Société de Calcul Mathématique SA
*(Mathematical Modelling Company, Corp.)*
*Tools for decision help*
*since 1995*

# Fight against Fraud

## *- Mathematical tools -*

A "fraud" is of course of juridical nature: a person may or may not have the rights to receive some document (such as a passport) or be entitled to some help (such as health, employment, and so on), or reimbursement (insurance). So, one might expect that all checking must be individual, and must concern the authenticity of all documents presented by the person. This topic, apparently, does not require any mathematics.

But this is not quite so; indeed, thousands of organizations and millions of persons are concerned, so one cannot check all demands individually. There is a clear need for automatic tools, which will characterize in a simple and robust manner all profiles which may result in frauds. Such tools rely on mathematics. The concerned profiles will then be checked more thoroughly.

These mathematical tools have a preliminary role: they allow a first, quick, treatment. They must be as efficient as possible: detect true frauds, but not too many false alarms (people who would be identified as fraudulent, though they are not). False alarms are a major concern in such a case.

Mathematical tools will allow two kinds of investigations:

– Self-coherence of all information given by the applicant

Here, we must check that all the information provided are coherent between themselves: one date should be after another, the various locations mentioned are compatible, and so on. For a car, the reimbursement after an accident should fall in predefined intervals, depending on the model, the age, and so on. In any application, the information provided cannot be "random".

– Coherence with other demands

Here, we must check that we did not receive hundreds of demands, all with the same name, coming from the same small village, or all with the same address, or all with the same data, whatever these data must be.

The search is made upon the existence of identical, replicate, fields in the databases; this is allowed by all the laws in all countries and does not carry any restriction to individual rights.

All these tools we just mentioned are purely deterministic: they consist in computer treatment, usually extractions from databases and comparisons of fields, according to several criteria. But they can be completed by probabilistic tools, which will allow to characterize "average profiles" of the persons who apply, on all the parameters one wants to consider (age, residence, place of birth, time of the year, and so on). One can then detect any person who differs too much from the average profile, according to a predefined threshold.

Qualifying deterministic tools is rather simple; things are harder with probabilistic tools if one wants them to be useful. Inside a given organization, such tools should not be constructed by the statisticians who are employed by the organization itself, for two main reasons:

– The usual statistics of the organization incorporate the fraud, which may be quite ancient.

– The statisticians who are employed by this organization see the present project as a criticism of their own work.

So, the fight against fraud must be done from the Chairman's authority, or by the Inspectors or Controllers, if they exist. Those who have done the work cannot be those who check it: this is an old piece of wisdom!

**Our achievements**

They also concern the search for “vulnerabilities” in systems; it's a logical approach: fraud results from a vulnerability that someone discovered.

- Analysis of vulnerabilities of a domestic network, for Thomson Multimedia and Canal + Technologies, 2002-2003.
- Exports of sensitive material. Délégation aux Affaires Stratégiques, French Ministry of Defense, 2002-2003.
- Making a list of university courses related to sensitive domains. Service des Recherches et Etudes Amont, DGA, French ministry of Defense, 2003-2004.
- The Naval Shield: protection of a vessel against a terrorist attack. Together with Thales Naval France, Thales Systèmes Aéroportés et TDA Armements, Service des Programmes Navals, DGA, French ministry of Defense, 2004-2009.
- Analysis of the vulnerabilities of an electronic archive system, for CDC-Arkhinéo, 2006.
- Analysis of the vulnerabilities in the confection of a biometric passport, Agence Nationale des Titres Sécurisés, 2008.
- 2013-2014, Monceau Assurances: Analysis of fraud situations using probabilistic techniques.
- 2016, Monceau Assurances: Study of the situations where the number of accidents looks too high.
- 2018, Monceau Assurances: Analysis of possible frauds in reimbursements after car accidents.
- SGBT, 2019: Analysis of data relating to a dispute and determination of causalities.