

SophiaDoerr

Biomedical AI & Medical Imaging Researcher

Profile

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Portfolio

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Scholar

Google Scholar

ORCID

ORCID:
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Languages

English ★★★★★
Spanish ★★★★★
Japanese ★★★★★

Biomedical AI researcher with 8+ years of experience in medical imaging, deep learning, clinical AI, and spine surgery analytics. Current ML PhD work focuses on multimodal large language models that integrate structured electronic health record data, clinical notes, and medical images for ICU deterioration prediction. Prior work includes CT-based injury classification, 3D Slicer-based image analysis workflows, vertebral annotation, surgical instrumentation detection, image registration, and quantitative spine imaging. Available for remote consulting, expert annotation, clinical AI evaluation, medical imaging review, and technical research support.

Technical Focus

Medical Imaging & 3D Workflows

3D Slicer, CT imaging, spine imaging, vertebral annotation, surgical instrumentation detection, image registration, intraoperative cone-beam CT, 3D visualization, image-guided surgery.

Machine Learning & AI

Deep learning, multimodal LLMs, clinical NLP, computer vision, image classification, predictive modeling, model evaluation, clinical AI translation.

Programming & Data Science

Python, MATLAB, statistical modeling, biomedical data science, reproducible analysis workflows, technical communication, scientific writing.

Employment & Research Experience

- 2026 - Now **PhD Student** [UW ICU Data Science Lab](#)
Develop multimodal large language models using electronic health record structured data, clinical notes, and medical images to predict ICU deterioration. Future work includes prognostication, treatment prediction, and human-factors methods for clinical AI implementation.
- 03/24 - Now **TRIUMPH Student Researcher** [UW Population Health Institute](#)
Develop systematization methods to classify Public Health Infrastructure Grant activities across Wisconsin, with the goal of connecting mutual interests, reducing duplication, and improving public health outcomes.
- 09/21 - 01/22 **Senior Data Scientist in Health** [Booz Allen Hamilton](#)
Developed NLP algorithms supporting the FDA Center for Devices and Radiological Health's interest in medical device surveillance and oversight using public data resources.
- 06/20 - 06/22 **Neurosurgery Researcher** [JHU Neurosurgery Spinal Research Lab – Baltimore, MD](#)
Developed clinical algorithms in collaboration with neurosurgical clinicians for spinal navigation surgery using deep learning and AI. Implemented a network to automatically predict Thoracolumbar Injury Classification and Severity Score (TLICS) from CT imaging to support streamlined treatment decision-making.

- 06/20 - 09/21 **Data Scientist Research Associate** [Center for Naval Analyses – Arlington, VA](#)
Generated machine learning, statistical, and deep learning methods for predictive analytics in Navy-contracted projects. Supported process improvement through data-driven analysis, stakeholder engagement, and briefings to senior Navy audiences.
- 01/18 - 05/20 **ISTAR Research Assistant** [ISTAR Lab at Johns Hopkins Hospital – Baltimore, MD](#)
Developed and implemented algorithms for spinal navigation surgery, including an automatic global spinal alignment method with 93.8% of predictions within 95% confidence bounds and a surgical instrumentation detection pipeline using image processing and deep learning with 88% detection accuracy. Used 3D Slicer-based workflows for vertebral annotation, medical image visualization, and quantitative spine imaging analysis.
- 05/17 - 08/17 **Biomedical Engineering Summer Associate** [Medtronic – Littleton, MA](#)
Designed and implemented a deep learning network for surgical applications to process instrumentation in CT images. Used thousands of simulated training images for network training and achieved an 85% Dice score on the testing set.

Additional Technical Experience

- 01/19 - 05/19 **Surgineering Student Researcher** [Johns Hopkins University – Baltimore, MD](#)
Observed six weeks of clinical rotations and designed, implemented, and demonstrated a system to detect and identify orthopaedic surgical instruments on the sterile side table for tool prediction, surgical technique data collection, and lost-instrument detection.
- 01/18 - 08/18 **Cloud-Based Software Consultant** [JHU Applied Physics Lab – Baltimore, MD](#)
Conducted UX interface testing for an intelligence project using manual and automatically scripted processes. Implemented and used AWS data analytic workflows and answered advanced IT queries for users.
- 09/17 - 05/18 **Co-founder of Disaster Relief Aid Webapp** [Illuminate – Baltimore, MD](#)
Developed a webapp frontend integrated with Truffle using JavaScript for verified blockchain-based donations to disaster relief.
- 08/16 - 05/17 **Cerviscreen Design Project** [Johns Hopkins University – Baltimore, MD](#)
Prototyped and designed a preterm labor screening device with Dr. Robert Allen using cervical consistency index, with 50% greater predictive accuracy than the clinical gold standard.

Selected Publications, Posters & Presentations

1. S. A. Doerr, C. Weber-Levine, A. Hersh, T. Awosika, B. Judy, Y. Jin, D. Raj, A. Liu, D. Lubelski, C. Jones, H. Sair, N. Theodore. **"Automated Prediction of the Thoracolumbar Injury Classification and Severity Score from Computed Tomography using a novel deep learning algorithm."** *JNS Spine Big Data Focus Edition*. 2022 April.
2. S. A. Doerr, A. Uneri, Y. Huang, X. Zhang, P. A. Helm, N. Theodore, J. H. Siewerdsen. **"Data-driven detection and registration of spine surgery instrumentation in intraoperative images."** *SPIE Medical Imaging Proceedings and Presentation*. 2020.
3. S. A. Doerr, T. De Silva, R. Vijayan, R. Han, A. Uneri, M. D. Ketcha, X. Zhang, N. Khanna, E. Westbroek, B. Jiang, C. Zygourakis, N. Aygun, N. Theodore, J. H. Siewerdsen. **"Automatic analysis of global spinal alignment from simple annotation of vertebral bodies."** *Journal of Medical Imaging*. 2020 May;7(3):035001.

4. S. A. Doerr. **"Image analysis for spine surgery: data-driven detection of spine instrumentation & automatic analysis of global spinal alignment."** MSE thesis, Johns Hopkins University, Baltimore.
5. S. A. Doerr, T. De Silva, R. Vijayan, R. Han, A. Uneri, M. D. Ketcha, X. Zhang, N. Khanna, E. Westbroek, C. Zygourakis, N. Aygun, N. Theodore, J. H. Siewerdsen. **"Automatic analysis of global spinal alignment from spine CT images."** *SPIE Medical Imaging*. 2019.
6. R. Vijayan, T. De Silva, R. Han, A. Uneri, S. Doerr, M. Ketcha, A. Perdomo-Pantoja, N. Theodore, and J. Siewerdsen. **"Automatic trajectory and instrument planning for robot-assisted spine surgery."** *SPIE Medical Imaging*. 2019.
7. R. Vijayan, T. De Silva, R. Han, X. Zhang, A. Uneri, S. A. Doerr, M. D. Ketcha, A. Perdomo-Pantoja, N. Theodore, J. H. Siewerdsen. **"Automatic pedicle screw planning using atlas-based registration of anatomy and reference trajectories."** *Physics in Medicine & Biology*. 2019;64(16):165020.
8. M. Levine, T. De Silva, M. D. Ketcha, R. Vijayan, S. Doerr, A. Uneri, S. Vedula, N. Theodore, J. H. Siewerdsen. **"Automatic localization in spine CT: a deep-learning approach for image guidance and surgical data science."** *SPIE Medical Imaging Proceedings and Presentation*. 2019.
9. T. De Silva, S. Vedula, A. Perdomo-Pantoja, R. Vijayan, S. A. Doerr, A. Uneri, R. Han, M. D. Ketcha, R. Skolasky, T. Witham, N. Theodore, J. H. Siewerdsen. **"SpineCloud: image analytics for predictive modeling of spine surgery outcomes."** *Journal of Medical Imaging*. 2020.
10. S. A. Doerr, P. Helm, A. Souza, S. Nam, S. Ronen, S. Shi. **"A Deep Learning Approach For Spinal Navigation Surgery."** Abstract and Presentation, Medtronic 2017.

Awards & Honors

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| 02/26 | <p>Visiting Scholar Fellow Medical University of South Carolina
Completed a visiting scholar fellow program focused on research to improve mechanistic understanding, diagnosis, and treatment for patients with connective tissue and cardiovascular disorders.</p> |
| 02/20 | <p>Image-Guided Surgery Best Poster Award SPIE Medical Imaging – Houston, TX
Awarded “Cum Laude” for best poster and research within the Image-Guided Surgery category for work on data-driven detection and registration of spine surgery instrumentation in intraoperative images.</p> |
| 05/19 | <p>Runner-up Best Project Award for Machine Learning: Deep Learning Course Johns Hopkins University – Baltimore, MD
Awarded for a deep learning project that created a choral music voice synthesizer to help composers hear realistic choir arrangements.</p> |
| 02/19 | <p>Robert Wagner Best Paper Award FinalistSPIE Medical Imaging – San Diego, CA
Co-author of paper nominated for Best Paper Award for “Automatic trajectory and instrument planning for robot-assisted spine surgery.”</p> |
| 09/17 | <p>HopHacks Fall 2017 Sponsor Awards Johns Hopkins University – Baltimore, MD
Won Booz Allen Hamilton Best Relief Aid Hack and JPMorgan Best Hack for Social Good for Illuminate, a disaster relief webapp.</p> |

Education

- 2022 - Now **Doctor of Medicine, Doctor of Philosophy** [University of Wisconsin–Madison – Madison, WI](#)
Program: *Medical Scientist Training Program, TRIUMPH Program*
Focus: *Biomedical Data Science*
- 2018 - 2020 **Master of Science in Engineering** [Johns Hopkins University – Baltimore, MD](#)
Program: *Biomedical Engineering*
Focus: *Imaging & Instrumentation*
- 2013 - 2017 **Bachelor of Science** [Johns Hopkins University – Baltimore, MD](#)
Major: *Biomedical Engineering, Applied Mathematics & Statistics*
Minor: *Computational Medicine*

Selected Leadership & Service

- 01/21 - Now **Medical Imaging Journal Reviewer** [Medical & Biological Engineering & Computing](#)
Serve as reviewer for medical imaging and machine learning manuscripts.
- 01/23 - 06/23 **Committee on Health Information Technology Member** [AMA MSS](#)
Developed resolution on equitable development of AI through the CHIT standing committee, participated in monthly meetings, and collaborated on committee briefs.
- 05/23 - 06/25 **Council on Ethical and Judicial Affairs Student Member** [AMA](#)
Conducted ethics policy review and supported AMA judicial processes as a student member of CEJA.
- 01/23 - Now **Co-Leader for Women and Gender Minorities in Medicine** [UWSMPH](#)
Develop and coordinate inclusive programming and speaker events supporting women and gender minorities in medicine.

Updated May, 2026

Sophia Doerr