# Caterina Lamuta

Assistant Professor
Mechanical Engineering (ME), University of Iowa

Curriculum Vitae as of April 19, 2023


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| Campus Address: | 2404 Seamans Center, University of Iowa |
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| Research website | https://lamuta.lab.uiowa.edu/, SMMS LAB |


## EDUCATION AND PROFESSIONAL HISTORY

### Higher Education

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| 2017 | **PhD**, Mechanical Engineering, University of Calabria, Italy<br>**Thesis:** Development and characterization of advanced ceramic materials. |
| 2013 | **MS**, Mechanical Engineering, Summa cum laude and Honors, University of Calabria, Italy<br>**Thesis:** Molecular dynamics applied to the mechanical characterization of materials. |
| 2011 | **BS**, Mechanical Engineering, Summa cum laude and Honors, University of Calabria, Italy<br>**Thesis:** Stretch-blow molding process for the fabrication of PET bottles. |

### Professional and Academic Positions

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| 2018 - Present | **Assistant Professor**, Mechanical Engineering, The University of Iowa |
| 2017 - 2018 | **Postdoctoral Fellow**, Beckman Institute, University of Illinois at Urbana-Champaign |

### Licensures and Certifications

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| 2014 | **Professional Mechanical Engineer Certification**, Engineers Association, Cosenza, Italy |

### Honors and Awards

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| 2023 | **ONR Young Investigator Program (YIP) Award** |
| 2022 | **OVPR (Office of the Vice President for Research) Early Career Scholar of the Year 2022,** University of Iowa |
| 2022 | **Faculty Early Career Excellence Award,** College of Engineering, University of Iowa |
| 2021 | **Recognition award (P3 High Impact Hiring Initiative (HIHI))** from the **Office of the Provost,** University of Iowa |
| 2021 | **DARPA Young Faculty Award (YFA)** |
| 2021 | **Old Gold Summer Fellowship**, CoE University of Iowa |
| 2017 - 2018 | **Beckman Postdoctoral Fellowship**, Beckman Institute, University of Illinois at Urbana-Champaign |
| 2013 | **Master of Science Degree with Honors**, University of Calabria, Italy |
| 2011 | **Bachelor of Science Degree with Honors**, University of Calabria, Italy |
| 2009 | **Best student award** from the **College of Engineering**, University of Calabria, Italy |

### Memberships

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| 2018 - Present | Material Research Society (MRS) |
| 2018 - Present | Society of Women Engineers (SWE) |
| 2018 - Present | The American Society of Mechanical Engineers (ASME) |
| 2018 - Present | Grant Training Center Member Community |
| 2021 - Present | International Society of Bionic Engineering (ISBE) |

# TEACHING AND MENTORING

## Courses Taught at the University of Iowa

| Term | Course# | Title | Enrollment |
|---|---|---|---|
| Spring 2023 | ME:6130 | Novel Artificial Muscles and Sensors for Evolving Robotics | 15 |
| Fall 2022 | ME:4200:0001 | Modern Engr Materials for Mech Design | 13 |
| Spring 2022 | URES:3993:7253 (422:198:253) | Undergraduate Research/Creative Projects | 1 |
| Fall 2021 | ME:4200:0001 | Modern Engr Materials for Mech Design | 21 |
| Summer 2021 | URES:3992:4486 (422:197:486) | Undergraduate Research/Creative Projects | 1 |
| Spring 2021 | ME:3052:0002 | Mechanical Systems | 93 |
| Spring 2021 | URES:3993:3055 (422:198:055) | Undergraduate Research/Creative Projects | 1 |
| Spring 2021 | ME:6191:0001 (058:191:001) | Graduate Seminar: Mechanical Engineering | 47 |
| Fall 2020 | ME:4200:0001 | Modern Engr Materials for Mech Design | 21 |
| Spring 2020 | ME:3052:0002 | Mechanical Systems | 100 |
| Fall 2019 | ME:4098:6680 | Individual Investigations Mechanical Eng | 1 |
| Fall 2019 | ME:4200:0001 | Modern Engr Materials for Mech Design | 18 |
| Spring 2019 | ME:4098:3875 | Individual Investigations Mechanical Eng | 2 |
| Fall 2018 | ME:4098:2664 | Individual Investigations Mechanical Eng | 1 |

## Innovations in Teaching

***Design & Implementation of New Courses***

Jan 2022 **ME:6130 Novel Artificial Muscles and Sensors for Evolving Robotics**

Aug 2019 - Present **ME:4200 Modern Engineering Materials for Mechanical Design**

## Research Supervision

***PhD Students***

August 2022-Present — Rabiu Mamman, ME PhD Advisor (Dean's Fellowship)

February 2020 - Present — Shakib, Mahmudul Alam, ME PhD Advisor

August 2021 - Present — Maxson, Sean, ME PhD Advisor

August 2019 - — Weerakkody, Thilina, Mechanical Engineering, ME PhD Advisor

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| Present | |
| August 2018 - Present | Kotak, Parth, Mechanical Engineering, ME PhD Advisor (Dean's Fellowship) |
| August 2021 – August 2022 | Bell, Samantha, ME PhD Advisor (Dean's Fellowship) |
| August 2021 - Present | Gao, Zhaolin, ME PhD Advisor |
| October 2019 - Present | Greco, Carlo, University of Calabria, Italy, PhD Co-Advisor |
| July 2020 – Present | Zhang, Shao, Dentistry Department, UIowa (research collaboration/mentoring) |

***Visiting Scholars***

| | |
|---|---|
| July 2023 | Elio Curcio, University of Calabria, Italy |
| October 2020 – June 2021 | Greco, Carlo, University of Calabria, Italy |
| February 2019 - June 2019 | Giovinco, Valentina, University of Calabria, Italy |
| September 2021– June 2022 | Uzun, Utku, Tarsus University, Turkey |

***Master Students***

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|---|---|
| January 2018 - June 2019 | Giovinco, Valentina, University of Calabria, Italy, Co-Advisor |

***Undergraduate Students***

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|---|---|
| January 2023-present | Braeden Harrell, BME, UIowa |
| October 2022-December 2022 | Jaspreet, Gill, ME, UIowa |
| March 2022-Present | Dexter, Morgan, BME, UIowa |
| March 2022-Present | Lo, Blaze, ME, UIowa |
| August 2021-Present | Dingman, Cole, BME, UIowa |
| August 2021-Present | Calderon, Victor, ME UIowa |
| August 2020-Present | McFadden, Marissa, BME, UIowa |
| August 2020-2021 | Lopez, Eleanor, ME, UIowa |
| August 2020 - Present | Johnson, Tatum, ME UIowa |
| April 2020 - 2021 | Vessey, Kai, ME, Iowa |
| October 2019 - 2021 | Vanderhoef, Cyan, ME UIowa |
| August 2019 - 2021 | Fang, Jarjunn, BME, UIowa |

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| August 2019 - 2021 | Elliot, Leah, ME, UIowa |
| April 2019 - 2020 | Reis, Alyssa, BME, UIowa |
| April 2019 - 2021 | Mudd, Madeline, BME, UIowa |
| April 2019 - 2021 | Daws, Sawsan, Physics and Astronomy, UIpwa |
| January 2019 - 2021 | Mendez, Abdeel, ME UIowa |
| January 2019 - 2021 | Gallegos, Jeremy, BME, UIowa |
| January 2019 - 2021 | Nastruz, Madison, BME, UIowa |
| May 2019 - August 2019 | Wilkinson, Adam, BME, UIowa |
| August 2018 - May 2019 | Beaton, Grant Duncan, ME UIowa |

## Student Mentoring

### *BS - Directed Individual/Independent Study*

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|---|---|
| August 2020-2022 | McFadden, Marissa, BME, UIowa |
| August 2020-2021 | Lopez, Eleanor, ME, UIowa |
| January 2019 - August 2019 | Movitz, David, ME |
| April 2019-2021 | Daws, Sawsan |
| August 2018 - August 2019 | Beaton, Grant Duncan, ME |

### *PhD - Commitee Member*

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|---|---|
| April 2020 | He, Li |
| November 2021 | Attarian, Siamak |
| May 2020 | Samantha, Avik |
| November 2021 | Fei, Fan |
| March 2020 | Wang, Qinghua |

### *Master's Thesis Committee Member*

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| April 2021 | El Tuhami, Ahmed, ME |
| December 2018 | Berdon, Randall; |

### *High School Students*

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| January 2020 – August 2021 | Kompella, Vedanta Vishnu, Kennedy High School, Cedar Rapids |

### *Elementary School Students*

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| Nov 2018- 2020 | Murali, Shanza, Borlaug Elementary School, Iowa City |

## RESEARCH PRODUCTS AND FUNDED RESEARCH

### *Refereed Journal Papers*

1. James Neilan, Maxwell Hammond, Anthony Dempsey, Will Ward, Stephen Stewart, Jessica Friz, Caterina Lamuta and Venanzio Cichella "A Soft Material Robotic End-Effector for Reversible Strut Joining", (**under review**)
2. Parth Kotak, Sean Maxson, Thilina Weerakkody, Caterina Lamuta, "Octopus-inspired muscular hydrostats powered by Twisted and Coiled Artificial Muscles" (**under review**)
3. Mahmudul Alam Shakib, Zhaolin Gao, Sebastiano Candamano, Caterina Lamuta, "Ion Channels and Electroosmosis in Porous Geopolymers: a Novel Category of Low-cost Memristors", (**under review**)
4. Maxwell Hammond, Venanzio Cichella, Caterina Lamuta, (2023), "'Bioinspired Soft Robotics: state of the art, challenges, and future directions'", *Current Robotics Reports, SpringerNature* (**in press**)
5. Utku Uzun, Caterina Lamuta, Mehmet Yetmez, "Friction and wear characteristics of bismuth selenide topological insulator" *Materials Letters* (**in press**)
6. Thilina Weerakkody, Maxwell Hammond, James Neilan, Venanzio Cichella, Caterina Lamuta, (2023), "Modeling and Control of Twisted and Coiled Artificial Muscles (TCAMs) for Soft Robotics", *Robotica*, *SpringerNature,* 1-16. https://link.springer.com/article/10.1007/s11012-023-01651-8
7. Caterina Lamuta, (2023) "Perspective on highly twisted artificial muscles", Applied physics letters 122 (4), 040502 (**by invitation only**). https://aip.scitation.org/doi/abs/10.1063/5.0133971 (**selected as Editor's pick**)
8. Kotak P., Johnson T., Lamuta C., (2023), Bioinspired fouling-release smart skin powered by Twisted Spiral Artificial Muscles (TSAMs), *Advanced materials technologies* 8 (4), 2201262, **RISING STAR Special Issue (by nomination only)** https://onlinelibrary.wiley.com/doi/full/10.1002/admt.202201262
9. Greco C., Weerakkody T., Cichella V., Pagnotta L., Lamuta C., (2023), "Lightweight Bioinspired Exoskeleton for Wrist Rehabilitation Powered by Twisted and Coiled Artificial Muscles", Robotics 12 (1), 27. https://www.mdpi.com/2218-6581/12/1/27
10. Daws S., Kotak P., Kuo C., Lue C. S., Politano A., Lamuta C., (2022) Platinum diselenide PtSe2: an ambient-stable material for flexible electronics, *Materials Science and Engineering: B* 283, 115824 https://www.sciencedirect.com/science/article/pii/S0921510722002185
11. Bell, S., Bangel, A., Weerakkody, T., Song, X. and Lamuta, C., (2022) Automated manufacturing system for carbon fiber-based twisted and coiled artificial muscles (TCAMs). *Manufacturing Letters*, *33*, pp.19-23 https://www.sciencedirect.com/science/article/pii/S221384632200030X
12. Huang, W., Nelson, B., Tian, S., Ordikhani-Seyedlar, R., Auyeung, R.C., Samanta, A., Hu, H., Shaw, S., Lamuta, C. and Ding, H., (2022) Superhydrophobic surface processing for metal 3D printed parts. *Applied Materials Today*, *29*, p.101630 https://www.sciencedirect.com/science/article/pii/S2352940722002645
13. Kotak, P., Wilken, J., Anderson, K. and Lamuta, C., (2022). Carbon Fiber Based Twisted and Coiled Artificial Muscles (TCAMs) for Powered Ankle-Foot Orthoses (AFO). *Journal of Biomechanical Engineering, 144 (1)* https://asmedigitalcollection.asme.org/biomechanical/article-abstract/doi/10.1115/1.4051927/1115050/Carbon-Fiber-Based-Twisted-and-Coiled-Artificial
14. Uzun, U., Lamuta C., Yetmez M., (2022) Nanoindentation creep behavior of single-crystal Bi2Se3 topological insulator, *Physica Stataus Solidi b*, 2100481, https://onlinelibrary.wiley.com/doi/abs/10.1002/pssb.202100481
15. Fei F., Kotak P., He L., Li X., Vanderhoef C., Lamuta C., Song X., (2021), Cephalopod-inspired stretchable self-morphing skin via Embedded 3D Printing and Twisted Spiral Artificial Muscles, *Advanced Functional Materials*, 31 (46), 2105528, https://onlinelibrary.wiley.com/doi/10.1002/adfm.202105528
16. Fei F., Kotak P., He L., Li X., Vanderhoef C., Lamuta C., Song X., (2021), Cephalopod-inspired stretchable self-morphing skin via Embedded 3D Printing and Twisted Spiral Artificial Muscles, *Advanced Functional Materials*, 31 (46), 2170342, JOURNAL COVER https://onlinelibrary.wiley.com/doi/abs/10.1002/adfm.202170342
17. Kotak P., Greco C., Pagnotta L., Lamuta C., (2021), The evolution of mechanical actuation: from conventional actuators to artificial muscles, *International Materials Reviews*, 67 (6), 575-619 (**by invitation**) https://www.tandfonline.com/doi/full/10.1080/09506608.2021.1971428

18. Hammond, M., Cichella, V., Weerakkody, T. and Lamuta, C., (2021), Robust and Adaptive Sampled-Data Control of Twisted and Coiled Artificial Muscles*, IEEE Control Systems Letters*, 6, 1232-1237.https://ieeexplore.ieee.org/abstract/document/9462397?casa_token=9LuDSKN70dwAAAAA:HzXK1vk90R38eTSWLYVVbV-ll0TZJqjV0RrOY07WXaE3SJpZ0eKIKGJ_LqlZaqMypM1yRW8WSQ
19. Samanta, A., Huang, W., Parveg, A.S., Kotak, P., Auyeung, R.C., Charipar, N.A., Shaw, S.K., Ratner, A., Lamuta, C. and Ding, H., (2021). Enabling Superhydrophobicity-Guided Superwicking in Metal Alloys via a Nanosecond Laser-Based Surface Treatment Method. ACS Applied Materials & Interfaces. https://pubs.acs.org/doi/abs/10.1021/acsami.1c09144
20. Kotak P., Weerakkody T., Lamuta C., (2021), Physics-based Dynamic Model for the Electro-thermal Actuation of Bio-Inspired Twisted Spiral Artificial Muscles (TSAMs), *Polymer*, 222, 123642. https://www.sciencedirect.com/science/article/abs/pii/S0032386121002652
21. Greco, C., Kotak, P., Gallegos, J., Fang, J., Wilkinson, A., Pagnotta, L., Lamuta, C. (2020). Scalable Manufacturing System for Bionspired Twisted Spiral Artificial Muscles (TSAMs). *Manufacturing Letters,* 26, 6-11. https://www.sciencedirect.com/science/article/abs/pii/S2213846320301474
22. Wang, Q., You, H., Lowery, Z., Li, S., Fu, H., Wang, R., Lamuta, C., Toor, F., Wu, W., Ratner, A., Ding, H. (2020). An Innovative Laser Metasurface Fabrication Technique for Highly Flexible Optoelectronic Devices. *Journal of Micro and Nano-Manufacturing*, *8*(1). https://asmedigitalcollection.asme.org/micronanomanufacturing/article-abstract/8/1/010901/1072673/An-Innovative-Laser-Metasurface-Fabrication
23. Kim, T. A., Lamuta, C., Kim, H., Leal, C., Sottos, N. R. (2020). Interfacial Force-Focusing Effect in Mechanophore-Linked Nanocomposites. *Advanced Science* 7 (7), 1903464. https://api.elsevier.com/content/abstract/scopus_id/85080080833
24. Giovinco, V., Kotak, P., Cichella, V., Maletta, C., Lamuta, C. (2019). Dynamic model for the tensile actuation of thermally and electro-thermally actuated Twisted and Coiled Artificial Muscles (TCAMs). *Smart Materials and Structures*, 29 (2), 025004. https://iopscience.iop.org/article/10.1088/1361-665X/ab5e38/meta
25. Lamuta C., (2019). Elastic constants determination of anisotropic materials by depth-sensing indentation. *SN Applied Sciences,* 1 (10), 1-13. https://link.springer.com/article/10.1007/s42452-019-1301-y
26. Lamuta, C., He, H., Zhang, K., Rogalsky, M., Sottos, N. R., Tawfick, S. (2019). Digital Texture Voxels for Stretchable Morphing Skin Applications. *Advanced Materials Technologies*, *4*(8), 1900260. https://onlinelibrary.wiley.com/doi/abs/10.1002/admt.201900260
27. Candamano, S., Sgambitterra, E., Lamuta, C., Pagnotta, L., Chakraborty, S., Crea, F. (2019). Graphene nanoplatelets in geopolymeric systems: a new dimension of Nanocomposites. *Materials Letters*, *236*, 550-553. https://www.sciencedirect.com/science/article/abs/pii/S0167577X18317816
28. Lamuta, C., Campi, D., Pagnotta, L., Dasadia, A., Cupolillo, A., Politano, A. (2018). Determination of the mechanical properties of SnSe, a novel layered semiconductor. *Journal of Physics and Chemistry of Solids*, *116*, 306-312. https://api.elsevier.com/content/abstract/scopus_id/85041391157
29. Lamuta, C., Messelot, S., Tawfick, S. (2018). Theory of the tensile actuation of fiber reinforced coiled muscles. *Smart Materials and Structures*, *27*(5). https://api.elsevier.com/content/abstract/scopus_id/85046696200
30. Sgambitterra, E., Lamuta, C., Candamano, S., Pagnotta, L. (2018). Brazilian disk test and digital image correlation: a methodology for the mechanical characterization of brittle materials. *Materials and Structures/Materiaux et Constructions*, *51*(1). https://api.elsevier.com/content/abstract/scopus_id/85040933092
31. Politano, A., Lamuta, C., Chiarello, G. (2017). Cutting a Gordian Knot: Dispersion of plasmonic modes in Bi2Se3 topological insulator. *Applied Physics Letters*, *110*(21). https://api.elsevier.com/content/abstract/scopus_id/85019719488
32. Lamuta, C., Candamano, S., Crea, F., Pagnotta, L. (2016). Direct piezoelectric effect in geopolymeric mortars. *Materials and Design*, *107*, 57-64. https://api.elsevier.com/content/abstract/scopus_id/84973474075
33. Lamuta, C., Campi, D., Cupolillo, A., Aliev, Z. S., Babanly, M. B., Chulkov, E. V., Politano, A., Pagnotta, L. (2016). Mechanical properties of Bi2Te3 topological insulator investigated by density functional theory and nanoindentation. *Scripta Materialia*, *121*, 50-55. https://api.elsevier.com/content/abstract/scopus_id/84966706378

34. Lamuta, C., Cupolillo, A., Politano, A., Aliev, Z. S., Babanly, M. B., Chulkov, E. V., Alfano, M., Pagnotta, L. (2016). Nanoindentation of single-crystal Bi2Te3 topological insulators grown with the Bridgman–Stockbarger method. *Physica Status Solidi (B) Basic Research*, *253*(6), 1082-1086. https://api.elsevier.com/content/abstract/scopus_id/84959010953
35. Lamuta, C., Cupolillo, A., Politano, A., Aliev, Z. S., Babanly, M. B., Chulkov, E. V., Pagnotta, L. (2016). Indentation fracture toughness of single-crystal Bi2Te3 topological insulators. *Nano Research*, *9*(4), 1032-1042. https://api.elsevier.com/content/abstract/scopus_id/84964765617
36. Lamuta, C., Di Girolamo, G., Pagnotta, L. (2015). Microstructural, mechanical and tribological properties of nanostructured YSZ coatings produced with different APS process parameters. *Ceramics International*, *41*(7), 8904-8914. https://api.elsevier.com/content/abstract/scopus_id/84929270382

### *Refereed Book Chapters*

1. Yourdkhani, M., Koohbor, B., Lamuta, C., Dean, L. M., Centellas, P., Ivanoff, D. G., Robertson, I. D., White, S. R., Sottos, N. R. (2019). Thermo-mechanical properties of thermoset polymers and composites fabricated by frontal polymerization. *Conference Proceedings of the Society for Experimental Mechanics Series* (pp. 89-91). https://api.elsevier.com/content/abstract/scopus_id/85055353169
2. Alfano, M., Lamuta, C., Chiarello, G., Politano, A. (2017). Elastic Properties and Electron–Phonon Coupling of Graphene/Metal Interfaces Probed by Phonon Dispersion. *Carbon Nanostructures* (9783319581323th ed., pp. 47-59). https://api.elsevier.com/content/abstract/scopus_id/85045996504

### *Conference Proceeding*

1. Parth Kotak, Sean Maxson, Thilina Weerakkody, Caterina Lamuta, “Soft tentacles for underwater robotics powered by Twisted and Coiled Artificial Muscles (TCAMs)” ASME SMASIS 2023 Austin, TX, 11-13 September 2023.
2. Mahmudul Alam Shakib, Zhaolin Gao, Caterina Lamuta, Synaptic Plasticity in Electroosmosis-Driven Geopolymer Memristors, ASME SMASIS 2023 Austin, TX, 11-13 September 2023.
3. Rabiu Mamman, Parth Kotak, Caterina Lamuta, Bioinspired Active Vortex Generators to Delay Stall on an Airfoil at Low Reynolds Number, ASME SMASIS 2023 Austin, TX, 11-13 September 2023.
4. Maxwell Hammond, Venanzio Cichella, Caterina Lamuta, “A Cosserat Rod Model for a Hyperelastic Continuum Robot Actuated by Twisted and Coiled Artificial Muscles”, ASME SMASIS 2023 Austin, TX, 11-13 September 2023.
5. Parth Kotak, Sean Maxson, Caterina Lamuta, Muscular Hydrostats Inspired by Cephalopods, ASME SMASIS 2022 Dearborn, MI, 12-14 September 2022.
6. Tatum Johnson, Parth Kotak, Caterina Lamuta, Marine Biofilm Removal via Cephalopod-Inspired Smart Skin, ASME SMASIS 2022 Dearborn, MI, 12-14 September 2022.
7. Samantha Bell, Bill Bangel, Xuan Song, Caterina Lamuta, Automated Manufacturing Process for Carbon Fiber Twisted and Coiled Artificial Muscles (TCAMs), ASME SMASIS 2022 Dearborn, MI, 12-14 September 2022.
8. Thilina Weerakkody, Maxwell Hammond, Venanzio Cichella, Caterina Lamuta “Dynamic Modelling and Robust Control for Twisted and Coiled Artificial Muscles”, ASME SMASIS 2022 Dearborn, MI, 12-14 September 2022.
9. Mahmudul Alam Shakib, Zhaolin Gao, Caterina Lamuta, Novel Geopolymer Based Artificial Synapses, ASME SMASIS 2022 Dearborn, MI, 12-14 September 2022.
10. Hammond, M., Cichella, V., Weerakkody, T. and Lamuta, C., Robust and Adaptive Sampled-Data Control of Twisted and Coiled Artificial Muscles, 2021 IEEE Conference on Decision and Control (CDC).
11. S. Zhang, S. J. Franciosa, P. Kotak, S. Ribeiro Cunha, S. Armstrong, C. Vidal, X. J. Xie, C. Lamuta, Hydrophobic Coating Effect on Universal Adhesive’s Dentin Bonding Nanomechanical Properties, AADOCR 2022 Annual Meeting.
12. Fei F., Kotak P., He L., Li X., Vanderhoef C., Lamuta C., Song X., Stretchable and Waterproof Self-Morphing Skin via Embedded Printing and Twisted Spiral Artificial Muscles (TSAMs) Inspired by Cephalopods, ASME SMASIS (Smart Materials, Adaptive Structures and Intelligent Systems) 2021 conference.
13. Parth Kotak, Thilina Weerakkody, Mahmudal Alam Shakib, Caterina Lamuta, Cephalopod-inspired muscular hydrostats from twisted and coiled artificial muscles (tcams), ASME SMASIS (Smart Materials,

Adaptive Structures and Intelligent Systems) 2021 conference.

14. Mahmudul Alam Shakib, Utku Uzun, Sebastiano Candamano, Caterina Lamuta, Piezoelectric performance of graphene reinforced metakaolin based geopolymer mortars, ASME SMASIS (Smart Materials, Adaptive Structures and Intelligent Systems) 2021 conference.
15. Weerakkody, T., Kotak, P., Lamuta, C. *Artificial papillae for self-morphing skin: a dynamic model*. Society of Engineering Science (SES) Conference 2020.
16. Kotak, P., Harwood, C., Buchholz, J., Lamuta, C. *Boundary Layer Transition Induced by Bio-Inspired Twisted Spiral Artificial Muscles*. ASME SMASIS (Smart Materials, Adaptive Structures and Intelligent Systems) 2020 conference. Accepted/In Press September 2020
17. Greco, C., Weerakkody, T., Kielas-Jensen, C., Cichella, V., Pagnotta, L., Lamuta, C. *Lightweight and Anthropomorphic Assistive Robotics from Twisted and Coiled Artificial Muscles*. Society of Engineering Science (SES) Conference 2020. Accepted/In Press September 2020
18. Greco, C., Weerakkody, T., Kielas-Jensen, C., Cichella, V., Pagnotta, L., Lamuta, C. *Rehabilitation Glove powered by Twisted and Coiled Artificial Muscles*. ASME SMASIS (Smart Materials, Adaptive Structures and Intelligent Systems) 2020 Conference. Accepted/In Press September 2020
19. You, H., Lowery, z., Wang, Q., Lamuta, C., Wang, R., Wu, W., Ding, H. *A Novel Laser Patterning Process for Highly Flexible Transparent Conducting Heater*. Raleigh, North Caroline, USA: 2019 World Congress on Micro and Nano Manufacturing. Accepted/In Press September 10, 2019
20. Lamuta, C., He, H., Zhang, K., Rogalski, M., Sottos, N., Tawfick, S. (2019). *Cephalopod-inspired self-morphing skin*. ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS) 2019.
21. Giovinco, V., Cichella, V., Maletta, C., Lamuta, C. (2019). *Dynamic Model for The Tensile Actuation of Carbon Fibers/Silicone Rubber Twisted and Coiled Artificial Muscles*. ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS) 2019.
22. Wang, Q., Lamuta, C., Toor, F., Arnold, M., Ding, H. *Laser-based Metamaterial Fabrication of Flexible THz Optics*. 56th Annual Technical Meeting of the Society of Engineering Science (SES2019). Accepted/In Press September 3, 2019
23. Lamuta, C., He, H., Zhang, K., Rogalski, M., Sottos, N., Tawfick, S. *Twisted Spiral Artificial Muscles for Texture and Shape Modulation*. 56th Annual Technical Meeting of the Society of Engineering Science (SES2019). Accepted/In Press September 3, 2019
24. Kim, T. A., Lamuta, C., Kim, H., Leal, C., Moore, J., White, S., Sottos, N. *Enhanced mechanical reactivity of mechanophore-linked nanocomposites*. ABSTRACTS OF PAPERS OF THE AMERICAN CHEMICAL SOCIETY. Accepted/In Press August 2019
25. Candamano, S., Sgambitterra, E., Lamuta, C., Rotella, G., Pagnotta, L., Crea, F. (2017). *Effect of graphene nanoplatelets on properties of geopolymers mortars*. The 7th Advanced Functional Materials and Devices (AFMD), December 18-23, 2017, Havana, Cuba..
26. Lamuta, C., Bruno, L., Candamano, S., Pagnotta, L. (2017). Piezoresistive characterization of graphene/metakaolin based geopolymeric mortar composites. *MRS Advances* (61st ed., vol. 2, pp. 3773-3779). https://api.elsevier.com/content/abstract/scopus_id/85044210996
27. Sgambitterra, E., Lamuta, C., Candamano, S., Pagnotta, L. (2015). *Determination of elastic constants of isotropic materials by means of Brazilian Disk Test and Digital Image Correlation*. 44° National Conference of the Italian Association for Stress Analysis (AIAS), September 2-5, 2015, Messina, Italy.
28. Lamuta, C., Di Girolamo, G., Caliandro, P., Pagnotta, L. (2014). *Influence of process parameters on the microstructural and mechanical properties of plasma sprayed nanostructured YSZ coatings*. Recent Advances in Energy, Environment and Materials Proc. of the International Conference on Energy, Environment and MaterialScience (EEMAS'14)(Saint Petersburg, Russia, 23-25 September, 2014).
29. Lamuta, C., Di Girolamo, G., Caliandro, P., Pagnotta, L. (2014). *Microstructure and Mechanical Properties of nanostructured plasma sprayed YSZ coatings*. 43° National Conference of the Italian Association for Stress Analysis (AIAS), September 9-12, 2014, Rimini, Italy.

## Inventions and Patents

1. Tawfick, Sameh, Lamuta, Caterina, "Elongate fiber artificial muscles and method of fabrication", US Patent 11,060,512, https://patents.google.com/patent/US11060512B2/en

## Grants and Contracts

1. ONR DURIP – Electrodynamic Testing System and 3D Profilometers for Research on Self-Morphing Smart Skins for Hydrodynamic Drag Control and Antifouling, 2020-2023, $417,792.50 (PI)
2. ONR - Adaptive Texture and Shape Modulation of a Soft Skin from Bio-inspired Coiled Actuators, 2019-2022, $429,774 (PI)
3. CoE UIowa – WARD: Wearable Artificial Muscles-based Rehabilitation Device, 2020, $19, 240 (PI)
4. DARPA YFA - Cephalopods-inspired Self-morphing Stretchable Soft Skin from Twisted and Coiled Artificial Muscles, 2021-2023, $ 422,771 (PI)
5. NSF MoMS – Machine Learning-Enhanced Multiscale Modeling of Spatially Tailored Materials, 2021-2024, $486,358.00 (co-PI 20%)
6. AFOSR – Ion Channels in Geopolymers: Artificial Synapses with Unique Electro-Mechanical Properties, 2021-2024 $300,000 (PI)
7. ONR - Cephalopods-inspired Self-morphing Skin for Dynamic Antifouling and Turbulence Tripping, 2022-2025, $360,081.00 (PI)
8. OVPR UIowa – P3 HiHi, 2021-2023, $100,000
9. NSF STTR - Smart Semiautonomous Fluid Drainage System for Surgical Procedures, 2022-2023, $151,282.00 (co-PI 33%)
10. NASA EPSCOR (Iowa State) – Twisted and Coiled Artificial Muscle-based Soft Robots 2022-2023, $46,066 (PI 50%)
11. ONR YIP - SOFTOPUS: A Cephalopods-inspired Intelligent Soft Robot for Sensing, Manipulation, Locomotion, and Texture Modulation, 2022-2025, $502,242 (PI)

## Invited Talks

### *UIowa Seminars/Lectures*

2023 Lamuta, C., (Invited Seminar) "Artificial Muscles and Artificial Synapses", Department of Biomedical Engineering, University of Iowa (February 2023).

2022 Lamuta, C., (Invited Seminar) " *Smart Materials and Artificial Muscles*", Department of Electrical and Computer Engineering, University of Iowa (January 2022).

2020 Lamuta, C., (Invited Seminar) " *Biomimetics and Artificial Muscles*", Department of Electrical and Computer Engineering, University of Iowa (October 2020).

2020 Lamuta, C., (Invited Seminar) " *Artificial Muscles for Robotics and Underwater Applications*" Department of Chemical and Biochemical Engineering, University of Iowa (November 2020).

2018 *You@UI recruitment program for top scholars: How engineers learn from nature*, University of Iowa, Iowa City, Iowa, United States Presenters/Authors: Lamuta, Caterina

### *External Invited Lectures/Keynotes*

2023 **Keynote invited speaker** "Artificial Muscles for underwater applications" at the Chemical and Biological Defense Gordon Research Conference (**GRC**) March 19-24, 2023

2022 **Keynote invited speaker** "Bioinspired material systems", Virtual 2nd Edition - Academia International Materials Science & Engineering Conference, November 18 - 19, 2022

2021 Invited Seminar "Smart materials and artificial muscles", University of Calabria (December 2021)

2020 Invited seminar "Twisted and Coiled Artificial Muscles for Robotics and Underwater Applications", University of Calabria (December 2020)

2019 **Keynote invited speaker**, "Artificial muscles and smart systems", Annual Congress of the Italian Society for Biomaterials (SIB) 2019, Caserta, Italy

2022 **Keynote invited speaker** "Smart Materials and Artificial Muscles", DoD sponsored JSHS (Junior Science and Humanity Symposium), 7-8 March 2022, Iowa City

2021 **Keynote invited speaker** "Biomimetics and Artificial Muscles" Scientex Smart Materials 2021 Conference, Vienna, Austria, November 13, 2021.

2019 **Keynote invited speaker SES** 2019 – Society of Engineering Science 56th Annual Technical Meeting, "Enhancing Mechanochemical Activity in Polymer Nanocomposites", Saint Louis, Missouri, United States. Authors: Lamuta, Caterina, Moore, Jeff, Sottos, Nancy Student Presenters/Authors: Kim, Tae Ann

2021 Invited Seminar "Smart Materials and Artificial Muscles", University of Wisconsin-Madison.

2019 Invited seminar "Artificial muscles and bio-inspired material systems", 3M Technical Forum seminar, 3M, Minneapolis, Minnesota, United States

***Posters***

2023 Rabiu Mamman, Parth Kotak, Austin Krebill, James Buchholz, Caterina Lamuta, "Active vortex generators powered by Twisted Spiral Artificial Muscles (TSAMs)", Research Open House, CoE UIowa, April 20, 2023.

2023 Mahmudul Alam Shakib, Zhaolin Gao, Caterina Lamuta, "Memory properties of Geopolymer-based Artificial Synapses", Research Open House, CoE UIowa, April 20, 2023.

2023 George Elias, Marissa McFadden, Braedon Harrell, Samira Afshari, Kirsten M. Anderson, Jason Wilken, Caterina Lamuta, & Deema Totah, "Memory properties of Geopolymer-based Artificial Synapses", Research Open House, CoE UIowa, April 20, 2023.

2023 Sean Maxson, Parth Kotak, Thilina Weerakkody, Caterina Lamuta, "Octopus-inspired Soft tentacles", Research Open House, CoE UIowa, April 20, 2023.

2023 Maxwell Hammond, Venanzio Cichella, Caterina Lamuta, "A Cosserat Rod Model for soft tentacles", Research Open House, CoE UIowa, April 20, 2023.

2023 Maxwell Hammond, Venanzio Cichella, Caterina Lamuta, "A Cosserat Rod Model for a Hyperelastic Continuum Robot Actuated by Twisted and Coiled Artificial Muscles", ISGC Student Research Symposium March 27, 2023, Ames, IA.

2022 Caterina Lamuta, "DARPA YFA: Cephalopods-inspired Self-morphing Stretchable Soft Skin (S4) from Twisted and Coiled Artificial Muscles (TCAMs)", Defense TechConnect 2022, National Harbor, MA 26-29 September 2022.

2022 Parth Kotak, Fan Fei, Li He, Cyan Vanderhoef., Xuan Song, Caterina Lamuta, Muscular Hydrostats Inspired by Cephalopods, Research Open House, CoE UIowa.

2022 Parth Kotak, Caterina Lamuta, Octopi-Inspired Shape Changing Smart Skin Powered by Twisted Spiral Artificial Muscles (TSAMs), Research Open House, CoE UIowa.

2022 Tatum Johnson, Parth Kotak, Caterina Lamuta, Marine Biofilm Removal via Cephalopod-Inspired Smart Skin, Research Open House, CoE UIowa. ***BEST UNDERGRADUATE POSTER AWARD from ME***

2022 Samantha Bell, Bill Bangel, Xuan Song, Caterina Lamuta, Automated Manufacturing Process for Carbon Fiber Twisted and Coiled Artificial Muscles (TCAMs), Research Open House, CoE UIowa. ***BEST GRADUATE POSTER AWARD from ME***

2022 Thilina Weerakkody, Maxwell Hammond, Venanzio Cichella, Caterina Lamuta Dynamic Modelling and Robust Control for Twisted and Coiled Artificial Muscles, Research Open House, CoE UIowa.

2022 Mahmudul Alam Shakib, Zhaolin Gao, Caterina Lamuta, Novel Geopolymer Based Artificial Synapses, Research Open House, CoE UIowa.

2020 Conference for Undergraduate Women in Physics, *Using Nanoindentation to Determine The Mechanical Properties of PtSe2*, Minneapolis, Minnesota, United States Presenters/Authors: Daws, Sawsan, Kotak, Parth, Lamuta, Caterina

2019 56th Annual Technical Meeting of the Society of Engineering Science (SES2019),

*Mechanical Characterization of Carbon Fibre Artificial Muscles for the Design of Orthotic Devices*, Saint Louis, Missouri, United States Presenters/Authors: Wilken, Jason, Lamuta, Caterina Student Presenters/Authors: Kotak, Parth

2019 Summer Undergraduate Research Conference, *Design of a Scalable Manufacturing System for Twisted Spiral Artificial Muscles (TSAMs)*, Graduate College, University of Iowa Presenters/Authors: Gallegos, Jeremy, Wilkinson, Adam, Lamuta, Caterina

2019 Research Open House, *Mechanical Characterization of Carbon Fiber Artificial Muscles*, College of Engineering, University of Iowa Presenters/Authors: Wilken, Jason, Lamuta, Caterina Student Presenters/Authors: Kotak, Parth

2018 Gordon Research Conference, *Artificial Chromatophores from Coiled Carbon Fibers and Mechanoresponsive Polymers*, Ventura, California, United States Presenters/Authors: Lamuta, Caterina, Kim, Tae Ann, Tawfick, Sameh, Sottos, Nancy

***Workshops***

2019 MIMEMS 2019, *Modeling of twisted and coiled artificial muscles (TCAMs)*, AIAS, Pizzo Calabro, Italy Presenters/Authors: Cichella, Venanzio, Maletta, Carmine, Pagnotta, Leonardo, Lamuta, Caterina Student Presenters/Authors: Giovinco, Valentina

2017 Geopolymers workshop – IX Edition, Geopolymer composites, *Direct piezoelectric effect in geopolymeric mortars*, Napoli, Italy Presenters/Authors: Lamuta, Caterina, Candamano, Sebastiano, Crea, Fortunato, Pagnotta, Leonardo

### Areas of Research Interest

Artificial camouflage
Artificial muscles
Bio-inspired materials systems
Depth-sensing indentation
Human assistive robotics
Multifunctional materials
Self-morphing structures
Smart materials

## SERVICE

### Reviewer

2023 - Present **Journal: Advanced Functional Materials, Reviewer**
2023 - Present **Journal: Advanced Materials Technologies, Reviewer**
2020 - Present **Journal: Science AAAS, Reviewer**
2021 - Present **Journal: Nature Communication, Reviewer**
2022 - Present Journal: Smart Materials and structures
2020 - Present Journal: Sensors and Actuators B: Chemical
2021 – Present Conference: ASME SPIE Conference
2020 - Present Journal: Applied Science
2020 - Present Conference: ASME SMASIS
2021 - Present **NSF** DARE Program, **ad hoc reviewer**
2022 - Present **AFOSR** Young Investigator Program (YIP), **invited reviewer**
2020 - Present Journal: AIAA
2019 - Present Journal: Journal of Physics and Chemistry of Solids
2019 - Present Journal: J. Compos. Sci.
2019 - Present Journal: Polymers for advanced Technologies
2019 - Present Journal: Nanoscience and Nanotechnology Letters
2018 - Present Journal: Actuators
2018 - Present Journal: Coatings
2018 - Present Journal: Applied Sciences
2018 - Present Journal: Materials and Design

## Conference Organization

| | |
|---|---|
| 2018 - 2019 | **Symposium Organizer and Chair** for the symposium 7.7 "Mechanics of multifunctional materials for sensing, actuation, adaptation and remodeling", Society of Engineering Science **SES 2019** Conference |
| 2020- Present | **Symposium Organizer and Chair for the symposium 6 "Bioinspired Smart Materials and Systems", ASME SMASIS 2021, 2022, and 2023Conference** |

## UIowa Service

| | |
|---|---|
| 2021 - Present | Undergraduate Research Committee Member |
| 2018 - Present | Formula SAE, Advisor |
| 2022 | BME Design Faculty panel member |
| 2022 | ME Senior Design Faculty panel member |
| November 2018 - Present | Speaker for the faculty panel for the Explore Engineering@Iowa (EDay) program |
| 2019 - 2020 | Mechanical Engineering Department Secretary |
| 2023 | Faculty search committee |
| 2022 | Faculty search committee |
| 2019 - 2020 | Faculty search committee |
| 2019 | Lecturer search committee |
| November 2020 | Peer Observation of Teaching Observer for Austin Krebill |
| January 2020 | Peer Observation of Teaching Observer for Justin Garvin |
| 2020 - Present | CoE Top Scholar Visit Day engineering faculty panel discussion, Guest Speaker |
| December 2021 | Invited Speaker at CoE "Explore Engineering Program" for high school students |
| October 2021 | Gave a research presentation to the ME Advisory Board, Fall 2021. |

## Community Service

| | |
|---|---|
| 2020 - Present | The American Society of Mechanical Engineers, **ASME SMASIS Division Member** |
| 2020 - Present | The American Society of Mechanical Engineers, **Technical Committee Member** for **ASME SMASIS "Bioinspired Smart Materials and Systems"** |
| 2019 - Present | ASME SMASIS Student and Young Professional Symposium, Student Professional Development Panel, Expert Panel |
| November 2021 | Invited Speaker at "First Round Dowtown" Interview Series, Iowa City. |

## Media Coverage

- Iowa Magazine (January 9, 2023) https://magazine.foriowa.org/story.php?ed=true&storyid=2283
- Daily Iowan (Ottobre 18, 2022) https://dailyiowan.com/2022/10/18/university-of-iowa-assistant-professor-creates-cephalopod-inspired-softopus-robot-with-office-of-naval-research-funds/
- College of Engineering, University of Iowa (September 27, 2022) https://engineering.uiowa.edu/news-all/2022/09/ui-engineering-professor-receives-2023-young-investigator-program-award-naval
- Office Of Naval Research, (September 22, 2022) https://www.nre.navy.mil/2023-young-investigators
- College of Engineering, University of Iowa (March 22, 2022) https://engineering.uiowa.edu/news-all/2022/03/engineering-faculty-postdoc-and-students-selected-discovery-and-innovation-awards

- University of Iowa (March 17, 2022) https://research.uiowa.edu/impact/news/ui-announces-recipients-discovery-and-innovation-awards
- College of Engineering, University of Iowa (September 26, 2022) https://engineering.uiowa.edu/news-all/2022/09/ui-engineering-professor-receives-2023-young-investigator-program-award-naval
- College of Engineering, University of Iowa (March 22, 2022) https://engineering.uiowa.edu/news-all/2022/03/engineering-faculty-postdoc-and-students-selected-discovery-and-innovation-awards
- University of Iowa (March 17, 2022) https://research.uiowa.edu/impact/news/ui-announces-recipients-discovery-and-innovation-awards
- Daily Iowan (September 28, 2021). https://dailyiowan.com/2021/09/28/university-of-iowa-researchers-make-artificial-muscles-with-grant/
- College of Engineering, University of Iowa (September 14, 2021). https://engineering.uiowa.edu/news-all/2021/09/ui-mechanical-engineering-professor-receives-darpa-young-investigator-award
- College of Engineering University of Iowa. (April 17, 2020). https://engineering.uiowa.edu/news-all/2020/04/ui-laboratories-collaborate-low-cost-lightweight-orthotic-robotic-rehabilitation
- Il Germe (April 28, 2020). https://www.ilgerme.it/venanzio-cichella-e-caterina-lamuta-sono-raianesi-i-due-inventori-del-dispositivo-per-le-disabilita/
- Innovation Toronto. (September 25, 2019). https://www.innovationtoronto.com/2019/09/a-smart-skin-inspired-by-the-cephalopod-which-can-be-used-in-3d-displays-and-as-interfaces-for-the-visually-impaired/
- Innovations report. (September 24, 2019). https://www.innovations-report.com/html/report/materials-science/researchers-recreate-living-3d-displays.html
- Eurekalert! (September 23, 2019). https://www.eurekalert.org/pub_releases/2019-09/uoi-rrl092319.php
- Nano Werk. (September 23, 2019). https://www.nanowerk.com/nanotechnology-news2/newsid=53654.php
- Science Daily. (September 23, 2019). https://www.sciencedaily.com/releases/2019/09/190923140821.htm?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+sciencedaily%2Fmatter_energy%2Fvirtual_reality+%28Virtual+Environment+News+--+ScienceDaily%29
- SciTechDaily. (September 23, 2019). https://scitechdaily.com/researchers-recreate-living-3d-displays-lightweight-smart-skins-with-artificial-muscles-video/
- TechXplore. (September 23, 2019). https://techxplore.com/news/2019-09-recreate-d.html
- College of Engineering University of Iowa. (September 19, 2019). https://www.engineering.uiowa.edu/news/researchers-recreate-living-3d-displays
- Eccellenze calabresi. (September 13, 2018). https://www.eccellenzecalabresi.it/muscoli-artificiali-una-ricercatrice-calabrese-oltre-i-limiti-della-scienza/
- Tecnologia de Materiais (Brazil). (May 17, 2018). http://tecnologiademateriais.com.br/portaltm/os-incriveis-musculos-artificiais-de-fibra-de-carbono/
- Wonderful Engineering. (April 2018). https://wonderfulengineering.com/coiled-carbon-fiber-muscle-strongest-yet-can-lift-12000-times-weight/
- Digital Trends. (April 20, 2018). https://www.digitaltrends.com/cool-tech/artificial-muscle-12600x-weight/
- Smart Huanqiu (Chinese). (April 19, 2018). http://smart.huanqiu.com/roll/2018-04/11885709.html
- Yahoo. (April 19, 2018). https://www.yahoo.com/news/artificial-muscle-lift-12-600-161023850.html
- N1plus (Russian). (April 18, 2018). https://nplus1.ru/news/2018/04/18/muscles
- New Atlas. (April 18, 2018). https://newatlas.com/carbon-fiber-artificial-muscle/54256/
- Tech Times. (April 18, 2018). https://www.techtimes.com/articles/225563/20180418/scientists-create-carbon-fiber-artificial-muscles-that-can-lift-12-600-times-their-own-weight.htm
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- Verdict, Medical Devices. (April 18, 2018). https://www.medicaldevice-network.com/news/artificial-muscles-can-lift-12600-times-weight/
- Eurekalert! (April 17, 2018). https://www.eurekalert.org/pub_releases/2018-04/uoic-scf041718.php
- Reddit. (April 16, 2018). https://www.reddit.com/r/science/comments/8d550k/strong_carbon_fiber_artificial_muscles_can_lift/
- You Tube. (April 16, 2018). https://www.youtube.com/watch?v=k7vvBi__LwM
- MechSE UIUC. (April 13, 2018). https://mechanical.illinois.edu/news/strong-carbon-fiber-artificial-muscles-can-lift-12600-times-their-own-weight

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- Daily Iowan. (September 26, 2019). https://dailyiowan.com/2019/09/26/ui-researchers-develops-smart-skin-for-the-u-s-navy/
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