



ACHIEVE

RESEARCH & GRANTS ACTIVITIES @ ROBERT MORRIS UNIVERSITY • 4th Edition Volume 1 • Fall 2018

Associate Provost's Message

The Research & Grants Administration is happy to share the Fall 2018 issue of the R&G Newsletter. We hope this newsletter will play an important role in showcasing research & grant activities at RMU.

In this issue, we feature nine grant applications submitted by RMU faculty from January to June 2018. The summaries presented here are in the Principal Investigators' own words. Some of these applications have been awarded and others are pending. For this period, eighteen opportunities were discussed/explored and nine full proposals were submitted. McAllister & Quinn provided grant writing services for one of these applications. The remaining grant proposals were written by our faculty and staff with support from Research & Grants Administration, Office of Institutional Advancement, and Financial Operations. As always, supporting institution data was provided by Office of Institutional Research.

The Research & Grants Administration encourages all faculty and staff to pursue research and participate in various research & grants related activities. The administration is available to help you answer questions related to grant searching, writing, budgeting, and managing. Please contact us with your questions, comments, suggestions, and concerns.

Have a great Fall semester!

Sincerely,

Sushil Acharya
*Associate Provost for Research,
Graduate Study & International
Programs*



➤ Adaptive Randomized Rounding in the Big Parsimony Problem

Grant Agency: **National Science Foundation**

Many practical problems arising in data analytics involve clustering; i.e., the process of grouping objects of similar kinds into smaller groups within the larger population. One of the questions facing science, engineering and business is how to organize the huge amounts of available data into meaningful structures or break a large heterogeneous population into smaller homogeneous groups. Clustering analysis is an exploratory data analysis tool which aims at sorting different objects into groups in a way that the degree of association between two objects is maximal if they belong to the same group and minimal otherwise.

In published scientific articles, hierarchical algorithms are used far more than non-hierarchical clustering. Applications of hierarchical clustering typically can be divided into those that build large trees so that, for instance, a user can navigate a large collection of documents, and those that build trees to represent a scientific process, such as phylogenetic trees (evolutionary trees). The Hamming distance between two sequences of equal length is the number of positions at which the corresponding symbols are different. An integer programming formulation of a dendrogram minimizing the Hamming distances within groups is flexible and efficient, but suffers from symmetry and overwhelming complexity. In bioinformatics a biological dendrogram, so called phylogenetic tree, gained notoriety in complexity of its construction. The project develops polyhedral and probabilistic methods for the big parsimony problem to construct the most parsimonious phylogenetic tree on DNA-sequences.

Sangho Shim
*Principal Investigator
Assistant Professor of
Industrial and Manufacturing
Engineering, SEMS*



Grant Proposal Activities - January to June 2018



Grant Opportunities
Explored



Grant Proposals
Submitted

➤ Cumulative Damage Model of Repetitive Nerve Injury

Grant Agency: **National Science Foundation**

Through an interdisciplinary approach that brings together methods from neurobiology, computational mechanics, experimental mechanics, bioimaging, and high-performance computing, this project aims to improve our fundamental understanding of injury development in mechanically-induced optic nerve injuries. An integrated experimental and computational modeling approach will be used to study the accumulation of microstructural damage in nerve tissue components during mechanical stretch injury. In addition to these research goals, this project also aims to broaden the participation of women and veterans in engineering through the expansion of a Women in STEM Summer camp and by providing summer research opportunities to veteran undergraduate students.



Rika Carlsen
Principal Investigator
Assistant Professor of Mechanical and Biomedical Engineering, SEMS

➤ Laser Welding Applications and Commercialization

Grant Agency: **MECCO**

MECCO, a local laser company, awarded RMU a \$23.5k grant for the 2018-2019 school year for "Laser Welding Applications and Commercialization." This is the third grant from MECCO to RMU in the past 2 years. The previous work included investigating the history and methods of welding plastics with lasers, conducting a market study of competitors and competing processes, and designing a process by which plastic samples can be made at RMU, welded at MECCO and then tested for strength and other factors at RMU to optimize the welding process. These contracts cover faculty and student support and also include a laser marking system on loan to RMU for use by students. This latest contract continues previous efforts but emphasizes the development of a welding system that is ready for market and includes creating a process to demonstrate welding to potential customers that have unique applications with various plastics and part shapes. These awards have generated two honors theses, a graduate research project, a senior design project, supported 3 internships for credit and involved 11 engineering students to date. MECCO has also directly hired 4 RMU engineering students during this collaboration, two interns and two full time employees.

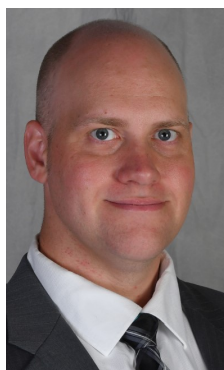


Marcel Minutolo
Principal Investigator
Associate Professor of Management, SBUS

➤ University/Government Research Partnership

Grant Agency: **Department of Human Services Allegheny County**

Robert Morris University has been selected by Allegheny County, on behalf of its Department of Human Services (DHS), to join DHS in a University/Government Research Partnership that will use DHS and its academic partners' resources to understand, improve and evaluate initiatives and perform research that is in alignment with the values of DHS and directly benefits the residents of Allegheny County. Participation in this Partnership is an opportunity for Robert Morris University to inform the DHS research agenda and have access to DHS resources including data, technical assistance and subject matter expertise. DHS envisions that projects by RMU and other partners could include use of data, tests of new hardware or software by DHS staff, or research that involves human subjects as well as DHS staff and clients (as appropriate). Anyone from RMU that may have a research interest is invited to share their interest with Dr. Minutolo who will bring the ideas to DHS.



Ben Campbell
Principal Investigator
Assistant Professor of Engineering, SEMS

➤ **Investigating the Rate-dependent Responses and Damage Mechanisms of the Neuronal Cytoskeleton under Dynamic Mechanical Loads**

Grant Agency: **Charles E. Kaufmann Foundation**

The optic nerve, which transmits electrical signals from the retina at the back of the eye to the brain, can become damaged when it is mechanically loaded during head trauma. Although it has been shown that increased stretch of the optic nerve results in greater functional impairment, the progression of stretch-induced structural damage in the optic nerve has yet to be fully characterized. Through an integrated experimental and computational approach, this proposed work will study the accumulation of damage in the optic nerve from repetitive stretch injury. The knowledge acquired will provide greater insight into the role of mechanical stretch on the development of optic nerve injuries, such as indirect traumatic optic neuropathy (ITON), for which the etiology of injury is currently unknown. By identifying those components that play a significant neuroprotective role and whose damage significantly increases the risk of further injury, this research will help guide therapeutic interventions of mechanically-induced optic nerve injuries.



Rika W. Carlsen
Principal Investigator
Assistant Professor of
Mechanical and Biomedical
Engineering, SEMS

➤ **Development of a Commercial Laser Welding System**

Grant Agency: **MECCO**

Based upon the success of the previous collaboration between Robert Morris University and MECCO, "Investigation and Commercialization of Laser Welding," which culminated in a presentation at the Triennial National Plastics Exposition, this grant extended the partnership through the summer of 2018. In addition to the principal investigator, Dr. Campbell, another RMU engineering faculty member, Dr. Luis Monterrubio, was added to the proposal for limited support leveraging his experience in designing and testing parts for the automotive industry. Two RMU engineering student interns were included in this project to assist in making plastic dog bone samples using RMU's injection molding machine, welding them at MECCO, testing them for strength at RMU, and analyzing the results. Dr. Campbell and the students continued to design and develop tooling for welding, expanded the literature search, and assembled information for training MECCO staff in marketing, sales, and applications. As part of the agreement, RMU now has a fully integrated and enclosed MECCO laser marking system available for student use in the Engineering Learning Factory, on loan through the end of 2019.



Benjamin Campbell
Principal Investigator
Associate Professor of Engineering,
SEMS

➤ **An Exploratory Study of the Relationships between High School Math Courses, Standardized Test Scores, and Post-secondary Success for Pennsylvania Students**

Grant Agency: **PA Department of Education**

Dr. Mary Hansen submitted a proposal for a PDE research agenda item related to PDE's Statewide Longitudinal Data Systems (SLDS) grant received in September 2015. As part of this PDE project, the agency identified research topics and questions that are aligned with PDE goals and priorities. Dr. Hansen's proposal related to PDE's interest in factors that increase the likelihood of Pennsylvania high school students' enrollment in post-secondary institutions. Using retrospective data provide by PDE, the study proposes to utilize both exploratory descriptive analyses and inferential statistical analysis to examine the relationships between high school math course participation, enrollment in high school AP math courses, and college enrollment and success. Dr. Hansen intends to examine and present descriptive and inferential statistics highlighting factors that predict post-secondary enrollment and success, overall, by region, and by demographic subgroups. The findings would contribute to the understanding of opportunity to learn related to mathematics courses for Pennsylvania high school students.



Mary Hansen
Principal Investigator
Professor of Education,
SESS

➤ CIS Cyber Scholars Program

Grant Agency: **National Science Foundation (NSF)**

The Computer and Information Systems Department will establish the *CIS Cyber Scholars Program*, to engage low-income, academically talented community college transfer students in computing majors. Within RMU’s CIS majors, approximately one in three students enters as a transfer student from a community college. There is great promise in engaging community college transfer students as a pipeline into STEM bachelor degree programs; if four-year undergraduate institutions can provide effective academic and social supports to meet the transfer student’s unique needs. The project team will recruit, retain, graduate, and place 30 students in STEM careers by implementing and studying a new orientation for STEM transfer students, a faculty-student mentorship program, service learning opportunities, active learning enhancements in several CIS courses, and career development and placement activities.



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➤ Leadership by Design: Principal Certification for the Pittsburgh Urban Leadership Corps

Grant Agency: **PA Department of Education**

“Leadership by Design: Principal Certification for the Pittsburgh Urban Leadership Corps” is a grant to support a partnership between Robert Morris University and Propel Charter Schools. It provides aspiring principals with the education and support to develop their leadership skills and attain Principal Certification. It also addresses the need of Propel Charter Schools for principals with the experience needed to effectively manage a Propel school. The grant expands the partnership between RMU and Propel CS by increasing by two-thirds the Principal Pipeline from 2017-18 to 2018-19. Under this grant, aspiring school leaders from Propel enter the RMU Principals Program under a full scholarship. The program involves a full year working on projects in Propel schools, with expert principals as mentors. After receiving Principal Certification, they also receive additional mentoring and support the following year, and commit to a three-year term of service at Propel.

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