CASE STUDY

High-Performance Computing
Software Development

Optimal Design with 5x Performance Boost

DATADVANCE Discovers that Intel® Distribution for Python* Outpaces Standard Python

"Many of our customers integrate pSeven Core into their software environments using a Python interface to implement our Design Space Exploration algorithms seamlessly into the product development processes. Intel Distribution for Python can help them get the best results even faster."

—Sergey Morozov
CEO, DATADVANCE

In the competitive world of CAD/CAE, high performance is everything. Optimal design of a product with dozens or even hundreds of components is what determines its quality, usability, and competitiveness—and can even help it save human lives. Getting to the optimal design quickly is another key to success.

DATADVANCE is a company that provides software products for high-end CAD/CAE model optimization—with a wide range of intellectual data analysis, predictive modeling, and design optimization services for customers in industries like aerospace, automotive, biomedical, electronics, and others.

A key contributor to the flexibility of the company's flagship pSeven* platform is its full scriptablility with Python* pSeven Core*. And when DATADVANCE tested Intel® Distribution for Python*, it found a new way for its customers to find the speed they need—boosting performance up to 5x over the standard Python distribution.

Solving Challenging Engineering Problems

pSeven is a design space exploration platform that allows even non-math experts to solve challenging engineering problems and discover optimal designs in just a few clicks. They can use it to:

- **Cut design lead time** by integrating their engineering software tools.
- **Enhance product performance** with multi-objective optimization.
- **Predict response values for new designs**, accelerate complex simulations by many orders of magnitude, and capture essential knowledge from vast amounts of data approximation models.
- **Ensure process quality** using validated workflows.

Why Python?

One key part of pSeven is its flexibility for customers who need a Python scripting interface.

"All the design space exploration algorithms and techniques in pSeven are contained in a standalone Python library," explained Alexander Prokhorov, head of software development at DATADVANCE. "Besides developing convenience, that grants our users more flexibility when the standard capabilities of the GUI are just not enough for solving complex engineering problems."

With a wide range of open source data analysis tools, Web frameworks, and testing instruments, the Python programming language is one of the largest programming communities, with a robust ecosystem. Its design philosophy emphasizes code readability and its syntax allows programmers to express concepts in fewer lines of code. It helps enable clear programming on both small and large scales and

supports multiple programming paradigms—including object-oriented, imperative, functional, and procedural—and has a large and comprehensive standard library. Python interpreters are available for many operating systems.

Finding the Best Performance

One of the biggest draws for Python is that it's easy to learn and use. However, as an interpreted language, Python also is notorious for being too slow for high-performance, compute-intensive applications.

To ensure it was able to give its customers the best Python performance possible, DATADVANCE tested both Intel Distribution for Python and the standard Python.

Intel Distribution for Python is a free tool that addresses the fundamental performance challenges of Python, delivering the speed of compiled languages with full optimization for a wide range of processors and coprocessors from Intel. It can show great improvements for computation packages like NumPy*, SciPy*, and scikit-learn*.

"We tested different version combinations and distributions of Python and NumPy for estimation of Sobol* indices using pSeven Core, since it's one of the common problems our customers solve. For older versions of Python—for example, 2.6—the boost reached even 10x, but for the newer ones it stayed around 3x to 5x," said Dmitry Vetrov, chief developer at DATADVANCE.

"Many of our customers integrate pSeven Core into their software environments using a Python interface to implement our Design Space Exploration algorithms seamlessly into the product development processes," said Sergey Morozov, CEO of DATADVANCE. "Intel Distribution for Python can help them get the best results even faster."

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Intel Distribution for Python >

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Comparison of pSeven Core Performance using Different Python Distributions >

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