

HPC User Budget Map Survey: Machine Learning's Impact on HPC Environments

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EXECUTIVE SUMMARY

Intersect360 Research surveyed the High Performance Computing (HPC) user community to complete its tenth Site Budget Allocation Map, a look at how HPC sites divide and spend their budgets. We surveyed users on their spending in seven top-level categories: hardware, software, facilities, staffing, services, cloud computing, and other. Each category was further divided into constituent subcategories, resulting in 27 unique items included in the analysis. Additionally, the respondents were asked about their future budget expectations.

For this iteration of the annual Budget Map survey, Intersect360 Research incorporated questions to investigate the use of machine learning and its interrelationship with HPC budgets, systems, and personnel. This report examines the use of machine learning, the impact on the HPC budget, the systems used, and the personnel to manage the systems.

The Budget Map survey series includes the following reports:

- *HPC Site Budget Allocation Map: Budget Expectations*
- *HPC Site Budget Allocation Map: Machine Learning's Impact on HPC Environments*
- *HPC Site Budget Allocation Map: Budget Distribution*
- *HPC Site Budget Allocation Map: Public Cloud Spending*
- *HPC Site Budget Allocation Map: Segmentation, Methodology, and Demographics*

For this survey, *machine learning* is defined as an inclusive term. The survey questions focused on the current trends in deep neural networks, also referred to as deep learning, machine learning, and more generally, as artificial intelligence. For the purpose of this survey and report, all are referred to as machine learning.

More than half of the survey respondents reported they were running machine learning programs currently, as part of or in addition to their HPC environments. Another 11% planned to implement machine learning programs in the next year. Most respondents viewed machine learning workloads as a component of their HPC budget, and close to two-thirds of respondents have shared personnel across HPC and machine learning. The machine learning trend is a key factor in the near-term growth of HPC budgets, and it has already had an effect on HPC installations. (See also: *Worldwide High Performance Computing 2017 Total Market Model and 2018–2022 Forecast: Products and Services* and *HPC User Site Census: Machine Learning Applications*.)

Despite the prevalence of machine learning, Intersect360 Research is cautious in describing the size of the machine learning “market.” This report primarily highlights spending that is shared, and moreover, the increase in HPC budget attributable to machine learning is only incremental. The vast majority of spending on infrastructure that is dedicated to machine learning comes from hyperscale companies. Outside of hyperscale, evidence points mostly to shared infrastructures in HPC environments, or the use of public cloud beyond HPC.

TECHNOLOGIES COVERED IN THIS REPORT

- HPC system elements
 - Systems, clusters
- Processor elements
 - Accelerators
- Software elements
 - Application software
 - In-house developed applications
- Cloud computing, grid computing, utility computing
 - Public cloud technologies
- Other Technologies
 - Artificial Intelligence/Machine Learning/Deep Learning

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
TECHNOLOGIES COVERED IN THIS REPORT	2
INTRODUCTION	4
RESULTS AND ANALYSIS	5
State of Using Machine Learning	5
Figure 1: State of Using Machine Learning by Sector	6
Machine Learning and Public Cloud	6
Figure 2: HPC Public Cloud Spend for Sites Currently Using Machine Learning.....	7
Impact of Machine Learning on the HPC Environment.....	7
HPC Budget.....	8
Figure 3: Relationship Between Machine Learning Budgets and HPC.....	8
Figure 4: Machine Learning’s Impact on Total Budgets for High-Performance Workloads	9
HPC Hardware	9
Figure 5: Hardware Used for Machine Learning and HPC	9
HPC Personnel.....	10
Figure 6: Personnel in Machine Learning and HPC	10
CONCLUSIONS.....	11