Stanford



Sandy Napel

Professor of Radiology (Integrative Biomedical Imaging Informatics), Emeritus

Rad/Integrative Biomedical Imaging Informatics at Stanford

Curriculum Vitae available Online

CONTACT INFORMATION

- **Alternate Contact**

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Bio

BIO

I am the former Division Chief of IBIIS (Integrative Biomedical Imaging Informatics at Stanford), whose mission is to advance the clinical and basic sciences in radiology, while improving our understanding of biology and the manifestations of disease, by pioneering methods in the information sciences that integrate imaging, clinical and molecular data, and and the former co-director of the Radiology 3D and Quantitative Imaging Lab, providing clinical service to the Stanford and local community. My primary focus was on radiomics and radiogenomics, i.e., making image features computer-accessible, to facilitate content-based retrieval of similar lesions, and prediction of molecular phenotype, response to therapy, and prognosis from imaging features. I have also been involved in developing diagnostic and therapy-planning applications and strategies for the acquisition, visualization, and quantitation of multi-dimensional medical imaging data. Examples are: creation of three-dimensional images of blood vessels using CT, visualization of complex flow within blood vessels using MR, computer-aided detection and characterization of lesions (e.g., colonic polyps, pulmonary nodules) from cross-sectional image data, visualization and automated assessment of 4D ultrasound data, and fusion of images acquired using different modalities (e.g., CT and MR). I have also been involved in developing and evaluating techniques for exploring cross-sectional imaging data from an internal perspective, i.e., virtual endoscopy (including colonoscopy, angioscopy, and bronchoscopy), and in the quantitation of structure parameters, e.g., volumes, lengths, medial axes, and curvatures. I am also interested in creating workable solutions to the problem of "data explosion," i.e., how to look at the thousands of images generated per examination using modern CT and MR scanners.

If you are interested in these topics, I invite you to visit the IBIIS website (http://ibiis.stanford.edu/)

ACADEMIC APPOINTMENTS

- Emeritus Faculty, Acad Council, Rad/Integrative Biomedical Imaging Informatics at Stanford
- Member, Bio-X
- Member, Cardiovascular Institute
- Member, Stanford Cancer Institute

ADMINISTRATIVE APPOINTMENTS

- Division Chief, Integrative Biomedical Imaging Informatics at Stanford , (2009-2025)

- co-Director, Radiology 3D and Quantitative Imaging Laboratory , (1996-2025)

HONORS AND AWARDS

- College of Fellows, American Institute for Medical and Biological Engineering (AIMBE) (November 2009)
- Distinguished Investigator Award, Academy of Radiology Research (2012)

PROFESSIONAL EDUCATION

- BS, SUNY Stony Brook , Engineering Sciences (1974)
- MS, Stanford University , Electrical Engineering (1976)
- PhD, Stanford University , Electrical Engineering (1981)

LINKS

- Integrative Biomedical Imaging Informatics at Stanford (IBIIS): http://ibiis.stanford.edu
- 3D and Quantitative Imaging Web Site: http://3dqlab.stanford.edu
- My NCBI Publications: http://www.ncbi.nlm.nih.gov/sites/myncbi/sandy.napel.1/bibliography/43913272/public/
- My Lab Site: http://med.stanford.edu/riipl.html

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

I am the Division Chief of IBIIS (Integrative Biomedical Imaging Informatics at Stanford), whose mission is to advance the clinical and basic sciences in radiology, while improving our understanding of biology and the manifestations of disease, by pioneering methods in the information sciences that integrate imaging, clinical and molecular data, and co-director of the Radiology 3D and Quantitative Imaging Lab, providing clinical service to the Stanford and local community. My primary focus is on radiomics and radiogenomics, i.e., making image features computer-accessible, to facilitate content-based retrieval of similar lesions, and prediction of molecular phenotype, response to therapy, and prognosis from imaging features. I have also been involved in developing diagnostic and therapy-planning applications and strategies for the acquisition, visualization, and quantitation of multi-dimensional medical imaging data. Examples are: creation of three-dimensional images of blood vessels using CT, visualization of complex flow within blood vessels using MR, computer-aided detection and characterization of lesions (e.g., colonic polyps, pulmonary nodules) from cross-sectional image data, visualization and automated assessment of 4D ultrasound data, and fusion of images acquired using different modalities (e.g., CT and MR). I have also been involved in developing and evaluating techniques for exploring cross-sectional imaging data from an internal perspective, i.e., virtual endoscopy (including colonoscopy, angioscopy, and bronchoscopy), and in the quantitation of structure parameters, e.g., volumes, lengths, medial axes, and curvatures. I am also interested in creating workable solutions to the problem of "data explosion," i.e., how to look at the thousands of images generated per examination using modern CT and MR scanners.

Teaching

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Bioengineering (PhD Program)
- Biomedical Data Science (PhD Program)

Publications

PUBLICATIONS

- **Quantitative imaging feature pipeline: a web-based tool for utilizing, sharing, and building image-processing pipelines.** *Journal of medical imaging (Bellingham, Wash.)*

Mattonen, S. A., Gude, D., Echegaray, S., Bakr, S., Rubin, D. L., Napel, S.
2020; 7 (4): 042803

- **Stanford DRO Toolkit: Digital Reference Objects for Standardization of Radiomic Features.** *Tomography (Ann Arbor, Mich.)*
  Jaggi, A., Mattonen, S. A., McNitt-Gray, M., Napel, S.
  2020; 6 (2): 111–17
- **Radiomics and Radiogenomics: Technical Basis and Clinical Applications**
  edited by Xing, L., Li, R., Napel, S., Rubin, D. L.
  CRC Press.2019
- **Quantitative imaging of cancer in the postgenomic era: Radio(geno)mics, deep learning, and habitats.** *Cancer*
  Napel, S., Mu, W., Jardim-Perassi, B. V., Aerts, H. J., Gillies, R. J.
  2018
- **A radiogenomic dataset of non-small cell lung cancer.** *Scientific data*
  Bakr, S., Gevaert, O., Echegaray, S., Ayers, K., Zhou, M., Shafiq, M., Zheng, H., Benson, J. A., Zhang, W., Leung, A. N., Kadoch, M., D Hoang, C., Shrager, et al
  2018; 5: 180202
- **Radiogenomics is the future of treatment response assessment in clinical oncology** *MEDICAL PHYSICS*
  El Naqa, I., Napel, S., Zaidi, H.
  2018; 45 (10): 4325–28
- **NOTE: This list is not complete** *see CV link*
  Napel, S.
  2013
- **Demonstration of Interoperability Between MIDRC and N3C: A COVID-19 Severity Prediction Use Case.** *Journal of imaging informatics in medicine*
  Whitney, H. M., Baccile, R., Li, H., Drukker, K., Meyer, C., Gruszauskas, N. P., Chen, W., Lauderdale, D. S., Napel, S., Kahaki, S., Sá, R. C., Beesley, C., Phalora, et al
  2025
- **Multimodal data curation via interoperability: use cases with the Medical Imaging and Data Resource Center.** *Scientific data*
  Chen, W., Whitney, H. M., Kahaki, S., Meyer, C., Li, H., Sa, R. C., Lauderdale, D., Napel, S., Gersing, K., Grossman, R. L., Giger, M. L.
  2025; 12 (1): 1340
- **FUTURE-AI: international consensus guideline for trustworthy and deployable artificial intelligence in healthcare.** *BMJ (Clinical research ed.)*
  Lekadir, K., Frangi, A. F., Porras, A. R., Glocker, B., Cintas, C., Langlotz, C. P., Weicken, E., Asselbergs, F. W., Prior, F., Collins, G. S., Kaissis, G., Tsakou, G., Buvat, et al
  2025; 388: e081554
- **3D Printing for the Development of Palatal Defect Prosthetics.** *Federal practitioner : for the health care professionals of the VA, DoD, and PHS*
  Calderon, C., Golzar, A., Marcott, S., Gifford, K., Napel, S., Fleischmann, D., Baik, F. M., Osborne, T. F., Finegersh, A., Sirjani, D.
  2024; 41 (Suppl 2): S3-S7
- **AI in Radiology: Opportunities and Challenges.** *Seminars in ultrasound, CT, and MR*
  Flory, M. N., Napel, S., Tsai, E. B.
  2024
- **Performance of alternative manual and automated deep learning segmentation techniques for the prediction of benign and malignant lung nodules.** *Journal of medical imaging (Bellingham, Wash.)*
  Selby, H. M., Mukherjee, P., Parham, C., Malik, S. B., Gevaert, O., Napel, S., Shah, R. P.
  2023; 10 (4): 044006
- **Machine learning with multimodal data for COVID-19.** *Heliyon*
  Chen, W., Sá, R. C., Bai, Y., Napel, S., Gevaert, O., Lauderdale, D. S., Giger, M. L.
  2023; 9 (7): e17934

- **Predicting treatment response for the safe non-operative management of patients with rectal cancer using an MRI-based deep-learning model**
  Selby, H. M., Liu, C., Sheth, V., Napel, S., Wagner, T., Morris, A. M.
  LIPPINCOTT WILLIAMS & WILKINS.2023

- **Early Detection of Lung Cancer in the NLST Dataset.** *medRxiv : the preprint server for health sciences*
  Mukherjee, P., Brezhneva, A., Napel, S., Gevaert, O.
  2023

- **Predicting recurrence risks in lung cancer patients using multimodal radiomics and random survival forests.** *Journal of medical imaging (Bellingham, Wash.)*
  Christie, J. R., Daher, O., Abdelrazek, M., Romine, P. E., Malthaner, R. A., Qiabi, M., Nayak, R., Napel, S., Nair, V. S., Mattonen, S. A.
  2022; 9 (6): 066001

- **The Medical Segmentation Decathlon.** *Nature communications*
  Antonelli, M., Reinke, A., Bakas, S., Farahani, K., Kopp-Schneider, A., Landman, B. A., Litjens, G., Menze, B., Ronneberger, O., Summers, R. M., van Ginneken, B., Bilello, M., Bilic, et al
  2022; 13 (1): 4128

- **Radiomic features quantifying pixel-level characteristics of breast tumors from magnetic resonance imaging predict risk factors in triple-negative breast cancer.**
  Mantz, A. B., Zhou, R., Kozlov, A., DeMartini, W., Chen, S., Okamoto, S., Ikeda, D. M., Mattonen, S. A., Napel, S., Alkim, E., Sledge, G. W., Kurian, A. W., Liu, et al
  LIPPINCOTT WILLIAMS & WILKINS.2022

- **Artificial intelligence and machine learning in cancer imaging.** *Communications medicine*
  Koh, D., Papanikolaou, N., Bick, U., Illing, R., Kahn, C. E., Kalpathi-Cramer, J., Matos, C., Marti-Bonmati, L., Miles, A., Mun, S. K., Napel, S., Rockall, A., Sala, et al
  2022; 2: 133

- **Lung Nodule Malignancy Prediction in Sequential CT Scans: Summary of ISBI 2018 Challenge** *IEEE TRANSACTIONS ON MEDICAL IMAGING*
  Balagurunathan, Y., Beers, A., Mcnitt-Gray, M., Hadjiiski, L., Napel, S., Goldgof, D., Perez, G., Arbelaez, P., Mehrtash, A., Kapur, T., Yang, E., Moon, J., Perez, et al
  2021; 40 (12): 3748-3761

- **Machine Learning Approach to Differentiation of Peripheral Schwannomas and Neurofibromas: A Multi-Center Study.** *Neuro-oncology*
  Zhang, M., Tong, E., Wong, S., Hamrick, F., Mohammadzadeh, M., Rao, V., Pendleton, C., Smith, B. W., Hug, N. F., Biswal, S., Seekins, J., Napel, S., Spinner, et al
  2021

- **Machine-learning Approach to Differentiation of Benign and Malignant Peripheral Nerve Sheath Tumors: A Multicenter Study**
  Zhang, M., Tong, E., Hamrick, F., Pendleton, C., Smith, B., Hug, N., Mattonen, S., Napel, S., Spinner, R., Yeom, K., Wilson, T., Mahan, M.
  AMER ASSOC NEUROLOGICAL SURGEONS.2021

- **Machine-Learning Approach to Differentiation of Benign and Malignant Peripheral Nerve Sheath Tumors: A Multicenter Study.** *Neurosurgery*
  Zhang, M., Tong, E., Hamrick, F., Lee, E. H., Tam, L. T., Pendleton, C., Smith, B. W., Hug, N. F., Biswal, S., Seekins, J., Mattonen, S. A., Napel, S., Campen, et al
  2021

- **Machine Learning Radiomics Model for Early Identification of Small-Cell Lung Cancer on Computed Tomography Scans.** *JCO clinical cancer informatics*
  Shah, R. P., Selby, H. M., Mukherjee, P., Verma, S., Xie, P., Xu, Q., Das, M., Malik, S., Gevaert, O., Napel, S.
  2021; 5: 746-757

- **MRI-based radiomics for prognosis of pediatric diffuse intrinsic pontine glioma: an international study.** *Neuro-oncology advances*
  Tam, L. T., Yeom, K. W., Wright, J. N., Jaju, A., Radmanesh, A., Han, M., Toescu, S., Maleki, M., Chen, E., Campion, A., Lai, H. A., Eghbal, A. A., Oztekin, et al
  2021; 3 (1): vdab042

- **Quantitative image features from radiomic biopsy differentiate oncocytoma from chromophobe renal cell carcinoma.** *Journal of medical imaging (Bellingham, Wash.)*
  Jaggi, A., Mastrodicasa, D., Charville, G. W., Jeffrey, R. B., Napel, S., Patel, B.
  2021; 8 (5): 054501

- **Interreader Variability in Semantic Annotation of Microvascular Invasion in Hepatocellular Carcinoma on Contrast-enhanced Triphasic CT Images.** *Radiology. Imaging cancer*
  Bakr, S., Gevaert, O., Patel, B., Kesselman, A., Shah, R., Napel, S., Kothary, N.
  2020; 2 (3): e190062

- **A Shallow Convolutional Neural Network Predicts Prognosis of Lung Cancer Patients in Multi-Institutional CT-Image Data.** *Nature machine intelligence*
  Mukherjee, P., Zhou, M., Lee, E., Schicht, A., Balagurunathan, Y., Napel, S., Gillies, R., Wong, S., Thieme, A., Leung, A., Gevaert, O.
  2020; 2 (5): 274-282

- **The Image Biomarker Standardization Initiative: Standardized Quantitative Radiomics for High-Throughput Image-based Phenotyping.** *Radiology*
  Zwanenburg, A., Vallieres, M., Abdalah, M. A., Aerts, H. J., Andrearczyk, V., Apte, A., Ashrafinia, S., Bakas, S., Beukinga, R. J., Boellaard, R., Bogowicz, M., Boldrini, L., Buvat, et al
  2020: 191145

- **A shallow convolutional neural network predicts prognosis of lung cancer patients in multi-institutional computed tomography image datasets** *Nature Machine Intelligence*
  Mukherjee, P., Zhou, M., Lee, E., Schicht, A., Balagurunathan, Y., Napel, S., Gillies, R., Wong, S., Thieme, A., Leung, A., Gevaert, O.
  2020; 2 (5): 274–282

- **Radiomics Signatures of Cardiovascular Risk Factors in Cardiac MRI: Results From the UK Biobank.** *Frontiers in cardiovascular medicine*
  Cetin, I., Raisi-Estabragh, Z., Petersen, S. E., Napel, S., Piechnik, S. K., Neubauer, S., Gonzalez Ballester, M. A., Camara, O., Lekadir, K.
  2020; 7: 591368

- **The utility of three-dimensional models in complex microsurgical reconstruction.** *Archives of plastic surgery*
  Ogunleye, A. A., Deptula, P. L., Inchauste, S. M., Zelones, J. T., Walters, S. n., Gifford, K. n., LeCastillo, C. n., Napel, S. n., Fleischmann, D. n., Nguyen, D. H.
  2020; 47 (5): 428–34

- **Stability and reproducibility of computed tomography radiomic features extracted from peritumoral regions of lung cancer lesions** *MEDICAL PHYSICS*
  Tunali, I., Hall, L. O., Napel, S., Cherezov, D., Guvenis, A., Gillies, R. J., Schabath, M. B.
  2019; 46 (11): 5075–85

- **Bone Marrow and Tumor Radiomics at 18F-FDG PET/CT: Impact on Outcome Prediction in Non-Small Cell Lung Cancer.** *Radiology*
  Mattonen, S. A., Davidzon, G. A., Benson, J., Leung, A. N., Vasanawala, M., Horng, G., Shrager, J. B., Napel, S., Nair, V. S.
  2019: 190357

- **[18F] FDG Positron Emission Tomography (PET) Tumor and Penumbra Imaging Features Predict Recurrence in Non-Small Cell Lung Cancer.** *Tomography (Ann Arbor, Mich.)*
  Mattonen, S. A., Davidzon, G. A., Bakr, S., Echegaray, S., Leung, A. N., Vasanawala, M., Horng, G., Napel, S., Nair, V. S.
  2019; 5 (1): 145–53

- **Stability and reproducibility of computed tomography radiomic features extracted from peritumoral regions of lung cancer lesions.** *Medical physics*
  Tunali, I. n., Hall, L. O., Napel, S. n., Cherezov, D. n., Guvenis, A. n., Gillies, R. J., Schabath, M. B.
  2019

- **A RADIOMICS APPROACH TO ANALYZE CARDIAC ALTERATIONS IN HYPERTENSION**
  Cetin, I., Petersen, S. E., Napel, S., Camara, O., Gonzalez Ballester, M., Lekadir, K., IEEE
  IEEE.2019: 640–43

- **Principles and Rationale of Radiomics and Radiogenomics** *Radiomics and Radiogenomics: Technical Basis and Clinical Applications*
  Napel, S.
  CRC Press.2019; 1: 3–12

- **Deep Learning Techniques for Automatic MRI Cardiac Multi-Structures Segmentation and Diagnosis: Is the Problem Solved?** *IEEE TRANSACTIONS ON MEDICAL IMAGING*
  Bernard, O., Lalande, A., Zotti, C., Cervenansky, F., Yang, X., Heng, P., Cetin, I., Lekadir, K., Camara, O., Gonzalez Ballester, M., Sanroma, G., Napel, S., Petersen, et al
  2018; 37 (11): 2514–25

- **Magnetic resonance imaging and molecular features associated with tumor-infiltrating lymphocytes in breast cancer.** *Breast cancer research : BCR*
  Wu, J., Li, X., Teng, X., Rubin, D. L., Napel, S., Daniel, B. L., Li, R.
  2018; 20 (1): 101

- **Deep learning to predict survival prognosis for patients with non-small cell lung cancer using images and clinical data**
  Lee, E. H., Zhou, M., Gamboa, N., Brennan, K., Itakura, H., Nair, V., Napel, S., Wong, S., Gevaert, O.
  AMER ASSOC CANCER RESEARCH.2018

- **Erratum: Semi-automated pulmonary nodule interval segmentation using the NLST data.** *Medical physics*
  Balagurunathan, Y., Beers, A., Kalpathy-Cramer, J., McNitt-Gray, M., Hadjiiski, L., Zhao, B., Zhu, J., Yang, H., Yip, S. S., Aerts, H. J., Napel, S., Cherezov, D., Cha, et al
  2018; 45 (6): 2689-2690

- **GFPT2-expressing cancer-associated fibroblasts mediate metabolic reprogramming in human lung adenocarcinoma.** *Cancer research*
  Zhang, W., Bouchard, G., Yu, A., Shafiq, M., Jamali, M., Shrager, J. B., Ayers, K., Bakr, S., Gentles, A. J., Diehn, M., Quon, A., West, R. B., Nair, et al
  2018

- **Semi-automated pulmonary nodule interval segmentation using the NLST data** *MEDICAL PHYSICS*
  Balagurunathan, Y., Beers, A., Kalpathy-Cramer, J., McNitt-Gray, M., Hadjiiski, L., Zhao, B., Zhu, J., Yang, H., Yip, S. S. F., Aerts, H. L., Napel, S., Cherezov, D., Cha, et al
  2018; 45 (3): 1093–1107

- **Intratumoral Spatial Heterogeneity at Perfusion MR Imaging Predicts Recurrence-free Survival in Locally Advanced Breast Cancer Treated with Neoadjuvant Chemotherapy.** *Radiology*
  Wu, J. n., Cao, G. n., Sun, X. n., Lee, J. n., Rubin, D. L., Napel, S. n., Kurian, A. W., Daniel, B. L., Li, R. n.
  2018: 172462

- **Non-Small Cell Lung Cancer Radiogenomics Map Identifies Relationships between Molecular and Imaging Phenotypes with Prognostic Implications.** *Radiology*
  Zhou, M. n., Leung, A. n., Echegaray, S. n., Gentles, A. n., Shrager, J. B., Jensen, K. C., Berry, G. J., Plevritis, S. K., Rubin, D. L., Napel, S. n., Gevaert, O. n.
  2018; 286 (1): 307–15

- **Radiogenomics Map: A Novel Approach for Noninvasive Identification of Molecular Properties? Response** *RADIOLOGY*
  Gevaert, O., Napel, S.
  2017; 285 (3): 1061

- **Quantitative Image Feature Engine (QIFE): an Open-Source, Modular Engine for 3D Quantitative Feature Extraction from Volumetric Medical Images.** *Journal of digital imaging*
  Echegaray, S., Bakr, S., Rubin, D. L., Napel, S.
  2017

- **Prediction of EGFR and KRAS mutation in non-small cell lung cancer using quantitative 18F FDG-PET/CT metrics.** *Oncotarget*
  Minamimoto, R., Jamali, M., Gevaert, O., Echegaray, S., Khuong, A., Hoang, C. D., Shrager, J. B., Plevritis, S. K., Rubin, D. L., Leung, A. N., Napel, S., Quon, A.
  2017; 8 (32): 52792-52801

- **Prediction of EGFR and KRAS mutation in non-small cell lung cancer using quantitative 18F FDG-PET/CT metrics.** *Oncotarget*
  Minamimoto, R., Jamali, M., Gevaert, O., Echegaray, S., Khuong, A., Hoang, C. D., Shrager, J. B., Plevritis, S. K., Rubin, D. L., Leung, A. N., Napel, S., Quon, A.
  2017

- **Variations in the functional visual field for detection of lung nodules on chest computed tomography: Impact of nodule size, distance, and local lung complexity.** *Medical physics*

Ebner, L., Tall, M., Choudhury, K. R., Ly, D. L., Roos, J. E., Napel, S., Rubin, G. D.
2017

- **Adaptive local window for level set segmentation of CT and MRI liver lesions.** *Medical image analysis*
  Hoogi, A., Beaulieu, C. F., Cunha, G. M., Heba, E., Sirlin, C. B., Napel, S., Rubin, D. L.
  2017; 37: 46-55

- **Predictive radiogenomics modeling of EGFR mutation status in lung cancer** *SCIENTIFIC REPORTS*
  Gevaert, O., Echegaray, S., Khuong, A., Hoang, C. D., Shrager, J. B., Jensen, K. C., Berry, G. J., Guo, H. H., Lau, C., Plevritis, S. K., Rubin, D. L., Napel, S., Leung, et al
  2017; 7

- **A Convolutional Neural Network for Automatic Characterization of Plaque Composition in Carotid Ultrasound** *IEEE JOURNAL OF BIOMEDICAL AND HEALTH INFORMATICS*
  Lekadir, K., Galimzianova, A., Betriu, A., del Mar Vila, M., Igual, L., Rubin, D. L., Fernandez, E., Radeva, P., Napel, S.
  2017; 21 (1): 48-55

- **Heterogeneous Enhancement Patterns of Tumor-adjacent Parenchyma at MR Imaging Are Associated with Dysregulated Signaling Pathways and Poor Survival in Breast Cancer.** *Radiology*
  Wu, J. n., Li, B. n., Sun, X. n., Cao, G. n., Rubin, D. L., Napel, S. n., Ikeda, D. M., Kurian, A. W., Li, R. n.
  2017: 162823

- **Noninvasive radiomics signature based on quantitative analysis of computed tomography images as a surrogate for microvascular invasion in hepatocellular carcinoma: a pilot study.** *Journal of medical imaging (Bellingham, Wash.)*
  Bakr, S. n., Echegaray, S. n., Shah, R. n., Kamaya, A. n., Louie, J. n., Napel, S. n., Kothary, N. n., Gevaert, O. n.
  2017; 4 (4): 041303

- **Radiomics of Lung Nodules: A Multi-Institutional Study of Robustness and Agreement of Quantitative Imaging Features.** *Tomography : a journal for imaging research*
  Kalpathy-Cramer, J., Mamomov, A., Zhao, B., Lu, L., Cherezov, D., Napel, S., Echegaray, S., Rubin, D., McNitt-Gray, M., Lo, P., Sieren, J. C., Uthoff, J., Dilger, et al
  2016; 2 (4): 430-437

- **A Rapid Segmentation-Insensitive "Digital Biopsy" Method for Radiomic Feature Extraction: Method and Pilot Study Using CT Images of Non-Small Cell Lung Cancer.** *Tomography : a journal for imaging research*
  Echegaray, S., Nair, V., Kadoch, M., Leung, A., Rubin, D., Gevaert, O., Napel, S.
  2016; 2 (4): 283-294

- **Intratumor Partitioning of Serial Computed Tomography and FDG Positron Emission Tomography Images Identifies High-Risk Tumor Subregions and Predicts Patterns of Failure in Non-Small Cell Lung Cancer After Radiation Therapy** *58th Annual Meeting of the American-Society-for-Radiation-Oncology (ASTRO)*
  Wu, J., Gensheimer, M. F., Dong, X., Rubin, D. L., Napel, S., Diehn, M., Loo, B. W., Li, R.
  ELSEVIER SCIENCE INC.2016: S100–S100

- **Robust Intratumor Partitioning to Identify High-Risk Subregions in Lung Cancer: A Pilot Study.** *International journal of radiation oncology, biology, physics*
  Wu, J., Gensheimer, M. F., Dong, X., Rubin, D. L., Napel, S., Diehn, M., Loo, B. W., Li, R.
  2016; 95 (5): 1504-1512

- **A Comparison of Lung Nodule Segmentation Algorithms: Methods and Results from a Multi-institutional Study** *JOURNAL OF DIGITAL IMAGING*
  Kalpathy-Cramer, J., Zhao, B., Goldgof, D., Gu, Y., Wang, X., Yang, H., Tan, Y., Gillies, R., Napel, S.
  2016; 29 (4): 476-487

- **SU-D-207B-05: Robust Intra-Tumor Partitioning to Identify High-Risk Subregions for Prognosis in Lung Cancer.** *Medical physics*
  Wu, J., Gensheimer, M., Dong, X., Rubin, D., Napel, S., Diehn, M., Loo, B., Li, R.
  2016; 43 (6): 3349-?

- **A Rapid Segmentation-Insensitive 'Digital Biopsy' Method for Radiomic Feature Extraction; Method and Pilot Study Using CT Images of Non-Small Cell Lung Cancer** *Tomography*
  Echegaray, S., Nair, V., Kadoch, M., Leung, A., Rubin, D., Gevaert, O., Napel Sandy , et al

2016; 2 (4): 283–94

- **Core samples for radiomics features that are insensitive to tumor segmentation: method and pilot study using CT images of hepatocellular carcinoma.** *Journal of medical imaging (Bellingham, Wash.)*
  Echegaray, S., Gevaert, O., Shah, R., Kamaya, A., Louie, J., Kothary, N., Napel, S.
  2015; 2 (4): 041011-?
- **Special Section Guest Editorial:Radiomics and Imaging Genomics: Quantitative Imaging for Precision Medicine.** *Journal of medical imaging (Bellingham, Wash.)*
  Napel, S., Giger, M.
  2015; 2 (4): 041001-?
- **Magnetic resonance image features identify glioblastoma phenotypic subtypes with distinct molecular pathway activities.** *Science translational medicine*
  Itakura, H., Achrol, A. S., Mitchell, L. A., Loya, J. J., Liu, T., Westbroek, E. M., Feroze, A. H., Rodriguez, S., Echegaray, S., Azad, T. D., Yeom, K. W., Napel, S., Rubin, et al
  2015; 7 (303): 303ra138-?
- **Magnetic resonance image features identify glioblastoma phenotypic subtypes with distinct molecular pathway activities.** *Science translational medicine*
  Itakura, H., Achrol, A. S., Mitchell, L. A., Loya, J. J., Liu, T., Westbroek, E. M., Feroze, A. H., Rodriguez, S., Echegaray, S., Azad, T. D., Yeom, K. W., Napel, S., Rubin, et al
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