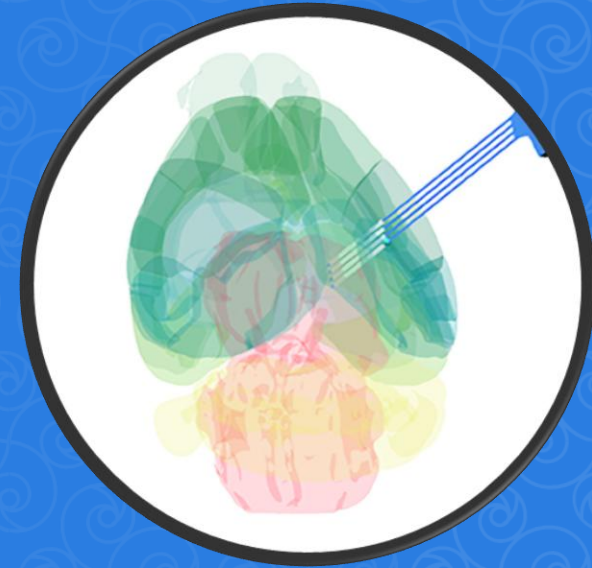




ALLEN INSTITUTE *for*
NEURAL DYNAMICS

PINPOINT

UNITY FOR HUMANITY 2025 PITCH DECK



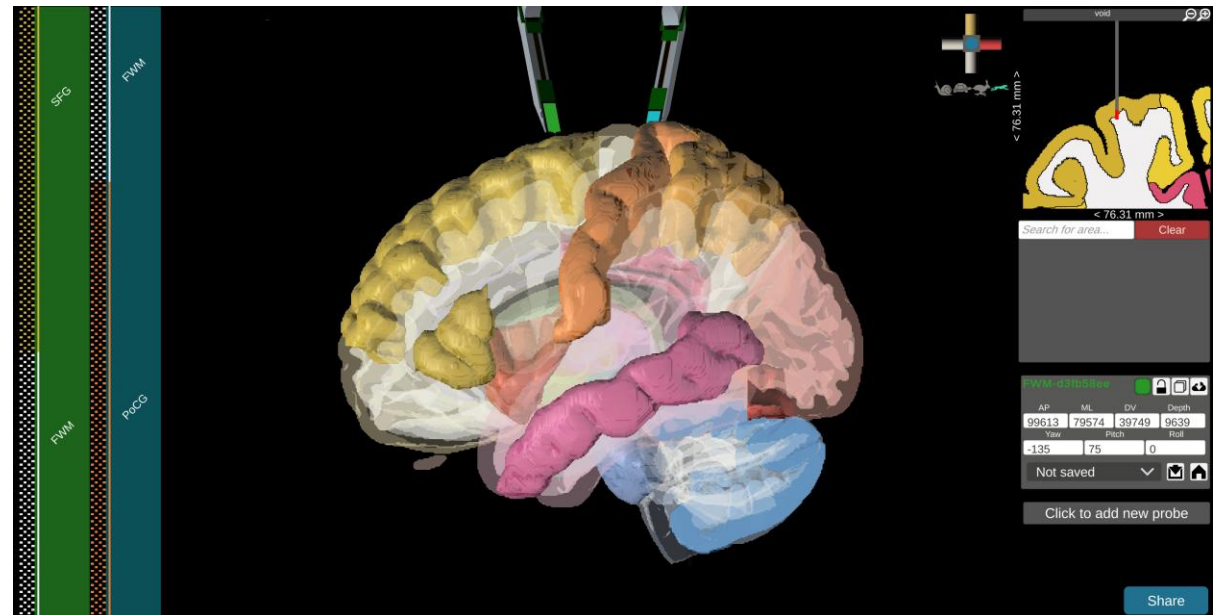
What is Pinpoint?

Interactive 3D visualization
and automation tools
for neuroscience research
and neurosurgery

Available for **free** on the **web**,
desktop, and **handheld consoles**

Demo Video:

<https://youtu.be/io03ATeKapc>



Human brain atlas with Neuropixel electrophysiology probes.

Our Goals with this Grant

Automation

Develop an automated platform for **reproducible** neurosurgical procedures, reducing variability and improving the **efficiency** of experimental workflows.

Expand Access

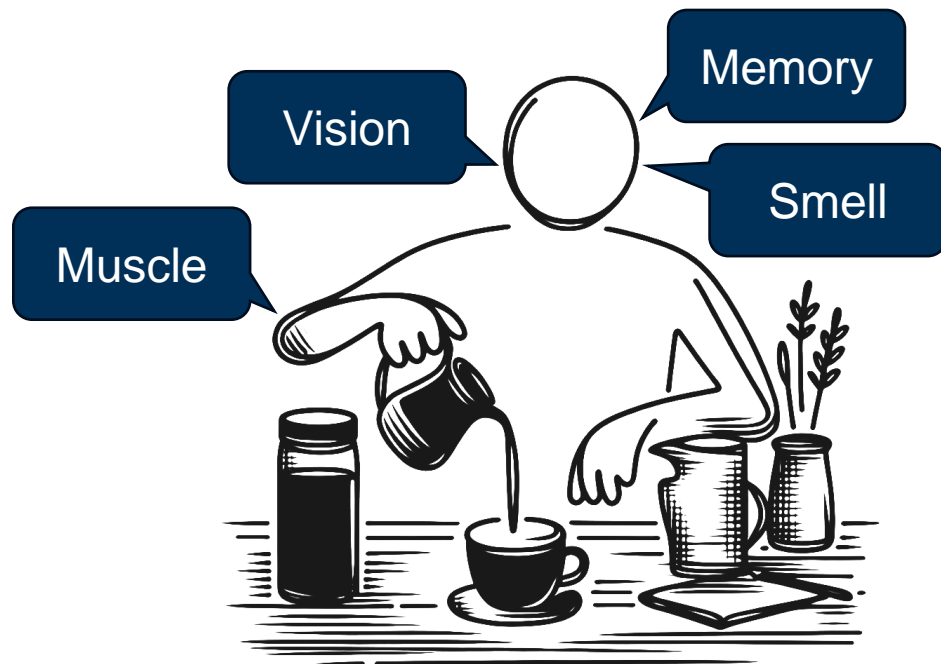
Expand access to **large-scale** neuroscience research by offering **free, web-based** tools for experiment planning, execution, and **education**.

Modern neuroscientists need tools to study the whole brain

Neuroscientists now recognize that **neurodegenerative diseases**, such as Parkinson's and Alzheimer's, affect the entire brain. Understanding these disorders and the **large-scale complex circuits** they impact requires techniques that scale up to measure neural activity **across the whole brain**.

Why do we need new tools?

Human behavior engages multiple regions of the brain...

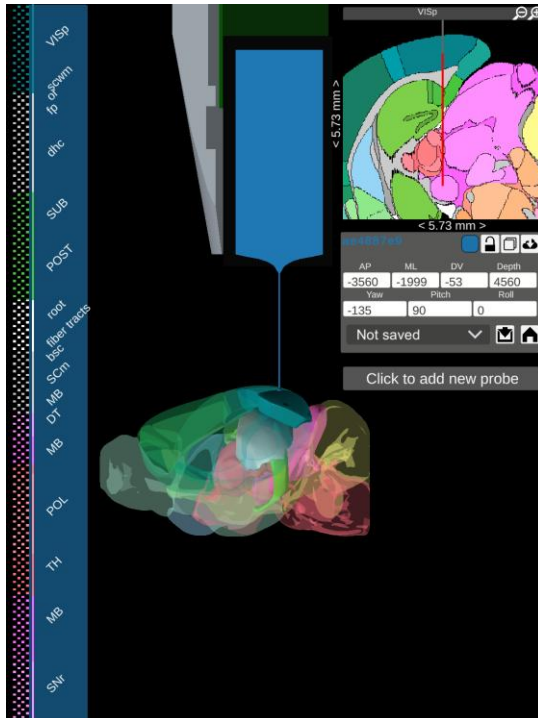


... but current tools only help with studying individual regions



What can Pinpoint do today?

Intuitive 3D planning with in-depth surgical information

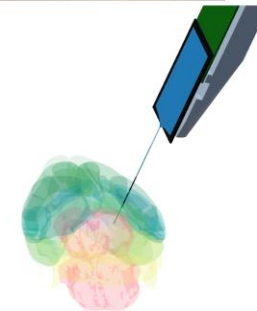


Repeatable surgeries with researcher-assisted robotics

Robotic manipulator



Following a plan defined in Pinpoint



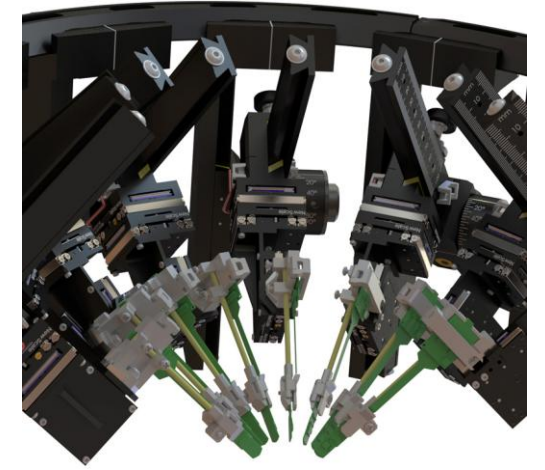
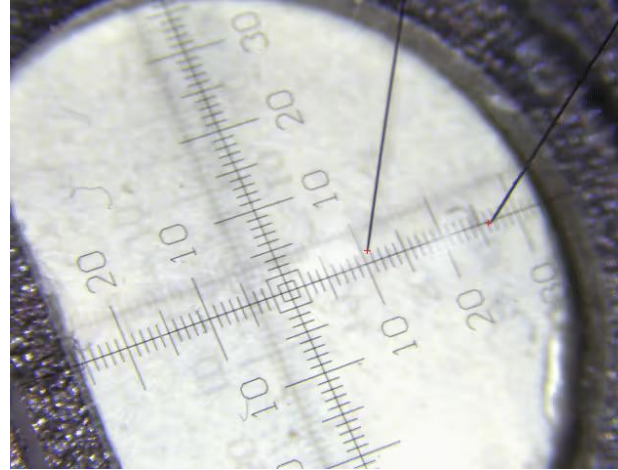
The Future is Fully Automated

Automated surgeries **reduce human error** and **increase efficiency**, enabling neuroscientists to **scale up their work to the whole brain**, unlocking studies and surgeries previously deemed impossible.

Aim 1: Automation

We will develop **computer vision assisted** systems to enable unattended surgery.

This will **reduce human error** and enable **scalable parallelization** of surgery procedures, required for working with the whole brain.

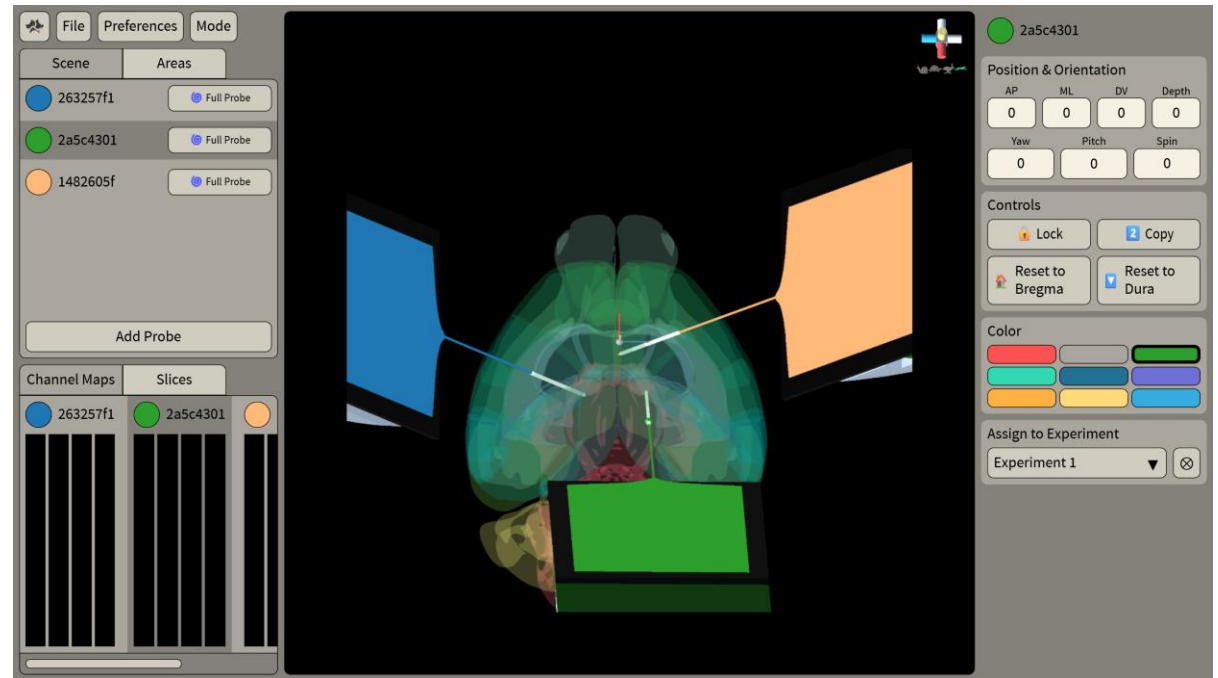


(Right) Parallax computer vision tracking system (probe tips marked with red crosses).
(Left) New Scale MPM rig.

Aim 1: Automation (cont.)

Develop **intuitive interfaces** to **plan and automate** **unattended surgeries**.

Change the **interaction paradigm** for neuroscience tools, emphasizing **digital twinning** and **robotic automation**.



Planned future interface for Pinpoint (using UI Toolkit).

Aim 2: Expanding Access

Bring our free, web-based tools for experiments, surgeries, and education to the **community**.

Share our work at **conferences and workshops** and integrate them into the **classroom** for the next generation. Feedback from community use and user studies drive our development plan.

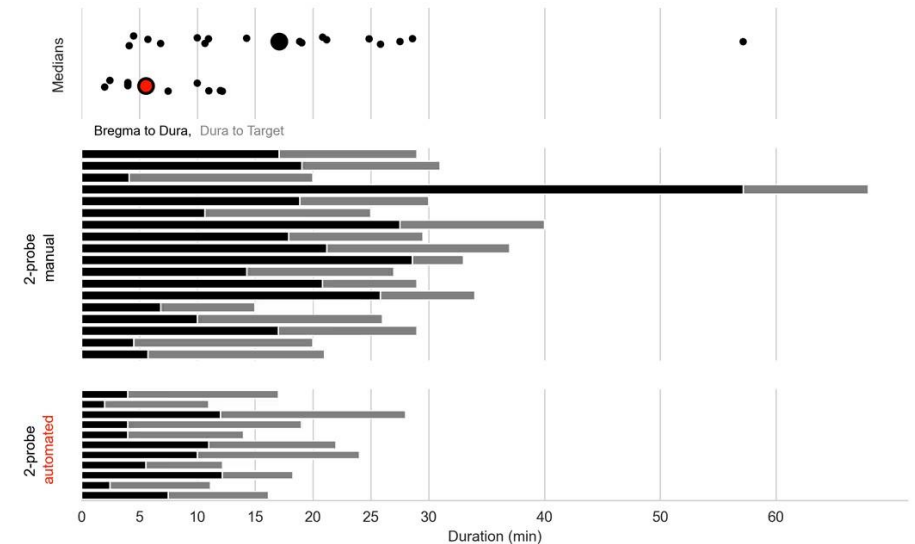


Dr. Birman teaching Pinpoint to researchers at the Allen Institute 2024 Neuropixels and OpenScope Workshop.

How much does automation help?

Using data from experiments in rodents:

- One probe takes about 15 minutes to implant.
- Manually, this process **scales linearly**: two probes take 30 minutes, etc.
- With automation, the process is **parallelized**: any number of probes can be inserted in the same time window.
- *In our data*: the median implant time for **automation** (red dot) is significantly lower than **manual implants** (black dot).



Electrophysiology setup timing in a rodent neuroscience research lab.

Pinpoint's Impact

3 GOOD HEALTH
AND WELL-BEING



Improve surgery ethics and safety by **reducing human error** through automation. **Enables whole-brain studies** essential for addressing neurodegenerative diseases.

4 QUALITY
EDUCATION



Open-source, web-based system **democratizes access** to cutting-edge neuroscience tools for education. The project has also fostered software engineering **research for undergraduates**.

9 INDUSTRY, INNOVATION
AND INFRASTRUCTURE



Introduces **advanced robotics** and computer vision techniques to neurosurgery. These will **boost the efficiency and reproducibility** of smaller-scale operations as well.

Project Timeline

	2025 Summer	2025 Fall	2025 Winter	2026 Spring	2026 Summer
Automation system	Active	Active	Completed	Completed	Completed
UI and hardware integration	Completed	Active	Active	Completed	Completed
Scientific outreach (conferences)	Completed	Completed	Active	Completed	Completed
Education outreach	Completed	Completed	Active	Active	Completed
Evaluation and Adjustments	Completed	Completed	Completed	Completed	Active

Grant Budget Allocation

We are requesting **\$100,000** for salary support for Daniel Birman and Kenneth Yang for **software development** and **support and outreach**.

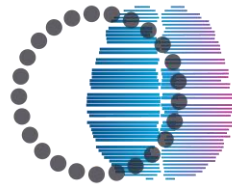
Source	Item	Description
80% Unity for Humanity	Aims development	DB working at 5% effort KJY at 100% effort for the duration of the project.
20% Unity for Humanity	Support and outreach	Running workshops through the Allen Institute, collaborating with researchers at universities and industry partners, publishing papers, and presenting at conferences.
Allen Institute	Maintenance	DB 15% effort
Allen Institute	Cloud deployment costs	AWS deployment (EC2 instance and S3 storage)

Sponsors and Grants Who Have Funded Us



Washington Research
FOUNDATION

≈\$50,000 post-doctorate and undergraduate fellowship



INTERNATIONAL
BRAIN
LABORATORY

≈\$50,000 with Simons Foundation

SIMONS
FOUNDATION

\$11,500 through the Shenoy Undergraduate Research Fellowship



National Institutes of Health
*The BRAIN Initiative**

≈\$20,000



UNIVERSITY of WASHINGTON

\$10,000 through the Mary Gates Undergraduate Research Scholarship

We are the **Virtual Brain Lab**



Daniel Birman, PhD

Software Engineer
Allen Institute for Neural Dynamics



Kenneth J. Yang

Computer Science
University of Washington ('25)

- We develop 3D visualization tools for experimenting with, exploring, and simulating brains.
- All projects are open-source on [GitHub](#).
- We foster undergraduate research:



Kenneth Yang, Jasmine Schoch, Qiqi Liang,
Selina Li, Kai Nylund

THANK YOU

Product Website:

<https://pinpoint.virtualbrainlab.org>

Our Websites:

<https://virtualbrainlab.org>

<https://www.allenneuraldynamics.org/>



ALLEN INSTITUTE *for*
NEURAL DYNAMICS

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