

Artistic Display of Research

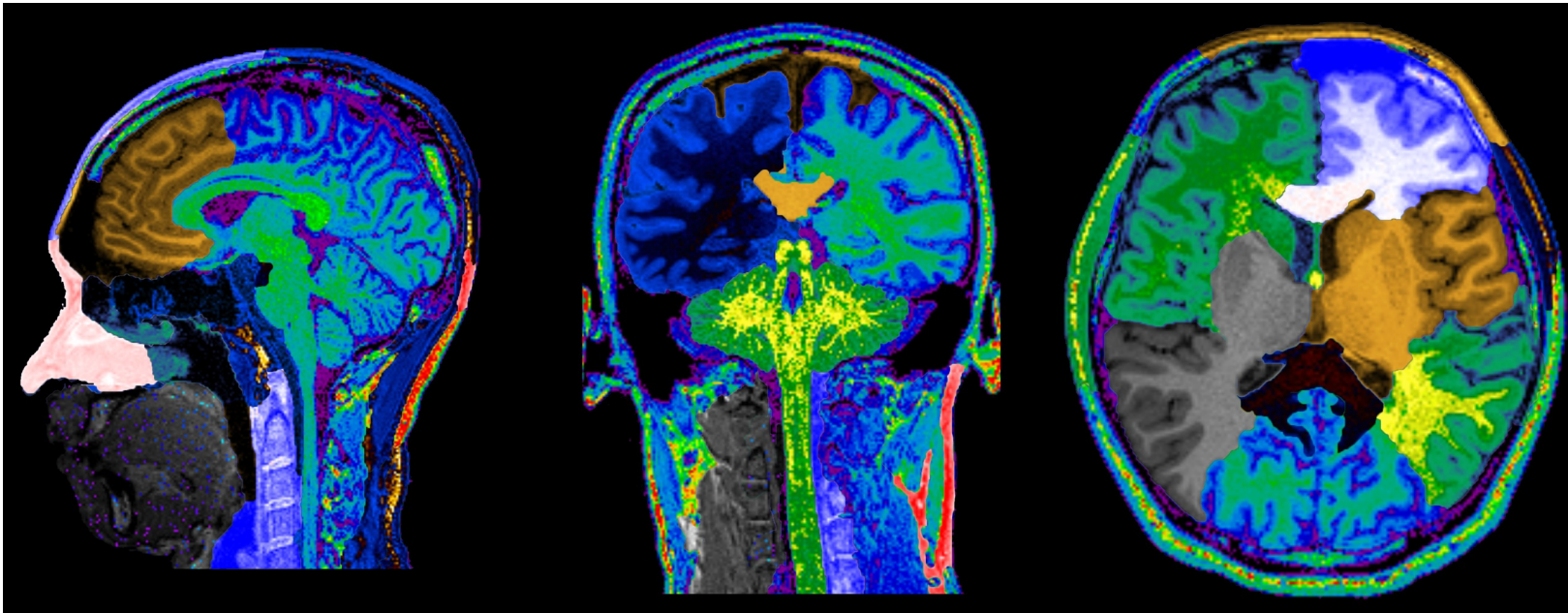
2023

Graduate Students submission

Total number : 9 submission

How Not to Mislead with Visualization

Vote#: G1



Submitted by : Folk Narongrit

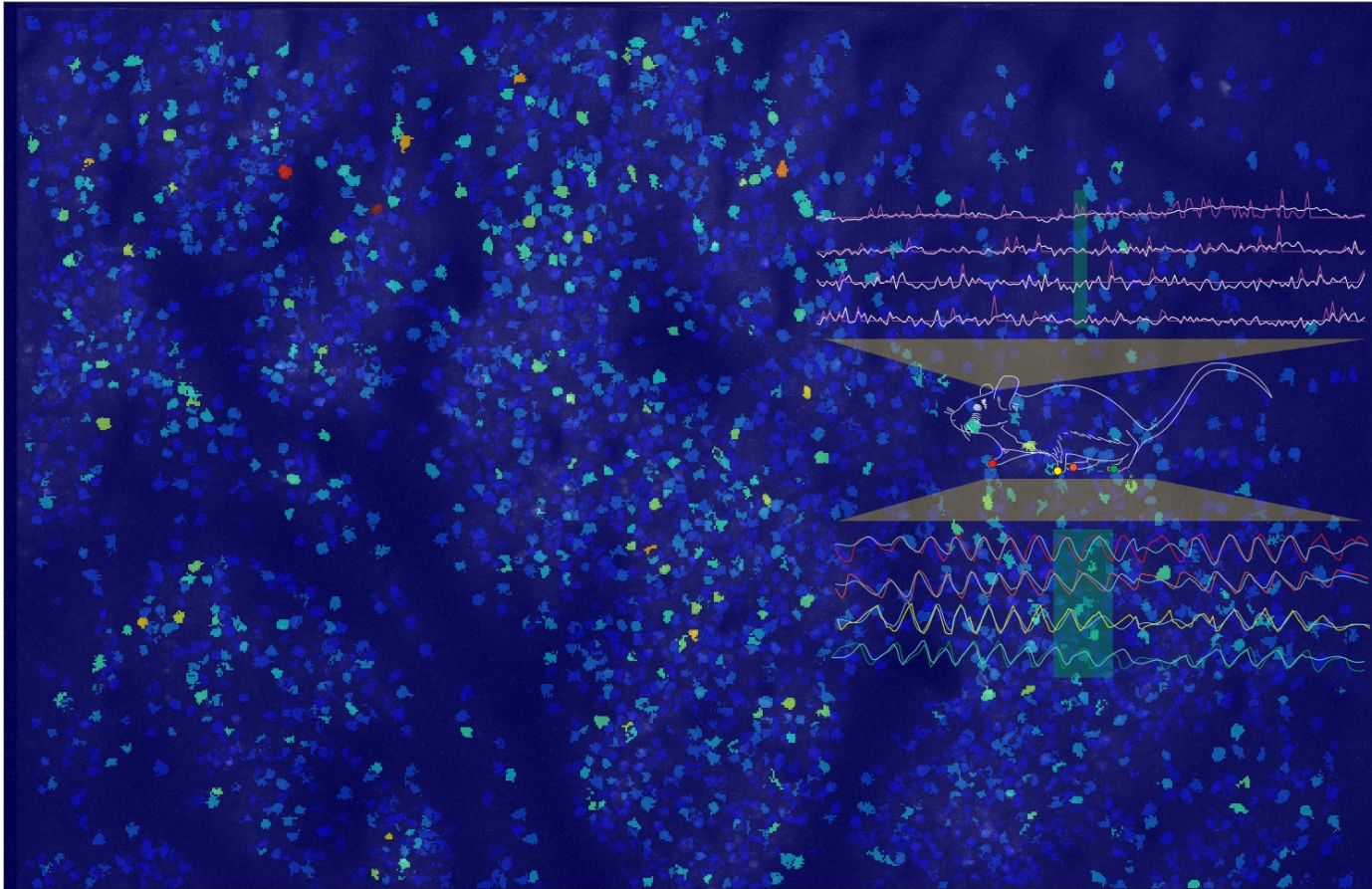
Contributors : Nathan Ooms

Creation : MRI data of the human brain was collected at the Purdue MRI Facility using the Siemens MAGNETOM Prisma 3T MRI scanner using the MPRAGE sequence (Magnetization-Prepared Rapid Acquisition Gradient Echo). Image reconstruction was performed by the scanner, which outputted raw grayscale images. Several common colormaps are then applied to different regions of interest using MATLAB.

Caption: This image is a typical MRI scan of the human brain with a twist: multiple colormaps and contrast settings are applied to the same image. Interpretation of MRI images depends on the color scheme and brightness/contrast settings. Not using the appropriate color settings for the particular clinical application could yield misleading diagnoses. This work shows an extreme case of misleading color settings affecting the interpretation of MRI data and serves as a reminder to be mindful when interpreting or visualizing data.

How did the artificial intelligence model decode neural signals into limb movements?

Vote#: G2



Submitted by : Seungbin Park

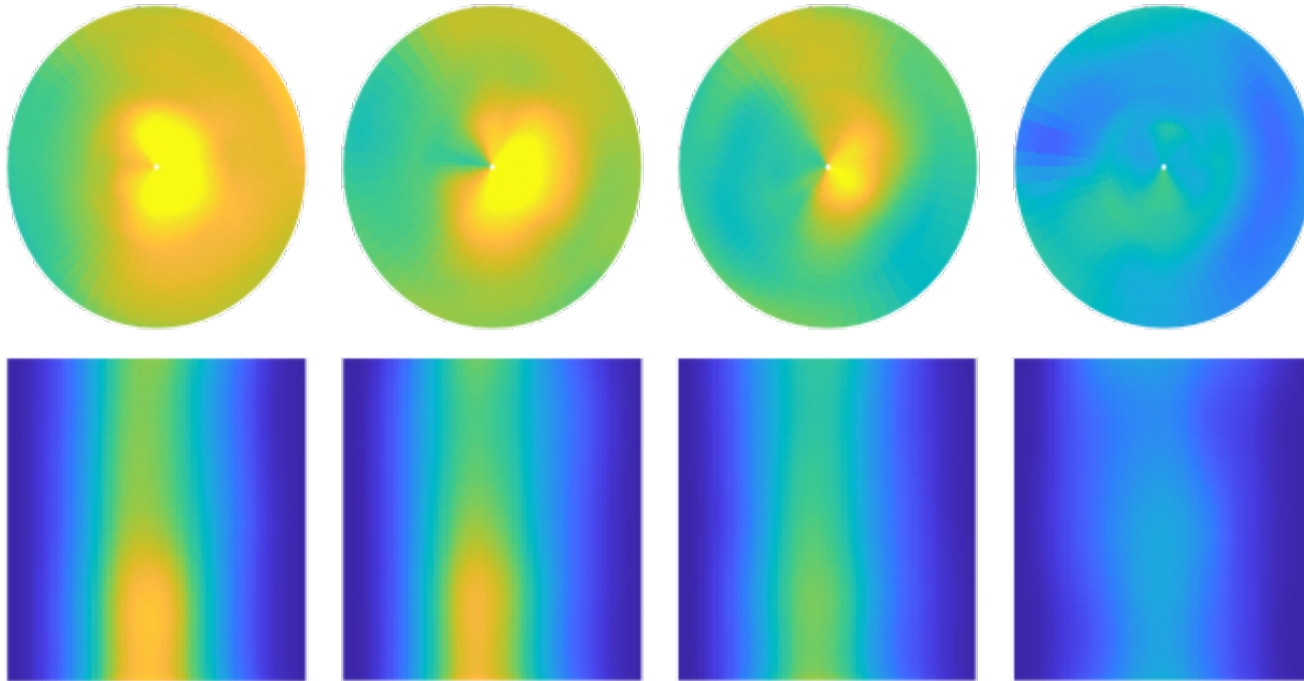
Contributors : Megan Lipton, Maria Dadarlat

Creation : Neurolabware two-photon microscope system and Scanbox was used for two-photon calcium imaging. Python and Illustrator were used for plotting.

Caption: The color heatmap shows the relative importance of each neuron used in the artificial intelligence (AI) decoding model (an artificial neural network) overlaid on the maximum intensity projection of two-photon calcium images of the somatosensory cortex area of a mouse. The AI decoding model decodes neural signals recorded by two-photon calcium imaging into multi-limb coordinates of a running mouse. The relative importance of neurons was calculated from the gradients of the loss function with respect to each neuron. It partially explains how the AI model worked, which also can help understand how the brain works related to movement.

Waning Hearts

Vote#: G3



Submitted by : Conner Clair Earl

Contributors :

Creation : The image is composed of group-averaged polar and cartesian strain maps of patients with Duchenne muscular dystrophy. They were generated using MATLAB from a custom-built graphical user interface to analyze cardiac magnetic resonance strain images.

Caption: The image shows representative maps of progressive heart dysfunction in a group of patients with Duchenne muscular dystrophy. From left to right, each of the Four columns represents a group of patients with worsening heart disease demonstrating the inexorable progression of this disease with no current cure. Using these functional maps can give us further insight into better understanding and treating this disease.

Heart Failure Rat Receives Life-Saving Heat Therapy

Vote#: G4

STEAMY HEAT THERAPY ADVENTURES OF REMY THE RAT

Hey doc,
been pretty
tired lately
and short of
breath.

Let's have a
look.

WHOOSH-WHOOSH-WHOOSH

HIGH-FREQUENCY ULTRASOUND TO THE RESCUE!!!

HEART FAILURE W/
PRESERVED EJECTION FRACTION

Let's try
some sauna
heat therapy.

Thanks doc,
I feel better
already!

Submitted by : Luke Schepers

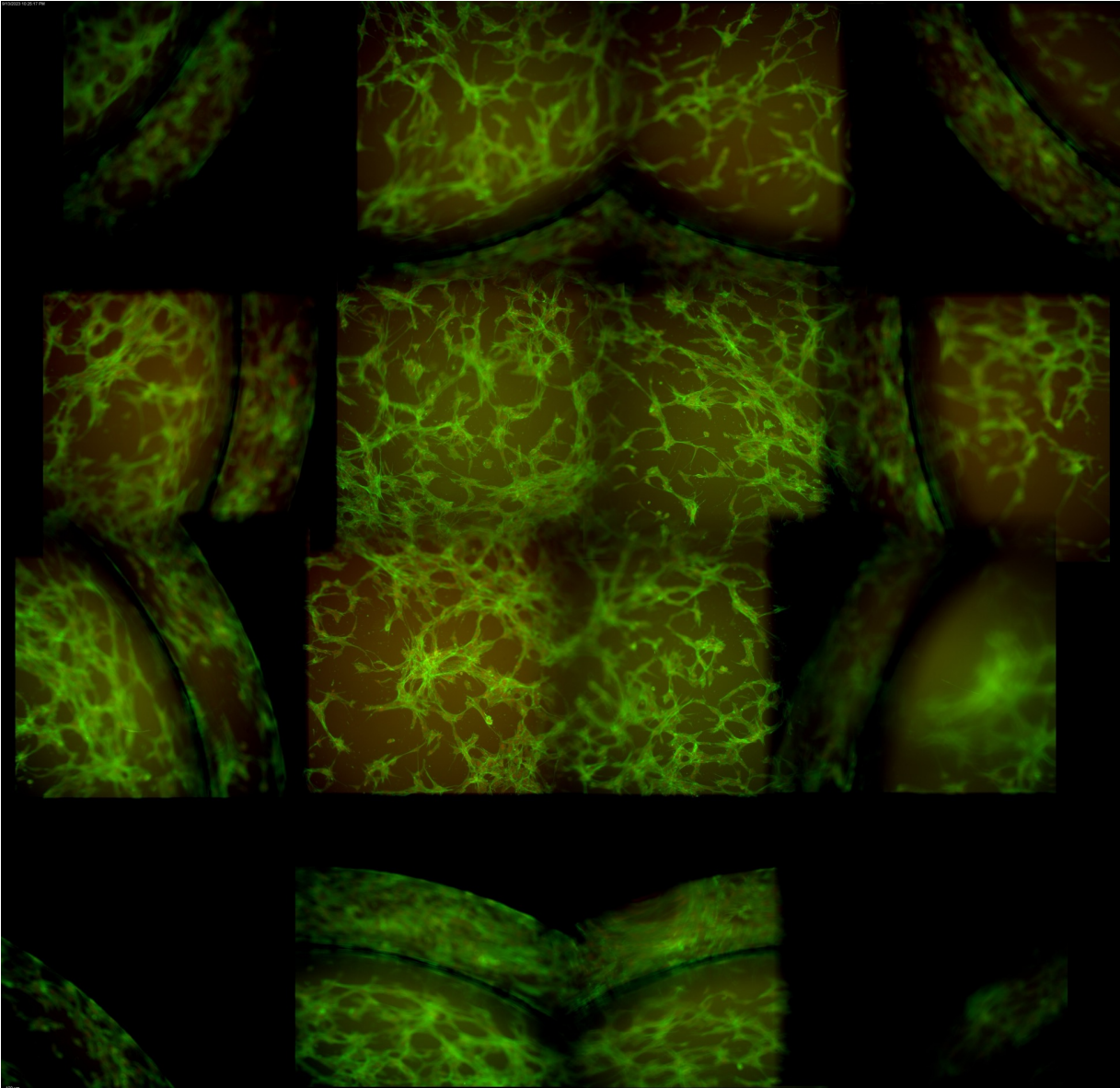
Contributors : Mike Belbis; Craig Goergen; Daniel Hirai

Creation : This comic was created in adobe photoshop using ultrasound images and images of the rats we used for our study on the potential of heat therapy for patients undergoing heart failure with preserved ejection fraction.

Caption: This comic depicts our investigation into the potential of sauna heat therapy for patients undergoing heart failure. Individuals undergoing heart failure may no longer be able to exercise regularly, but heat therapy is a promising alternative that offers similar benefits to the cardiovascular system through vasodilation and the release of nitric oxide.

Microangiogenic Kaleidoscope

Vote#: G5



Submitted by : Claudia Benito Alston

Contributors : Luis Solorio

Creation : The image was created using a Leica Widefield microscope and the LAS X Life Science Microscope Software. These are HUVECS (Human Umbilical Vein Endothelial Cells) co-cultured with ASCs (Adipose-derived Stem Cells) in a collagen sandwich culture to achieve microangiogenesis in Ibidi's μ -Slides.

Caption: The image depicts the initial stages of capillary formation in a collagen hydrogel. Fun fact: the process of angiogenesis, which is the formation of new capillaries and blood vessels, entails the migration, growth and differentiation of endothelial cells, which end up lining blood vessels. Extra fun fact: "kaleidoscope" is derived from the Ancient Greek word *καλός* (kalos), "beautiful, beauty".

Sonographer's Rorschach Test

Vote#: G6



Submitted by : Elnaz Ghajar-Rahimi

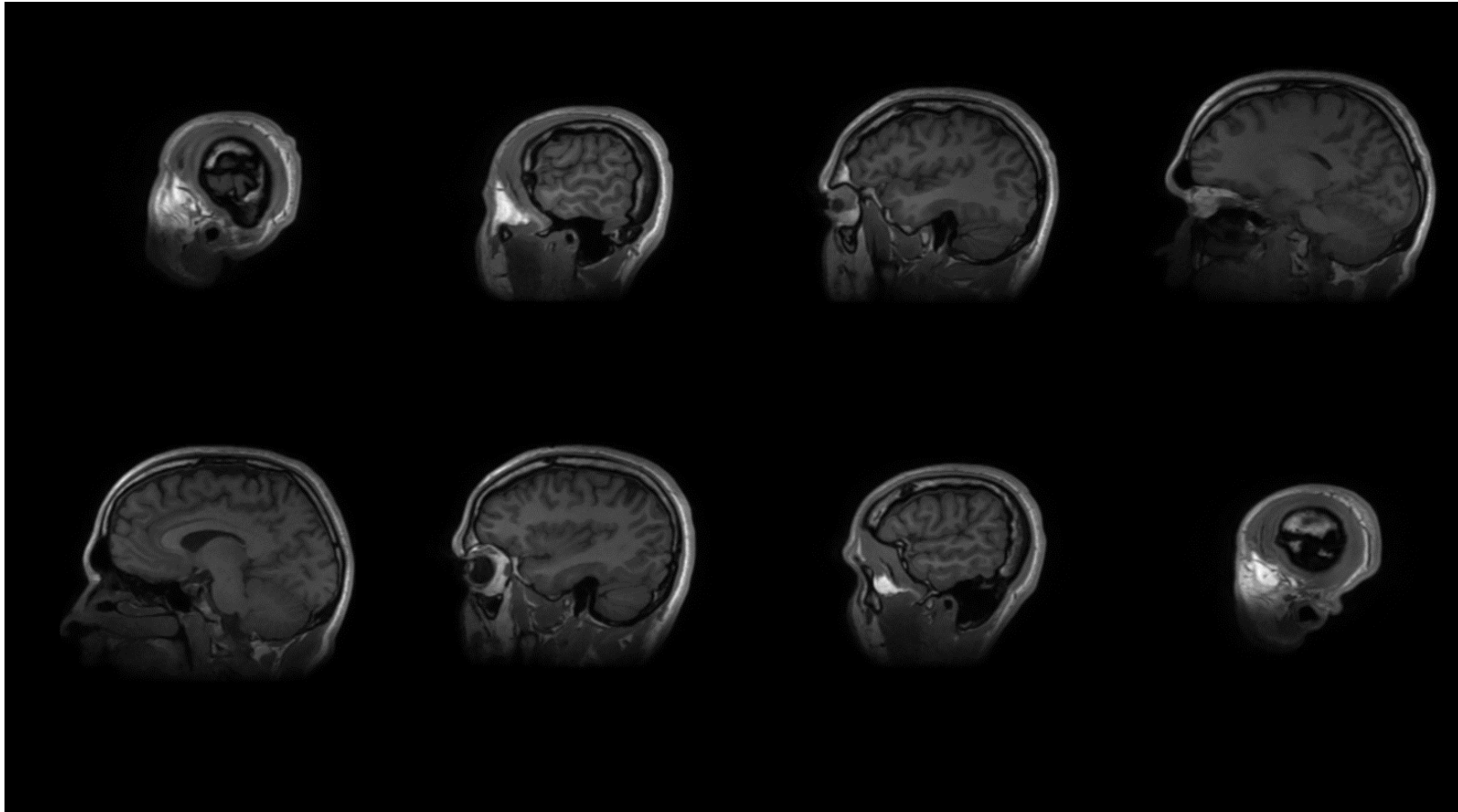
Contributors :

Creation : The images were collected using a Vevo3100 high frequency ultrasound system with a MX550D transducer. The images were acquired by myself and exported to a tiff from VevoLab (software that accompanies the ultrasound system) and arranged in an artistic manner in powerpoint.

Caption: Ultrasound images of the aortic arch (sagittal/side view) and the left ventricle (parasternal long axis view) in mice with aortic stenosis, arranged to mimic a Rorschach ink blot test. Ultrasound is a primary imaging modality for assessing cardiac function and disease severity in humans. These images, when mapped to the cardiac cycle, can shed light on heart geometry, contractility, and blood flow behavior. Images were taken with a Vevo3100 ultrasound system.

The Inner Workings of a Graduate Researcher

Vote#: G7



Submitted by : Adalyn Maria Fulu Meeks

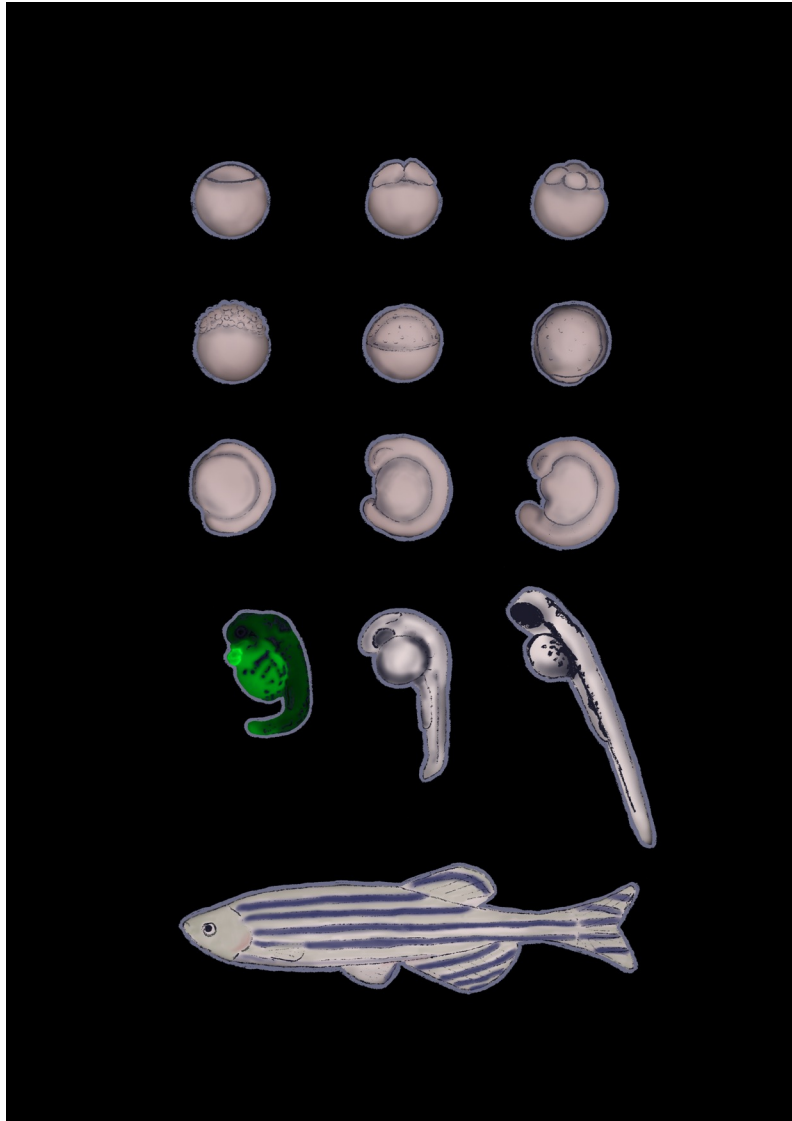
Contributors : Adalyn Meeks; Alex Donabedian; Greg Tamer

Creation : This image was taken using a GE 3T MRI machine.

Caption: This is an image of a head and brain using magnetic resonance imaging (MRI). The picture shows some slices we have to create a 3D rendering from the images.

Stages of Zebrafish Development

Vote#: G8



Submitted by : Nissa Jo Larson

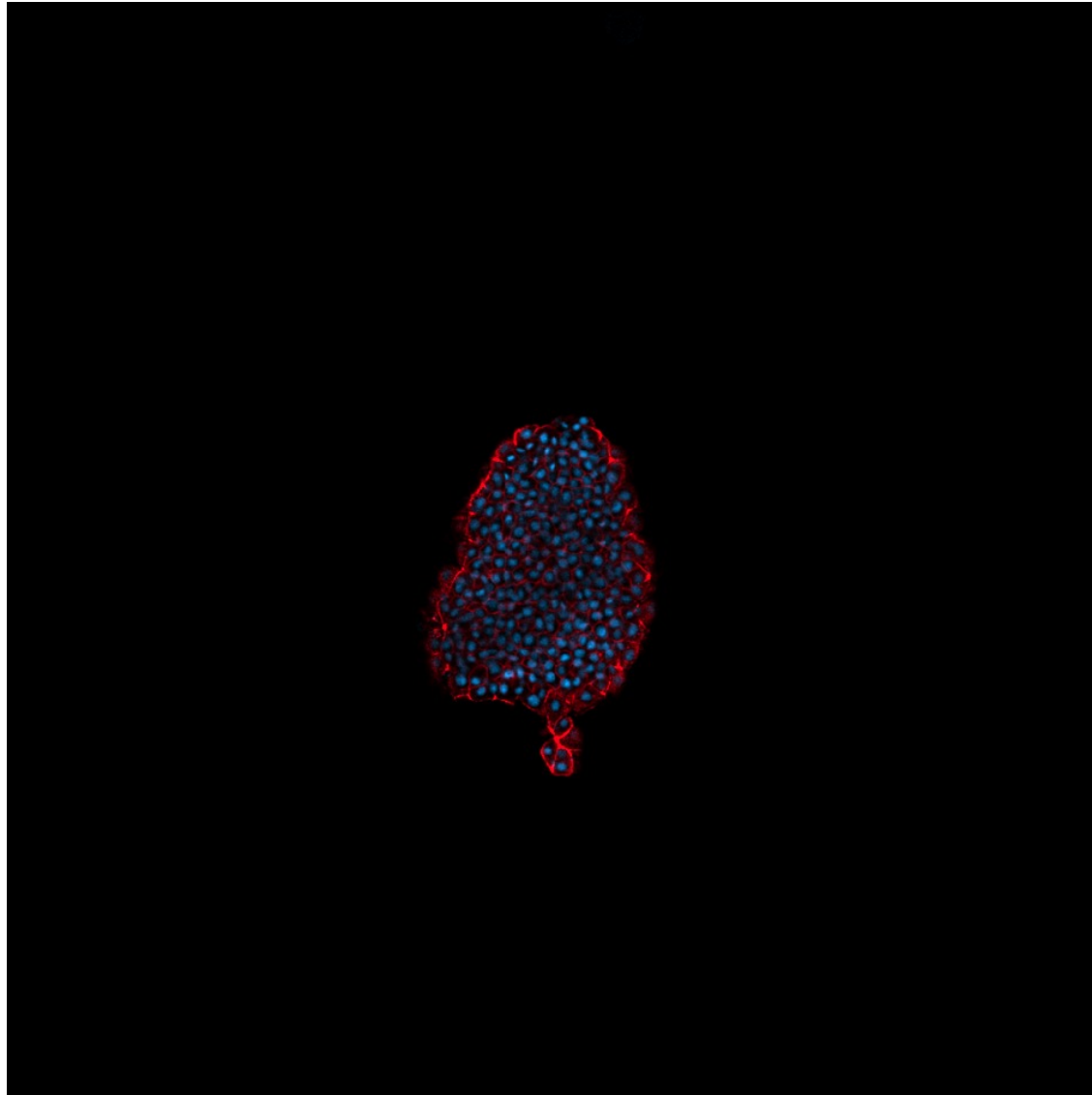
Contributors :

Creation : The piece was created using Adobe Fresco. Confocal microscope Zeiss 800 was used to obtain the fluorescent image in green

Caption: Zebrafish are an incredible model organism used to study developmental biology and regenerative medicine. This diagram charts the first 48 hours post fertilization (hpf) of development and shows the final mature form of the fish (not to scale). The fluorescent image was taken of a 24 hpf embryo from a line genetically modified to have a fluorescent heart.

The sugarcoated embryogenesis

Vote#: G9



Submitted by : Mothieshwar Jayaraman Krishnan

Contributors : Kali Nicole Konstantinopoulos

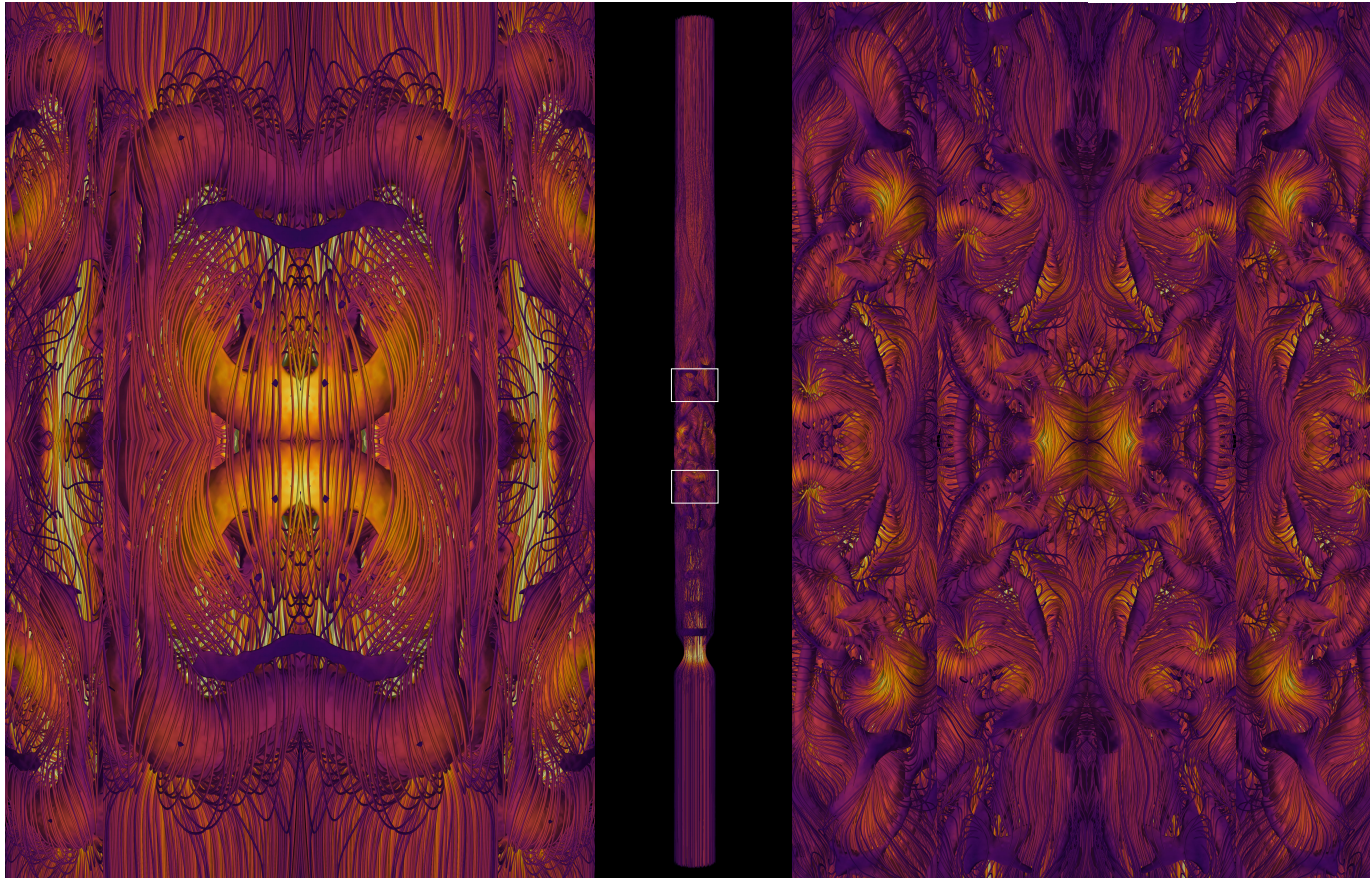
Creation : Actin filaments are essential for giving developing zebrafish embryos a definitive structure. This image was captured using a Zeiss confocal microscope from a broken embryo sample.

Caption: This image shows a 5-hour-old zebrafish embryo and how the actin (structures stained red) filaments and micro ridges maintain the cell's (stained in blue) boundaries and integrity. After further labeling and freezing, the samples are cut into slices using a cryotome, and then they are examined using confocal microscopy. Actin is one of the dominant cell proteins and it regulates several cellular processes. To better understand cell signaling pathways and the biomechanics of cell division, it would be helpful to study the actin filament assembly in developing cells.

Under Graduate Students submission

Total number : 2 submission

Symmetry in Stenotic Blood Flow



Submitted by : Moses Joe Hamm

Vote#: UG1

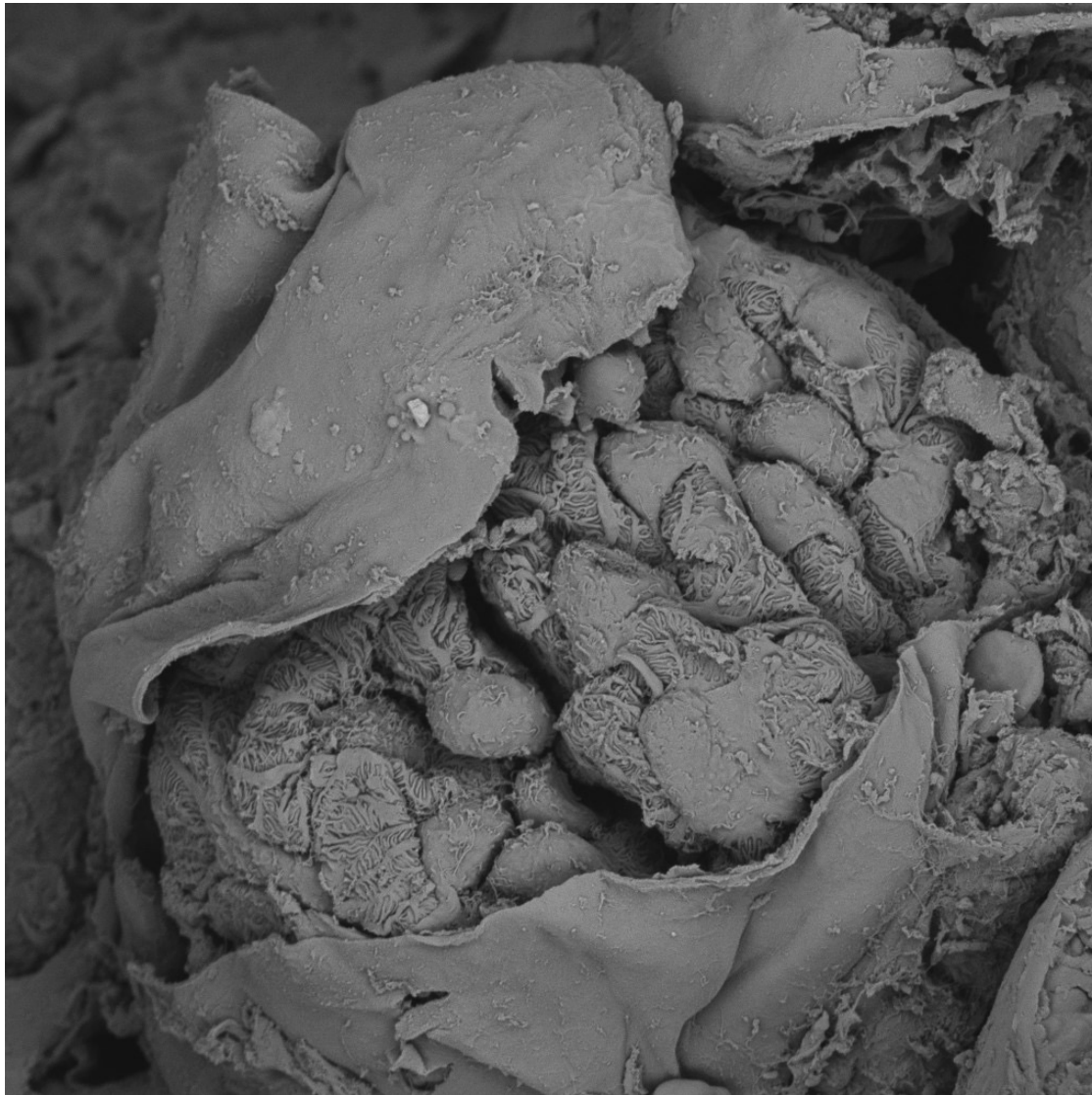
Contributors : Neal Patel; Vitaliy Rayz

Creation : Pulsatile blood flow past a stenosis with a peak Reynolds number of 3500 was simulated using open-source computational fluid dynamics software SimVascular. This Reynolds number resulted in a transition to turbulence. In order to capture all scales of turbulence, the Kolmogorov length scale was estimated, and the mesh resolution was set accordingly. Results were analyzed in Paraview (an open-source software). Streamlines were generated, and corresponding vortex cores were visualized using Q-criterion isosurfaces. Interesting flow structures were then isolated and used to create two symmetric patterns.

Caption: Turbulent blood flow is associated with increased shear stress on artery walls and red blood cells, negatively affecting blood vessel wall remodeling. The transition from laminar to turbulent flow due to a stenosed blood vessel was simulated using computational fluid dynamics (CFD). Simulation results are visualized in the middle panel of this figure. Upstream, flow streamlines are smooth and ordered. Downstream, velocity increases and chaotic vortices quickly form. To generate the side panels, flow structures and vortex cores from the transitional (left panel) and turbulent (right panel) flow regions were extracted and arranged in symmetric patterns.

Inside Bowman's Capsule

Vote#: UG2



Submitted by : Sarah E Grev

Contributors : Jennifer Anderson

Creation : This image was created using Scanning Electron Microscopy at a scale of ten micrometers.

Caption: This image shows a glomerulus inside the right kidney of a mouse. The glomerulus sits inside a capsule called "Bowman's Capsule" which is seen beginning to peel away from the glomerulus. The glomerulus is primarily responsible for filtering blood and recognized by the interlocking pattern across its surface. The image was captured using Scanning Electron Microscopy (SEM) at a scale of ten micrometers. SEM helped determine how glomeruli are affected due to preeclampsia over the course of pregnancy. This glomerulus appears normal, but glomeruli affected by preeclampsia will no longer display the interlocking pattern.