

Establishing the Center for Data Analysis and Statistics (CDAS) at the United States Military Academy

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1 Executive Summary

The Center for Data Analysis and Statistics (CDAS) was organized in the Department of Mathematical Sciences, United States Military Academy in January of 2004. The center is designed to provide statistical consulting and perform analysis to support researchers in the West Point community and for DoD agencies as required. In this paper we discuss the organization, mission and utility of the CDAS. The paper is designed to inform members of the DoD statistical community of the opportunities and benefits the CDAS can provide for their own agencies. We also briefly discuss completed and ongoing projects as well as lessons learned in establishing a statistical consulting service.

2 Introduction

The Department of Mathematical Sciences at the United States Military Academy (USMA) established the Center for Data Analysis and Statistics (CDAS) to address a perceived need for statistical consulting support both at USMA and throughout the Department of Defense (DoD). The CDAS was founded in January of 2004 with the primary goal of providing support to USMA researchers with statistical questions and data analysis needs. The organization is also chartered to potentially provide support to organizations outside of the West Point community as needed.

3 CDAS Organization

The CDAS is a new branch of an already existing center: the Mathematical Sciences Center of Excellence (MSCE). The MSCE provides coordination for outreach and projects for both faculty and students in the Department of Mathematical Sciences with a variety of external organizations to include an important partnership with the Army Research Laboratory (ARL). The CDAS enhances the capabilities to include a statistical component and support.

The organization of the CDAS is depicted in Figure 1. In addition to administrative leadership from a director and assistant director, the primary statistical expertise is provided by “senior faculty advisors” with Ph.D.’s in statistics or related fields. Members of the CDAS work on projects in teams (or individually) but have ready access to the senior advisors in case they need statistical support themselves.

Currently, membership and participation is completely voluntary and done in addition to normal teaching loads. The CDAS has between 15 and 20 members who have expressed an interest in working on projects. The membership is not restricted to the Department of Mathematical Sciences. The CDAS has active members from the Orthopedic Surgeon at Keller Army Community Hospital, the Department of Electrical Engineering and

Computer Science and the Department of Systems Engineering at West Point. Members include both Ph.D. and M.S. degree holders in a variety of fields to include statistics, biostatistics, epidemiology and operations research.

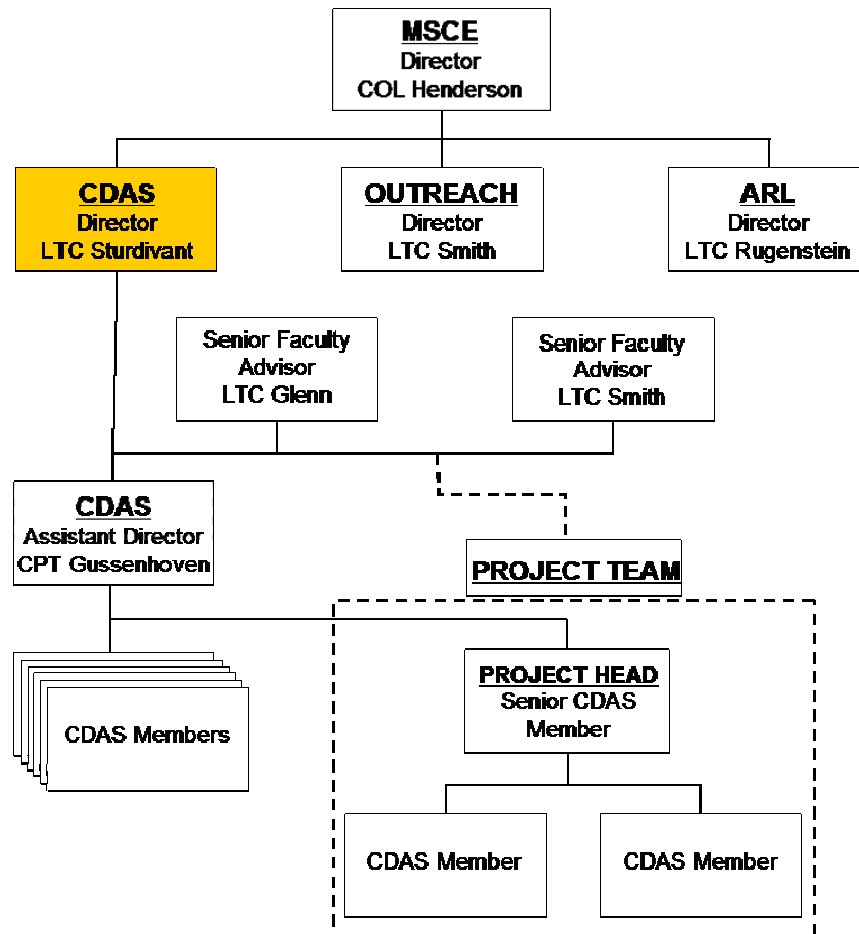


Figure 1: Organization of the CDAS

4 CDAS Mission and Projects

The CDAS is designed to provide statistical consulting and data analysis support for the West Point community first and to DoD agencies where possible. The level of support can range across a very wide spectrum. In some cases, the service could be as limited as answering a quick statistical question or acting to review/comment on a statistical approach to a problem. At the other extreme, the project might include complete data analysis done by the CDAS for a client.

In addition to provided support to other agencies, the CDAS is designed to also provide professional development opportunities for faculty members at USMA. The projects allow members to increase their statistical expertise, keep current on statistical techniques and put skills into practice. These experiences are invaluable for rotating military faculty

members who will leave West Point for assignments throughout the Army – many in Functional Area (FA) 49 (Operations Research) where they will perform similar duties.

A third goal is to enhance the educational experience for cadets in our programs. This can occur in several ways. One is that the faculty projects provide insights and examples for use in the classroom. In some instances, faculty work is extended to student work in homework assignments our course projects.

A more direct impact is that cadets may become involved in the actual CDAS work. There are two mechanisms in place for such participation. The first is the MA491 course: a senior thesis conducted in the spring semester. Where the scope and timing of a client project is appropriate, the CDAS members can act as advisors for a cadet(s) thesis to work on the problem (or part of it). A second opportunity for cadets to participate is during summer Academic (AIAD). In that case, the client actually sponsors a cadet during the summer to work on a project.

While the organization is relatively new, we have already had numerous clients across the gamut of possible projects. We have provided tutoring and quick answers to statistical questions for many clients. Several much larger projects have also come to the CDAS and cross a wide spectrum of disciplines, statistical techniques and organizations. Some examples include:

- A study of juvenile recidivism in New York with the New York Military Academy; involved logistic regression and survival analysis
- Donor solicitation with the Association of Graduates (AOG) at West Point; sampling theory, ANOVA and categorical data analysis
- Football “sabermetrics” advice for a cadet project; involved ordinal logistic regression
- ACL injuries in cadets studied by the orthopedic surgeon at West Point – primarily categorical data analysis

Several projects are currently being worked and some tentative ties with organizations outside of West Point in place. We have intentionally built the organization slowly in order to ensure quality service. As a volunteer organization, our greatest challenge is encouraging participation from all members so that a few are not over-whelmed with work. We are developing a web-site and data base to help control and manage requests for statistical support. The administrative aspects of such an organization still require some work.

The other obvious challenge is to ensure we have the appropriate expertise to provide sound statistical advice and support. Most clients have brought problems somewhat foreign to the member providing the service. This leads to a need to shape client expectations as the CDAS team needs time to research the topic. On the other hand, these cases provide the very professional development opportunities we seek for our members. As a group, the CDAS has a wealth of expertise in a variety of statistical areas providing needed support to those working a project. Regular monthly meetings provide opportunities to discuss ongoing projects or have members share their own statistical knowledge to expand that of each individual member. These meetings have probably been the greatest benefit of the CDAS to date.

5 The CDAS and Other Agencies

Over time, we hope to become a ready source of statistical support throughout the DoD. In this vein, we offer several important benefits to agencies that might need statistical work done. One advantage of using the CDAS is that we can offer an “honest broker” and a “second set of eyes” on data analysis projects. In most cases, the CDAS is unaffected by the results of a statistical analysis done by agencies we might support. As a result, our confirmation of results of such analysis can provide strong support since we have no vested interest in the outcome.

A second role we might provide in time is something of a repository for statistical analysis throughout the Army. If West Point has ties to various agencies performing data analysis we might be able to help connect (as the ACAS does) those working on similar problems.

Perhaps most importantly, the CDAS can help support when either expertise or time are lacking. This support might be quick questions and advice or could be much larger in scope. The CDAS is prepared to help perform the analysis when needed. Even very large projects over longer periods of time are possible. In particular, the organizations with such needs can consider several key opportunities for support. One is the previously mentioned cadet availability. This is best during the Spring semester (January through April) with senior projects or during the summer in dedicated AIADs.

Our faculty members are also available for larger project work. This is particularly the case during the summer months when many instructors work on research projects.

Finally, membership in the CDAS is not limited to either the Department of Mathematical Sciences or United States Military Academy. We can envision a CDAS which includes statisticians from a number of organizations ready to provide support to the DoD on statistical projects. We should note here that we are actively pursuing hiring new civilian Ph.D. in statistics or related fields to infuse more expertise into the CDAS. These positions are part of an established post-doctoral fellowship (Davies Fellowship) which has been very successful for all participants over a number of years.

6 Contact Information

Information on the CDAS may be found at the web site:

<http://www.dean.usma.edu/departments/math/CDAS/>