Exercice 1: Basic AI Concepts

1. **What is AI?** Artificial intelligence is the ability of a computer or machine to mimic human cognitive functions such as learning, problem-solving, and decision-making. It involves creating systems that can perceive their environment, reason, and act autonomously.
2. **AI in Everyday Life:**
2.1 **Recommendation systems:** Netflix suggesting movies, Amazon recommending products.
2.2 **Virtual assistants:** Siri, Alexa, Google Assistant.
2.3 **Spam filters:** Email filtering to identify and block junk mail.
3. **What is an AI Agent?** An AI agent is an entity (software or embodied in hardware like a robot) that perceives its environment through sensors, makes decisions based on that perception, and acts upon the environment through actuators to achieve a specific goal.
4. **Future of AI:** I envision AI becoming more integrated into our lives, automating tasks, and helping us make better decisions in areas like healthcare, transportation, and environmental management. However, it's crucial to address ethical concerns and ensure responsible development.

Exercise 2: AI's Evolution and Impact

1. **Computing Power's Influence:** The rapid increase in computing power, especially the development of GPUs, has enabled the training of complex AI models (like deep neural networks) on massive datasets, leading to significant breakthroughs in areas like image recognition and natural language processing.
2. **Symbolic vs. Statistical AI:**
2.1. **Symbolic AI:** Uses rules and logic to represent knowledge and solve problems. *Example:* Expert systems for medical diagnosis.
2.2. **Statistical AI:** Learns patterns from data using statistical methods. *Example:* Image recognition using convolutional neural networks.
3. **Areas of AI Impact:**
3.1. Healthcare
3.2. Finance
3.3. Transportation
4. **AI Applications:**
4.1. **Healthcare:** AI helps with disease diagnosis, drug discovery, and personalized medicine.
4.2. **Finance:** AI is used for fraud detection, algorithmic trading, and risk assessment.
4.3. **Transportation:** Self-driving cars and traffic optimization systems rely on AI.

Exercise 3: Building an AI Team for a Bank

1. Roles and Skills:

1.1. **Key Roles:** AI Strategist/Manager , Data Scientists , Machine Learning Engineers , Data Engineers , Financial Analysts/Domain Experts, Project Manager, UX/UI Designer , Ethicist/Legal Counsel

1.2. **Responsibilities and Skills:** **AI Strategist:** Defines the AI strategy, aligns it with business goals. *Skills:* Strategic thinking, business acumen, AI knowledge. **Data Scientist:** Develops and evaluates AI models. *Skills:* Machine learning, statistics, programming (Python, R). **ML Engineer:** Deploys and maintains AI models. *Skills:* Software engineering, cloud computing, DevOps. **Data Engineer:** Collects, cleans, and manages data. *Skills:* Data warehousing, ETL, database management. **Financial Analyst:** Provides domain expertise, interprets results. *Skills:* Financial markets, banking products. **Project Manager:** Manages project

timelines and resources. *Skills:* Project management methodologies. **UX/UI Designer:** Designs user-friendly interfaces. *Skills:* UX/UI design principles. **Ethicist:** Ensures ethical considerations are addressed. *Skills:* Ethics, law, AI ethics.

2. **Team Structure:**

2.1. **Structure:** A hybrid structure would be suitable for a bank. A central AI team can develop core AI capabilities, while smaller, specialized teams can work on specific projects within different departments (e.g., fraud detection, loan approval).

2.2. **Organization Chart:**

AI Director
├── AI Strategy & Planning
│ └── AI Strategist
├── Core AI Team
│ ├── Data Scientists
│ └── ML Engineers
├── Departmental AI Teams (e.g., Fraud, Loans)
│ ├── Data Scientists
│ ├── ML Engineers
│ └── Domain Experts (Financial Analysts)
└── Data Engineering
└── Data Engineers

3.Team Management:

3.1. **Communication:** Regular meetings (stand-ups, project reviews), collaboration tools, documentation.

3.2. **Conflict Management:** Clear communication channels, mediation, conflict resolution training.

3.3. **Motivation:** Competitive salaries, opportunities for growth, recognition, work-life balance.

4.PERFORMANCE EVALUATION:

4.1. **Metrics:** Model accuracy, deployment speed, business impact (e.g., reduction in fraud, improved customer satisfaction), project completion rate.

4.2. **Monitoring:** Regular progress reports, project milestones, performance dashboards.

5. Ethical Questions:

Data privacy and security

Algorithmic bias and fairness

Transparency and explainability of AI models

Job displacement due to automation

Accountability for AI decisions

Exercise 4: Machine Learning Types and Algorithms

1. **Supervised vs. Unsupervised Learning:**
1.1. **Supervised Learning:** The algorithm learns from labeled data (input-output pairs). The goal is to predict the output for new, unseen input.
1.2. **Unsupervised Learning:** The algorithm learns from unlabeled data. The goal is to discover patterns or structures in the data.
2. **Algorithms:**
2.1. **Supervised:**

- ✓ Linear Regression (for predicting continuous values)
- ✓ Decision trees (for classification problems)

2.2. **Unsupervised:**

- ✓ K-Means Clustering (for grouping similar data points)
- ✓ Principal Component Analysis (PCA) (for dimensionality reduction)

3. **Problem Types:**
3.1. Linear Regression: Predicting house prices.
3.2. Logistic Regression: Classifying emails as spam or not spam.

3.3. K-Means Clustering: Segmenting customers based on their purchasing behavior.
3.4. PCA: Reducing the number of features in a dataset while preserving important information.
4. **Loan Repayment Prediction:** Supervised learning. You have labeled data (past loan applications with information about whether the loan was repaid or not). You can train a model to predict the likelihood of a new applicant repaying their loan.
5. **Bakery Problem:**

5.1. **Type of Learning:** Supervised learning. The baker has labeled data (day of the week and number of loaves sold). He wants to predict the number of loaves he will sell *tomorrow* (new, unseen input).

5.2. **Algorithm:** Linear Regression or a similar regression algorithm (like Polynomial Regression if the relationship is more complex). The day of the week can be encoded numerically (e.g., Monday=1, Tuesday=2, ..., Sunday=7) or using one-hot encoding. The algorithm can learn the relationship between the day of the week and the number of loaves sold, and then use that relationship to predict sales for future days. A time series approach could also be considered if the baker wants to take into account trends over multiple weeks.