The Vision for CISML

- Develop **interdisciplinary** theory and practice of intelligent systems and machine learning technologies
- Enable **cross-fertilization** of ideas from several individual disciplines
- Attract **increased external funding** involving multiple faculty
- Connect **industry with curricula and research**
- Help UTK reach its **Top 25 goal**, by cultivating our established strengths in intelligent systems and machine learning
- Attract more **highly qualified students**
- Integrate **curricular content** and emphasize interdisciplinary study
CISML UTK Faculty – From 3 Colleges, 6 Depts.

**College of Engineering:**
- **CISML Director:** Dr. Michael W. Berry, Electrical Engineering and Computer Science (EECS)
  - Dr. Itamar Arel, EECS
  - Dr. Qing Cao, EECS
  - Dr. Lynne Parker, EECS
  - Dr. J. Wes Hines, Nuclear Engineering
  - Dr. Bruce MacLennan, EECS
  - Dr. Hairong Qi, EECS
  - Dr. Jindong Tan, MABE

**College of Arts and Sciences**
- Dr. Daniela Corbetta, Psychology
- Dr. Shih-Lung Shaw, Geography

**College of Business Administration**
- Dr. Ham Bozdogan, Statistics, Operations, and Mgmt. Sci. (SOMS)
- Dr. Wenjun Zhou, SOMS
CISML Nat’l Lab Affiliates – from 2 Divisions, 4 groups

Computer Science and Mathematics Division:
- Dr. Jacob Barhen, Complex Systems Group
- Dr. Tom Potok, Applied Software Engineering Group

Computational Science and Engineering Division
- Dr. Brian Worley, CSE Director
- Dr. Vladimir Protopopescu, CSE Chief Scientist
- Dr. John Goodall, Cyber Security and Information Infrastructure Research Group
- Dr. Songhua Xu, Early Career Biomedical Research
CISML Affiliates have broad expertise in Intelligent Systems and Machine Learning:

- Reinforcement learning, deep machine learning (Arel, Parker)
- Text/data mining and knowledge discovery (Berry, Bozdogan, Cao, Goodall, Parker, Potok, Worley, Xu, Zhou)
- Human infant perceptual and motor learning (Corbetta)
- Cognitive learning (Arel, Corbetta)
- Pattern recognition (Barhen, Berry, Cao, Hines, Parker, Qi, Shaw, Tan)
- Prognostics and diagnostics (Hines, Parker)
- Embodied intelligence (Arel, Corbetta, MacLennan, Parker)
- Collaborative/Cooperative/Distributed systems (Parker, Potok, Protopopescu, Qi, Tan)
- Remote sensing (Barhen, Cao, Parker, Tan)
- Biologically-inspired intelligence (Arel, MacLennan, Parker, Potok)
CISML Industry Affiliates

- Each industry affiliate contributes $5K annually

- In return, their benefits are:
  - Access to undergrad and grad students for internships, employment
  - Collaborative research with CISML
  - Access to all public domain software developed, with opportunities for licensing
  - Access to faculty and student research publications
  - Display of corporate logo on website
  - Participation in Industrial Affiliate workshop
  - Recognition as CISML Industrial Affiliate

More industry affiliates being recruited …
Key Objective of CISML: Leverage Research Synergies to Pursue Multi-Collaborator Funding

- **Strategy:**
  - **Identify unique synergies amongst CISML Faculty, National Lab, and Industry Affiliates**
    - Through extensive discussions, CISML seminars, cross-fertilization of ideas
  - **Leverage synergies to pursue new directions for multi-collaborator, multi-disciplinary research**
    - Through proposal development
  - **Explore and pursue opportunities for Center-level funding**
    - E.g., with NSF, NIH, Department of Energy, etc.
Emerging Synergy

- Grasping eDiscovery momentum with existing and prospective industry affiliates and ORNL

  - Build a coalition of CISML affiliates around the opportunities presented for developing new and novel algorithms and software for eDiscovery.

    - Definition: *Electronic discovery (eDiscovery) is the process of collecting and analyzing electronic documents to determine their relevance to a legal matter.*

  - Participants

    - Faculty affiliates: Berry, Parker, Zhou
    - ORNL affiliates: Goodall, Potok, Worley, Xu
    - Industry affiliates: Huron Legal, M-CAM, Catalyst Repository Systems
Emerging Synergy (cont.)

– **Vision and Strategy**
  
  – Capitalize on new opportunities that have arisen to establish and continue developing learning-based technologies that assist software developers, service providers, and legal teams in efficiently and accurately identifying the most relevant documents for litigation.

– **Pursue center level funding via NSF’s Industry/University Cooperative Research Centers Program (I/UCRC)**
  
  • Funding Amount - $10,000,000  
  • Centers funded – 2 to 8

From NSF Solicitation “The Industry/University Cooperative Research Centers (I/UCRC) program develops long-term partnerships among industry, academe, and government. An I/UCRC contributes to the Nation's research infrastructure base and enhances the intellectual capacity of the engineering and science workforce through the integration of research and education.”
Recent CISML Accomplishments

- Established a permanent/comprehensive web presence (http://cisml.utk.edu/)
- Continued bi-weekly research seminar series; 18 seminars held to date (presentations available on website)
- Established a collaborative relationship with the Center for Brain-Like Computing and Machine Intelligence in Shanghai, China
Recent CISML Accomplishments (cont.)

- Added three new Industry Affiliates:
  - Huron Legal
  - Link Analytics
  - M·CAM

- Added four new Faculty Affiliates:
  - Wenjun Zhou
    Statistics, Operations And Management Science
  - Shih-Lung Shaw
    Geography
  - Qing Cao
    Electrical Engineering and Computer Science
  - Jindong Tan
    Mechanical, Aerospace, and Biomedical Engineering
Recent CISML Accomplishments (cont.)

- Six multi-investigator proposal submissions
- Produced multiple internships with existing industry affiliates
- Established a new seminar course for PhD students in machine learning
- Established a more unified presence with move into the new Min H. Kao building
NSF I/UCRC Initiative

Presented by: Dr. Michael W. Berry, Director-elect

April 20, 2012
Industry/University Cooperative Research Centers Program (I/UCRC)

- Estimated Number of Awards: 2 to 8 full center awards and 4 to 12 planning grant awards annually.
- Anticipated Funding Amount: $10,000,000 (dependent on the availability of funds); anticipated funding includes continued annual support and supplemental requests for existing centers.
- Letter of Intent: June 29, 2012
- Center Proposal due: September 28, 2012
Industry/University Cooperative Research Centers Program (I/UCRC)

“The Industry/University Cooperative Research Centers (I/UCRC) program develops long-term partnerships among industry, academe, and government. The centers are catalyzed by a small investment from the National Science Foundation (NSF) and are primarily supported by industry center members, with NSF taking a supporting role in the development and evolution of the center. Each center is established to conduct research that is of interest to both the industry members and the center faculty. An I/UCRC contributes to the Nation's research infrastructure base and enhances the intellectual capacity of the engineering and science workforce through the integration of research and education. As appropriate, an I/UCRC uses international collaborations to advance these goals within the global context.”
NSF 12516: I/UCRC Membership

- A single university center must have a minimum of $400,000 annually in membership fees with a minimum of eight full members.
- An example to count memberships for a center site that has a $50,000 full membership fee is as follows:

  Company A paying $50,000 in membership fees counts as one full member and one vote; Company B paying $100,000 in membership fees counts as one full member and two votes; Company C paying $150,000 in membership fees counts as one full member and two votes per signed membership agreement; and, Company D paying $25,000 counts as half member and half a vote. Thus, in this particular example, the center site has 3.5 members and membership fees totaling $325,000.
A center director at the lead institution is responsible for all aspects of center operations;

Co-directors that manage their university team's researchers and collaborate with the administrative lead and other sites within the center (for multi-university centers);

An Industrial Advisory Board (IAB) that reviews and recommends on all research activities;

A university policy committee that facilitates the operation of the center while ensuring operation within the policies of the universities;

A uniform and consistent policy for handling memberships and member privileges across all sites of a center;

A collaborative and participative research environment;

Graduate and other student involvement; and

A plan for addressing diversity.
Multi-institutional center proposals are given preference over single institutional proposals. The initial Phase I I/UCRC award to a center has a potential duration of five years. NSF support is intended to augment the support that a center receives from industry and other sponsors.

The I/UCRC program uses the following funding formulas:

- Multi-institutional center sites with an annual industry membership participation between $150,000 to $300,000 can receive up to $60,000 annually. The center must obtain a total of $300,000 in membership participation to receive an award.
- Multi-university research sites with $300,000 or more in annual memberships can receive up to $80,000 annually. Single university I/UCRCs obtaining $400,000 or more in annual memberships can receive up to $80,000 annually.