Stanford



Vivek P. Buch, MD

Assistant Professor of Neurosurgery

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Bio

BIO

Dr. Buch is a neurosurgeon with fellowship training in epilepsy, functional, and minimally invasive neurosurgery. He is an Assistant Professor of Neurosurgery, and Christina and Hamid Moghadam Faculty Scholar at Stanford University.

Dr. Buch focuses his expertise on the open and minimally invasive treatment of epilepsy, low grade brain tumors, movement and neuropsychiatric disorders, facial and body pain syndromes, and other complex neurological conditions. He uses advanced and innovative techniques to treat both adult and pediatric patients. For each patient, he develops a personalized care plan that is designed to be both comprehensive and compassionate.

Dr. Buch has conducted extensive research. His career goal is to develop restorative bioengineering approaches for complex neurocognitive, neurodevelopmental, and neuropsychiatric disorders. He is creating network-neuroprosthetics and focused ultrasound delivery mechanisms for precision cellular, gene, and molecular therapies to restore abnormal brain circuit function in these vulnerable patient populations. He is further pioneering novel intraoperative technologies including personalized network-based targeting, holographic mixed reality, and artificial intelligence platforms for minimally invasive cranial surgery.

He has co-authored articles on his research discoveries in Nature Medicine, Neuron, Brain, Annals of Surgery, Frontiers in Neuroscience, Epilepsia, Brain Stimulation, Stereotactic and Functional Neurosurgery, Surgical Innovation, Frontiers in Surgery, Journal of Neurosurgery, and many other journals. Articles focus on developing novel network control theory applications to human brain functions and new techniques and technologies to enhance neurosurgical effectiveness and patient outcomes.

He is the Section Editor for NEUROSURGERY, and a guest editor for Surgical Innovation and Brain Sciences. He also has co-authored chapters in the books Neurosurgical Atlas, Operative Techniques in Epilepsy Surgery, Deep Brain Stimulation, and The Encyclopedia of Medical Robotics.

Dr. Buch has presented the findings of his research at the national conferences of numerous professional associations. Among them are the American Association of Neurological Surgeons, Society for Neuroscience, Congress of Neurological Surgeons, and Society for Imaging Informatics in Medicine. Topics include understanding network mechanisms of cognitive control and advances in the use of augmented reality technology to enhance neurosurgical approaches.

For his clinical, research, and academic achievements. Dr. Buch has earned many honors. He has won awards from the American Association of Neurological Surgeons, American Roentgen Ray Society, Congress of Neurological Surgeons, and National Institutes of Health.

Dr. Buch is a member of the American Association of Neurological Surgeons, Congress of Neurological Surgeons, World Society for Stereotactic and Functional Neurosurgery, American Association of Stereotactic and Functional Neurosurgery, and Alpha Omega Alpha Medical Honor Society.

He holds patents on such topics as artificial intelligence systems designed to help guide surgery and neural control signals for behavioral modification and closed-loop stimulation therapy.

CLINICAL FOCUS

- Neurosurgery
- Epilepsy Surgery
- Deep Brain Stimulation
- Laser Interstitial Thermal Therapy
- Focused Ultrasound
- Functional Mapping for Brain Tumors
- Awake Craniotomies
- Movement Disorders
- Facial Pain Syndromes

ACADEMIC APPOINTMENTS

- Assistant Professor University Medical Line, Neurosurgery
- Member, Bio-X
- Member, Wu Tsai Human Performance Alliance
- Member, Wu Tsai Neurosciences Institute

ADMINISTRATIVE APPOINTMENTS

• Christina and Hamid Moghadam Faculty Scholar, School of Medicine, (2024- present)

HONORS AND AWARDS

- Young Neurosurgeon of the Year Award Functional & Restorative Neurosurgery, Congress of Neurological Surgeons
- Nomination for TV Documentary Series, "New Frontiers in Neurosurgery"
- Cover Article Selection, Epilepsia
- Editor's Choice, World Neurosurgery Best Papers
- Pilot Award, Penn Health-Tech Medical Device Competition
- "Rookie of the Year" Influencers of Healthcare Nomination, Philadelphia Inquirer
- Invited Speaker, PennHealthX Medical Innovation Symposium
- Nomination, STAT Wunderkinds
- Resident Award, American Roentgen Ray Society
- Podium Presentation Selections, American Association of Neurological Surgeons
- Editor's Choice: Best Papers, Journal of Neurosurgery Peds

• Award, Who's Who in America

- National Innovation Pre-Accelerator Advancement Selection, FedTech
- National Innovation Cohort Selection, Best Team, Lead Inventor, FedTech
- Podium Presentation Selection Functional Scientific Session, American Association of Neurological Surgeons
- Annual Meeting Best Oral Presentation, Pennsylvania Neurosurgical State Society
- Alpha Omega Alpha Selection, Medical National Honor Society
- Sigma Xi Research Award -- Most Outstanding Student Researcher in MD Class of 2013, The Warren Alpert Medical School of Brown University (2013)
- Dr. Stanley M. Aronson Award -- Most Outstanding Student in Neurosciences in MD Class of 2013, The Warren Alpert Medical School of Brown University (2013)
- National Institutes of Health Research Scholar Selection, Howard Hughes Medical Institute
- 2nd Place Overall Abstract Award, North American Neuromodulation Society
- · Podium Presentation Selection, American Society for Stereotactic and Functional Neurosurgery
- · Best Poster Award, Movement Disorders, American Society for Stereotactic and Functional Neurosurgery
- New Investigator Award Finalist, Rhode Island Hospital Research Celebration
- Presidential Scholar, United States Department of Education

PROFESSIONAL EDUCATION

- Fellowship: Stanford University Dept of Neurosurgery (2021) CA
- Fellowship: University of Pennsylvania Dept of Neurology PA
- Instructor, Stanford University, Epilepsy, Restorative, and Functional Neurosurgery, Department of Neurosurgery (2021)
- Fellowship, University of Pennsylvania, Epilepsy and Minimally Invasive Neurosurgery, Department of Neurosurgery (2020)
- Residency: University of Pennsylvania Dept of GME (2020) PA
- Medical Education: Warren Alpert Medical School Brown University (2013) RI
- Research Scholar, Howard Hughes Medical Institute National Institutes of Health , Complex Network Science (2012)

Research & Scholarship

CLINICAL TRIALS

• FIH Study of NRTX-1001 Neural Cell Therapy in Drug-Resistant Unilateral Mesial Temporal Lobe Epilepsy, Recruiting

Teaching

STANFORD ADVISEES

Med Scholar Project Advisor

Fatima Al Rashed

Postdoctoral Faculty Sponsor

Anjali Datta, Jay Park, Aybike Saglam

Publications

PUBLICATIONS

• The fasciola cinereum of the hippocampal tail as an interventional target in epilepsy. Nature medicine

Jamiolkowski, R. M., Nguyen, Q. A., Farrell, J. S., McGinn, R. J., Hartmann, D. A., Nirschl, J. J., Sanchez, M. I., Buch, V. P., Soltesz, I. 2024

- Ultrasound-Induced Cascade Amplification in a Mechanoluminescent Nanotransducer for Enhanced Sono-Optogenetic Deep Brain Stimulation. ACS nano Wang, W., Kevin Tang, K. W., Pyatnitskiy, I., Liu, X., Shi, X., Huo, D., Jeong, J., Wynn, T., Sangani, A., Baker, A., Hsieh, J. C., Lozano, A. R., Artman, et al 2023
- Subjective states induced by intracranial electrical stimulation matches the cytoarchitectonic organization of the human insula. *Brain stimulation* Duong, A., Quabs, J., Kucyi, A., Lusk, Z., Buch, V., Caspers, S., Parvizi, J. 2023
- Developing the surgeon-machine interface: using a novel instance-segmentation framework for intraoperative landmark labelling. *Frontiers in surgery* Park, J. J., Doiphode, N., Zhang, X., Pan, L., Blue, R., Shi, J., Buch, V. P. 2023: 10: 1259756
- Accumbens connectivity during deep-brain stimulation differentiates loss of control from physiologic behavioral states. *Brain stimulation* Rolle, C. E., Ng, G. Y., Nho, Y. H., Barbosa, D. A., Shivacharan, R. S., Gold, J. I., Bassett, D. S., Halpern, C. H., Buch, V. 2023
- Long-term outcomes of mesial temporal laser interstitial thermal therapy for drug-resistant epilepsy and subsequent surgery for seizure recurrence: a multi-centre cohort study. *Journal of neurology, neurosurgery, and psychiatry* Youngerman, B. E., Banu, M. A., Khan, F., McKhann, G. M., Schevon, C. A., Jagid, J. R., Cajigas, I., Theodotou, C. B., Ko, A., Buckley, R., Ojemann, J. G., Miller, J. W., Laxton, et al 2023
- Causal evidence for the processing of bodily self in the anterior precuneus. *Neuron* Lyu, D., Stieger, J. R., Xin, C., Ma, E., Lusk, Z., Aparicio, M. K., Werbaneth, K., Perry, C. M., Deisseroth, K., Buch, V., Parvizi, J. 2023
- Multisite thalamic recordings to characterize seizure propagation in the human brain. *Brain : a journal of neurology* Wu, T. Q., Kaboodvand, N., McGinn, R. J., Veit, M., Davey, Z., Datta, A., Graber, K. D., Meador, K. J., Fisher, R., Buch, V., Parvizi, J. 2023
- Taking modern psychiatry into the metaverse: Integrating augmented, virtual, and mixed reality technologies into psychiatric care. Frontiers in digital health

Ford, T. J., Buchanan, D. M., Azeez, A., Benrimoh, D. A., Kaloiani, I., Bandeira, I. D., Hunegnaw, S., Lan, L., Gholmieh, M., Buch, V., Williams, N. R. 2023; 5: 1146806

- Pilot study of responsive nucleus accumbens deep brain stimulation for loss-of-control eating. *Nature medicine* Shivacharan, R. S., Rolle, C. E., Barbosa, D. A., Cunningham, T. N., Feng, A., Johnson, N. D., Safer, D. L., Bohon, C., Keller, C., Buch, V. P., Parker, J. J., Azagury, D. E., Tass, et al 2022
- Magnetic resonance imaging-guided laser interstitial thermal therapy for refractory focal epilepsy in a patient with a fully implanted RNS system: illustrative case. *Journal of neurosurgery. Case lessons*

Buch, V. P., Mirro, E. A., Purger, D. A., Zeineh, M., Wilmer-Fierro, K., Razavi, B., Halpern, C. H. 2022; 3 (21): CASE22117

- How the Brain Anticipates: From Neurons to Networks Ramayya, A. G., Buch, V., Richardson, A., Lucas, T., Gold, J. AMER ASSOC NEUROLOGICAL SURGEONS.2022
- Conversion to Hybrid Deep Brain Stimulation System to Enable Multi-Contact Fractionation Can be Therapeutic. Movement disorders : official journal of the Movement Disorder Society

Ojukwu, D. I., Wang, A. R., Hornbeck, T. S., Lim, E. A., Sharrard, J., Dhall, R., Buch, V. P., Halpern, C. H. 2022

- Network Brain-Computer Interface (nBCI): An Alternative Approach for Cognitive Prosthetics *FRONTIERS IN NEUROSCIENCE* Buch, V. P., Richardson, A. G., Brandon, C., Stiso, J., Khattak, M. N., Bassett, D. S., Lucas, T. H. 2018; 12: 790
- Navigated peel-away sheath assisted placement of fully pre-assembled Ommaya reservoir systems: Technical note. *World neurosurgery: X* Wathen, C. A., Punchak, M., Madsen, P., Vaughan, K., Buch, V., Marcotte, P. J.

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- Evolution of SEEG Strategy: Stanford Experience. *Neurosurgery clinics of North America* Buch, V. P., Parvizi, J. 2024; 35 (1): 83-85
- An Individualized Tractography Pipeline for the Nucleus Basalis of Meynert Lateral Tract. medRxiv : the preprint server for health sciences Crockett, R. A., Wilkins, K. B., Zeineh, M. M., McNab, J. A., Henderson, J. M., Buch, V. P., Brontë-Stewart, H. M. 2023
- Predicting Sedation Level using Surface and Intracranial EEG with Convolutional Neural Networks during Emergence from Anesthesia Han, L., Purger, D., Eagleman, S., Halpern, C., Buch, V., Razavi, B., Meador, K., Drover, D. LIPPINCOTT WILLIAMS & WILKINS.2023: 583-585
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 Jena, R., Zhornyak, L., Doiphode, N., Chaudhari, P., Buch, V., Gee, J., Shi, J., IEEE
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- Methods and Impact for Using Federated Learning to Collaborate on Clinical Research. *Neurosurgery* Cheung, A. T., Nasir-Moin, M., Fred Kwon, Y. J., Guan, J., Liu, C., Jiang, L., Raimondo, C., Chotai, S., Chambless, L., Ahmad, H. S., Chauhan, D., Yoon, J. W., Hollon, et al
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- Do-It-Yourself Augmented Reality Heads-Up Display (DIY AR-HUD): A Technical Note. International journal of spine surgery Yoon, J. W., Spadola, M., Blue, R., Saylany, A., Sharma, N., Ahmad, H. S., Buch, V., Madhavan, K., Chen, H. I., Steinmetz, M. P., Welch, W. C., Malhotra, N. R. 2021
- Theta Synchrony Is Increased near Neural Populations That Are Active When Initiating Instructed Movement *ENEURO* Ramayya, A. G., Yang, A., Buch, V. P., Burke, J. F., Richardson, A. G., Brandon, C., Stein, J. M., Davis, K. A., Chen, H., Proekt, A., Kelz, M. B., Litt, B., Gold, et al 2021; 8 (1)
- Focused ultrasound for functional neurosurgery. *Journal of neuro-oncology* Lev-Tov, L., Barbosa, D. A., Ghanouni, P., Halpern, C. H., Buch, V. P. 2021
- Development of an Intraoperative Pipeline for Holographic Mixed Reality Visualization During Spinal Fusion Surgery *SURGICAL INNOVATION* Buch, V. P., Mensah-Brown, K. G., Germi, J. W., Park, B. J., Madsen, P. J., Borja, A. J., Haldar, D., Basenfelder, P., Yoon, J. W., Schuster, J. M., Chen, H. I. 2020: 1553350620984339
- Aventricular hemispherotomy: technical note *JOURNAL OF NEUROSURGERY-PEDIATRICS* Brimley, C., Buch, V. P., Pisapia, J. M., Kennedy, B. C. 2020; 26 (6): 642-647
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• Focused Ultrasound Thalamotomy with Dentato-Rubro-Thalamic Tractography in Patients with Spinal Cord Stimulators and Cardiac Pacemakers STEREOTACTIC AND FUNCTIONAL NEUROSURGERY

Buch, V. P., McShane, B. J., Beatson, N., Yang, A., Blanke, A., Tilden, D., Korn, M., Chaibainou, H., Ramayya, A., Wombacher, K., Maier, S., Marashlian, T., Wolf, et al

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• Thalamic Deep Brain Stimulation for Essential Tremor: Relation of the Dentatorubrothalamic Tract with Stimulation Parameters WORLD NEUROSURGERY

Yang, A., Buch, V. P., Heman-Ackah, S. M., Ramayya, A. G., Hitti, F. L., Beatson, N., Chaibainou, H., Yates, M., Wang, S., Verma, R., Wolf, R. L., Baltuch, G. H.

2020; 137: E89-E97

• Detailed Analysis of Hydrocephalus and Hindbrain Herniation After Prenatal and Postnatal Myelomeningocele Closure: Report From a Single Institution NEUROSURGERY

Flanders, T. M., Heuer, G. G., Madsen, P. J., Buch, V. P., Mackell, C. M., Alexander, E. E., Moldenhauer, J. S., Zarnow, D. M., Flake, A. W., Adzick, N. 2020; 86 (5): 637-645

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Cho, S. S., Buch, V. P., Teng, C. W., De Ravin, E., Lee, J. K. 2020; 136: 326

• F-18-Fluciclovine PET to distinguish treatment-related effects from disease progression in recurrent glioblastoma: PET fusion with MRI guides neurosurgical sampling NEURO-ONCOLOGY PRACTICE

Henderson, F., Brem, S., O'Rourke, D. M., Nasrallah, M., Buch, V. P., Young, A. J., Doot, R. K., Pantel, A., Desai, A., Bagley, S. J., Nabavizadeh, S. 2020; 7 (2): 152-157

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 Dorfer, C., Rydenhag, B., Baltuch, G., Buch, V., Blount, J., Bollo, R., Gerrard, J., Nilsson, D., Roessler, K., Rutka, J., Sharan, A., Spencer, D., Cukiert, et al 2020; 61 (5): 841-855
- Second Window Indocyanine Green (SWIG) Near Infrared Fluorescent Transventricular Biopsy of Pineal Tumor *WORLD NEUROSURGERY* Cho, A., Cho, S. S., Buch, V. P., Buch, L. Y., Lee, J. K.

2020; 134: 196-200

• Refocusing neurosurgical resident education amidst the COVID-19 crisis: A mental imagery-based transfer learning approach for virtual teaching of operative fundamentals.

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• Endoscopic endonasal resection versus open surgery for pediatric craniopharyngioma: comparison of outcomes and complications JOURNAL OF NEUROSURGERY-PEDIATRICS

Madsen, P. J., Buch, V. P., Douglas, J. E., Parasher, A. K., Lerner, D. K., Alexander, E., Workman, A. D., Palmer, J. N., Lang, S., Kennedy, B. C., Vossough, A., Adappa, N. D., Storm, et al 2019; 24 (3): 236-245

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- An estimation of global volume of surgically treatable epilepsy based on a systematic review and meta-analysis of epilepsy JOURNAL OF NEUROSURGERY

Vaughan, K. A., Ramos, C., Buch, V. P., Mekary, R. A., Amundson, J. R., Shah, M., Rattani, A., Dewan, M. C., Park, K. B. 2019; 130 (4): 1127-1141

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- Increased dynamic modularity of the fronto-temporo-limbic network precedes enhanced task performance *Journal of Neurosurgery* Buch, V., Brandon, C., Khambhati, A., Richardson, A., Bassett, D., Lucas, T. 2018
- Rotational vertebrobasilar insufficiency due to compression of a persistent first intersegmental vertebral artery variant: case report JOURNAL OF NEUROSURGERY-SPINE

Buch, V. P., Madsen, P. J., Vaughan, K. A., Koch, P. F., Kung, D. K., Ozturk, A. K.

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