Advanced Research Computing Technology and Innovation Core

ARCTIC

Georgia State University

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

- 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

Current usage
130 PI
750 Active users

Sum of Active Allocation Count
BY FIELD OF SCIENCE
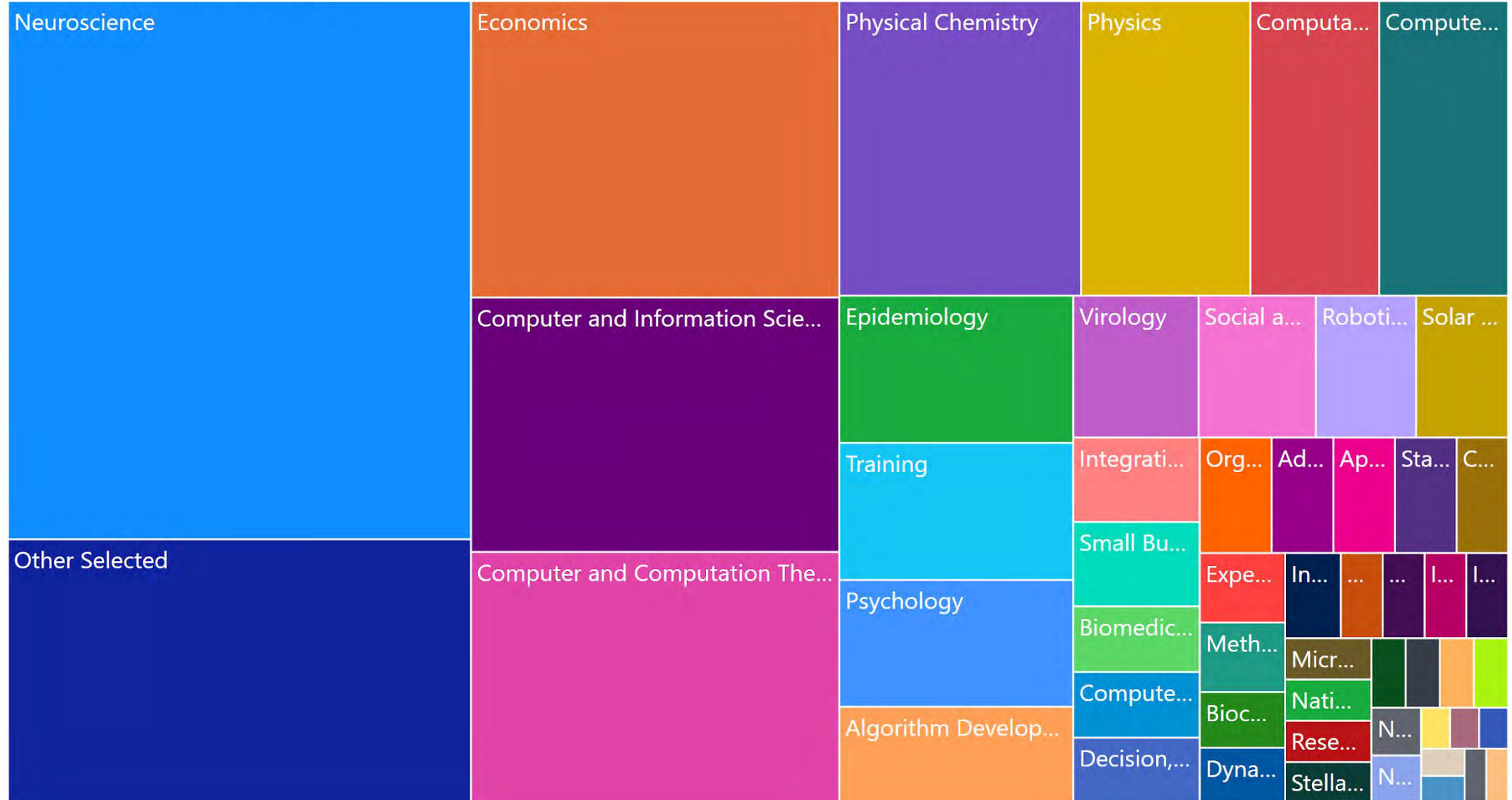
Active Users Distribution by Field of Science

Sum of User Count by Field of Science

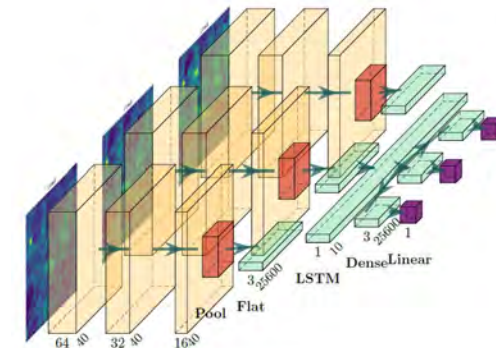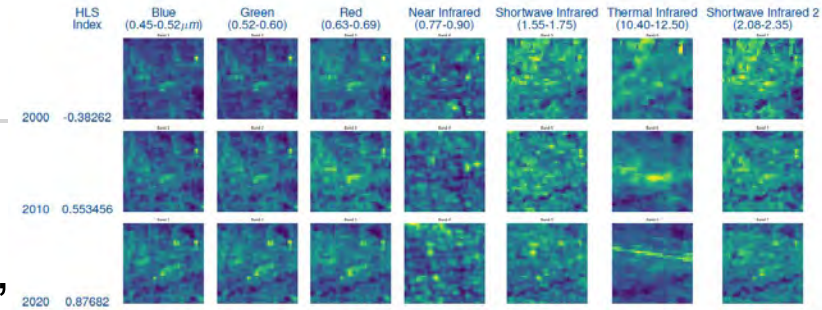# Research Highlights

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
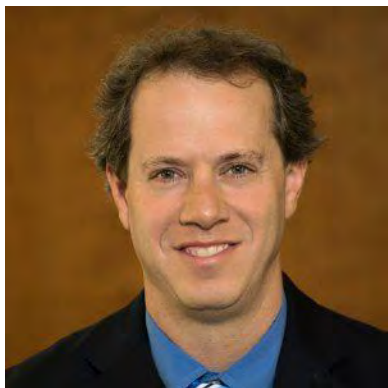
Dr. Andrew Gewirtz: (Biomedical Sciences)

o 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
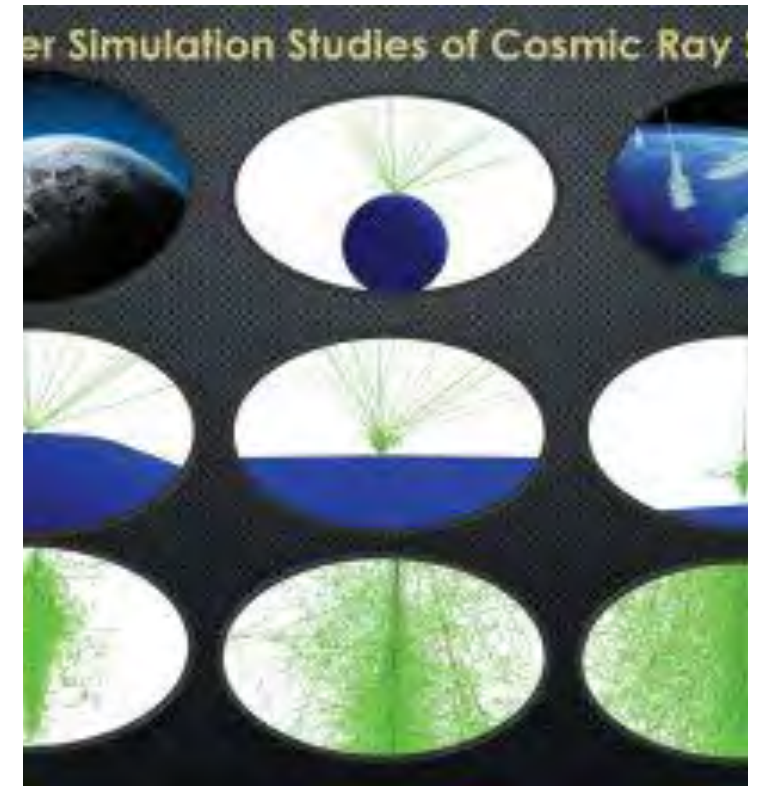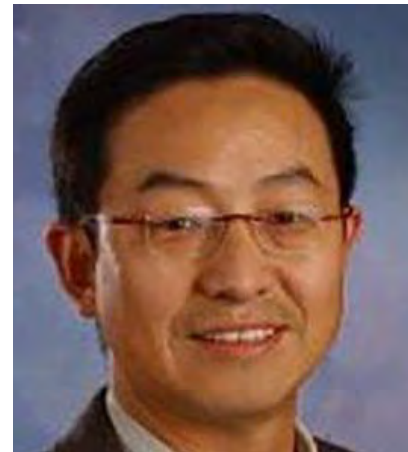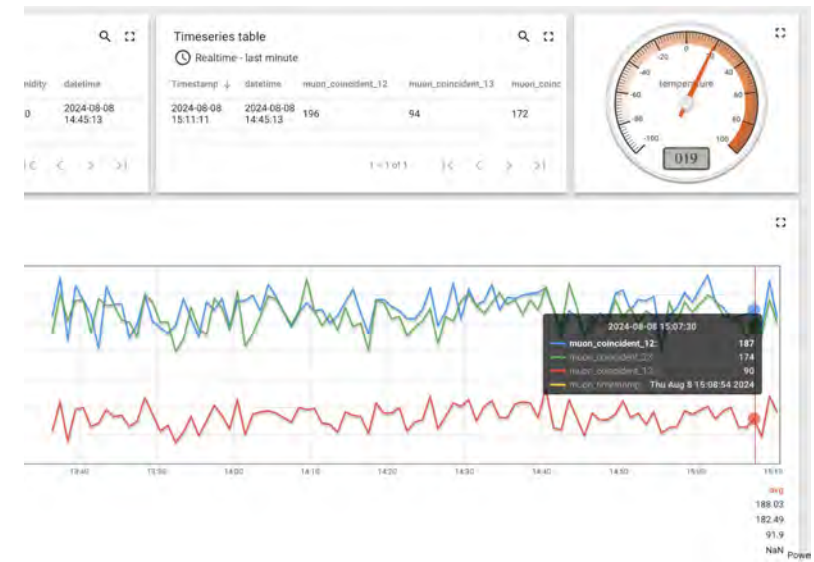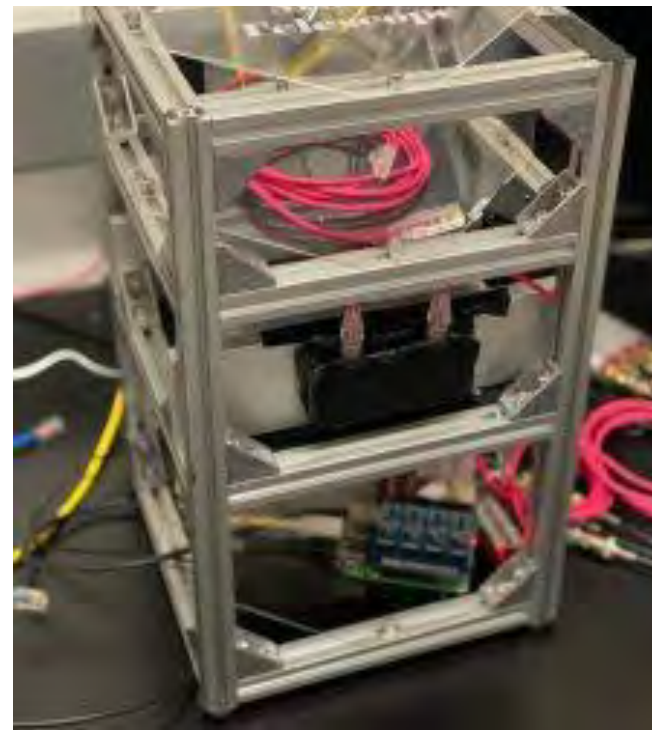
- Dr. Samer Gozem: (Chemistry)

o 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 Highlights

- 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

Research Highlights

Flaviviruses

Isolation of primary mouse neurons

Flavivirus infection

Transcriptomic analysis

Resistance to flavivirus-induced neuropathology

Susceptible mice
Can be infected
Develop lethal encephalitis
Die from the infection

Resistant mice
Can be infected
Show no disease signs
Survive the infection

Resistance is controlled by the Oas1b gene

Mechanism of protection is not known

- 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 AI² Research Laboratory
  - AI² 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.
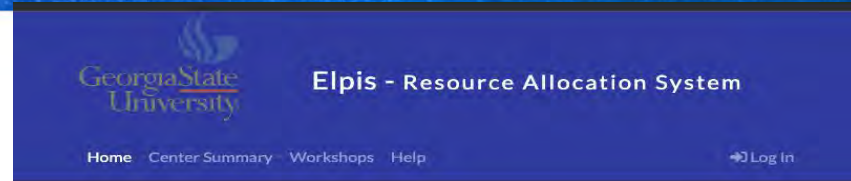
Augmented Learning

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...

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/ARCTIC@mygsu.onmicrosoft.com/b

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

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)
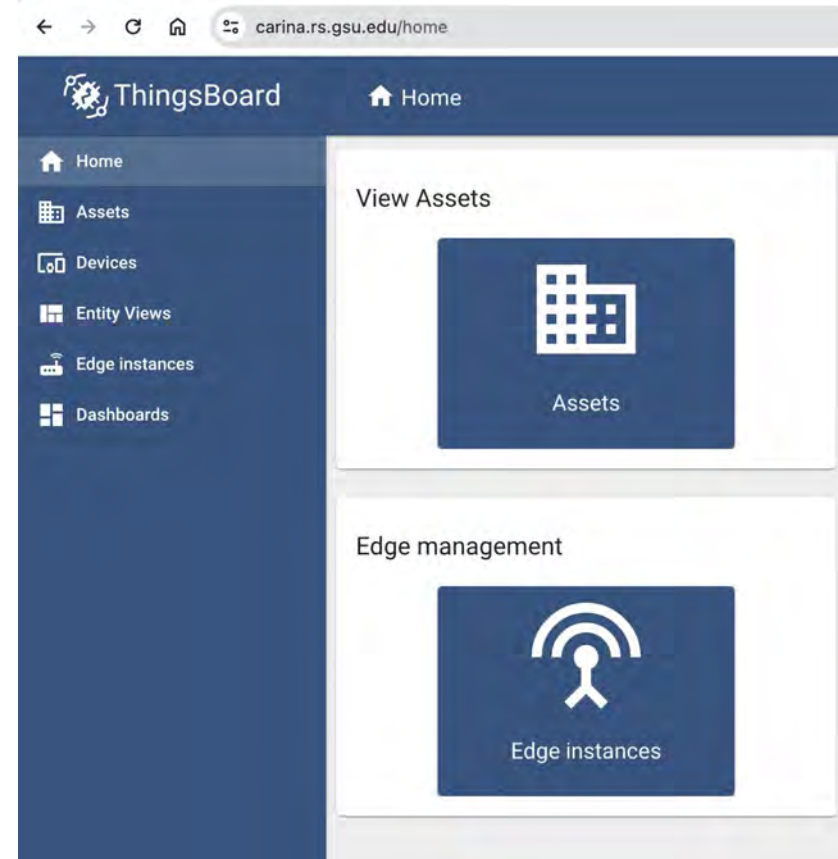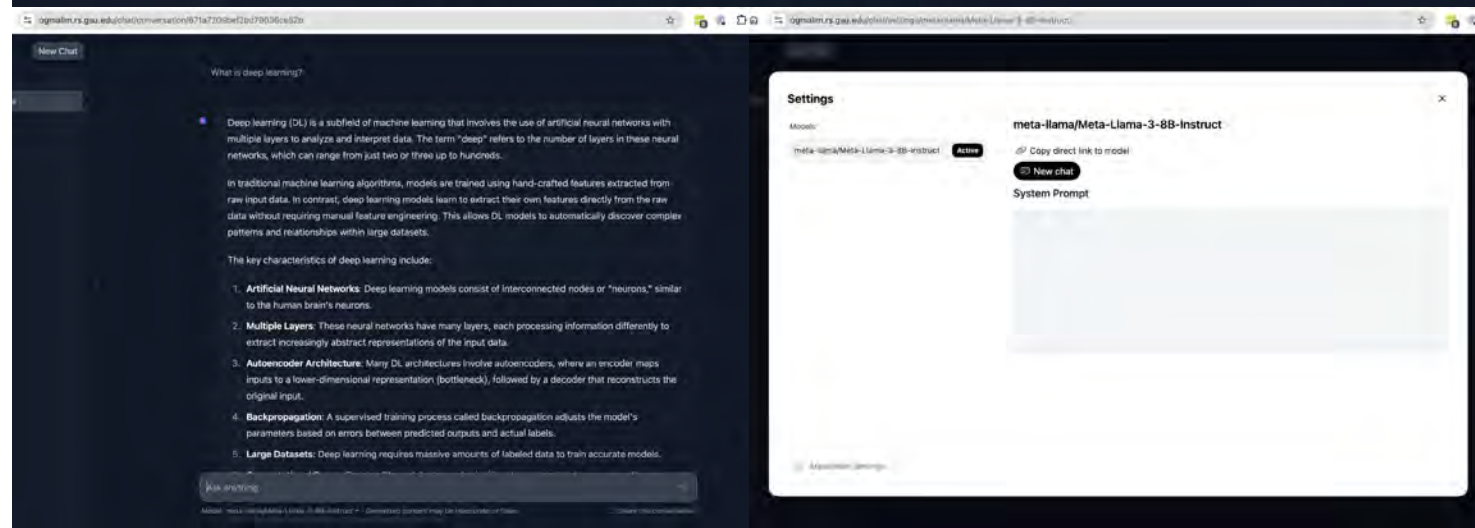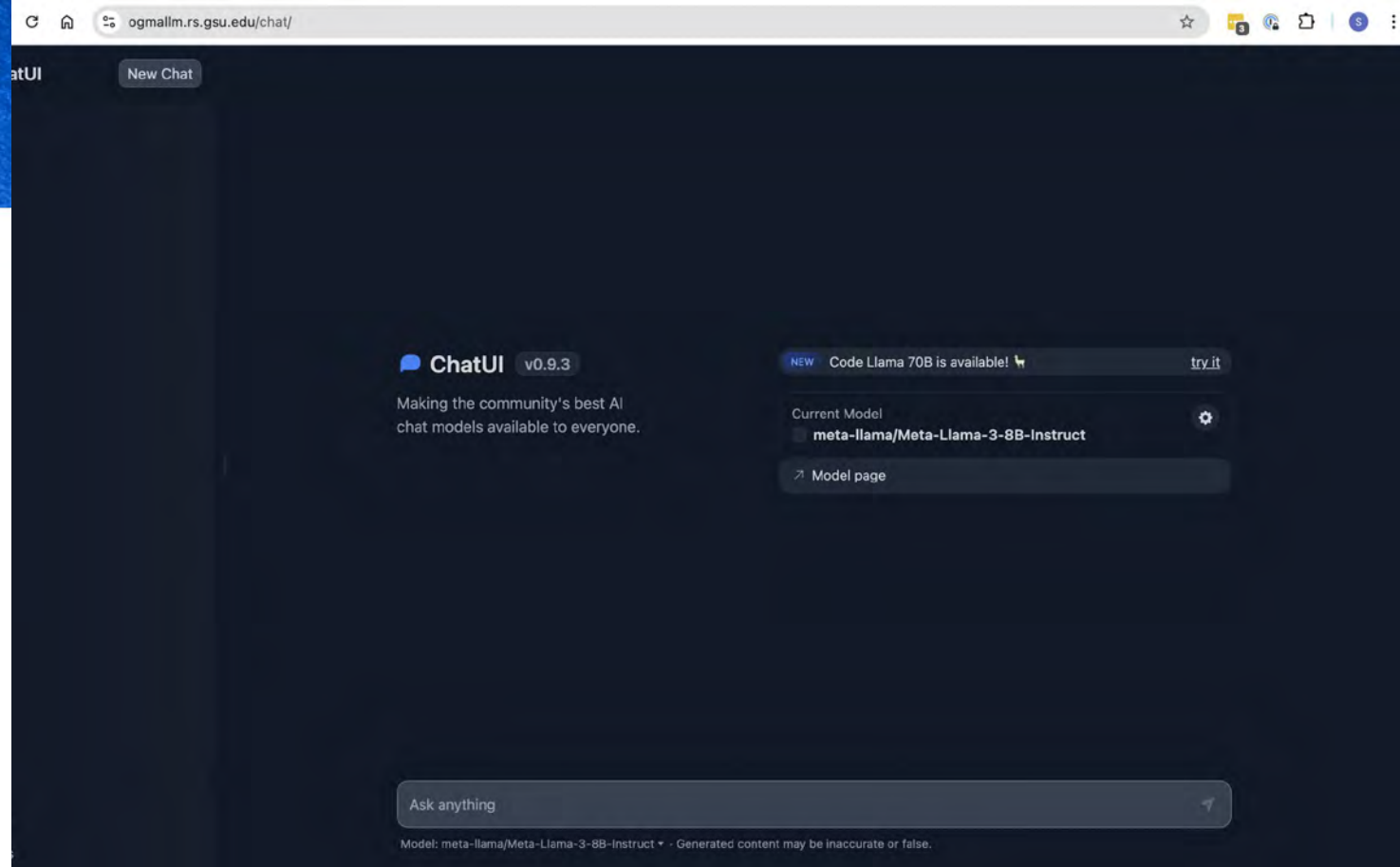
Deployed Models and Services

- 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.
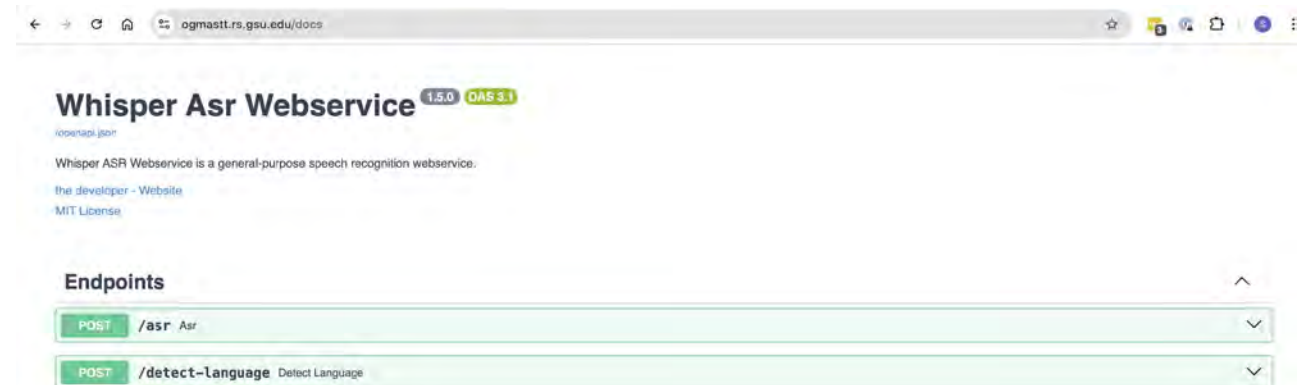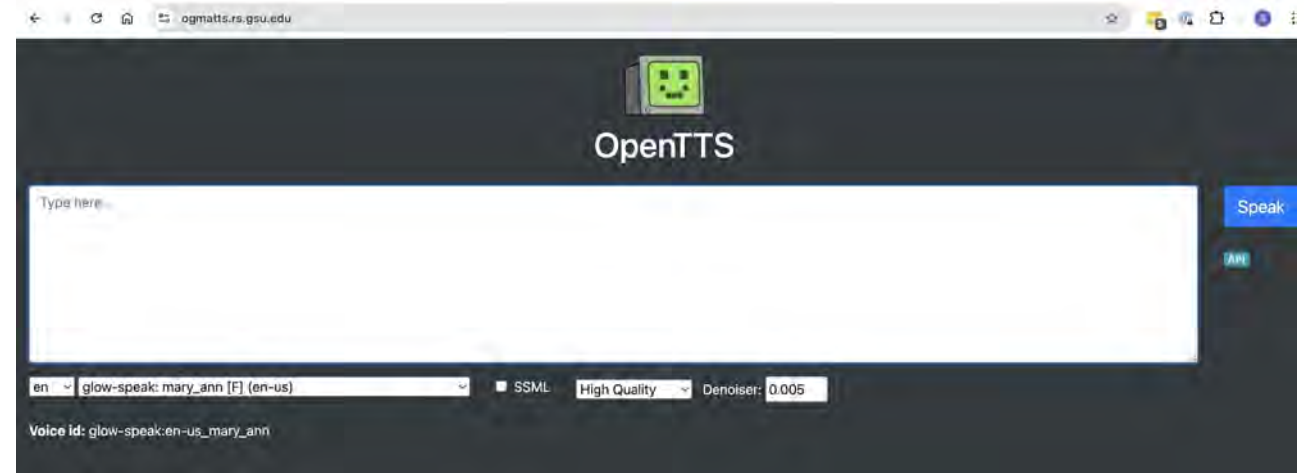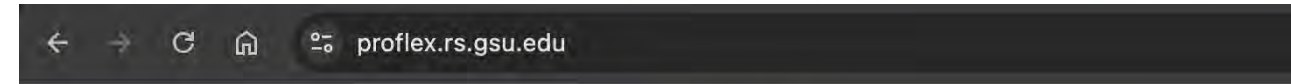
Huggingface Chat UI

- 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.

Thank you!

Please email to 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