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13. ABSTRACT (Maximum 200 words) Most of the preceding research deals with arguments in which the predicates are familiar enough to reason about. Some of our work during the past year also dealt with category-based arguments in which the predicates were unfamiliar and unlikely to enter the reasoning process, predicates like "has sesamoid bones." In Lopez's dissertation he showed that phenomena that have previously been found only in a judgment task also botained in a task that required subjects to partially generate the category-based arguments. In other work, we showed that some of the standard phenomena obtained with unfamiliar predicates also obtain in cultures that are very removed from Western Influences (only the American end of the research was in any way supported by this grant). All in all, our research documents the importance of similarity and plausibility computations in reasoning, and suggests that these computations are very natural ones.					
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Annual Report for AFOSR Grant #92-0265 (6/1/92-5/31/93)  
 "Development and Application of a Model of  
 Individual Decision Making in Military Contexts"

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Our research deals with judgments of probability about category-based arguments, which have the following form:

Some members of Category C have Property P

Therefore other (all) members of Category C have Property P.

We have emphasized cases in which the categories are familiar ones, like "lions", the properties or predicates are familiar enough to reason about, like "have skins that are more resistant to penetration than most synthetic fibers", and the subject's task is to judge the probability that the conclusion is true given that the premises are true. A sample item is:

Housecats have skins that are more resistant to penetration than most  
synthetic fibers

Therefore Lions have skins that are more resistant to penetration than  
 most synthetic fibers

In last year's Annual Report, I described a model of category-based judgments that we had developed. In brief, this "Gap" model assumes that:

(1) Each category and predicate is represented by a set of attributes and values.

(2) The values of the premise category (e.g., "Housecat") are compared to those of the predicate to see if the former are at least as great as the latter.

(3) To the extent that the premise category's values are less than those of the predicate, the latter are scaled down; and

(4) To the extent that the predicate's values are scaled down, the conclusion category's values are more likely to be at least as great as those of the predicate and hence the conclusion is likely to be judged probable.

Statements and tests of the Gap model are about to appear in two journals (Osherson, Smith, Myers, Shafir, & Stob, in press; Smith, Shafir, & Osherson, in press).

In the last year of the grant period we have elaborated the Gap model in various ways, as well as provided more demanding empirical tests of the

model. In two studies, we tested a quantitative version of the model in a way that required no free parameters. After making their probability judgments, subjects indicated which features they had used in arriving at their judgments, and we used these features as direct estimates of the attribute-values involved. We found correlations between predicted and observed probabilities that ranged between .5 and .6. In another study, we found evidence for the Gap model's assumption that processing the premise leads to a revision of belief about the predicate.

We also began a new line of research this year, that is concerned with using the Gap model to construct a normative model of probability judgments. While the Gap model is a good descriptive model of how people make probability judgments about category-based arguments, the predicted judgments need not be "coherent," i.e., they need not conform to the probability calculus. Yet such conformity is most desirable from the perspective of expert systems. Using linear programming techniques, we have used the Gap model to generate a normative model (which of course makes only coherent probability judgments), where this normative model essentially contains much of the psychology that underlies the Gap model.

In a related vein, we have also begun to explore both normative and related descriptive models of how one uses a few given probabilities to generate any other desired probability from the same distribution. This work is discussed in our paper on ampliative inference (Osherson, Shafir, & Smith, in press).

Most of the preceding research deals with arguments in which the predicates are familiar enough to reason about. Some of our work during the past year also dealt with category-based arguments in which the predicates were unfamiliar and unlikely to enter the reasoning process, predicates like "has sesamoid bones." In Lopez's dissertation he showed that phenomena that have previously been found only in a judgment task also obtained in a task that required subjects to partially generate the category-based arguments. In other work, we showed that some of the standard phenomena obtained with unfamiliar predicates also obtain in cultures that are very removed from Western influences (only the American end of the research was in any way supported by this grant). All in all, our research documents the importance of similarity and plausibility computations in reasoning, and suggests that these computations are very natural ones.

Articles

Lopez, A., Gunthil, G., Gelman, S.A., & Smith, E.E. (1992). The development of category based induction. Child Development, 63, 1070-1090.

Osherson, D., Smith, E.E., Myers, T.S., Shafir, E.B., & Stob, M. (in press). Extrapolating human probability judgment. Theory and Decision.

Smith, E.E., Shafir, E.B., & Osherson, D. (in press) Similarity, Plausibility, and judgments of probability. Cognition.

Osherson, D., Shafir, E., & Smith, E.E. (in press). Ampliative inference. Cognition.

Dissertations

Lopez, A. (1993). Argument testing: Hypothesis testing in categorical arguments. University of Michigan Ph.D. Dissertation.

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Interactions

Papers on "Similarity, Plausibility, and Judgments of Category Based Arguments" presented by E.E. Smith at: Psychonomics Society Meetings (11/92), and Northwestern University (4/93).

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