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From the Editors

Deterrence, Multiattribute Utility, and Probability and Bayes' Updating

L. Robin Keller
Operations and Decision Technologies, The Paul Merage School of Business, University of California, Irvine, Irvine, California 92697, lrkeller@uci.edu

Kelly M. Kophazi
Institute for Operations Research and the Management Sciences, Hanover, Maryland 21076, kelly.kophazi@informs.org

We review the past year in this issue's "From the Editors" column, which is coauthored with Managing Editor Kelly M. Kophazi, then we preview this issue's five research articles. Our first article, by Naraphorn Haphuriwat, Vicki M. Bier, and Henry H. Willis, is on "Deterring the Smuggling of Nuclear Weapons in Container Freight Through Detection and Retaliation." Next, Ali E. Abbas presents a method for "Decomposing the Cross Derivatives of a Multiattribute Utility Function into Risk Attitude and Value." The next two articles contain methods for determining probabilities. In our third article, Robert F. Bordley develops a method for "Using Bayes' Rule to Update an Event's Probabilities Based on the Outcomes of Partially Similar Events." Next, a method for "Aggregating Large Sets of Probabilistic Forecasts by Weighted Coherent Adjustment" is developed by Guanchun Wang, Sanjeev R. Kulkarni, H. Vincent Poor, and Daniel N. Osherson. The final article is by Xiting Yang, Joseph B. Kadane, Heidi M. Crane, and Mari M. Kitahata on "Whether to Retest the Lipids of HIV-Infected Patients: How Much Does Fasting Bias Matter?"

Key words: decision analysis; applications: medical; applications: military; applications: public policy; applications: terrorism; Bayesian updating; combining forecasts; conditional probabilities; consensus; cross derivatives; deviation; fasting; game theory; hierarchical; HIV; human memory; incoherence penalty; judgment aggregation; lipid measurement; Markov chain Monte Carlo techniques; multivariate risk aversion; multiattribute utility; probability; pseudocounts; risk analysis; similarity; treatment decision; value functions; weighting; editorial

A teacher affects eternity; he can never tell where his influence stops.

Henry Adams

Our opening quote helps prompt us to take stock of our aims and what we have accomplished in the last year in our annual "From the Editors" column coauthored with Managing Editor Kelly M. Kophazi. We aim to reach and influence a broad audience throughout the world through our archival journal. A broad variety of papers have appeared in *Decision Analysis*, on theory, assessment methodologies, experiments, surveys, and applications.[1] Recent articles by the editors summarizing the papers in each issue include Keller (2010, 2011), Keller et al. (2010), and Keller and Kophazi (2010). Full text versions of these editorials are available, along with the "About the Authors" section (containing author biographies and photos) from our journal's online site.[2]

[1] Over the years, we have successfully managed to have teams who have been honored with the DAS (Decision Analysis Society) Practice Award prepare papers for the journal. See http://www.informs.org/Recognize-Excellence/Community-Prizes-and-Awards/Decision-Analysis-Society/DAS-Practice-Award.

[2] Last year INFORMS and all of the journal websites moved to a new content management system. The old *Decision Analysis* website at http://da.pubs.informs.org now resolves to http://www.informs.org/Journal/DA. See the journal archives at http://da.journal.informs.org/. Past issues are archived by HighWire Press®,

One measure of our global reach is the large number of countries represented by our corresponding authors. In the past year, from May 1, 2010, through the end of April 2011, we had submissions from corresponding authors from 29 countries, an increase from the 22 countries in the prior year. There were 12 new countries this year, and 5 countries from the prior year were not represented this year. Adding in all the coauthors on the submitted papers increases the number of countries represented.

Decision Analysis is covered by the Social Science Citation Index, beginning with Volume 6, Issue 1 (March 2009). Aiming for a wide audience, we widely disseminate information about papers published in the journal, announcing the authors and paper titles in each issue via e-mails to Decision Analysis Society[3] members, posting on the Decision Analysis Web forum,[4] and journal news articles in the *Decision Analysis Newsletter*.[5] We distribute a flyer advertising the journal at conferences, which you are encouraged to download and distribute among your colleagues.[6]

We continue to have good turnaround times for our reviews. The average turnaround time to a one-round decision (of reject, revise, or accept) is 31 days.[7] For papers submitted after May 1, 2010, the average number of days until the final decision was 38 days. The median was 12 days, with a minimum of 0 days and a maximum of 272 days. Papers are with referees for an average of 32 days (for original submissions) and 22 days (for revisions).

As we entered 2011, we began year two of the second and final three-year term of this editorship, covering Volumes 7, 8, and 9. There will be a search committee in 2012, appointed by the INFORMS Board of Directors, to recommend a new Editor-in-Chief, following the standard procedures of our publisher, INFORMS.[8] This mandatory search for a new editor is one way that INFORMS journals remain highly ranked and up to date.

In the coming year, we are planning for a special issue of *Decision Analysis* on "Games and Decisions in Reliability and Risk," with guest editors Refik Soyer, Fabrizio Ruggeri, and Jason R. W. Merrick. The focus of the special issue is on the use of game theory and decision theory in reliability analysis and risk analysis. The special issue aims to bring together novel research from disciplines that have the potential to contribute to this theme, including (but not limited to) economics, engineering, finance, mathematics, medical sciences, military sciences, probability, and statistics. See Keller et al. (2011) for the Call for Papers. The last special issue was the one in honor of Michael H. Rothkopf on auctions, in March 2010; see Bordley et al. (2010) for a summary of the papers in that issue.

Newly implemented last year was a statement to which all corresponding authors agree when submitting a paper to any INFORMS-published journal:

> I acknowledge that in submitting this paper I am aware of INFORMS policy on plagiarism and copyright (http://authors.pubs.informs.org). Further I acknowledge that I will report to the editor(s) of the journal all of my manuscripts (e.g., prior publications, conference proceedings, book chapters, papers submitted to other journals) that have substantial overlap with the submitted paper. I also certify that the copyright for all portions of this paper can and will be transferred to INFORMS upon acceptance.[9]

As we turn to the first article, I am reminded of the Girl Scout (and Boy Scout) motto of "Be Prepared," since the article examines possible preparations to protect against terrorism.

Our first article in this issue is by Naraphorn Haphuriwat, Vicki M. Bier, and Henry H. Willis on "Deterring the Smuggling of Nuclear Weapons

which also offers anyone the option to sign up for free for *Decision Analysis* eTOCs (e-mailed Table of Contents) alerts.

[3] See http://www.informs.org/Community/DAS/Decision-Analysis-Journal.

[4] See http://www.syncopation.com/forums/viewforum.php?f=7.

[5] See http://www.informs.org/Community/DAS/Newsletter.

[6] See http://www.informs.org/Community/DAS/Decision-Analysis-Journal for the Decision Analysis Flyer.

[7] This includes papers under all associate editors (both the official ones and the ad hoc ones) and includes some papers rejected without going to referees.

[8] See the journal site at http://www.informs.org/Journal/DA/Editorial-Office for contact information and photos of the editorial office team, including Production Editor Kimberly Anoweck. See photos of the editorial board members at http://www.informs.org/Pubs/DA/Promo-Folder/PHOTOS.

[9] See http://www.informs.org/Find-Research-Publications/INFORMS-Journals/Author-Portal/Publications-Policies/Guidelines-for-Copyright-Plagiarism for more information.

in Container Freight Through Detection and Retaliation." Haphuriwat et al. (2011) develop a game-theoretic model of terrorist decision making to examine the role of nuclear detection technologies in deterring nuclear terrorism, using publicly available data. They find that if the defender can credibly threaten the attacker with costly retaliation, then partial inspection at ports of entry may be sufficient. But, if the defender does not impose high retaliation costs, 100% inspection is likely to be needed to deter nuclear smuggling attempts. This article extends the findings on cargo screening from Merrick and McLay (2010). Bakir (2008) also considered cargo screening decisions.

Other related papers on national security in *Decision Analysis* include Barrett (2010) on measures for chlorine truck attack prevention, Caswell et al. (2011) on the best national strategy to prevent or delay another country from acquiring nuclear weapons, Feng and Keller (2006) on potassium iodide distribution in nuclear incidents, Hausken and Zhuang (2011) on governments' and terrorists' choices between attacking the enemy and defending against an attack, and von Winterfeldt and O'Sullivan (2006) on protecting airplanes against surface-to-air missile attacks. Some additional prior game theory papers in *Decision Analysis* include van Binsbergen and Marx (2007), Cobb and Basuchoudhary (2009), and Cavusoglu and Raghunathan (2004) on decision theory versus game theory for analyzing detection software; Lippman and McCardle (2004) on dividing an estate; and Rothkopf (2007) on why decision theory, rather than game theory, is the right tool for analyzing auctions. In addition to her contribution as an author, Vicki Bier also provides leadership to the journal as an associate editor; see Keller et al. (2010).

Next, in "Decomposing the Cross Derivatives of a Multiattribute Utility Function into Risk Attitude and Value," Ali E. Abbas presents a simple method for reasoning about the signs of the cross derivatives of a multiattribute utility function. Abbas (2011) uses derivatives of a univariate utility function over value and the properties of the value function, and demonstrates the approach to examine multivariate risk aversion. In addition to his service as an associate editor, prior contributions by Abbas to *Decision Analysis* include Abbas (2009) on linear and log-linear pools of experts' judgments, Abbas et al. (2008) on probability encoding methods, Abbas and Hann (2010) on name-your-own price auctions, Abbas (2007) on invariant utility functions, Abbas and Howard (2005) on attribute dominance utility, and Abbas and Aczél (2010) on functional equations. Related prior papers in *Decision Analysis* include Dees at al. (2010) on additive multiattribute value functions, Denuit and Eeckhoudt (2010) on bivariate stochastic dominance and substitute risk-(in)dependent utilities, and Sandvik and Thorlund-Petersen (2010) on sensitivity analysis of risk tolerance.

We now move on to two papers on determining probabilities. Our third article, by Robert F. Bordley, is "Using Bayes' Rule to Update an Event's Probabilities Based on the Outcomes of Partially Similar Events." Noting that while there is a known Bayesian solution to updating the probability of an event given information on the outcome of *n completely* similar events, Bordley (2011) points out that in many cases, there is only information on *partially* similar events. He then extends the known solution to cases with partially similar prior events. A related prior contribution in *Decision Analysis* is Bordley (2009) on combining the opinions of experts who partition events differently. Related papers in *Decision Analysis* include Abbas et al. (2008) on two probability assessment methods; Baillon (2008) on a method for eliciting probabilities using exchangeable events; and Bickel (2010), Johnstone (2007), Kilgour and Gerchak (2004), and Schervish et al. (2009) on probability scoring rules. Bordley provided leadership as a guest editor for the Michael H. Rothkopf special issue (see Bordley et al. 2010) and is a member of the journal's editorial board.

Our fourth article, by Guanchun Wang, Sanjeev R. Kulkarni, H. Vincent Poor, and Daniel N. Osherson, is on "Aggregating Large Sets of Probabilistic Forecasts by Weighted Coherent Adjustment." Wang et al. (2011) propose a new algorithm for combining probability assessments from a large pool of forecasters, using two measures of a forecaster's credibility to determine the person's weight in the calculation of the aggregated probability. The algorithm was then applied to a data set of probability estimates on events related to the 2008 U.S. presidential election. This paper is a follow-up to Predd et al. (2008), a prior contribution in *Decision Analysis* on aggregating probability assessments from incoherent or abstaining experts

coauthored by three members of this same research team (Osherson, Kulkarni, and Poor). A related prior paper in *Decision Analysis* is Merrick (2008) on getting the right mix of experts.

Now it is time for our *Trivia question*: Ralph Keeney and his wife considered a number of objectives for naming their son. Which of the following was NOT an objective they considered?

A: Single spelling; B: Not a unisex name; C: Reasonable initials; D: Understandable pronunciation with last name; E: Understandable pronunciation with middle and last name; F: No obvious "unwanted" nickname; G: Not unique; H: Not extremely common; I: Not religious; J: Not named after anyone; K: Not end in the letters "LOF"; L: Nice-sounding in foreign languages; M: No "EE" sounds.

See the footnote for the trivia answer.[10] Next we move on from anticipating a birth to treating HIV-infected patients.

Our final article, by Xiting Yang, Joseph B. Kadane, Heidi M. Crane, and Mari M. Kitahata, examines the medical treatment decision of "Whether to Retest the Lipids of HIV-Infected Patients: How Much Does Fasting Bias Matter?" Because there is uncertainty about the amount of time a patient has actually fasted prior to a blood test, there is uncertainty in the true low-density lipoprotein (LDL) cholesterol value, which is calculated from other lipid values that are directly measured (total cholesterol, high-density lipoprotein (HDL) cholesterol, and triglycerides). Yang et al. (2011) analyze a four-level Bayesian hierarchical model to determine true LDL cholesterol using Markov chain Monte Carlo techniques and elicited prior distributions. Then, the expected-loss-minimizing treatment decisions can be determined for individual patients.

Prior contributions in *Decision Analysis* by Kadane include Boatwright et al. (2010) on common value versus private value categories in online auctions, Kadane (2011) on partial-Kelly strategies and expected utility, and Schervish et al. (2009) on proper scoring rules. Related papers in *Decision Analysis* include Cantor (2004) on clinical medicine applications in the decision analysis literature, Erkin et al. (2010) on eliciting patients' revealed preferences, Keeney and Vernik (2007) on the biological clock decision, Pauker and Wong (2005) on influence diagrams in medicine, and Harvey and Østerdal (2010) on cardinal scales for health evaluation.

[10] *Trivia answer*: K—In his *Value-Focused Thinking* book, Keeney (1992, pp. 397–399) provided 15 objectives for choosing a name, which did not include *Not ending in the letters "LOF"*.

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