

# Advanced Research Computing Technology and Innovation Core

## ARCTIC



# About Georgia State

- Located in ATLANTA GA
- Urban public research university
- 224.72 million in research funding in fiscal year 2023
- <https://research.gsu.edu/>





# About ARCTIC

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- Established in 2020
- Funded by National Science Foundation (NSF) Major Research Infrastructure (MRI) Grant
- 75 Million CPU hour capacity
- 1.5 Million GPU node hour capacity
- 70 TB total system memory
- Federated identity management using CILogon
- <https://arctic.gsu.edu>



# User Group Distribution by Field of Science

Sum of Active Allocation Count

BY FIELD OF SCIENCE

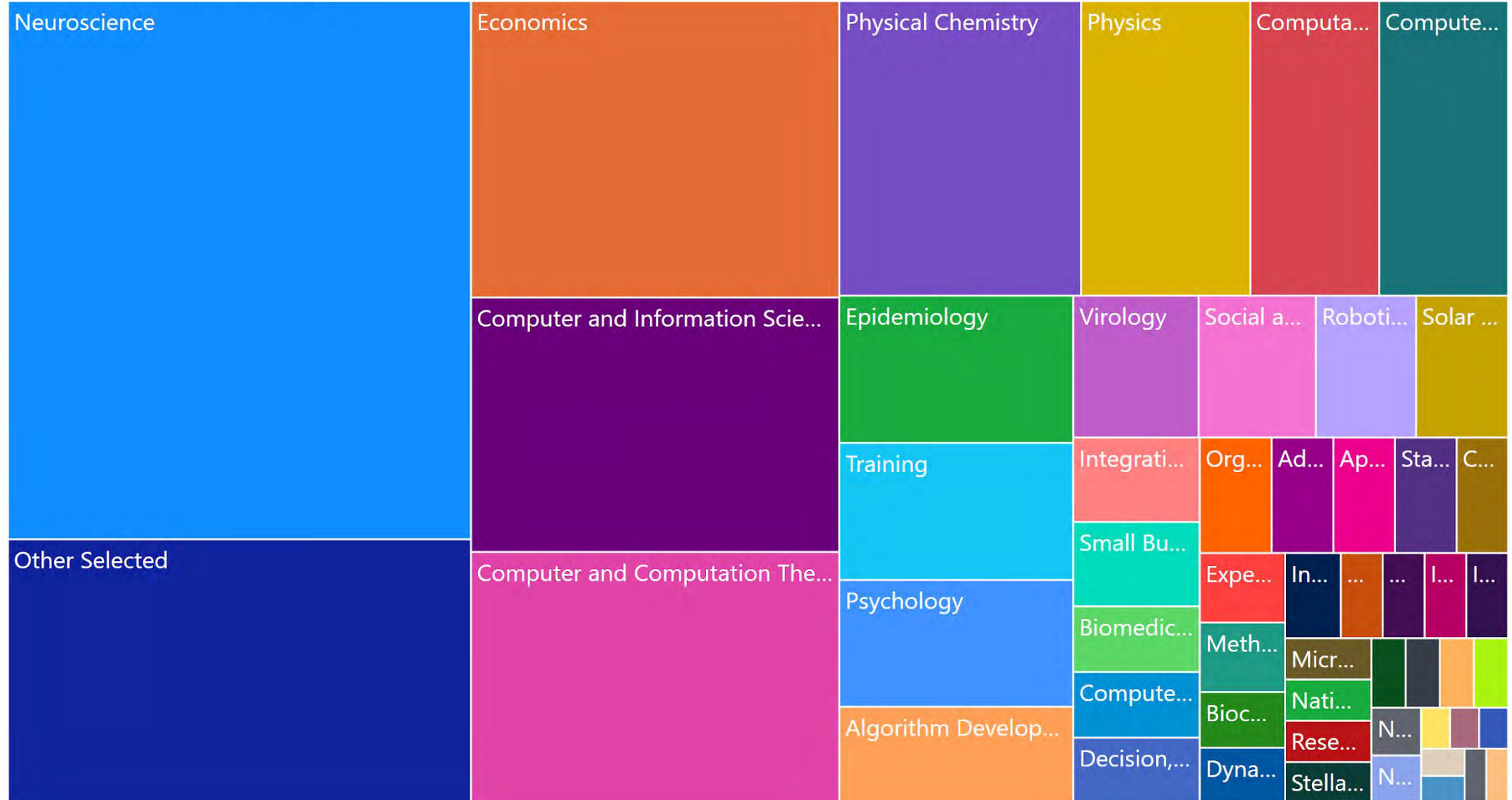


Current usage  
130 PI  
750 Active users



# Active Users Distribution by Field of Science

Sum of User Count by Field of Science



# Research Highlights

Dr. Alejandro Del Valle : ( Risk Sciences )

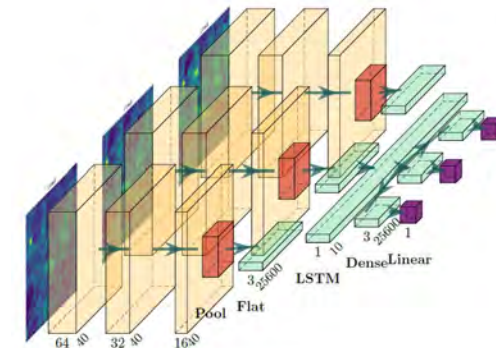
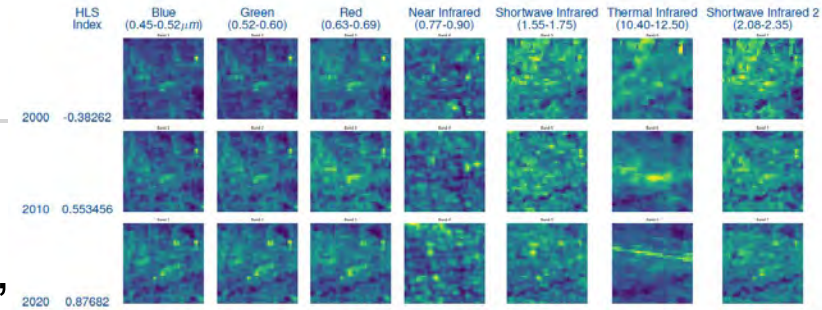
- Development Economics, Applied Microeconomics, Environmental Economics, Health Economics

Economic effects of natural disasters and aims to identify how government policies and markets can help society adapt to climate change

- Dr. Arun Rai : ( Information Systems )

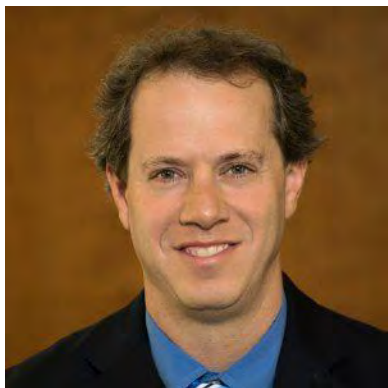
- Digital Innovation and Transformation, Managing Artificial Intelligence, Platform Business Models and Ecosystems, Design and Use of Information Systems, Governance of Digital Resources, Economic, Behavioral, and Societal Impacts of Digital Technologies

The research has contributed to understanding of the design, use and impacts of information systems, digital transformation of organizations and supply chains, governance of IT resources, online collectives and digital platforms, and deployment of digital innovations to address societal problems including poverty, health disparities, infant mortality and digital inequality



# Research Highlights

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Dr. Andrew Gewirtz: ( Biomedical Sciences )

- Innate Immunity, Microbiome, Intestinal Inflammation and Obesity/Diabetes
  - Understand the normal mechanisms by which pro-inflammatory signals protect against microbes and discern how they go awry in disease states

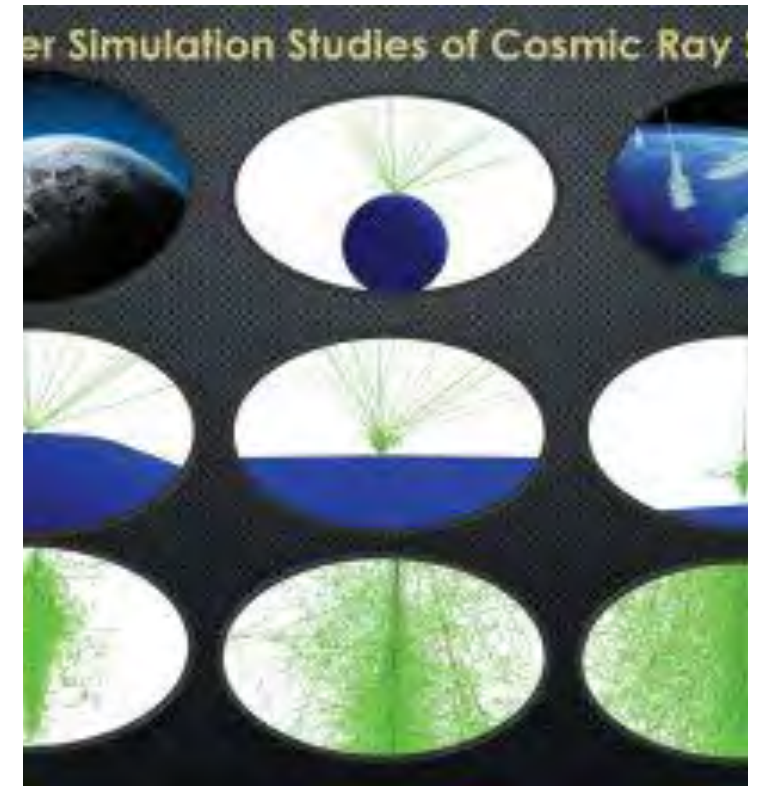
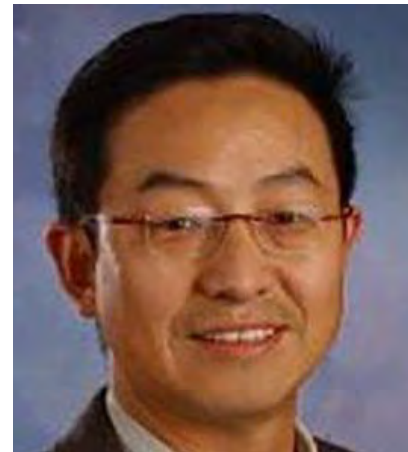
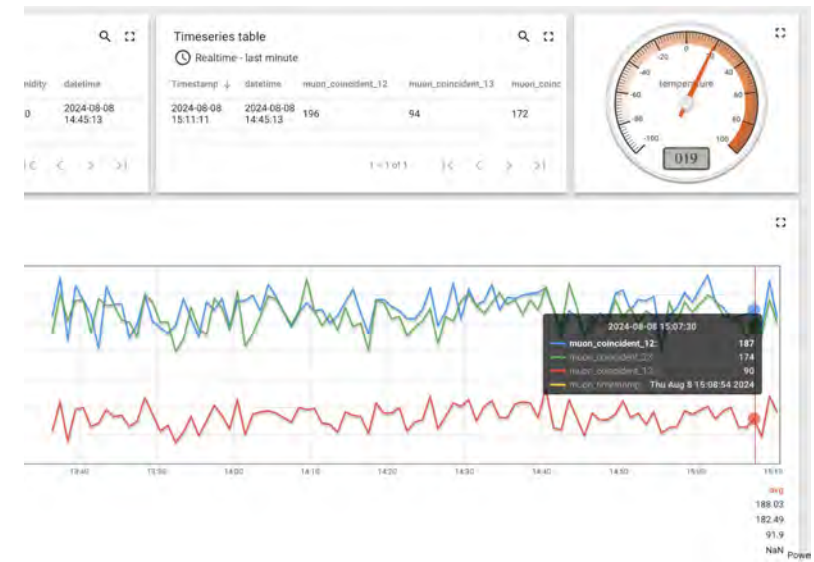
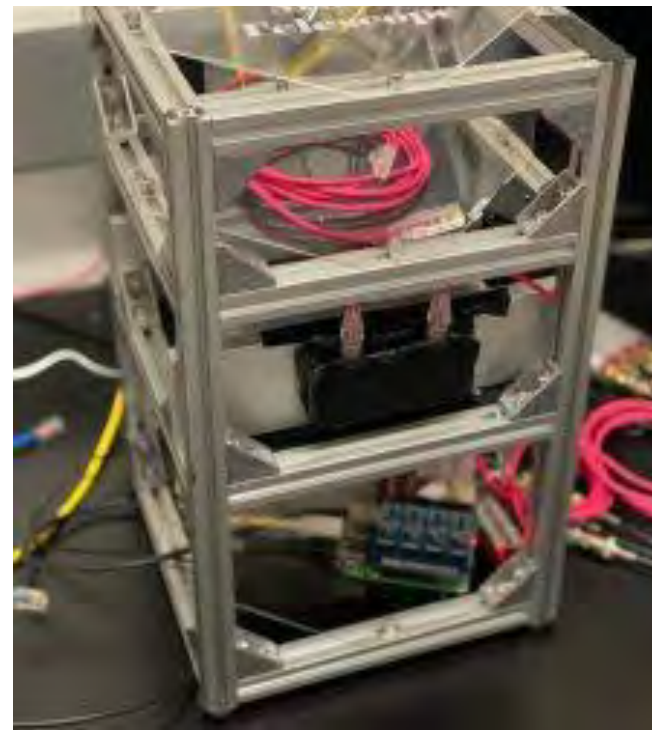
• Dr. Samer Gozem: (Chemistry)

- Computational Chemistry, Modeling of Photochemical and Photobiological processes
  - investigate light-induced chemistry in chemical and biological systems



# Research Highlights

- IOT instrumentation and data collection
  - Dr. Xiaochun He – Global Cosmic Ray detector network





# Research Highlight



**Summary:** The first installment of the Pulitzer Prize-winning graphic novel acclaimed as "the most affecting and successful narrative ever done about the Holocaust" (Wall Street Journal) and "the first masterpiece in comic book history" (The New Yorker). A brutally moving work of art—widely hailed as the greatest graphic novel ever written—Maus recounts the chilling experiences of the author's father during the Holocaust, with Jews drawn as wide-eyed mice and Nazis as menacing cats. Maus is a haunting tale within a tale, weaving the author's account of his father's relationship with his adoptive father into an extraordinary retelling of

## Sponsored Content

**Wandering Stars** (Year: 2024) (Genre: Historical Fiction)

The system also calculates predicted ratings for sponsored content, and it predicts you would like this book: 8.48 out of 10



**Summary:** The eagerly awaited follow-up to Pulitzer Prize-finalist Tommy Orange's breakout best seller There There—winner of the PEN/Hemingway Award, the John Leonard Prize, the American Book Award, and one of the New York Times 10 Best Books of 2018—Wandering Stars traces the legacies of the Sand Creek Massacre of 1864 and the Carlisle Indian Industrial School through to the chilling aftermath of Orville Red Feather's shooting in There There, Colorado, 1884. Star, a young survivor of the Sand Creek Massacre, is brought to the Fort Marion Prison in Florida, where he is forced to learn English and American Christianity by Sweeney.

**The Name of the Wind** (Year: 2007) (Genre: Fiction)

The system predicts you would like this book: 9.9 out of 10



**Summary:** Told in Kvothe's own voice, this is the tale of the magically gifted young man who grows to be the most notorious wizard his world has ever seen. The intimate narrative of his childhood in a troupe of traveling players, his years spent as a near-feral orphan in a crime-ridden city, his daringly brazen yet successful bid to enter a legendary school of magic, and his life as a fugitive after the murder of a king form a gripping coming-of-age story unrivaled in recent literature. A high-stakes story written with a poet's hand, The Name of the Wind is a masterpiece that will transport readers into the world and mind of a wizard.

**The Hobbit and The Lord of the Rings** (Year: 1973) (Genre: Fantasy)

The system predicts you would like this book: 9.9 out of 10



**Summary:** This four-volume, boxed set contains J.R.R. Tolkien's epic masterworks The Hobbit and the three volumes of The Lord of the Rings (The Fellowship of the Ring, The Two Towers, and The Return of the King). In The Hobbit, Bilbo Baggins is whisked away from his comfortable, unambitious life in Hobbiton by the wizard Gandalf and a company of dwarves. He finds himself caught up in a plot to raid the treasure hoard of Smaug the Magnificent, a large and very dangerous dragon. The Lord of the Rings tells of the great quest undertaken by Frodo Baggins and the Fellowship of the Ring—Gandalf the wizard, the heroic Merry

- Flask application deployed on K8s.
- CI/CD pipeline using Github Actions.
- Making life easier with deployment automation, faster product delivery, cost savings

- Dr. Nasim Mousavi (Computer Information Systems)
- Science gateways – Support research needs that are not strictly computing



(Rating 10 = you like the book the most. Rating 0 = You like the book the least).

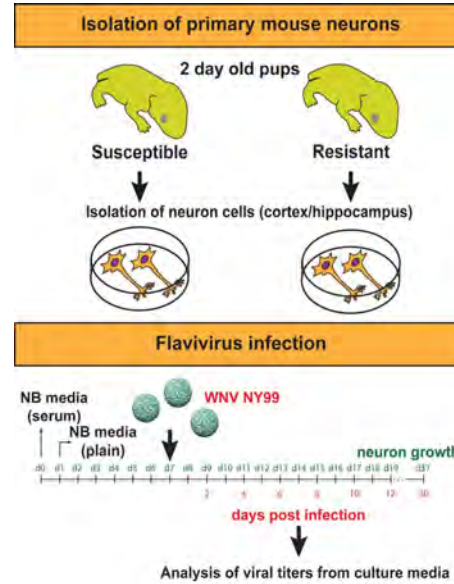
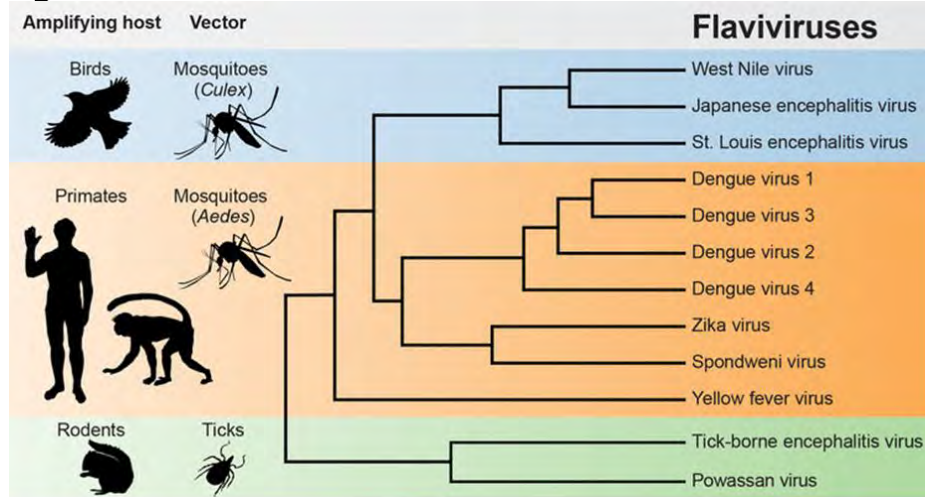
- If you need more information about books, you can click on the name of each of them.
- Once you are done with the rating, click on **Show Recommendations**.

You have rated 0 books

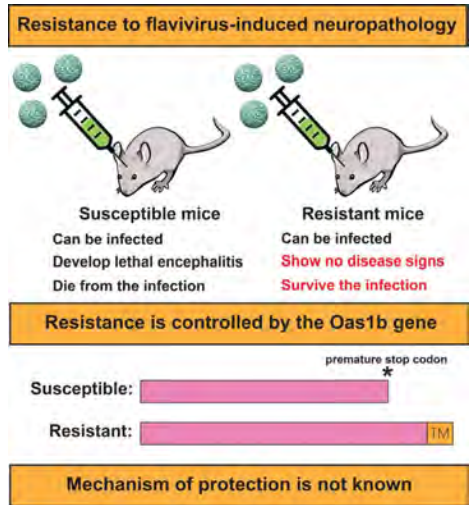
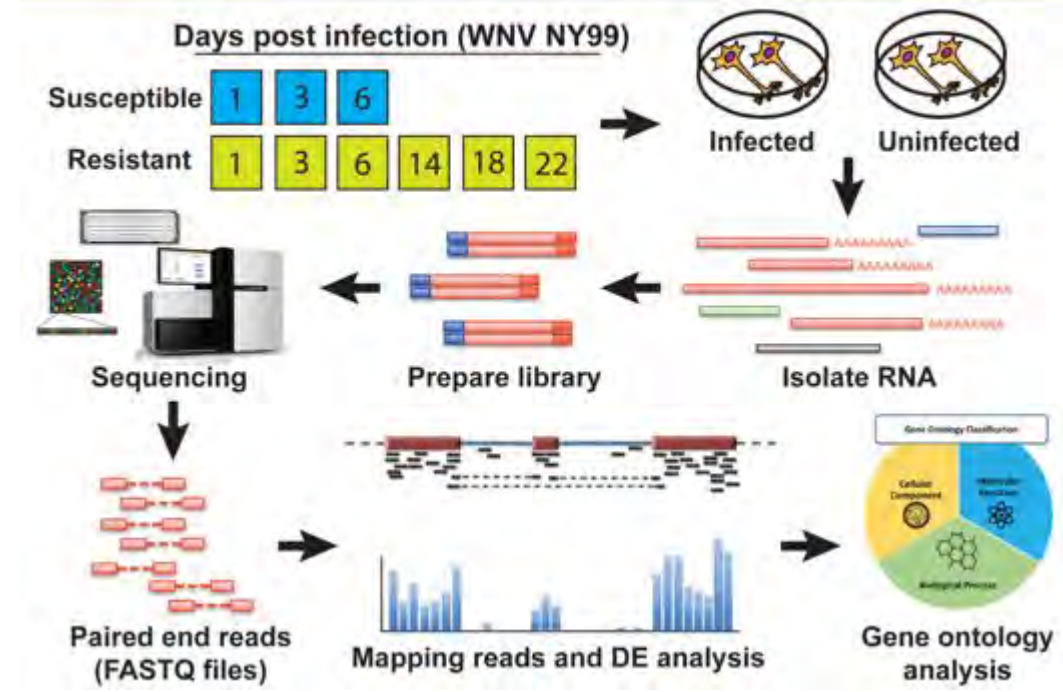
Search:

Book Title	Genre	Year	Your Rating
<a href="#">The Fault in Our Stars</a>	Historical Fiction	2012	<input type="text"/>
<a href="#">Mn som hatar kvinnor</a>	Fiction	2005	<input type="text"/>
<a href="#">Harry Potter and the Half-Blood Prince</a>	Fantasy	2005	<input type="text"/>
<a href="#">The Hate</a>	Fantasy	2009	<input type="text"/>
<a href="#">The Lightning Thief</a>	Fantasy	2005	<input type="text"/>
<a href="#">Fifty Shades of Grey</a>	Historical Fiction	2011	<input type="text"/>
<a href="#">Eat, pray, love one woman's search for everything across Italy, India and Indonesia</a>	Memoir	2006	<input type="text"/>
<a href="#">The Book Thief</a>	Historical Fiction	2005	<input type="text"/>
<a href="#">City of Bones</a>	Fiction	2007	<input type="text"/>
<a href="#">New Moon Twilight</a>	Fantasy	2006	<input type="text"/>
<a href="#">Eclipse</a>	Fantasy	2007	<input type="text"/>
<a href="#">Water for Elephants</a>	Fiction	2006	<input type="text"/>
<a href="#">The Girl on the Train</a>	Memoir	2015	<input type="text"/>
<a href="#">A Thousand Splendid Suns</a>	Fiction	2007	<input type="text"/>
<a href="#">Looking for Alaska</a>	Fiction	2005	<input type="text"/>
<a href="#">The Maze Runner</a>	Chick Lit	2009	<input type="text"/>
<a href="#">The Glass Castle</a>	Memoir	2005	<input type="text"/>

# Research Highlight



## Transcriptomic analysis



- Transcriptomic Analyses of Flavivirus-Infected Neurons from Genetically Susceptible And Resistant Mice
  - Dr. Margo Brinton (Biology)



# Research Highlight



- AI-augmented educational technology
  - Dr. Min Kyu Kim
  - Associate Professor, founding director of the AI<sup>2</sup> Research Laboratory
  - AI<sup>2</sup> Research Laboratory builds an interdisciplinary and cross-institutional effort that unites experts in learning sciences, computer sciences, STEM educators and literacy researchers from multiple institutions.

## AI-Supported Learning

We have deployed advanced AI techniques—for example, affective computing and Natural Language Processing (NLP) AI— to develop automated formative assessment and feedback technologies for learner cognition, motivation, and emotions.

## Interactive Learning

Human-Computer Interaction is not just about learner-to-computer interaction. Technology can enable learners to be more interactive with peers and instructors in technology-based learning environments.

## Augmented Learning

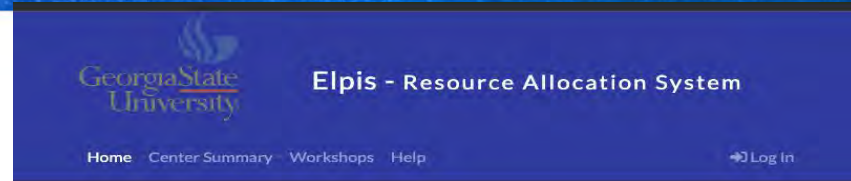
Teaching and learning effectiveness can be augmented by learning technologies appropriately integrated with the optimal pedagogy in a context. We focus on the affordances of new technologies to track and diagnose the patterns of learner performance and provide multi-dimensional scaffolds catered to individuals' needs.

## Immersive Learning

Problem-centered learning requires effective problem-posing strategies that engage learners in a real-world problem situation. Given a problem context, learners play a pivotal role in solving the problem. We utilize mixed-reality and augmented-reality techniques to build immersive learning in real-world scenarios.

# Getting access to ARCTIC Infrastructure

1. Management portal : <https://elpis.rs.gsu.edu>
2. Authenticate using CILogon through your institution IDM
3. Become a PI in ARCTIC system by submitting a research proposal
4. Reviewed by allocation com



Resource\*  
ACIDS (Cluster)

Abstract\*

General description about what you plan to do with this allocation.

Users

- Select All Users
- Neranjan Edirisinghe Pathirannehelage (neranjan)
- Scott Burns (sburns17)
- Sanju Timsina (stimsina)

Select users in your project to add to this allocation.

Add Documents

Type*	Document*		Delete
Main Documer	Choose File	No file chosen	
Type*	Document*		Delete
Progress Repe	Choose File	No file chosen	
Type*	Document*		Delete
Publications	Choose File	No file chosen	
Submit	Add Another Document		

# Documents needed



<https://arcwiki.rs.gsu.edu/en/policy/resource-allocations#required-documents>

## Required Documents:

- Main Document
  - Covers scientific background, research objectives and justification
  - 3 page max
- CVs for PI and CoPIs
- Code Performance and Scaling
  - Covers claims of code performance
  - 2 page maximum



Sample at <https://arcwiki.rs.gsu.edu/elpis/proposal.pdf>

# Allocation Approval Process



1. No limit on computing resource requests and scratch (runtime) space
2. Long term storage allocations are limited to 1TB
3. Additional long term storage can be purchased at \$200/TB/3 years
4. Requests are reviewed quarterly by the Resource Allocation Committee
5. Committee may recommend internal review with cybersecurity in some cases
6. All allocations are for 1 year period
7. Progress report is needed for renewal

SUBMISSION PERIOD	USERS NOTIFIED	ALLOCATION BEGIN DATE
Jan 15 thru Feb 01	March 15	April 1
Apr 15 thru May 01	June 15	Jul 1
Jul 15 thru Aug 01	September 15	Oct 1
Oct 15 thru Nov 01	December 15	Jan 1

# User Support



- Users can create ticket through <https://hydra.gsu.edu/>
- For users working in multiple projects, they can select the project they want to create the ticket for.



- Long term Collaborative Hands-On Support for Selective Projects.
- Consultation Appointments - <https://outlook.office365.com/owa/calendar/RCTIC@mygsu.onmicrosoft.com/b>



The screenshot displays the Hydra project management system interface. The browser address bar shows [hydra.gsu.edu/projects](https://hydra.gsu.edu/projects). The navigation menu includes Home, My page, Projects, Administration, and Help. The main header is labeled 'Hydra' and contains sub-menus for Projects, Activity, Issues, Gantt, and Agile. The 'Projects' section is active, showing a filter for 'Status' set to 'is active'. Below this, there are buttons for 'Apply', 'Clear', and 'Save'. The 'Issues' sub-menu is selected, and the 'New issue' form is displayed. The form fields include: Tracker (Support), Subject (empty), Description (with a rich text editor toolbar), Status (New), Priority (Normal), Assignee (empty), and Files (Choose Files, No file chosen, Maximum size: 25 MB).



# Accessing the system

- Hemera provides remote web access to cluster resources.
- Lower the barrier to entry
- Support multiple applications,
- Interactive access and batch job submission

The screenshot displays the Hemera dashboard at [hemera.rs.gsu.edu/pun/sys/dashboard](http://hemera.rs.gsu.edu/pun/sys/dashboard). The navigation bar includes links for "Open OnDemand", "Files", "Jobs", "ACIDs Interactive Apps", "TReNDs Interactive Apps", and "My Interactive Sessions". A dropdown menu is open, listing the following categories and applications:

- 3D Modeling
  - 3D-Slicer
  - Blender
- Biology
  - CompuCell3D - CC3D Player
  - CompuCell3D - TWEedit++
  - DeepLabCut
  - Jupyter Lab - DeepLabCut
- Deep Learning
  - PyTorch (Jupyter Lab)
  - TensorBoard
  - TensorFlow (Jupyter Lab)
- Desktops
  - Acids Desktop
- File Transfer
  - RCIone Browser
  - RCIone Web GUI
- GUIs
  - RStudio
  - SAS
  - SPM
  - Stata

Below the navigation bar, the "OPEN OnDemand" logo is visible, with the text "OnDemand provides an integrated, single access point for all of your HPC resources." A large QR code is positioned on the right side of the dashboard.

This screenshot shows the top navigation bar of the Hemera dashboard, including the browser address bar with the URL [hemera.rs.gsu.edu/pun/sys/dashboard](http://hemera.rs.gsu.edu/pun/sys/dashboard) and the navigation menu with links for "Open OnDemand", "Files", "Jobs", "ACIDs Interactive Apps", "TReNDs Interactive Apps", and "My Interactive Sessions".

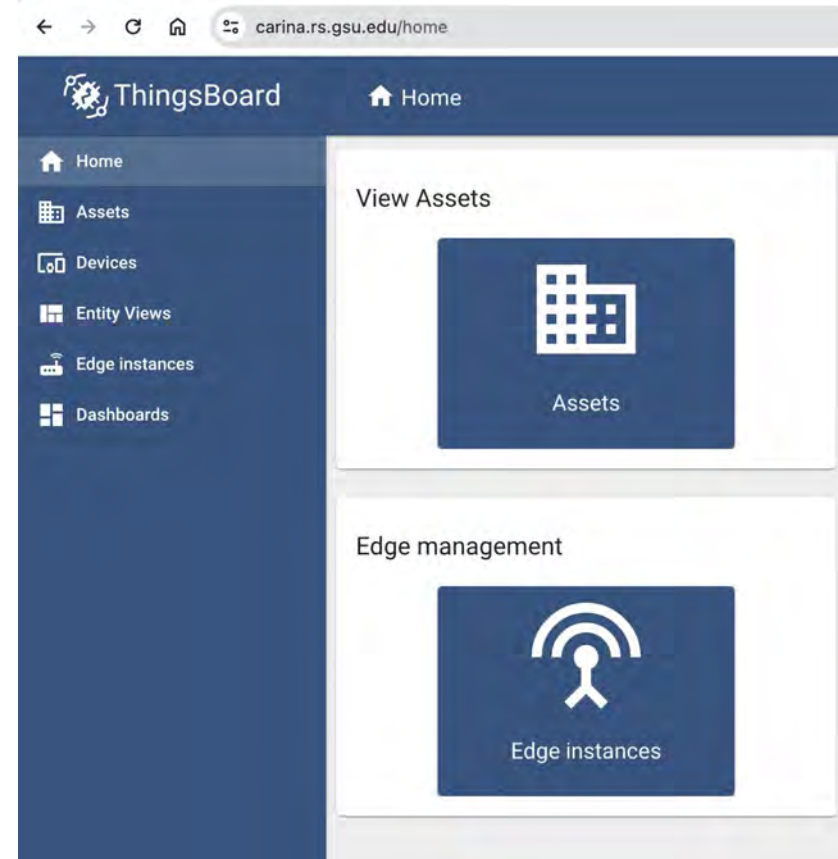
**OPEN**  
**OnDemand**  
OnDemand provides an integrated, single access point for all of your HPC resources.



# Additional Research Support



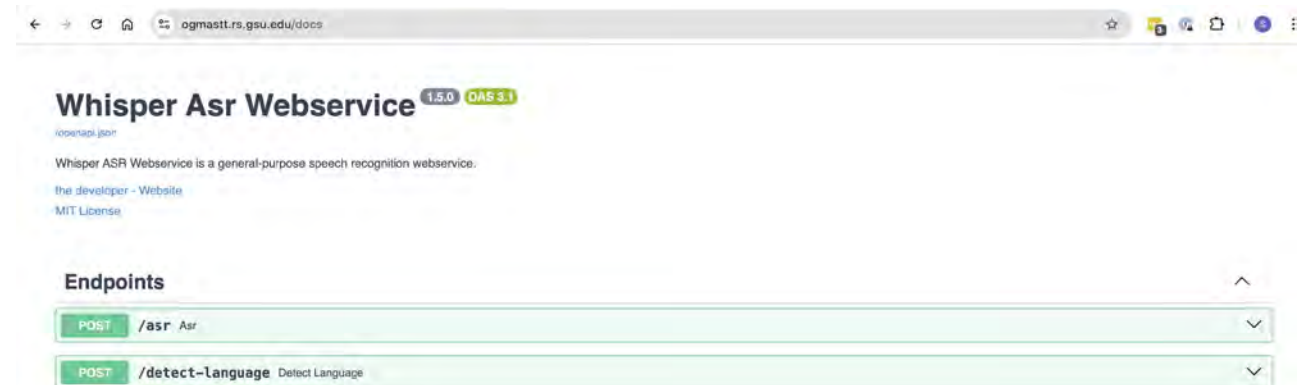
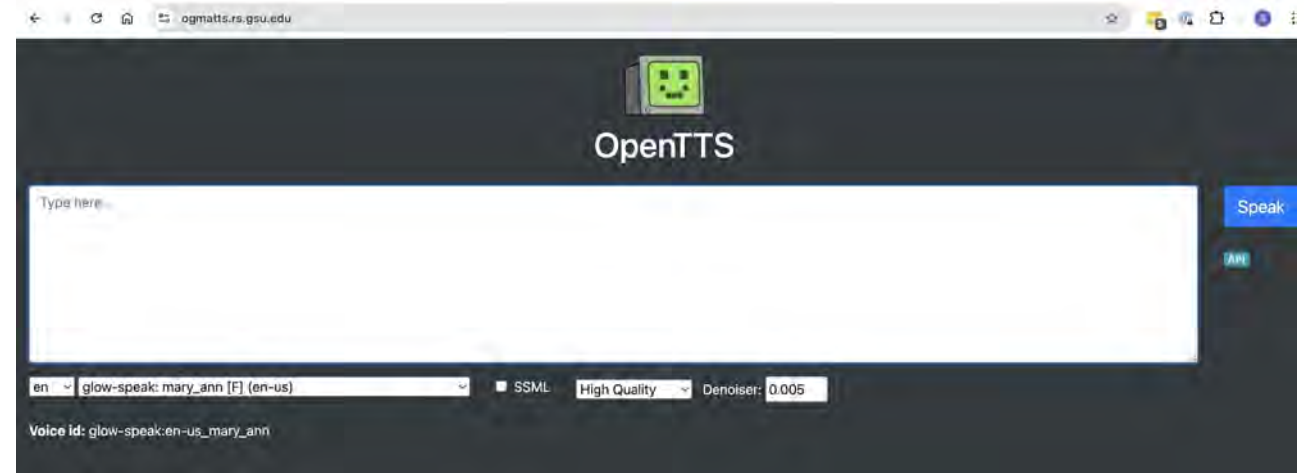
- Containerized Custom application deployment and management on k8s
- CI/CD pipeline setup for easy deployment and maintenance
- IOT data collection and management
- Cloud-native data storage
- Provide resources for Educational purposes(For Eg; Class, Training)



# Deployed Models and Services

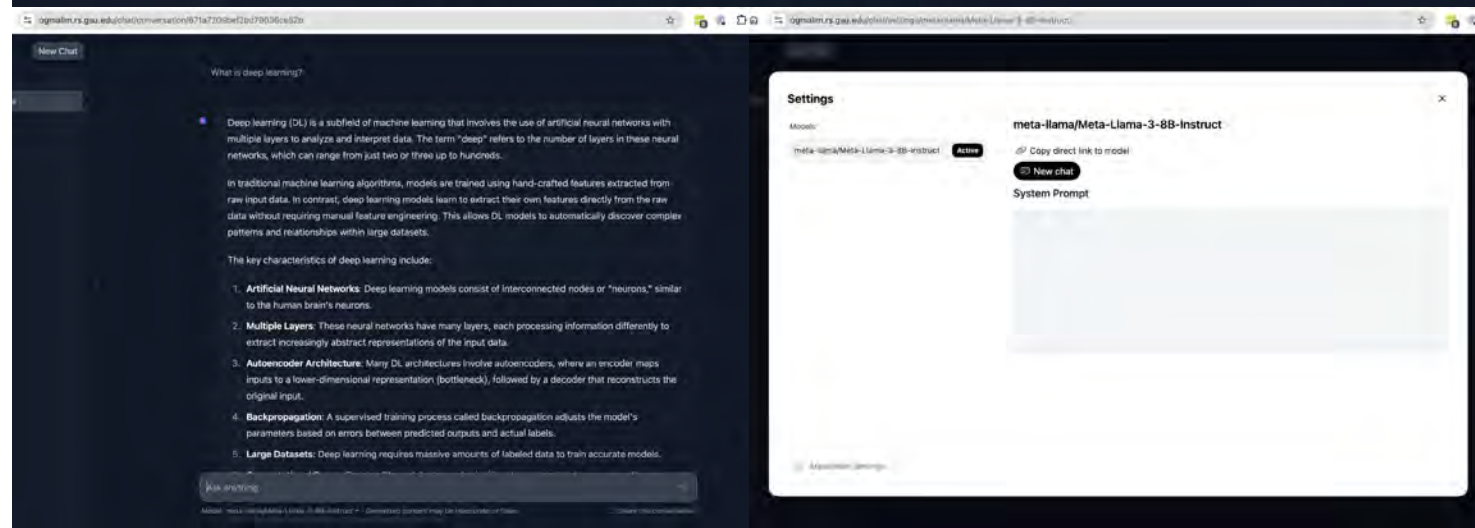
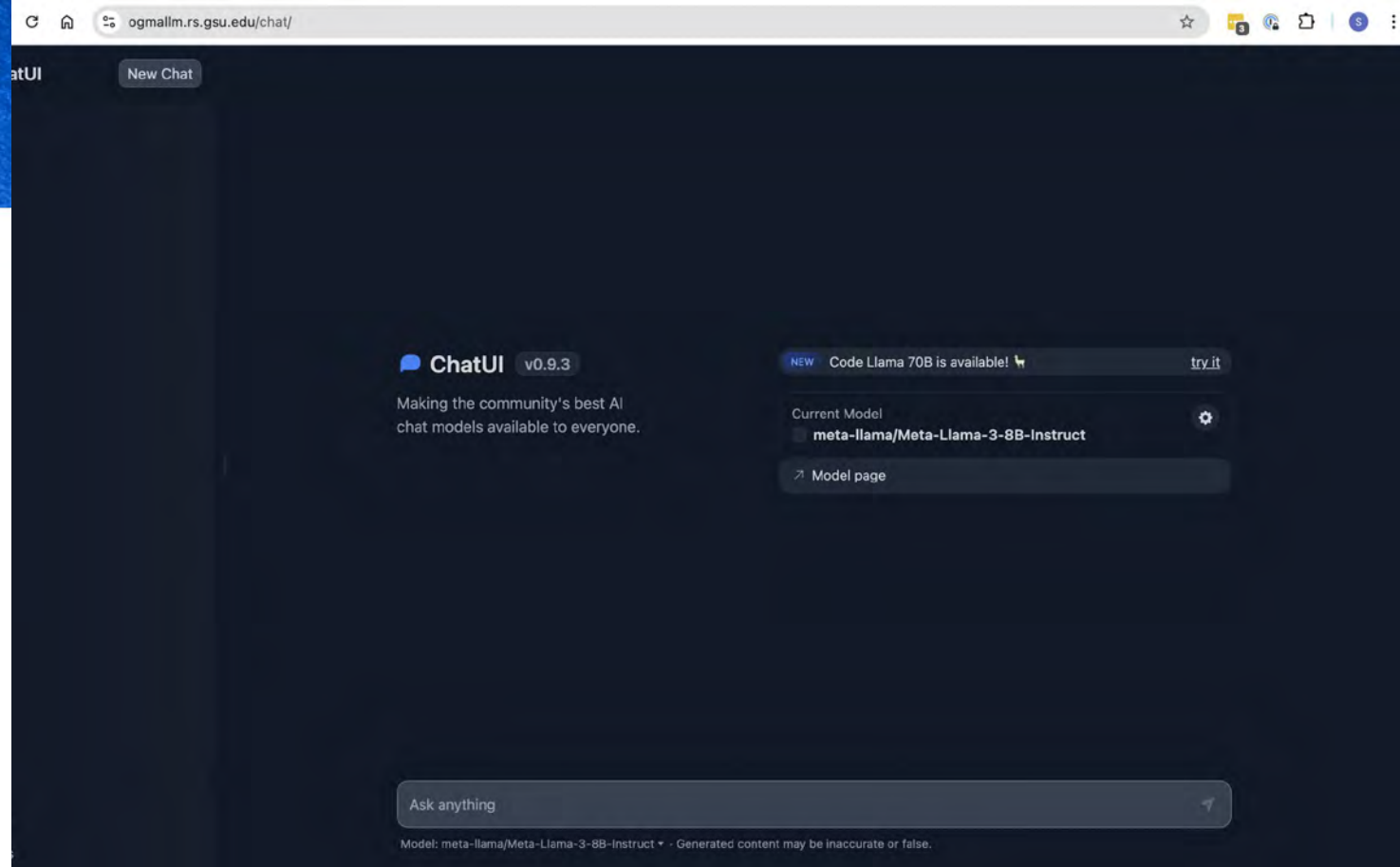


- API for LLM training and inference deployed on K8s cluster.
- Interact with LLM models using WebUI.
- API and UI for Text-To-Speech and Speech-To-Text Conversion models.
- Pilot Project.



# Huggingface Chat UI

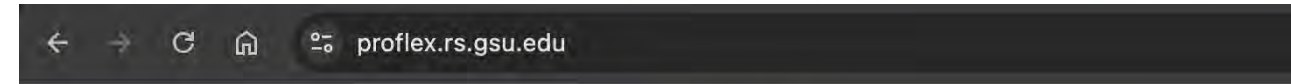
- Using Meta-LLama-3-8B-Instruct
- Can set system prompts through settings



# LLM Models



- Choose LLM models from the list to work with your desired LLM models.
- Pilot Project.



Menu

Proflex

Login



Menu

Proflex

Jobs

LLMs

Logout

Qwen2-5-72B-Instruct-GPTQ-Int4

Model: Qwen/Qwen2.5-72B-Instruct-GPTQ-Int4

Show details

llama-3-8b

Model: meta-llama/Meta-Llama-3.1-8B

Show details

zephyr-7b

Model: HuggingFaceH4/zephyr-7b-beta

Show details

# Thank you!



Please email to [arc@gsu.edu](mailto:arc@gsu.edu) if you have any questions

Web Site : <https://arctic.gsu.edu>

Request PI status: <https://elpis.rs.gsu.edu>

Help desk: <https://hydra.gsu.edu>

