



**31<sup>st</sup> Annual Meeting of  
North American Fuzzy Information  
Processing Society**

**August 6-8, 2012  
Berkeley, CA**

**PROGRAM**



## **SPONSORING ORGANIZATION**



## **SUPPORTING ORGANIZATION**





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# ORGANIZERS

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*University of California, Berkeley*

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I. Burhan Turksen (Canada)  
José Luis Verdegay (Spain)  
Mark Wierman (USA)  
Dongrui Wu (USA)  
Slawomir Zadrozny (Poland)

# SCHEDULE AT GLANCE

## Sunday, August 5, 2012

7:00pm-10:00pm

Welcome Reception

*Boiler Room, Courtyard  
Hotel Shattuck, Berkeley, CA*

## Monday, August 6, 2012

*Hotel Shattuck, Berkeley, CA*

8:45am 9:00am	Opening and Conference Information		
9:00am 9:50am	<b>Outline of a Restriction-Centered Theory of Reasoning and Computation in an Environment of Uncertainty and Imprecision</b> , <i>Lotfi A. Zadeh</i> , Crystal Ballroom II		
9:50am 10:10am	Coffee break		
	<i>Crystal Ballroom I</i>	<i>Crystal Ballroom II</i>	<i>Boiler Room Section C</i>
10:10am 11:10am	M1: <b>Clustering</b>	M2s: <b>Fuzziness in our Social and Cultural Life - I</b>	M3: <b>Math - I</b>
11:10am 12:10pm	M4: <b>Applications</b>	M5s: <b>Fuzziness in our Social and Cultural Life - II</b>	M6: <b>Math - II</b>
12:10pm 1:30pm	Lunch (provided, Hotel Shattuck)		
1:30pm 2:20pm	<b>Fuzzy Methods for Constructing Multi-Criteria Decision Functions</b> , <i>Ronald R. Yager</i> , Crystal Ballroom II		
	<i>Crystal Ballroom I</i>	<i>Crystal Ballroom II</i>	<i>Boiler Room Section C</i>
2:20pm 3:20pm	M7: <b>Neural Networks</b>	M8s: <b>Fuzziness in our Social and Cultural Life - III</b>	M9: <b>Type-2 Fuzzy Sets</b>
3:20pm 3:40pm	Coffee break		
	<i>Crystal Ballroom I</i>	<i>Crystal Ballroom II</i>	<i>Boiler Room Section C</i>
3:40pm 4:40pm	M10: <b>Information and Fuzzy Systems</b>	M11: <b>Best Student Papers</b>	M12s: <b>Fuzzy logic with Engineering Applications – I</b>
4:40pm 5:40pm	M13: Ontologies and Databases	M14: <b>Best Papers</b>	M15s: <b>Fuzzy logic with Engineering Applications – II</b>



## Tuesday, August 7, 2012

Hotel Shattuck, Berkeley, CA

9:00am 9:50am	<b>Need for Expert Knowledge (and Soft Computing) in Cyberinfrastructure-Based Data Processing</b> , Vladik Kreinovich, Crystal Ballroom II		
9:50am 10:10am	Coffee break		
	<i>Crystal Ballroom I</i>	<i>Crystal Ballroom II</i>	<i>Boiler Room Section C</i>
10:10am 11:10am	T1: <b>Language and Decision Making</b>	T2s: <b>Hybrid Intelligent Systems – I</b>	T3s: <b>Inter-relation between Interval and Fuzzy Techniques – I</b>
11:10am 12:10pm	T4: <b>Natural Language Processing</b>	T5s: <b>Hybrid Intelligent Systems – II</b>	T5s: <b>Inter-relation between Interval and Fuzzy Techniques – II</b>
12:10pm 1:30pm	Lunch (provided, Hotel Shattuck)		
1:30pm 2:20pm	<b>Concepts: Are They Logically Fuzzy</b> , Eleanor Rosch, Crystal Ballroom II		
	<i>Crystal Ballroom I</i>	<i>Crystal Ballroom II</i>	<i>Boiler Room Section C</i>
2:20pm 3:20pm	T7: <b>Type-2 Fuzzy Sets – Control and Prediction</b>	T8: <b>AHP and Choice Model</b>	T9s: <b>Inter-relation between Interval and Fuzzy Techniques – III</b>
3:20pm 3:40pm	Coffee break		
	<i>Crystal Ballroom I</i>	<i>Crystal Ballroom II</i>	<i>Boiler Room Section C</i>
3:40pm 4:40pm	T10s: <b>Basic and Advanced Computing with Words – I</b>	T11s: <b>Hybrid Intelligent Systems – III</b>	T12: <b>BioMedical Applications – I</b>
4:40pm 5:40pm	T13s: <b>Basic and Advanced Computing with Words – II</b>	T14s: <b>Hybrid Intelligent Systems – IV</b>	T15s: <b>BioMedical Applications – II, and Methods</b>

## Wednesday, August 8, 2012

Hotel Shattuck, Berkeley, CA

9:00am 9:50am	<b>Intellectual Information Learning and Control of Knowledge System (IILCKS): Overview and Implementation</b> , Shahnaz N. Shahbazova, Crystal Ballroom II		
9:50am 10:10am	Coffee break		
	<i>Crystal Ballroom I</i>	<i>Crystal Ballroom II</i>	<i>Boiler Room Section C</i>
10:10am 11:10am	W1: <b>Theory</b>	W2: <b>Algorithms and Control</b>	W3s: <b>Fuzzy Optimization and Decision Making – I</b>
11:10am 12:10pm	W4: <b>Prediction, Classification and Detection</b>	W5: <b>Fuzzy Logic</b>	W6s: <b>Fuzzy Optimization and Decision Making – II</b>

**Sunday, August 5, 2012**

**7:00pm-10:00pm**

**Welcome Reception**

*Boiler Room, Courtyard  
Hotel Shattuck, Berkeley, CA*

**Monday, August 6, 2012**



**8:45am-9:00am**

*Room: Crystal Ballroom II*

Opening and Conference Information

**9:00am-9:50am**

*Room: Crystal Ballroom II, Chair: Asli Celikyilmaz*

Outline of a Restriction-Centered Theory of Reasoning and Computation in an Environment of Uncertainty and Imprecision

*Lotfi A. Zadeh*

*University of California, Berkeley, USA*

**9:50am-10:10am**

Coffee Break

**10:10am-11:10am**

**M1: Clustering**

*Room: Crystal Ballroom I, Session Chair: Amit Banerjee*

Crisp and Fuzzy Cluster Validity: Generalized Intra-Inter Silhouette Index

*Mohammad Rawashdeh and Anca Ralescu*

Inclusion Based Robust Clustering of Fuzzy Sets

*Amit Banerjee*

A Fuzzy Weighted Clustering Method for Symbolic Interval Data

*Arthur Alvim and Renata Souza*

**M2s: Fuzziness in our Social and Cultural Life – I**

*Room: Crystal Ballroom II, Session Chairs: Veronica Sanz and Rudolf Seising*

How Many Unemployed Are There? and other early non-technical "Fuzzy-papers" by Lotfi A. Zadeh

*Rudolf Seising*

An analytic view on the fuzzy concept of wisdom (best student paper nominee)

*Anett Hoppe and Mario Tabacchi*

Reasoning in Black and White?

*Enric Trillas*

**M3: Math – I**

**Room: Boiler Room Section C, Session Chair: Thomas Whalen**

Fuzzy calculus via extension of the derivative and integral operators and fuzzy differential equations  
*Luciana Gomes and Laécio Barros*

The Existence for a Solution on the Closed Subset to the Cauchy Problems of Fuzzy Differential Equation  
*Yabin Shao and Zengtai Gong*

Much Ado About Nothing: Fuzzy Infinities and Infinitesimals  
*Thomas Whalen and Murray Cohen*

**11:10am-12:10pm**

**M4: Applications**

**Room: Crystal Ballroom I, Session Chair: Aminah Robinson Fayek**

Ranking Biomedical Literature Search Result Based on Relevance Feedback Using Fuzzy Logic and Unified Medical Language System

*Massuod Alatrash, Hao Ying, Peter Dews, Ming Dong  
and R. Michael Massanari*

An Interval Type-2 Fuzzy Model for Vehicle Routing Problems in Supply Chains  
*Mohammad Hosein Fazel Zarandi  
and Masoumeh Rostam Niakan Kalhori*

Modeling Construction Labour Productivity Using Fuzzy Logic and Exploring the Use of Fuzzy Hybrid Techniques  
*Aminah Robinson Fayek and Abraham Assefa Tsehayae*

**M5s: Fuzziness in our Social and Cultural Life – II**

**Room: Crystal Ballroom II, Session Chairs: Veronica Sanz and Rudolf Seising**

How to introduce Fuzzy Logic in Schools and High schools (best paper nominee)

*Itziar García-Honrado*

A look at modern art evolution through the tinted glasses of fuzziness  
*Marco Tabacchi and Setimo Termini*

Fuzzy inference Systems and social applications  
*Gisella Facchinetti, Tindara Addabbo, Tommaso Pirotti,  
and Giovanni Mastroleo*

**M6: Math – II**

**Room: Boiler Room Section C, Session Chair: Jun Li**

Powers of Indistinguishability Operators  
*Gabriel Mattioli and Jordi Recasens*

A Concept of Universal Fuzzy Integrals  
*Erich Peter Klement and Radko Mesiar*

Discrete Complex Fuzzy Logic  
*Dan Tamir, Mark Last, Horia-Nicolai Teodorescu  
and Abraham Kandel*

**12:10pm-1:30pm**

Lunch (*provided, Hotel Shattuck*)

**1:30pm-2:20pm**

*Room: Crystal Ballroom II, Chair: Marek Reformat*

Fuzzy Methods for Constructing Multi-Criteria Decision Functions

*Ronald R. Yager  
Iona College, New York, USA*

**2:20pm-3:20pm**

**M7: Neural Networks**

*Room: Crystal Ballroom I, Session Chair: Fernando Gomide*

A Fast Learning Algorithm for Uninorm-Based Fuzzy Neural Networks

*Andre Lemos, Walmir Caminhas and Fernando Gomide*

Modular Neural Networks with Granular Fuzzy Integration for Human Ear Recognition

*Daniela Sanchez and Patricia Melin*

**M8s: Fuzziness in our Social and Cultural Life – III**

*Room: Crystal Ballroom II, Session Chairs: Veronica Sanz and Rudolf Seising*

Applying a Fuzzy Model Approach to the Classification of Sexual Differences: Beyond the Male/Female Binary (**best paper nominee**)

*Veronica Sanz and Sergio Guadarrama*

Fuzzy Causality in Social Sciences

*Cristina Puente and Jose Angel Olivas*

**M9: Type-2 Fuzzy Sets**

*Room: Boiler Room Section C, Session Chair: Erich Peter Klement*

A Faster Iterative Computation of the Centroid of an Interval Type-2 Fuzzy Set

*Miguel Melgarejo and Carlos Celemin*

Decision Making on Energy Options using Type-2 Fuzzy Relation: A Case Study

*Vidyottama Jain and Ashok Deshpande*

A fuzzy linear regression model for interval type-2 fuzzy sets

*Olga Poleshchuk and Evgeny Komarov*

**3:20pm-3:40pm**

Coffee Break

**3:40pm-4:40pm**

**M10: Information and Fuzzy Systems**

*Room: Crystal Ballroom I, Session Chair: Michinori Nakata*

Dual Rough Approximations in Possibilistic Information Systems

*Michinori Nakata and Hiroshi Sakai*

Parametric T-norms in Reconfigurable Digital Fuzzy Systems

*I. Batyrshin, I. Rudas, P. Cortes Antonio, M.A. Ramirez Salinas, L. Villa-Vargas, and H. Molina Lazano*

A Review of Developments from Fuzzy Rule Bases to Fuzzy Functions

*I. Burhan Turksen*

**M11: Best Student Paper**

**Room: Crystal Ballroom II, Session Chair: Asli Celikyilmaz**

Identifying Adverse Drug Reaction Signal Pairs by a Multi- Agent Intelligent System with Fuzzy Decision Model

*Ayman Mansour, Hao Ying, Peter Dews, Yanqing Ji, and R. Michael Massanari*

Fuzzy Cognitive Maps Development Using Ant Colony Optimization with Local Search Procedure

*Ye Chen, Lawrence Mazlack, and Long Lu*

Solving Satisfiability in Fuzzy Logics with Evolution Strategies

*Tim Brys, Yann-Michaël De Hauwere, Martine De Cock, and Ann Nowé*

**M12s: Fuzzy logic with Engineering Applications – I**

**Room: Boiler Room Section C, Session Chairs: Ashok Deshpande and Rehan Sadiq**

Segmentation of fingerprint images based on bi-level processing using Fuzzy rules

*Hasan Fleyeh, Erfan Davami, and Diala Jomaa*

Fuzzy-based Fugacity Model for Propagating Uncertainty in Assessing Swimmer Exposures to Disinfection Byproducts (best student paper nominee)

*Roberta Dyck, Rehan Sadiq, Manuel Rodriguez, Sabrina Simard, and Robert Tardif*

Fuzzy logic Application in Water Supply System Management - A Case Study

*Asheesh Sharma, Jyoti Yadav, Pranjali Mandilkm, Parvin Ladkat, and Ashok Deshpande*

**4:40pm-5:40pm**

**M13: Ontologies and Databases**

**Room: Crystal Ballroom I, Session Chair: Valerie Cross**

Measuring Information Content for an Ontological Concept

*Valerie Cross and Anurekha Chennai-Thiagarajan*

Fuzzy Semantic Similarity in Linked Data using the OWA Operator

*Parisa D. Hossein Zadeh and Marek Z. Reformat*

Dynamical construction of binary relations in coreference detection

*Marcin Szymczak, Antoon Bronselaer, Slawomir Zadrozny, and Guy De Tré*

**M14: Best Paper Session**

**Room: Crystal Ballroom II, Session Chair: William Melek**

A Fuzzy Multi-Criteria Approach for Evaluating Biofuels Feedstocks

*Jadwiga R. Ziolkowska*

A Hybrid Approach to Develop an Interval Type-2 Fuzzy Logic System

*Sepideh Sedehizadeh, Mohammad Hossein Fazel Zarandi, and I. Burhan Turksen*

Locating Local Extrema under Interval Uncertainty: Multi-D Case

*Karen Villaverde and Vladik Kreinovich*

**M15s: Fuzzy logic with Engineering Applications - II**

*Room: Boiler Room Section C, Session Chairs: Ashok Deshpande and Rehan Sadiq*

Approximate reasoning in fuzzy resolution

*Banibrata Mondal and Swapan Raha*

Fuzzy Continuous Dynamical System: A Multivariate Optimization Technique

*Abhirup Bandyopadhyay and Samarjit Kar*

Forecasting Time-Between-Failures of Software using Fuzzy Time Series Approach

*Dilip Kumar Yadav, S. K. Chaturvedi, and R. B. Misra*

**Tuesday, August 7, 2012**



**9:00am-9:50am**

*Room: Crystal Ballroom II, Chair: Valerie Cross*

Need for Expert Knowledge (and Soft Computing) in  
Cyberinfrastructure-Based Data Processing

*Vladik Kreinovich  
University of Texas at El Paso, USA*

**9:50am-10:10am**

Coffee Break

**10:10am-11:10am**

**T1: Language and Decision Making**

*Room: Crystal Ballroom I, Session Chairs: Daniel Sanchez and Sergio Guadarrama*

Evaluation of Fuzzy Quantified Sentences: Keeping the Boolean Properties

*Daniel Sanchez, Miguel Delgado, Maria-Amparo Vila, and Jesus Chamorro-Martinez*

Computing optimal optimistic decisions using min-based possibilistic networks

*Salem Benferhat, Faiza Khellaf, and Ismahane Zeddigha*

Contributions of Fuzzy Logic and Bounded Rationality to Cognitive Machines in Organizations

*Farley Nobre*

**T2s: Hybrid Intelligent Systems – I**

*Room: Crystal Ballroom II, Session Chairs: Oscar Castillo and Patricia Melin*

Optimization of Type-2 Fuzzy Integration in Ensemble Neural Networks for Predicting the Dow Jones Time Series

*Martha Pulido and Patricia Melin*

Comparison between Multiobjective GA and PSO for Parameter Optimization of AT2-FLC for a real application in FPGA

*Yazmin Maldonado and Oscar Castillo*

A Comparison between a DTCNN and SOM like Approach for Dynamic Object Detection in Videos

*Mario I. Chacon-Murguia and Jesus David Urias-Zavala*

**T3s: Inter-relation between Interval and Fuzzy Techniques – I**

*Room: Boiler Room Section C, Session Chairs: Karen Villaverde and Vladik Kreinovich*

Assessment of Functional Impairment in Human Locomotion: A Fuzzy-Motivated Approach

*Murad Alaqtash, Thompson Sarkodie-Gyan, and Vladik Kreinovich*

Categories of Interval-Valued Fuzzy Sets (best paper nominee)

*John Harding, Carol Walker, and Elbert Walker*

Estimating Correlation under Interval and Fuzzy Uncertainty: Case of Hierarchical Estimation

*Ali Jalal-Kamali*



**11:10am-12:10pm**

**T4: Natural Language Processing**

*Room: Crystal Ballroom I, Session Chairs: Imre J. Rudas*

Simulation of Language Evolution using Fuzzy Grammars

*Juan Paulo Alvarado-Magaña, Antonio Rodríguez-Díaz, Juan R. Castro, and Oscar Castillo*

An API for Generalized Constraint Language based Expert System

*Purvag Patel, Elham S. Khorasani, and Shahram Rahimi*

Structuring Information From Natural Language Descriptions: Accounting for Uncertainty

*Julia Taylor and Victor Raskin*

**T5s: Hybrid Intelligent Systems – II**

*Room: Crystal Ballroom II, Session Chairs: Oscar Castillo and Patricia Melin*

Kinematic Analysis of Gait Cycle using a Fuzzy System for Medical Diagnosis

*Omar Arias-Enriquez, Mario I. Chacon-Murguia, and Rafael Sandoval-Rodriguez*

Decentralized Direct and Indirect I-Term Adaptive Fuzzy-Neural Control of a Bioprocess Plant

*Ieroham Baruch, Sergio M. Hernandez, Eloy Echeverria, and Oscar Castillo*

Swarm Optimization for Design an Optimal Fuzzy Logic Controller of a DC Motor

*Fevrier Valdez, Patricia Melin, and Oscar Castillo*

**T6s: Inter-ralation between Interval and Fuzzy Techniques – II**

*Room: Boiler Room Section C, Session Chairs: Karen Villaverde and Vladik Kreinovich*

Laws of Excluded Middle and Contradiction in Checklist Paradigm Based Fuzzy Interval Logic

*Eunjin Kim*

Semi-Heuristic Target-Based Fuzzy Decision Procedures: Towards a New Interval Justification

*Christian Servin, Van-Nam Huyhn, and Yoshiteru Nakamori*

Do Constraints Facilitate or Inhibit Creative Problem Solving: A Theoretical Explanation of Two Seemingly Contradictory Experimental Studies

*Karen Villaverde, Olga Kosheleva, and Martine Ceberio*

**12:10pm-1:30pm**

Lunch (*provided, Hotel Shattuck*)

**1:30pm-2:20pm**

*Room: Crystal Ballroom II, Chair: Mark Wierman*

Concepts: Are They Logically Fuzzy

*Eleanor Rosch*

*University of California, Berkeley, USA*

**2:20pm-3:20pm**

**T7: Type-2 Fuzzy Sets - Control and Prediction**

*Room: Crystal Ballroom I, Session Chair: Hao Ying*

A Technique for Deriving Analytical Structure of a General Class of Interval Type-2 TS Fuzzy Controller

*Haibo Zhou and Hao Ying*

Type-2 Fuzzy Granular Approach for Intelligent Control: The case of Three Tank water Control

*Leticia Cervantes and Oscar Castillo*

Type-2 Fuzzy Rule Base System with Parameter Optimization for Forecasting of Tardiness

*Mohammad Hossein Fazel Zarandi, and Reyhaneh Gamasae*

**T8: AHP and Choice Model**

*Room: Crystal Ballroom II, Session Chairs: Mark Wierman*

Fuzzy Weights using Sensitivity Analysis for Double Inner Dependence AHP

*Shin-Ichi Ohnishi, Takahiro Yamanoi, and Tatsuhiko Saito*

A Critique of Fuzzy Rational Choice Models

*Mark Wierman, Terry Clark, John Mordeson, and William Tastle*

Analytic Hierarchy Process and Granularity: Assessment of Risk Severity on Livestock Wellness

*Krishna Mohan Kovur, Marek Z Reformat, and Witold Pedrycz*

**T9s: Inter-ralation between Interval and Fuzzy Techniques – III**

*Room: Boiler Room Section C, Session Chairs: Karen Villaverde and Vladik Kreinovich*

Local Extrema under Interval Uncertainty: Multi-D Case

*Karen Villaverde and Vladik Kreinovich*

An Interval-based Algorithm to Extract Fuzzy Measures for SQA problem

*Xiaojing Wang, Angel F. Garcia Contreras, and Martine Ceberio*

Modal Intervals as a New Logical Interpretation of the Usual Lattice Order Between Interval Truth Values

**(best student paper nominee)**

*Francisco Zapata*

**3:20pm-3:40pm**

Coffee Break

**3:40pm-4:40pm**

**T10s: Basic and Advanced Computing with Words – I**

*Room: Crystal Ballroom I, Session Chairs: Jerry Mendel and Mohammad Reza Rajati*

Fast Fuzzy Set Qualitative Comparative Analysis (Fast fsQCA)

*J.M. Mendel and M.M. Korjani*

Fuzzy Set Qualitative Comparative Analysis (fsQCA): Challenges and Application (best paper nominee)

*M.M. Korjani and J.M. Mendel*

Validation of Fuzzy Set Qualitative Comparative Analysis (fsQCA): Granular Description of a Function  
*M.M. Korjani and J.M. Mendel*

**T11s: Hybrid Intelligent Systems – III**

*Room: Crystal Ballroom II, Session Chairs: Oscar Castillo and Patricia Melin*

Fuzzy Granular Gravitational Clustering Algorithm (best student paper nominee)

*Mauricio A. Sanchez, Oscar Castillo, Juan R. Castro, and Antonio Rodriguez-Diaz*

Bio-inspired Optimization of Fuzzy logic Controllers for Autonomous Mobile Robot

*Ricardo Martinez-Soto, Oscar Castillo, and Luis T. Aguilar*

Interval type-2 fuzzy integral to improve the performance of edge detectors based on the gradient measure

*Olivia Mendoza and Patricia Melin*

**T12: BioMedical Applications – I**

*Room: Boiler Room Section C, Session Chair: Nick Pizzi*

Application of Fuzzy Logic for Selection of Machinery Health Monitoring Strategies

*Ajit Verma, Srividya Ajit, Alok Goyal, and P.G. Ramesh*

Soft Computing and Infectious Disease Modeling: A Review and Prescription

*Nick Pizzi*

A New Computational Fuzzy Time Series Model to Forecast Number of Outpatient Visits

*Bindu Garg, M.M Sufyan Beg, and A.Q Ansari*

**4:40pm-5:40pm**

**T13s: Basic and Advanced Computing with Words – II**

*Room: Crystal Ballroom I, Session Chairs: Jerry Mendel and Mohammad Reza Rajati*

Solving Zadeh's Swedes and Italians Challenge Problem (best student paper nominee)

*M.R. Rajati and J.M. Mendel*

Perceptual Computer Application in Learning Outcome Evaluation

*M. Hao and J.M. Mendel*

Verbalizing time series data from a macroscopic viewpoint

*I. Kobayashi*

**T14s: Hybrid Intelligent Systems – IV**

*Room: Crystal Ballroom II, Session Chairs: Oscar Castillo and Patricia Melin*

Interval type-2 fuzzy logic for image edge detection quality evaluation

*Felicitas Perez, Olivia Mendoza, Patricia Melin, and Juan R. Castro*

Backpropagation method with type-2 Fuzzy Weight Adjustment for Neural Network Learning (best paper nominee)

*Fernando Gaxiola, Patricia Melin, and Fevrier Valdez*

Optimization Method for Membership Functions of Type-2 Fuzzy Systems based on the Uncertainty Level for Response Integration in Modular Neural Networks

*Denisse Hidalgo and Patricia Melin*

**T15: BioMededical Applications - II and Methods**

*Room: Boiler Room Section C, Session Chairs: Enric Trillas and Nick Pizzi*

The SI epidemiological model with interactive fuzzy parameters

*Valtemir Cabral and Laécio C. Barros*

Shooting method for fuzzy two-point boundary value problems

*Barnabas Bede and Imre J. Rudas*

Conjectures in De Morgan Algebras

*Enric Trillas and Daniel Sanchez*

**7:00pm-11:00pm**

Conference Banquet

*Berkeley City Club*

*2315 Durant Avenue, Berkeley CA 94704*

The Birth and Blossoming of Fuzzy Systems

– Towards a historical web-exhibition

*Rudolf Seising*

*European Centre for Soft Computing in Mieres (Asturias), Spain*

**Wednesday, August 8, 2012**



**9:00am-9:50am**

*Room: Crystal Ballroom II, Chair: Vladik Kreinovich*

Intellectual Information Learning and Control of Knowledge System (IILCKS):  
Overview and Implementation

*Shahnaz N. Shahbazova  
Azerbaijan Technical University, Azerbaijan*

**9:50am-10:10am**

Coffee Break

**10:10am-11:10am**

**W1: Theory**

*Room: Crystal Ballroom I, Session Chair: Nicolas Madrid*

On least coherence-preserving negations

*Nicolas Madrid and Manuel Ojeda-Aciego*

T-Indistinguishability Operators with respect to Ordinal Sums

*Dionis Boixader and Jordi Recasens*

Regularity of upper semicontinuous fuzzy measures

*Jun Li and Chen Li*

**W2: Algorithms and Control**

*Room: Crystal Ballroom II, Session Chair: Ricardo C. Silva*

Using ranking function in dual approach to solve quadratic programming problem under fuzzy environment

*Ricardo C. Silva and Akebo Yamakami*

The Tellez-Molina-Villa Algorithm

*Arturo Tellez-Velazquez, Heron Molina-Lozano, and Luis A. Villa-Varga*

The Coordinated Control of Circulating Fluidized Bed Boiler Based on the Fuzzy PID Control

*Li XF*

**W3s: Fuzzy Optimization and Decision Making – I**

*Room: Boiler Room Section C, Session Chair: Mohammad Hossein Fazel Zarandi*

A general model for Linear Programming with Interval Type-2 Fuzzy technological coefficients

*Juan Carlos Figueroa Garcia*

A Type-2 Data Mining Optimization for Predicting Pistachio Global Market

*S. Malek, Mohamadi Golsefid, I.B. Turksen, and M. H. F. Zarandi*

The Existence for a Solution on the Closed Subset to the Cauchy Problems of Fuzzy Differential Equations

*Ya-Bin Shao and Zeng-Tai Gong*

**11:10am-12:10pm**

**W4: Prediction, Classification and Detection**

*Room: Crystal Ballroom I, Session Chair: Asli Celikyilmaz*

Bi-criteria Bottleneck Assignment Problem

*Yue Ge, Minghao Chen and Hiroaki Ishii*

Fuzzy Decision Tree applied to Defects Classification of manufacturing the glass using data from a glass furnace Model

*Herbert Costa and Alessandro La Neve*

A fuzzy bounding box merging technique for moving object detection

*Jilin Tu, Ana Del Amo, Yi Xu, Li Guan, Mingching Chang, and Thomas Sebastian*

**W5: Fuzzy Logic**

*Room: Crystal Ballroom II, Session Chair: Jorma K. Mattila*

Some Comments on Excluded Middle and Contradiction Laws as Limit Values in Fuzzy Logic

*Omar Salazar and Jairo Soriano*

Zadeh Algebra as the Basis of Lukasiewicz Logics

*Jorma K. Mattila*

**W6s: Fuzzy Optimization and Decision Making – II**

*Room: Boiler Room Section C, Session Chair: Mohammad Hossein Fazel Zarandi*

A systematic type-2 fuzzy optimization model for global market analysis and its application

*S. MalekMohamadi Golefid, I.B. Turksen, and M. H. F. Zarandi*

A New Validation Criteria for Type-2 Fuzzy C-means and Possibilistic C-means

*Mohammad Hossein Fazel Zarandi, and Abolfazl Doostparast Torshizi*

### Lotfi A. ZADEH



**Biography** Lotfi A. Zadeh is a Professor in the Graduate School, Computer Science Division, Department of EECS, University of California, Berkeley. In addition, he is serving as the Director of BISC (Berkeley Initiative in Soft Computing). Lotfi Zadeh is an alumnus of the University of Tehran, MIT and Columbia University. He held visiting appointments at the Institute for Advanced Study, Princeton, NJ; MIT, Cambridge, MA; IBM Research Laboratory, San Jose, CA; AI Center, SRI International, Menlo Park, CA; and the Center for the Study of Language and Information, Stanford University. His earlier work was concerned in the main with systems analysis, decision analysis and information systems. His current research is focused on fuzzy logic, computing with

words and soft computing, which is a coalition of fuzzy logic, neurocomputing, evolutionary computing, probabilistic computing and parts of machine learning. Lotfi Zadeh is a Fellow of the IEEE, AAAS, ACM, AAAI, and IFSA. He is a member of the National Academy of Engineering and a Foreign Member of the Russian Academy of Natural Sciences, the Finnish Academy of Sciences, the Polish Academy of Sciences, Korean Academy of Science & Technology and the Bulgarian Academy of Sciences. He is a recipient of the IEEE Education Medal, the IEEE Richard W. Hamming Medal, the IEEE Medal of Honor, the ASME Rufus Oldenburger Medal, the B. Bolzano Medal of the Czech Academy of Sciences, the Kampe de Feriet Medal, the AACC Richard E. Bellman Control Heritage Award, the Grigore Moisil Prize, the Honda Prize, the Okawa Prize, the AIM Information Science Award, the IEEE-SMC J. P. Wohl Career Achievement Award, the SOFT Scientific Contribution Memorial Award of the Japan Society for Fuzzy Theory, the IEEE Millennium Medal, the ACM 2001 Allen Newell Award, the Norbert Wiener Award of the IEEE Systems, Man and Cybernetics Society, Civitate Honoris Causa by Budapest Tech (BT) Polytechnical Institution, Budapest, Hungary, the V. Kaufmann Prize, International Association for Fuzzy-Set Management and Economy (SIGEF), the Nicolaus Copernicus Medal of the Polish Academy of Sciences, the J. Keith Brimacombe IPMM Award, the Silicon Valley Engineering Hall of Fame, the Heinz Nixdorf MuseumsForum Wall of Fame, other awards and twenty-six honorary doctorates. He has published extensively on a wide variety of subjects relating to the conception, design and analysis of information/intelligent systems, and is serving on the editorial boards of over sixty journals.

#### Talk

**Outline of a Restriction-Centered Theory of Reasoning and Computation in an Environment of Uncertainty and Imprecision** The theory which is outlined in this lecture, call it RRC for short, is a departure from traditional approaches to reasoning and computation. A principal advance is an enhanced capability for reasoning and computation in an environment of uncertainty and imprecision. The point of departure in RRC is a basic premise—in the real world such environment is the norm rather than exception.

A concept which has a position of centrality in RRC is that of a restriction. Informally, a restriction is an answer to the question: What is the value of a variable  $X$ ? More concretely, a restriction,  $R(X)$ , on a variable,  $X$ , is a limitation on the values which  $X$  can take—a limitation which is induced by what is known or perceived about  $X$ . A restriction is singular if the answer to the question is a singleton; otherwise it is nonsingular. Generally, nonsingularity implies uncertainty. A restriction is precisiated if the limitation is mathematically well defined; otherwise it is unprecisiated. Generally, restrictions which are described in a natural language are unprecisiated.

There are many kinds of restrictions ranging from very simple to very complex. Examples.  $3 \leq X \leq 6$ ;  $X$  is normally distributed with mean  $m$  and variance  $\sigma^2$ ;  $X$  is small; it is very likely that  $X$  is small; it is very unlikely that there will be a significant increase in the price of oil in the near future.

The canonical form of a restriction is an expression of the form  $X \text{ is } R$ , where  $X$  is the restricted variable,  $R$  is the restricting relation and  $r$  is an indexical variable which defines the way in which  $R$  restricts  $X$ .

## Ronald R. YAGER



**Biography** Ronald R. Yager is a fellow of the IEEE, the New York Academy of Sciences and the Fuzzy Systems Association. He has served at the NSF as program director in the Information Sciences program. He was a NASA/Stanford visiting fellow as well as a research associate at the University of California, Berkeley. He has served as a lecturer at NATO Advanced Study Institutes. He received his undergraduate degree from the City College of New York and his Ph. D. from the Polytechnic University of New York. Currently, he is Director of the Machine Intelligence Institute and Professor of Information and Decision Technologies at Iona College. He is editor and chief of the International Journal of Intelligent Systems. He serves on the editorial board of a

number of journals including the IEEE Transactions on Fuzzy Systems, Neural Networks, Data Mining and Knowledge Discovery, IEEE Intelligent Systems, Fuzzy Sets and Systems, the Journal of Approximate Reasoning and the International Journal of General Systems. He is one of the co-founders of the conference on Information Processing and the Management of Uncertainty (IPMU). He has published over 500 articles and fifteen books. In addition to his pioneering work in the area of fuzzy logic he has made fundamental contributions in decision making under uncertainty and the fusion of information. His current research interests include the development of technologies for a more intelligent internet (E-Commerce, data mining, information retrieval) aggregation theory, decision making under uncertainty and higher order information fusion.

### Talk

**Fuzzy Methods for Constructing Multi-Criteria Decision Functions** We review the basic foundations for constructing multi-criteria decision functions using fuzzy set methods. We emphasize the ability of this approach to enable the modeling of linguistically specified decision functions and see this as a kind of computing with words. We discuss the inclusion of importance weights for different criteria. We look at various types of valuation for criteria by an alternative; numeric, ordinal, intuitionistic and interval value. We look at methods for selecting the alternative that best satisfies the multi-criteria decision function. We look at generalized aggregation methods for constructing multi-criteria decision functions using the OWA Operator and the Choquet Integral.



## Eleanor ROSCH



**Biography** Eleanor Rosch is currently a Professor of the Graduate School in the Department of Psychology, Program in Cognitive Science, and the Groups in Religious Studies and Buddhist Studies at the University of California, Berkeley. Her research in concepts and categorization challenged the once accepted Aristotelian view of concepts and word meaning as classical sets that could be combined by the logic of classical operations and offered evidence for the processing of concepts in many contexts in relation to their prototypical good examples. A second line of research has focused on what the teachings and practices of the traditions that our culture calls religions (such as Buddhist mindfulness) have to tell psychology about the mind. She is co-editor of the book *Cognition and Categorization* and co-author of *The Embodied Mind: Cognitive Science and Human Experience*.

### Talk

**Concepts: Are They Logically Fuzzy** Concepts, categories, and word meaning had a long history of being understood as classical sets in which members could be combined by the operations of classical logic. However, beginning in the 1970s, my work and those of others has established that category membership is actually a gradient with members judged to have different degrees of goodness of example and with the boundaries of the category often indeterminate. Such gradients are psychologically important because they correlate with all the major dependent variables studied in psychology. Does this mean that concepts and word meaning are fuzzy? If so, conceptual combination should follow specifiable operations of fuzzy logic. However, there is much evidence that they do not; the understanding of conceptual combinations appears to depend on an individual's mental encyclopedia of real world knowledge rather than a fixed and specifiable mental dictionary. We are left with some interesting questions: Do we want to call concepts and categories fuzzy sets because they have membership gradients even though one cannot perform fuzzy logical operations on them? And could fuzzy logic perform useful practical functions for limited domains of concepts in specific situations even if it does not explain concepts theoretically?

## Vladik KREINOVICH



**Biography** Vladik Kreinovich received his M.Sc. in Mathematics and Computer Science from St. Petersburg University, Russia, in 1974, and Ph.D. from the Institute of Mathematics, Soviet Academy of Sciences, Novosibirsk, in 1979. In 1975-80, he worked with the Soviet Academy of Sciences, in particular, in 1978-80, with the Special Astrophysical Observatory (representation and processing of uncertainty in radioastronomy). In 1982-89, he worked on error estimation and intelligent information processing for the National Institute for Electrical Measuring Instruments, Russia. In 1989, he was a Visiting Scholar at Stanford University. Since 1990, he is with the Department of Computer Science, University of Texas at El Paso. Also, served as an invited professor in Paris (University of Paris VI), Hong Kong, St. Petersburg, Russia, and Brazil. Main interests: representation and processing of uncertainty, especially interval computations and intelligent control. Published 3 books, 6 edited books, and more than 800 papers. Member of the editorial board of the international journal "Reliable Computing" (formerly, "Interval Computations"), and several other journals. Co-maintainer of the international website on interval computations <http://www.cs.utep.edu/interval-comp> Honors: President-Elect, North American Fuzzy Information Processing Society; Foreign Member of

the Russian Academy of Metrological Sciences; recipient of the 2003 El Paso Energy Foundation Faculty Achievement Award for Research awarded by the University of Texas at El Paso, and a co-recipient of the 2005 Star Award from the University of Texas System.

## **Talk**

### **Need for Expert Knowledge (and Soft Computing) in Cyberinfrastructure-Based Data**

**Processing** A large amount of data has been collected and stored at different locations. When a researcher or a practitioner is interested in a certain topic, it is desirable that he or she gets easy and fast access to all the relevant data. For example, when a geoscientist is interested in the geological structure of a certain area, it will be helpful if he or she get access to a state geological map (which is usually stored at the state's capital), NASA photos (stored at NASA Headquarters and/or at one of corresponding NASA centers), seismic data stored at different seismic stations, etc. Similarly, when an environmental scientist is interested in the weather and climate conditions in a certain area, it is helpful if he or she has access to satellite radar data, to data from bio-stations, to meteorological data, etc. Cyberinfrastructure is a general name for hardware and software tools that facilitate this data transfer and data processing, making it easier for the user. Ideally, a user should simply type in the request, and the system will automatically find and process the relevant data -- it should be as easy and convenient as a google search. At present, the main challenges in cyberinfrastructure design are related to the actual development of the corresponding hardware and software tools. Most existing tools are concentrating on moving the data and on processing the data by using existing well defined algorithms. As cyberinfrastructure becomes a reality, it becomes clear that while some of its results are exciting, other results require additional expert analysis and corrections. To make results more relevant, it is therefore desirable to incorporate expert knowledge into the cyberinfrastructure. Some expert knowledge is formulated in precise terms; these types of knowledge are easier to incorporate. However, a large part of expert knowledge is formulated not in precise terms, but by using imprecise (fuzzy) words from a natural language (like "small"). To incorporate this knowledge, it is therefore natural to use fuzzy techniques (and more generally, soft computing techniques), techniques specifically designed for formalizing such imprecise facts and rules. In this talk, we describe several problems in which such incorporation is needed, and we overview our experience of such incorporation in geosciences and environmental sciences applications of cyberinfrastructure. 1) Somewhat surprisingly, the need for such expert knowledge emerges even in situations when we simply want to "fuse" data from different sources. In such situations, seemingly natural statistical approaches (such as Maximum Likelihood methods), sometimes lead to physically meaningless results. To get physically meaningful results, we must supplement the data itself (and the corresponding statistical information) with expert knowledge describing which fusion results are physically meaningful and which are not. In the talk, we show how this expert knowledge can help. 2) The need for an expert knowledge is even more acute in the actual data processing, e.g., in solving inverse problems, when we need to reconstruct the values of the quantities of interest -- such as density at different depths and different locations -- from the measurement results. From the mathematical viewpoint, the corresponding problems are often "ill-posed", meaning that usually, several drastically different density distributions are consistent with the same observations. Out of all these distributions, we need to select the physically meaningful one(s) -- and this is where expert knowledge is needed, to describe what "physically meaningful" means. On the example of the above geophysical problem, we show how this expert knowledge can be taken into account. 3) The above two applications are related to processing the existing data, the data coming from the existing measuring instruments. In many practical situations, the data from the existing instruments is not sufficient, so new measuring instruments are needed. For example, to get a better understanding of weather and climate processes, we need to place more meteorological stations in under-covered areas -- such as Arctic, Antarctic, and desert areas. Which are the best locations for these new instruments? Which are the best designs? We would like to gain as much information as possible from these new instruments. The problem is that we do not know exactly what processes we will observe -- this uncertainty is what motivates us to build the new stations in the first place. Because of this uncertainty, to make a reasonable decision, we need to use expert

knowledge. In this talk, we show how we have used NASA's experience of solving a similar problem of optimization under uncertainty -- when NASA selected the sites for the first Moon landings -- to find the optimal location of a meteorological tower.

## Rudolf SEISING



**Biography** Dr. Seising is an Adjoint Researcher at the European Centre for Soft Computing in Mieres (Asturias), Spain. His main areas of research comprise historical and philosophical foundations of science and technology. After a study of Mathematics and Physics at the Ruhr-University of Bochum (Germany) he obtained his Ph.D. at the Faculty of Philosophy, Philosophy of Science, and Statistics of the Ludwig-Maximilians-University in Munich (Germany), with a Thesis on Probabilistic Structures in Quantum Mechanics. At the same university he completed later the German Habilitation in history of science with the thesis: *The Fuzzification of Systems: The Genesis of the Theory of Fuzzy Sets and their first Applications – Their Development until the 70s in*

the 20th century. (Springer 2007). Among other books he edited *Views on Fuzzy Sets and Systems from Different Perspectives. Philosophy and Logic, Criticisms and Applications.* (Springer-Verlag 2009), and (together with Verónica Sanz) *Soft Computing in Humanities and Social Sciences* (Springer 2012). Dr. Seising has been Scientific Assistant for computer sciences at the University of the Armed Forces in Munich from 1988 to 1995 and for history of sciences at the same university from 1995 to 2002. From 2002 to 2008 he was with the Core unit for Medical Statistics and Informatics at the University of Vienna Medical School, which in 2004 became the Medical University of Vienna. Since 2005 he is College Lecturer at the Faculty of History and Arts, at the Ludwig-Maximilians-University Munich. From April to September 2008 he was acting as Professor for the history of science at the Friedrich-Schiller-University Jena (Germany) and from September 2009 to March 2010 at the Ludwig-Maximilians-University in Munich. He has been several times Visiting Scholar at the University of California, Berkeley. Since 2004 he is Chairman of the IFSA Special Interest Group "History" and since 2007, of the EUSFLAT Working Group "Philosophical Foundations".

### Talk

**The Birth and Blossoming of Fuzzy Systems – Towards a historical web-exhibition** 50 years ago, in 1962, Professor Lotfi A. Zadeh used the word "fuzzy" for the first time in a scientific paper: "..., we need a radically different kind of mathematics, the mathematics of fuzzy or cloudy quantities which are not describable in terms of probability distributions." (From *Circuit Theory to System Theory*, Proceedings of the IRE, May 1962, pp. 856-65.) It is also not to be forgotten that in about three years, the theory of Fuzzy Sets and Systems will be 50 years old. It is in our opinion that this 50 years long development of a now well-known theory that is used in technology, economics and other fields should have a mirror in a historical documentation in the world wide web. To this end we commenced the project of a web-exhibition on the history of Fuzzy Sets and Systems and its applications. The starting was founded by the European Centre for Soft Computing in Asturias, Spain and the 1st World Conference on Soft Computing (San Francisco, May 23-26, 2011). It is intended that the exhibition will be launched in the year 2013. We also aim to establish a real exhibition on history of Fuzzy Sets and Systems and its applications and we plan to open this exhibition during the IFSA-EUSFLAT 2015 conference that will take place in Oviedo, Asturias (Spain). This talk will give some information on the state of the art of these exhibition plans and examples of its content.

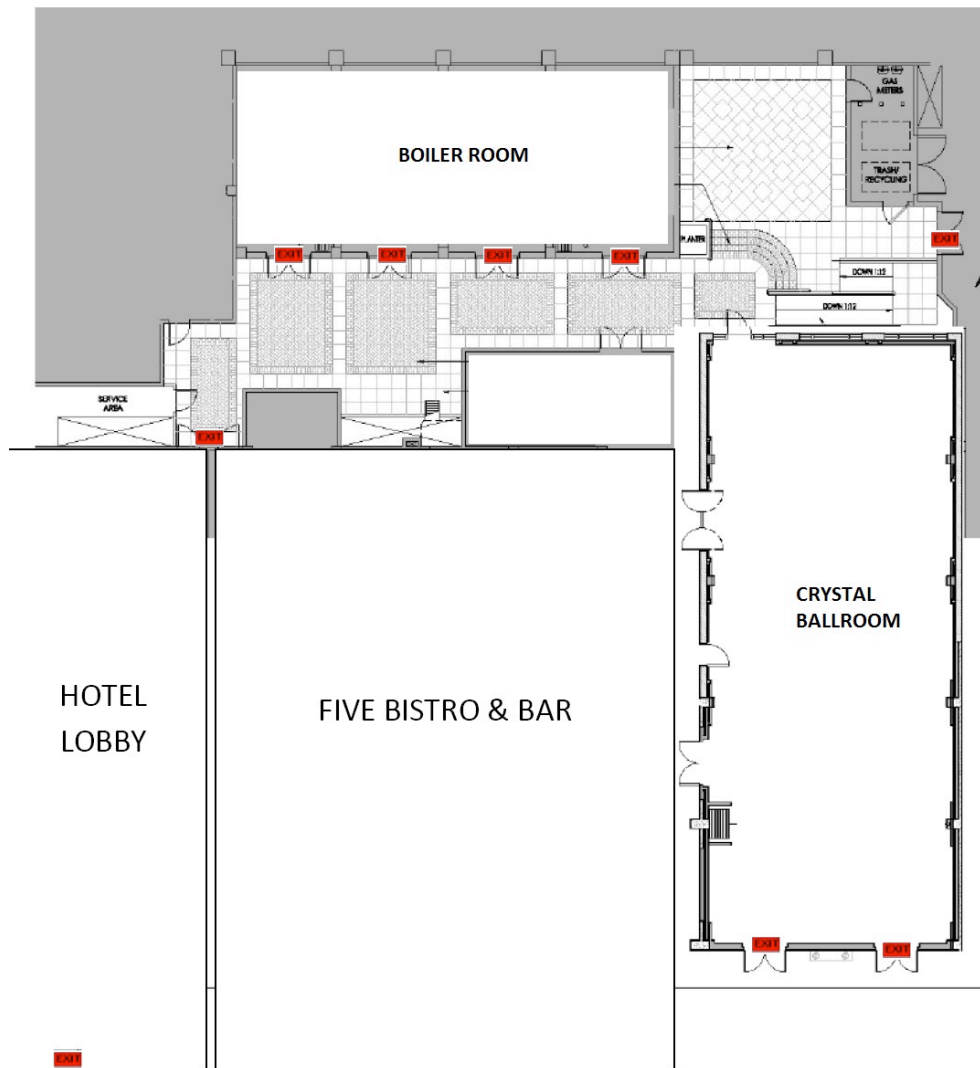
## Shahnaz N. SHAHBAZOVA

**Biography** Shahnaz N. Shahbazova is an associate professor in the faculty of Information Technology and Programming at the Azerbaijan Technical University. She became a Candidate of Technical Sciences in 1995, and associate professor in 1996. She is a member of Berkeley Initiative in Soft Computing (BISC) group. Doctor of Philosophy in Engineering Sciences, International Personnel Academy UNESCO, since 2000. Starting 2002, she is an academician of the Azerbaijan Modern National Academy named by L. Zadeh. Her research interests include Artificial Intelligence, Soft Computing, Intelligent System and Fuzzy Neural Network. Award Grants: India (1998), Germany-DAAD (1999), Germany-DAAD (2003), USA UC-Berkeley Fulbright (2006/2007), Germany-DAAD (2010).

### Talk

**Intellectual Information Learning and Control of Knowledge System (IILCKS): Overview and Implementation** This talk is about the application of mathematical technologies and methods of analysis, as well as information modeling techniques to development and implementation of a system for comprehensive learning process. The system uses intelligent models and methods for continuous guiding and monitoring of students' learning processes. The presentation focuses on the description of main building blocks responsible for practical effectiveness of the learning procedures offered by the system. These blocks "provide" intellectual instructions and exercises for a student with the minimal involvement of teachers and educational institutions. The talk describes the selected solutions for determining the students' levels of knowledge. It presents the algorithm for estimating knowledge levels based on a set of sample questions corresponding to the current levels of knowledge of participated students. The algorithm also allows for determining the basic misconceptions and knowledge gaps. The performance of this algorithm – using the smallest possible number of questions – is comparable to the traditional survey methods conducted by teachers. The proposed algorithm is based on the FNN and is coupled with a knowledge base. Its decision-making power brings a new level of quality to the decision and selection processes. Thanks to the flexibility and transparency of its logic, it can be easily adopted to virtually any educational material. The IILCKS presents the outcome of the learning process in a visually appealing way – a student card. The card allows an instructor to assess the volume and quality of student's learning processes in a matter of seconds. The results of analysis of the IILCKS system are presented.

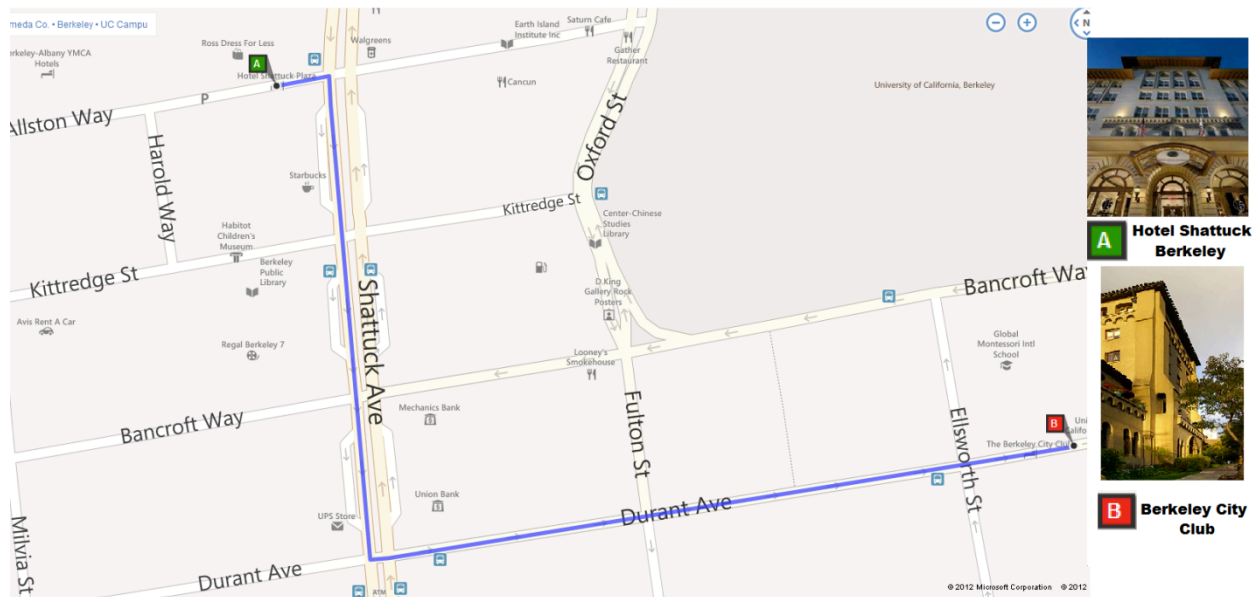
### Hotel Shattuck Floor Plan



## Directions to Conference Banquet

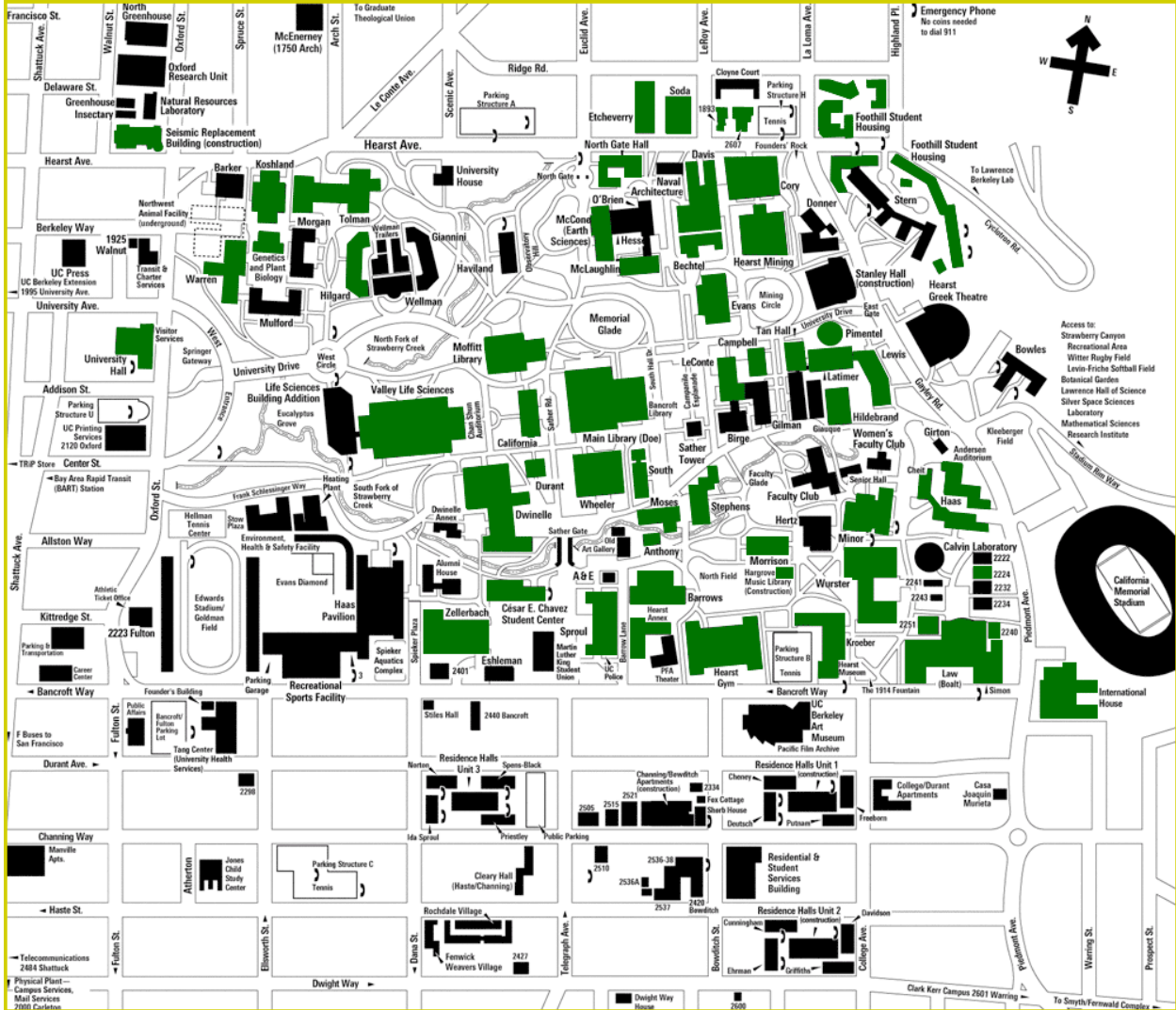
**A: Conference Venue:** Hotel Shattuck Plaza, 2086 Allston Way Berkeley, CA 94704

**B: Conference Banquet:** Berkeley City Club, 2315 Durant Avenue, Berkeley CA 94704



# University of California, Berkeley UCB Campus Map

(includes the libraries and faculty locations)



# UCB College of Engineering MAP

