

# Technosocial Predictive Analytics Initiative

Summer 2008



QUARTERLY NEWSLETTER

## AAAI SPRING SYMPOSIUM

March 22-25, 2009  
Stanford University



On March 22-25, 2009, the Association for the Advancement of Artificial Intelligence, in cooperation with Stanford University's Department of Computer Science, will present the 2009 Spring Symposium Series, featuring Technosocial Predictive Analytics as one of nine major topics to be discussed. Our symposium will explore new methods for anticipatory analytical thinking. These new methods implement a multi-perspective

approach to predictive modeling through the integration of human and physical factors, and extend the reach of anticipatory thinking by enhancing a user's cognitive access and facilitating the continuous acquisition of knowledge inputs.

Our goal is to bring together experts from a variety of disciplines relevant to this emerging field of inquiry to stimulate the inception of a new community of interest. Additionally, the symposium will include invited talks and a special session with government agency representatives to discuss requirements and follow-on activities. For further details about scientific scope, submission procedures and symposium logistics visit the Symposium website at [http://predictiveanalytics.pnl.gov/aaai\\_symposium/](http://predictiveanalytics.pnl.gov/aaai_symposium/).



### Antonio's Notes

Welcome back to the Technosocial Predictive Analytics Initiative at the Pacific Northwest National Laboratory. As we approach the end of our first year, I am pleased with the progress of our five projects, and the feedback received from the Advisory Committee in April. With their input we are developing a unified platform which combines capabilities and outputs across the three focus areas – Techno-

social Modeling, Knowledge Inputs and Cognitive Enhancement – to provide collaborative/competitive decision making. In this newsletter we give you a preview of these envisioned developments. Exciting upcoming events include hosting one of the nine symposia selected by the Association for the Advancement of Artificial Intelligence for the March 2009 AAAI Spring Symposium Series, to be held at Stanford University. And, be sure to check out our special feature this month on our progress in developing serious gaming technology for cognitive enhancement.

Project information is always available online. For more information, visit our website <http://predictiveanalytics.pnl.gov>.

## THIRD QUARTER PROJECT STATUS

### Knowledge Encapsulation Framework: A framework for Knowledge Inputs for Technosocial Predictive Analytics

A semantic wiki structure is now complete. Modeling teams are building their knowledge bases; development of the dynamic, workflow-driven spaces is underway which enables the teams to vet and align discovered material with their models. Using the wiki as a means of describing the structure of the models, the gaming scenario can be quickly orchestrated.

### Development of Serious Gaming Technology for Cognitive Enhancement in Predictive Analytics

Progress includes a formal definition of game elements and parameters, initial rules crafted for a simple example (non-TPAI) model, first scenario for a TPAI-model-driven game selected and drafted.

### Vulnerability of Food Security and Energy Infrastructures to Climate Change and Terrorism

A knowledge repository now captures both print and internet social media knowledge; a description of a biofuels game accounts for the tradeoffs among new fuel development and food security, and a new framework is integrating agricultural, energy, land-use, security, and policy aspects of government decisions in India.

### Predicting the Impact of Climate Change on U.S. Power Grids and Its Wider Implications on National Security

The climate analytics work on temperature modeling is now complete. Energy simulations are on track to integrate with power grid simulations scheduled for next year. On the social study front, we are shifting our focus to the investigation on the impacts of demographics and technology changes to our study.

### Dynamic Scenarios for Organizations in Infrastructures

The team has developed a prototype dynamic Bayesian net model for detecting diversion of sensitive nuclear materials, worked with an IED subject matter expert to identify variables and scenarios for use in an IED model, and submitted a social modeling proposal related to nonproliferation intent assessment to NA-22.

#### Leadership Team

Antonio Sanfilippo, Initiative Lead and Knowledge Inputs Area Lead  
Jim Thomas, Cognitive Enhancement Area Lead  
Steve Unwin, Technosocial Modeling Lead

#### Operational Team

Janine Anderson, Communications  
Amanda Cowell, Administrator  
Gary Morgan, Strategy Advisor  
Fran Stanley, Finance  
Tim Strycker, Operations



**Pacific Northwest**  
NATIONAL LABORATORY

## SERIOUS GAMING

Through the combination of rules and interfaces, the TPAI Gaming team employs a compelling user experience to tap into the creative and competitive nature of the human players. Gaming methods and technologies are used to create scenarios that enable developing solutions for serious problems through a “what-if-then” view.

The goal is to create an environment that encourages users to think about a problem differently than if they were reading a written report and looking at a series of graphs. Game play is recorded and made available for post-game analysis to help identify the opportunities that players seized.

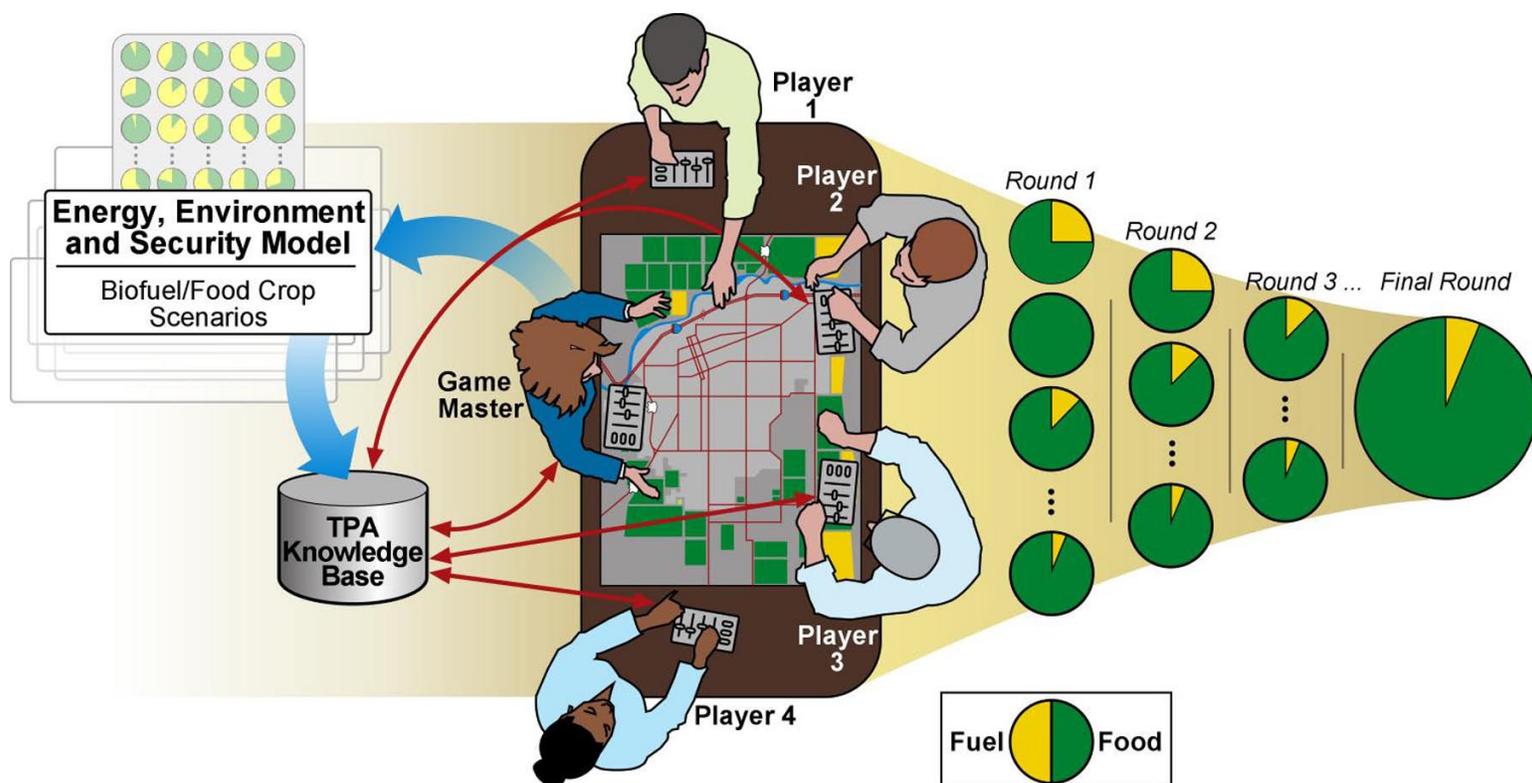
In the Technosocial Predictive Analytics Initiative, we seek to use games as a means for enabling a “conversation” between

expert players and predictive models. In games facilitated by a “Game Master,” who crafts a compelling scenario, and built upon the outputs of TPAI’s Focus Area 1 models, players take on roles that are responsible for trying to attain specific goals or represent a broad interest. Players have access to “handles” that are used to change parameters relevant to the scenario. Through the manipulation of their handles and interactions with each other and the Game Master, the players explore the output space of the models.

Currently the gaming project is most closely tied with the Vulnerability of Food Security and Energy Infrastructure to Climate Change project, led by Liz Malone, to define the first TPAI-driven game. In the

Knowledge Encapsulation Framework project, Andrew Cowell and the KEF team are working on defining how information can flow from the models to players in a game scenario, and ultimately back into the knowledge repository as we feed back insights gained during game play.

Over the next several months, we will be completing an initial prototype game (not based on a TPAI model), to better understand how to balance human involvement and computer-generated data and control. We will also be creating example scenarios derived from the various TPAI modeling teams’ outputs, with a special focus on expanding one or more of those scenarios into a well-defined game.



### Playing the “biofuel vs. food crop” game

A group of experts led by the game master works collaboratively/competitively to narrow down plausible solutions to the allocation of land resources to biofuel or food production. The solution space consists of alternative scenarios generated by the Energy, Environment and Security Model in which more/less land is allocated to biofuel or food production, following a request by the game master. Model output is encapsulated in XML so that it can be easily loaded into the TPA knowledge base. Players exercise their scenario selections by manipulating parameters to issue knowledge base queries.