   - Basic concepts, GPT, and LLM (Large Language Models).
   - Overview of GPT models (e.g., ChatGPT, GPT-3, GPT-4) and LLM.
   - Applications of GPT and LLM in various industries.
   - Introduction to concepts such as Natural Language Processing (NLP), neural networks, and deep learning.
2. **Using ChatGPT in office work: Prompt Engineering.**
   - Web user interface. Accounts, model versions, prompts, and conversations.
   - Types of prompts: system, user, assistant, function.
   - Tactics for creating effective prompts. One-shot, few-shot.
   - Persona. Managing tone and style of responses.
   - Managing response formatting.
   - Optimization and personalization of prompts.
   - Injecting and storing context for long-term dialogue sessions.
3. **Prompts - examples of applications, best practices, and patterns.**
   - Practical examples of using GPT and prompts in daily work.
   - Creating documents. Corrections, summarization, rewriting texts, translations.
   - Solving tasks. Answering questions, generating formulas and codes (e.g., HTML, programming languages).
   - Example scenarios for selected industries and applications.
4. **Brief comparison of available and alternative language models.**
   - ChatGPT, Gemini, and Copilot.
   - Differences between language models, e.g., when using identical prompts.
   - Short overview of strengths and weaknesses of various models and their versions, e.g., in mathematical tasks, translations, internet accessibility, and current knowledge.

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5. **Other services and their integration with ChatGPT - image generating.**

- Generating images and graphics: DALL-E and its integration with ChatGPT at the web interface level.

6. **OpenAI API, its applications, and integration with your own applications. Creating company chatbots and assistants.**

- Configuration and security of using OpenAI API.
- Accounts, costs, and fees.
- Types of API calls. Endpoints.
- Integration of Chat GPT with other models and AI services.
- Creating custom (e.g., company-specific) chatbots and voice assistants.

7. **Introduction to Machine Learning (ML). Basic concepts, operations, applications.**

- Organizing definitions and concepts.
- Data analysis, ML, AI, neural networks, deep learning.
- Data, algorithm, model, prediction.
- Regression and classification.
- Error, methods of its measurement and comparisons.
- Supervised and unsupervised learning. Reinforcement learning (RL).
- Brief overview of AI technology types.

8. **Decision trees, regression, and logistic regression.**

> Introducing participants to decision tree models and logistic regression
> using the example of choosing a drug or therapy for patients. Participants will learn how decision trees work and how to create them based on example medical data to identify optimal treatment options.

8.1. Introduction to decision trees.

- Basic concepts of decision trees.
- Structure of a decision tree.
- Decision tree creation algorithms.

8.2. Applications of decision trees in medicine.

- Disease diagnosis / medical procedures.
- Selection of medication or therapy.
- Treatment outcome prediction.

8.3. Creating a decision tree for medication/therapy selection.

- Collecting and cleaning medical data.
- Preparing data for analysis.
- Building a decision tree.

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8.4. Interpretation of the decision tree.

- Evaluation of decision tree accuracy.
- Visualization of the decision tree.
- Drawing conclusions from the decision tree.

8.5. Application of decision trees in medical practice.

- Supporting treatment decision-making.
- Communicating analysis results with patients.
- Monitoring treatment outcomes.

8.6. Introduction to logistic regression.

- Concept of regression. Reminder of basic linear regression.
- Logistic regression. Basic concepts.
- Logistic regression algorithm.
- Interpretation of logistic regression results.
- Application of logistic regression in healthcare.
- Implementation of logistic regression.

Case Study: Decision-making in healthcare - selection of a cardiology drug based on laboratory test results. Using two different ML models for the same problem.

9. **Recommendation systems: Machine Learning in E-commerce and the entertainment industry.**

Presentation of using logistic regression in e-commerce. Participants will learn how to apply this method to analyze customer behavior data and make business decisions that can increase sales and conversion.

9.1. Application of logistic regression in E-commerce.

- Predicting conversion.
- Customer segmentation.
- Product recommendations.
- Optimization of marketing campaigns.

9.2. Implementation of logistic regression in E-commerce.

- Data collection and cleaning.
- Preparing data for analysis.
- Building a logistic regression model.
- Evaluation of the logistic regression model.

Case Study: Application of logistic regression in e-commerce practice.

10. **Nearest Neighbors Method (k-NN), collaborative filtering - and why Netflix paid a million dollars for a movie recommendation algorithm and never used it.**

Using k-nearest neighbors and collaborative filtering for movie recommendations. Participants will learn how to use these methods to analyze user preference data – using the example of recommending movies that are likely to be enjoyed by users.

10.1. Introduction to product recommendations.

- Basic concepts of product recommendations.
- Challenges associated with product recommendations.
- Different methods of product recommendations.

10.2. Nearest Neighbors Method (k-NN).

- Basic concepts of the k-NN method.
- Using k-NN for movie recommendations.
- Tuning k-NN parameters.

10.3. Collaborative filtering.

- Basic concepts of collaborative filtering.
- Different types of collaborative filtering.
- Using collaborative filtering for movie recommendations.

10.4. Evaluation of movie recommendation systems.

- Metrics for evaluating recommendation systems.
- Comparing different recommendation methods.
- Optimization of the recommendation system.

10.5. Applications of product recommendations in practice.

- Implementation of a product recommendation system.
- Use of product recommendations in streaming services.
- Use of product recommendations in online stores.

Case Study: Demo of developing a movie recommendation system.

11. **Introduction to deep learning. Deep neural networks in text and image processing.**

> Introduction to deep learning. System architecture and selected applications in text and image processing.

12. **Natural Language Processing (NLP) on the example of Sentiment analysis of customer statements (reactions to product, service, brand).**

> The goal is to familiarize participants with the basics of Natural Language Processing (NLP) and practical applications of this field in various areas.

12.1. Introduction to NLP.

- Basic NLP concepts.
- NLP system architecture.
- Selected NLP algorithms.

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12.2. Text analysis.

- Text representation and normalization.
- Text segmentation.
- Morphology and part-of-speech tagging.
- Syntax and syntactic analysis.
- Semantics and semantic analysis.

12.3. Text generating.

- Basic text generating techniques.
- Rule-based text generating.
- Statistical text generating.
- Neural network-based text generating.

12.4. Discussion of selected NLP applications.

- NLP in search engines.
- NLP in recommendation systems.
- NLP in chatbots.
- NLP in opinion analysis.
- NLP in foreign language processing.

Case Study: Sentiment analysis of a product/service/brand.

13. **Image processing. Predicting pneumothorax or COVID-19 based on X-ray images.**

> Introducing participants to image processing technology and practical applications of this field in selected areas.

13.1. Introduction to image processing and deep learning.

- Basic concepts of image processing and deep learning.
- Architecture of Convolutional Neural Networks (CNN).
- Selected image processing and deep learning algorithms.

13.2. Image representation and preliminary processing.

- Image file formats.
- Reading and saving images.
- Image format conversion.
- Basic operations on images (cropping, resizing, color change).

13.3. Image segmentation.

- Threshold-based image segmentation.
- Region-based image segmentation.
- Edge-based image segmentation.

13.4. Object recognition.

- Image classification.
- Object detection.
- Object localization.

13.5. Applications of image processing and deep learning.

- Medical image processing.
- Satellite image analysis.
- Facial recognition.
- Automatic image generation.

Case Study: Prediction of pneumothorax (or another disease, depending on the dataset used during the presentation) based on X-ray images.

14. **Anomaly analysis. Financial system fraud.**

> Introduction to anomaly analysis methods and AI applications in finance – particularly in detecting and combating fraud.

14.1. Introduction to anomaly analysis.

- Basic concepts of anomaly analysis.
- Types of anomalies (point, contextual, collective).
- Challenges associated with anomaly detection.

14.2. Anomaly detection methods.

- Statistical methods.
- Machine learning methods.
- Neural network-based methods.

14.3. Applications of anomaly analysis in financial systems.

- Detection of payment fraud.
- Detection of money laundering.
- Detection of market manipulation.

14.4. Implementation of anomaly detection in financial systems.

- Choosing the appropriate method.
- Data preparation.
- Model evaluation.

Case Study: Anomaly analysis of sample financial/transactional data.

15. **AI project management elements. Machine Learning project lifecycle. CRISP-ML(Q) methodology.**
    - Introduction to CRISP-ML(Q).
    - Overview of methodology elements.
    - Stages of the machine learning process.
    - Data collection and cleaning.
    - EDA (Exploratory Data Analysis).
    - Model building and evaluation.
    - Hyperparameter tuning.
    - Model deployment and monitoring.
    - AI project management, methodologies, and team management.

16. **Deploying large language models without using the cloud - Llama 3 example.**
    - Situations and requirements (e.g., regulatory) when we do not want or cannot use cloud solutions.
    - Demonstration of solution implementation on our own infrastructure (on-premise) based on the Llama 3 model.

17. **Ethical and legal issues in AI and selected auxiliary tools.**
    - Ethical use of AI and model fairness.
    - Privacy management.
    - AI regulations in different regions.
    - Social implications of AI.
    - Legal aspects and copyrights.
    - Presentation of other selected models and services: Whisper (speech recognition - ASR and its applications), Sora (generating videos based on text).

Price: 2990 PLN

(for companies: net price, for individuals: gross price – we cover the VAT, public entities – exempt from VAT).