

Stanford



Richard E. Fan

Clinical Assistant Professor, Urology

Bio

BIO

Richard E. Fan, Ph.D., is an engineer embedded in the Department of Urology in the Stanford School of Medicine.

Dr. Fan's research relates to the development of clinically driven biomedical instrumentation and medical devices. He is interested in translational application of emerging technologies in the medical and surgical spaces, as well as the development of platforms to explore clinical and pre-clinical evaluation. His primary work is currently focused on image guided detection and treatment of prostate cancer, including MR-US fusion, focal therapies, embedded systems and robotics.

ACADEMIC APPOINTMENTS

- Clinical Assistant Professor, Urology

ADMINISTRATIVE APPOINTMENTS

- Engineering Director, Urologic Cancer Innovation Lab, (2014- present)
- Undergraduate Programs, Stanford Byers Center for Biodesign, (2017- present)

PROFESSIONAL EDUCATION

- PhD, UCLA , Biomedical Engineering (2010)
- MS, UCLA , Electrical Engineering (2006)
- BS, University of Arizona , Electrical Engineering (2005)

LINKS

- Urologic Cancer Innovation Lab: <http://ucil.stanford.edu>
- Stanford Byers Center for Biodesign: <http://biodesign.stanford.edu>

Teaching

COURSES

2022-23

- Biodesign Fundamentals: MED 175B (Spr)
- Biodesign Fundamentals: MED 275B (Spr)
- Biodesign: Need in Finding Healthcare: MED 260 (Aut)
- Senior Capstone Design I: BIOE 141A (Aut)

- Senior Capstone Design II: BIOE 141B (Win)

2021-22

- Biodesign Fundamentals: MED 175B (Spr)
- Biodesign Fundamentals: MED 275B (Spr)
- Biodesign: Seminar in Need-Driven Medical Innovation: MED 260 (Spr)
- Senior Capstone Design I: BIOE 141A (Aut)
- Senior Capstone Design II: BIOE 141B (Win)

2020-21

- Biodesign Fundamentals: MED 275B (Spr)
- Senior Capstone Design I: BIOE 141A (Aut)
- Senior Capstone Design II: BIOE 141B (Win)

2019-20

- Biodesign Fundamentals: MED 275B (Spr)
- Senior Capstone Design I: BIOE 141A (Aut)
- Senior Capstone Design II: BIOE 141B (Win)

Publications

PUBLICATIONS

- **A review of artificial intelligence in prostate cancer detection on imaging.** *Therapeutic advances in urology*
Bhattacharya, I., Khandwala, Y. S., Vesal, S., Shao, W., Yang, Q., Soerensen, S. J., Fan, R. E., Ghanouni, P., Kunder, C. A., Brooks, J. D., Hu, Y., Rusu, M., Sonn, et al
2022; 14: 17562872221128791
- **Domain generalization for prostate segmentation in transrectal ultrasound images: A multi-center study.** *Medical image analysis*
Vesal, S., Gayo, I., Bhattacharya, I., Natarajan, S., Marks, L. S., Barratt, D. C., Fan, R. E., Hu, Y., Sonn, G. A., Rusu, M.
2022; 82: 102620
- **Evaluation of post-ablation mpMRI as a predictor of residual prostate cancer after focal high intensity focused ultrasound (HIFU) ablation.** *Urologic oncology*
Khandwala, Y. S., Morisetty, S., Ghanouni, P., Fan, R. E., Soerensen, S. J., Rusu, M., Sonn, G. A.
2022
- **Multi-institutional analysis of clinical and imaging risk factors for detecting clinically significant prostate cancer in men with PI-RADS 3 lesions.** *Cancer*
Fang, A. M., Shumaker, L. A., Martin, K. D., Jackson, J. C., Fan, R. E., Khajir, G., Patel, H. D., Soodana-Prakash, N., Vourganti, S., Filson, C. P., Sonn, G. A., Sprenkle, P. C., Gupta, et al
2022
- **Computational Detection of Extraprostatic Extension of Prostate Cancer on Multiparametric MRI Using Deep Learning.** *Cancers*
Moroianu, S. L., Bhattacharya, I., Seetharaman, A., Shao, W., Kunder, C. A., Sharma, A., Ghanouni, P., Fan, R. E., Sonn, G. A., Rusu, M.
2022; 14 (12)
- **Bridging the gap between prostate radiology and pathology through machine learning.** *Medical physics*
Bhattacharya, I., Lim, D. S., Aung, H. L., Liu, X., Seetharaman, A., Kunder, C. A., Shao, W., Soerensen, S. J., Fan, R. E., Ghanouni, P., To'o, K. J., Brooks, J. D., Sonn, et al
2022
- **Correlation of 68Ga-RM2 PET with Post-Surgery Histopathology Findings in Patients with Newly Diagnosed Intermediate- or High-Risk Prostate Cancer.** *Journal of nuclear medicine : official publication, Society of Nuclear Medicine*
Duan, H., Baratto, L., Fan, R. E., Soerensen, S. J., Liang, T., Chung, B. I., Thong, A. E., Gill, H., Kunder, C., Stoyanova, T., Rusu, M., Loening, A. M., Ghanouni, et al

2022

- **MULTI-INSTITUTIONAL ANALYSIS OF CLINICAL AND IMAGING RISK FACTORS FOR DETECTING CLINICALLY SIGNIFICANT PROSTATE CANCER IN MEN WITH PI-RADS 3 LESIONS**
Fang, A., Shumaker, L., Martin, K., Onah, O., Jackson, J., Khajir, G., Fan, R., Soodana-Prakash, N., Patel, H., Vourganti, S., Filson, C., Sprenkle, P., Sonn, et al
LIPPINCOTT WILLIAMS & WILKINS.2022: E959
- **Image quality assessment for machine learning tasks using meta-reinforcement learning.** *Medical image analysis*
Saeed, S. U., Fu, Y., Stavrinides, V., Baum, Z. M., Yang, Q., Rusu, M., Fan, R. E., Sonn, G. A., Noble, J. A., Barratt, D. C., Hu, Y.
2022; 78: 102427
- **The Learn2Reg 2021 MICCAI Grand Challenge (PIMed Team)**
Shao, W., Vesal, S., Lim, D., Li, C., Golestani, N., Alsinan, A., Fan, R., Sonn, G., Rusu, M., Aubreville, M., Zimmerer, D., Heinrich, M.
SPRINGER INTERNATIONAL PUBLISHING AG.2022: 168-173
- **Integrating zonal priors and pathomic MRI biomarkers for improved aggressive prostate cancer detection on MRI**
Bhattacharya, I., Shao, W., Soerensen, S. C., Fan, R. E., Wang, J. B., Kunder, C., Ghanouni, P., Sonn, G. A., Rusu, M., Drukker, K., Iftekharuddin, K. M.
SPIE-INT SOC OPTICAL ENGINEERING.2022
- **EXTERNAL VALIDATION OF AN ARTIFICIAL INTELLIGENCE ALGORITHM FOR PROSTATE CANCER GLEASON GRADING AND TUMOR QUANTIFICATION**
Schmidt, B., Bhambhani, H. P., Fan, R. E., Kunder, C., Kao, C., Higgins, J. P., Rusu, M., Sonn, G. A.
LIPPINCOTT WILLIAMS & WILKINS.2021: E1004
- **Deep Learning Improves Speed and Accuracy of Prostate Gland Segmentations on Magnetic Resonance Imaging for Targeted Biopsy** *JOURNAL OF UROLOGY*
Soerensen, S., Fan, R. E., Seetharaman, A., Chen, L., Shao, W., Bhattacharya, I., Kim, Y., Sood, R., Borre, M., Chung, B., To'o, K. J., Rusu, M., Sonn, et al
2021; 206 (3): 605-612
- **DETAILED ANALYSIS OF MRI CONCORDANCE WITH PROSTATECTOMY HISTOPATHOLOGY USING DEEP LEARNING-BASED DIGITAL PATHOLOGY**
Hockman, L., Fan, R., Schmidt, B., Bhattacharya, I., Rusu, M., Sonn, G.
LIPPINCOTT WILLIAMS & WILKINS.2021: E813-E814
- **The stanford prostate cancer calculator: Development and external validation of online nomograms incorporating PIRADS scores to predict clinically significant prostate cancer.** *Urologic oncology*
Wang, N. N., Zhou, S. R., Chen, L., Tibshirani, R., Fan, R. E., Ghanouni, P., Thong, A. E., To'o, K. J., Amirkhiz, K., Nix, J. W., Gordetsky, J. B., Sprenkle, P., Rais-Bahrami, et al
2021
- **Deep Learning Improves Speed and Accuracy of Prostate Gland Segmentations on MRI for Targeted Biopsy.** *The Journal of urology*
Soerensen, S. J., Fan, R. E., Seetharaman, A., Chen, L., Shao, W., Bhattacharya, I., Kim, Y., Sood, R., Borre, M., Chung, B. I., To'o, K. J., Rusu, M., Sonn, et al
2021: 101097JU0000000000001783
- **Automated Detection of Aggressive and Indolent Prostate Cancer on Magnetic Resonance Imaging.** *Medical physics*
Seetharaman, A., Bhattacharya, I., Chen, L. C., Kunder, C. A., Shao, W., Soerensen, S. J., Wang, J. B., Teslovich, N. C., Fan, R. E., Ghanouni, P., Brooks, J. D., To'o, K. J., Sonn, et al
2021
- **MR method for measuring microscopic histologic soft tissue textures.** *Magnetic resonance in medicine*
Sonn, G. A., Fan, R. E., Kunder, C. A., Gold, G. E., James, K. M., Parker, I. D., Carlson, J. M., Cannizzaro, S. M., James, T. W.
2021
- **3D Registration of pre-surgical prostate MRI and histopathology images via super-resolution volume reconstruction.** *Medical image analysis*
Sood, R. R., Shao, W. n., Kunder, C. n., Teslovich, N. C., Wang, J. B., Soerensen, S. J., Madhuripan, N. n., Jawahar, A. n., Brooks, J. D., Ghanouni, P. n., Fan, R. E., Sonn, G. A., Rusu, et al
2021; 69: 101957
- **ProGNet: Prostate Gland Segmentation on MRI with Deep Learning**
Soerensen, S., Fan, R., Seetharaman, A., Chen, L., Shao, W., Bhattacharya, I., Borre, M., Chung, B., To'o, K., Sonn, G., Rusu, M., Isgum, Landman, B. A.
SPIE-INT SOC OPTICAL ENGINEERING.2021

- **Optimization of a Thermal Flow Meter for Failure Management of the Shunt in Pediatric Hydrocephalus Patients.** *Annual International Conference of the IEEE Engineering in Medicine and Biology Society. IEEE Engineering in Medicine and Biology Society. Annual International Conference*
Charles Chen, Z., Gary, A., Gupta, V., Grant, G., Fan, R. E.
2021; 2021: 1551-1556
- **Selective identification and localization of indolent and aggressive prostate cancers via CorrSigNIA: an MRI-pathology correlation and deep learning framework.** *Medical image analysis*
Bhattacharya, I., Seetharaman, A., Kunder, C., Shao, W., Chen, L. C., Soerensen, S. J., Wang, J. B., Teslovich, N. C., Fan, R. E., Ghanouni, P., Brooks, J. D., Sonn, G. A., Rusu, et al
2021; 75: 102288
- **Weakly Supervised Registration of Prostate MRI and Histopathology Images**
Shao, W., Bhattacharya, I., Soerensen, S. C., Kunder, C. A., Wang, J. B., Fan, R. E., Ghanouni, P., Brooks, J. D., Sonn, G. A., Rusu, M., DeBruijne, M., Cattin, P. C., Cotin, et al
SPRINGER INTERNATIONAL PUBLISHING AG.2021: 98-107
- **UTILITY OF PSA DENSITY IN PREDICTING UPGRADED GLEASON SCORE IN MEN ON ACTIVE SURVEILLANCE WITH NEGATIVE MRI.** *Urology*
Press, B. H., Khajir, G., Ghabili, K., Leung, C., Fan, R. E., Wang, N. N., Leapman, M. S., Sonn, G. A., Sprenkle, P. C.
2021
- **Adaptable Image Quality Assessment Using Meta-Reinforcement Learning of Task Amenability**
Saeed, S. U., Fu, Y., Stavrinides, V., Baum, Z. C., Yang, Q., Rusu, M., Fan, R. E., Sonn, G. A., Noble, J., Barratt, D. C., Hu, Y., Noble, J. A., Aylward, et al
SPRINGER INTERNATIONAL PUBLISHING AG.2021: 191-201
- **Clinically significant prostate cancer detection on MRI with self-supervised learning using image context restoration**
Bolous, A., Seetharaman, A., Bhattacharya, I., Fan, R. E., Soerensen, S., Chen, L., Ghanouni, P., Sonn, G. A., Rusu, M., Mazurowski, M. A., Drukker, K.
SPIE-INT SOC OPTICAL ENGINEERING.2021
- **Clinical -Prostate cancer Multicenter analysis of clinical and MRI characteristics associated with detecting clinically significant prostate cancer in PI-RADS (v2.0) category 3 lesions** *UROLOGIC ONCOLOGY-SEMINARS AND ORIGINAL INVESTIGATIONS*
Al Awamlh, B., Marks, L. S., Sonn, G. A., Natarajan, S., Fan, R. E., Gross, M. D., Mauer, E., Banerjee, S., Hectors, S., Carlsson, S., Margolis, D. J., Hu, J. C.
2020; 38 (7)
- **Registration of pre-surgical MRI and histopathology images from radical prostatectomy via RAPSODI.** *Medical physics*
Rusu, M., Shao, W., Kunder, C. A., Wang, J. B., Soerensen, S. J., Teslovich, N. C., Sood, R. R., Chen, L. C., Fan, R. E., Ghanouni, P., Brooks, J. D., Sonn, G. A.
2020
- **Multicenter analysis of clinical and MRI characteristics associated with detecting clinically significant prostate cancer in PI-RADS (v2.0) category 3 lesions.** *Urologic oncology*
Al Hussein Al Awamlh, B. n., Marks, L. S., Sonn, G. A., Natarajan, S. n., Fan, R. E., Gross, M. D., Mauer, E. n., Banerjee, S. n., Hectors, S. n., Carlsson, S. n., Margolis, D. J., Hu, J. C.
2020
- **ProsRegNet: A deep learning framework for registration of MRI and histopathology images of the prostate.** *Medical image analysis*
Shao, W. n., Banh, L. n., Kunder, C. A., Fan, R. E., Soerensen, S. J., Wang, J. B., Teslovich, N. C., Madhuripan, N. n., Jawahar, A. n., Ghanouni, P. n., Brooks, J. D., Sonn, G. A., Rusu, et al
2020; 68: 101919
- **Simultaneous transrectal ultrasound and photoacoustic human prostate imaging.** *Science translational medicine*
Kothapalli, S., Sonn, G. A., Choe, J. W., Nikoozadeh, A., Bhuyan, A., Park, K. K., Cristman, P., Fan, R., Moini, A., Lee, B. C., Wu, J., Carver, T. E., Trivedi, et al
2019; 11 (507)
- **Prostate Magnetic Resonance Imaging Interpretation Varies Substantially Across Radiologists** *EUROPEAN UROLOGY FOCUS*
Sonn, G. A., Fan, R. E., Ghanouni, P., Wang, N. N., Brooks, J. D., Loening, A. M., Daniel, B. L., To'o, K. J., Thong, A. E., Leppert, J. T.
2019; 5 (4): 592-99
- **How Often is the Dynamic Contrast Enhanced Score Needed in PI-RADS Version 2?** *Current problems in diagnostic radiology*
Roh, A. T., Fan, R. E., Sonn, G. A., Vasanaawala, S. S., Ghanouni, P., Loening, A. M.
2019

- **AUTOMATED DETECTION OF PROSTATE CANCER ON MULTIPARAMETRIC MRI USING DEEP NEURAL NETWORKS TRAINED ON SPATIAL COORDINATES AND PATHOLOGY OF BIOPSY CORES**
Chen, L., Bien, N., Fan, R., Cheong, R., Rajpurkar, P., Thong, A., Wang, N., Ahmadi, S., Rusu, M., Brooks, J., Ng, A., Sonn, G.
LIPPINCOTT WILLIAMS & WILKINS.2019: E1098
- **GENERALIZABLE MULTI-SITE TRAINING AND TESTING OF DEEP NEURAL NETWORKS USING IMAGE NORMALIZATION.** *Proceedings. IEEE International Symposium on Biomedical Imaging*
Onofrey, J. A., Casetti-Dinescu, D. I., Lauritzen, A. D., Sarkar, S., Venkataraman, R., Fan, R. E., Sonn, G. A., Sprenkle, P. C., Staib, L. H., Papademetris, X.
2019; 2019: 348-351
- **Applying the PRECISION approach in biopsy naïve and previously negative prostate biopsy patients.** *Urologic oncology*
Wang, N. N., Teslovich, N. C., Fan, R. E., Ghanouni, P. n., Leppert, J. T., Brooks, J. D., Ahmadi, S. n., Sonn, G. A.
2019
- **GENERALIZABLE MULTI-SITE TRAINING AND TESTING OF DEEP NEURAL NETWORKS USING IMAGE NORMALIZATION**
Onofrey, J. A., Casetti-Dinescu, D. I., Lauritzen, A. D., Sarkar, S., Venkataraman, R., Fan, R. E., Sonn, G. A., Sprenkle, P. C., Staib, L. H., Papademetris, X., IEEE
IEEE.2019: 348-51
- **Framework for the co-registration of MRI and Histology Images in Prostate Cancer Patients with Radical Prostatectomy**
Rusu, M., Kunder, C., Fan, R., Ghanouni, P., West, R., Sonn, G., Brooks, J., Angelini, E. D., Landman, B. A.
SPIE-INT SOC OPTICAL ENGINEERING.2019
- **Teaching Urologists "How to Read Multi-Parametric Prostate MRIs Using PIRADSV2": Results of an iBook Pilot Study.** *Urology*
Wang, N. N., Fan, R. E., Ghanouni, P. n., Sonn, G. A.
2019
- **Performance of multiparametric MRI appears better when measured in patients who undergo radical prostatectomy.** *Research and reports in urology*
Wang, N. N., Fan, R. E., Leppert, J. T., Ghanouni, P., Kunder, C. A., Brooks, J. D., Chung, B. I., Sonn, G. A.
2018; 10: 233-235
- **Gallium 68 PSMA-11 PET/MR Imaging in Patients with Intermediate- or High-Risk Prostate Cancer** *RADIOLOGY*
Park, S., Zacharias, C., Harrison, C., Fan, R. E., Kunder, C., Hatami, N., Giesel, F., Ghanouni, P., Daniel, B., Loening, A. M., Sonn, G. A., Iagaru, A.
2018; 288 (2): 495-505
- **Reduction of Muscle Contractions during Irreversible Electroporation Therapy Using High-Frequency Bursts of Alternating Polarity Pulses: A Laboratory Investigation in an Ex Vivo Swine Model** *JOURNAL OF VASCULAR AND INTERVENTIONAL RADIOLOGY*
Sano, M. B., Fan, R. E., Cheng, K., Saenz, Y., Sonn, G. A., Hwang, G. L., Xing, L.
2018; 29 (6): 893-98
- **Gallium 68 PSMA-11 PET/MR Imaging in Patients with Intermediate- or High-Risk Prostate Cancer.** *Radiology*
Park, S. Y., Zacharias, C., Harrison, C., Fan, R. E., Kunder, C., Hatami, N., Giesel, F., Ghanouni, P., Daniel, B., Loening, A. M., Sonn, G. A., Iagaru, A.
2018: 172232
- **The impact of computed high b-value images on the diagnostic accuracy of DWI for prostate cancer: A receiver operating characteristics analysis.** *Scientific reports*
Ning, P. n., Shi, D. n., Sonn, G. A., Vasanaawala, S. S., Loening, A. M., Ghanouni, P. n., Obara, P. n., Shin, L. K., Fan, R. E., Hargreaves, B. A., Daniel, B. L.
2018; 8 (1): 3409
- **Performance of multiparametric MRI appears better when measured in patients who undergo radical prostatectomy** *RESEARCH AND REPORTS IN UROLOGY*
Wang, N. N., Fan, R. E., Leppert, J. T., Ghanouni, P., Kunder, C. A., Brooks, J. D., Chung, B., Sonn, G. A.
2018; 10: 233-35
- **Reduction of Muscle Contractions during Irreversible Electroporation Therapy Using High-Frequency Bursts of Alternating Polarity Pulses: A Laboratory Investigation in an ExVivo Swine Model.** *Journal of vascular and interventional radiology : JVIR*
Sano, M. B., Fan, R. E., Cheng, K., Saenz, Y., Sonn, G. A., Hwang, G. L., Xing, L.
2018; 29 (6): 893
- **Mass spectrometric imaging of prostate biopsy samples: Cancer margin assessment from the distribution of small metabolites and lipids**
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- **Diagnosis of prostate cancer by desorption electrospray ionization mass spectrometric imaging of small metabolites and lipids** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Banerjee, S., Zare, R. N., Tibshirani, R. J., Kunder, C. A., Nolley, R., Fan, R., Brooks, J. D., Sonn, G. A.
2017; 114 (13): 3334-3339
- **Asymmetric Waveforms Decrease Lethal Thresholds in High Frequency Irreversible Electroporation Therapies** *SCIENTIFIC REPORTS*
Sano, M. B., Fan, R. E., Xing, L.
2017; 7
- **Prostate Magnetic Resonance Imaging Interpretation Varies Substantially Across Radiologists.** *European urology focus*
Sonn, G. A., Fan, R. E., Ghanouni, P. n., Wang, N. N., Brooks, J. D., Loening, A. M., Daniel, B. L., To'o, K. J., Thong, A. E., Leppert, J. T.
2017
- **Production of Spherical Ablations Using Nonthermal Irreversible Electroporation: A Laboratory Investigation Using a Single Electrode and Grounding Pad.** *Journal of vascular and interventional radiology*
Sano, M. B., Fan, R. E., Hwang, G. L., Sonn, G. A., Xing, L.
2016; 27 (9): 1432-1440 e3
- **PROSTATE CANCER YIELD IN MRI LESIONS VARIES ACROSS RADIOLOGISTS**
Sonn, G., Fan, R., Li, S., Ghanouni, P., Loening, A., Daniel, B., To'o, K., Gill, H., Chung, B., Brooks, J.
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- **Simplified prostate lesion grading for magnetic resonance imaging and improved cancer detection at fusion-targeted prostate biopsy.**
Kardos, S. V., Nawaf, C., Fan, R., Cornfeld, D., Weinreb, J., Schulam, P., Sprengle, P.
AMER SOC CLINICAL ONCOLOGY.2015
- **Haptic Biofeedback for Improving Compliance With Lower-Extremity Partial Weight Bearing** *ORTHOPEDICS*
Fu, M. C., DeLuke, L., Buerba, R. A., Fan, R. E., Zheng, Y., Leslie, M. P., Baumgaertner, M. R., Grauer, J. N.
2014; 37 (11): E993–E998
- **A Novel Device to Preserve Intestinal Tissue Ex-Vivo by Cold Peristaltic Perfusion**
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IEEE.2014: 3118–21
- **The role of tactile feedback in grip force during laparoscopic training tasks**
Wottawa, C. R., Cohen, J. R., Fan, R. E., Bisley, J. W., Culjat, M. O., Grundfest, W. S., Dutson, E. P.
SPRINGER.2013: 1111–18
- **Design and Evaluation of Partial Weight-Bearing Sensor and Haptic Feedback System for Lower-Extremity Orthopedic Patients**
DeLuke, L., Zheng, Y., Fan, R. E., Fu, M. C., Grauer, J. N., Morrell, J. B., IEEE
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- **Fabrication of a Thin-film Capacitive Force Sensor Array for Tactile Feedback in Robotic Surgery**
Paydar, O. H., Wottawa, C. R., Fan, R. E., Dutson, E. P., Grundfest, W. S., Culjat, M. O., Candler, R. N., IEEE
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- **In-vitro cell system for studying molecular mechanisms of action associated with low intensity focused ultrasound**
Babakhanian, M., Fan, R. E., Mulgaonkar, A. P., Singh, R., Culjat, M. O., Danesh, S. M., Toro, L., Grundfest, W., Melega, W. P., VoDinh, T., MahadevanJansen, A., Grundfest, W. S.
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- **Applications of Tactile Feedback in Medicine**
Wottawa, C., Fan, R., Bisley, J. W., Dutson, E. P., Culjat, M. O., Grundfest, W. S., Westwood, J. D., Westwood, S. W., FellanderTsai, L., Haluck, R. S., Hoffman, H. M., Robb, R. A., Senger, et al
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- **Remote Tactile Sensing Glove-Based System**
Culjat, M. O., Son, J., Fan, R. E., Wottawa, C., Bisley, J. W., Grundfest, W. S., Dutson, E. P., IEEE

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- **Characterization of a Pneumatic Balloon Actuator for Use in Refreshable Braille Displays**

Fan, R. E., Feinman, A. M., Wottawa, C., King, C., Franco, M. L., Dutson, E. P., Grundfest, W. S., Culjat, M. O., Westwood, J. D., Westwood, S. W., Haluck, R. S., Hoffman, H. M., Mogel, et al

IOS PRESS.2009: 94-+

- **A haptic feedback system for lower-limb prostheses** *IEEE TRANSACTIONS ON NEURAL SYSTEMS AND REHABILITATION ENGINEERING*

Fan, R. E., Culjat, M. O., King, C., Franco, M. L., Boryk, R., Bisley, J. W., Dutson, E., Grundfest, W. S.

2008; 16 (3): 270–77

- **A Prototype Haptic Feedback System for Lower-Limb Prostheses and Sensory Neuropathy**

Fan, R. E., Culjat, M. O., King, C., Franco, M. L., Sedrak, M., Bisley, J. W., Dutson, E. P., Grundfest, W. S., Westwood, J. D., Haluck, R. S., Hoffman, H. M., Mogel, G. T., Phillips, et al

IOS PRESS.2008: 115-+

- **Optimization of a Tactile Feedback System to Aid the Rehabilitation of Lower-Limb Amputees**

Culjat, M. O., Fan, R. E., Grundfest, W. S., IEEE

IEEE.2008: 63