Peer Comparison of XSEDE and NCAR Publication Data

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INTRODUCTION

We present a framework that compares the publication impact based on a comprehensive peer analysis of papers produced by scientists using the Extreme Science and Engineering Discovery Environment (XSEDE) and National Center for Atmospheric Research (NCAR) resources. The analysis is introducing a percentile ranking based approach of citations of the XSEDE and NCAR papers compared to peer publications in the same journal that do not use these resources.

This analysis is unique in that it evaluates the impact of the two facilities by comparing the reported publications from them to their peers from within the same journal issue. From this analysis, we can see that papers that utilize XSEDE and NCAR resources are cited statistically significantly more often. Hence we find that reported publications indicate that XSEDE and NCAR resources exert a strong positive impact on scientific research.

METHOD

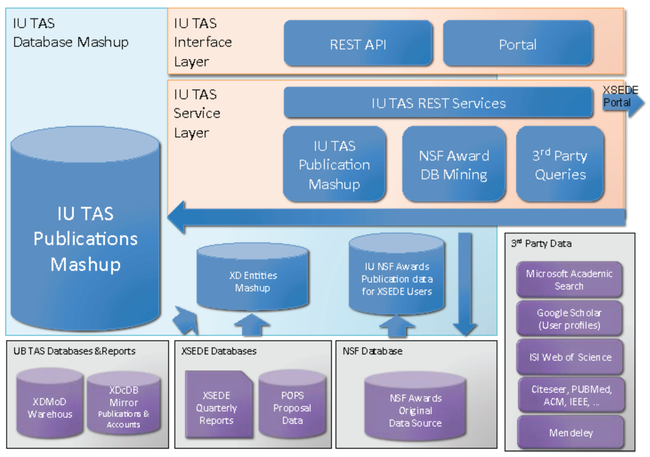

Figure 1. System architecture

We have developed a system to conduct the data gathering, processing, and metrics calculation and evaluation (Figure 1). It is a layered architecture involving various sources and interacting with multiple other services and sites. The method is applied to XSEDE and also adapted to NCAR to retrieve relevant data, generate metrics, as well as impact evaluation [1].

We compared XSEDE and NCAR publications with their peers by looking at the citation count and relative ranking. The process is as the following:

1. Identify publication venues of the reported XSEDE/NCAR publications;
2. Retrieve all publication data from the venues in the same time period;
3. Identify the peers comparison groups(publications in same journal issues);
4. Calculate ranking scores of XSEDE/NCAR publications and their peers;
5. Use the raw ranking scores to derive comparison metrics at different aggregation level (e.g. journal, Field of Study).

During this process we have retrieved more than one million publication records to facilitate the peers comparison.

RESULTS

	# Publications	Rank - Average	Rank - Median	# Citation - Average	# Citation - Median
XSEDE	2349	61	65	26	11
Peers	168422	49	48	13	5

Table 1. Comparison data of XSEDE and peers

T-test for ranking (Welch Two sample t-test)
T=21.4134, df=2412.99, p-value<2.2e-16
95% confidence interval: [10.80, 12.98]

T-test for citation count:
T=7.057, df=2358.929, p-value=2.228e-12
95% confidence interval: [9.40, 16.63]

Table 1. lists the numeric results of compared XSEDE publications and the peers. The T-test shows that the result is statistically significant for both the ranking and citation count (average or median). See also Figure 5 (at the bottom).

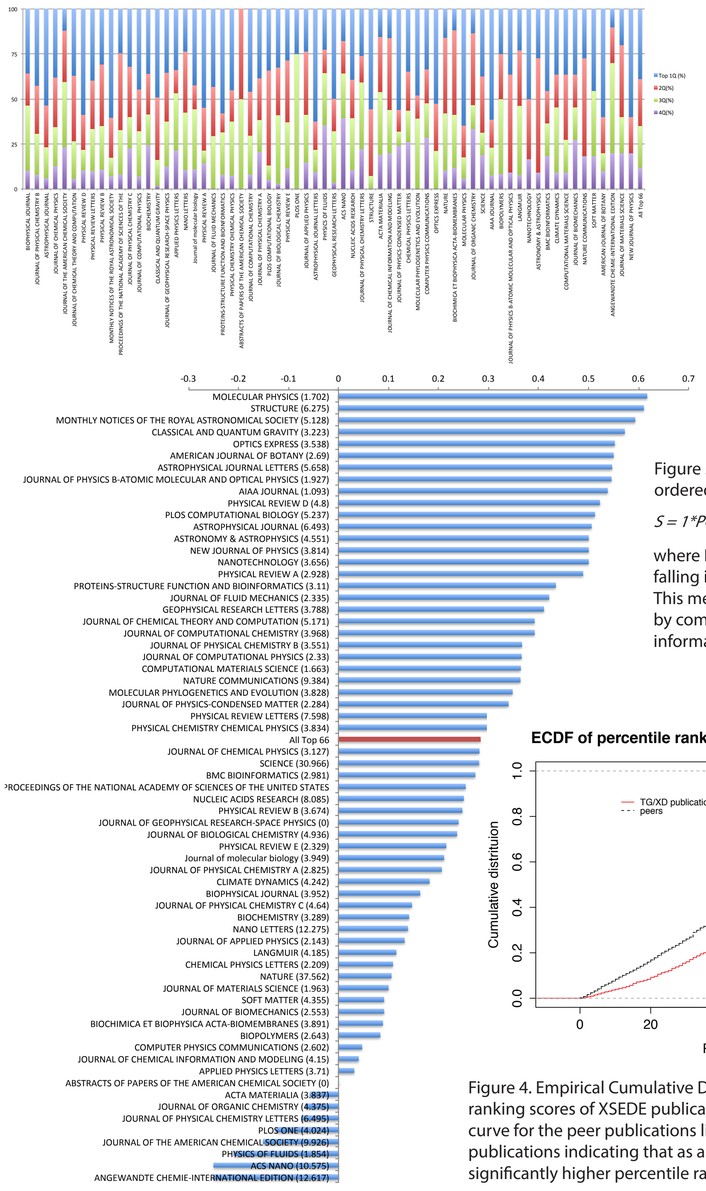

Figure 3. Publication venues for XSEDE data ordered by a merit score defined as:

$S = 1*PQ_1 + 0.5*PQ_2 + (-0.5)*PQ_3 + (-1)*PQ_4$

where PQ_i is the percentage of pubs falling into the top i-th quarter.
This metric enables a quantative comparison by combining all the percentile ranking information.

Figure 2. (left) shows the comparison results for XSEDE when grouped by journals. For each journal, the ranking quarter distribution (based on individual percentile rankings) is shown. E.g., BLUE indicats the portion of papers falling into the top quarter by percentile ranking among peers; RED indicates those falling into the 2nd quarter. Altogether they have those falling in the better half. The chart shows XSEDE publications tend to receive more citations in most journals comparing to the peers within the same journal issues.

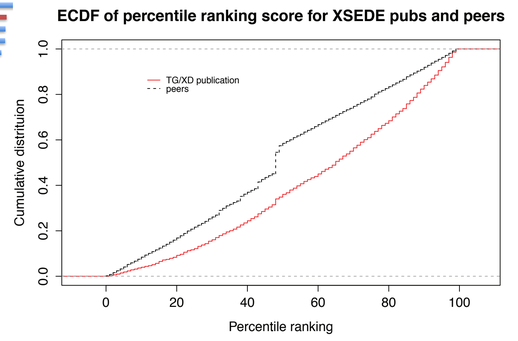

Figure 4. Empirical Cumulative Density Function (ECDF) of percentile ranking scores of XSEDE publications (Red) and peers (Black). The ECDF curve for the peer publications lies well above that of the XSEDE publications indicating that as a group the XSEDE publications have a significantly higher percentile ranking.

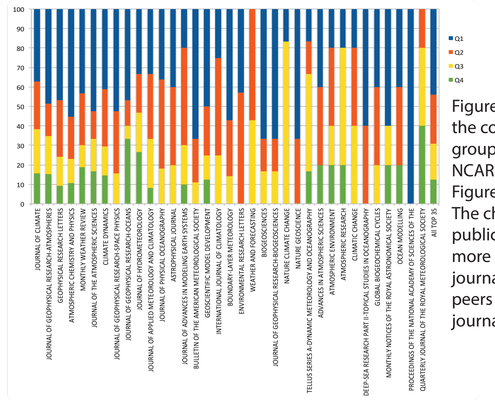

Figure 5. (left) shows the comparison results grouped by journals for NCAR data, similar to Figure 2 for XSEDE data. The chart shows that NCAR publications tend to receive more citations in most journals comparing to the peers within the same journal issues.

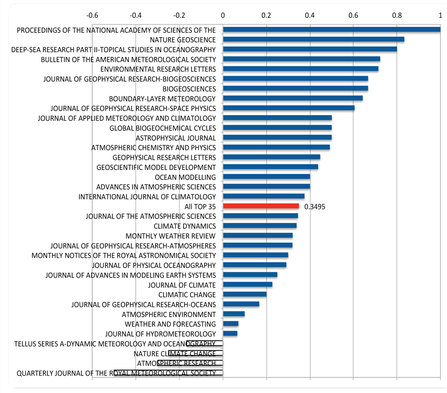

Figure 6. Publication venues for NCAR publication data ordered the merit score defined previously. Having a positive score for most journals, as well as the 0.35 overall score indicates that NCAR publications tend to be cited more often than their peers appeared in the same journal issues.

CONCLUSIONS

The NCAR score is slightly higher than that of XSEDE as XSEDE has a wider range of FOS. Computational intense disciplines that most NCAR users come from result in higher score values using the resources. For both XSEDE and NCAR publications, the impact metric measured by a performance score (defined based on percentile ranking of citation data) is positive and higher than their peers that have not used such resources.

ACKNOWLEDGEMENTS

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REFERENCES

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2. von Laszewski, G., Wang, F., Fox, G. C., Furlani, T. R., DeLeon, R. L., & Gallo, S. M. Peer comparison of XSEDE publication data. Presented in XSEDE'15.