Sabbatical Report

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Date range of the sabbatical leave: Fall 2015  

First of all, I would like to thank the UH Hilo Administrative Leaders, my colleagues from the Mathematics Department and my colleagues from the NSF UHH S-STEM Program for supporting my Sabbatical leave. It was an exciting time of research challenges, productive collaborations, rewarding results and further academic and professional refinement.

Sabbatical objectives and planned activities

As outlined in my Application, my objectives were to continue my research in Information Geometry and in Higher Education. The sabbatical leave allowed me to achieve both goals and participate in new collaborations. I am pleased to report that I had the opportunity to even exceed the initial plan and advance in a third area as well, Academic Leadership.

I. Research in Information Geometry

1. Previous work that lead to the new research

My recent research has been focused on the geometry of some statistical parameter spaces that can be used to address the new challenges of our times. The functions that constitute those parameter spaces have been used to model various processes and phenomena in the nature and human society. Some of these functions are applied to weather forecast and industrial risk management. Others are used in medicine for studies and development of new treatments for leukemia and some epidemic diseases. Another group is used in modeling the neural network and human brain functions to further advance the development of artificial intellect.

The rapid development of the modern information technologies presents our society with various new challenges. The parameter space constituted by the Weibull distribution (W) is a perfect choice of study in that regard. The Weibull distribution has been used in life data analysis, extreme value theory, radar systems, wind analysis, weather forecasting. Most recently the Weibull distribution became a vital part in modeling of fading channels and the wireless communications.

I have been studying some of the key geometric characteristics of the Weibull manifold (W) such as the geodesic distance, differential equations of geodesics, scalar curvature, Gauss curvature, etc.

2. New contributions

During my recent collaboration with colleagues from Japan we were able to advance the study of the W space and obtain new interesting results. We studied the $\alpha$–connection, the geodesics with respect to the 0–connection, some almost complex structures which are parallel with respect to the $\alpha$–connection, the Laplace operator with respect to the $\alpha$–connection and a special differential equation of W. We reported our findings in a collaborated paper which has been accepted for publication in the International Journal for Information Geometry and its Applications, Tensor, N. S.

II. Academic research
The transformation of our STEM education has become a high national priority. Its success depends on the STEM faculty’s innovative thinking, active participation in the process, and taking new initiatives. As planned, I devoted part of my sabbatical leave to my work on further advancing the STEM education at UH Hilo.

1. Previous work that lead to the new research

My first program “STEM Students’ Success Through Enhanced Math” (STEM SSTEM) started in 2006 and proved to be very successful. We were on the right path.

The next step, as I saw it, was to expand the program so that to help not only our Mathematics majors, but all our STEM students. Taking the initiative to unify all STEM departments on campus into a new interdisciplinary collaborative program came naturally. With the kind cooperation and hard work of all my colleagues Natural Science Department Chairs at that time, our new STEM Research Honors Program at UH Hilo was born. Our first STEM Honors cohort (Spring 2015) was exceptional, so is the second cohort (Spring 2016). As the path to excellence in STEM has been established, it was time for the next step:

To find a way to make the STEM Excellence at UHH as inclusive as possible. This professional dream became a reality thanks to the generous support from NSF. My colleagues co-PI's and I (as PI) were awarded the NSF S-STEM grant ($ 625,000.00) to establish our new Program “Scholarships for STEM UH Hilo” (NSF S-STEM). The program supports students from financially disadvantaged families, who otherwise would be unable to go to college, to pursue their STEM degrees. The scholarships we now award are $20,000 per student for 4 years of their studies. Our scholars also receive a much needed academic support, mentorship and other academic help.

2. New contributions

During my sabbatical I continued my work on advancing the STEM education and our two new STEM programs at UHH. The results have been reported in the paper “Promoting Excellence in Undergraduate Research”, which has been accepted for publication by the Clute Institute for Academic Research. I was also invited to present our innovative strategies and best practices to internationally recognized educators from USA, Europe, Asia, and Africa at the International Conference of Higher Education in London, UK.

III. Academic leadership

1. Previous work that lead to the new results

In 2011 I was “drafted” to become department chair of the Mathematics department. I graciously declined this responsible task because I felt I was absolutely unprepared to lead a department, let alone to lead one of the largest departments on campus. However, the specific circumstances dictated to accept the position. With no previous experience as a chair, nor with any aspirations to ever lead a department, and with no opportunity for any professional training at that time, all I could do was educate myself. I had to learn on my own, and to learn quickly, how: a) to be a good department chair of a key department serving the entire campus and b) to be a good leader of the 10 years Program review of my department and our two Mathematics programs.

In 2013-14 the opportunity for a formal training finally presented. I was accepted to, and graduated from, the reputable Academic Leadership Academy, Penn State University, PA.

2. New results

During my sabbatical I was accepted in, and in Spring 2016 graduated from, the nation most prestigious Program “Women in Academic Leadership” at Harvard Institute of Higher Education, Harvard.