








**Computer Science Department  
First year of Bachelor's degree**

## **Chapter 2 - ADVANTAGES & RISKS of ARTIFICIAL INTELLIGENCE**

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# SUMMARY

## **Advantages of AI**

-  **Intelligent Automation and Increased Productivity**
-  **Advanced Data Analysis (Big Data)**
-  **Advances in Healthcare**
-  **Improvement of Educational Systems**
-  **Optimization of Transportation and Smart Cities**
-  **Acceleration of Scientific Research**
-  **Personalization of Digital Services**
-  **Contribution to Sustainable Development**

# SUMMARY



## Risks of AI

-  Economic Risks and Labor Market Transformation
-  Algorithmic Bias and Discrimination
-  Lack of Transparency and the “Black Box” Problem
-  Privacy Violations and Mass Surveillance
-  Information Manipulation and Disinformation
-  Security and Military Risks
-  Excessive Dependence and Loss of Human Skills
-  Concentration of Technological Power

# **Advantages of Artificial Intelligence (In-Depth Development)**



Artificial Intelligence (AI) has become a major driver of technological innovation and socio-economic transformation. Its impact extends beyond the field of computer science to influence all strategic sectors of society.

# Intelligent Automation and Increased Productivity

One of the primary advantages of AI is its ability to automate repetitive, complex, or large-scale tasks.

## **Benefits:**

- . Reduction of human errors
- . 24/7 operational capability
- . Acceleration of decision-making processes
- . Decrease in operational costs

In industry (Industry 4.0), intelligent systems optimize production lines, detect defects in real time, and anticipate failures (predictive maintenance).

AI does not merely replace human labor; it enhances human capabilities (the concept of “augmented intelligence”).

# Advanced Data Analysis (Big Data)

AI systems can process massive volumes of data that are impossible to analyze manually.



## **Applications:**

- Banking fraud detection
- Economic forecasting
- Climate modeling
- Behavioral analysis

Through machine learning, models learn patterns and improve their performance over time.

AI transforms raw data into actionable knowledge for strategic decision-making.

# Advances in Healthcare

The medical sector significantly benefits from AI:



- Imaging-assisted diagnosis (radiology, MRI)
- Early disease detection
- Personalized medicine based on genetic data
- Accelerated drug discovery

AI systems can identify complex correlations invisible to the human eye, contributing to improved diagnostic accuracy.

# Improvement of Educational Systems

AI enables:



- Personalized adaptive learning
- Intelligent tutoring systems
- Analysis of student performance
- Early detection of school dropout

It promotes learner-centered education by adapting to each student's pace & level.



# Optimization of Transportation and Smart Cities



- Intelligent traffic management
- Reduction of traffic congestion
- Autonomous vehicles
- Energy consumption optimization

Intelligent systems contribute to more efficient and sustainable mobility.

# Acceleration of Scientific Research

AI has become a fundamental tool for:



- Molecular simulation
- Space exploration
- Genomic analysis
- Complex physical modeling

It enables researchers to explore hypotheses faster than traditional methods allow.

# Personalization of Digital Services

In commerce and digital platforms:



- Product recommendation systems
- Targeted advertising
- Optimized user experience

This personalization improves user satisfaction and economic efficiency.

# Contribution to Sustainable Development

AI can support environmental objectives:




- Energy consumption optimization
- Precision agriculture
- Environmental monitoring
- Intelligent management of natural resources

It enables better resource allocation and waste reduction.

# Conclusion

The advantages of AI lie in its capacity to:

-  - Increase human efficiency
- Improve decision-making accuracy
- Stimulate innovation
- Sustainably transform economic and social systems

However, these benefits can only be fully realized if AI development is guided by responsible and ethical frameworks.


# Risks of Artificial Intelligence




Despite its impressive performance, AI raises major economic, ethical, social, and security concerns. These risks require regulation and multidisciplinary reflection.

# Economic Risks and Labor Market Transformation

AI can support environmental objectives:

-  - Repetitive industrial tasks
- Administrative services
- Call centers
- Transportation (autonomous vehicles)

**Associated challenges:**

-  - Technological unemployment
- Growing inequalities between skilled and unskilled workers
- Concentration of wealth within major technology companies

However, AI also creates new professions (data scientist, AI engineer, AI ethicist). The main challenge lies in adaptation and professional reskilling.

# Algorithmic Bias and Discrimination

AI systems learn from historical data.

If these datasets contain biases, AI may reproduce or even amplify these injustices.

## Examples:



- Automated recruitment favoring certain profiles
- Facial recognition systems with uneven accuracy across groups
- Discriminatory credit-scoring systems

## Core issue:

AI is not neutral. It reflects both data and human design choices.

This raises fundamental questions:

- . How can fairness be ensured?
- . Who is responsible in case of error?



# Lack of Transparency and the “Black Box” Problem

Many advanced models (particularly deep learning systems) are difficult to interpret.

## Consequences:



- Decisions that cannot be clearly explained
- Difficulty in auditing systems
- Loss of user trust

In sensitive fields such as healthcare, justice, and finance, explainability becomes essential.

# Privacy Violations and Mass Surveillance

AI relies on the collection and analysis of vast amounts of data:



- Biometric data
- Behavioral data
- Browsing data
- Images and videos


## Risks:

- Generalized surveillance
- Abusive commercial exploitation
- Infringement of individual freedoms

Facial recognition and intelligent tracking systems raise significant societal concerns.

# Information Manipulation and Disinformation

Generative systems can produce:

-  - Deepfakes
- Fake news articles
- Fabricated speeches
- Highly realistic artificial images

## Impacts:

- Political manipulation
- Large-scale disinformation
- Erosion of trust in media

The ability to distinguish truth from falsehood becomes a central challenge.

# Security and Military Risks

AI can be used in:



- Autonomous weapons
- Automated cyberattacks
- Military surveillance systems

The development of autonomous weapons raises major ethical concerns:

- Who controls the decision to use lethal force?
- Who is responsible in case of error?

# Excessive Dependence and Loss of Human Skills

Overreliance on AI may lead to:



- Reduced critical thinking
- Decline in analytical skills
- Automation of moral decision-making

AI should remain a decision-support tool rather than a complete substitute for human judgment.

# Concentration of Technological Power

AI development is dominated by a small number of corporations and states.


## Possible consequences:



- Geopolitical imbalances
- Data monopolization
- Technological dependency of developing countries

# Conclusion

The risks of AI do not imply that its development should be halted, but rather that it must be accompanied by:

-  - Robust regulatory frameworks
- Promotion of ethical and responsible AI
- Algorithmic transparency
- Digital literacy and public awareness

The challenge of AI is not only technological but profoundly human & societal.










**Computer Science Department  
First year of Bachelor's degree**

**Prolog**  
**Basic Concepts**  
**COURSE of PROLOG: INTELLIGENCE**  
**ARTIFICIELLE (IA)**

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# FIRST STEPS IN PROLOG

-  How it works
-  Using it for knowledge bases
-  Listes of application

# LOGIC PROGRAMMING

## Origins:

-  1970, Marseille, Colmerauer

-  Listes of application

## Bibliography

-  L. Sterling, E. Shapiro, The Art of Prolog, Masson

-  Clocksin, Mellish, Programming in Prolog, Eyrolles

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# Prolog

## What is PROLOG?

**PROLOG** = **PRO**gramming **LOG**ic



\* It's a language that is:

- declarative (it describes what, not how)
- based on first-order logic
- widely used in symbolic AI



- Application areas:**
- Artificial Intelligence,
  - Expert systems
  - Automated reasoning
  - Natural language processing
  - Problem solving

# THE PROLOG LANGUAGE

■ A language for expressing knowledge based on the **language of predicates (first order Logic)**

■ **Declarative Programming:**

■ The user defines a **knowledge base**

■ The Prolog interpreter uses this **knowledge base** to answer **questions**

# Constants & Variables

## Constants

- Numbers : 12, 3.5

- Atoms :

- Strings of characters beginning with a lowercase letter

- Strings of characters between " "

- Empty list []

## Variables

- Strings of characters beginning with a capital letter

- Strings of characters beginning with \_

- The variable "indeterminate" : \_



# A Prolog program consists of:

## ■ Facts

■ Horn's clause reduced to a positive literal

$P(\dots)$ , where  $P$  is a predicate.

`father(ali,meziane).`      `father(larbi,saadi).`

## ■ Rules

■ Complete Horn clause

$P(\dots) \text{ :- } Q(\dots), \dots, R(\dots).$

`grand_father(X, Y) :- father(X,Z), father(Z,Y).`

## ■ Questions

■ Horn clause without positive literal

`father (ali,X), mother(ania,X).`

`father(ali,X).`      `mother(ania,X).`

# Facts

A fact describes a truth.

**Syntax:** fact

**Example:** man (ali).

woman (sara).

parent (sli, ahmed).

parent (sara, ahmed).

\* ali is a man

\* ali is ahmed's parent

# Rules

A **rule** allows us to deduce new knowledge.

## Syntax

`conclusion :- condition1, condition2.`

## Example

```
father(X, Y) :-  
    man(X) ,  
    parent(X, Y) .
```

X is the father of Y if :

- . X is a man

- X is a parent of Y

# Requests (questions)

Requests are submitted to the system **Prolog**.

## Example

```
father(ali, ahmed) .
```

**Answer :**

```
true. %We have this fact.
```

## Example

```
father(leila, ahmed) .
```

**Answer :**

```
false.%We have not this fact.
```

# Variables

- Beginning with a **capital letter**
- Representing unknown values

## Example

?- parent(X, ahmed) .

**Answer :**

**X = ali ;**

**X = sara.**

# The inference mechanism

Prolog uses:

- **Unification**

- **Backtracking**

- It tries:

- 1. a solution

- 2. if unsuccessful → backtracking

- 3. searches for another solution \_

# Factorial

`fact(0,1) .`

`fact(N,F) :- N > 0, N1 is N-1, fact(N1,F1),  
F is N * F1.`

## Testing :

?- fact(0,F). F = 1.

?- fact(1,F). F = 1.

?- fact(2,F). F = 2.

?- fact(3,F). F = 6.

?- fact(4,F). F = 24.

?- fact(5,F). F = 120.

# Member of a list

```
member (X, [X|_]) .
```

```
member (X, [_|T]) :-  
    member (X, T) .
```

**Testing :**

```
?- member (b, [a,b,c]) .  
true.
```



## Sum of a list

`sum([ ], 0) .`

`sum([H|T], S) :-  
 sum(T, S1),  
 S is H + S1.`

**Testing :**

`?- sum([5,11,25], S) .  
S = 46.`

# Maximum

`max ([X] , X) .`

`max ([H|T] , M) :-`

`max (T , M1) ,`

`(H > M1 -> M = H ;`

`M = M1) .`

**Testing :**

`?- max ([6,15,3] , M) .`

`M = 15 .`

**How do we run a program?**

# **Step 1 — Write the program**

## **1.-Open an editor**

**You can use :**

- . Notepad (Bloc-notes)**
- . Notepad++**
- . VS Code (better)**

## 2.- Write a short program 'test.pl'

**Example :** test.pl

**% Facts**

man(ali).

man(karim).

woman(sara).

**% Rules**

father(X,Y) :-

    man(X),

    parent(X,Y).

parent(ali, karim).

### 3.- Save the file

#### **Important :**

- . Name : test.pl
- . Type : **All the files**
- . Encodage : UTF-8
- . Extension : .pl

**P.S.** : Do Not Save in **‘.txt’**

# Step 2 — Launching SWI-Prolog

We have two possibilities:

## ◆ Method 1 (easy)

1. Click on SWI-Prolog
2. A black window will open:

?-

## Method 2 (command line)

In the folder where your file is located:

swipl

# Step 3 — Load the file

**In Prolog:**

**?- [test].**

**or**

**?- consult('test.pl').**

**If all goes well:**

**true.**



# Step 4 — Run a query

**Example:**

**?- man(ali).**

**Answer :**

**true.**

**Or :**

**?- man(X).**

**Result :**

**X = ali ;**

**X = karim.**

**The ';' allows you to search for another solution**

## Step 5 — Modifying the program

If you modify the file:

1. Save

2. Reload in Prolog:

?- make.

or

?- [test].

### Example AI

fact(0,1).

fact(N,F) :- N > 0, N1 is N-1,  
fact(N1,F1), F is N \* F1.

## Testing :

?- fact(5,F).

Result :

F = 120.

## Common Mistakes

1. Forgetting the period at the end
2. Using a capital letter in the wrong place
3. Saving as a .txt file
4. Not reloading after editing