

ANTON ALYAKIN

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EDUCATION

Washington University in St. Louis <i>Doctor of Medicine</i> 2024 Congress of Neurological Surgeons AI Fellow	[Aug 2021, May 2026] (Expected)
Johns Hopkins University <i>Master of Science in Engineering</i> Applied Mathematics & Statistics	[Jan 2019, Dec 2019]
Johns Hopkins University <i>Bachelor of Science</i> Computer Science Applied Mathematics & Statistics	[Aug 2015, May 2019]

RESEARCH

New York University <i>AI Research Engineer / Visiting Medical Student</i> Department of Neurosurgery / OLAB Faculty Supervisor: Eric K. Oermann	[Mar 2024, present]
Washington University in Saint Louis <i>Medical Student Researcher</i> Department of Neurosurgery / Leuthardt Lab Faculty Supervisor: Eric Leuthardt	[Mar 2023, present]
Johns Hopkins University <i>Assistant Research Engineer</i> Department of Applied Mathematics & Statistics / Neruodata Lab Faculty Supervisors: Carey E. Priebe & Joshua T. Vogelstein	[Jan 2020, Mar 2021]
Johns Hopkins University <i>Graduate Research Assistant</i> Department of Applied Mathematics & Statistics Faculty Supervisor: Carey E. Priebe	[Jun 2019, Dec 2019]
Johns Hopkins University <i>Undergraduate Research Assistant</i> Department of Computer Science Faculty Supervisor: Suchi Saria	[May 2017, May 2019]

AWARDS

Johns Hopkins University Applied Mathematics & Statistics Prize for Outstanding Master's Research Applied Mathematics & Statistics Achievement Award Undergraduate Departmental Honors with Thesis, Computer Science Undergraduate Departmental Honors, Applied Mathematics & Statistics Undergraduate General Honors Whitening School of Engineering Dean's List (8/8 Semesters)	2020 2019 2019 2019 2019 2015-2019
TASIS The American School In Switzerland 2015 Shah Akbar Khan Award for Excellence in Mathematics 2015 AP Scholar with Distinction Valedictorian	2015 2015 2015

DISSERTATIONS

1. **A. Alyakin**, *Robust Hypothesis Testing of Location Parameters using Lq-Likelihood-Ratio-Type Test in Python*, a thesis submitted to The Johns Hopkins University in conformity with the requirements for the degree of Master of Science in Engineering, 2019. [arXiv] [library] [code]
2. **A. Alyakin**, *Motif Discovery in the Irregularly Sampled Time Series Data*, a thesis submitted to The Johns Hopkins University in conformity with the requirements for Senior Honors Thesis in Computer Science, 2019. [pdf]

PUBLICATIONS

1. X. Han[†], **A. Alyakin**[†], S. Ciprut, C. Lapierre, J. Stryker, A. Lowe, J. Golfinos, D. Kondziolka, E. K. Oermann, *Neuro Data Hubs: Clinical Research Data Services for Neurosurgical Departments*, Neurosurgery Practice, to appear, 2025.
2. K. L. Sangwon, X. Han, A. Becker, Y. Zhang, R. Ni, J. Zhang, D. A. Alber, **A. Alyakin**, M. Nakatsuka, N. Fabbri, Y. Aphinyanaphongs, J. Yang, A. Chachoua, D. Kondziolka, I. Laufer, E. K. Oermann, *Automating the referral of cancer patients with and without the use of large language models*, Neurosurgery, to appear, 2025.
3. **A. Alyakin**, D. Kurland, D. Alber, K. Sangwon, D. Li, A. Tsirigos, E. Leuthardt, D. Kondziolka, E. Oermann, *CNS-CLIP: Transforming a Neurosurgical Journal into a Multimodal Medical Model*, Neurosurgery, 2025. [journal]
4. D. A. Alber, Z. Yang, **A. Alyakin**, E. Yang, J. Zhang, S. Rai, A. A. Valliani, G. R. Rosenbaum, A. K. Amend-Thomas, D. B. Kurland, C. M. Kremer, A. Eremiev, B. Negash, D. D. Wiggan, M. A. Nakatsuka, K. L. Sangwon, S. Neifert, H. A. Khan, A. V. Save, A. Palla, E. A. Grin, M. Hedman, M. Nasir-Moin, C. X. Liu, L. Y. Jiang, M. A. Mankowski, D. L. Segev, Y. Aphinyanaphongs, H. A. Riina, J. G. Golfinos, D. A. Orringer, D. Kondziolka, E. K. Oermann, *Medical Large Language Models are Vulnerable to Data-poisoning Attacks*, Nature Medicine, 2025. [journal]
5. R. Guennoun[†], **A. Alyakin**[†], H. Higushi, S. Demehri, *Commensal HPVs Have Evolved to Be More Immunogenic Compared with High-Risk α -HPVs*, Vaccines, 2024. [journal]
6. J. Lee, M. A. Ruiz-Cardozo, R. P. Patel, S. Javeed, R. S. Lavandi, C. Newsom-Stewart, **A. Alyakin**, C. A. Molina, N. Agarwal, W. Z. Ray, M. Santacatterina, B. H. Pennicooke, *Clinical Prediction for Surgical versus Nonsurgical Interventions in Patients with Vertebral Osteomyelitis and Discitis*, Journal of Spine Surgery, 2024. [journal]
7. **A. A. Alyakin**, J. Agterberg, H. S. Helm, and C. E. Priebe, *Correcting a Nonparametric Two-sample Graph Hypothesis Test for Graphs with Different Numbers of Vertices with Applications to Connectomics*, Applied Network Science, 2024. [journal] [arXiv] [code]
8. M. Powell, C. Clark, **A. Alyakin**, J. T. Vogelstein, B. Hart, *Exploration of Residual Confounding in Analyses of Associations of Metformin Use and Outcomes in Adults With Type 2 Diabetes*, JAMA Network Open, 2022. [journal] [arXiv]
9. F. Rahman, N. Finkelstein, **A. Alyakin**, N. A. Gilotra, J. Trost, S. P. Schulman, S. Saria, *Using Machine Learning for Early Prediction of Cardiogenic Shock in Patients with Acute Heart Failure*, Journal of the Society for Cardiovascular Angiography & Interventions, 2022. [journal] [arXiv]
10. J. Chung[†], B. Varjavand[†], J. Arroyo, **A. Alyakin**, J. Agterberg, M. Tang, J. T. Vogelstein, C. E. Priebe, *Valid Two-Sample Graph Testing via Optimal Transport Procrustes and Multiscale Graph Correlation with Applications in Connectomics*, Stat, 2021. [journal] [arXiv] [code]
11. K. Marchisio, Y. Park, A. Saad-Eldin, **A. Alyakin**, K. Duh, C. Priebe, P. Koehn, *An Analysis of Euclidean vs. Graph-Based Framing for Bilingual Lexicon Induction from Word Embedding Spaces*, Findings of the Association for Computational Linguistics: EMNLP 2021. [journal] [arXiv] [code]

ABSTRACTS

1. A. Save, **A. Alyakin**, J. Stryker, D. A. Alber, J. Zhang, G. Rosenbaum, S. Singh, E. Leuthardt, D. Kondziolka, E. K. Oermann, *A Platform for Serving Large Language Models for Neurosurgical Diagnostic Support*, 93th American Association of Neurological Surgeons Annual Scientific Meeting, 2025.
2. G. R. Rosenbaum, L. Y. Jiang, I. Sheth, J. Stryker, **A. Alyakin**, D. A. Alber, N. K. Goff, Y. J. F. Kwon, J. E. Markert, M. Nasir-Moin, J. M. Niehues, K. L. Sangwon, E. Yang, E. K. Oermann, *MedG-KRP: Medical Graph Knowledge Representation Probing*, Findings of the 4th Machine Learning for Health symposium (ML4H), 2024. [arXiv]
3. K. L. Sangwon, D. Kurland, **A. Alyakin**, D. Kondziolka, E. K. Oermann, *Seven Decades Of Change: Tracing The Evolution Of Neurosurgery Through Lexical Analysis Of Neurosurgery Publications Of The CNS (1955-2024)*, Digital Abstract at the 2024 Annual CNS Meeting, 2024.
4. K. L. Sangwon, **A. Alyakin**, D. Kurland, E. Leuthardt, D. Kondziolka, E. K. Oermann, *A Generalizable Pipeline for Building an Extensive Domain-Specific Dataset from a Medical Journal - Neurosurgery Edition*, Oral Presentation at the 2024 Annual CNS Meeting, 2024.
5. **A. Alyakin**, D. Kurland, D. Alber, K. Sangwon, D. Li, A. Tsirigos, E. Leuthardt, D. Kondziolka, E. Oermann, *CNS-CLIP: Transforming a Neurosurgical Journal into a Multimodal Medical Model*, Oral Presentation at the 2024 Annual CNS Meeting, 2024.

PREPRINTS

1. **A. Alyakin**, J. Stryker, D. A. Alber, K. L. Sangwon, J. V. Lee, B. Duderstadt, A. Save, D. Kurland, S. Frome, S. Singh, J. Zhang, E. Yang, K. Y. Park, C. Orillac, A. Valliani, S. Neifert, A. Liu, A. Patel, C. Livia, D. Lau, I. Laufer, P. A. Rozman, E. T. Hidalgo, H. Riina, R. Feng, T. Hollon, Y. Aphinyanaphongs, J. G. Golfinos, L. Snyder, E. Leuthardt, D. Kondziolka, E. K. Oermann, *Repurposing the Scientific Literature with Vision-Language Models*, manuscript submitted, 2025. [arXiv]
2. K. Vishwanath, **A. Alyakin**, M. Ghosh, J. V. Lee, D. A. Alber, K. Sangwon, D. Kondziolka, E. K. Oermann, *Evaluating the Performance and Fragility of Large Language Models on Neurosurgical Board-like Questions*, abstract submitted, manuscript in preparation, 2025. [arXiv]
3. K. Vishwanath, **A. Alyakin**, J. V. Lee, A. Anand, D. A. Alber, E. K. Oermann, *Medical Large Language Models are Easily Distracted*, manuscript submitted, 2025. [arXiv]
4. K. Vishwanath, J. Stryker, **A. Alyakin**, D. A. Alber, E. K. Oermann, *MedMobile: A mobile-sized language model with expert-level clinical capabilities*, manuscript submitted, 2025. [arXiv]
5. S. Singh, **A. Alyakin**, D. A. Alber, J. Stryker, A. P. S Tong, K. L. Sangwon, Nicholas Goff, M. de la Paz, M. Hernandez-Rovira, K. Y. Park, D. Kondziolka, E. K. Oermann, *It is Too Many Options: Pitfalls of Multiple-Choice Questions in Generative AI and Medical Education*, manuscript submitted, 2025. [arXiv]
6. C. Hang, R. Deng, L. Y. Jiang, Z. Yang, D. A. Alber, **A. Alyakin**, E. K. Oermann, *BPQA Dataset: Evaluating How Well Language Models Leverage Blood Pressures to Answer Biomedical Questions*, 2025. [arXiv]
7. **A. Alyakin**, Y. Qin, and C. E. Priebe, *LqRT: Robust Hypothesis Testing of Location Parameters using Lq-Likelihood-Ratio-Type Test in Python*, 2019. [arXiv] [code]

SUBMISSIONS

1. A. Y. Fu, A. A. Valliani, **A. Alyakin**, D. Kondziolka, K. Oermann, *Tabular Foundation Models Predict Clinical Outcomes in Skull Base and Cerebrovascular Surgery*, abstract and manuscript submitted, 2025.
2. C. X. Liu, **A. Alyakin**, J. V. Lee, D. Friedman, Y. Wang, E. K. Oermann, *Montage-Agnostic Foundation Model for Seizure Detection*, abstract submitted, manuscript in preparation, 2025.
3. C. X. Liu, **A. Alyakin**, J. V. Lee, D. Friedman, Y. Wang, E. K. Oermann, *Routine EEG Foundation Model For Epilepsy Diagnosis*, abstract submitted, manuscript in preparation, 2025.
4. **A. Alyakin**, J. Stryker, D. A. Alber, E. Leuthardt, D. Kondziolka, E. K. Oermann, *CNS-Obsidian: A Neurosurgery-Tailored Vision-Language Model Fine-Tuned Exclusively on Scientific Publications*, abstract submitted, 2025.
5. **A. Alyakin**, J. Stryker, S. Singh, D. A. Alber, A. Save, D. Kurland, C. Orillac, A. A. Valliani, S. Neifert, D. Lau, I. Laufer, P. A. Rozman, E. T. Hidalgo, H. Riina, L. Snyder, E. C. Leuthardt, D. Kondziolka, E. Oermann, *Automated Generation And Human Evaluation Of Neurosurgical Board Examination And Self-Assessment Questions*, abstract submitted, 2025
6. **A. Alyakin**, J. Stryker, R. Feng, T. Hollon, D. Kondziolka, E. K. Oermann, *AI-Powered Pipeline Transforms Neurosurgical Articles into High-Quality Graphical Abstracts*, abstract submitted, 2025.
7. **A. Alyakin**, J. V. Lee, H. Riina, E. K. Oermann, *Computational Optimization Of Endovascular Coil Deployment Parameters For Aneurysm Treatment: A Physics-Based Simulation Approach*, abstract submitted.
8. **A. Alyakin**, *Computational Optimization Of Laser Interstitial Thermal Therapy Parameters For Brain Tumor Ablation: A Thermodynamics-Based Simulation Approach*, abstract submitted 2025.
9. S. Singh, J. Zhang, **A. Alyakin**, E. K. Oermann, *GRPO Versus SFT: Optimizing Large Language Models For Neurosurgical Decision Support*, abstract submitted, 2025.
10. N. Maarouf, D. Reinecke, A. Smith, J. E. Markert, T. G Cogan, X. Han, **A. Alyakin**, D. A. Alber, M. Park, N. K. Goff, H. Weiss, E. S. Harake, K Eddy BS, T. Hollon, E. K. Oermann, D. A. Orringer, *Natural Language Processing Methods Automate Molecular Marker Extraction from Glioma Pathology Reports*, manuscript in preparation.

TALKS

Congress of Neurological Surgeons

2025 Artificial Intelligence in Neurosurgery: A Practical Course

May 31st, 2025

How Can We Build Foundation Models with Neurosurgical Data

Global AI Frontier Lab

[Future] Global AI Frontier Lab: Seminar Series

June 16th, 2025

Data Quality is Multidimensional: Product-Market-Data Fit in AI and Neurosurgery

REVIEW

Neurosurgery

Reviewer

[2024, present]

Quantitative Imaging in Medicine and Surgery

Reviewer

[2024, present]

Digital Health

Reviewer

[2025, present]

TEACHING

Congress of Neurological Surgeons

Faculty

[Future] CNS 2025 Special Symposium 3: Data Science and AI for Neurosurgeons *Sep 2025*
2025 Artificial Intelligence in Neurosurgery: A Practical Course *May 2025*

Teaching Assistant

CNS 2024 Special Symposium 3: Data Science and AI for Neurosurgeons *Sep 2024*

Johns Hopkins University

Teaching Assistant

580.475 Biomedical Data Science *Fall 2019*
553.430/630 Introduction to Statistics *Spring 2019*
553.436/636 Data Mining *Fall 2018*

MENTORING

NYU OLAB

Undergraduate Intern Supervisor

Shrutika Singh *[2024, Present]*
Krithik Vishwanath *[2024, Present]*

High School Intern Supervisor

Gabriel Rosenbaum *[2024, 2024]*

SOCIETIES

Congress of Neurological Surgeons

Medical Student Member *[2024, present]*

SKILLS

Languages (in order of proficiency):

Python, English, Russian, R, Matlab, Java, C++.

Python skills:

PyTorch[DDP, FSDP, DeepSpeed, PyTorchLightning, LightningFabric, HuggingFaceAccelerate],
Tensorflow.

Other skills:

L^AT_EX, Git, SLURM, API[OpenAI, Anthropic, AWS Bedrock], Prompt Engineering,
Databases[PostgreSQL, BigQuery], Lead climbing (6b/5.10), Bouldering (7a/V6 indoor; V2
outdoor).

INTERESTS

Clinical:

Cerebrovascular and skull base surgery
Complex reconstructive spine surgery
Neuroendovascular interventions
Stereotactic Radiosurgery

Research:

Large language models (LLMs) and vision-language models (VLMs) in neurosurgery
Statistical networks theory in applications to connectomics
Artificial intelligent agent systems
Causality and consciousness