Information Technology and Systems Center

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Academics
Educating our Workforce

Research
Creating and Applying Knowledge

Economic Development
Commercializing Intellectual Property
Research - Creating and Applying Knowledge

Engineering Systems

Science

Optics / Microelectronics

Information Systems

Productivity Enhancement
Success Builds on the Integration of Domain Experts and Information Technology

**Domain Scientists and Engineers**
- Research and Analysis
- Data Set Development

**Information Technology Scientists**
- Information Science Research
- Knowledge Management
- Data Exploitation

**Collaborations**
- Accelerate research process
- Maximize knowledge discovery
  - Minimize data handling
  - Contribute to both fields
Primary Research Focus Areas

• Data Mining and Knowledge Discovery
• Text Mining for Analysis
• Sensor Networking
• Visual Analytics
• Collaboration Systems
• Intelligence and Warfare Simulations
• Ontologies, Semantics and Semantic Web
• Geo and Bioinformatics
• Information Management and Data Technologies
• High Performance Computing
• Information Assurance / Cybersecurity
Improving Data Usability

• Advanced Applications
  o **Data organization and management** for archival and analysis
  o **Data Mining** in real-time and for post-run analysis
  o **Interchange Technologies** for improved data exploitation
  o **Semantics** to transform data exploitation via intelligent automated processing

• Cyberinfrastructure
  o **Grid and Cloud technologies** for seamless access to multiple computational and data resources into a virtual computing environment
  o **High Performance Computing** for high speed parallel computation, for multiple agent computations, and other applications
  o **Advanced Networking** for networked applications development and high performance connectivity
UAH has been at the forefront of mining sensor data for over 15 years

- Automated discovery of patterns, signatures, anomalies from vast observational data sets
- Derived knowledge for decision making and response
- Allows learning and training for adaptation
- **ADaM – Algorithm Development and Mining System** toolkit with 100+ algorithms
- Many users worldwide

http://datamining.itsc.uah.edu
GLIDER

Visualization and Analysis tool for Earth Science Researchers using ADaM, IVICS, WorldWind:

• **Visualize and analyze** satellite data in its native sensor view.
• **Apply different** image processing algorithms on the data.
• **Apply different** pattern recognition/data mining algorithms on the data.
• **Project** satellite data and analysis/mining results onto a globe and overlay additional layers.
• **Provides multiple views** to manage, visualize, and analyze data files.

Funded by NASA SMD/ACCESS
Noesis: Ontology Based Search and Resource Aggregation Tool

- Information searching can be enhanced considerably through the integration of ontologies into search systems – Noesis is one example

- Ontologies are used in Noesis for query expansion and semantic mediation of vocabularies to search heterogeneous databases

- Noesis is integrated into multiple information systems including into NASA Stennis’ Coastal Online Assessment and Synthesis (COAST) geobrowser
  - Searching KMZ/KML resources and auto-launching Google Earth to display these files
  - Added Mangrove Ontology to Noesis – of great interest to coastal managers in Mexico

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<tr>
<td>Search Results</td>
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<td>Related Terms</td>
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**Related Terms**
- **Atmospheric pressure**
  - Wikipedia, the free encyclopedia
  - Atmospheric pressure is the pressure at any point in the Earth's atmosphere. In most circumstances atmospheric pressure is closely approximated by... [Go to wiki](https://en.wikipedia.org/wiki/Atmospheric_pressure)

**Search Results**
- **Pressure**
  - Wikipedia, the free encyclopedia
  - Pressure is defined as force per unit area, it is usually more convenient to use pressure rather than force to describe the influence upon fluid behavior...
  - [Go to wiki](https://en.wikipedia.org/wiki/Pressure)

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*Noesis, developed for LEAD, is also being used by NASA ESIP Federation, Gulf of Mexico Regional Collaboration Project and others*
Global Hydrology Resource Center

- **Partnership** between NASA and UAHuntsville to apply **advanced information technologies** to a variety of **science data projects**, thereby enabling research and scientific discovery
- **Full service NASA data center** providing data ingest, routine and custom processing, archive, distribution, user support, and science data services
  - Ingest: ~ 5 GB/Day; Data Distribution: ~ 34 GB/Day; 5TB Data Archive
  - **Passive Microwave Data**
    - Massive inventory of satellite and aircraft based data
  - **Lightning Imaging Sensor (LIS) Science Computing Facility**
    - National lightning data center for the TRMM Lightning Imaging Sensor and validation networks
  - **AMSR-E Science Investigator-led Processing System**
    - Generates swath, daily, and monthly products of precipitation, sea ice, water vapor, cloud water, sea surface temps, etc.
  - **Field Campaigns**:
    - Web-based collaboration for science before, during, and after experiments. Data acquisition, integration, archive and distribution
  - GHRC has been the **top-ranked NASA Earth science data center in customer service** for three of the past four years.
New Coastal IT projects

**IT for Genesis and Rapid Intensification experiment (GRIP-IT):** data management, collaboration tools and other information technologies for upcoming field campaign

**Sediment Analysis Network for Decision Support (SANDS)** will generate decision support products using NASA satellite observations to address the impacts of tropical storms and hurricanes on sediment disturbance, suspension, transport, and deposition in the north central Gulf of Mexico. User community to include:
- Dauphin Island Sea Lab
- Alabama Department of Conservation
- Department of the Interior
- Mobile Bay National Estuary Program
- NOAA Center for Coastal Ocean Research

**DSS Environment for Modeling of Atmospheric Nutrient Deposition (DEMAND)** will use satellite data and output from a chemical/aerosol transport model to estimate wet and dry deposition of nutrients over land, inland water bodies, estuaries and the Gulf of Mexico region, in order to aid in decision making processes related to water quality and nutrient inputs into aquatic ecosystems. User community to include:
- Alabama Department of Environmental Management (ADEM)
- Mobile Bay National Estuary Program (MBNEP)
• Talkoot is a customizable “software appliance” to build collaborative portals for Earth Science services and analysis workflows

• Talkoot is leveraging Drupal, an open architecture platform, to provide the core Content Management System capabilities required by an online collaborative portal
  – Drupal also has a vast array of specialized modules that have been developed by its user community to provide additional features

• Talkoot is adding Earth science specific modules to provide data searching, processing and analysis capabilities.