

JULIANA N. ANGELL (SABA)

4409 Cedar Valley Dr.
Plano, Texas 75024

PHONE: (512) 300-5154

EMAIL: juliana.saba@utdallas.edu; sabajuli@gmail.com

WEBSITE: <https://crss.utdallas.edu/CILab/index.html>

Education

2011–2015 Bachelors of Science, Biomedical Engineering
University of Texas at Dallas

2016–2019 Masters of Science, Biomedical Engineering
University of Texas at Dallas

2016–2021 Doctor of Philosophy, Electrical Engineering
University of Texas at Dallas

Doctoral Dissertation: “Leveraging Landmark Acoustic Features in Cochlear Implant Signal Processing”

Advisor: John H.L. Hansen, Ph.D.

Professional Experience

2013 – 2016 **Undergraduate Researcher**
Biomaterials for Osseointegration Novel Engineering Lab (BONE Lab)
University of Texas at Dallas, Department of Bioengineering

2017 **Quality Engineer Intern**
Baylor Scott and White University Medical Center

2016 – 2021 **Research Assistant**
Cochlear Implant Processing Laboratory (CILab) – Center for Robust
Speech Systems (CRSS)
University of Texas at Dallas, Department of Electrical Engineering

2021 – Present **Research Associate/Research Scientist**
Cochlear Implant Processing Laboratory (CILab) – Center for Robust
Speech Systems (CRSS)
University of Texas at Dallas, Department of Electrical Engineering

Academic Projects

Leveraging the perception and production of the Lombard Effect
for cochlear implant users (2018 – Present)

- **Algorithm Development** – Designed four variations of a Lombard perturbation routine as a pre-processing algorithm for cochlear implant users (MATLAB, PRAAT)
- **Signal Processing** – Integrated physiological components from neural behavior and Lombard perturbation into an ‘n’-of-‘m’ signal processing strategy for cochlear implants (MATLAB)
- **Human Subject Testing** – Designed and conducted three perceptual experiments with normal hearing/cochlear implant listeners; established new and maintained prior Institutional Review Board (IRB) study protocols (including COVID-19 provisions), distributed participation marketing material, developed COVID-19 compliant experimental protocols, and facilitated subject recruitment
- **Data Analysis/Data Visualization** – Developed custom metrics, electrodiagram-based visualization tools, and implant-specific channel criterion statistics to determine effectiveness of signal processing routines (SPSS, GraphPad, MATLAB)
- **Machine Learning** – Developed simple convolutional neural network to mimic cochlear implant classification of noise-induced speech (Lombard Effect) and noise exposure type (Keras, Python)

Acoustic feature-based channel selection criteria within ‘n’-of-‘m’ sound
coding strategies (2017 – 2019)

- **Algorithm Development** – Created an offline and real-time signal processing strategy embedded within ACE processing framework (Cochlear Corp.) using a disruptive channel selection to provide important voicing cues in quiet and noisy conditions (MATLAB)

- **Signal Processing** – Developed offline formant estimation algorithm for sound processing using a hybrid technique of traditional and speech production approaches; developed custom sigmoid and logarithmic compression strategies to map spectral densities to electric stimulation patterns (MATLAB, PRAAT)
- **Speech Analysis** – Tracked formant plots for ideal/ground-truth estimation, developed consonant-specific energy analysis pre- and post-compression stages within cochlear implant signal processing routines, identified channel behavior of enhanced pre-processing strategies (MATLAB, Wavesurfer)
- **Human Subject Testing** – Designed and conducted four perceptual experiments with cochlear implant users, maintained compliance through Institutional Review Board (IRB)
- **Statistics** – Normative statistics, post-hoc analyses, and repeated measures analysis of variance for subject-specific data, accepted publications in peer-reviewed journals (SPSS, GraphPad)
- **Research Platform** – Maintained partial responsibilities to update software suite for CI signal processing routines for CCI-MOBILE, developed documentation and support content for research community (HTML)

Pre-submission and DeNovo application for E-Vac therapy system

(Spring 2018)

- **Quality Management System** – Supported the development of QMS for document control, labeling, design controls, device packaging, and device identification, ISO 13485
- **DeNovo Application** – Developed DeNovo and 513g pre-submission applications to seek FDA approval of the E-Vac therapy system for a new intended use
- **Test Plan** – Developed testing plan to ensure safety and effectiveness of E-Vac systems using ISO 17025, ISO 11737, ISO 10993, ISO 11607
- **Commercialization** – Outlined a business model and timeline to commercialization plan to support clinical trials of the device (US)
- **Regulatory (Brazil)** – Developed regulatory process for Brazilian market (RDC 36/2016, RDC 185/2001)

Rheological, cytotoxic, and electro-chemical characterization of dental cement in contact with titanium

(2015 – 2016)

- **Cell Culture** – Maintained MC3T3-E1 and HCG-1 cell lines, trained lab members in technique, performed longitudinal cytotoxicity studies, cell proliferation and differentiation analysis, and cell quantification and visualization practices, ISO 10993-5
- **Rheological Evaluation** – Designed a bench-top experiment to measure the shear forces associated with placement of crown onto abutments with different dental cement compositions (Discovery HR-3 Rheometer, TA instruments), ASTM D638–91, ISO 5833
- **Electrochemical Evaluation** – Investigated electrochemical resistance and corrosion of cement in contact with CpTi (Gamry Instruments), ASTM 2129-15
- **Machine Shop** – Cut, polished, and sonicated commercially pure titanium for cytotoxicity experiments and electrochemical experiments
- **Imaging** – Captured microscopic images of cell culture, cemented CpTi, and video recording of simulated cementation process in a mechanical setup (Keyence Corporation)

Design and development of a novel cement-retained dental abutment implant system

(2013 – 2016)

- **Medical Device Development** – Supported design of a cement quantity independent, cement-retained abutment system from preliminary renderings (SolidWords, Dassault Systems) to commercialization process (Patented, 2018)
- **Iterative Design** – Developed and designed preliminary, bench-top experiments for various abutment geometries to determine final product based on mechanical, structural, and rheological components
- **Mechanical Evaluation** – Supported experiments to quantify pull-out forces from novel cement retained abutment systems (Mechanical Testing System, MTS), ISO 5833
- **Modeling and Simulation** – Assisted in computational fluid dynamic modeling (STAR-CCM+, Siemens PLM), finite element analysis for cement-implant interaction, and preliminary stress/force evaluation (Abaqus/CAE, Dassault Systems)

Honors and Awards

- Student Travel Award – July 14, 2019 (Conference on Implantable Auditory Prosthesis, Lake Tahoe, CA)
- Student Travel Subsidies Award – October 16, 2018 (176th Meeting of the Acoustical Society of America, Victoria, Canada)
- Best Poster Award – March 9, 2018 (American Cochlear Implant Alliance)
- Student Travel Award – July 19, 2017 (Conference on Implantable Auditory Prosthesis, Lake Tahoe, CA)
- NIH Small Business Innovation Research (SBIR) Award (\$16.7K) to BONE Lab – June 9, 2016 (University of Texas at Dallas, Richardson, TX)
- Invitation to Engineers Week at the Perot Museum – February 25, 2016 (Perot Museum of Nature and Science, Dallas, TX)
- Undergraduate in Research Scholar Award – October 26, 2015 (University of Texas at Dallas, Richardson, TX)
- Hands-On Workshop in Education Invitation, 2015 (Acoustical Society of America, Salt Lake City, UT)

Professional Affiliations/Memberships

- Student Member, Society of Women Engineers (2019 – 2021)
- Student Member, American Cochlear Implant Alliance (2018 – 2019)
- Student Member, Acoustical Society of America (ASA) (2016 – 2021)
- Member, ASA Education and Communication Committee (2015 – 2016)
- Student Member, IEEE EMBS Dallas Chapter (2013 – 2015)

Publications

- **Saba, J.N.**, and Hansen, J.H.L. (2021). “The effects of Lombard perturbation on speech intelligibility in noise for normal hearing and cochlear implant listeners,” Submitted to: *Journal of the Acoustical Society of America* on September 13, 2021.
- Hansen, J.H.L., Lee, J., Ali, H., and **Saba, J.N.** (2020). “A speech perturbation strategy based on ‘Lombard Effect’ for enhanced intelligibility for cochlear implant listeners,” *Journal of the Acoustical Society of America*, 147, 1418–1428. doi:10.1121/10.0000690
- Hansen, J.H.L., Ali, H., **Saba, J.N.**, Charan, R.M.C., Mamun, N., Ghosh, R., Brueggeman, A. (2019) CCI-MOBILE: Design and evaluation of a cochlear implant and hearing aid research platform for speech scientists and engineers. *IEEE EMBS International Conference on Biomedical & Health Informatics (BHI)*, May 19-22, 2019, doi: 10.1109/BHI.2019.8834652
- **Saba, J.N.**, Ali, H., Hansen, J.H.L. (2018) Formant priority channel selection for an “n-of-m” sound processing strategy for cochlear implants. *Journal of the Acoustical Society of America*, 144: 3371–3380.
- Marvin, J.C., Gallegos, S.I., Parsaei, S., Rodrigues, D.C. (2018) In vitro evaluation of cell compatibility of dental cements used with titanium implant components. *Journal of Prosthodontics*, vol. 0: 1–8.
- **Saba, J.N.**, Rodriguez, L., Siddiqui, D.A., Shrikar, S., Rodrigues, D.C. (2017) Investigation of the Corrosive Effects of Dental Cement on Titanium. *Journal of Bio- and Tribo-Corrosion*. doi: 10.1007/s40735-017-0083-2
- Rodriguez, L., **Saba, J.N.**, Meyer, A., Chung, K., Wadhvani, C.P.K., Rodrigues, D.C. (2016) In vitro effects of dental cements on hard and soft tissues associated with dental implants. *Journal of Prosthetic Dentistry*, 118(1): 31–35.
- Rodriguez, L.C., **Saba, J.N.**, Meyer, C.A., Chung, K.H., Wadhvani, C.P.K., Rodrigues, D.C. (2016) A finite element analysis of novel vented dental abutment geometries for

cement-retained crown restorations. *Clinical and Experimental Dental Research*, vol. 2 (2): 136–145.

Conferences

- **Saba, J.N.**, and Hansen, J.H.L. (2021) “The effects of quality, loudness, and intelligibility using a Lombard perturbation routine for normal hearing and cochlear implant listeners,” in Proceedings of the Conference on Implantable Auditory Prostheses (CIAP-2021), Lake Tahoe, CA, pp. 213.
- Ghosh, R., **Saba, J.N.**, Brueggeman, A., Mamun, N., Shekhar, R.C., Ali, H., Hansen, J.H.L. “Research platform for real-time field testing of cochlear implants strategies and custom signal processing parameters,” 16th International Conference on Cochlear Implants and Other Implantable Technologies, March 18–21, 2020, Orlando, FL.
- **Saba, J.N.**, Ali, H., Hansen, J.H.L. (2019) “CCi-MOBILE: Individual channel boosting of consonant and vowel segments in n-of-m strategies for cochlear implants,” Conference on Implantable Auditory Prostheses (CIAP-2019), Lake Tahoe, CA, July 14-19, 2019, pp. 265.
- **Saba J.N.**, and Hansen, J.H.L. (2019) “CCi-MOBILE: Machine learning implications in cochlear implants: Identification of Lombard speech using CNN-based classification,” in Proceedings of the Conference on Implantable Auditory Prostheses (CIAP-2019), Lake Tahoe, CA, pp. 92.
- Ghosh, R., **Saba, J.N.**, Mamun, N., Shekhar, R.C., Brueggeman, A., Ali, H., Hansen, J. H.L. “CCi-MOBILE: Moving towards exploring advanced research paradigms for cochlear implant and hearing aid users,” Conference on Implantable Auditory Prostheses (CIAP-2019), Lake Tahoe, CA, July 14-19, 2019, pp. 263.
- **Saba, J.N.**, Brochtrup, C., Ali, H., Hansen, J.H.L. “Is implicit formant coding useful for speech perception with cochlear implants?” Proceedings of the 176th Meeting of the Acoustical Society of America, Victoria, British Columbia, November 7, 2018.
- Hansen, J.H.L., Ali, H., **Saba, J.N.** “Mobile research platform for hearing research,” 40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, July 17–21, 2018, Honolulu, Hawaii.
- **Saba, J.N.**, Ali, H., Hansen, J.H.L. “A formant-based approach for channel selection in ‘*n*-of-*m*’ sound coding strategies for cochlear implants,” Proceedings of CI2018 Conference on Emerging Issues in Cochlear Implantation, Washington DC, March 7–10, 2018.
- Ali, H., Ammula, S., **Saba, J.N.**, Hansen, J.H.L. “CCi-MOBILE platform for cochlear implant and hearing-aid research,” Proceedings of the 1st Int. Conference on Challenges in Hearing Assistive Technology (CHAT-17), Stockholm, Sweden, August 19, 2017.
- **Saba, J.N.**, Ali, H., Hansen, J.H.L. “Improving channel selection criteria in n-of-m strategies for cochlear implant sound coding strategies,” Conference on Implantable Auditory Prostheses (CIAP-2017), Lake Tahoe, CA, July 16-21, 2017, pp. 227.
- **Saba, J.N.**, Lee, J., Ali, H., Ta, S., Nguyen, T., Hansen, J.H.L. “Impulse suppression algorithm development of a compatible program for cochlear implant users,” Proceedings of the 171st meeting of the Acoustical Society of America, Salt Lake City, UT, May 27, 2016, pp. 2224.
- **Saba, J.N.**, Ali, H., Lee, J., Hansen, J.H.L., Ta, S., Nguyen, T., Chilson, C. “Development of an electro-mechanical model of the middle ear,” Proceedings of the 170th meeting of the Acoustical Society of America, Jacksonville, FL, November 3, 2015.
- **Saba, J.N.**, Lee, J., Ali, H., Ta, S., Nguyen, T., Chilson, C., Hansen, J.H.L. “Developing an educational electro-mechanical model of the middle ear and impulse noise reduction algorithm for cochlear implant users,” IEEE Signal Processing and Signal Processing Education Workshop (SP/SPE), Salt Lake City, UT, August 10, 2015, pp. 83–88.

- **Saba, J.N.**, Rodriguez, L.C., Agaryian, S., Rodrigues, D.C. "Computational fluid dynamic (CFD) modeling: how bone cement characteristics and procedural parameters impact extravasation during vertebroplasty," IEEE Dallas Medical Device Symposium, Richardson, TX, Nov. 7–8, 2014.

Workshops/Seminars

- "Hands-On With CCI-MOBILE: A Cochlear Implant and Hearing-Aid Research Platform," Association of Research in Otolaryngology, Orlando, FL, February 19, 2021.
- "CCI-MOBILE Research Platform for Cochlear Implants and Hearing Aids – Hands-On Workshop", Conference of Implantable Auditory Prosthesis, Lake Tahoe, CA, July 18, 2017.
- "CCI-MOBILE Technical Workshop for Signal Processing Engineers and Speech Scientists," Conference of Implantable Auditory Prosthesis, Lake Tahoe, CA, July 17, 2019.

Patents

- Rodrigues, DC. Rodriguez, LC. Saba, JN. Wadhvani, C. (2018) SYSTEMS AND METHODS FOR DENTAL ABUTMENTS WITH CEMENT-RETAINED CROWNS, US Patent Serial Number 10,368,965.