

Heather L. Borgard

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Education

- 2023 PhD in Biomedical Engineering (*No Degree*), University of California, Davis
- 2017-2020 MSc in Biomedical Engineering, University of British Columbia, Vancouver, Canada
- Thesis: *Predicting Occlusal Force and Area through a Simulation of Mastication and Controlled Study*
- 2011-2015 BS in Biomedical Engineering, Arizona State University, Tempe, AZ
- Capstone: *Universal Bioreactor for Tissue Engineering of Hollow Organs*

Professional Experience

- 2023 Senior Bioinformatics Systems Analyst
University of California Santa Cruz / Santa Cruz, CA
- Developed and maintained bioinformatic workflows from genomic sequencing to data analysis for large-scale projects including single-cell DNA sequencing.
 - Designed data models and scripts for consistent, accurate, and repeatable implementation
- 2021-2023 Research Associate (Informatician I)
Oregon Health & Science University / Portland, OR
- Developed machine learning models in Python and R using EHR data to predict patient appointment attendance and cancellations for OHSU hospital system
 - Researched how baseline recordings affect data quality using national and local registries of ophthalmological data
- 2020-2022 Bioinformatics Core Program Manager
Research Corporation of University of Hawaii / Honolulu, HI
- Supported bioinformatics researchers and students by handling administrative processes and helping receive several internal and external grant funding
- 2017-2020 Graduate Research Assistant
University of British Columbia / Vancouver, Canada
- Predicted postoperative functional outcomes following mandibular reconstruction surgery through patient-specific computer simulations of mastication
- 2018-2019 Animal Care Technician
University of British Columbia / Vancouver, Canada
- Delivered superior animal care for labs within in a large research facility
- 2015-2017 Research Assistant
Midwestern University / Glendale, AZ
- Oversaw multiple research projects comparing animal models of the larynx to functional analysis of vocalization leading to two publications

- 2015-2017 Physical Therapy Rehab Technician
Banner Health / Sun City, AZ
- Aided physical therapists with treatment plans and led a weekly Parkinson's patient therapy class
- 2014-2015 Biomedical Product Development
Arizona State University / Tempe, AZ
- Conducted a capstone project with the Mayo Clinic of Arizona to develop a hollow organ bioreactor stimulating vocal cell proliferation

Awards and Scholarships

- 2018 Volunteer of the Month
Let's Talk Science Award
- 2018 Faculty of Applied Science Graduate Award
UBC Scholarship
- 2011-2015 Regents High Honors Endorsement
ASU Scholarship
- 2014-2015 Dean's List
ASU

Technical Skills

Programming Languages: R (8 years), Python (5 years), C++ (6 years), Matlab (5 years), Java (2 years), SQL (2 years)

Software: Amira, Avizo, Blender, SPSS, SolidWorks, Unity

Medical Image Analysis: CT, MRI, DTI

Machine Learning: PyTorch, Scikit-Learn, TensorFlow, NumPy

Other: biomedical instrumentation, macOS and Windows development tools, AI, VR/AR (Unity, Android, Google Cardboard), medical imaging (CT, DTI, MRI)

Publications

Wu X., Sánchez A., Lloyd J., **Borgard H.**, Fels S., Paydarfar J., Halter R. (2024) Estimating tongue deformation during laryngoscopy using a hybrid FEM-multibody model and intraoperative tracking – a cadaver study, *Computer Methods in Biomechanics and Biomedical Engineering*, DOI: 10.1080/10255842.2023.2301672

Gao Z., Xu J., Jijiwa M., Nasu M., **Borgard H.**, Gong T., Chen S., Fu Y., Deng Y. (2022 accepted). Comprehensive landscape of tRNA-derived fragments in lung cancer. *Molecular Therapy Journal of Hematology & Oncology*.

Guo R., Chen Y., **Borgard H.**, Jijiwa M., Nasu M., He M., & Deng Y. (2020). The Function and Mechanism of Lipid Molecules and Their Roles in The Diagnosis and Prognosis of Breast Cancer. *Molecules* (Basel, Switzerland), 25(20), 4864. <https://doi.org/10.3390/molecules25204864>; PMCID: PMC7588012; PMID: 33096860

Borgard H., Abdi A.H., Prisman E., Fels S. (2020) Creation of Categorical Mandible Atlas to Benefit Non-Rigid Registration. In: Ateshian G., Myers K., Tavares J. (eds) Computer Methods, Imaging and Visualization in Biomechanics and Biomedical Engineering. CMBBE 2019. Lecture Notes in Computational Vision and Biomechanics, vol 36. Springer, Cham. https://doi.org/10.1007/978-3-030-43195-2_50

Wu X, Sánchez CA, Lloyd J, **Borgard H**, Fels S, Paydarfar JA, Halter RJ. (2020). Estimating tongue deformation during laryngoscopy using hybrid FEM-multibody model and intraoperative tracking: a cadaver pilot study. Proc. SPIE 11315, Medical Imaging 2020: Image-Guided Procedures, Robotic Interventions, and Modeling, 113151E. <https://doi.org/10.1117/12.2550471>

Borgard, H.L., Baab, K., Pasch, B. et al. (2020). The Shape of Sound: a Geometric Morphometrics Approach to Laryngeal Functional Morphology. J Mammal Evol 27, 577–590 <https://doi.org/10.1007/s10914-019-09466-9>

Wu X, Fels S, Paydarfar JA, Halter RJ, Sanchez CA, Kahng PW, Rees CA, Ponukumati AS, Eisen EA, Pastel DA, **Borgard H**, Lloyd JE. (2019). Multi-modal Framework for Image-guided Trans-oral Surgery with Intraoperative Imaging and Deformation Modeling. Annu Int Conf IEEE Eng Med Biol Soc. 2019 Jul; 2019:6975-6978. doi: 10.1109/EMBC.2019.8857322

Abdi, A.H., **Borgard, H.**, Abolmaesumi, P. & Fels, S.. (2019). AnatomyGen: Deep Anatomy Generation From Dense Representation With Applications in Mandible Synthesis. Proceedings of The 2nd International Conference on Medical Imaging with Deep Learning, in PMLR 102:4-14

Riede, T., **Borgard, H. L.**, & Pasch, B. (2017). Laryngeal airway reconstruction indicates that rodent ultrasonic vocalizations are produced by an edge-tone mechanism. Royal Society Open Science. <https://doi.org/10.1098/rsos.170976>

Presentations

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| 2019 | <i>Creation of Categorical Mandible Atlas to Benefit Non-Rigid Registration.</i> Computer Methods, Imaging and Visualization in Biomechanics and Biomedical Engineering Symposium. New York City, NY, August 2019 |
| 2019 | <i>A Validated Study on the Prediction of Masticatory Function Post HNC Reconstructive Surgery Using a Subject-Specific Biomechanical Computer Model.</i> Biomedical Engineering Graduate Association Symposium, University of British Columbia, Vancouver, Canada, March 2019 |
| 2017 | <i>Airway Reconstruction in Vocal Organs.</i> Kenneth A. Suarez Research Day, Midwestern University, Glendale, AZ, April 2017 |
| 2016 | <i>Of Tinamou, Vulture, and Hummingbird Vocal Function and Morphology.</i> Southwest Brain Cognition and Vocal Behavior Meeting, University of Arizona, Tucson, AZ, August 2016 |
| 2015 | <i>Universal Bioreactor for Tissue Engineering of Large Hollow Organs for Regenerative and Reparative Medicine.</i> Biomedical Engineering Symposium, Arizona State University, Tempe, AZ, April 2015. |

Teaching Experience

Graduate Teaching Assistant, University of British Columbia

Graded and advised students in courses with 20-30 students

Spring 2019, EECE 518 – *Human Interface Technologies*

Fall 2018, BMEG 557 - *Statistical Methods for Evaluating Medical Technologies*

Teaching Assistant, Arizona State University

Graded and advised students in courses with over 30 students

Fall 2014, BME 382, *Biomedical Product Design and Development*

Spring 2014, BME 300– *Bioengineering Product Design*

Fall 2013, FSE 294 – *Special Topics in Engineering*

Graduate Course Projects

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| 1/2018-4/2018 | <p>Labyrinth Nature Walk in VR for Stress Reduction Therapy
 <i>Human Interface Technologies (EECE518) / Vancouver, Canada</i></p> <ul style="list-style-type: none"> • Developed a virtual reality environment that was targeted to reduce stress and enhance pedestrians' walking experience through a natural, labyrinth meditation |
| 1/2018-4/2018 | <p>Deep Reinforcement Learning for Simple Motor Arm
 <i>Sensimotor Computation (CPSC 530P) / Vancouver, Canada</i></p> <ul style="list-style-type: none"> • Created an optimal learning control paradigm for an inverse model of biomechanical systems |
| 9/2017-12/2017 | <p>DTI Fiber Tracking of the Human Tongue
 <i>Medical Imaging (EECE 544) / Vancouver, Canada</i></p> <ul style="list-style-type: none"> • Analyzed DTI muscle fiber data of the human tongue and compared with other studies that measured muscle fiber lengths and trajectories |

Volunteer Work

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| 2023 | <p>Graduate Science Mentor
 <i>UC Davis/Roseville High School</i></p> <ul style="list-style-type: none"> • Guided high school students with independent science projects providing constructive feedback, resources, and mentorship for scientific learning |
| 2021 | <p>Grant Writer
 <i>Overt Foundation</i></p> <ul style="list-style-type: none"> • Performed extensive research and crafted proposals to obtain funding for a non-profit organization which functions to reduce the financial burden and stigma surrounding mental health treatment |
| 2017-2019 | <p>Teacher Partnership Volunteer
 <i>Let's Talk Science, University of British Columbia</i></p> <ul style="list-style-type: none"> • Designed science curriculum for elementary and middle schools by leading hands-on science activities |
| 2013-2015 | <p>ProC.U.R.E Volunteer
 <i>Project C.U.R.E.</i></p> |

- Repaired, cleaned, packaged medical devices for delivery to underserved areas

2013-2014

EMT Volunteer

Student Emergency Medical Services (SEMS), Arizona State University

- Provided direct patient care on the ASU campus as a first responder

2012-2013

Research Volunteer

Haynes Lab, Arizona State University

- Performed DNA/RNA isolation utilizing real time PCR

Languages

English (Native)

Mandarin (Intermediate)