

SUMMARY

Clinical data scientist with over 8 years of experience leveraging medical imaging and electronic health record (EHR) data to develop and deploy machine learning models that improve patient outcomes. Skilled in data engineering, predictive modeling, and healthcare analytics with expertise across SQL, Python, and cloud-based machine learning environments. Experienced in integrating structured and unstructured clinical data, evaluating model fairness and generalizability, and collaborating with multidisciplinary teams to translate research insights into clinical applications. Published author with a strong foundation in healthcare data science, medical imaging, and applied machine learning.

EXPERIENCE

- 07/2024–present **Research Scientist**, *Department of Surgery, University of California San Diego*, La Jolla, California
- Designed and executed **SQL** workflows to extract, clean, and transform large-scale EHR data from structured and unstructured sources for modeling and analysis.
 - **COSMOS** Data Architect and Data Scientist certified; analyzed multi-institutional EHR data across UC Health systems.
 - Built and validated machine learning models for peripheral artery disease (PAD) detection using **EHR data**.
 - Developed reproducible machine learning pipelines for PAD prediction in collaboration with clinicians and integrated **cloud-based** notebooks into research workflows.
 - Evaluated **fairness, bias, and generalizability** across diverse patient populations and healthcare systems to assess equitable model performance.
 - Led data cleaning, harmonization, and profiling across five UC Health sites to support PAD **phenotyping** and prediction.
 - Designed and implemented **representation learning** methods to capture longitudinal clinical trajectories for PAD phenotyping.
 - Analyzed guideline adherence and **treatment patterns** in patients with PAD to assess quality of care and disparities across patient groups.

- 05/2022–06/2024 **Postdoctoral Fellow**, *Department of Radiology, University of California San Diego*, La Jolla, California
- Designed and implemented **machine learning models** using biomarkers derived from **Restriction Spectrum Imaging (RSI)** to classify clinically significant prostate cancer.
 - Validated biomarker performance by implementing and applying **deformable image registration** to align MRI data with whole-mount histopathology.
 - Developed a **quantitative method** for cross-scanner calibration to ensure reproducible RSI biomarker quantification across acquisition protocols.
 - Extracted MRI data from **Picture Archiving and Communication System** and applied RSI models to build a large, structured imaging dataset for research and model development.
 - Conducted quantitative analyses demonstrating the benefits of RSI-based biomarkers for **radiation treatment planning** (RelGNITE study).
 - Conducted multi-scanner MRI reproducibility **patient studies** to assess the consistency of RSI biomarker.
 - Contributed to multiple **peer-reviewed publications** and international conference presentations.

Contact: Tyler M. Seibert - tseibert@health.ucsd.edu

- 09/2019–04/2022 **Postdoctoral Fellow**, *Department of Radiation Medicine & Applied Sciences, University of California San Diego*, La Jolla, California
- Built a **knowledge-based dose prediction model** for cervical brachytherapy and evaluated its performance against clinical benchmarks.
 - Conducted a **feasibility study** applying the trained model within the clinical workflow for brachytherapy to assess whether needle supplementation decisions could be automated or standardized.
 - Developed and validated a **Python-based algorithm** to automatically transform 3D dose predictions into deliverable brachytherapy treatment plans.
 - Built automated **batch export scripts** for querying PACS and treatment planning systems and transferring DICOM data to MIM software and designated directories.
 - Authored **five peer-reviewed publications** and presented research at national and international conferences.

Contact: Sandra M. Meyers - sandra.meyers@bccancer.bc.ca

- 08/2016–08/2019 **Doctoral Candidate**, *Department of Radiation and Oncology, University Hospital Erlangen, Erlangen, Germany*
- Developed **quality-assurance algorithms** for interstitial multi-catheter brachytherapy using electromagnetic tracking.
 - Conducted and analyzed a **clinical study** involving over 50 breast cancer patients to evaluate **catheter tracking accuracy** and test integration of an **electromagnetic afterloader prototype** into routine clinical workflow.
 - Collaborated with Elekta on maintenance and troubleshooting, **providing feedback** to improve the prototype.
 - Performed **retrospective analyses** of breast brachytherapy cases to enhance treatment precision and QA.
 - **Supervised and mentored** multiple master theses that resulted in oral presentations at national and international conferences and peer-reviewed publications.

Contact: *Christoph Bert* - christoph.bert@uk-erlangen.de

EDUCATION

- 2016–2019 **Medical Physics**, *PhD*, Department of Radiation Oncology, Friedrich-Alexander University Erlangen-Nuremberg, Erlangen, Germany, *Magna Cum Laude*
Thesis: *Quality assurance for interstitial multi-catheter breast brachytherapy using electromagnetic tracking*
- 2013–2016 **Computer Science**, *MSc*, Friedrich-Alexander University Erlangen-Nuremberg, Erlangen, Germany, *1.6 (1.0 excellent - 4.0 sufficient)*
Specialization: Medical image and data processing
Thesis: *Automatic detection and analysis of inter-fractional prostate motion during radiation therapy*
- 2009–2014 **Biomedical Engineering**, *BSc*, Technical University of Ilmenau, Ilmenau, Germany, *2.0 (1.0 excellent - 4.0 sufficient)*
Thesis: *Extension of a computational WTA model*
- 2013–2013 **Exchange Semester**, *School of Psychology, University of Birmingham*, Birmingham, United Kingdom
Thematic focus: Simulation of winner takes all model for visual search experiments
- 2011–2012 **Exchange Semester**, *L'école d'ingénieur- ENSEIRB-MATMECA*, Bordeaux, France
Thematic focus: Studies of electrical engineering with focus on signal processing

SKILLS

- Experienced in clinical data science, including large-scale EHR and medical imaging analytics, feature engineering, and predictive modeling.
- Experienced working with clinical terminologies such as ICD, CPT, LOINC, and RxNorm for EHR feature extraction and data standardization.
- Strong record of scientific publications and collaboration with multidisciplinary clinical and technical teams across data science, radiation oncology, and surgery.
- Skilled in developing reproducible machine learning workflows and translating models into clinically applicable tools.
- Experience with AI-assisted development (e.g., Claude Code, GitHub Copilot) to support data analysis and model development.
- Highly detail-oriented and self-motivated, with a strong focus on data accuracy and reproducibility.
- Deep understanding of the healthcare domain, particularly radiology, radiation oncology, and vascular surgery.

TECHNICAL SKILLS

- Programming Matlab¹, Python ², R², SQL¹, C#³, Java³, Bash³
(1 advanced, 2 intermediate, 3 basic)
- Applications Git, Visual Studio, Visual Studio Code, AWS SageMaker, Databricks, ITK, VTK, 3DSlicer, ImageJ, OncentraBrachy, MIM, BrachyVision, Microsoft Office, REDCap, Sectra, Epic, COSMOS
- Data Science medical image analysis (CT, CBCT, MRI), multi-modality image registration (MRI to histopathology), spatial interpolation and image resampling, DICOM data processing, representation learning for longitudinal EHR data, predictive modeling (XGBoost, Random Forest), model evaluation (AUROC, AUPRC, calibration, fairness), clustering, statistical modeling (linear mixed-effects models)

LANGUAGES

German (native speaker), English (fluent), French, Spanish

NOTABLE PUBLICATIONS

- K. Kallis**, L. Moore, D. Brown, J., Mayadev, K.L. Moore and S.M. Meyers, Automated Treatment Planning Framework for Brachytherapy of Cervical Cancer Using 3D Dose Predictions
Physics in Medicine & Biology (2023), 10.1088/1361-6560/acc37c
- K. G. Cortes, **K. Kallis**, A. Simon J., Mayadev, S.M. Meyers and K.L. Moore, Knowledge-Based Three-Dimensional Dose Prediction for Tandem-And-Ovoid Brachytherapy
Brachytherapy (2022), doi.org/10.1016/j.brachy.2022.03.002
- K. Kallis**, J. Mayadev, K. Kisling, D. Brown, D. Scanderbeg, X. Ray, K. Cortes, A. Simon, C.M. Yashar, J.P. Einck, L.K. Mell, K.L. Moore and S. M. Meyers, Knowledge-based dose prediction models to inform gynecologic brachytherapy needle supplementation for locally advanced cervical cancers
Brachytherapy (2021) doi.org/10.1016/j.brachy.2021.07.001

PUBLICATIONS

- K. Kallis**, C. Quitevis, M.B. Malas, E.G. Ross, Performance, Generalizability, and Fairness of a Peripheral Artery Disease Detection Model Across Patient Phenotypes and Health Systems
Journal of the American Medical Informatics Association (2026 submitted),
- K. Kallis**, C.C. Conlin, C. Ollison, M.E. Hahn, R. Rakow-Penner, A.M. Dale and T.M. Seibert, Quantitative MRI biomarker for classification of clinically significant prostate cancer: calibration for reproducibility across echo times
Journal of Applied Medical Physics (2024), 10.1002/acm2.14514
- K. Kallis**, C.C. Conlin, T.S. Hussain, A.Y. Zhong, D. Do, A.J. Lui, R. Karunamuni, J. Kuperman, M.E. Hahn, R. Rakow-Penner, A. Chatterjee, A. Oto, G.S. Karczmar, A.M. Dale and T.M. Seibert, Comparison of synthesized and acquired high *b*-value diffusion-weighted MRI for detection of prostate cancers
Cancer Imaging (2024), 10.1101/2023.02.17.23286100v1
- A.J. Lui, **K. Kallis**, A.Y. Zhong, T.S. Hussain, C.C. Conlin, L.A. Digma, N. Phan, I.T. Mathews D. Do, M. Rojo Domingo, R. Karunamuni, J. Kuperman, A.M. Dale, R. Rakow-Penner, M.E. Hahn and T.M. Seibert, ReIGNITE RT Boost: An international study testing the accuracy and feasibility of using restriction spectrum imaging (RSI) MRI to guide intraprostatic tumor target volume for radiotherapy boost
International Journal of Radiation Oncology Biology Physics (2023), 10.1016/j.ijrobp.2023.07.004
- K. Kallis**, J. Mayadev, B. Covele, D. Brown, D. Scanderbeg, A. Simon, H. Frisbie-Firsching, C.M. Yashar, J.P. Einck, L.K. Mell, K.L. Moore and S. M. Meyers, Evaluation of dose differences between intracavitary applicators for cervical brachytherapy using knowledge-based models
Brachytherapy (2021) doi.org/10.1016/j.brachy.2021.08.010
- T. Yusufaly, **K. Kallis**, A. Simon, J. Mayadev, C.M. Yashar, J. P. Einck, L.K. Mell, D. Brown, D. Scanderberg, S.J. Hild, B. Covele, K.L. Moore and S. M. Meyers, A knowledge-based organ dose prediction tool for brachytherapy treatment planning of cervical cancer patients
Brachytherapy (2020) 10.1016/j.brachy.2020.04.008
- K. Kallis**, M. Ziegler, M. Lotter, S. Kreppner, V. Strnad, R. Fietkau, and C. Bert, Is adaptive treatment planning in multi-catheter interstitial breast brachytherapy necessary?
Radiotherapy & Oncology (2019) doi.org/10.1016/j.radonc.2019.08.015
- S. Masitho, **K. Kallis**, V. Strnad, R. Fietkau, and C. Bert, Error detection using an electromagnetic tracking system in multi-catheter breast interstitial brachytherapy
Physics in Medicine & Biology (2019) doi.org/10.1088/1361-6560/ab4336
- K. Kallis**, N. Abu-Hossin, S. Kreppner, M. Lotter, V. Strnad, R. Fietkau, and C. Bert, Estimation of inter-fractional variations in interstitial brachytherapy with the help of a hybrid treatment delivery system
Radiotherapy & Oncology (2019) doi.org/10.1016/j.radonc.2019.08.012
- K. Kallis**, T. Kaltsas, S. Kreppner, M. Lotter, V. Strnad, R. Fietkau, and C. Bert, Impact of inter- and intra-observer variabilities of catheter reconstruction on multi-catheter interstitial brachytherapy of breast cancer patients
Radiotherapy & Oncology (2019), doi.org/10.1016/j.radonc.2019.02.017
- K. Kallis**, S. Kreppner, M. Lotter, V. Strnad, R. Fietkau, and C. Bert, Introduction of a hybrid Flexitron afterloader system used for quality assurance in multi-catheter interstitial brachytherapy of breast cancer
Physics in Medicine & Biology (2018), doi.org/10.1088/1361-6560/aabb5a

CONFERENCE CONTRIBUTIONS

- Vascular Annual Meeting 2025 **K. Kallis**, E.G.Ross, Assessing performance and generalizability of AI-based PAD detection models across California Health Systems(*poster*)
- ISMRM&ISMRT Annual Meeting 2024 **K. Kallis**, C.C. Conlin, C. Ollison, M.E. Hahn, R. Rakow-Penner, A.M. Dale, T.M. Seibert, Quantitative MRI biomarker for classification of clinically significant prostate cancer: calibration for reproducibility across echo times (*poster*)
- ISMRM&ISMRT Annual Meeting 2023 **K. Kallis**, C.C. Conlin, T.S. Hussain, A.Y. Zhong, D. Do, A.J. Lui, R. Karunamuni, J. Kuperman, M.E. Hahn, R. Rakow-Penner, A. Chatterjee, A. Oto, G.S. Karczmar, A.M. Dale, T.M. Seibert, Comparison of synthesized and acquired high b-value diffusion-weighted MRI for detection of prostate cancers (*poster*)
- 64.AAPM Annual Meeting 2022 **K. Kallis**, L. Moore, D. Brown, J. Mayadev, K.L. Moore and S.M. Meyers, Towards automated, knowledge-based brachytherapy treatment planning: Converting 3D dose to optimized dwell times (*oral presentation*)
- Virtual COMP Meeting 2021 **K. Kallis**, J. Mayadev, K. Kisling, X. Ray, D. Scanderbeg, D. Brown, K.L. Moore and S.M. Meyers, Knowledge-Based Models to Predict Needle Necessity in Cervical Brachytherapy: A Novel Tool to Assist Physician Decision-Making (*oral presentation*)
- 63.ASTRO Annual Meeting **K. Kallis**, J. Mayadev, K. Kisling, X. Ray, D. Scanderbeg, D. Brown, C. Yashar, J. Einck, L. Mell, L. A. Simon, K.L. Moore and S.M. Meyers, Feasibility of knowledge-based dose predictions to inform needle supplementation in cervical brachytherapy (*poster*)
- Virtual Joint AAPM | COMP Meeting 2020 **K. Kallis**, D. Brown, D. Scanderbeg, K. Kisling, B. Covele, C. Yashar, J. Einck, L. Mell, L. A. Simon, J. Mayadev, K.L. Moore and S.M. Meyers, Can knowledge-based dose prediction models inform brachytherapy needle decision-making for cervical cancer? (*eposter*)
- Virtual Joint AAPM | COMP Meeting 2020 **K. Kallis**, B. Covele, L. A. Simon, D. Brown, D. Scanderbeg, K. Kisling, C. Yashar, J. Einck, L. Mell, J. Mayadev, K.L. Moore and S.M. Meyers, What knowledge-based dose prediction models tell us about ovoid vs. ring based brachytherapy applicators (*blue ribbon poster*)
- 38.ESTRO Annual Meeting 2019 **K. Kallis**, T. Kaltsas, S. Kreppner, M. Lotter, V. Strnad, R. Fietkau and C. Bert, Variability in catheter reconstruction for multi-catheter interstitial brachytherapy of breast cancer (*poster*)
- 49.DGMP Jahrestagung 2018 **K. Kallis**, S. Masitho, V. Strnad, R. Fietkau, and C. Bert, Qualitätssicherung durch elektromagnetisches Tracking in der interstitiellen multi-katheter HDR Brachytherapie (*oral presentation*)
- 24.DEGRO Jahrestagung 2018 **K. Kallis**, V. Strnad, R. Fietkau, and C. Bert, Qualitätssicherung durch elektromagnetisches Tracking in der interstitiellen multi-katheter HDR Brachytherapie mit Hilfe eines hybriden Afterloading Systems (*oral presentation*)
- 37.ESTRO Annual Meeting 2018 **K. Kallis**, V. Strnad, R. Fietkau and C. Bert, Quality assurance for interstitial brachytherapy using an EMT system integrated into an afterloader (*oral presentation*)
- 48.DGMP Jahrestagung 2018 **K. Kallis**, V. Strnad, R. Fietkau, and C. Bert, Quality assurance for intersital brachytherapy using a hybrid flexitron afterloader system (*oral presentation*)
- 23.DEGRO Jahrestagung 2018 **K. Kallis**, T. Brandt, V. Strnad, S. Lettmeier, R. Fietkau, A. Meier and C. Bert, CBCT-basierte Detektion und Analyse der Lagestabilität von implantieren Goldmarkern und Formveränderungen des Rektalballons während der Strahlentherapie des Prostata-Ca (*poster*)