Associate Provost's Message

Happy New Year 2019.

The Research & Grants Administration is happy to share the Spring 2019 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 eight grant applications submitted by RMU faculty from July to December 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, nineteen opportunities were discussed/explored and seven full proposals and one Letter of Intent were submitted. All grant proposals were written by our faculty and staff with support from Research & Grants Administration and Financial Operations. As always, supporting institution data was provided by the 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 are available to help you answer questions related to grant searching, writing, budgeting, and managing. Please contact us with your questions, comments, suggestions, and concerns. Starting January 2019, all faculty and academic administrators are requested to contact R&GA for all grant opportunities before proceeding to Institutional Advancement or to any potential funders.

Have a great Spring semester!

Sincerely,

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

Grant Proposal Activities - July to December 2018

19

Grant Opportunities Explored

7

Grant Proposals Submitted

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 hylogenetic 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

❯ 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 issue 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**

Ben Campbell
Principal Investigator
Assistant Professor of Engineering, SEMS

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.

❯ Scholarships

Grant Agency: **CVS Health Foundation**

The CVS Health Foundation has provided three $1000 scholarships for FNPs who have experience in rural/underserved health. Recipients will be chosen by the DNP faculty.

Terri Devereaux
Project Director
Director, DNP Program
Associate Professor of Nursing, SNHS

The Black Male Leadership Development Institute (BMLDI)

Agency: **Evergreen National Education Prize**

Since 2008 773 adolescent males from the Pittsburgh area have participated in the BMLDI program. The program was established to address a national crisis of limited success in high-school/college by supporting the development of positive racial identity and providing access to peer and adult role models. These African American leaders/professionals/educators engage participants and cultivate and reinforce students' leadership competencies. During the 2017-18 program year, independent evaluators conducted a formative evaluation of the program. The study revealed that the majority of the participants positively interpreted the messages of leadership as important and that for many participants, sports is often valued over academics. The study provided the leadership team an opportunity to continue what was successful but also strengthen the program by incorporating coaches, players and other influential leaders to help bridge the gap between academics and athletics (Attachment-1). The BMLDI has produced a direct impact on helping students gain access to a post-secondary degree/credential as evidenced by the 2016-2017 and 2017-2018 cohort outcomes data report. The 2016-17 report uncovered that 100% (14/14) of seniors graduated high school and 78.5% of students were accepted to a four-year college or university; 14% (2/14) joined the work force; and 7% (1/14) entered the armed services. The 2017-18 cohort report revealed 100% (10/10) graduated high school and 90% (9/10) were accepted to a four-year college/university; This evidence suggests there is potential for growth and need for the program to continue.

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.

Chester Thompson
Principal Investigator
Assistant VP, Underrepresented Minority Achievement

Marcel Minutolo
Principal Investigator
Associate Professor of Management, SBUS

> **Repetitive Neural Injury: Investigating the Relationship Between Structure and Functional Damage**

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. This proposed work will study the structural 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

> **Competing for the Humanities: Responses to the RMU Permanent Art Collection**

Grant Agency: **Council of Independent Colleges**

Tim Schlak
Principal Investigator
Dean, University Library
Assistant Professor of
Learning Resources

In partnership with the Sewickley Arts Initiative (SAI), Robert Morris University proposes a research and presentation competition among students similar to the ARTiculation Prize competition hosted annually in various parts of Europe and the UK. The competition will engage RMU students (competition entrants) with selections from the University's permanent art collection in order to develop their research, presentation, and creative skills as well as to provide an opportunity to share and promote the RMU Permanent Art Collection of the University to its surrounding communities. Two competitions will be hosted: one a presentation-style competition and the other creative submissions of responses to pieces from the Permanent Art Collection. Entrants for the competition will come from the RMU undergraduate student body and will be invited to deliver a ten minute presentation about a work of art of their choosing from the Collection. They will be asked to research their chosen work, describe it in their own words, and explain how they find it inspiring. The works they choose from will be carefully selected to give students entry points into exploring the second part of their research and presentation. In consultation with Media Arts faculty, the grant team will select art from the permanent collection that helps students bridge into exploring one of three relevant themes, including diversity and inclusion, sexuality and gender, and body image and perceptions of the Self.