NOTES

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1 Theoretical framework

In this section, we discuss the causes of incomplete evidence, and the relationship between incompleteness and accuracy. We conclude this section by identifying two questions that may guide responses to missing evidence. This theoretical framework paves the way to the legal framework in the next section.

1.1 Causes of gaps

To understand how gaps in the evidence come about, it is important to distinguish the problem of gaps from the problem of fallibility. Imagine a system of adjudication that is immune from gaps in the evidence. The system is both complete and infallible. It has access to evidence about every possible fact at any time in any place and this evidence is infallible. The problem of gaps does not arise here. But it is not the infallibility of the system that eliminates the problem. For a fallible legal system could still avoid the problem of gaps. Think of a complete yet fallible system. It has access to evidence about every possible fact at any time in any place. Yet the evidence could be erroneous or misleading. Say, every action by any individual at any time in any place is recorded, and the recording is accessible by the legal system. This is completeness. But suppose recordings can be erroneous, say because the pixels can get messed up and depict people doing what they were not doing. This is fallibility: evidence may give a picture of the facts that does not correspond to them. This complete yet fallible legal system would not incur the problem of gaps, but would still incur the problem of erroneous decisions. Recordings that show indication of error should count as weaker evidence compared to recordings that show no error. So the problem of gaps is not due to fallibility, but incompleteness. A complete system of adjudication, then, has access to every fact via at least one item of evidence, whether it be fallible or infallible.[1]

R: Not sure if this full-blown-completeness fiction is useful, to be discussed.

Now, if completeness does not imply infallibility, one might now wonder whether incompleteness implies fallibility. It does not. Say the truth of some complex proposition $A \wedge B \wedge C$ is under dispute, and facts A, B and C are all there is to know. So having evidence about the three of them would satisfy completeness. Suppose there is infallible evidence that A holds and infallible evidence that C holds, but no infallible evidence about B. Assume that A, B and C are independent, so evidence about one is not—indirectly—evidence about the other.[2] This system would be infallible (all the evidence that there is infallible), yet incomplete (not every fact is evidenced by an item of evidence). So incompleteness does not imply fallibility either.[3]

Incompleteness and fallibility are distinct concepts. One is neither sufficient nor necessary for the other. In the world we live in, however, any system of adjudication will be fallible and incomplete. Fallibility and incompleteness are often intertwined.

[1] Facts can also be evidential facts—say whether evidence support some hypothesis and to what degree. So, completeness would require evidence about first-order facts, as well as evidence also about evidential facts, and and so on. This would create an infinite regress, which makes it difficult, even in principle, to have complete evidence. So a complete system of adjudication is very hard to come by.

[2] In contrast, suppose that A, B and C form a temporally ordered series of events: A stands for forming an intention to do φ; B stands for doing φ; and C stands for bringing about a consequence of doing φ. Since A and C are known for sure, B becomes more likely in light of A and C. In fact, A and C are fallible evidence for B. So, relative to A, B and C, the evidence is actually complete yet fallible, since the evidence about B is fallible.

[3] More generally, consider this set-up: every proposition in the set Σ is causally independent of any proposition in the set Δ. Suppose a system of adjudication has access to infallible evidence about all the facts described by the propositions in Σ, but no evidence whatsoever about the facts described by the propositions in Δ. This system would be infallible, yet incomplete. There would be no fallible evidence.

With a better grasp of incompleteness, the first question is, why does a system of adjudication fail to be complete—that is, fail to have access to every fact? There could be several explanations. First, some facts may not be evidentiable. For example, before genetic testing was invented, the fact that a blood stain carried a genetic profile was not evidentiable; it could not be translated into evidence. Second, a fact may be evidentiable, but it was not the target of evidence. For example, a blood stain was not analyzed or no witness could see what happened inside the store when the customer tripped and fell. A pressing problem with making an evidentiable fact an actual target of evidence is that this process of evidence production might be too expensive or time-consuming. Third, even if a fact is evidentiable and was the target of evidence at some point, the resulting evidence could not be retained, was destroyed or deteriorated significantly later on. Say a video recording of what happened inside the store existed, but was later deleted; perhaps it was too costly to keep it in storage. Finally, even if a fact is evidentiable, was the target of evidence and the evidence exists, it was not presented at trial. It might have been too costly, time-consuming or practically impossible to present the evidence. Say research shows the expert witness of the other side is wrong, but presenting this research requires hiring a qualified expert and the party does not have the time or resources to do that, or did not consider this option.

Failure to make a fact a target of evidence, the destruction of the evidence or failure to present evidence at trial could occur as mere accidents or in bad faith—for example, when one of the litigants in a trial had an interest in destroying the evidence. There are of course variations in between these two extremes: nor was it accidental, nor was it intentional but the destruction was due to someone's negligence or failure to follow certain standards. The destruction may also be mandated by a company's standards to minimize costs or by competing interests, such as privacy.

So, to identify the key contributing causes of incomplete evidence, three should be mentioned: first, the limited resources available to the litigants and the legal system more generally (in terms of time, money, intellectual acumen, etc.); second, the partisan interests of the litigant who may prefer that some evidence not be presented; and third, general historical and societal constraints about evidence production. A system of adjudication with unlimited resources, no partisan interest and no constraints could in principle gather evidence about all facts.

R: I'm wondering to what extent you're a bit belaborating these details, would the readers be surprised seeing any of these reasons of incompleteness? What's the philosophical point of listing them and making these distinctions?

1.2 Gaps and accuracy

When gaps in the evidence occur, the quality of adjudication seems to deteriorate. But in what way, exactly, does it deteriorate? If there are gaps, what is the problem with them? This question, however, is too general. It does not specify the objectives that adjudication should pursue. So, to narrow it down, assume that the primary goal of adjudication is to make judgments about people's actions that are factually correct—that is, to maximize true positives (say, convict factually guilty people) and true negatives (say, acquit factually innocent people). We consider another objective of trial decision-making, dispute resolution, later on. Focusing on accuracy for now, the question becomes: does the existence of gaps in the evidence make the legal system less likely to reach accurate judgments?

In a sense, the answer to this question is obviously positive. Because not every fact is reflected in evidence accessible to the legal system, there will be criminal acts, frauds, infringements of rights etc. that go undetected. In fact, most crimes and wrongdoings go undetected, and some have particularly low rates of prosecution. This is unsurprising, but a matter that pertains more squarely to institutions outside the system of adjudication itself, such as police investigation.

Consider now a narrower question. If a defendant stands accused in a civil or criminal trial, does the fact that the evidence could be incomplete make it more likely that an erroneous judgment would be reached, either a false positive or false negative verdict? The answer, once again, seems positive, but a closer scrutiny shows that the matter is far from straightforward.

Suppose that favorable and unfavorable evidence to one of the parties is missing because of fortuitous reasons and random accidents. This situation is similar to when random errors, with no systemic pattern, occur in large data collection (more on this later). When evidence is missing at random, there is no reason to think that trial decisions would necessarily be more error prone. True, in individual cases, gaps in the evidence may cause errors. If exculpatory evidence ends up missing and the defendant was actually innocent, an incorrect guilty verdict could have been avoided had the exculpatory evidence not gone missing. Conversely, if incriminating evidence ends up missing and the defendant was actually guilty, an incorrect acquittal could have been avoided had the incriminating evidence not gone missing. So gaps may cause mistaken verdicts in individual cases. However, we should consider the long-term accuracy

of the adjudication system. Additional evidence, be incriminating or exculpatory, could turn a would-be-correct-verdict into an incorrect one. So gaps in the evidence need not be detrimental to accuracy if they follow a random pattern. In fact, gaps in the evidence may actually be accuracy-enhancing.

This claim can be illustrated with a simple model. First, consider the following fallible and incomplete system of adjudication. Against each trial defendants a body of (sometimes gappy) evidence is amassed. Relying on the (sometimes incomplete) evidence available, the long-run false positive rate (false conviction rate) is 30% and the false negative rate (false acquittal rate) also 30%. In other words, this legal system of adjudication—with occasional gaps in the evidence—has true positive and true negative rates of 70%. In addition, the evidence presented against defendants fails to be complete in 40% of the cases *at random*. There is no discernible systemic pattern by which evidence goes missing. (The numbers are illustrative and play no specific role in the argument that follows.)

Compare this fallible and incomplete system with one that is fallible but complete. In those 40% of cases in which completeness would fail, this second system can supply complete evidence instead. Suppose the presence of complete evidence makes a difference for trial decisions in only half of those 40% cases. So the two systems have the same 30% rate of false positives and false negatives in 80% of the cases. The difference is localized in 20% of cases in which the added evidence that fills the gaps makes a difference to the decision. In those cases, the trial decision depends entirely on the added evidence that fills the gaps. So the changes in the error rates in those cases boil down essentially to the reliability of the added evidence—that is, how well the added evidence tracks facts about guilt and innocence, specifically, the probability the evidence is incriminating when the defendant is factually guilty (true positive rate) and the probability it is exculpatory when the defendant is factually innocent (true negative rate). Now, three sub-cases must be distinguished. First, if the reliability of the added evidence is greater than that of the body of evidence without the added evidence, the complete system will have lower error rates. Second, if the reliability of the added evidence is the same as that of the body of evidence without the added evidence, the complete and incomplete systems will have the same error rates. Finally—and this is the most important case—if the reliability of the added evidence is lower than that of the body of evidence without the added evidence, the complete system will have higher error rates. So, adding missing evidence to fill gaps need not improve the accuracy of trial decisions, and it may actually diminish it in some circumstances.

We now have an answer to our question: how do gaps in the evidence impact accuracy? Whenever the addition of the missing evidence would have improved the reliability of the available evidence, gaps in the evidence are regrettable, because they increase the error rates of the decision system. However, whenever a body of evidence with gaps is not any worse in terms of reliability than a complete body of evidence, gaps in the evidence are not regrettable. If a body of evidence with gaps is better in terms of reliability than a complete body of evidence, gaps in the evidence are actually preferable.

Here is an illustration of when a more complete body of evidence may be less reliable than an incomplete one. Suppose there is a good, reliable evidence linking the defendant to the crime scene in a murder case: a genetic and a fingerprint match. There is no evidence, however, about the defendant whereabouts immediately before the crime nor about who else visited the crime scene immediately before. Compare this case with one in which the same evidence is presented and—in addition—a neighbor testifies about that another person visited the victim's house before the defendant did. This additional evidence, though relevant, has a low probative value compared to the other evidence. The neighbor is an elderly man whose memory has proven unreliable in other circumstances. Even though the additional evidence would make the overall body of evidence more complete, its reliability in tracking the facts of guilt or innocence is lower than the genetic match and fingerprint evidence.[4]

Besides accuracy, it is worth mentioning—at least briefly—another important goal of trial adjudication: the timely resolution of disputes. Arguably, gaps in the evidence have the same double-sided impact on dispute resolution as they do on accuracy. Gaps may enhance or diminish accuracy, and similarly, they may favor or hinder dispute resolution. A complete body of evidence may favor dispute resolution, in the sense that it can close off questions and doubts that an incomplete body of evidence would instead leave open. In this sense, complete evidence favors dispute resolution. On the other hand, the signal-to-noise ratio—or what we earlier called the reliability of the evidence—in a complete body of evidence could be lower than in a body of evidence with gaps. When this happens, the complete body of evidence would be less likely to settle a dispute and may actually invite further litigation.

[4]This example was liberally inspired by Lee Johnson v. Jeff Premo (2021 Oregon App. Ct.), Marion County Circuit Court08C11553 - A159635, available on-line https://law.justia.com/cases/oregon/court-of-appeals/2021/a159635.html

1.3 Random or systemic gaps

The answer to the question about the impact of gaps on accuracy (and dispute resolution) is premised on the assumption that gaps arise for fortuitous and random processes; they do not follow a systemic pattern. When they do follow a systemic pattern, gaps in the evidence pose an additional problem. We now turn to this additional problem.

To underscore the point about random patterns in evidence gaps, it is instructive to draw a comparison with data collection. The problem of gaps in the evidence is pervasive and not confined to legal systems of adjudication. For example, researchers in the social sciences may need to make inferences from data sets that contain gaps:

> consider a large survey of families conducted in 1967 with many socioeconomic variables recorded, and a follow-up survey of the same families in 1970. Not only is it likely that there will be a few missing values scattered throughout the data set, but also it is likely that there will be a large block of missing values in the 1970 data because many families studied in 1967 could not be located in 1970. (Inference and Missing Data Author(s): Donald B. Rubin Source: Biometrika, Vol. 63, No. 3 (Dec., 1976), pp. 581-592)

In such cases, it is paramount to understand the mechanism that explains why some data points can go missing. If randomness is the cause, that some data are missing should raise a minor problem. In the quotation above, the researcher was attempting to paint an accurate picture of large scale historical trends in socioeconomic variables for families in the 60's and 70's. That individual data points are missing at random should not affect the understanding of these large scale historical trends. If, instead, the mechanism exhibits a systemic pattern, that pattern must be taken into account and the inferences drawn from the data should be corrected. What this correction should be is a difficult question to answer.

The problem of gaps in the evidence in legal systems of adjudication shares some of the problem of gaps in data, but is also distinctive. It is distinctive in that the causes for why evidence goes missing in legal trials are not the same as the causes why data can go missing (see earlier discussion of causes of missing evidence). On the other hand, there is an important parallelism. Data points can be missing because of random error in observational data. Similarly, legal evidence can be missing because of fortuitous circumstances that do not follow any systemic pattern.

But what happens when gaps in the evidence do follow systemic patterns? The problem of gaps seems more acute when one side or the other has better access to complete evidence—say for economic reasons—and then takes advantage of what we might term *informational asymmetry*. In this sense, symmetric (random) gaps in the evidence are less worrisome—if at all—than asymmetric (systemic) ones. When gaps in the evidence follow a systemic pattern, they do have an additional detrimental effect on accuracy as well as fairness. For suppose wealthy defendants have better access to additional evidence and use that evidence whenever it would benefit their case. This will cause a unilateral reduction of findings of liability against wealthy defendants: the ability of wealthy defendants to find evidence in their favor—and possibly destroy evidence against them if necessary—would benefit them regardless of the facts of the case. The legal system of adjudication will thus be less likely to distinguish between truly guilty wealthy defendants and truly innocent wealthy defendants. This outcome will be detrimental for accuracy, but also for fairness: decisions about wealthy defendants will be less accurate and the system will perform differently across poor and wealthy defendants.

So, a tentative conclusion here is that gaps in the evidence are particularly worrisome when they are informationally asymmetric, and less so when they occur for fortuitous circumstances even when they might have a negative effect on accuracy.

1.4 Guiding questions

In light of the above discussion, the final question to ask concerns how the legal system should respond to gaps in the evidence. What rules (if any) it should put in place to remedy gaps? We have seen that gaps in the evidence are not necessarily a bad thing. It is not true, in general, that they increase the likelihood that a legal decision could be erroneous. With this in mind, the following critical questions can guide how to respond to gaps in the evidence:

(Q1) Compare the body of available evidence (with gaps) and the would-be body of evidence (without gaps). Do we have reasons to believe that the complete body would be more reliable than the body of available evidence?

(Q2) What is the cause that brought about gaps in the evidence? Is it a fortuitous fact or the result of a systemic pattern that advantages one or the other party in the trial?

These questions outline a theoretical framework for designing remedies. Consider the first question. If the answer is no, the missing evidence should raise no concern. It has no discernible impact on accuracy. Answering this first question might be quite difficult, though. For how do we assess what the would-be complete evidence is like if the missing evidence is not present? In the next section, we will see that this question can be realistically answered in some cases. In fact, whether such a question can be realistically answered is itself a good guiding criterion for responding to missing evidence.

If the answer to the first questions is yes, the missing evidence will have an impact on accuracy. Then, consider the second critical question. If the missing evidence is the result of a systemic pattern, this would make the evidence particularly problematic. Insofar as this pattern can be corrected and eliminated—by means of appropriate incentives—suitable remedies for missing evidence should be formulated. These remedies should aim to compensate the party that is negatively affected by the missing evidence. But if the missing evidence is the result of a fortuitous fact—good or bad lack, depending on which side we look—there cannot much the legal system can do. The reduced level of accuracy that results from the missing evidence might be an inevitable cost that any system of adjudication must bear.

These remarks draw a line between gaps in the evidence the system of adjudication should care about, and gaps the system should not care about. In what follows, we will analyze some paradigmatic legal cases that contain gaps in the evidence. These cases will allow us to become familiar with the legal framework for dealing with missing evidence. We will then see how the theoretical framework can inform how the law should handle gaps in the evidence.

2 Tentative general theory [stil working on this]

It is time to put all the pieces together.

2.1 Preliminary questions

In the legal framework, the first question is whether the missing evidence is prejudicial; in the theoretical framework, the first question is whether adding the missing would bring about a more reliable decision-making system. But the legal and theoretical framework need not be in conflict with one another. The case law focuses on clearly prejudicial forms of missing evidence—evidence that should have a substantive impact on the balance of the evidence, not just a slight, unclear, conjectural impact. The case law also emphasizes the problem of creating evidence from non-evidence: if the missing evidence is to have an impact on trial decision-making, its (conjectured) probative value must be clear enough to outweigh the need for adversarial testing of the evidence.

The balance of reason in favor of considering missing evidence—even when its probative value one way or another is conjectural—might be different in criminal than in civil cases. If criminal cases protect defendant against mistaken convictions more strongly than civil trials protect defendants against mistake findings of liability, then potentially exculpatory evidence that is missing should perhaps have more impact in decision in criminal rather than civil cases.[5]

ADD POINT ABOT CONJECTURAL GAPS

2.2 Epistemic remedies

In thinking about remedies, there are two main approaches, not necessarily incompatible. The first is to draw on as many epistemic resources as possible for assessing the epistemic impact of missing evidence.

On the other hand, the evidential value of missing evidence remains quite limited. Consider the remedy that sometimes could adopts when evidence is missing: if the evidence is missing because of bad faith intent by one of the parties, presume the missing evidence would disfavor that party. Form a purely epistemological pint, this inference is unwarranted. Even assuming that the only explanation why

[5] Another avenue in criminal cases to raise questions of missing evidence is for a defendant to claim that their counsel was ineffective, for example, by failing to introduce exculpatory evidence that was not otherwise available. To make a difference, this argument requires that "the deficient performance prejudiced the defense." Strickland v. Washington, 466 US 668, 687 (1984).

the evidence is missing is bad faith—say, the intentional destruction of the evidence—this fact still does not warrant the evidence that the missing evidence shouf disfavor the party that destroyed it. Why? So long as we admit that evidence coudl go missing for fortuitous reasons, the inference that the evidence must be go against te party that destroyed does not go through. This seems counterintuitive. Still, that inference can be warranted on polcy grounds, not epistemological grounds.

For example, if the evidence is missing because of bad faith, a plausible inference is that the missing evidence would favor the party that destroyed the evidence in bad faith. This is just the more obvious example, but there are more subtle ways to exploit epistemological resources and take into account the fact of missing evidence.

THINGS TO ADD:

- use also Rafal's weight or Bayesian network.
- Use also Kaye's suggestion of using the fact of missing evidence as itself an item of evidence. Jury instruction sometimes follow this scheme.
- See Hamer's argument below and criticism.

2.3 Policy incentives

Go beyond epistemology to create right incentives, but need not go too much beyond epistemology if goal is to increase accuracy in the long-run. So remedies could create incentive to preserve evidence that, if presented, would improve accuracy of adjudication.

3 Sparse notes

3.1 Structure of paper

First talk about some paradigmatic legal cases and established legal framework to handle cases of missing evidence.

One: Salem trials. Here the content of the missing is know, so is it really a case of missing evidence?

Two: Target case. Here tha there is missing evidence is clear (vida was erased), but te question of the conten of the video is open.

Three: could there be other cases in which whether the evidence is missing or not might depend on what kind of partisan story one subscribes to? Or perhaps there might be conflicting stories about why the evidence is missing.

Note that the legal framework only addresses cases of manifest missing evidence — cases in which (a) we know evidence is missing and (b) we know why it is missing (e.g. bad faith, negligence, etc.), so we need to decide what to do with the information (a) and (b), (e.g. draw an adverse inference).

Two limitations of the legal framework: (1) if there is no bad faith intent, then there is no adverse inference to be drawn; (2) given a settled story about what happened, the story itself tells us some evidence is missing. But could there other cases of missing evidence—say more conjectural?

Beyond (1). Consider the case there is no bad faith intent, but the evidence is still missing. What kind of remedy could address the gap in this case? Humer's argument is that since the missing evidence could point in both directions—guilt and innocence—the evidential value should be dismissed. Missing evidence averages out and thus return the same probability of guilt as the original evidence. This argument does not seem correct. So challenge it.

Beyond (2). The even more difficult question is what to do when there is story that clearly tells us that the evidence is missing, or it is not clear that the evidence is missing. Here is the difference between the express "gaps" and "missing evidence" start to matter. For example, do you have a gap in the evidence if you have not considered evidence about how reliable an eyewitness is? Yes and no. This aspects suggests that evidence is open-ended and thus the problem gaps is less pressing.

3.2 Key claims

(0) Start with Target case which seems to contain a lot of complexity and overview of main topics, then examine legal approach. DONE

(1) Difference between gaps in a clearly defined story and generic gaps in the evidence. The former, when filled, would clearly make the decision making more accurate, while the latter could make it less accurate. So we need not obsess about gaps in general, but only gaps that are clearly articulated. Sp, a decision procedure with more evidence (filling clear gaps) is more accurate, but a decision procedure worth more evidence (not filling clear gaps) need not be more accurate. So conjectural gaps might be less important thazn clear narrative gaps.

(2) Consider now only clearly specified gaps that are accuracy enhancing. Such gaps in evidence may be random/fortuitous or follow a systematic pattern. They only worrisome if they follow a systematic pattern. If they are random, they will reduce accuracy (because of 1), but not favor one side or the other systemically. So sucvh cases might not need any regulatations.

(3) Two rationales for remedies: epistemic individual specific and policy rationale. First, if evidence was intentionally removed, it is likely it would favopr the other party, etc. here an inference about what the missing/removed evidence was likely is made. No appeal to policy. Instead, we can also device a policy that says: sanction behavior that destroyed evidence when it is in bad faith. The two approaches might converge byt might also diverge sometimes. Example: evidence destruction was by accident, but there was duty for the defendant to preserve evidence. So, epistemic individual approach would not draw any adverse inference, but the policy approach would.

(4) Consider cases of missing stats about reliability of lab genetic testing or information about visibility conditions for eyewitness. Is this a clearly defined gap in the evidence or a generic gap?

3.3 Hamer's argument