Computationally-Enabled Social and Collective Intelligence: Research Challenges

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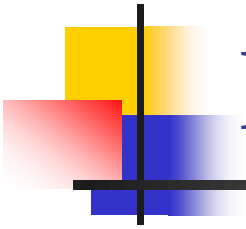


Moving Towards the Future

- What is ….?
- Existing systems
- Vision of the future
- Research challenges

What is ….?

- **Collective intelligence** is a shared or group intelligence that emerges from the collaboration and competition of many individuals.
- **Socially Intelligent Computing** brings together people and computers creating new forms of collaboration, communication, and emergent intelligence that were not previously achievable by human or computer alone.

Collective Intelligence: Examples

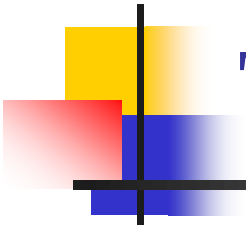
- "**Open source**" brings together thousands of Internet-connected volunteer programmers worldwide. (Linux, Apache Web Server)
- **Recommender systems** automatically generate personalized recommendations by matching consumer's seeking and purchasing behaviors to millions of customers with similar behaviors. (Amazon, ebay)
- **Internet search engines** prioritize Web pages via a "popularity contest" that assesses the extent to which each page has been linked to by other pages. (Google)
- **Wikipedia**, an example of the social and collective construction of knowledge, evolves through the mediated volunteer efforts of millions of people worldwide.

Many Individuals Focus on Specific Challenges: Examples

- Zhu Ling, a student at Tsinghua University, was diagnosed with thalium poisoning after her friends posted a letter on Internet newsgroups describing her symptoms, seeking help identifying her illness.
- AstroAlert uses the Internet to alert thousands of astronomy hobbyists to gather a rich body of timely observations about transient celestial events.
- “Goldcorp Challenge,” publishes on the Web all the data they possess about one of their locations and offering prize money to those who identify likely veins of gold on it.
- NASA’s ClickWorkers website harnesses volunteer efforts to identify craters in Mars images.
- espgame.org brings hundreds of thousands of people online to play what to them is a game and to the game’s creators is a way to determine captions on tens of millions of images on the World Wide Web.

Social Computing: Examples

- Howard Dean uses **Meetup.com** for grassroots campaigning and fundraising for his Presidential campaign, setting a record by raising $7.6 million in a single quarter from tens of thousands of contributors with an average contribution of $112.
- Millions of people who have never physically met regularly work together in teams to develop and execute complex game-playing behaviors in online virtual worlds such as **World of Warcraft**.
- **Facebook** a free-access social networking website where users can join networks organized by city, workplace, school, and region to connect and interact with other people.
- **Twitter** is a social networking and micro-blogging service that enables its users to send and read other users' updates known as *tweets*.



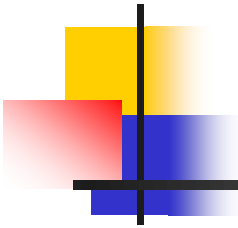
Towards the future

- **Computers are participants** in Human-Computer Intelligent systems: as mediators between people, as tools used by people, or as equal or complementary participants with people.
- Requires that we imbue computers with **better understanding of people** and how we interact both with one another and with computers, at a wide range of granularities.
- The computational parts of the system need to demonstrate **different types of intelligence**: social, cognitive, perceptual

Research Challenge: Understanding key properties of **emergent intelligence**

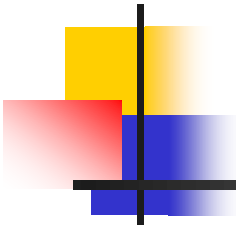
- What are the characteristics of emergent intelligence?
- What types of emergent intelligence can human-computer systems demonstrate?
- Can we model or parameterize what is “computable” or what behaviors are achievable by human-computer intelligent systems?
- What socio-technical values should emergent human-computer intelligent systems incorporate?
- What are structures of the new knowledge created by human-computer intelligence?

Research Challenge: Developing or adopting methods for the study of human-computer intelligence



- What are effective methods for studying emergence of human-computer intelligence?
- How can different methods of study effectively compare the various types of emergent human-computer intelligence?
- How do methods of study scale from small through large numbers of entities in human-computer intelligent systems?

Research Challenge: Designing and building systems that facilitate emergent human-computer intelligence



- What computational, cognitive, and social substrates and abstractions enable and facilitate the design of systems with emergent human-computer intelligent properties?
- What role do the social and interaction cues that humans rely on when interacting with one another play in emergent human-computer intelligence?
- How can we design human-computer intelligent systems for socially desirable values and properties?
- What design techniques and technical characteristics enable open systems for the fullest breadth of intelligences?

NSF Programs in CISE/IIS

- Human Centered Computing
- Robust Intelligence
- CreativeIT (with SBE)
- Human-Computer Intelligence (under development with SBE)