Northern Illinois University Law Review

Volume 30 | Issue 3 Article 3

7-1-2010

Can a Computer Read a Doctor's Mind? Whether Using Data Mining as Proof in Healthcare Fraud Cases is Consistent with the Law of Evidence

Colin Caffrey

Can a Computer Read a Doctor's Mind? Whether Using Data Mining as Proof in Healthcare Fraud Cases is Consistent with the Law of Evidence

COLIN CAFFREY*

I. INTRODUCTION

Healthcare fraud is a growing problem in the United States—3% to 10% of spending on healthcare is wasted because of fraud.[1] The federal government[2] and others[3] are using computerized data mining to identify and

* Colin Caffrey is an attorney. He wants to thank his family for their support and his friends, especially Cory Kestner and Mike Kogut, for their advice and guidance.

1. Julie Appleby, *Medical Claims "Mined" to Find Fraud*, USA TODAY, Nov. 7, 2006, at 1B.

2. Press Release, U.S. Justice Dep't, Medicare Fraud Strike Force Operations Lead to Charges Against 53 Doctors, Healthcare Executives, and Beneficiaries for More than $50

mitigate this type of fraud. Data mining analyzes the prior acts of a provider to find patterns that might be indicative of this type of fraud.[4] This article will consider the use of information gleaned from data mining in a criminal trial. It will examine whether information so gleaned can be admitted under the law of evidence. First, this article will provide background on the use of data mining to detect fraud. Then it will consider three threshold evidentiary questions: (1) whether prior acts by a physician are competent evidence against him in a criminal trial; (2) whether an expert's testimony on data mining is proper expert testimony, meaning is this subject a proper one for expert testimony and may an expert testify about his conclusions based on data mining; and (3) whether the methodology of data mining satisfies the relevant standard of *Frye* or *Daubert*, and thus is an appropriate basis for expert testimony. It will analyze these questions under both the Federal Rules of Evidence and the common law.

II. AN EXPLANATION OF DATA MINING

Out of all the claims filed it is difficult to identify a single act as fraud.[5] Data mining takes advantage of the fact that most fraudfeasors commit many acts of fraud.[6] Data mining finds the fraudulent claims by looking for patterns of billing irregularities created by the repeated fraud.[7] Computerized data mining is able to analyze the relationships between two hundred million electronic claims records.[8]

Data mining uses artificial intelligence to find these patterns.[9] Analyzing a massive amount of data, computers are able to find unusual patterns in the data[10] using tools like statistical models, mathematical algorithms, and machine learning.[11] The results of these analyses create parameters, which

---

Million in Alleged False Billing in Detroit (June 24, 2009), *available at* http://www.justice.gov/opa/pr/2009/June/09-ag-623.html.

3. Jeffrey W. Seifert, *Data Mining and the Search for Security: Challenges for Connecting the Dots and Databases*, 21 GOV'T INFO. Q. 461, 463 (2004).

4. Sue Ashton-Davies, *Data Mining Digs Deep in High-Tech War Against Fraud*, AUSTRALIAN, May 26, 1998, at 36.

5. James L. Garcia, *Using Technology to Fight Fraud: New Software Systems Sift through Mountains of Data to Give Healthcare Fraud Investigators the Upper Hand in Combating Crooks*, HEALTH MGMT. TECH., Jan. 2002, at 32, 34.

6. *Id.* at 34.

7. Robert Regis Hyle, *Criminal Minds*, TECH DECISIONS, Feb. 2009, at 22, 24.

8. Mark Taylor, *HighTech Software Sleuthing. New Computer Tools Give Government Tighter Handle on Hard-to-Track Healthcare Fraud*, MODERN HEALTHCARE, Dec. 4, 2000 at 46, 46.

9. Ashton-Davies, *supra* note 4, at 36.

10. Emma Young, *Drilling for Data*, SYDNEY MORNING HERALD, Oct. 15, 1996, at Computers 1.

11. Seifert, *supra* note 3, at 463.

are then used to analyze the records of the practitioners.[12] Parameters are statistics derived not from a sample, but from an entire population of data.[13] For example, records of practitioners are compared to a previously identified parameter: computer identified suspicious patterns.[14] During the comparison, those billing records might then be run through as many as three hundred algorithms to find suspicious activity that conforms to these patterns.[15]

Data mining is one of the most important tools for detecting fraud.[16] These techniques have proven to be very effective at fighting fraud by identifying suspicious billing. Agencies can then investigate the fraud.[17] The United Kingdom Insurance Fraud Bureau has used these techniques to detect fraud and save eight million pounds.[18] These techniques were also used by the FBI to detect healthcare fraud committed in Boston.[19]

III. THE USE OF INFORMATION OBTAINED BY DATA MINING AS EVIDENCE

Since data mining is becoming an important and effective investigatory tool, this article will now look at whether it is admissible as evidence.

A. QUESTION ONE: WHETHER THE USE OF PRIOR ACTS BY PRACTITIONERS IS PROPER UNDER THE LAW OF EVIDENCE?

Data mining identifies patterns of suspicious billing.[20] Since it compares the bills submitted by a practitioner over time to find unusual patterns, and thus fraudulent activity, the prohibition against propensity evi-

---

12. *Id.*

13. SAM KASH KACHIGAN, MULTIVARIATE STATISTICAL ANALYSIS 9-10 (1982). This article notes that, for the purpose of legal analysis, it will treat statistics and parameters as the same because the only difference is from what they are derived.

14. Karen Dearne, *Cheats Unearthed as Data Miners Dig*, AUSTRALIAN, June 19, 2001, at 43 (quoting Jolie Reichel, National Research Manager of MBF, one of Australia's largest insurance companies).

15. Nathan Conz, *Stopping Fraud Before it Occurs: Medical Mutual of Ohio Leverages VIPS' Star Sentential Software to Identify Potentially Fraudulent Claims Activity as It Comes Through the Door Discouraging Fraud Before It Begins*, INS. & TECH., May 2008, at 13, 13.

16. Dearne, *supra* note 14, at 43 (quoting Jolie Reichel, National Research Manager of MBF, one of Australia's largest insurance companies).

17. Charles Babcock & Marianne Kolbesuk McGee, *Filter out Frauds,* INS. & TECH., Sept. 2004, at 40, 42.

18. Ian Grant, *Data Mining Increases Insurance Fraud Arrests*, COMPUTER WKLY., Aug. 14, 2007, at 133, 133.

19. Taylor, *supra* note 8, at 46.

20. Hyle, *supra* note 7, at 22, 23.

dence is implicated. The question becomes: Is using prior suspicious bills and discussing the suspicious patterns as evidence consistent with the law's ban on propensity evidence? This article will now discuss that question under both the Federal Rules of Evidence and the common law of evidence.

1. Under the Federal Rules of Evidence

The answer to this question is governed by Federal Rule of Evidence 404(b). The relevant portion of the rule states:

> Evidence of other crimes, wrongs, or acts is not admissible to prove the character of a person in order to show action in conformity therewith. It may, however, be admissible for other purposes, such as proof of motive, opportunity, intent, preparation, plan, knowledge, identity, or absence of mistake or accident . . . .[21]

This rule only prohibits using prior bad acts to prove character.[22] Prior acts can be admitted to show lack of good faith and intent.[23]

In *United States v. Wales*, the government was allowed to introduce prior acts by a smuggler to show his intent to smuggle goods.[24] The government was allowed to show that the defendant knew how to fill out customs forms.[25] The government introduced this evidence to prove he intentionally did not declare items on his customs form.[26]

In *United States v. Erikson*, which involved a medical fraud prosecution, the government introduced evidence of prior acts by the defendant-doctor.[27] The defendant in that case was accused of improperly billing Medicare.[28] He was accused of billing the government for twenty-seven hours of service during a workday.[29] As part of its case, the government introduced evidence that the doctor had previously engaged in improper billing practices.[30] The government introduced evidence of those prior billing practices even though the defendant doctor had not been accused of a crime in rela-

---

21. FED. R. EVID. 404(b).
22. United States v. Davis, 103 F.3d 660, 672 (8th Cir. 1996) (citing United States v. Williams, 95 F.3d 723, 731 (8th Cir. 1996)).
23. United States v. Walls, 577 F.2d 690, 696-97 (9th Cir. 1978) (citing United States v. Moore, 522 F.2d 1068, 1079 (9th Cir. 1975)).
24. 977 F.2d 1323, 1326-27 (9th Cir. 1992).
25. *Id.*
26. *Id.*
27. 75 F.3d 470, 477-79 (9th Cir. 1996).
28. *Id.* at 473.
29. *Id.* at 474.
30. *Id.* at 477-79.

tion to them.[31] Specifically citing Federal Rule of Evidence 404(b), the court upheld the admission of this evidence.[32]

Admitting evidence from data mining is no different than admitting the evidence of improper billing from *Erikson*. In *Erikson*, the prior acts were found by human beings.[33] Data mining uses patterns to find the prior acts. Federal Rule of Evidence 404(b) makes no provision for treating prior acts found by humans any differently than prior acts found by computer using data mining.[34]

2. *Under the Common Law*

This section of the article will discuss the question under the common law. Since most states have adopted some version of Federal Rule of Evidence 404(b), the focus will be on the major states that have not adopted it: Illinois, Massachusetts, and New York; however, a pre-rules case from another jurisdiction will be used for illustrative purposes.

The common law bars prior acts evidence admitted to show propensity.[35] They are admissible for any other purpose,[36] including showing the defendant's guilty knowledge[37] or intent.[38] Proving fraud requires proving intent, so prior acts are relevant to show that a practitioner did not simply make a mistake in billing, but to show he truly had the requisite intent when he improperly billed.

The law recognizes that prior acts are probative as to intent[39] and is a reason to admit prior acts.[40] The New York Court of Appeals stated: "[E]vidence of uncharged crimes or acts may be admissible to show, inter alia, the defendant's intent to commit the crime charged."[41]

---

31. *Id.* at 478.
32. *Erickson*, 75 F.3d at 478.
33. *Id.* at 477.
34. *See* FED R. EVID. 404(b).
35. Illinois v. Gilliam, 670 N.E.2d 606, 620 (Ill. 1997) (citing Illinois v. Stewart, 473 N.E.2d 840, 859 (Ill. 1984)).
36. Massachusetts v. Garrey, 765 N.E.2d 725, 736 (Mass. 2002) (citing Massachusetts v. Martino, 588 N.E.2d 651, 659 (Mass. 1992)).
37. New York v. Alvino, 519 N.E.2d 808, 812 (N.Y. 1987) (citing New York v. Molineux, 61 N.E. 286, 294 (N.Y. 1901)).
38. Massachusetts v. Gollman, 762 N.E.2d 847, 850 (Mass. 2002) (citing Massachusetts v. Helfant, 496 N.E.2d 433, 441 (Mass. 1986)).
39. *Id.* (citing *Helfant*, 496 N.E.2d at 441).
40. *Helfant*, 496 N.E.2d at 441 (citing Massachusetts v. Schoening, 396 N.E.2d 1004, 1009 (Mass. 1979)).
41. People v. Lynch, 63 A.D.3d 959, 2009 WL 1694124, at *1 (N.Y. App. Div. June 16, 2009) (citing *Alvino*, 519 N.E.2d at 812).

The rationale of this rule was explained long ago in *People v. Dolan*.[42] In that case, the defendant was charged with the uttering of forged notes.[43] As part of its case-in-chief the prosecution showed that the defendant had uttered other forged notes.[44] The court explained its reasoning by citing and analyzing their earlier decisions in *People v. Sharp*[45] and *People v. Everhardt*.[46] The appellate court began with a discussion of *Everhardt*.[47] The court observed that a defendant's knowledge of the forgery was a necessary element of the crime of uttering.[48] The court then stated that the purpose for showing other forgeries was to show the defendant's intent.[49] The *Dolan* court explained the rationale by citing *People v. Sharp*.[50] The court explained:

> "A man might think" said Judge Peckham in *People v. Sharp*, "the money he passed was good, and he might be mistaken once or even twice; but the presumption of mistake lessens with every repetition of the act of passing money really counterfeit." The latter observation very tersely states a rule that is applicable to prosecutions for forgery as to cases of passing counterfeit money.[51]

Even before this case had been decided, courts had extended the *Everhardt* rationale to cases of larceny by false pretenses.[52]

This principle was applied by the New York Court of Appeals in *People v. Marrin*.[53] In that case, the commissioner of deeds was convicted of acknowledging a deed with the name James Cahill, a nonexistent person,[54] as part of a land transaction.[55] The prosecution was allowed to show that he had forged other deeds with that name to prove that he did not mistakenly and innocently endorse the deed for another claiming to be James Cahill.[56] This demonstrated that the defendant was the one who had swin-

---

42. 78 N.E. 569 (N.Y. 1906).
43. *Id.*
44. *Id.*
45. People v. Sharp, 14 N.E. 319 (N.Y. 1887).
46. People v. Everhardt, 11 N.E. 62 (N.Y. 1887).
47. *Dolan*, 78 N.E. at 570 (citing *Everhardt*, 11 N.E. at 62).
48. *Id.*
49. *Id.*
50. *See id.* at 570.
51. *Id.* (citing *Sharp*, 14 N.E. 319, 343-44 (Peckham, J., concurring)) (citation omitted).
52. Mayer v. People, 80 N.Y. 364, 373-74 n.a1 (N.Y. 1880).
53. 98 N.E. 474 (N.Y. 1912).
54. *Id.* at 475.
55. *Id.*
56. *Id.*

dled the victim.[57] This ruling is still good law; it was recently cited by the court of appeals in a discussion about propensity evidence.[58]

Currently, courts applying common law continue to apply this principle. For example, in *Commonwealth v. Imbruglia*, the defendant was accused of trafficking in counterfeit bonds and currency.[59] Previous instances where the defendant had sold counterfeit bonds and currency were admissible to show he intended to sell counterfeit bonds and currency.[60] In *People v. Illgen*, the Illinois Supreme Court upheld the admission of prior instances of abuse by the defendant against the victim.[61] In that case, the defendant was accused of murdering his wife.[62] In his defense, the accused maintained that the shooting was accidental.[63] The prior instances of abuse were used to show that the defendant had the requisite intent to murder his wife.[64]

Prior acts have long been used to show a physician's criminal intent. In *State v. Raub*,[65] the defendant stood accused of illegally prescribing whiskey.[66] The state introduced evidence showing that he had prescribed whiskey to fifty-six other patients.[67] The Washington Supreme Court held that the number of prescriptions written was admissible to show that the doctor had not written those prescriptions in good faith.[68] The court held:

> But the gravemen [sic] of the offense is not in the doing of the deed, but in the faith in which it was done. The rule seems to have grown out of the necessities of the statute, for the act itself is presumptively a lawful act sanctioned by statute. It is rendered unlawful, when and only when, the writer of the prescription abuses the confidence that is reposed in him and by the injection of the subtle quality of bad faith thwarts the police power of the state. From the nature of things, good or bad faith can only be proved by resort to circumstances and sidelights. If it were otherwise—if the mere giving of a prescription or a number of

57. *Id.*
58. People v. Rojas, 760 N.E.2d 1265, 1267 (N.Y. 2001).
59. 387 N.E.2d 559, 561 (Mass. 1979).
60. *Id.* at 566.
61. 583 N.E.2d 515, 522 (Ill. 1991).
62. *Id.* at 518.
63. *Id.*
64. *Id.* at 522.
65. 173 P. 1094 (Wash. 1918). *Raub* was decided before Washington adopted its Rules of Evidence. *See id.*
66. *Id.* at 1095. Prescribing whiskey for non-medical purposes was, at that time, illegal. *See id.* at 1094-95.
67. *Id.* at 1094.
68. *Id.* at 1095.

> prescriptions by a licensed physician would bar further inquiry—the law would be emasculated of its purpose. It is not going beyond the range of judicial vision to say that liquor has not always been regarded as a cure-all or touchstone of health, but that it has grown in popular favor as a remedy as the chance of procuring it has grown remote; and, although a physician who prescribes it may be imposed upon at times, a general dispensation of the remedy at or about the time charged is sufficient to put him to the defense of his good intention before a jury of his countrymen. [69]

The court in *Raub* identified long ago the problems with prosecuting doctors: often times an individual act by a doctor is not obviously illegal. However, the repetition or the pattern of acts show the liability. The *Raub* court recognized this and allowed in the doctor's prior acts.[70]

3. *Conclusion*

Using the prior acts of a physician to prove his criminal liability is not novel. It is admissible under the Federal Rules of Evidence and the common law. It also has deep roots in the common law. Data mining is simply a new way to find, analyze, and interpret a physician's prior acts. The next section of this article will discuss whether it is appropriate for an expert witness to testify about what data mining says about those prior acts.

B. QUESTION 2: IS TESTIMONY BASED ON DATA MINING PROPER EXPERT TESTIMONY?

This article will now discuss whether testimony concerning data-mined evidence is proper expert testimony. This article will consider that question under both the Federal Rules of Evidence and common law.

1. *Under the Federal Rules*

There are three main issues to be dealt with concerning whether data-mined evidence is proper expert testimony under the Federal Rules of Evidence. The first is whether the subject is one about which expert testimony may be heard. The second is whether expert testimony may be heard on intent. The last issue is the effect Federal Rule of Evidence 704(b) has on testimony about intent.

---

69. *Id.*
70. *Raub*, 173 P. at 1094.

The first issue is governed by the first part of Federal Rule of Evidence 702 stating: "If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert . . . may testify thereto . . . ."[71] This standard allows for the exclusion of expert testimony only when a trier of fact would be as able to understand an issue as well as an expert.[72] Expert testimony brings specialized knowledge to an issue, helping the trier of fact to understand it.[73]

Medical billing is a highly complex and technical field.[74] No typical trier of fact has an understanding of the complex regulations governing billing, particularly Medicare billing.[75] The Sixth Circuit held that portions of testimony of Medicare auditors concerning descriptions of Medicare rules and regulations and background information on Medicare[76] should not have been allowed as lay testimony.[77]

The second issue concerns whether expert testimony on intent is proper. This answer too is governed by Federal Rule of Evidence 702. The applicable section of that rule states expert testimony is proper if it "will assist the trier of fact . . . to determine a fact in issue."[78] Courts have held that this allows fact finders to draw inferences of intent from expert testimony.[79] In *United States v. Doe,* an expert was allowed to testify about the practices of drug couriers, so that the jury could infer that the defendants had the requisite intent.[80]

In *United States v. Dotson*, a tax evasion case, the court held that expert testimony concerning the defendant's actions was proper.[81] The expert was allowed to testify that the defendant's actions were consistent with tax evasion.[82] In *United States v. Brawner*, experts were allowed to testify that a defendant's actions were consistent with telemarketing fraud.[83] The expert

71. FED. R. EVID. 702.

72. Corneveaux v. CUNA Mut. Ins. Group, 76 F.3d 1498, 1505 (10th Cir. 1996) (citing United States v. Rice, 52 F.3d 843, 847 (10th Cir. 1995)).

73. United States v. Conn, 297 F.3d 548, 554 (7th Cir. 2002) (citing United States v. Peoples, 250 F.3d 630, 641 (8th Cir. 2001)).

74. *See* United States v. White, 492 F.3d 380, 401 (6th Cir. 2007).

75. *Id.* at 403-04 (citing United States v. Strange, 23 F. App'x 715, 717 (9th Cir. 2001)).

76. *Id.* at 404.

77. *Id.*

78. FED. R. EVID. 702.

79. United States v. Dunn, 846 F.2d 761, 762-63 (D.C. Cir. 1988).

80. 149 F.3d 634, 637 (7th Cir. 1998).

81. 817 F.2d 1127, 1131-32 (5th Cir. 1987).

82. *Id.* at 1132.

83. 173 F.3d 966, 970 (6th Cir. 1999).

explained the telemarketing fraud to the jury.[84] The court held that the average juror was unfamiliar with telemarketing fraud.[85]

In *City of Tuscaloosa v. Harcros Chemicals, Inc.*, an anti-trust case, the court allowed expert testimony based on statistics.[86] The defendants were accused of conspiring to fix the prices of chlorine in Alabama.[87] The expert statistically analyzed events occurring in the Alabama chlorine market.[88] He was allowed to testify about his statistical analysis of the Alabama chlorine market so that the trier of fact could better understand what was happening.[89]

In *Shad v. Dean Witter Reynolds, Inc*, the defendants were accused of churning—the excessive trading of brokerage accounts by the broker so that he may reap profits by earning commissions.[90] The plaintiff's expert proposed to testify that churning occurred.[91] He had examined the records of the plaintiff's accounts.[92] He identified patterns of trading that indicated that churning occurred.[93] The Ninth Circuit held that this testimony was proper under Federal Rule of Evidence 702, and that the trial court had improperly excluded it.[94]

Courts have also held that computer-generated analysis[95] and statistical analysis[96] are proper bases for expert testimony concerning intent. Courts have also held expert testimony explaining fraud is proper. Expert testimony based on data mining is no different than the expert testimony in *Shad* and *Tuscaloosa* in that the analysis is done by computer rather than by a statistician. Like the expert testimony in those cases, data mining looks for abnormal patterns.[97] Computer analysis is also accepted by the courts.[98] Viewing these cases together, there is no reason why expert testimony based on data mining should be excluded by the courts.

---

84. *Id.* at 968-69.
85. *Id.*
86. 158 F.3d 548, 563-64 (11th Cir. 1998).
87. *Id.* at 554.
88. *Id.* at 563.
89. *Id.* at 565-66.
90. 799 F.2d 525, 530 (9th Cir. 1986).
91. *Id.* at 528.
92. *Id.*
93. *Id.*
94. *Id.* at 529-30.
95. *See, e.g.*, McReynolds v. Sodexho Marriott Serv., Inc., 349 F. Supp. 2d 30, 36 (D.C. Cir. 2004).
96. *See, e.g.*, Schanzer v. United Tech. Corp., 120 F. Supp. 2d 200, 206-07 (D. Conn. 2000).
97. Hyle, *supra* note 7, at 22, 24.
98. *See, e.g.*, *McReynolds*, 349 F. Supp. 2d at 36.

Data-mined evidence satisfies Federal Rule of Evidence 702. This article will now consider whether Federal Rule of Evidence 704(b) bars this type of testimony. Rule 704(b) states:

> No expert witness testifying with respect to the mental state or condition of a defendant in a criminal case may state an opinion or inference as to whether the defendant did or did not have the mental state or condition constituting an element of the crime charged or of a defense thereto. Such ultimate issues are matters for the trier of fact alone.[99]

There is a circuit split as to what extent this rule applies to expert testimony concerning intent. Some circuits have held that this rule only bars mental health experts from testifying as to intent.[100] Other circuits have held that this rule bars all experts from giving an opinion concerning the defendant's mental state.[101] This article will first discuss the rule in circuits that only bar mental health experts from testifying as to intent; it will then discuss the second view.

The Seventh Circuit has said the key difference between mental health experts and other experts is that mental health experts base their opinions on "special personal knowledge."[102] Law enforcement officers have been allowed to testify that the presence of a gun indicates that the defendant intended to deal drugs.[103] The data-mining experts are like the police experts—they testify that the patterns indicate that the defendant doctor intended to defraud the government, just as police experts testify that the presence of the gun indicates an intent to deal drugs.

Even in the more restrictive circuits, Federal Rule of Evidence 704(b) does not bar all expert testimony relevant to intent.[104] In those circuits experts may testify, but they may not draw the ultimate inference.[105] In *United States v. Morales*, the Ninth Circuit held that a defendant, charged with willfully making false entries, should have been allowed to call an expert to testify to her weak grasp of bookkeeping principles.[106] In another case, a DEA agent was allowed to testify that the amount of cocaine possessed indicated intent to distribute.[107]

---

99. FED. R. EVID. 704(b).
100. United States v. Morales, 108 F.3d 1031, 1036 (9th Cir. 1997).
101. *Id.*
102. United States v. Blount, 502 F.3d 674, 679 (7th Cir. 2007) (citing United States v. Lipscomb, 14 F.3d 1236, 1242 (7th Cir. 1994)).
103. *Blount*, 502 F.3d at 679.
104. *Morales*, 108 F.3d at 1037.
105. *Id.* at 1038.
106. *Id.*
107. *Id.* (citing United States v. Gomez-Norena, 908 F.2d 497, 502 (9th Cir. 1990)).

The data-mining experts are doing nothing more than what the experts in *Morales* and *Gomez-Norena* were allowed to do. Like the bookkeeping expert, they are not testifying as to what the defendant thought; they are merely providing information to assist the trier of fact in inferring intent.

2. *Under the Common Law*

This article will now discuss whether expert testimony based on data mining is proper under the common law. Expert testimony under the common law is permitted if the subject is one about which expert testimony may be heard and is relevant.[108] This article will first consider whether the subject matter is one on which expert testimony may be heard. Then it will consider if it is relevant, and if so, whether it may heard without violating the prohibition on testimony on an ultimate issue. Finally, it will consider whether an expert may base his or her testimony on the type of mathematical analysis that underlies data mining.

Two standards determine whether the subject is one in which expert testimony may be heard. Some common law courts have adopted the assist-the-trier-of-fact-standard of the federal rules rather than the traditional necessary-to-assist-the-trier-of-fact-standard.[109] The testimony gleaned from data mining is admissible under both these standards.

Under the more restrictive standard, a police officer was allowed to testify, as an expert, that circumstances indicated that seized drugs were not for personal use.[110] Under the more liberal standard, a police officer was allowed to testify as an expert about street gang culture.[111]

In *Noah v. Bowery Savings Bank*, a venerable case decided under the more restrictive standard, the court explained how these principles are applicable to data mining.[112] That case concerned the deposit of a forged money order.[113] The court held that it was permissible to call, and that the plaintiff should have called, an expert witness concerning the bank's procedures for dealing with potentially forged money orders,[114] because the procedures for dealing with forgeries were beyond the knowledge of a juror.[115]

---

108. *See* Commonwealth v. Lloyd, 702 N.E.2d 395, 397 (Mass. App. Ct. 1998); *see also* People v. Loera, 619 N.E.2d 1300, 1311-12 (Ill. App. Ct. 1993).

109. *See* People v. Enis, 564 N.E.2d 1155, 1164 (Ill. 1990) (citing People v. Jordan, 469 N.E.2d 569, 576 (Ill. 1984)).

110. *See* Commonwealth v. Gollman, 762 N.E.2d 847, 851-52 (Mass. 2002).

111. *See Loera*, 619 N.E.2d at 1311-12.

112. 122 N.E. 235 (N.Y. 1919).

113. *Id.* at 235.

114. *Id.* at 236-37.

115. *Id.* at 237.

The procedures concerning medical billing are complicated.[116] They are at least as complicated as a bank's procedures for validating a money order. They are at least as unfamiliar to a trier of fact as gang culture or drug dealing. If a police officer's testimony about gang culture would be helpful to the jury, then expert testimony about a complex field like medical billing would be helpful as well. If a police officer's testimony about circumstances surrounding drug dealing was necessary to assist the trier of fact, then an expert's testimony about the circumstances surrounding fraudulent medical billing would also be necessary to assist a trier of fact. If, under the more restrictive common law standard, an expert would be allowed to testify about bank procedures or drug dealing, and, under the more liberal standard, to testify about gang culture, an expert should be allowed to testify about medical billing under both the more restrictive standard and the more liberal standard.

The next question considered is whether expert testimony on intent is relevant under the common law. The rule, as stated by the New York Court of Appeals, is that expert testimony is admissible if it is relevant to the facts of the case.[117] Relevant evidence is evidence that touches upon a matter at issue and helps the finder of fact ascertain the truth of the matter.[118] As discussed above, data mining helps the finder of fact determine the doctor's state of mind.

In *People v. Polanco*, the New York Appellate Division allowed an expert to testify that guns and drug paraphernalia in an apartment showed that the apartment was a stash house.[119] This was held to be relevant to the question of the defendant's intent.[120] In *People v. Free*, an Illinois case, a psychologist testified that PCP would not prevent a defendant from forming the intent to kill.[121]

Evidence derived from data mining is relevant. The data-mining expert is doing what the experts in *Polanco* and *Free* did. The data-mining expert is using his expertise to provide information that the jury can use to infer intent. This rule is limited by the ultimate issue prohibition.

Experts have been traditionally barred from giving their opinion on an ultimate issue.[122] This section of the article will discuss to what extent that

116. *Cf.* United States v. White, 492 F.3d 380, 391-92 (6th Cir. 2007) (citing United States v. Strange, 23 F. App'x 715, 717 (9th Cir. 2001)).

117. *See* People v. Allweiss, 396 N.E.2d 735, 740 (N.Y. 1979) (citing Dougherty v. Milliken, 57 N.E. 757, 759 (N.Y. 1900)).

118. *See* Porter v. Valentine, 41 N.Y.S. 507, 508 (N.Y. App. Term 1896) (citing Platner v. Platner, 78 N.Y. 90 (1879)).

119. 856 N.Y.S.2d 601, 602-03 (N.Y. App. Div. 2008).

120. *Id.*

121. 447 N.E.2d 218, 233 (Ill. 1983).

122. *See, e.g.*, Commonwealth v. Mendrala, 480 N.E.2d 1039, 1042 (Mass. App. Ct. 1985).

rule exists today, and how it would affect the testimony of an expert in data mining.

An expert cannot give an opinion as to a defendant's guilt or innocence.[123] An expert's testimony, however, can touch on the ultimate issue.[124] In *Commonwealth v. Tanner*, the Massachusetts Court of Appeals discussed exactly what this distinction means.[125] It held that expert testimony must be "explanatory,"[126] not conclusory.[127] Explanatory evidence helps the trier or triers of fact interpret evidence that they would normally be unable to interpret.[128] In *Tanner*, the court held that a police officer's expert testimony that the defendant engaged in a drug transaction was improper because it was too conclusory and thus impinged on the fact finding role of the jury.[129]

This rule does not bar all testimony by an expert interpreting a defendant's acts. In *People v. Ingram*, the New York Supreme Court, Appellate Division, stated that an expert could testify that certain acts and circumstances were consistent with the sale of drugs, without running afoul of the ultimate issue rule.[130]

The testimony of data-mining experts concerning their findings is clearly explanatory. The process of medical billing is incredibly complicated.[131] It is beyond the ability of a lay juror to understand.[132] The data mining experts are explaining how the patterns of billing are consistent with healthcare fraud. The expert testimony helps the trier of fact interpret the complex billing records. They are like the experts in *Polanco* and *Free*, whose testimony is used to explain complex circumstances so that the trier of fact may infer intent.

Next, this article turns to whether an expert may testify to the probability of something. Data mining is analysis of probabilities—it finds unusual billing patterns. There is a paucity of state decisions concerning this. Courts have held that an expert may testify as to probabilities if his underlying

---

123. *See* Commonwealth v. Tanner, 700 N.E.2d 282, 285-86 (Mass. App. Ct. 1998) (citing Commonwealth v. Colin C., 643 N.E.2d 19, 22-23 (Mass. 1994); Commonwealth v. Cordero, 614 N.E.2d 1000, 1000 (Mass. App. Ct. 1993); Commonwealth v. Pikul, 511 N.E.2d 336, 339-40 (Mass. 1987)).

124. *See Mendrala*, 480 N.E.2d at 1042.

125. 700 N.E.2d 282 (Mass. App. Ct. 1998).

126. *Id.* at 286-87.

127. *Id.* at 286.

128. *Id.* (citing *Colin C.*, 643 N.E.2d at 22-23; *Cordero*, 614 N.E.2d at 1000-01; Commonwealth v. Munera, 578 N.E.2d 418, 421-22 (Mass. App. Ct. 1991)).

129. *Id.* at 287.

130. 770 N.Y.S.2d 294, 296 (N.Y. App. Div. 2003) (citing Matott v. Ward, 48 N.Y.2d 455, 459 (N.Y. 1979)).

131. *See* United States v. White, 492 F.3d 380, 403-04 (6th Cir. 2007).

132. *See id.*

methodology is valid.[133] Courts have therefore held, at least implicitly, that an expert testimony based on statistics is proper.

In *People v. Miller*, the Illinois Supreme Court allowed an expert to testify to results of a DNA analysis based on statistics.[134] The court overruled an earlier case prohibiting the use of this type of analysis, because the court found that the methodology had gained general acceptance and thus satisfied Illinois' rule on determining whether a methodology is valid.[135] In *People v. Wesley*, the New York Court of Appeals allowed the introduction of DNA evidence in that state[136] remarking that the underlying probability analysis had been generally accepted as valid.[137]

DNA typing relies upon a computer to analyze the results.[138] Although courts have not specifically ruled that an expert may use a computer to conduct a statistical analysis, they have implicitly allowed this by allowing DNA evidence.

An expert testifying about data mining is similar to the experts in *Miller* and *Wesley*. DNA analysis consists of comparing patterns of DNA from two samples to determine if they match.[139] A healthcare data-mining expert is comparing the patterns of billing by a provider to other patterns to find unusual patterns. Both are using a valid underlying methodology to obtain results which are then explained to the jury. Like the DNA testimony above, the results of data mining should be admissible.

3. *Conclusion*

Expert testimony based on data mining is admissible under both the Federal Rules of Evidence and common law. Testimony on the complicated subject would assist the trier of fact. An expert may give testimony relevant to intent without violating Rule 704(b) of the Federal Rules of Evidence. An expert may base his testimony on computer and statistical analysis.

Under the common law, medical billing is complicated enough so that expert testimony may be heard on it. The evidence is relevant because intent of a provider is a fact in issue, and the expert is providing information from which the trier of fact may infer intent. An expert may base his testi-

133. People v. Miller, 670 N.E.2d 721, 731 (Ill. 1996), *abrogated by In re* Commitment of Simmons, 821 N.E.2d 1184, 1190 (Ill. 2004).

134. *Id.*

135. *Id.* (regarding use of material outside the record to determine if *Frye* standard was met).

136. 83 N.Y.2d 417 (N.Y. 1994).

137. *Id.*

138. *Miller*, 670 N.E.2d at 730.

139. *Wesley*, 83 N.Y.2d at 441-42.

mony on statistical analysis if the underlying methodology is valid. This article now turns to an analysis of the underlying methodology.

C. QUESTION 3: DOES THE METHODOLOGY OF DATA MINING SATISFY THE *DAUBERT* OR *FRYE* STANDARD?

This section discusses whether or not data mining is an appropriate basis for expert testimony. There are two major standards for determining whether an expert's underlying methodology is valid: *Frye* and *Daubert.* First, this article will discuss whether data mining is a proper basis under the *Daubert* standard; then this article will discuss whether it is a proper basis under the *Frye* standard.

1. The Daubert *Standard*

The admissibility of expert testimony in the federal system is governed by Federal Rule of Evidence 702. In *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, the Supreme Court held that this rule established a gate keeper function for the courts.[140] The courts were charged with determining whether an expert's testimony was reliable.[141] Courts have set out many factors for determining reliability.[142] In *Kumho Tire Co. v. Carmichael*, the Su-

---

140. 509 U.S. 579, 589 (1993).

141. *Id.*

142. FED. R. EVID. 702 (advisory committee's note). The committee's note lists five factors:

> (1) whether the expert's technique or theory can be or has been tested—that is, whether the expert's theory can be challenged in some objective sense, or whether it is instead simply a subjective, conclusory approach that cannot reasonably be assessed for reliability; (2) whether the technique or theory has been subject to peer review and publication; (3) the known or potential rate of error of the technique or theory when applied; (4) the existence and maintenance of standards and controls; and (5) whether the technique or theory has been generally accepted in the scientific community.

Id. The note then lists five more factors: (1) whether the opinion grows from independent research or was developed for the purposes of litigation, (2) whether the expert has unjustifiably extrapolated from an accepted premise to an unjustified conclusion, (3) whether the expert has adequately accounted for alternative explanations, (4) whether the expert has exercised the care appropriate to professional work, and (5) whether the field is known to reach reliable results in the area of the proposed testimony. *Id.* Other factors in addition to those in the advisory committee note are (1) nonjudical uses and experience with the process or technique, (2) its novelty and relationship to other methods of analysis, (3) the qualifications and professional stature of the expert witness, (4) the types of error experienced, whether likely to favor the offering or understate what he seeks to prove, and (5) the existence of a body of professional literature appraising the process or technique which tends to insure widespread attention or critical scrutiny. *Id.*; *see also* United States v. Downing, 753 F.2d 1224, 1237-42 (3d Cir. 1985).

preme Court found that this rule applied to all expert testimony, not only testimony based on scientific experiments.[143] In *Anderson v. Westinghouse Savannah River Co.*, the Fourth Circuit applied the *Daubert* standard via *Kumho* to statistical techniques.[144]

Courts have flexibility in determining how to apply the *Daubert* standard.[145] In *United States v. Conn*, the Seventh Circuit explained this by saying that "the measure of intellectual rigor will vary by the field of expertise and the way of demonstrating expertise will vary."[146] This means that the courts can pick and choose which factors to use in determining the reliability of an expert's methodology.[147] In cases involving statistical evidence, not all *Daubert* factors are relevant.[148] This article will now discuss those factors most relevant to the analysis of data mining. The general acceptance factor will be discussed in the next section concerning the *Frye* standard.

The first factor to be considered is non-judicial use. Methodologies that have uses outside litigation are considered more reliable.[149] The Sixth Circuit has stated that "[w]e have been suspicious of methodologies created for the purpose of litigation, because 'expert witnesses are not always unbiased scientists.'"[150] In that case, the court rejected an expert's methodology for determining whether the designs of toy trains had been copied because it was created for the case at bar.[151]

In *United States v. Ewell*, a district court allowed a new type of DNA test to be used.[152] One of the factors in the decision was that the test was used outside the judicial context.[153]

Data mining is more like the DNA test than the design comparison in *Mike's Train House, Inc. v. Lionel, L.L.C.*[154] Data mining has been used extensively outside the judicial context by the banking and insurance industries to detect fraud.[155] Fifty-two percent of Fortune 1000 companies use

143. 526 U.S. 137, 141 (1999).

144. 406 F.3d 248, 262-63 (4th Cir. 2005).

145. Mukhtar v. Cal. State Univ., Hayward, 299 F.3d 1053, 1064 (9th Cir. 2002) (citing United States v. Hankey, 203 F.3d 1160, 1167 (9th Cir. 2000)).

146. 297 F.3d 548, 556 (7th Cir. 2002) (citing Tyus v. Urban Search Mgmt., 102 F.3d 256, 263 (7th Cir. 1996)).

147. Chapman v. Maytag Corp., 297 F.3d 682, 687 (7th Cir. 2002) (citing United States v. Vitek Supply Corp., 144 F.3d 476, 485 (7th Cir. 1998)).

148. City of Tuscaloosa v. Harcros Chems. Inc., 158 F.3d 548, 563 n.16 (11th Cir. 1998) (citing Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 593-94 (1993)).

149. Mike's Train House, Inc. v. Lionel, L.L.C., 472 F.3d 398, 408 (6th Cir. 2006) (citing Turpin v. Merrell Dow Pharm., Inc., 959 F.2d 1349, 1352 (6th Cir. 1992)).

150. *Mike's Train House, Inc.*, 472 F.3d at 408 (quoting *Turpin*, 959 F.2d at 1352).

151. *Id.*

152. United States v. Ewell, 252 F. Supp. 2d 104, 115 (D.N.J. 2003).

153. *Id.*

154. *See* 472 F.3d at 403-13.

155. Seifert, *supra* note 3, at 463.

data mining for one purpose or another,[156] including Amazon, to detect fraud.[157] Data mining used to combat healthcare fraud uses the same techniques as these industries.[158] Doctors themselves use data mining to analyze clinical information.[159] Like the DNA technique, data mining has been used extensively outside the courtroom and thus satisfies the non-judicial criteria of *Daubert*.

The next *Daubert* factor to be considered is testing. Whether a theory has been tested is one of the most important factors to be considered in a *Daubert* analysis[160] because testing is what creates scientific knowledge.[161] The testing separates science from speculation.[162] In *Chapman v. Maytag*, the Seventh Circuit did not allow an expert's testimony[163] theorizing that a malfunctioning appliance caused a power surge that killed the victim[164] because he never tested his theory.[165]

Data mining to detect healthcare fraud has been tested. Researchers tested data mining with a real world data set from Taiwan.[166] They used data from National Health Insurance in Taiwan.[167] Their results showed that data mining is an effective fraud detection technique.[168]

Unlike the techniques discussed above, which were disallowed because they were untested, data mining to detect healthcare fraud has been tested. It thus satisfies the testing requirement of *Daubert*.

The next factor considered is peer review. Courts consider peer review to determine if a technique is "good science."[169] A lack of peer review is

---

156. Amir Hormozi & Stacy Giles, *Data Mining: A Competitive Weapon for Banking and Retail Industries*, INFO. SYS. MGMT. 62, 62 (2004).

157. Dearne, *supra* note 14, at 43.

158. Appleby, *supra* note 1, at 1B.

159. Tom Mitchell, *Machine Learning and Data Mining: Machine Learning Algorithms Enable Discovery of Important "Regularities" in Large Data Sets*, COMM. ACM, Nov. 1999, at 31-32.

160. Chapman v. Maytag Corp., 297 F.3d 682, 688 (7th Cir. 2002) (citing Bradley v. Brown, 42 F.3d 434, 438 (7th Cir. 1994)).

161. *Id.* at 688 (citing *Bradley*, 42 F.3d at 438).

162. Bickel v. Pfizer, Inc., 431 F. Supp. 2d 918, 922 (N.D. Ind. 2006).

163. 297 F.3d at 688.

164. *Id.* at 686.

165. *Id.* at 688.

166. Wan-Shiou Yang & San-Yih Hwang, *A Process-Mining Framework for the Detection of Healthcare Fraud and Abuse*, 31 EXPERT SYS. WITH APPLICATIONS 56, 67 (2006).

167. *Id.*

168. *Id.*

169. Nelson v. Tenn. Gas Pipeline Co., 243 F.3d 244, 251 (6th Cir. 2001) (citing Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579, 594 (1993)).

considered to indicate poor science.[170] Courts have not hesitated to exclude techniques that have not been peer reviewed.[171]

Conversely, peer review has been mentioned as a reason to allow expert testimony.[172] The D.C. Circuit allowed the ion mobility technique of determining if a substance is cocaine after the FBI chemist testified that many papers had been written about it.[173]

In *Quiet Tech DC-8 v. Hurel-Dubois UK*, the Court of Appeals for the Eleventh Circuit considered the technique of computer modeling of jet engines.[174] The plaintiff in that case argued that the defendant had failed to design a jet engine to specifications.[175] The court allowed the computer modeling technique because it had been evaluated in peer reviewed journals.[176]

Like the computer modeling technique, data mining, as mentioned above, has been evaluated in peer reviewed journals.[177] It thus satisfies that *Daubert* criteria.

Independent research is another *Daubert* factor, as it shows reliability.[178] Courts view research prepared for litigation dubiously.[179] As discussed above, data mining has been researched extensively outside the judicial context.

Novelty is the final *Daubert* factor discussed. Novelty may make a particular technique inadmissible.[180] In *Mike's Train House*, one of the reasons the court disallowed the expert's testimony was because no one else had used his technique of evaluating designs.[181] As discussed above, data mining is used extensively both to detect healthcare fraud and for other reasons. It is therefore not novel and thus satisfies this *Daubert* criterion.

---

170. *Id.*
171. Wilson v. Taser Int'l, Inc., 303 F. App'x 708, 714 (11th Cir. 2008).
172. United States v. Law, 528 F.3d 888, 912 (D.C. Cir. 2008) (citing Ambrosini v. Labarraque, 101 F.3d 129, 134 (D.C. Cir. 1996)).
173. *Id.* at 912.
174. 326 F.3d 1333, 1337 (11th Cir. 2003).
175. *Id.* at 1336.
176. *Id.* at 1343-44.
177. Yang & Hwang, *supra* note 166, at 67; *see also* Seifert, *supra* note 3, at 463.
178. Johnson v. Manitowoc Boom Trucks, 484 F.3d 426, 434 (6th Cir. 2007).
179. *Id.*
180. Mike's Train House, Inc. v. Lionel, L.L.C., 472 F.3d 398, 409 (6th Cir. 2006).
181. *Id.*

2. *The* Frye *Standard*

The older *Frye* standard is still used in many states to evaluate an expert's methodology.[182] Its standard also comprises part of the *Daubert* standard. This section of the article will apply the *Frye* standard to data mining to detect medical fraud.

The standard for admissibility under *Frye* is general acceptance within the scientific community.[183] The standard is meant to prevent unproven scientific techniques from being used in court.[184] *Frye* allows scientists, those most able to judge, the deciding voice in whether to admit evidence based on a scientific technique.[185]

Frye requires a consensus in the scientific community,[186] but it does not require all scientists to agree.[187] It is unclear what a consensus requires.[188] Some courts have said it requires a clear majority of members of that community to agree,[189] while others have held a significant minority would suffice.[190]

In *People v. Eyler*, the Illinois Supreme Court applied the *Frye* standard to a technique of taking fingerprints.[191] The state obtained fingerprints from a garbage bag containing the remains of the victim.[192] Those fingerprints were taken by the supergluing method,[193] a method used twenty-five percent of the time when taking fingerprints.[194] It had been used since 1981.[195] The FBI and police agencies in other countries used it.[196] The *Eyler* court held that this was sufficient to show that the technique was generally accepted and thus satisfied the requirements of *Frye*.[197]

---

182. CHRISTOPHER B. MUELLER & LAIRD C. KIRKPATRICK, EVIDENCE 652 (3d ed. 2003).

183. Frye v. United States, 293 F. 1013 (D.C. Cir. 1923).

184. People v. Marsh, 429 N.W.2d 615, 618 (Mich. Ct. App. 1989) (citing People v. Gonzales, 329 N.W.2d 743, 746 (Mich. 1982)).

185. People v. Leahy, 882 P.2d 321, 325 (Cal. 1994) (citing People v. Kelly, 549 P.2d 1240, 1244 (Cal. 1976)).

186. DeMeyer v. Advantage Auto, 797 N.Y.S.2d 743 (N.Y. Sup. Ct. 2005) (citing People v. Wesley, 633 N.E.2d 451, 463-64 (N.Y. 1994) (Kaye, C.J., concurring)).

187. *See Leahy*, 882 P.2d at 329-30.

188. State v. Alberico, 861 P.2d 192, 201-02 (N.M. 1993).

189. *Id.*

190. *Id.*

191. 549 N.E.2d 268, 283 (Ill. 1989).

192. *Id.*

193. *Id.* at 283-84.

194. *Id.* at 284.

195. *Id.*

196. *Eyler*, 549 N.E.2d at 284-85.

197. *Id.* at 286.

In determining whether a technique is generally accepted, courts look beyond case law.[198] Looking beyond the case law shows that data mining is like the supergluing technique. It has been generally accepted as reliable as it is used by thousands of institutions.[199] Fifty-two percent of Fortune 500 companies use some form of data mining.[200] It is used in retail credit card services and telecommunications.[201] It is used by those industries to detect fraud.[202] Well known companies like Amazon use it to detect fraud.[203]

Many techniques used by those companies are used to detect healthcare fraud.[204] The use of data mining to detect fraud in healthcare is widespread. It has been used by insurance companies to detect fraudulent billing.[205] Governments have used this system extensively to detect fraud. Those governments include Utah,[206] several counties in New York,[207] and Australia. [208] It is also used by the United Kingdom Insurance Fraud Bureau.[209]

Doctors themselves use data mining, although not to detect fraud; it is used to determine the effectiveness of medical treatments.[210]

Data mining is like the supergluing technique allowed by the court. Its extensive use shows its general acceptance in the scientific community by a majority, or at least a very significant minority, of scientists.

3. *Conclusion*

Data mining satisfies both the *Frye* and *Daubert* tests. It satisfies the relevant *Daubert* criteria for determining reliability. It has been tested and peer reviewed, for example. It satisfies the *Frye* test as well. Data mining has been generally accepted for detecting fraud both inside and outside the

198. People v. Wesley, 633 N.E.2d 451, 462 (N.Y. 1994) (Kaye, C.J., concurring).

199. Ann Milley, *Healthcare and Datamining*, HEALTH MGMT. TECH., Aug. 2000, at 44, 44.

200. Hormozi & Giles, *supra* note 156, at 62.

201. *Id.* at 66.

202. Seifert, *supra* note 3, at 463.

203. Dearne, *supra* note 14, at 43.

204. Appleby, *supra* note 1, at 1B.

205. Babcock & McGee, *supra* note 17, at 40.

206. Milley, *supra* note 199, at 45.

207. Phil Fairbanks, *New Weapon to Fight Medicaid Fraud: Computer Program Uncovers Illegal Practices by Local Health Care Providers*, BUFFALO NEWS, Sept. 8, 2005, at B1; *see also* James Goodman, *Monroe to Put Byte on Health Cheaters*, ROCHESTER DEMOCRAT & CHRON., Mar. 12, 2006, at B1.

208. Dearne, *supra* note 14, at 43.

209. Grant, *supra* note 18, at 133.

210. Lisa Sokol et al., *Precursory Steps to Mining HCFA Healthcare Claims*, 34 HAW. INT'L CONF. ON SYS. SCI., at 1 (2001).

medical arena. Many companies use it to detect fraud; many programs use it to detect healthcare fraud.

IV. CONCLUSION

The use of data mined evidence is clearly allowed under both the Federal Rules of Evidence and the common law. The use of past acts to prove intent is allowed under both. Medical billing is a subject on which expert testimony is proper due to its complexity. An expert may give evidence relevant to intent without falling afoul of FRE 704(b) or the common law ultimate issue prohibition. The methodology of data mining satisfies both the *Frye* and *Daubert* standards of admissibility.

In conclusion, an expert could testify that data mining indicated that a doctor had committed fraud. In essence, the expert is testifying about what the computer has inferred about the defendant's state of mind. The computer using data mining has read the doctor's mind and its conclusions are now being used against the doctor in court. Such testimony would be admissible in courts following either the Federal Rules of Evidence or common law.