**Learning objectives**

Operating system

* *Describe how an OS works and use analysis tools*
* *Describe the operating system's memory and process management mechanisms*

Descriptive statistics and continuous laws

* *Analyze the results of descriptive statistics to understand the characteristics of the data set.*
* *Analyze and evaluate methods for detecting anomalies in time series data based on thresholds such as z-score, IQR, percentage of maximum and robust statistics.*

Implementing a concept

* *Identify appropriate resources, experiment and collect data*

Cross-disciplinary skills

* *Establish the mathematical model of a real computer problem*
* *Solve a mathematical problem using a python program*

**Introduction**

As part of her internship at OPTIMAL, a company specializing in advanced IT solutions, Emma, a third-year engineering student, is tasked with analyzing CPU, memory and network performance. The aim of this activity is to develop her skills in the management and optimization of IT systems.

**Topic**

[**Instructions**](https://moodle.cesi.fr/pluginfile.php/143026/mod_resource/content/2/co/_3_-_Mini_prosit_Statistiques_SI.html)

**Quiz**

Emma starts her A3 internship at OPTIMAL with enthusiasm. She is greeted by Lucas, her internship tutor, who introduces her to her first project: in-depth performance analysis of key components of computer operating systems.

**Lucas**: "Hello Emma, welcome to OPTIMAL! We've got an interesting project for you: monitoring and analyzing CPU, memory and network performance on our servers. This data is crucial to optimizing our IT solutions for our customers.

**Emma**: "Hello Lucas! Yes, I'm very keen to get started. I know that these analyses are essential to keep our systems running smoothly and efficiently." Emma starts by using advanced monitoring tools to collect real-time data on CPU, memory and network performance from OPTIMAL's servers.

**Lucas**: "Here's the first data we collected yesterday over 24 hours with a frequency of 1 minute. We have measurements on CPU usage, memory consumption, network traffic and server temperature. What would be your first steps in analyzing this data?"

**Emma**: "I think it would be a good idea to calculate descriptive statistics for each metric. This will give us an overview of average performance and help us identify trends."

To deepen their analysis, Emma decides to use Python, a skill she developed during her studies, to automate the data analysis process and extract valuable patterns on CPU, memory and network performance.

**Emma**: "Initial analysis of data statistics gives us a good overview, but we also need to check whether our data follows a given distribution for further analysis." **Emma**: "We've identified that CPU utilization is often high during certain hours of the day, which could indicate poorly optimized processes or poorly distributed workloads."

**Lucas:** "For memory, we observe peaks in usage when running certain applications. We should explore strategies to improve memory management and optimize its use." Based on her in-depth analysis,

Emma offers concrete recommendations for OPTIMAL to optimize CPU, memory and network performance, maximizing the efficiency of IT infrastructures.

**Emma**: "For example, by using data-driven alertness thresholds, we can adjust execution schedules for intensive tasks, and by optimizing memory management, we could reduce operational costs and improve the user experience for our customers." At the end of her internship at OPTIMAL, Emma presents her findings to the IT infrastructure management team, demonstrating how rigorous analysis can lead to significant improvements in the performance and efficiency of IT systems. She also suggests exploring predictive methods to anticipate future demands on IT resources, in order to proactively optimize system performance at OPTIMAL.

[**Resources for students**](https://moodle.cesi.fr/pluginfile.php/143026/mod_resource/content/2/co/_3_-_Mini_prosit_Statistiques_SI.html)

[**Introduction to operating systems and memory management**](https://moodle.cesi.fr/pluginfile.php/143026/mod_resource/content/2/co/_3_-_Mini_prosit_Statistiques_SI.html)

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1. [Introduction aux systèmes d’exploitation.](https://univ.scholarvox.com/reader/docid/88859221/page/311)
2. [Gestion de la mémoire](https://univ.scholarvox.com/reader/docid/88859221/page/383)
3. [Introduction à la supervision des systèmes informatiques](https://univ.scholarvox.com/reader/docid/88913048/page/25)

**.CSV data for one week of system observation at OPTIMAL :**

[server\_usage\_data.csv [csv]](https://moodle.cesi.fr/pluginfile.php/143026/mod_resource/content/2/res/server_usage_data.csv)

[**Descriptive Statistics Course**](https://moodle.cesi.fr/pluginfile.php/143026/mod_resource/content/2/co/_3_-_Mini_prosit_Statistiques_SI.html)

[Statistiques descriptives](https://univ.scholarvox.com/reader/docid/88833765?searchterm=Statistique%20descriptive%20%3A%20en%2027%20fiches%20Ed.%208https%3A%2F%2Funiv.scholarvox.com%2Fcatalog%2Fbook%2Fdocid%2F88833765%3Fsearchterm%3DStatistique%20descriptive%20%3A%20en%2027%20fiches%20Ed.%208)

[**Assessment**](https://moodle.cesi.fr/pluginfile.php/143026/mod_resource/content/2/co/_3_-_Mini_prosit_Statistiques_SI.html)