

Kacie Kaile

PhD Candidate
Optical Imaging Laboratory
Dept of Biomedical Engineering
Florida International University
Miami, FL

kkail001@fiu.edu
<http://web.eng.fiu.edu/oil>

RESEARCH INTERESTS:

Development and implementation of low cost optical imaging technologies for wound imaging, analysis, and monitored healing. Specifically, using remote mobile platforms catering to self or community based care.

PATENTS:

1. “Multi-modal smartphone imaging/therapy based technology,” Inventors: Anuradha Godavarty, Kacie **Kaile**. Non-Provisional Patent filed at FIU (Jan **2022**).
2. “Cell Phone Based Tissue Oxygenation Measuring Device” Inventors: Anuradha Godavarty, **Kacie Kaile**. Invention disclosure filed at FIU (May 11, **2018**). US Non-Provisional Patent Filing (March **2019**), published: US 16/406,712.

INVITED TALKS:

Podcast for American Cancer Society: “Incubating women-led technology start-ups” March **2021**

PUBLICATIONS:

JOURNALS: 4 peer reviewed manuscripts, 3 first author

1. **Kaile, Kacie**, Christian Fernandez, and Anuradha Godavarty. "Development of a Smartphone-Based Optical Device to Measure Hemoglobin Concentration Changes for Remote Monitoring of Wounds." **2021** *Biosensors* 11, no. 6: 165. <https://doi.org/10.3390/bios11060165>.
2. **Kacie Kaile**, Mahadevan J, Leiva K, Khandavilli D, Narayanan S, Muthukrishnan V, Wu W, Mohan V, Godavarty A. Tissue Oxygenation Measurements to Aid Scalpel Debridement Removal in Patients with Diabetes. *J Diabetes Sci Technol*. **2021** Feb 20:1932296821992050. doi: 10.1177/1932296821992050.
3. **Kacie Kaile**, Anuradha Godavarty. “Development and validation of a smartphone based near-infrared optical imaging device to measure physiological changes in-vivo,” *Micromachines*, March 9 **2019**.

4. Leiva, Kevin, Mahadevan, Jagadeesh, **Kaile, Kacie**, Schutzman, Richard. “Breath-hold paradigm to assess variations in oxygen flow in diabetic foot ulcers using a non-contact near-infrared optical scanner,” Invited paper, *Advances in Wound Care*. July 25 **2019**.

CONFERENCE PRECEEDINGS: 12 external conferences, 8 first author

5. **Kacie Kaile**, Alexander Trinidad, Venkatabashyam Ramnarayan, Coimbatore Subramanian Shanthi Rani, Ranjit Mohan Anjana, Vishwanathan Mohan, Ganesan Uma Sankari, Kumaradas Gini Venisha, Anuradha Godavarty, Smartphone oxygenation measuring device to differentiate low-risk stable and chronic diabetic foot ulcers from high-risk complicated ulcers: a pilot study in India. SPIE: Optics and Biophotonics in Low-Resource Settings IX, PW23B SPIE BIOS. Jan 28- Feb 2, paper number: BO302-21 (Submitted).

Kacie Kaile, Alexander Trinidad, Kevin Leiva, Aliette Epsinosa, Robert Kirsner, Anuradha Godavarty. “A stand-alone smartphone based optical device to measure tissue oxygenation in diabetic foot ulcers.” Biophotonics Congress: Biomedical Optics, Fort Lauderdale, Florida, USA, 24 – 27 April **2022**.

6. **Kacie Kaile**, Masrur Soban, Ananda Mondal, Anuradha Godavarty. Machine learning algorithms to classify Fitzpatrick skin types during tissue oxygenation mapping. Biophotonics Congress: Biomedical Optics, Fort Lauderdale, Florida, USA, 24 – 27 April **2022**.

8. **Kacie Kaile**, Kevin Leiva, Christian Fernandez, Wensong Wu, Maximillian Weigelt, Aliette Espinosa, Robert Kirsner, Anuradha Godavarty. “Tissue Oxygenation Measurements in Diabetic Foot Ulcers using a Smartphone Based NIR Imaging Device.” SPIE Annual Meeting, March 6 - 11 **2021**.

9. **Kacie Kaile**, Jagadeesh Mahadevan, Kevin Leiva, Dinesh Khandavilli, Sivakumar Narayanan, Varalakshmi Muthukrishnan, Mohan Viswanathan, Wensong Wu, Anuradha Godavarty. “Effectiveness of Scalpel Debridement in Diabetics using NIR imaging Technology for Ulcer Prevention.” SPIE Annual Meeting, March 6 - 11 **2021**.

10. **Kacie Kaile**, Anuradha Godavarty. “Noise Removal Techniques in Smartphone Based NIR Imaging of Tissue Oxygenation Changes.” SPIE Annual Meeting, March 6 - 11 **2021**.

13. **K. Kaile**, C. Fernandez, A. Godavarty, “Tissue oxygenation measurements using a noncontact, smartphone-based near-infrared optical device,” OSA Biophotonics Congress: Biomedical Optics, OSA Technical Digest, paper TM3B.2 (**2020**)

14. V. Roldan, K. Leiva, **K. Kaile**, M. Weigelt, A. Espinoza, R. Kirsner, A. Godavarty, “Spatial-temporal maps of oxygen saturation in foot ulcers using a near-infrared optical scanner,” BMES Virtual Annual Meeting, Oct 14-17, **2020**.

15. **Kacie Kaile**, Kevin Leiva, Jagadeesh Mahadevan, V Ramnarayan, Miguel Alonso, Vishwanatha Mohan, Anuradha Godavarty, “Low-cost smartphone based imaging device to detect subsurface tissue oxygenation of wounds,” Proc. of SPIE 10869, Optics and Updated 30 Aug 2020 11/70 Biophotonics in Low-Resource Settings V; 1086912 (**2019**) <https://doi.org/10.1117/12.2510425> (2019).

16. Kevin Leiva, Jagadeesh Mahadevan, Priscilla Lozano, **Kacie Kaile**, Richard Schutzman, Edwin Robledo, Dinesh Khandavilli, Sivakumar Narayanan, Varalakshmi Muthukrishnan, Mohan Viswanathan, Wensong Wu, Anuradha Godavarty, “Oxygenation based perfusion assessment of diabetic foot ulcers using a breath-hold paradigm,” Proc of SPIE 10873, Optical Biopsy XVII: Toward Real-Time Spectroscopic Imaging and Diagnosis; 1087304 (**2019**) <https://doi.org/10.1117/12.2509917>.

17. Anuradha Godavarty, **Kacie Kaile**, Kevin Leiva, Jagadeesh Mahadevan, Dinesh Khandavilli, Sivakumar Narayanan, Varalakshmi Muthukrishnan, and Mohan Viswanathan, “Tissue oxygenation to assess healing diabetic foot ulcers and effectiveness of scalpel debridement,” BMES 50th Annual Meeting, Oct17-20 **2018**, Atlanta, GA.

18. Leiva K, Mahadevan J, **Kaile K**, Schutzman R, Robledo E, Khandavilli D, Narayanan S, Muthukrishnan V, Viswanathan M, Godavarty A, “Breath hold paradigm assesses regions of reduced oxygenation in diabetic foot ulcers,” OSA Biophotonics Congress: Biomedical Optics Congress **2018** (Microscopy/Translational/ Brain/OTS) OSA Technical Digest (Optical Society of America, **2018**), paper JTh3A.11; <https://doi.org/10.1364/TRANSLATIONAL.2018.JTh3A.11>

PRESENTATIONS- *Presenter

NATIONAL LEVEL PRESENTATIONS: 7 first author oral talks & 3 first author poster presentations, 1 co-authored oral talk presentation & 4 co-authored poster presentations

1. **Kacie Kaile***, Alexander Trinidad, Kevin Leiva, Alette Epsinosa, Robert Kirsner, Anuradha Godavarty. “A stand-alone smartphone based optical device to measure tissue oxygenation in diabetic foot ulcers.” Biophotonics Congress (OSA): Biomedical Optics, Fort Lauderdale, Florida, USA, 24 – 27 April **2022**, (Oral talk)

2. **Kacie Kaile***, Masrur Soban*, Ananda Mondal, Anuradha Godavarty. Machine learning algorithms to classify Fitzpatrick skin types during tissue oxygenation mapping. Biophotonics Congress: Biomedical Optics, Fort Lauderdale, Florida, USA, 24 – 27 April **2022**, (Poster)

3. **Kacie Kaile***, Kevin Leiva, Christian Fernandez, Wensong Wu, Maximillian Weigelt, Alette Espinosa, Robert Kirsner, Anuradha Godavarty. "Tissue Oxygenation Measurements in Diabetic Foot Ulcers using a Smartphone Based NIR Imaging Device." SPIE Annual Meeting, March 6 - 11 **2021**. (Oral talk)
4. **Kacie Kaile***, Jagadeesh Mahadevan, Kevin Leiva, Dinesh Khandavilli, Sivakumar Narayanan, Varalakshmi Muthukrishnan, Mohan Viswanathan, Wensong Wu, Anuradha Godavarty. "Effectiveness of Scalpel Debridement in Diabetics using NIR imaging Technology for Ulcer Prevention." SPIE Annual Meeting, March 6 - 11 **2021** (Oral talk)
5. **Kacie Kaile***, Anuradha Godavarty. "Noise Removal Techniques in Smartphone Based NIR Imaging of Tissue Oxygenation Changes." SPIE Annual Meeting, March 6 - 11 **2021** (Poster)
6. **Kacie Kaile***, Christian Fernandez, Anuradha Godavarty. "A Smartphone-based oxygenation measuring device to assess healing status of foot ulcers." Innovations in Wound Healing Conference: Dec 11-13, **2020**. (Poster)
7. Kevin Leiva*, **Kacie Kaile**, Valentina Roldan, Maximillian Weigelt, Alette Espinoza, Robert Kirsner, Wensong Wu, Anuradha Godavarty. "Spatio-temporal mapping of oxygenation changes in foot ulcers." Innovations in Wound Healing Conference: Dec 11-13, **2020**. (Poster)
8. **Kacie Kaile***, Christian Fernandez, Anuradha Godavarty. "Smartphone Based Imaging Device for Physiological Tissue Oxygenation Measurements." Biomedical Engineering Society **2020** virtual meeting, October 14 – 17 (Oral talk)
9. Kevin Leiva*, **Kacie Kaile**, Valentina Roldan, Maximillian Weigelt, Alette **Espinoza**, Robert Kirsner, Wensong Wu, Anuradha Godavarty. "In-Vivo Validation Study of a Low-Cost, Hand-Held Near Infrared Optical Scanner for Wound Imaging." Biomedical Engineering Society (virtual meeting), October 14 – 17 **2020** (Oral talk)
10. **K. Kaile***, C. Fernandez, A. Godavarty, "Tissue oxygenation measurements using a noncontact, smartphone-based near-infrared optical device," OSA Biophotonics Congress: Biomedical Optics, OSA Technical Digest, paper TM3B.2 (**2020**) (Oral talk)
11. V. Roldan*, K. Leiva, **K. Kaile**, M. Weigelt, A. Espinoza, R. Kirsner, A. Godavarty, "Spatial-temporal maps of oxygen saturation in foot ulcers using a near-infrared optical scanner," BMES Virtual Annual Meeting, Oct 14-17, **2020**. (Poster)

12. **Kacie Kaile***, Kevin Leiva, Jagadeesh Mahadevan, V Ramnarayan, Miguel Alonso, Vishwanatha Mohan, Anuradha Godavarty, “Low-cost smartphone based imaging device to detect subsurface tissue oxygenation of wounds,” Proc. of SPIE 10869, Optics and Updated 30 Aug 2020 11/70 Biophotonics in Low-Resource Settings V; 1086912 (2019) <https://doi.org/10.1117/12.2510425> (Oral talk)

13. Anuradha Godavarty, Kevin Leiva*, **Kacie Kaile***, Jagadeesh Mahadevan, Dinesh Khandavilli, Sivakumar Narayanan, Varalakshmi Muthukrishnan, and Mohan Viswanathan, “Tissue oxygenation to assess healing diabetic foot ulcers and effectiveness of scalpel debridement,” BMES 50th Annual Meeting, Oct17-20 2018, Atlanta, GA (Oral talk)

14. Jorge Barter*, Edwin Robledo, **Kacie Kaile**, Jagadeesh Mahadevan, Sivakumar Narayanan, Varalakshmi Muthukrishnan, Mohan Viswanathan, Anuradha Godavarty, “Assessment of Wound Healing in Diabetic Foot Ulcers Through the Use of Subclinical Tissue Oxygenation Measurements Obtained with Near Infrared Spectroscopy,” BMES 50th Annual Meeting, Oct17-20 2018, Atlanta, GA (Poster)

15. Maria Saavedra*, Kevin Leiva, **Kacie Kaile**, Francisco Perez-Clavijo, Anuradha Godavarty, “Tissue Oxygenation Changes in a Large Diabetic Foot Ulcer: Longitudinal Case Study,” BMES 50th Annual Meeting, Oct17-20 2018, Atlanta, GA (Poster)

INTERNAL PRESENTATIONS (within university or the state): 8 first author poster presentations, 5 co-authored oral talk presentations & 6 co-authored poster presentations

1. **Kacie Kaile***, Alexander Trinidad, Kevin Leiva, Aliette Espinosa, Robert Kirsner, Anuradha Godavarty. A smartphone based optical device with integrated app measures tissue oxygenation in diabetic foot ulcers. Graduate Research Day, FIU, March 9, 2022. (Poster)

2. Alexander Trinidad*, **Kacie Kaile**, Anuradha Godavarty. “A stand-alone smartphone based optical device to measure tissue oxygenation in Diabetic Foot Ulcers.” Florida Undergraduate Research Conference 2022 (Poster)

3. **Kacie Kaile***, Christian Fernandez, Anuradha Godavarty. “A non-contact Smartphone-based near infrared scanner to measure tissue oxygenation.” FIU Graduate Research Day, Feb 29 2021, Miami, FL (Poster)

4. **Kacie Kaile***, Kevin Leiva, Christian Fernandez, Maximillian Weigelt, Aliette Espinosa, Robert Kirsner, Anuradha Godavarty. Assessment of Tissue Oxygenation in Diabetic Foot Ulcers and Noise Removal Techniques with Smartphone Based Imaging. Graduate Student Appreciation Week (GSAW) 2021 (Poster)

5. Alex Trinidad*, **Kacie Kaile**, Anuradha Godavarty. “Smartphone app designed for automated oxygenation data and wound area estimation” 12th Annual Undergraduate Research Day. Florida International University, Sept 2021. (Poster)

6. A. Trinidad*, **K. Kaile**, A. Godavarty, “Smartphone app designed for automated oxygenation measurements,” Life Science South Florida (LSSF) STEM Undergraduate Research Symposium, Apr 10, **2021** (Oral talk)
7. Mariel Chavez*, **Kacie Kaile**, Anuradha Godavarty. “Standardized approach to assess performance of Non-contact Thermal measurements.” 11th Annual Undergraduate Research Day. Florida International University, Sept **2020**. (1st place poster)
8. V. Roldan, K. Leiva, **K. Kaile**, M. Weigelt, A. Espinosa, R. Kirsner, A. Godavarty, “Data analysis of images obtained with two near-infrared devices for static and dynamic imaging with a breath-hold paradigm in patients with diabetic foot ulcers,”” FIU 11th BME Undergraduate Research Day, Sept 25, **2020** (Oral)
9. Pablo Rodriguez*, **Kacie Kaile**, Anuradha Godavarty. “Development of a Thermal Imaging System to Obtain 2D Heat Maps without Contact.” 11th Annual Undergraduate Research Day. Florida International University, Sept **2020**. (Oral)
10. Alex Trinidad*, **Kacie Kaile**, Anuradha Godavarty. “Smartphone App Designed for Automated Tissue Oxygenation Measurements.” 11th Annual Undergraduate Research Day. Florida International University, Sept **2020**. (Oral)
11. **Kacie Kaile***, Christian Fernandez, Anuradha Godavarty. “A non-contact Smartphone-based near infrared scanner to measure tissue oxygenation.” FIU Graduate Research Day, Feb 29 **2020**, Miami, FL (Poster)
12. B. Meyer*, K. Leiva, **K. Kaile**, M. Saavedra, F. Perez-Clavijo, A. Godavarty, “Effect of re-vascularization on oxygenation flow in a chronic diabetic foot ulcer,” FIU-BME 10th Annual Undergraduate Research Day, Oct 4th **2019** (Poster)
13. **Kacie Kaile***, Anuradha Godavarty, “Development and validation of smartphone based oxygenation tool for in-vivo imaging,” BME Graduate Research Day at FIU, Mar **2019** & Graduate Student Appreciation Week (GSAW) – FIU, Apr **2019** (Poster)
14. Kevin Leiva*, Priscilla Lozano, Maria Saavedra, **Kacie Kaile**, Francisco Perez-Clavijo, Anuradha Godavarty, “Assessment of localized oxygenated flow changes induced by breath-holding using NIROS,” BME Graduate Research Day at FIU, Mar **2019** & Graduate Student Appreciation Week (GSAW) – FIU, Apr **2019** (Poster)
15. Maierhaba Sailaijiang*, **Kacie Kaile**, Anuradha Godavarty. “Validation of a Near-Infrared Optical Scanner to Measure Changes in Oxygenation: Phantom Studies,” FIU Graduate Research Day, March 1 **2018**, Miami, FL (Poster)

16. Kevin Leiva*, Jagadeesh Mahadevan, **Kacie Kaile**, Richard Schutzman, Edwin Robledo, Dinesh Khandavilli, Sivakumar Narayanan, Varalakshmi Muthukrishnan, Mohan Viswanathan, Anuradha Godavarty, “Assessing regions of reduced oxygenation in diabetic foot ulcers using near-infrared optical imaging” BME Graduate Research Day at FIU, Jan **2018** (Best Poster Award – 2nd place)

17. **Kacie Kaile***, Jagadeesh Mahadevan, Kevin Leiva, Edwin Robledo, Richard Schutzman, Cristianne Fernandez, Dinesh Khandavilli, Sivakumar Narayanan, Varalakshmi Muthukrishnan, Mohan Viswanathan, Anuradha Godavarty, “Tissue Oxygenation Measurements Aid Callus Removal in Patients with Diabetes” BME Graduate Research Day at FIU, Jan **2018** (Poster)

18. **Kacie Kaile***, “Convection Enhanced Delivery Brain Phantom Gel,” Materials Advantage at FIU, March **2018** (Best Poster - viewer’s choice)

EDUCATION:

B.S. in Biomedical Engineering Florida International University	Summer 2017
M.S. in Biomedical Engineering Florida International University	Fall 2017
PhD in Biomedical Engineering Florida International University Advisor: Dr. Anuradha Godavarty	Spring 2019 onwards

EXPERIENCE:

Graduate Assistant (towards ABET/SACS accreditation for BS) Department of Biomedical Engineering, FIU. Miami, FL.	Spring 2021 – current Fall 2019 – Spring 2020
Research Assistant National Science Foundation	Summer 2020 – Fall 2020
Graduate Teaching Assistant (BME4503C Medical Instrumentation – Online course) Department of Biomedical Engineering, FIU. Miami, FL.	Spring 2019
Graduate Teaching Assistant (BME4051 Biomedical Engineering Laboratory) Department of Biomedical Engineering, FIU. Miami, FL.	Fall 2018
Learning Assistant (BME4531 Medical Imaging) Department of Biomedical Engineering, FIU. Miami, FL.	Fall 2017 -Spring 2018
Undergrad Research Assistant Optical Imaging Laboratory, Dept of Biomedical Engineering	Spring 2016-Fall 2017

PROFESSIONAL DEVELOPMENT:

1. Using Remote Patient Monitoring to Enhance Chronic Disease Management (webinar), March **2022**.
2. Entrepreneurial Lead (EL) for grant funded by National Science Foundation: April **2021**
3. Diabetic Lower Extremity Symposium **2021** (Nov 17-19)
4. Venture lab: female founder speaker series **2021**: August 26th, September 21st, October 21st, November 18th.
5. The Future of Healthcare - Connected Health Experiences and Wearables (webinar). September **2021**.
6. FIME- medical trade fair and exhibition. September **2021**
7. Regional Innovation Corporation (I-corp) Seminar. Georgia Tech: VentureLab. September **2020**.
8. Female Founders Start-Up Program. Georgia Tech: VentureLab. November **2020**.

REVIEWER:

1. *Institute of Electrical and Electronics Engineers (IEEE)*- October **2020**.
2. *Journal of Biomedical Optics (JBO)* - September **2020**.
3. *Journal of Applied Optics. (OSA)* - December **2019**.
4. *Institute of Electrical and Electronics Engineers (IEEE)*- April **2019**.

MENTORING: Mentored/mentoring 16 undergraduate students since 2018 onwards

1. Optical Tissue Phantom Studies:
 Jose Perez-Calderin (2022 – current)
 Noble Amaldi (2022-current)
 Bridgette Meyer (2019)
 Priscilla Lozano (2018-2019)
 Manuel Vazquez (2018)
 Maierhaba Sailaijiang (2018)
2. Optical Imaging - Coding/Software Development:
 Isabella (2022)
 Rayyan Naji (2020)
 Juan Murillo (2019-2020)
 Jorge Barter (2018-2019)
3. Smartphone App Development for imaging:
 Alejandro Vecchio (2022 – current)
 Alex Trinidad (2020-2022)
 Azhar Ali (2022)
 Christian Fernandez (2018-2019)
4. Thermal imaging studies:
 Mariel Chavez (2020-2022)
 Pablo Rodriguez (2020)