REPORT OF THE ODU M&S STEERING COMMITTEE ON
THE GRADUATE ASSISTANTSHIP PROGRAM
November 2014

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Summary

This report summarizes the progress of students enrolled in the M&S Graduate Assistantship and Certificate programs over the last five years. During this period, 57 students have received a doctoral degree, master’s degree, or an M&S certificate. At least 34 of these students have entered the workforce as M&S professionals, subject matter experts, or educators. Another 35 students are currently enrolled in graduate or certificate programs.

This report provides some background on the M&S programs, outcomes, and a list of recent graduates and their current places of employment. Specific details on each program are appended to the document. These individual program summaries: list the key contributing faculty members, describe student progress, and present highlights of faculty and student accomplishments including awards, grant activity, publications, and presentations. The report also describes several challenges faced by the M&S Steering committee in their efforts to manage this university-wide interdisciplinary initiative since its inception. These issues provide valuable lessons learned for thinking about the promotion and management of interdisciplinary programs more generally.

1. Introduction

Old Dominion University is recognized as a world leader in Modeling & Simulation. ODU’s commitment to M&S research and education began with establishing the Virginia Modeling Analysis and Simulation Center (VMASC) in 1997 and creating M &S graduate programs in 1998 followed by the first PhD program in M&S in the USA in the year 2000. More recently, the Modeling, Simulation, and Visualization Department housed within the Batten College of Engineering, was established in 2010.

In 2006-2007, 17 new tenure-track Modeling and Simulation (M&S) faculty positions were created at ODU. Each of the six colleges received at least one new M&S faculty member to engage in M&S research and instruction and cultivate interest in M&S within their respective academic units. During this period, two interdisciplinary M&S committees were established: 1) the Modeling and Simulation Steering Committee, comprised of M&S faculty members from each college, was convened to coordinate and manage pedagogical issues across the university and to oversee the development of core and specialized M&S courses and programs; and 2) the M&S Executive
Committee, comprised of the deans from each college, the VP for Research, the Executive Director of VMASC, and the Vice Provost for Graduate Studies, was created to provide general oversight and governance of the M&S programs.

Although the members and the chair of the committee have changed during the years, a large core group of M&S faculty representing each of the colleges at ODU has been part of the committee since its inception. The Modeling and Simulation Steering Committee has met one to two times a month since its formation in August 2007.

The M&S Steering Committee initially engaged in conversations about what constitutes Modeling and Simulation faculty, programs, students and courses. The committee established the following definition:

A Modeling and Simulation faculty is a faculty member who is engaged in at least two of the following activities: (1) teaching Modeling and Simulation courses, (2) advising Modeling and Simulation students, and/or (3) Conducting Modeling and Simulation research.

In addition, the committee has reviewed and approved new interdisciplinary graduate M&S degrees and certificates, degree tracks and courses across all the colleges. The committee has also evaluated credentials of faculty certified to teach Modeling and Simulation courses.

The committee has engaged in several promotional initiatives with the goals of increasing interest in M&S research among the ODU community and attracting high-quality graduate students interested in pursuing a career or graduate education in an M&S. Some initiatives include the creation of an M&S graduate student association and an M&S web page (become active when the ODU website migration is complete).

Every year, the committee manages the distribution M&S scholarships provided by funds through the ODU Office of Research. There are approximately 25 scholarships at $18,000 each distributed among the colleges. The scholarships are used to recruit and/or to support graduate students, mostly PhD students, who are enrolled in a graduate M&S program at ODU. The scholarship can be renewed by the student for a maximum of 3 years. Currently, scholarships are distributed as follows: 10 scholarships go to the M&S department, 1 scholarship goes to each of the colleges and the remaining scholarships are distributed based on student credentials and on the needs of the specific M&S programs across ODU. The committee reviews the CVs of the students who receive the scholarships and also assesses their accomplishments on a yearly basis. Scholarship recipients are encouraged to present their progress at the Capstone Conference, usually held at VMASC in the month of April, and they are required to acknowledge the M&S ODU scholarship in every article they present and/or publish.

2. Outcomes

The principal objective of the M&S Graduate Assistantships is to expand and enhance the M&S workforce in the Commonwealth. This is accomplished by using the assistantships to recruit students who will be enrolled in M&S degree programs, M&S degree tracks, or M&S graduate certificate programs and who, upon graduation, plan to enter the M&S workforce. The M&S workforce includes students planning employment as M&S Professionals/Subject Matter Experts or M&S Educators. A secondary objective is to support the research activities of the M&S faculty who teach regularly in the M&S academic programs, conduct research in which M&S is a primary focus, and mentor students who plan to enter the M&S workforce.

The following outcomes were used to assess the impact of the primary objective of the M&S Graduate Assistantship Program: to increase the number and quality of M&S Professionals, Subject Matter Experts, and
Educators entering the M&S workforce. Initial data are shown in Table 1 for the overall number of graduates and the number of graduates entering the workforce.

<table>
<thead>
<tr>
<th>Table 1. Number of M&amp;S Graduates and Certificates Granted</th>
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<tbody>
<tr>
<td>MSVE Doctoral Program</td>
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<tr>
<td>All Other Programs</td>
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<tr>
<td>Total</td>
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</table>

* Based on data from only the last three years

An additional measure addresses the number and quality of M&S students by recruiting the most able and accomplished candidates. Table 2 shows the student progress over the last 5 years. Specific details on student accomplishments can be found in the individual program reports.

<table>
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<th>Table 2. Student Progress</th>
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<tbody>
<tr>
<td>Supported</td>
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<tr>
<td>Number of students who have completed their certificate requirements</td>
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<tr>
<td>Number of students currently pursuing certificates</td>
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<tr>
<td>Number of graduates</td>
</tr>
<tr>
<td>Number students actively enrolled and working to complete their degrees</td>
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</tbody>
</table>

Recent Graduates and Place of Employment

Sherida Bonton, Analyst, U.S. Army Corps of Engineers, Norfolk, VA
Warren Howell, Analyst, Norfolk Public Schools, Norfolk, VA
Antoine Taylor, Senior Analyst, SAIC Corp., Norfolk, VA
Ryan Clevenger, Systems Analyst III, Epsilon Systems Solutions, Inc., Portsmouth, VA
Kimberly van Dyke Gilligan, Research scientist, Oak Ridge Laboratory
Rebecca Sorell, Wargaming analyst for the National Defense University
Nick Drucker, M&S analyst for Newport News Shipbuilding
Erika Frydenlund, Senior project scientist at VMASC
Jie Wang, Data Visualization Developer, Bloomberg, New York.
Krzyztof Rechowicz, Visiting Assistant Professor, Old Dominion University, Commonwealth Center for Advanced Manufacturing, Disputanta, Virginia.
Elaine Blount, General Dynamics, Suffolk, VA.
John Sokolowski, Executive Director, VMASC, Old Dominion University.
Michael Martin, Department of Electrical Engineering and Computer Science, United Stated Military Academy at West Point
Sachin Shetty, Department of Electrical and Computer Engineering, Tennessee State University
Rafael Diaz, Research Associate Professor, VMASC
Bo Sun, Computer Science, Lincoln University, PA
Robert Robinson, Director of Center for Innovative Transportation Solutions, Old Dominion University
Charles Turnitsa, School of Computer Science, Columbus State University
Thomas Holland, Senior Strategist for Modeling and Simulation, Naval Surface Warfare Center Dahlgren
Elena Craig, Faculty, Old Dominion University.
John Gounley, Postdoctoral fellow, Institute de Recherche sur les Phenomenes hors Equilibre, Marseilles, France.
Ibrahim Kocaogul, Adjunct faculty, Old Dominion University.
Shu Liao; Faculty, Chongqing Technology and Business University in China.
Panon Phuworawong, Insurance industry analyst in Thailand.
3. Challenges

While there has been growing recognition that interdisciplinary work is critical across a range of academic areas, the management of such programs has proven a consistent challenge in the university environment. The more disparate the disciplines across which such work ranges, the more likely there are to be cultural and other differences that make cooperation and evaluation difficult. Even with relatively similar fields, cross-boundary work can be hobbled by the bureaucratic processes that are a necessary part of university administration. Promotion and Tenure guidelines are a particularly critical example of the kinds of processes that are made significantly more complex by faculty who work across boundaries.

Old Dominion University’s efforts to establish a university-wide interdisciplinary approach to modeling and simulation has highlighted some of these challenges, but also provides a useful context for thinking about the promotion and management of interdisciplinary programs more generally.

Modeling and simulation, by its very nature, is an interdisciplinary field of research and teaching. The creation of the MS&V Department within the College of Engineering provided a home for undergraduate and graduate engineering degrees in M&S, but has had only a limited impact on realizing the full potential interdisciplinary research and instructional activities in modeling and simulation at ODU. Likewise, VMASC provides a natural home for many aspects of M&S research. The challenge we face is to find a home for the interdisciplinary tracks and certificates in M&S that have been created across campus. This challenge is compounded by the administration’s decision to allow each College to manage graduate studies independently.

The process of building an interdisciplinary M&S program at ODU has faced a number of challenges, most of which remain ongoing. Most of these challenges are related to the difficulties of creating an interdisciplinary structure within an institutional environment that is organized along disciplinary lines. The institutional challenges for interdisciplinary M&S can be conceptualized in three related areas: organizational issues, data issues, and community issues.

Organizational Issues

Interdisciplinary M&S at ODU is organized primarily through the M&S steering committee, as outlined above. This, of course, depends almost entirely on the commitment and volunteerism of a small number of faculty. There is only minimal staff support and there are no real additional resources for producing and promoting cross-campus activities. The committee itself controls no real resources beyond its ability to make recommendations for the M&S fellowships. Faculty members receive little apparent credit for committee service or activities.

While much has been accomplished on a volunteer basis, creating rewards and incentives for interdisciplinary work, both in terms of scholarship and service, will likely be necessary to take this effort to the next level. It will be particularly important to develop mechanisms to recognize interdisciplinary work in the process of tenure and promotion.
There are, in fact, a number of institutional road blocks that make interdisciplinary M&S a more challenging effort. It took literally years, for example, to get a rudimentary cross-campus M&S website up and running, and it still doesn’t show up in a web search.

A number of other organizational issues can be categorized as problems for data and tracking.

Data Issues

Tracking student majors, progress, and post-graduate employment is difficult in the best of circumstances. It is exceedingly so in an interdisciplinary context. Most of the interdisciplinary M&S program works through the certificate programs, but students are not required to register or otherwise indicate their interest in doing the certificate until they have completed the work. This makes it difficult to keep track of these students.

More generally, there are no flags that would allow cross-campus identification and analysis of M&S students. Following up on students’ graduation and post-graduation plans is a similar challenge. The State is particularly interested in knowing how our M&S works impacts employment opportunities, but we have only limited capabilities for tracking these important outcomes.

The same holds true for classes. Cataloguing the set of M&S classes offered in any semester is a matter of personal communications and coordination among interested faculty. This makes it exceedingly unlikely that there will be coordination on times and sequencing of course offerings.

Employer satisfaction has not yet been assessed.

Community Issues

A critical element of solidifying M&S as an area of excellence for ODU is building an authentic community of M&S faculty, students, and alumni. This is made challenging by all of the institutional and data management issues raised above.

Thanks in particular to the work of Holly Gaff, we have developed a student group for M&S. We have also started coordinating some campus-wide seminars on M&S issues. More effective coordination with VMASC and the MS&V program in engineering, without, in either case, being subsumed is another important challenge.

For these purposes, it would be very helpful to develop a mechanism for positively identifying M&S faculty and students. At the student level, this could be facilitated by tracking core course enrollments. At the faculty level it is more difficult, since there are sometimes competing ideas about what constitutes M&S status. Creating some rewards at the college and university level for contributing to the ODU M&S effort could greatly facilitate this effort.
The area of Business Analytics has experienced explosive growth in recent years. An important part of Business Analytics is the use of Modeling and Simulation (M&S) techniques. M&S techniques have been employed in the business and public sectors for over 60 years, often under names such as "operations research", "management science", "decision sciences", "quantitative analysis", and others. The literature of many business and social science disciplines is rich with both practical and theoretical usage of simulation and other quantitative modeling techniques. Recent developments, such as agent-based simulation and virtual worlds, open even more avenues for M&S applicability. These techniques can be utilized to perform analysis and support decision-making in almost all areas of an organization, including supply chain, finance, and market research areas, to name a few. The certificate in Business Modeling and Simulation gives CBPA graduate students an opportunity to develop competency in business-focused quantitative modeling techniques, with a particular focus on simulation modeling.

Key Faculty:

* Dean C. Chatfield, Ph.D., Associate Professor of Information Technology and Decision Sciences, is interested in simulation modeling of supply chains as a means of understanding the inherent volatility in these systems. Dr. Chatfield is also interested in inventory management, meta-heuristic optimization techniques, decision support systems, and open standards for supply chain model storage and sharing. Dr. Chatfield teaches discrete event simulation, agent-based simulation, and operations management.

David Selover, Ph.D., Associate Professor of Economics, studies macroeconomic phenomena, such as the business cycle, and has interests in econometric methods and international economics. Dr. Selover teaches econometrics, international economics, and regularly leads a study-abroad class to study in East Asia.

* administers the CBPA M&S certificate program

Certificates:

The College of Business and Public Administration offers a Graduate Certificate in Business Modeling and Simulation. We have granted certificates to eight (8) students, including one PhD (Information Technology), three MA (Economics), one MBA, and three non-degree students. Two students received M&S fellowship funding with the remaining six being unfunded. Five of the six unfunded recipients paid completely out-of-pocket, meaning they were not funded by either M&S fellowships or other types of assistantships/funding. Our certificate students have used the Business M&S certificate as a springboard to further education, as a supplement to their current educational endeavors, and as a way to develop quantitative modeling and analysis skills to further their careers in public and private enterprise.

<table>
<thead>
<tr>
<th>Student Progress</th>
<th>Supported</th>
<th>Unsupported</th>
</tr>
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<tbody>
<tr>
<td>Total number of students completing their certificate requirements</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Total number of students currently pursuing certificates</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Number of graduates (degree-seeking only)†</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Number of non-degree certificate completions†</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Number degree-seeking students actively enrolled and working to complete their degrees</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Number of non-degree students pursuing certificates</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

† non-degree seeking students are not part of a graduate program other than the certificate
Current Positions of Certificate Recipients:

Alan Pritchard – PhD student, University of Maryland
Elizabeth Rasnick – PhD student, ODU College of Business and Public Administration
Sherida Bonton – Analyst, U.S. Army Corps of Engineers, Norfolk, VA
Ronald Greiser - unknown
Warren Howell – Analyst, Norfolk Public Schools, Norfolk, VA
Antoine Taylor – Senior Analyst, SAIC Corp., Norfolk, VA
Marius Wiedenfeld – MS student, University of Strathclyde Global Energy Management program
Ryan Clevenger - Systems Analyst III, Epsilon Systems Solutions, Inc., Portsmouth, VA

Faculty Highlights (activities facilitated by the M&S assistantship program):


Student Highlights:


• Alan Pritchard was admitted to two top-tier supply-chain PhD programs and began studies at the University of Maryland (a top-5 doctoral program in the area) in Fall 2013.

• Marius Wiedenfeld won a scholarship for M&S work entitled "Peak oil predictions and its impacts - myth or reality?” by the University of Strathclyde and was admitted to their Global Energy Management masters degree program.


Faculty Interdisciplinary M&S activities:

Dean C. Chatfield, editorial board member of International Journal of Business Analytics (IJBAN, 2012 – present) and European Journal of Industrial Engineering (EJIE, 2009 - present).

Dean C. Chatfield, reviewer for approximately 15 peer-review academic journals including International Journal of Simulation and Process Modeling (IJSPM) and Simulation Modeling Practice and Theory (SIMPAT) as well as flagship journals such as Production and Operations Management (POM) and Decision Sciences.
Dean C. Chatfield, member of ODU M&S Steering Committee (2007 - present).

Dean C. Chatfield, reviewed several NSF grant proposals in the area of supply chain simulation (2008 – present).

Dean C. Chatfield, student research advising for two CBPA students (departments of Economics and Information Technology)

Dean C. Chatfield, thesis/dissertation committee member for three graduate students from outside the CBPA (one from Health Sciences, two from BCET)


Modeling & Simulation in Education & Training

Simulations, games, and modeling tools are used extensively to facilitate learning and practice in education and training environments. The Darden College of Education offers a certificate in M&S through the Instructional Design and Technology program, a graduate-level program that is part of the STEM Education and Professional Studies Department. The M&S Simulation Certification in Education and Training provides students with a theoretical background and applied skills for the design, development, selection, integration, and evaluation of modeling and simulation techniques and tools for learning in K-12 through adult instructional settings. This certificate was the first of its kind in the U.S. and is a natural concentration area in ID&T given the widespread use of simulation and gaming as instructional tools in Pre-K-12 education, colleges, universities, and corporate and military training programs.

Key Faculty:
* Ginger S. Watson, Ph.D., Associate Professor, with research interests focused on performance, cognition, and learning in simulation, gaming, and virtual environments. The backbone of this research is the use of physiological measures to assess attention, immersion, and cognitive processing. Dr. Watson teaches courses in the theory and design of instructional simulations, psychometric-based assessments, applied statistics, and instructional learning theory.

Amy Adcock, Ed.D., Associate Professor, whose interest included the design, development and implementation of games and gaming methods for learning. Dr. Adcock taught courses in foundations of instructional design, cognition and instruction, online instruction, and instructional gaming. Dr. Adcock served as a faculty member at the ODU from August 2004-May 2014.

* administers the M&S certificate program in Education & Training

Certificates:
Fellowship support for students in the M&S Certificate in Education and Training program began in 2009. To date, six students who have enrolled in the program have received M&S graduate student fellowship funding. Of these four completed their certificate requirements and one additional student will complete the certificate this year. One student who received funding failed to complete the certificate. An additional 12 students enrolled in the certificate program and 10 of these have received certificates.

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<th>Supported</th>
<th>Unsupported</th>
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<tr>
<td>Number of students who have completed their certificate requirements</td>
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<td>10</td>
</tr>
<tr>
<td>Number of students currently pursuing certificates</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Number of graduates</td>
<td>2†</td>
<td></td>
</tr>
<tr>
<td>Number students actively enrolled and working to complete their degrees</td>
<td>3</td>
<td>2</td>
</tr>
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† 1 students withdrew from the program

Graduates and Current Positions:
Dr. Enilda Romero-Hall, Assistant Professor, Instructional Design & Technology Program, College of Social Sciences, Mathematics, & Education, University of Tampa, Tampa, FL

Dr. Jennifer Morrison, Assistant Professor-Clinical, Center for Technology in Education (CTE), John Hopkins University, Baltimore, MD

Current Status of Funded Students:
Mr. Don Robison, Instructional Designer, Eastern Virginia Medical School (EVMS), Norfolk, VA – Collecting Dissertation at US Coast Guard, Fall 2014. Expected Graduation, spring 2015.
Ms. Jana Eggleston, Doctoral Student, Ph.D. in Ecological Sciences, Department of Biological Sciences, College of Sciences, Old Dominion University

Ms. Yi-Ching (Gloria) Lin, Doctoral Student, Ph.D. in Occupational & Technical Studies, Darden College of Education, Old Dominion University. Preparing to complete comprehensive exams in spring 2015.

Faculty Highlights (grants, awards, patents, facilitated by the M&S assistantship program):


Watson, Ginger S. *Shipboard Simulator and Motion Sickness Mitigation*. Grant application submitted in partnership with SA Photonics as part of a Small Business Technology Transfer (STTR) proposal N08-T011-0036 submitted to NAVAIR. Phase I - $21,000. (July 14, 2008 – February 14, 2009)

Key Student Highlights (awards, key articles, major presentations, internships, grants; students in bold type)


Refereed Journal Publications


Refereed Conference Proceedings


**Refereed Presentations**


**Faculty Interdisciplinary M&S activities**
Ginger S. Watson, Chair, M&S Steering committee, (2012-2013)
Ginger S. Watson, Member, M&S Steering committee, (2007-present)
Ginger S. Watson, ODU Program Organizer, Virtual Exploration Sustainability Challenge (VESC) – Beta Test.
National Institute of Aerospace and National Aeronautics (NIA), National Aeronautics and Space Administration (NASA) Goddard Space Flight Center Hubble Research and Education teams, and Hampton Roads Modeling and Simulation Education Advisory Board. (October 2008 - October 2009).
Ginger S. Watson, Electronic Field Trip Experts Focus Group Member, Colonial Williamsburg, (2012).
International Studies

Overview

The Graduate Program in International Studies is an interdisciplinary social sciences program that recently celebrated its 25th anniversary at Old Dominion University. The program has twelve faculty members and admits approximately 25 MA or PhD students per year.

Modeling and Simulation has grown rapidly over the past twenty-years as a cutting-edge approach to understanding international relations. Game theory and agent-based modeling have a particularly rich history in international studies and have contributed a number of rich insights into the dynamics of conflict and cooperation at the international level.

GPIS has been involved in the interdisciplinary Modeling and Simulation effort from its earliest stages at Old Dominion University. For several years, VMASC and GPIS collaborated on a set of conversations and a colloquium series on the challenge of human behavioral modeling. This effort culminated in a set of significant DoD grants for work Human Behavioral Modeling and on Bayesian Network Analysis. During the past four years, GPIS has developed a specialized modeling and simulation track in both the MA and PhD programs. GPIS also grants a certificate in Modeling and Simulation.

GPIS currently offers four graduate courses in Modeling and Simulation:

IS762/862 – Game Theory for International Studies (Richman)
IS765/865 – Agent-Based Modeling & Simulation for International Studies (Earnest)
IS795/895 – Geographic Information Science for International Studies (Liu)
IS795/895 – Modeling and Simulation Theory for International Studies (Yoder)

In addition, GPIS M&S students have taken a range of classes in other departments across the University, including coursework in decision modeling, risk analysis, instructional simulation, modeling global events, combat modeling, and principles of visualization.

Key Faculty

David Earnest, GPIS and Department of Political Science and Geography
Kurt Taylor Gaubatz, GPIS and Department of Political Science and Geography
Hua Liu, Department of Political Science and Geography
Jesse Richman, Department of Political Science and Geography
Brandon Yoder, GPIS and Department of Political Science and Geography

The Numbers

Since the inception of the certificate program GPIS has awarded seven certificates in Modeling and Simulation. Four MA students have graduated with Modeling and Simulation as their primary track. Four PhD students have included Modeling and Simulation as one of their concentrations and have successfully passed their field comprehensive exam in Modeling and Simulation. Many other students have benefited from the opportunity to take the classes in game theory, agent-based modeling and geographic information science.

Modeling and Simulation Student Highlights

GPIS M&S students have consistently participated in the M&S capstone conference and have been awarded best paper and best presentation prizes. They have also presented their work at regional and national conferences in both international studies and in modeling and simulation.
Our students have also found the M&S concentration to be a potent addition for their employment profile. One of our first M&S fellowship recipients, Kimberly van Dyke Gilligan is now a research scientist at the Oak Ridge Laboratory working on nuclear non-proliferation issues. Rebecca Sorell, who was one of our first M&S certificate recipients, is now a wargaming analyst for the National Defense University, and will be returning to GPIS this coming fall to pursue the PhD with an M&S concentration. Another M&S certificate holder, Nick Drucker, is working as an M&S analyst for Newport News Shipbuilding. Erika Frydenlund is using her M&S skills as a Senior Project Scientist at VMASC. Several of our other M&S students have also held internship and research positions at VMASC.

Interdisciplinary or multidisciplinary M&S Activities

The Graduate Program in International Studies is, itself, an interdisciplinary program. It pulls together faculty across the social sciences, as well as from several fields in the humanities. The addition of interdisciplinary modeling and simulation has been a very natural fit.

In addition to collaborative projects with VMASC, we are also looking to increase our cooperation with the College of Business and Public Administration and the College of Engineering.
Health Care Modeling & Simulation

Modeling and Simulation in Health Care is a very diverse discipline and it involves several research techniques that can relevant to health services. For example, approaches of Modeling and Simulation can be used to train health care workers, track the spread of the disease, evaluate public health policy, provide virtual reality based interventions, and predict health outcomes.

Key faculty:

Gianluca De Leo PhD MBA

Dr. De Leo is an Associate Professor at the School of Medical Diagnostic & Translational Sciences in the College of Health Sciences. Currently, Dr. De Leo serves as the graduate program director of the Certificate in Modeling and Simulation in Health Care. Dr. De Leo has been involved in several projects related to e-health, biomedical informatics, serious gaming, virtual reality and mobile health, which were funded by the Italian Ministry of Health, the European Commission and the National Institutes of Health, Microsoft Research, the Virginia Center on Aging and several SBIR/STTR programs. Dr. De Leo teaches undergraduate and graduate classes in several programs at the College of Health Sciences. In the Spring 2013, Dr. De Leo taught “Decision Analysis in Health Care”, a class approved for the Certificate In Modeling and Simulation. Dr. De Leo joined ODU in 2006.

Holly Gaff PhD

Dr. Gaff is an Associate Professor in the Department of Biological Sciences in the College of Science. Dr. Gaff has a PhD in Mathematics, and her research is focused on developing mathematical models of mainly infectious diseases. She has extensive experience with modeling ticks and tick-borne diseases as well as leading a long-term surveillance project on ticks in the Hampton Roads area of Virginia. Her research has had funding from the NSF, NIH and DoD. Dr. Gaff teaches two Modeling and Simulation approved classes: BIOL 732/832 Modeling and Simulation in Life Sciences and BIOL 772/872 GIS in Life Sciences. Dr. Gaff joined ODU in 2007 as part of the School of Community and Environmental Health in the College of Health Sciences, and in 2010 she moved to the Department of Biological Sciences. She has graduate students in both departments.

Certificate:

Support for students in the Certificate in Modeling and Simulation in Health Care began in 2008. To date, 11 students have enrolled in the program and completed their certificate requirements. Only 6 students were supported on M&S fellowships. The majority of students enrolled in the Certificate in Modeling and Simulation in Health Care are graduate students who are pursuing a PhD in Health Service Research at the College of Health Sciences.

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<tr>
<th>Student Progress</th>
<th>Supported</th>
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<tbody>
<tr>
<td>Number of students who have completed their certificate requirements</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Number of students currently pursuing certificates</td>
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<td>0</td>
</tr>
<tr>
<td>Number of graduates</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Number students actively enrolled and working to complete their degrees</td>
<td>6</td>
<td>6</td>
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</table>
Faculty Highlights (grants, awards, patents, facilitated by the M&S assistantship program):

Gaff, H (PI) and K. Goodman (M&S fellow). Virginia Commonwealth University Center on Health Disparities. $3000 for dissertation research support.

Student Highlights (awards, key articles, major presentations, internships, grants; students in bold type)


Diggs LA, Viswakula D., De Leo G. A Multivariate Model to Predict Endotracheal Intubation Success by Paramedics in the Out-of-Hospital Setting. Capstone Conference 2014, April 17, Suffolk, VA (Best presentation in the Medical Track)

Barrios-Padrino C, McCombs G., Diawara N., De Leo G. The Use of Interactive Immersive Visualization for the Control of Dental Anxiety During Dental Hygiene Treatment. Capstone Conference 2013, April 11, Suffolk, VA (Best presentation in the Gaming & Virtual Reality Track)


**Faculty Interdisciplinary M&S activities**

Gianluca De Leo, M&S Steering committee member, (2006-present)

Holy Gaff, M&S Steering committee member, (2007-present)
Modeling, Simulation, and Visualization Engineering (MSVE) Department

Highlights and Activities of
M&S Degrees (undergraduate and graduate) and Graduate Certificates

Summer 2014

The MSVE Department was started in 2010 to support ODU’s new Bachelor of Science (B.S.) in Modeling and Simulation Engineering (M&SE) degree program. Since M&S programs at the graduate level have existed at ODU since 1998, an established cadre of motivated faculty, administrators, and M&S stakeholders were readily available to draw upon in the establishment of the undergraduate program and the Department.

ODU’s sojourn into graduate modeling and simulation programs was initially administered by Dr. Ralph Rogers who, a year earlier, had headed a workshop [1] on the subject while at the Department of Industrial Engineering and Management Systems at the University of Central Florida. His arrival at ODU spurred on the establishment of the first PhD program in M&S in the USA in the year 2000 and the first PhD graduate in M&S in 2003. A year after Dr. Rogers’ workshop, teaching M&S at the undergraduate level was the theme at a 1998 National Science Foundation (NSF) workshop in Vancouver, Canada [2]. Inspiringly, Sarjoughian and Zeigler (2001) broached the subject of teaching M&S as an undergraduate discipline. Later, in 2006, the NSF Blue Ribbon Panel on Simulation-Based Engineering Science (SBES) [4] stated that “seldom have so many independent studies by experts from diverse perspectives been in such agreement: computer simulation has and will continue to have an enormous impact on all areas of engineering, scientific discovery, and endeavors to solve major societal problems.”

Several years after pioneering a successful graduate program and building significant M&S infrastructure, we became the first in the world M&S department established specifically to support a B.S. program in the M&S discipline. Currently, the MSVE Department offers a full spectrum of academic programs. At the undergraduate level, we offer a Bachelor of Science Degree in Modeling and Simulation Engineering and a Minor in M&S for students majoring in other disciplines. At the graduate level, the Department offers a Graduate Certificate in M&S; Master of Science (thesis option) and Master of Engineering (non-thesis option) Degrees in M&S; and Doctor of Engineering (practitioner option) and Doctor of Philosophy (research option) Degrees in M&S.

Several universities have developed tracks or concentrations focusing on narrow sub-areas of modeling and simulation as part of other degree programs; however, to date, no accredited engineering program in modeling and simulation has been fully implemented. At the outset, ODU’s undergraduate M&SE program has been designed to meet four sources of program content and goals [5, 6]: the ABET criteria for accrediting engineering programs; the literature defining an M&S body of knowledge [7, 8]; a set of discipline-specific student outcomes identified by program faculty; and university general education requirements. The result is a curriculum that teaches the fundamental principles and theoretical foundations of M&S and prepares students to enter the workforce as entry-level modeling and simulation engineers. In addition, graduates will be prepared to enter graduate study in modeling and simulation and, with appropriate choice of program electives, other disciplines where modeling and simulation has application. M&SE graduates also will be prepared for certification via the Certified Modeling & Simulation Professional (CMSP) examination (www.simprofessional.org) and licensure as an Engineer in Training (EIT).

Besides these various degree options, MSVE offers graduate certificates in M&S. The Graduate Certificate in Modeling and Simulation Engineering is designed for those who meet the admission requirements of the modeling and simulation master's program who wish to broaden their knowledge of modeling and simulation related principles and practices without pursuing a graduate degree. This is a 12 credit hour non-degree program offered by the Department of Modeling Simulation and Visualization Engineering (MSVE). The certificate program is open to both degree-seeking and non-degree-seeking graduate students. Courses taken for the certificate program may later be applied to the master's degree in modeling and simulation.
M&S Certificate Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSIM 601 - Introduction to Modeling and Simulation</td>
<td>3 credits</td>
</tr>
<tr>
<td>MSIM 602 - Simulation Fundamentals</td>
<td>3 credits</td>
</tr>
<tr>
<td>One course from the following below:</td>
<td>3 credits</td>
</tr>
<tr>
<td>• MSIM 510 - Model Engineering</td>
<td></td>
</tr>
<tr>
<td>• MSIM 541 - Computer Graphics and Visualization</td>
<td></td>
</tr>
<tr>
<td>• MSIM 551 - Analysis for M&amp;S</td>
<td></td>
</tr>
<tr>
<td>• MSIM 603 - Simulation Design</td>
<td></td>
</tr>
<tr>
<td>MSIM Elective - An approved graduate level elective course</td>
<td>3 credits</td>
</tr>
</tbody>
</table>

An overall GPA of 3.0 or better is required to earn the certificate.

Course Descriptions
The following are catalog descriptions for the M&S courses listed above:

MSIM 601. Introduction to Modeling and Simulation. Lecture 3 hours; 3 credits. First course for modeling and simulation graduate students. Modeling and simulation discipline surveyed at an overview level of detail. Definitions, paradigms, applications, and sub-disciplines are introduced. Orient students to the Modeling and Simulation Graduate Program and provides a general conceptual framework for further MSIM studies.

MSIM 602. Simulation Fundamentals. Lecture, 3 hours; 3 credits. An introduction to the modeling and simulation discipline. Introduction to discrete event simulation (DES) including simulation methodology, input data modeling, output data analysis, and an overview of DES tools. Introduction to continuous simulation (CS) including simulation methodology, differential equation models, numerical solution techniques, and an overview of CS tools.

MSIM 510. Model Engineering. Lecture, 3 hours; 3 credits. The goal of this course is to develop understanding of the various modeling paradigms appropriate for capturing system behavior and conducting digital computer simulation of many types of systems. The techniques and concepts discussed typically include UML, concept graphs, Bayesian nets, Markov models, Petri nets, system dynamics, Bond graphs, etc. Students will report on a particular technique and team to implement a chosen system model.

MSIM 541. Computer Graphics and Visualization. Lecture, 3 hours; 3 credits. An introduction to graphical systems and methods. Topics include surfaces, solids, and realism techniques such as visible surface, lighting, shadows, and surface detail. Applications to modeling and simulation including 2-D and 3-D solid models, data visualization, and animation.

MSIM 551. Analysis for Modeling and Simulation. Lecture, 3 hours; 3 credits. An introduction to analysis techniques appropriate to the conduct of modeling and simulation studies. Topics include input modeling, random number generation, output analysis, variance reduction techniques, and experimental design. In addition, techniques for verification & validation are introduced. Course concepts are applied to real systems and data.

MSIM 603. Simulation Design. Lecture, 3 hours; 3 credits. Course develops the computer software skills necessary for the design and development of simulation software. Topics covered include software architectures, software engineering, software design, object-oriented programming, abstract data types and classes, data structures, algorithms, and testing and debugging techniques. Software design and development of simulation systems (discrete-event, continuous, and Monte Carlo) are emphasized.
The following are catalog descriptions for courses that may be also used for the MSIM Elective:

**MSIM 506. Introduction to Distributed Simulation.** Lecture, 3 hours; 3 credits. An introduction to distributed simulation. Topics include motivation for using distributed simulation, distributed simulation architectures, time management issues, and distributed simulation approaches. Current standards for distributed simulation are presented.

**MSIM 660. System Architecture and Modeling.** Lecture 3 hours; 3 credits. Students will learn the essential aspects of the system architecture paradigm through environment and analysis of multiple architecture framework and enterprise engineering, such as IDEFO, TOGAF, DODAF and OPM. Emphasis on system modeling and enterprise engineering.


**MSIM 741. Principles of Visualization.** Lecture, 3 hours; 3 credits. Well-designed graphical media capitalizes on human facilities for processing visual information and thereby improves comprehension, memory, inference, and decision making. This course teaches techniques and algorithms for creating effective visualizations based on principles and techniques from graphic design, visual art, perceptual psychology and cognitive science. Both users and developers of visualization tools and systems will benefit from this course.

**Key Faculty**

<table>
<thead>
<tr>
<th>Faculty Name</th>
<th>Area of Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audette, Michel</td>
<td>Medical applications in M&amp;S including imaging and surgery.</td>
</tr>
<tr>
<td>Leathrum, James</td>
<td>Parallel and distributed simulation, hardware and software simulation architectures, and applications of discrete event simulation to multi-modal transportation systems.</td>
</tr>
<tr>
<td>Madan, Bharat</td>
<td>Network and cyber security applications.</td>
</tr>
<tr>
<td>McKenzie, Frederic</td>
<td>Medical modeling and simulation, human behavior representation, and simulation architectures often focusing on aspects of scientific visualization and virtual reality.</td>
</tr>
<tr>
<td>Mielke, Roland</td>
<td>Systems theory, mathematical modeling, modeling and simulation education, application of continuous simulation in electrical engineering, and applications of discrete event simulation in transportation and enterprise decision support.</td>
</tr>
<tr>
<td>Noor, Ahmed</td>
<td>Computational mechanics, multi-scale modeling and simulation, interactive visual simulation, and advanced simulation-based learning environments.</td>
</tr>
<tr>
<td>Shen, Yuzhong</td>
<td>Game-based learning; visualization and computer graphics; modeling and simulation; and, signal and image processing.</td>
</tr>
<tr>
<td>Sokolowski, John</td>
<td>Human behavior modeling; decision system modeling; multiagent system simulation; and, modeling and simulation representation of social systems</td>
</tr>
<tr>
<td>Sosonkina, Masha</td>
<td>Physical based modeling and high performance computing and simulation.</td>
</tr>
</tbody>
</table>

In addition to our department faculty, MSVE collaborates closely with the Virginia Modeling, Analysis and Simulation Center (VMASC). VMASC researchers serve as research collaborators, graduate adjunct faculty, and ambassadors for M&S and the MSVE Department. Additionally, MSVE graduate students often are supported on VMASC research projects.
Modeling and Simulation Graduate Program

Since its commencement in 1997, Modeling and Simulation Graduate Program has awarded 52 Master of Science degrees, 100 Master of Engineering degrees, 22 Ph.D. degrees, and 5 graduate certificates. Since 2010, MSVE received 10 M&S graduate assistantships each year. Among the students who have received the M&S assistantships, four were awarded Ph.D. degrees, two were awarded Master of Engineering degrees, seven are in ABD (All But Defense) status, five have passed the Diagnostic Exam, and four are still taking courses.

Graduates Supported on M&S Fellowships and Current Positions:

- Dr. Jie Wang, Data Visualization Developer, Bloomberg, New York.
- Dr. Krzysztof Rechowicz, Visiting Assistant Professor, Old Dominion University, Commonwealth Center for Advanced Manufacturing, Disputanta, Virginia.
- Dr. Elaine Blount, General Dynamics, Suffolk, VA.
- Dr. Aras Rifat, 2014 graduate.

Other Notable M&S Graduates

- Dr. John Sokolowski, Executive Director, Virginia Modeling, Analysis, and Simulation Center, Old Dominion University.
- Dr. Michael Martin, Assistant Professor, Department of Electrical Engineering and Computer Science, United States Military Academy at West Point.
- Dr. Sachin Shetty, Assistant Professor, Department of Electrical and Computer Engineering, Tennessee State University.
- Dr. Rafael Diaz, Research Associate Professor, Virginia Modeling, Analysis, and Simulation Center.
- Dr. Bo Sun, Assistant Professor of Computer Science, Lincoln University, PA
- Dr. Robert Robinson, Director of Center for Innovative Transportation Solutions, Old Dominion University.
- Dr. Charles Turnitsa, Assistant Professor, School of Computer Science, Columbus State University
- Dr. Thomas Holland, Senior Strategist for Modeling and Simulation, Naval Surface Warfare Center Dahlgren,

Faculty Highlights (grants, awards, patents, facilitated by the M&S assistantship program):

Development of a Patient-Specific Spine Modeling and Surgery Simulation, Jeffress Memorial Trust, PI Michel Audette, $100,000, 07/1/2013 – 06/30/2014.

Haptic-Enabled Simulator for a NUSS Procedure Planner and Trainer, Children’s Hospital of the King’s Daughters (CHKD) - Children’s Surgical Specialty Group (CSSG), PI Rick McKenzie, $285,000 August 2012 – Spring 2014.


Shen, Y. (Co-PI). Improving Programming and Financial Literacy Education Using Student-Developed Games, National Science Foundation, 2011-2014, $200,000.

Parodi, A. (PI), Diallo, S., Scerbo, M.W., & Papelis, Y. LIVES and SIM Lab (Laboratory of Investigation, Validation and Verification of Emerging Simulators). EVMS, 2012. $50,000.

Papelis, Y. (PI), Scerbo, M.W., & Garcia, H.M. Virtual Operating Room. EVMS, 2012-present, $55,875.

**Student Highlights (awards, key articles, major presentations, internships, grants; students in bold type)**


**Aras, R.**, Graduate Travel Award, Old Dominion University, 2012.


**Faculty Interdisciplinary M&S activities**

Yuzhong Shen, ODU Gaming HUB, (2014-present)
John Sokolowski, Member, Governor’s Modeling and Simulation Advisory Board
John Sokolowski, Member, Executive Committee, National Modeling and Simulation Coalition
Mark W. Scerbo, Vice Chair, Society for Simulation in Healthcare, Research and Scientific Contents Committee (2012 – present)
Mark W. Scerbo, co-PI, Multidisciplinary Modeling and Simulation Program, IGERT proposal (2009), NSF, (unfunded)

**2013 MSVE Graduate Student Publications** (Calendar Year 2013 Only)

(13 journal papers, 2 book chapters, 29 conference papers)

**Journal Papers**


**Book Chapters**


**Conference Papers**

1. Mohammad F. Obeid and John Shull, “West Nile Virus System Dynamics Investigation in Dallas County, TX”, 2013 Winter Simulation Conference


**REFERENCES**


Computational and Applied Mathematics Modeling and Simulation

The Department of Mathematics and Statistics at Old Dominion University holds the unique distinction of being the only department in the Commonwealth of Virginia to offer B.S., M.S. and Ph.D. degrees in Computational and Applied Mathematics. As computational mathematics, or computational science in general, plays a greater role in every branch of the science, the department is equipped with programs which are designed to produce computational and applied mathematicians, statisticians and teachers with analytical and computational skills necessary to meet the challenges of the modern society. The department plays an integral part in University's campus-wide initiative to promote its research in Simulation and Modeling. Our simulation faculty currently conduct research in the following areas:

- Computational fluid dynamics, nonlinear heat conduction problem, computational aeroacoustics, complex fluids, nematic polymer dynamics, non-equilibrium hypersonic flow, hydrodynamic stability.
- Computational and mathematical biology, mathematical modeling of tumor growth, cancer biology, bioinformatics, optimal atomic configurations of biomolecules,
- Computational Statistics, multivariate analysis, regression diagnostics, probability theory.

Students enrolled in the MS or PhD program may earn the Modeling and Simulation Certificate, with concentration in either Computational and Applied Mathematics or Statistics, by completing an approved 12 credit hour course of study.

**Key Faculty:**

John Adam, Ph.D.; mathematical modeling, theoretical meteorological optics.

N. Rao Chaganty, Ph.D.; large deviations, generalized linear models, estimating equations.

Norou Diawara, Ph.D.; multivariate analysis, modeling, probability theory, estimation.

Fang Hu, Ph.D.; computational fluids with emphasis on turbulent mixing.

Hideaki Kaneko, Ph.D.; wavelets, numerical analysis of integral equations, finite element analysis, discontinuous Galerkin methods.

Li-Shi Luo, Ph.D.; kinetic theory and nonequilibrium statistical mechanics, lattice Boltzmann equation and CFD, complex fluids.

Yan Peng, Ph.D.; fluid dynamics, lattice Boltzmann equation, gas kinetic scheme, high performance computation.

Jin Wang, Ph.D.; numerical analysis, scientific computation, fluid dynamics, mathematical biology

Ruhai Zhou, Ph.D.; numerical analysis, scientific computation, numerical simulations of liquid crystalline polymers and nano-composite materials.

**Certificates:**

Support for students in the Computational and Applied Mathematics M&S Certificate Program began in 2008. To date, 10 students have completed the certification requirements. 14 students have been supported by an M&S scholarship.

<table>
<thead>
<tr>
<th></th>
<th>Supported</th>
<th>Unsupported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current students who have completed the certificate</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Students currently pursuing the certificate</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Graduates who have completed the certificate</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Total enrolled graduate students</td>
<td>4</td>
<td>45</td>
</tr>
</tbody>
</table>
Graduates and Current Positions:

Elena Craig, Ph.D.; faculty, Old Dominion University.

John Gounley, Ph.D.; Postdoctoral fellow, Institute de Recherche sur les Phenomenes hors Equilibre, Marseilles, France.

Ibrahim Kocaogul, Ph.D.; adjunct faculty, Old Dominion University.

Shu Liao; faculty, Chongqing Technology and Business University in China.

Panon Phuworawong, Ph.D.; insurance industry analyst in Thailand.

Sirisha Mushti, Ph.D.; Statistician, U.S. Food and Drug Administration.

Michael Pohrivchak, Ph.D.; Scientist, U.S. Naval Research Laboratory.

Drew S. Posny, Ph.D.; faculty, Wingate University.

Manasi Sheth-Chandra, Ph.D.

Traci Ann Sievenpiper, Ph.D.; faculty, LaSalle College.

Faculty Highlights (grants facilitated by the M&S Program):

Fang Hu, PI. 9/1/2008-8/31/2012, $120,846, Title: Analysis and implementation of accurate numerical boundary conditions for Large Eddy Simulations and the Boltzmann equation, funded by National Science Foundation, Division of Mathematical Sciences, ODURF# 382611.


Fang Hu, PI. 9/1/2008-8/31/2012, $120,846, Title: Analysis and implementation of accurate numerical boundary conditions for Large Eddy Simulations and the Boltzmann equation, funded by National Science Foundation, Division of Mathematical Sciences, ODURF# 382611.

L.-S. Luo (PI) and A. Beskok. A Unified Modeling Approach for Micro- and Nano-Scale Gas Flows, NSF DMS-0807983, $256,000, 07/01/2008 - 06/30/2012.


NSF CBETS-0827259, $13,000, 06/01/2008 - 05/30/2009.

NSF CBETS-0733134, $15,000, 07/01/2007 - 06/30/2008.


L. Greene (PI), L.-S. Luo, A. Pothen, C. Osgood, and P. Hatcher. Elucidation of Protein Structure Networks and Beyond, ODU-RF, $80,000 (01/01 - 06/30/2008).

Yan Peng, PI. $213,903, National Science Foundation, #DMS-1319078.

Yan Peng, PI. $70,599, ODU Internal Grant, ODURF #503921.

Student Highlights

Publications:


J. Gounley and Y. Peng, Shape recovery of elastic capsules from shear flow induced deformation, accepted by Communications in Computations Physics, November 2013.

J. Gounley and Y. Peng, Response and recovery times of elastic and viscoelastic capsules in shear flow, in revision.

J. Gounley and Y. Peng, Computational modeling of membrane viscosity of red blood cells, in revision.


Mushti, Sirisha; Analysis of continuous longitudinal data with ARMA(1, 1) and antedependence correlation structures. Thesis (Ph.D.)–Old Dominion University, 2013. 99 pp. ISBN: 978-1303-16620-4.


M.G. Forest, P. Phuworawong, Q. Wang, R. Zhou, Phil. Transactions A, "Rheological signatures in limit cycle behavior of dilute, active, polar LCPs in steady shear", accepted.


Posny, Drew S. Analyzing Cholera Dynamics in Homogeneous and Heterogeneous Environments. Thesis (Ph.D.)–Old Dominion University, 2014.

D. Posny and J. Wang, Computing the basic reproductive numbers for epidemiological models in nonhomogeneous environments. In revision.


Sheth, Manasi. The Doubly Inflated Poisson and Related Regression Models. Thesis (Ph.D.)–Old Dominion University, 2011.

Paper in progress.


Sheth-Chandra, M. “Modeling Epidemiological Features of Disease Outbreaks.”
Paper in progress.


Presentations:


John Gounley, Contributed Talk: Computational Modeling of Membrane Viscosity of Red Blood Cells Old Dominion University SIAM Student Chapter Conference, Norfolk, VA, April 2014.


John Gounley, Contributed Talk: A three-dimensional model of viscoelastic capsule deformation Old Dominion University SIAM Student Chapter Conference, Norfolk, VA, April 2013.

John Gounley, Contributed Talk: Modeling and simulation of the shape recovery of red blood cells Modeling, Simulation, & Visualization Student Capstone Conference, Suffolk, VA, April 2013.
John Gounley, Contributed Talk: *Shape recovery of viscoelastic capsules from shear flow induced deformation*. Graduate Student Colloquium, Old Dominion University, Norfolk, VA, September 2012.


John Gounley, Contributed Talk: *Modeling the shape deformation and recovery of red blood cells using the lattice Boltzmann method*. Old Dominion University SIAM Student Chapter Conference, Norfolk, VA, March 2012.


John Gounley, Contributed Talk: *A method for interface computing of two-phase Stokes flow in three dimensions*. Old Dominion University SIAM Student Chapter Conference, Norfolk, VA, April 2011.


Sirisha Mushti, “Analysis of longitudinal data using ARMA (1, 1) correlation model.” SIAM Conference, March 24, 2012, Norfolk, VA.

Sirisha Mushti, “Analysis of longitudinal data using ARMA (1, 1) correlation model.” ENAR Spring Meeting, April 1-4, 2012, Washington, DC.

Sirisha Mushti, “Pairwise likelihood approach for analyzing longitudinal data using a robust correlation structure.” VAS 2012 Meeting, May 24, 2012, Norfolk, VA.

Sirisha Mushti, “Modeling and Analysis of continuous longitudinal data using ante-dependence correlation structure”. 2013 Student Capstone Conference, April 11, 2013, Suffolk, VA.

Sirisha Mushti, “Pairwise likelihood method for analyzing continuous longitudinal data using ARMA(1,1) correlation structure.” SIAM Conference, April 13, 2013, Norfolk, VA.


Awards:


John Gounley, SIAM Student Travel Award for SIAM-AN12, 2012

John Gounley, Travel support for Graduate Student Mathematical Modeling Camp, 2011

John Gounley, ODU Philip R. Wohl Graduate Scholarship, 2011


Human Factors Psychology Modeling & Simulation

Human factors is a discipline in which principles of cognition, information processing, learning, and perception are applied to the design of technology. Knowledge of human factors helps create a better match between user capabilities and system demand; an understanding of human capabilities helps designers generate more veridical models of human behavior; and applying principles of human factors can create more effective simulator training systems. The Modeling and Simulation Certificate Program provides students with a focus on psychological principles that address end-user issues, with models of human behavior, and with knowledge/skill acquisition.

Key Faculty:
* Mark W. Scerbo, Professor, is interested in the development and evaluation of healthcare simulation technology. He also studies virtual reality systems and virtual environments and performance with adaptive technology. Dr. Scerbo teaches courses in sensation and perception, human factors, and virtual environments.

James Bliss Ph.D., Professor, studies the occurrence of alarm (and automation) mistrust, compliance with automated systems, human-robot interaction, and the use of virtual environments for training complex tasks such as surgery, firefighting, soldiering, and navigating unfamiliar environments. Dr. Bliss teaches courses in sensation and perception, learning, ergonomics, and safety.

Poornima Madhavan, Ph.D., Assoc. Professor, studies human decision-making processes in complex environments that embody risk, time pressure and uncertainty using computer-simulated military and defense/homeland security environments. She also studies environmental decision making and the role of trust in human-automation integrated performance. Dr. Madhavan teaches courses in sensation and perception, human factors, human-computer interaction, and decision-making.

* administers the HFP M&S certificate program

Certificates:
Support for students in the Human Factors Psychology M&S certificate program began in 2008. To date, 6 students have enrolled in the program and completed their certificate requirements. All students who received certificates were supported on M&S fellowships.

<table>
<thead>
<tr>
<th>Student Progress</th>
<th>Supported</th>
<th>Unsupported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students who have completed their certificate requirements</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Number of students currently pursuing certificates</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Number of graduates</td>
<td>2†</td>
<td></td>
</tr>
<tr>
<td>Number students actively enrolled and working to complete their degrees</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

† 2 students withdrew from the program

Graduates and Current Positions:
Dr. Erik Prytz, Research Scientist, Swedish Institute for Computer Science, Linköping University, Sweden

Dr. T. Robert Turner, Assistant Director, Simulation Based Surgical Education, American College of Surgeons, Chicago, IL

Faculty Highlights (grants, awards, patents, facilitated by the M&S assistantship program):

Parodi, A. (PI), Diallo, S., Scerbo, M.W., & Papelis, Y. LIVES and SIM Lab (Laboratory of Investigation, Validation and Verification of Emerging Simulators). EVMS, 2012. $50,000.
Papelis, Y. (PI), Scerbo, M.W., & Garcia, H.M. Virtual Operating Room. EVMS, 2012-present, $55,875.


**Student Highlights (awards, key articles, major presentations, internships, grants; students in bold type)**

**Turner, T. R.,** Human Factors & Ergonomics Society Student Member with Honors Award, 2009

**Turner, T. R.,** Best Paper, Health & Medicine Track, MODSIM World Conference & Expo, 2010

**Kennedy, R.A.,** 3rd Place, Medical and Healthcare Track, ODU M&S Capstone Student Conference, Suffolk, VA 2011.

**Kennedy, K.D.,** 3rd Place, Medical and Healthcare Track, ODU M&S Capstone Student Conference, Suffolk, VA 2011.

Outstanding Technology Abstract – 2nd Place, International Meeting on Simulation in Healthcare


Outstanding Technology & Program Innovation Abstract – 2nd Place, International Meeting on Simulation in Healthcare


Outstanding Research Abstract – 4th Place, International Meeting on Simulation in Healthcare


**Erik Prytz,** Best Paper award in the Education & Training track at the ODU M&S Capstone Student Conference, Suffolk, VA, 2012.

Outstanding Research Abstract – 2nd Place, International Meeting on Simulation in Healthcare


**Other Scholarly Productivity**


**Faculty Interdisciplinary M&S activities**
Mark W. Scerbo, Chair, M&S Steering committee, (2013-present)
Mark W. Scerbo, Vice Chair, Society for Simulation in Healthcare, Research and Scientific Contents Committee (2012 – present)
Mark W. Scerbo, co-PI, Multidisciplinary Modeling and Simulation Program, IGERT proposal (2009), NSF, (unfunded)