MATHEMATICAL NEUROONCOLOGY
LABORATORY
Kristin R. Swanson, PhD

As we reflect back on 2018, this has been an amazing year in the lab! We have written many new scientific papers and abstracts, started exciting new patient studies, filed new patents, and trained numerous students. There is so much more to do to improve glioma patient outcomes, but we are heartened by the progress being made. We would like to take this opportunity to share with you a brief summary of our past year in the lab. - *Kristin*

Scientific Productivity
- ✓ 2 patents filed
- ✓ 2 clinical trials launched
- ✓ 15 manuscripts published
- ✓ 11 manuscripts in preparation
- ✓ 5241 patient-specific models built from MRI

Funding
- ✓ 3+ new grants funded
- ✓ 15+ grant applications

Outreach
- ✓ 1 appearance on Netflix
- ✓ 18 abstracts published
- ✓ 17 conferences attended
- ✓ 1 Mayo Clinic Diversity & Inclusion Service Award

Education
- ✓ 17 ASU undergraduates trained
- ✓ 4 postdoctoral fellows trained
- ✓ 4 medical students trained
- ✓ Hosted weekly "Research Updates" seminar series

"EVERY PATIENT DESERVES THEIR OWN EQUATION"

You're watching
Bill Nye Saves the World
Season 2: Ep. 6
How to Travel Through Time

Kristin Swanson
@gliomath

Hi @BillNye I am a math oncologist building opt patient-specific Rx for #GBM #EveryPatientDeservesTheirOwnEquation #BillMeetScienceTwitter

5/21/17, 7:37 AM from Phoenix, AZ

How cool is that!

From a Tweet to Netflix!
Who knew that a single tweet could lead to a bit on the Netflix show "Bill Nye Saves the World" (S2/Ep6)! It was certainly a lot of fun to share some of our lab's work with the broader science-interested community! But the most fun was having my daughter, Kayla, experience meeting and getting autographs from the cast and crew – Bill, astronaut Scott Kelly, actor Zach Braff, actress Karlie Kloss, producer Brannon Braga, screenwriter Arthur Cuse, amongst many others – while taking in the importance of science in SAVING THE WORLD!

YOU CAN HELP US SOLVE BRAIN CANCER

To support the success of our innovative projects bridging mathematics, artificial intelligence, cancer, and oncology you can send your contribution here:
www.MathematicalNeuroOncology.org/donate

Every Patient is Different

Every patient is different—each has a tumor that grows at its own unique rate and responds in its own way. Even when receiving the same treatments, the variability in how fast the tumor grows over time across patients is astounding. We have built patient-specific avatars that simulate and predict tumor response with and without treatment. In a spectrum of **clinical** trials, we deployed these avatars as benchmarks that create metrics of response to new therapies. We can now identify how much better a patient is doing as a result of a new therapy to a level never possible. We are passionate to see these results improve the success of clinical trials.

Variability Across Patients!


Simulated Avatars Predict the Future
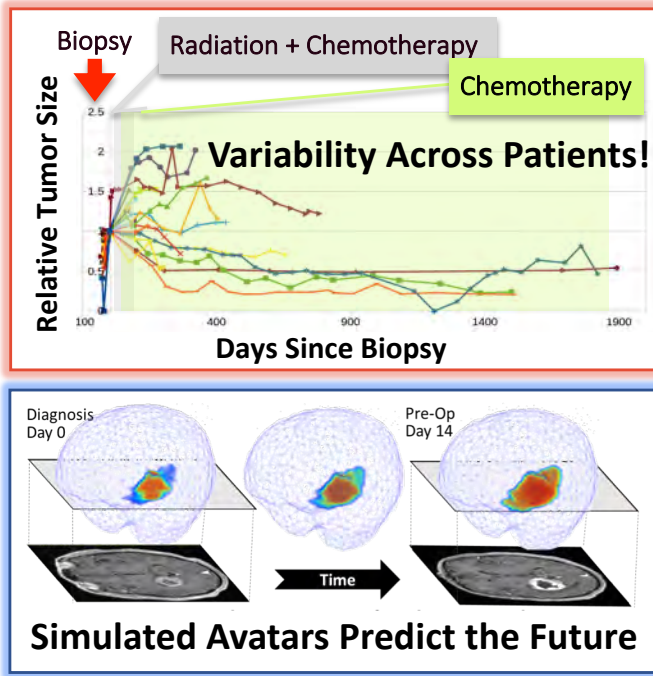
#SexMatters

In early March, we held a two-day workshop on the state-of-the-art research into sex differences across brain tumors and have been astounded at how much is unknown. For instance, it is common for human tumors and certainly tumor cell lines studied in the lab, to lose their sex chromosomes. We have brought this awareness into our ongoing investigations and have since found that using the power of artificial intelligence, we can predict if a brain is male or female only by looking at each tumor on MRI! There are many previously undiscovered sex differences that are essential to the future of precision medicine—stay tuned!

MRI: Satellite Maps of Tumors

Physicians rely heavily on MRIs to "see" inside a tumor, but much of the information in these images is currently underutilized. With the power of artificial intelligence coupled with image-localized biopsies, we have built state-of-the art methods to reveal the diverse tumor biology underlying the image, and predict where best for the surgeon to operate or the radiation therapist to radiate and beyond.
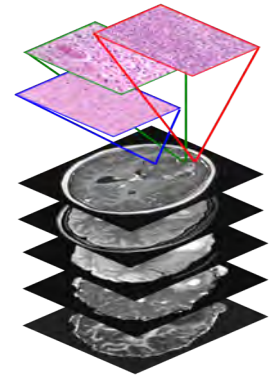
Artificial intelligence learns to fill-in-the-blanks between rare image-localized biopsies.

Education & Collaboration

Extensive collaboration and educational outreach are vital to our interdisciplinary work. This year, we acquired two remote **presence** devices to ease integration with our remote staff and students, as well as our numerous collaborators. This allowed remote staff to help mentor our summer interns, which included five undergraduates and one high school student! We also had three ASU undergraduate honors theses completed this year as we launch more trainees into the world!

High school intern discussing her project with remote staff scientist and local postdoc.