



Navigate your Business with
XAIEN

INTRODUCTION TO XAIEN

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1. A tool based on algorithms. Why does it exist at all?

Humans are always able to navigate complex situations sufficiently well through experience and intuition. But only sufficiently well. It was only through the consistent use of the scientific method and rationality that the achievements of modern times became possible. Rough estimates, intuition and experience won't get you to the moon. Rocket Science does. This consistent approach bears fruit not only in medicine, physics, and other natural sciences. But also, when one abstracts specific challenges in their entirety and asks oneself the general questions: How do you solve problems? How do you get to the set goal? How do you find the BEST solution? Or the most robust? The fastest? And how do our solution methods behave when the task gets bigger and bigger? Are they scalable?

Algorithmics is science's answer to all these questions. And the tools based on algorithmics are the fantastic (almost magic-looking) result of having really thought through a problem

2. Why are our methods the best, and where is the evidence?

There is no better solution than an **optimal solution**.

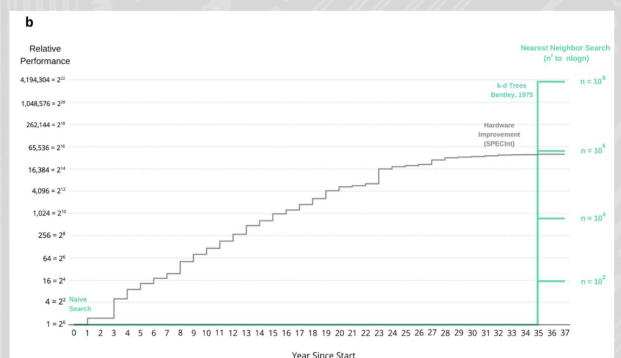
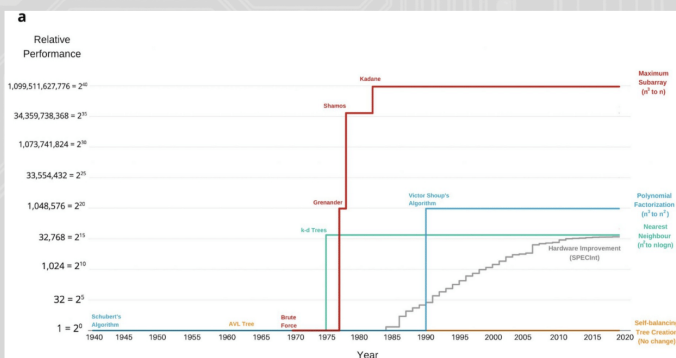
Algorithmics is the science of developing optimal methods. Among them are many different techniques, each developed over decades by the research community with a focus on delivering the best possible solutions in the shortest possible time and being able to prove it.

THE POWER OF ALGORITHMS

"Our results quantify two important lessons about how algorithm improvement affects computer science.

First, when an algorithm family transitions from exponential to polynomial complexity, it transforms the tractability of that problem in a way that no amount of hardware improvement can.

Second, as problems increase to billions or trillions of data points, algorithmic improvement becomes substantially more important than hardware improvement/Moore's law in terms of average yearly improvement rate. These findings suggest that algorithmic improvement has been particularly important in areas, such as data analytics and machine learning, which have large datasets." 1)



Relative performance improvement for algorithm families, as calculated using changes in asymptotic time complexity. The comparison line is the SPECint benchmark performance [20]. (a) Historical improvements for four algorithm families compared with the first algorithm in that family ($n = 1$ million). (b) Sensitivity of algorithm improvement measures to input size (n) for the "nearest-neighbor search" algorithm family. To ease comparison of improvement rates over time, in (b) we align the starting periods for the algorithm family and the hardware benchmark

1) How Fast Do Algorithms Improve?

By YASH SHERRY (MIT Computer Science & Artificial Intelligence Laboratory, Cambridge, MA 02139 USA)

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3. Why do such questions/challenges arise?

(Behind this is NP vs P, a millennium problem) If there are:

- **conflicting goals** (e.g., serving customers as much as possible while minimizing company overhead)
- and or there is **a very large room for maneuver and choice**,
- and within this, however, one is subject to **strict rules** (such as **dependencies**),

this creates a field of tension between all possible solutions.

Navigating this field of tension optimally is what we call "dealing with high complexity".

In a company, all these things are common and frequent. You must constantly reconcile conflicting interests and goals, you have a huge range of possible courses of action, and at the same time you find yourself subject to the laws of nature, the legal framework, and the mechanics of economics. Complexity in a company is therefore unavoidable.

A common answer to complexity nowadays is machine learning (ML). However, ML is not usefully applicable to everything, partly because **historical data is not available**. But relying instead on experience and intuition can't be the solution either.

Only a rigorous mathematical approach can deliver solutions that are **guaranteed** to do their job, not just hopefully.

4. XAIEN (Explainable AI Enterprise Navigator) brings science into the business

There are techniques out there that can tackle complex tasks, but they are not easily accessible. Locating these methods, mathematically modeling business goals and frameworks so that they can be addressed by the techniques and identifying structures and relationships in the tasks that make a technique particularly effective is an art in itself.

XAIEN brings the **most important and useful techniques and methods** to one place, and our consultants enable companies to undertake mathematical modeling that meets their goals and requirements. We are also constantly developing additional methods. This ensures that we have a **suitable method for every situation**.

Complex tasks continue to exist not only in a single area of a company, but have emerged in all kinds of domains, areas, tasks, or issues. Just as no one is any longer surprised that mathematics and digitization permeate all areas of life, it should come as no surprise that the methods of algorithms, built on mathematics and logic, are of great use in all these areas. XAIEN is consequently a **generic tool** that can be used in a very general way. It allows to perform complex optimizations, calculations, analyses, and simulations in any domain.

5. What does this mean for companies?

XAIEN is **without alternative**. We are the first in this field.

A similar tool is offered by our "market companion" Gurobi (<https://www.gurobi.com>), but their tool can only be used by experts. Also, because it is only one of numerous tools of algorithmics, it effectively maps only a small part of all tasks in a company. We provide consultants to guide them until the finished algorithm is easy to use. Our tool is easier to use, and you don't have to be a computer scientist to use it. We can find the right algorithm for any problem. That is why we were able to beat Gurobi in our model project for KPMG by exploring a faster and more efficient solution. Our algorithms deliver a solution **in minutes instead of weeks** (7min versus 100h).



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In all the following cases it is worthwhile to use XAIEN because the complexity is high enough that it is hard to reconcile everything:

- your task takes 40 person days or more
- you consider multiple data dimensions, and the product of their possible values is greater or equal to 10^5 (e.g., 200 days * 50 employees * 80 projects = $8 \cdot 10^5 > 10^5$)
- you suspect that you could increase the quality of your solution by 20 %
- you have 2 or more conflicting KPIs or criteria you care about

6. Our Vision

Current times are challenging economically, politically, socially, ecologically. The challenges are very complex and hard to keep track of. Whether wars or pandemics, companies need to react to events quickly.

Our ambition is to support enterprises to take **the optimization step to emerge stronger from the crisis**. With XAIEN, companies are no longer dependent on subjecting themselves to processes and predefined organizational structures to endure the complexity they inevitably encounter. Instead, they can approach any complex developments systematically.

**XAIEN ENABLES COMPANIES TO
NAVIGATE THEIR BUSINESS
WITH OPTIMAL, FAST, PRECISE
AND COMPREHENSIBLE
DECISIONS.**

