Comparative Argument Strength

James B. Freeman
Hunter College
City University of New York

Argument 1:

(1) Martina will do well in college.
(2) She scored high on the Scholastic Aptitude Test and
(3) She has demonstrated high scholastic motivation.

Warrant:

From: *x* scored high on the Scholastic Aptitude Test and *x* has demonstrated high scholastic motivation

To infer: *x* will do well in college

Contrast:

Argument 2:

(1) Martina will do well in college.
(2) She scored high on the Scholastic Aptitude Test

Warrant:
From: *x* scored high on the Scholastic Aptitude Test
To infer: *x* will do well in college

Rebuttal: *Ceteris paribus* Martina will not do well in college if she does not have high scholastic motivation. But for all you have shown, she does not have high scholastic motivation, i.e. please show that she does.

We cannot apply the rebuttal to Argument 1 as we did to Argument 2.

The warrant of Argument 1 is more rebuttal resistant than the warrant of Argument 2.

Proposal: Understand comparative argument strength (for defeasible arguments) as resistance to rebuttals, the more resistant to rebuttal, the stronger the argument.

The Method of Relevant Variables

Consider:
From: **P**x_1, ..., **P**x_n
To infer: **Q**x_1, ..., **Q**x_n

Backing: Observation of a constant conjunction of P's with Q's made under default conditions

Potential Rebutting Conditions: <x_1, ..., x_n> fails to satisfy some further condition that required for P's to be Q, <x_1, ..., x_n> satisfies some condition sufficient for P's not to be Q

Observation of a constant conjunction in a default situation backs a warrant to degree 0.

Method: Identify and order a finite set of relevant variables, V_1, ..., V_n. If no variant of V_1 constitutes a rebuttal to the warrant, it is backed to degree 1/n. If no combination of variants of V_1, V_2 constitutes a rebuttal to the warrant, it is backed to degree 2/n. ... If no counterexample appers through level i but does appear at level i+1, the warrant is backed to degree i/n. If no counterexample appears through level n, the warrant is backed to degree n/n and is regarded as a law of nature.

Proposal: We may compare argument strength through degree of support by a canonical test. Where i > j, a level of support to i/n is greater than a level of support to j/n.

Problem 1: How are relevant variables to be identified?

Problem 2: How are relevant variables to be ordered?

Defining Relevant Variables

Illustrative Paradigm:
Let ‘G’ indicate some genus of living things
Let ‘S_1x’, ..., ‘S_kx’ indicate distinct species of G
Let ‘Q_1x’, ..., ‘Q_kx’, ‘Q'_1x’, ..., ‘Q'_kx, R_1, ..., R_k be predicates which can be true of the living things included in the genus
Suppose that for the species S_i, observation of members of the species shows that for some j, Q_j’s in general are Q'_j, there are R_h’s which are Q_j’s but not Q'_j. Then R_h is a relevant variable with respect to genus G.

1. Take some genus.
2. Take some universal generalization in general satisfied by members of a species within that genus..
3. Take some property which may be satisfied by members of the species where the conjunction of the antecedent of the generalization and that property fails to satisfy the consequent of the generalization.
4. That property is a relevant variable for the genus.

Problem: Suppose we arbitrarily order the relevant variables. Suppose some relevant variables have many variants which constitute counterexamples to some generalization, while others have few if any. If those relevant variables producing few counterexamles appear early in the ordering, a generalization may pass several levels of a canonical test before being counterexampled while if the order were different, the generalization might pass few levels. The strength of the generalization is different depending on the order. But strength should not depend on order of the variables.

Ordering Relevant Variables

Cohen's Proposal: Order variables according to decreasing falsifcatory potential.

Empirical Assumption: There are a finite number of relevant variables and a finite number of variants in each.

In setting up a canonical test, then, the relevant variables should be ordered in the first place according to the empirical information that we have concerning how likely they are to generate counterexamples to the generalization being tested.

Order Through Prior Probability

Evidence for the relative number of counterexamples produced by a relevant variable contributes to assessing the prior probability of that variable to produce the same relative number of counterexamples. The greater relative number of counterexamples produced, the more **plausible** *ceteris paribus* that this particular relevant variable will produce the most counterexamples in further cases. The most plausible relevant variable before the canonical test is carried out has the highest prior plausibility and should be ordered first.

How does one assess overall plausibility?
How do we determine these prior probabilities?
Questions:
When do we have sufficient information to determine prior probabilities for canonical test purposes?
Why is information about other species relevant to determining falsificatory efficiency of a relevant variable for a given species?
How do we order relevant variables with the same number of counterexamples?
Is the ratio of favorable to overall cases to total number the proper criterion?

What is the connection between prior probability and plausibility?
What is plausibility?
What factors are involved in it?

Copi and Cohen's Standard Textbook Account:
Plausibility involves three properties:
compatibility with previously established hypotheses
predictive or explanatory power
simplicity

Hanson's Account of Plausibility:
Plausibility concerns whether a hypothesis is worth testing as opposed to whether it is true or acceptable (W. Salmon's appraisal)
Reasons to judge H plausible are reasons for thinking H likely to succeed if tested, and these are reasons distinct from reasons supporting the truth of H.
This conception gives us a criterion for judging relevant variables plausible.

Suppose we want to test a generalization of the form

(*) $(\forall x)(\mathbf{P}x \supset \mathbf{Q}x)$

We recognize five relevant variables among whose variants we may find counterexamples

We may now form five hypotheses:

Hypothesis H_1: $\mathbf{V}_1$ produces more counterexamples to (*) than any $\mathbf{V}_i$, $i > 1$.

etc.

Plausibility supporting reasons are "reasons for suggesting that, whatever specific claim the successful H will make, it will nonetheless be an hypothesis of one *kind* rather than another" (Hanson). But is not a relevant variable one way, kind, type of consideration where one might find counterexamples to a generalization being tested? Given a class of species, certain factors may be known to produce counterexamples to the generalization.

Each of the H_i's is a hypothesis about where to find counterexamples.

Furthermore, in looking to other species in a genus for evidence on which relevant variable produces the most counterexamples, we are reasoning by analogy that this relevant variable will have the most counterexamples in the species we are investigating.
Analogical reasons are reasons for plausibility, contributing to confirmation without confirming.

Salmon on Prior Probability and Plausibility

The plausibility of a hypothesis involves “direct consideration of whether the hypothesis is of a type likely to be successful” (1966, p. 118), i.e. direct consideration of its probability before taking into account a specific body of evidence, i.e. its proir probability.

What is the prior probability that for $1 \leq i \leq 5$, H_i (i.e. $\mathbf{V}_i$ produces more counterexamples to $(\forall \mathbf{x})(\mathbf{Px} \supset \mathbf{Qx})$ than any $\mathbf{V}_j$, $j \neq i$) is true before carrying out at least some preliminary version of a canonical test. i.e. what is the plausibility of H_i?

P attributes a property.
In a canonical test, we are testing the strength of a generalization $(\forall \mathbf{x})(\mathbf{Px} \supset \mathbf{Qx})$ for a species **S** of a genus **G**.
Suppose we have no knowledge of how many **P**'s are **Q**'s for **S**, but we do have this knowledge to some extent for the other species of the genus.
Even though short of a projection to **S** with any confidence, this information does indicate which relevant variable produces the most counterexamples across the species of the genus. It renders plausible some H_i, $1 \leq i \leq 5$.

This information lets us rank the relevant variables, i.e. the $\mathbf{V}_i$, $1 \leq i \leq 5$, on known counterexamples produced.

It satisfies one principal plausibility criterion: compatibility with previous results (hypotheses).

More specifically, it satisfies Rescher's criterion of the probative strength of the confirming evidence. Here probative strength is determined by amount of evidence.

May this plausibility ranking satisfy any further plausibility criteria?

How did we come by our data on which we ranked the prior probability of the relevant variables?
The data came through sources, our own observation and the word (testimony) of others.
The reliability of our sources is a factor affecting the plausibility of our ranking.
(Salmon's pragmatic criterion)
(Rescher's criterion of the authority or reliability of the sources vouching for a claim)
An authoritative source is not just an expert but includes someone in a position to have observed some event or common knowledge.

Plausibility, then, is not just a matter of quantity of evidence, but quality, specfically the quality of the sources which vouch for the evidence. Hence in ranking the plausibility of the claims about which relevant variable produces the most counterexamples, it is conceivable that more claims about particular variants of relevant variables of some V_j be recognized but the claim about V_i be regarded as the most plausible on the reliability, i.e. quality, of the sources vouching for it. Our plausibility ranking involves these two considerations, anount of evidence and reliability of source, quantitiy and quality.

What happens is quantity and quality considerations conflict? How may we properly order the relevant variables for plausibility of most counterexamples in this case?

Suppose we have just five relevant variables to order according to the plausibility of their having the most counterexamples.

Step I: We have a count of how many counterexamples they have produced across the species of the genus **G** of which **S** is a member.

Straight Method: Add up the count of the counterexmples each relevant vaiable has produced across the species.

Average Method: Average the counts for each relevant variable across species.

Take the relevant variables in descending order. This order constitutes the prior plausibility of the claims that $\mathbf{V}_i$ has the most relevant variables, for $1 \leq i \leq 5$.

Take 5, 4, 3, 2, 1 as the prior plausibility values.

Step II: Grade sources (freehand) for their reliability along the scale of strong, moderately strong, neither strong nor weak, moderately weak, weak. Assign values 5, 4, 3, 2, 1 according to this ranking. If we believe that a souce has not even minimal reliability, set it aside.

Rationale for Averaging Method:

Since we are trying to make a projection on which relevant variable may be expected to produce the most counterexamples for a given particular species **S**, the average of how each relevant variable has “performed” across the species of the genus may be more appropriate.

How do we combine these two plausibility measures?

The evidence provided by our count may let us say that the case for one of the relevant variables generating the most counterexamples is from a plausibilistic standpoint strong, moderately strong, neutral, moderately weak, or weak. The same holds for estimnates of source reliability.

Given the plausibility ranking of the count as prior plausibility and given the ranking of the reliability of the souces as further evidence, can we use a plausibility analogue of Bayes Theorem to combine these values?

The $\mathbf{H}_i$ are mutually exclusive. So we may state Bayes Theorem in this form:

$$Pr(\mathbf{H}_j/E) = Pr(\mathbf{H}_j)Pr(E/\mathbf{H}_j)/\sum_{1 \leq i \leq 5}[Pr(\mathbf{H}_i)Pr(E/\mathbf{H}_i)]$$

What does this mean plausibilistically?

1. Correlate plausibility values with numerical values, strong with 5, moderately strong with 4, etc.
2. Substitute that value for $Pr(\mathbf{H}_i)$.

What may Pr(E/$\mathbf{H}_j$) mean?

Conditional Probability:

When Pr(B) > 0, Pr(A/B) = Pr(A & B)/Pr (B).

How may we understand Pr(A & B) plausibilistically?

Rescher's Consequence Condition:

When a certain group of (mutually consistent) propositions in **S** entails some other proposition in **S**, then this resulting proposition cannot be less plausible than the least plausible among them. (*Plausible Reasoning*, p. 15)

Consider {A & B, A, B}. Clearly A, B $\models$ A & B. Let |A|, |B|, |A & B| denote the plausibility values of ‘A’, ‘B’, ‘A & B’. We have then that $\min\{|A|, |B|\} \leq |A \& B|$. For cases, as here, where **S** consists of a conjunction and its conjuncts, we may drop ‘$\leq$’ for ‘=’.

Take the souce reliability for each piece of evidence as the average of the source reliabilities of the sources vouching for it. Since $\mathbf{H}_i$ claims that $\mathbf{V}_i$ has the most variants producng counterexamples, we are concerned only with evidence for $\mathbf{H}_i$, call that E_i. The source reliability for E_1 is the average of the source reliabilites of the component reports constituting E_1.

Summary

1. Arguments instance warrants.
2. Warrants may be subject to rebuttals but may be more or less resistant to rebuttals.
3. The more resistant the warrant, the stronger the argument instancing it.
4. The method of relevant variables is a way of determining the resistance of a warrant to rebuttals; how many potential rebuttals fail to defeat the warrant?
5. Successfully applying the method requires ordering the relevant variables on the plausibility of the claim that a particular relevant variable has the most counterexamples to the associated generalization of the warrant among its variants.

6. Criteria for plausibility in this case are the previously established data concerning the falsificatory efficiency of the relevant variable and the reliability of reports vouching for this data.

How strong is strong enough, i.e. strong enough to justify accepting the conclusion of an argument on the basis of its premises? Stay tuned.