Robert N. Saunders, PhD

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OBJECTIVE

My mission is to become a DoD/IC leader in order to develop and transition advanced capabilities across the technology development "valley of death". I aim to transition these capabilities to support the Warfighter, maintain the battlespace advantage, and inspire/mentor the next generation of engineers and scientists. I am seeking opportunities as a senior manager/director (GS-14/15 equivalent) with responsibilities such as leading and managing personnel and programs, oversight of strategic directions and technology development, and/or management and integration of risk, requirements, and resources.

EDUCATION

Doctor of Philosophy, Industrial Engineering (Aug 2018 – Aug 2022)
Texas A&M University, College Station, TX
Thesis Topic: *Metal Additive Manufacturing Process-Structure-Property Relational Linkages Using Gaussian Process Surrogates*
Advisors: Dr. Alaa Elwany, Dr. Dimitris C. Lagoudas

Certificate in Applied Statistics, Statistics (Aug 2018 – July 2022)
Texas A&M University, College Station, TX

Master of Science, Aerospace Engineering (Aug 2013 – Aug 2015)
Texas A&M University, College Station, TX
Thesis Topic: *Modeling of Inductive Heating on Shape Memory Alloy Components*
Advisors: Dr. Dimitris C. Lagoudas, Dr. James G. Boyd

Bachelor of Science, Aerospace Engineering (Aug 2009 – May 2013)
Virginia Tech, Blacksburg, VA
Minor – Mathematics

PROFESSIONAL EXPERIENCE

Deputy Branch Chief, Launch Management Division (Sept 2023 – present)
Mission Manager, Launch Management Division (Feb 2023 – Sept 2023)
Office of Space Launch, National Reconnaissance Office, Chantilly, VA

- Lead team of civilian, military, and contractor support staff to deliver future launch solutions and offer flexible/tailorable launch support services
- Identify, research, develop, and transition advanced launch and on-orbit capabilities
- Facilitate and coordinate internal and external strategic outreach with industry and government partners
- Execute non-NSSL missions through partnerships and procurement of small launch vehicles

Mechanical Engineer (Sept 2016 – Feb 2023)
Materials Science & Technology Division, U.S. Naval Research Laboratory, Washington D.C.

- *Naval Research Laboratory Edison Memorial Graduate Training Program Recipient*
- Surrogate modeling based on multi-fidelity physics-based simulations and experiments for metal additive manufacturing.
- Microstructure modeling of features induced by powder additively manufacturing.
- Development of strategies to prevent and protect from injuries due to blast events.
- Computational modeling of room temperature aerosol deposition of nano-crystalline thick films

Jr. Biomechanics Engineer (June 2015 – Sept 2016)
Leidos Inc. c/o U.S. Naval Research Laboratory, Washington D.C.

- Development of strategies to prevent and protect from injuries due to blast events.
- Creation of correspondence rules to predict traumatic brain injury in humans.
- Image-based finite element modeling of human and porcine subjects.
- Development of a methodology for assessing combat helmets.
- Constitutive model calibration of hyper-viscoelastic biological materials.

Graduate Research Assistant (Aug 2013 – May 2015)
Aerospace Engineering Department, Texas A&M University, College Station, TX.
- Development of a framework to model inductive heating of shape memory alloy components.
- Design, modeling, and fabrication of a composite twisting wing using shape memory alloy torque tubes.
- Simulation and optimization of self-folding reprogrammable sheets using shape memory alloy and shape memory polymer.

Air Force Research Lab Scholars Program (May 2014 – Aug 2014)
Kirtland AFB, Albuquerque NM
- Design and construction of a deployable tensioned helical structure using composite pultrusions.

Medical Device Consulting (Jan 2014 – May 2014)
College Station TX
- Finite element modeling of shape memory alloy based biomedical devices.

OTHER EXPERIENCE

Naval Research Laboratory Student Mentor (Jun 2015 – Dec 2022)
- Served as a technical mentor for 2-4 summer students each year.

CASMART Design Challenge Advisor (Jan 2015 – May 2015)
- Design of a shape memory alloy based deployable solar array.
- Served as an advisor to a group of 5 undergraduates working on the project.

Undergraduate Research Assistant (June 2011 – July 2013)
Aerospace Engineering Department, Virginia Tech, Blacksburg VA.
Supervisor: Dr. Gary Seidel
- 1-D modeling and testing of shape memory alloys springs.

Virginia Tech Microgravity Research Team (Aug 2010 – July 2013)
Aerospace Engineering Department, Virginia Tech, Blacksburg VA.
Supervisor: Dr. Troy Henderson
- Investigation of a moving mass actuator control system for re-entry vehicles and small satellites.
- Chosen two consecutive years to participate in NASAs Reduced Gravity Flight Education Program.

PROFESSIONAL ACTIVITIES

- American Society of Mechanical Engineers, Member
- Journal Reviewer
  - ‡ Journal of DoD Research and Engineering
  - ‡ Journal of Intelligent Material Systems and Engineering
  - ‡ Materials Today
  - ‡ Finite Elements in Analysis and Design
  - ‡ Defence Technology
- Technical conference session/symposium organizer and chair

SKILLS

- Computer Languages – Fortran, Python, R, Matlab

- Software – Abaqus, COMSOL, ScanIP, Solidworks, Mathematica, Microsoft Office
- Basic machine shop and mechanical testing experience
- Windows, Linux, Unix experience
- Finite Element Modeling, Mechanics of Materials, Machine Learning, Statistical/Surrogate Modeling, Time and Personnel Management
- Coursera certificates in:
  ‡ Project Management & Other Tools for Career Development specialization
  ‡ Deep Learning specialization
  ‡ DeepLearning.AI TensorFlow Developer specialization
  ‡ Generative Adversarial Networks (GANs) specialization
  ‡ AI For Everyone course
  ‡ Machine Learning course
  ‡ Bayesian Methods for Machine Learning course (with honors)
- DAWIA Foundational Certification in Engineering & Technical Management
- DAWIA Technology Project Management Credential

PUBLICATIONS

Book Chapters

1. J. Michopoulos, A. Iliopoulos, J. Steuben, A. Birnbaum, N. Apetre, J. Song, Y. Fu, A. Achuthan, **R. Saunders**, A. Bagchi, R. Fonda, D. Rowenhorst, S. Olig, F. Martin, J. Moran, A. Ntiros, *Multiphysics Integrated Computational Materials Engineering Linking Additive Manufacturing Process Parameters with Part Performance*, In "Advances in Computers and Information in Engineering Research Vol. 2", ASME (2021).

Journal Articles

1. **R. Saunders**, K. Teferra, J. Michopoulos, D. Lagoudas, A. Elwany, *Metal AM Process-Structure-Property Relational Linkages using Gaussian Process Surrogates*. Additive Manufacturing (2023).
2. **R. Saunders**, A. Rawlings, A. Birnbaum, A. Iliopoulos, J. Michopoulos, D. Lagoudas, A. Elwany, *Additive Manufacturing Melt Pool Prediction and Classification via Multifidelity Gaussian Process Surrogates*. Integrating Materials and Manufacturing Innovation (2022).
3. **R. Saunders**, C. Butler, J. Michopoulos, D. Lagoudas, A. Elwany, A. Bagchi, *Mechanical Behavior Predictions of Additively Manufactured Microstructures Using Functional Gaussian Process Surrogates*. npj Computational Materials (2021).
4. **R. Saunders**, S. Johnson, D. Schwer, E. Patterson, H. Ryou, E. Gorzkowski, *A Self-Consistent Scheme for Understanding Particle Impact and Adhesion in the Aerosol Deposition Process*. Journal of Thermal Spray Technology (2021).
   ‡ Volume 30 best paper honorable mention
5. **R. Saunders**, X. G. Tan, A. Bagchi, *On the Development of Interspecies Traumatic Brain Injury Correspondence Rules*. Military Medicine (2019).
6. **R. Saunders**, A. Moser, P. Matic, *A Computationally Efficient Computer Aided Design Strategy for Iterative Combat Helmet Design and Analysis*. Journal of Engineering Science in Medical Diagnostics and Therapy (2019).
7. **R. Saunders**, X.G. Tan, S. Qidwai, A. Bagchi, *Towards Identification of Correspondence Rules to Relate Traumatic Brain Injury in Different Species*. Annals of Biomedical Engineering (2018).
8. **R. Saunders**, J. Boyd, F. Calkins, D. Lagoudas, *A Simplified Numerical Model for Induction Heating of Shape Memory Alloy Tubes*. Journal of Intelligent Materials Systems and Structures (2017).

9. **R. Saunders**, D. Hartl, J. Boyd, J. Brown, F. Calkins, D. Lagoudas, *A Validated Model for Induction Heating of Shape Memory Alloy Actuators*. Smart Materials and Structures (2016).

Refereed Conference Proceedings

1. A. Iliopoulos, J. Thomas, J. Steuben, **R. Saunders**, J. Michopoulos, A. Bagchi, A. Birnbaum, *Statistical Analysis of Tensile Test Performed on 316L Specimens Manufactured by Directed Energy Deposition*. In Proceedings of ASME 2020 International Design Engineering Technical Conferences, St. Louis MO, August 16-19 2020.
2. Y. Chen, D. Horner, M. Doherty, **R. Saunders**, A. Bagchi, T. O'Shaughnessy, *Shockwave Pressure Transmission through the Ear Canal with Hearing Protection*. In Proceedings of Personnel Armour Systems Symposium 2018, Washington DC, October 1-5 2018.
3. X.G. Tan, **R. Saunders**, A. Bagchi, *Computational analysis of performance of combat helmet to mitigate blast induced traumatic brain injury*. In Proceedings of Personnel Armour Systems Symposium 2018, Washington DC, October 1-5 2018.
4. P. Matic, **R. Saunders**, *Characterization of Combat Helmet Design Trade Spaces Accounting for Ballistic Threats, Brain Functional Areas, and Injury Considerations*. In Proceedings of Personnel Armour Systems Symposium (PASS), Washington DC, October 1-5 2018.
5. **R. Saunders**, A. Achuthan, A. Iliopoulos, J. Michopoulos, A. Bagchi, *Influence of Grain Size and Shape on Mechanical Properties of Metal AM Materials*. In Proceedings of Solid Freeform Fabrication Symposium, Austin, TX, Aug 13-15 2018.
6. X.G. Tan, **R. Saunders**, P. Matic, *Combat Helmet Pad Suspension Performance for Anthropomorphic Fit Designs, Brain Functional Areas and Injury Considerations*. In Proceedings of ASME International Mechanical Engineering Congress & Exposition (IMECE), Tampa, FL, Nov. 3-9, 2017.
7. **R. Saunders**, A. Achuthan, A. Bagchi, *A Method to Determine Local Stress Fields in Microstructure Features Produced by Additive Manufacturing*. In Proceedings of ASME International Mechanical Engineering Congress & Exposition (IMECE), Tampa, FL, Nov. 3-9, 2017.
8. X.G. Tan, **R. Saunders**, A. Bagchi, *Validation of a Full Porcine Finite Element Model for Blast Induced TBI Using a Coupled Eulerian-Lagrangian Approach*. In Proceedings of ASME International Mechanical Engineering Congress & Exposition (IMECE), Tampa, FL, Nov. 3-9, 2017.
9. A. Achuthan, A. Iliopoulos, J. Michopoulos, **R. Saunders**, A. Bagchi, *Towards a Constitutive Model That Encapsulates Microstructural Features Induced By Powder Additive Manufacturing.* In Proceedings of ASME International Design Engineering Technical Conference & Computers and Information in Engineering Conference (IDETC/CIE), Cleveland, OH, Aug. 6-9, 2017.
10. P. Matic, A. Moser, **R. Saunders**, *Combat Helmet Design Incorporating Multiple Ballistic Threats, Brain Functional Areas and Injury Considerations*. In Proceedings of ASME International Mechanical Engineering Congress & Exposition (IMECE), Phoenix, AZ, Nov. 13-19, 2016.
11. P. Matic, A. Moser, **R. Saunders**, *A Combat Helmet Computer Aided Design Strategy Incorporating Ballistic Threat, Brain Functional Areas and Injury Considerations*. In Proceedings of Personal Armour Systems Symposium (PASS), Amsterdam, NL, Sep. 19-23, 2016.
12. R. Wheeler, **R. Saunders**, K. Pickett, C. Eckert, H. Stroud, T. Fink, K. Gakhar, J. Boyd, D. Lagoudas, *Design of a Reconfigurable SMA-Based Solar Array Deployment*

Mechanism. In Proceedings of ASME Smart Materials Adaptive Structures and Intelligent Systems Conference (SMASIS), Colorado Springs, CO, Sep. 21–23, 2015.
‡ 1st place in CASMART Student Design Competition

13. **R. Saunders**, J. Herrington, L. Hodge, D. Hartl, J. Mabe, *Optimization of a Composite Morphing Wing with Shape Memory Alloy Torsional Actuators*. In Proceedings of ASME Smart Materials Adaptive Structures and Intelligent Systems Conference (SMASIS), Newport, RI, Sept. 8–10, 2014.
‡ Finalist in Best Student Hardware Competition

14. **R. Saunders**, D. Hartl, R. Malak, D. Lagoudas, *Design and Analysis of a Self-Folding SMA-SMP Composite Laminate*. In Proceedings of ASME International Design Engineering Technical Conference & Computers and Information in Engineering Conference (IDETC/CIE), Buffalo, NY, Aug. 17-20, 2014.

Contributed Conference Proceedings

1. X.G. Tan, **R. Saunders**, A. Bagchi, *Coupled Modeling for Investigation of Blast Induced Traumatic Brain Injury*. In Proceedings of International Conference on Computational Methods for Coupled Problems in Science and Engineering, Rhodes Island, Greece, June 12-14, 2017.

2. **R. Saunders**, D. Hartl, J. Boyd, D. Lagoudas, *Modeling and Development of a Twisting Wing Using Inductively Heated Shape Memory Alloy Actuators*. In Proceedings of SPIE Smart Structures and Non-Destructive Evaluation Conference, San Diego, CA, Mar. 8–12, 2015.

3. J. Herrington, L. Hodge, C. Stein, **R. Saunders**, D. Hartl, J. Mabe, *Development of a Twisting Wing Powered by an Shape Memory Actuator*. In Proceedings of AIAA SciTech 2015, Kissammee, FL, Jan. 5–9, 2014.

Technical Reports

1. **R. Saunders**, A. Achuthan, A. Iliopoulos, J. Michopoulos, A. Bagchi, *Effects of the Microstructural Grain Size and Aspect Ratio on the Mechanical Properties of Additively Manufactured Parts via Computational Analysis*. Defense Technical Information Center Report, Distribution A, NRL/FR/6353--20-10,411, 2020.

2. **R. Saunders**, *Metamaterials Using Additive Manufacturing Technologies*. Defense Technical Information Center Report, Distribution A, NRL/MR/6353--10,057, 2020.

3. **R. Saunders**, N. Kota, A. Bagchi, S. Qidwai, *On Challenges in Developing a High-Fidelity Human Head for Traumatic Brain Injury Prediction*. Defense Technical Information Center Report, Distribution A, NRL/MR/6350--9807, 2018.

4. P. Brewick, **R. Saunders**, A. Bagchi, *Biomechanical Modeling of the Human Head*. Defense Technical Information Center Report, Distribution A, NRL/FR/6350--17-10, 304, 2017.

Conference and Seminar Presentations

1. **R. Saunders**, A. Elwany, D. Lagoudas, A. Bagchi, *Mechanical Property Predictions of Additive Manufactured Microstructures via Surrogate Modeling*. 2020/2021 World Congress on Computational Mechanics (WCCM), COVID-19 Virtual Conference, January 11-15, 2021.

2. **R. Saunders**, *Mechanical Property Predictions of Additively Manufactured Microstructures Via Surrogate Modeling*. Simpleware Case Study Webinar. October 7, 2020. https://www.synopsys.com/simpleware/resources/case-studies/microstructure.html

3. **R. Saunders**, C. Butler, K. Genc, R. Cotton, P. Young, A. Elwany, D. Lagoudas, A. Bagchi, *Towards High Throughput Simulations of Microstructure Mechanical Behavior in*

AM. 2020 Conference on Advancing Analysis & Simulation in Engineering (CAASE), COVID-19 Virtual Conference, June 16-18, 2020.

4. **R. Saunders**, *Statistical Analysis of Fractional Anisotropy Effects on Traumatic Brain Injury*. ASME International Mechanical Engineering Congress & Exposition (IMECE), Salt Lake City, UT, November 11, 2019.

5. **R. Saunders**, R. Osborne, T. Martin, S. Johnson, E. Gorzkowski, *Mechanical Simulations of the Aerosol Deposition Process*. ASME International Mechanical Engineering Congress & Exposition (IMECE), Salt Lake City, UT, November 11, 2019.

6. **R. Saunders**, J. Mancias, A. Arroyave, I. Karaman, D. Lagoudas, A. Bagchi, A. Elwany, *Melt Pool Size Prediction via a Multi-Fidelity Gaussian Process Surrogate Model.* Solid Freeform Fabrication Symposium (SFF), Austin, TX, August 12-14, 2019.

7. **R. Saunders**, X. G. Tan, A. Bagchi, *Developing Correspondence Rules for Traumatic Brain Injury in Different Species*. International Forum on Brain Injury Countermeasures (IFBIC), McLean, VA, May 8, 2019.

8. **R. Saunders**, A. Achuthan, A. Iliopoulos, J. Michopoulos, A. Bagchi, *The Influence of Grain Size and Shape on Mechanical Properties of Metal AM Materials*. Solid Freeform Fabrication Symposium (SFF), Austin, TX, August 13-15, 2018.

9. **R. Saunders**, A. Achuthan, A. Iliopoulos, J. Michopoulos, A. Bagchi, *The Influence of Grain Size and Shape on the Mechanical Properties of AM Parts.* World Congress on Computational Mechanics (WCCM), New York, NY, July 22-28, 2018.

10. **R. Saunders**, X. G. Tan, A. Bagchi, *Advancements in Simulation of TBI to Develop Interspecies Correspondence Rules*. National Capital Area TBI Research Symposium, Bethesda, MD, March 7, 2018.

11. **R. Saunders**, A. Achuthan, A. Iliopoulos, J. Michopoulos, A. Bagchi, *A Method to Determine Local Stress Fields in Microstructure Features Produced By Additive Manufacturing*. ASME International Mechanical Engineering Congress & Exposition (IMECE), Tampa, FL, November 3-9, 2017.

12. **R. Saunders**, X. G. Tan, A. Bagchi, *Correspondence Rules to Correlate Interspecies Traumatic Brain Injury*. XXVI Congress of the International Society of Biomechanics, Brisbane, Australia, July 23-27, 2017.

13. **R. Saunders**, A. Romano, *A Parametric Study of Fractional Anisotropy and the Effects on Brain Injury Prediction*. XXVI Congress of the International Society of Biomechanics, Brisbane, Australia, July 23-27, 2017.

14. **R. Saunders**, X. G. Tan, A. Bagchi, *On the Development of Interspecies Traumatic Brain Injury Correspondence Rules*. National Capital Area TBI Research Symposium, Bethesda, MD, Mar. 8-9, 2017.

15. **R. Saunders**, A. Romano, *The Effects of Fractional Anisotropy on Traumatic Brain Injury Prediction*. National Capital Area TBI Research Symposium, Bethesda, MD, Mar. 8-9, 2017.

16. **R. Saunders**, S. Qidwai, A. Bagchi, *Validation of Two Porcine Models Against Low and High Rate Data*. ASME International Mechanical Engineering Congress & Exposition (IMECE), Phoenix, AZ, Nov. 11–17, 2016.

17. **R. Saunders**, S. Qidwai, *A Computational Study to Correlate Traumatic Brain Injury in Humans and Pigs*. ASME International Mechanical Engineering Congress & Exposition (IMECE), Phoenix, AZ, Nov. 11–17, 2016.

18. **R. Saunders**, S. Qidwai, A. Bagchi, *A Parametric Study of Fractional Anisotropic Representation in the Brain*. ASME International Mechanical Engineering Congress & Exposition (IMECE), Phoenix, AZ, Nov. 11–17, 2016.

19. S. Krishnamoorthi, A. Bagchi, S. Qidwai, **R. Saunders**, *Registration, Regional Identification and Transfer of data from MRI to finite element models*. ASME International Mechanical Engineering Congress & Exposition (IMECE), Phoenix, AZ, Nov. 11–17, 2016.

20. S. Qidwai, **R. Saunders**, S. Krishnamoorthi, A. Bagchi, *Development of Traumatic Brain Injury Scaling Rules between Humans and Pigs*. World Congress on Computational Mechanics (WCCM), Seoul, Korea, July 24 – July 29, 2016.

21. S. Krishnamoorthi, **R. Saunders**, S. Qidwai, *Registration, Regional Identification, and Transfer of Data from MRI Scans to Finite Element Models*. Summer Biomechanics, Bioengineering, and Biotransport Conference (SB3C), National Harbor, MD, June 29 – July 2, 2016.

22. **R. Saunders**, S. Qidwai, *Validation of a Porcine Head and Upper Torso Model*. Summer Biomechanics, Bioengineering, and Biotransport Conference (SB3C), National Harbor, MD, June 29 – July 2, 2016.

23. S. Qidwai, **R. Saunders**, *Scaling Rules between Human and Porcine Models for Traumatic Brain Injury*. Summer Biomechanics, Bioengineering, and Biotransport Conference (SB3C), National Harbor, MD, June 29 – July 2, 2016.

24. **R. Saunders**, N. Kota, A. Bagchi, S. Qidwai, *Development and Validation of a Porcine Head and Upper Torso Model*. ASME International Mechanical Engineering Congress & Exposition (IMECE), Houston, TX, Nov. 15–19, 2015.

25. S. Qidwai, **R. Saunders**, N. Kota, A. Bagchi, *On the Use of Human and Pig Head Models for Traumatic Brain Injury*. ASME International Mechanical Engineering Congress & Exposition (IMECE), Houston, TX, Nov. 15–19, 2015.

26. S. Qidwai, **R. Saunders**, N. Kota, A. Bagchi, *Towards Building Correspondence Rules between Human and Pig Head Models for Traumatic Brain Injury*. 13th US National Congress on Computational Mechanics (USNCCM), San Diego, CA, July 26-30, 2015.

27. **R. Saunders**, D. Hartl, J. Boyd, D. Lagoudas, *Modeling and Development of a Twisting Wing Using Inductively Heated Shape Memory Alloy Actuators*. SPIE Smart Structures and Non-Destructive Evaluation Conference, San Diego, CA, Mar. 8–12, 2015.

28. **R. Saunders**, J. Herrington, L. Hodge, D. Hartl, J. Mabe, *Optimization of a Composite Morphing Wing with Shape Memory Alloy Torsional Actuators*. ASME Smart Materials Adaptive Structures and Intelligent Systems Conference (SMASIS), Newport, RI, Sept. 8–10, 2014.