IVASS
ISTITUTO PER LA VIGILANZA SULLE ASSICURAZIONI

Global Insurance Fraud Summit 2020

Fighting frauds in the Italian MTPL market:

A public detection system

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1. Introduction

Insurance fraud is a worrisome and widespread phenomenon in many countries. Evidence shows that it creates losses for dozens of billions per year (CAIF, 2006, ABI, 2018, IE, 2013 and 2019)[1] with ultimate damage for consumers and citizens having to pay higher premiums for insurance coverage.

Italy is certainly no exception and since 2012 the Italian legislation has invested the Insurance Supervisory Authority (IVASS) with the mission of providing insurance companies with data and tools for a more effective struggle against frauds.

Motor Third Party Liability insurance (MTPL) is one of the most active areas of fraud and illegal behaviour, both in Italy and abroad.

2. The Italian MTPL market

In Italy, as of 2019, we had about 42 million insured vehicles (contracts), a claim frequency of 6%, 4400 euros (5120 $) of average claim, for a total of 10 billion euros (11.6 billion $), a loss ratio of 76%, and an expense ratio of 21%.

Intense activity is done by insurers and SIU (Special Investigation Units) to detect fraud attempts in the claim settlement phase, both in the form of false accidents and inflated bills.

Among the 2.5 million claims reported per year, about 22% are considered suspected cases and analyzed; 13% undergo further analysis and 2% are rejected. According to insurers' estimates provided in their annual fraud reports, 250 million euros (2% of premiums) are saved each year through the anti-fraud activity.

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[1] Coalition Against Insurance Fraud (2006), United we brand. Toward a national anti-fraud outreach campaign, available at https://www.insurancefraud.org/united-we-brand.htm

Association of British Insurers (2018), One scam every minute – ABI reveals the true extent of insurance fraud in the UK, available at https://www.abi.org.uk/news/news-articles/2018/08/one-scam-every-minute/

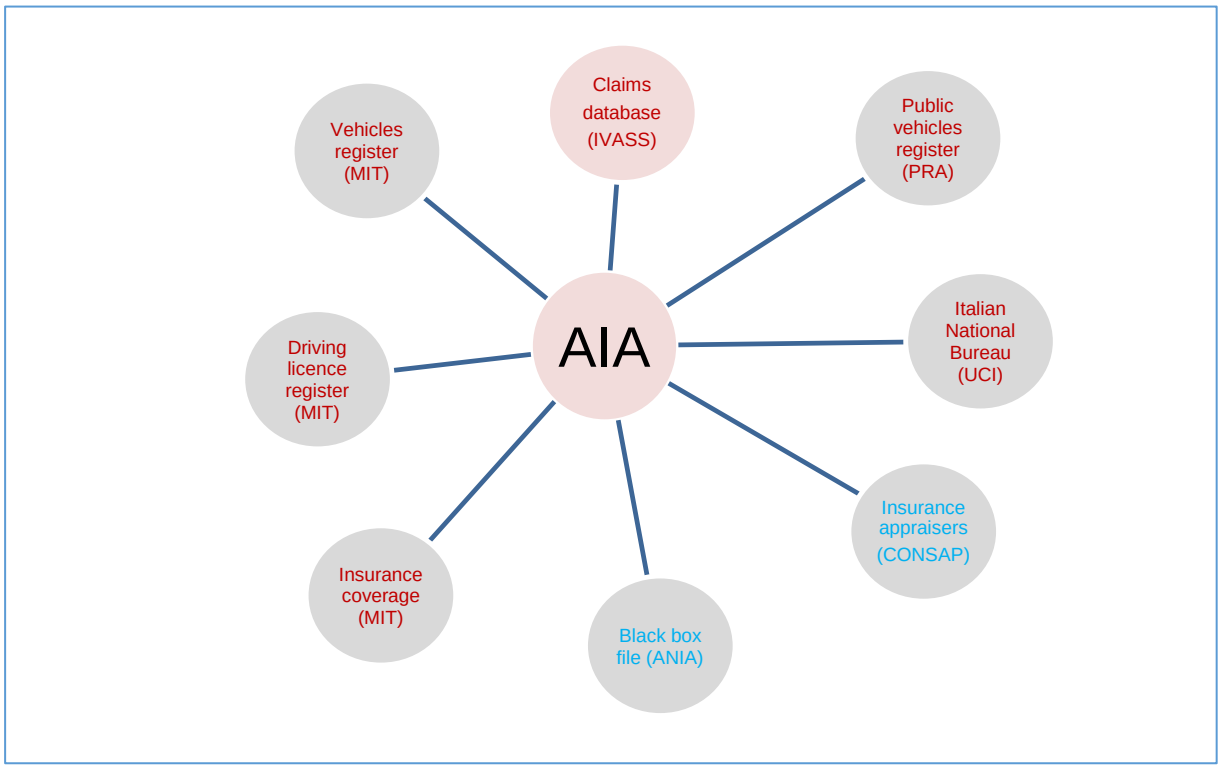
Insurance Europe (2013), The impact of insurance fraud, available at https://www.insuranceeurope.eu/impact-insurance-fraud

Insurance Europe (2019), Insurance fraud: not a victimless crime, available at https://www.insuranceeurope.eu/insurance-fraud-not-victimless-crime

3. AIA: The Anti-fraud Integrated Archive

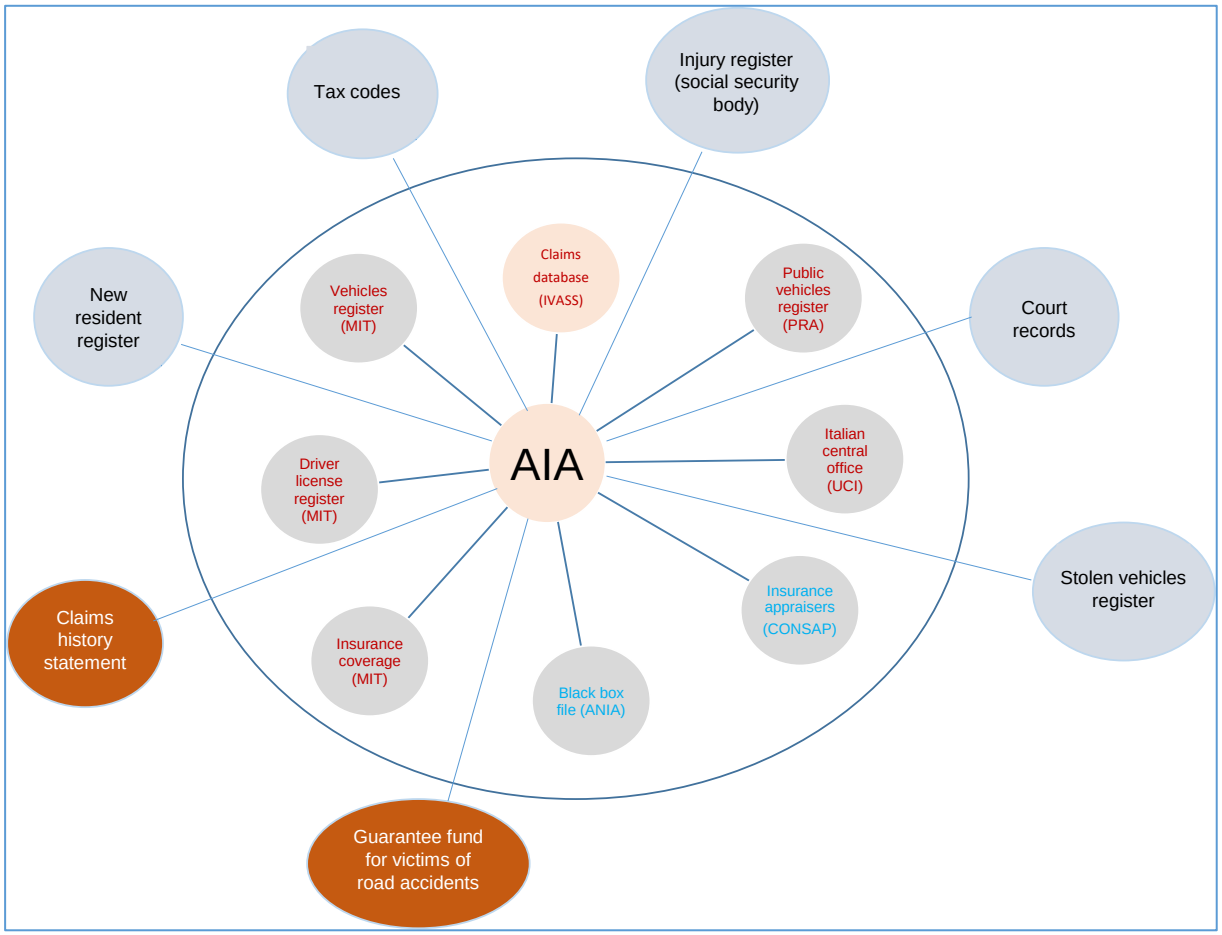
Since its very creation, in 2013, IVASS has worked hard to interconnect several Public Sector databases relevant for a double-check of the basic data of each MTPL claim: Vehicles Register, Driving licence Register, Insurance Coverage, Insurance Appraisers, etc. plus, of course, the Claims Database which is the core of the AIA (Fig. 1)

FIG. 1 - AIA initial eight archives



The setup of interconnected databases is in continuous development, including, as required by the establishing law (Decree Law 179/2012, art. 21), other relevant databases (General Register, Tax Codes, Court Records, etc.) with the aim to complete the AIA structure in a few years (Fig. 2).

FIG. 2 - AIA complete setup

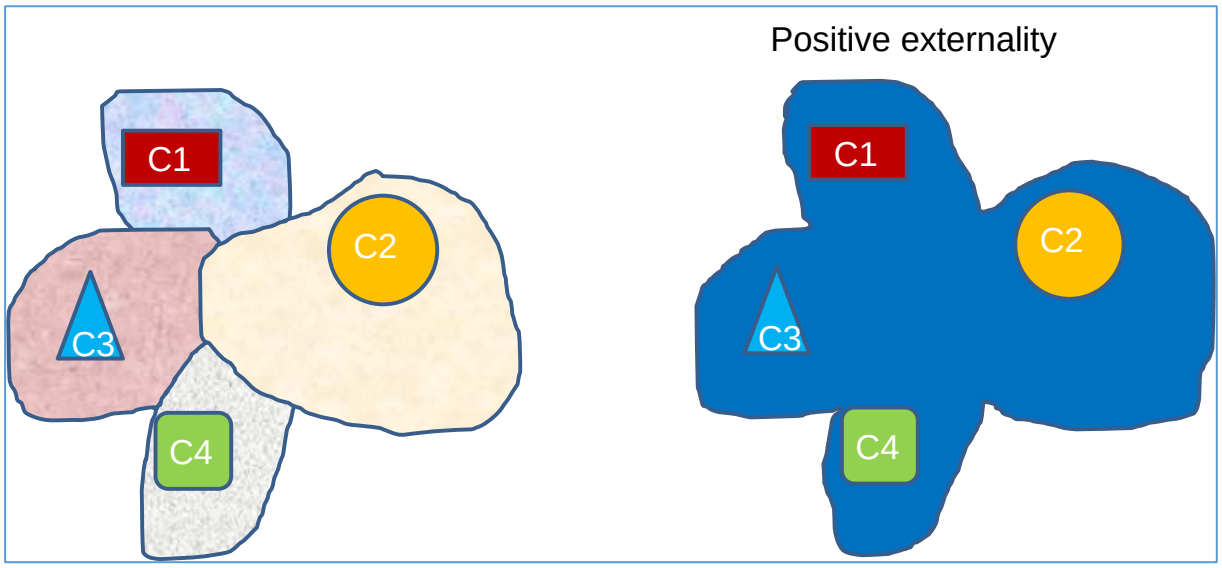


Apart from IVASS, the AIA users are the 59 insurance companies active in the Italian MPTL market, the Police and the Courts and Judiciary.

The Italian regulatory approach recognizes that information and anti-fraud activities are public goods and it is certainly sub-optimal to let each company build its own database and anti-fraud system.

AIA, instead, represents the sharing of all relevant information among all the stakeholders in the insurance market, minimizing total investment costs and maximizing the effectiveness and potential of a single, big database, to exploit the positive externality of the exponential growth of connections and to boost SIU activities (Fig. 3).

FIG. 3 – Many separated databases vs one big shared database



The heart of AIA, the Claims Data Base (BDS), has been in operation since 2001; it contains 57 million crashes with about 100 variables per crash, 20 million vehicles, and 22 million subjects involved (drivers, loss adjusters, witnesses, injured parties, etc.). At present, the Claims database has more than 6 billion records of information.

4. AIA 1.0: The Score system

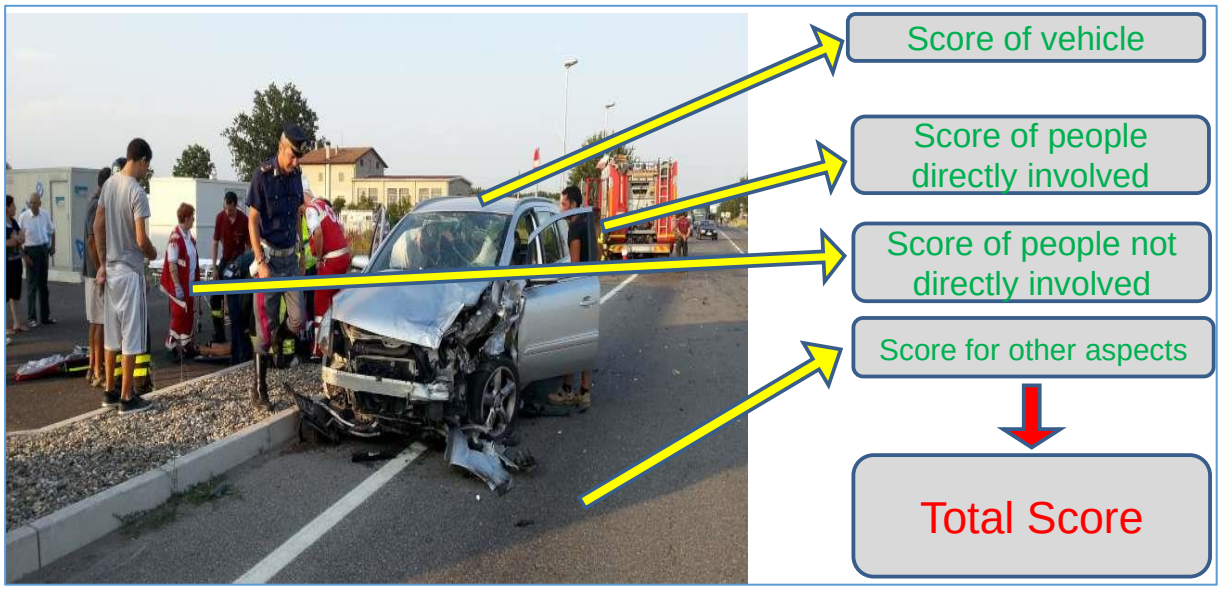
The first version of the AIA anti-fraud system is based on a set of binary 1/0 indicators on recurrences and cross-checks criteria[2].

Each indicator has a weight representing its contribution to the total score.

The indicators belong to 4 groups and are summed up to give a group score and a total score (Fig. 4).

[2] For example: Has the subject had any role in at least 3 claims in the last 18 months? Has the vehicle been involved in at least 3 claims during the last 18 months? Etc.

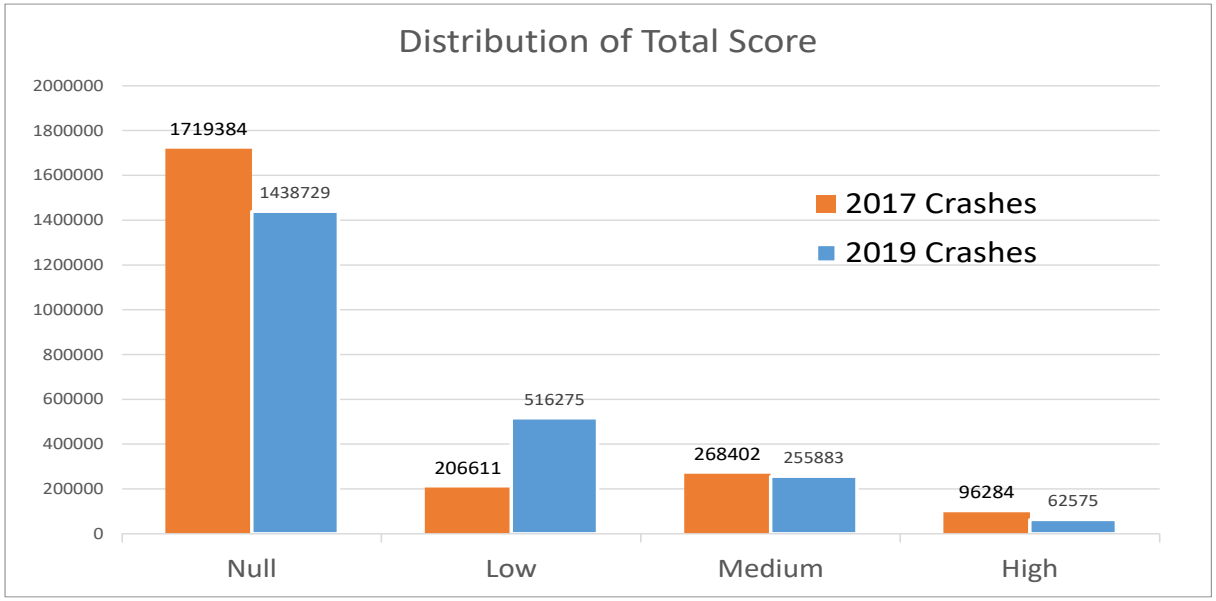
FIG. 4 - Four Groups of scores and Total score per claim



The total score is expressed in four qualitative classes: null – low – medium – high.

The last class includes all those cases towards which the best anti-fraud effort should be directed first (Fig. 5).

FIG. 5 - AIA 1.0 Distribution of total scores for 2017 and 2019 crashes

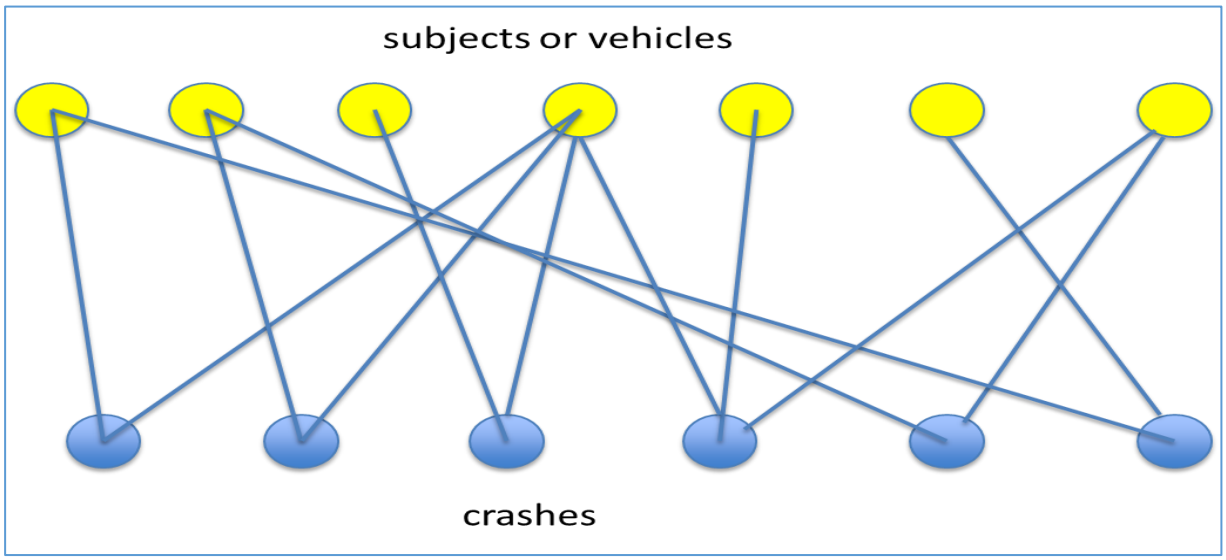


5. AIA 2.0: The Network Analysis approach

The last upgrade of the AIA system has introduced network analysis tools, capable of identifying possible hidden criminal networks which cannot be seen in the standard approach.

From the AIA databases, we have created a statistically validated bipartite network (SVN) composed of subjects (or vehicles) and crashes (Fig. 6).

FIG. 6 - Nodes (vertices) and links (edges) in a bipartite network

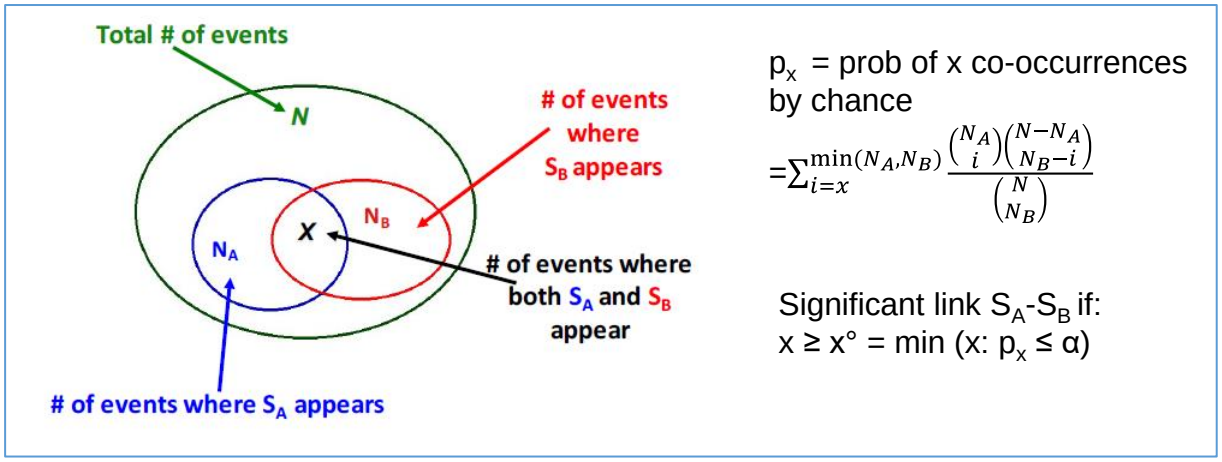


The statistical validation procedure is based on the probability of co-occurrences and their significance with respect to a random configuration. If the number of observed co-occurrences is greater than their random level (at a given significance level) then the link is considered statistically significant [3] and the SVN is eventually obtained.

[3] Tumminello M., Miccichè S., Lillo F., Piilo J., Mantegna R. N. (2011), Statistically Validated Networks in Bipartite complex Systems, PlosOne, 6, 3

Cesari R., Consiglio A., Farabullini F., Tumminello M., Vassallo P. (2020), Insurance Fraud Detection: A Statistically Validated Network Approach, IVASS

FIG. 7 - Statistical validation procedure for two subjects S_A and S_B



The following step is to identify the communities (clusters or modules) into the SVN. This is done by defining the modularity of a community essentially as the difference between the number of observed links among the community members and its expected value under random connectivity[4]. The optimal partition has dense connections “within” communities and sparse connections “between” communities.

Real life examples of communities are given in Fig. 8, 9, 10.

The first two figures show the same community, represented in two different ways. In the first one, the different subjects are highlighted and linked with lines whose thickness is proportional to the number of claims. In the second representation the claims are put in the foreground and the subjects positioned around.

In Fig. 10 a more complex community is represented, with a lower number of claims and a higher number of subjects involved, two of them pivotal.

[4] Newman M. E. J. and Girvan M., (2004) Finding and evaluating community structure in networks, Physical Review E 69

FIG. 8 - Example of a community (crashes as links)

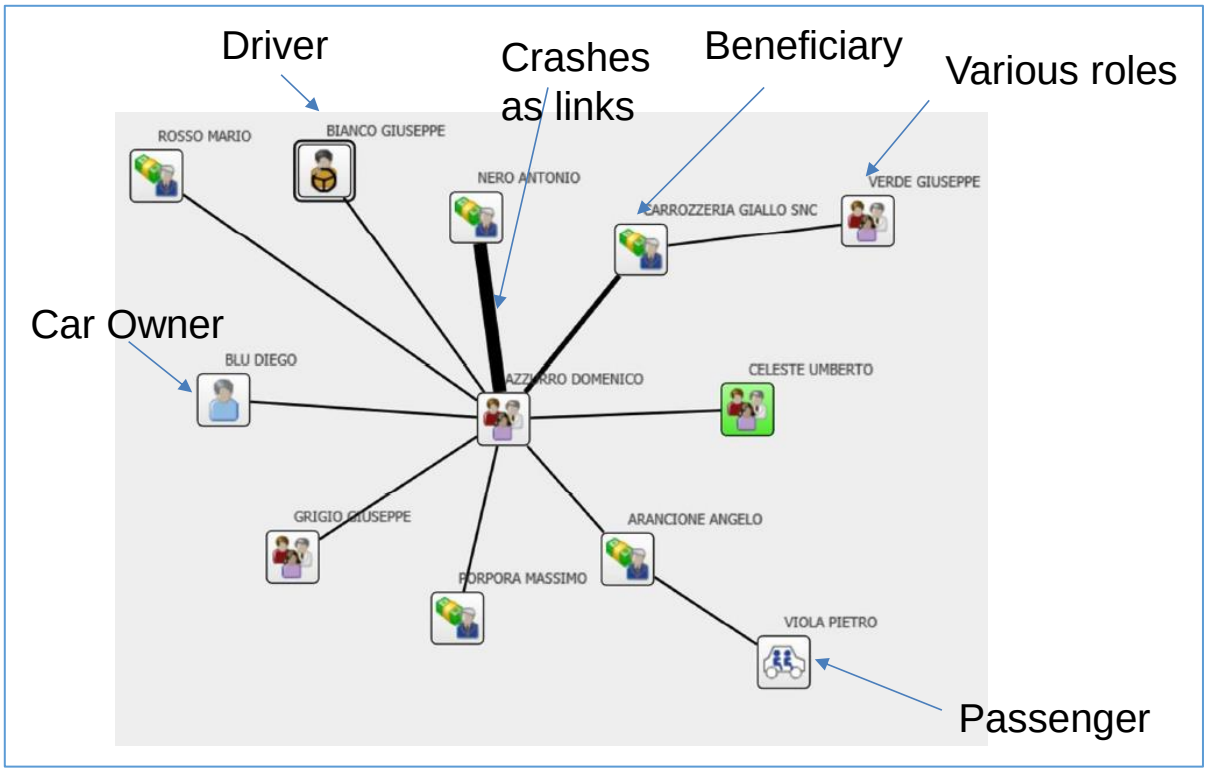


FIG. 9 - Example of a community (claims in foreground)

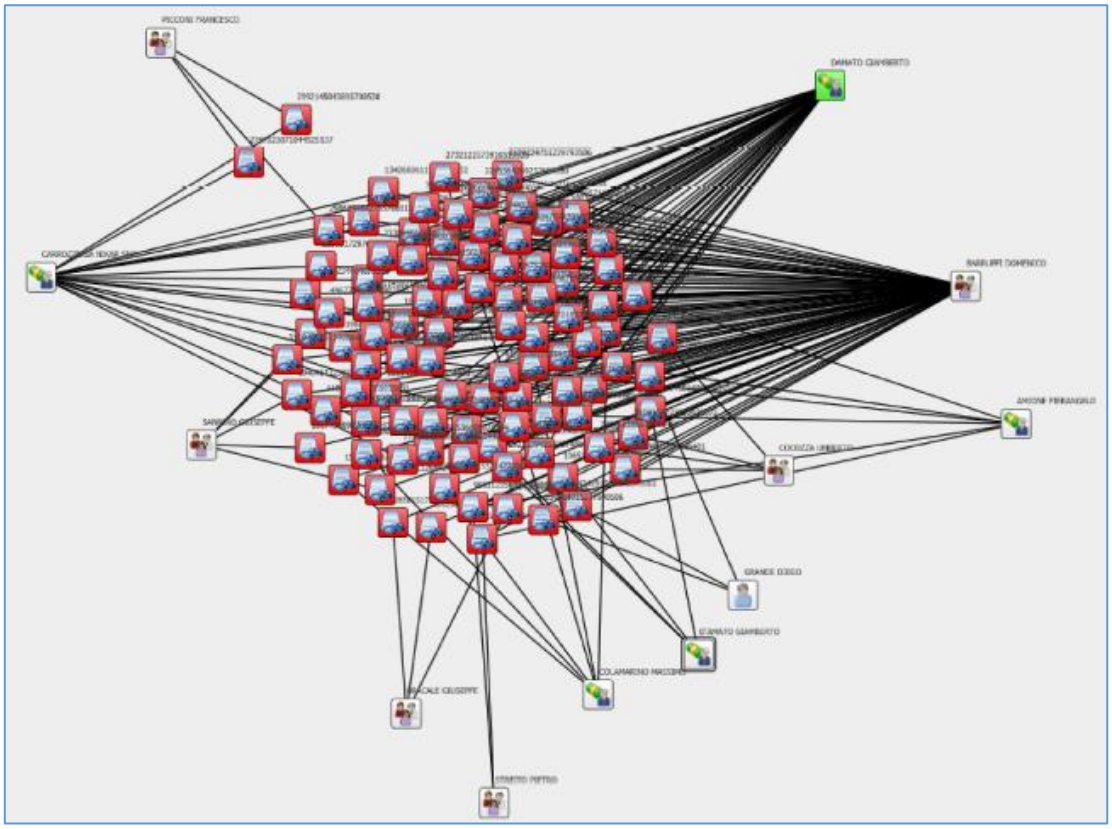
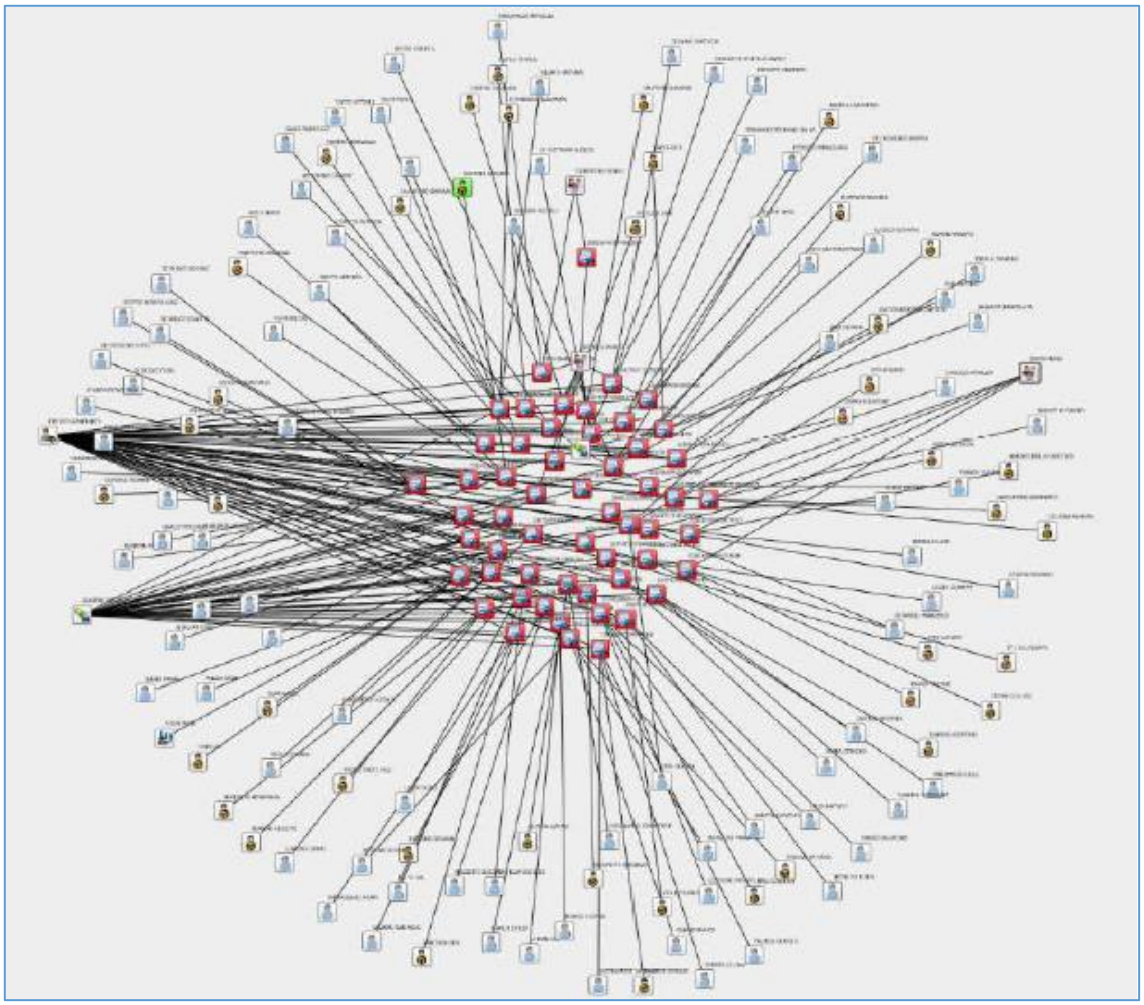


FIG. 10 - A more complex community



For each community, a set of quantitative indicators has been provided concerning size, connectivity, robustness as well as a global indicator with three thresholds to define a null, low, medium, and high level of suspicion of fraud.

The so obtained community network system (ISAIA, Investigation System for Antifraud Insurance Activity) has been validated through an out-of-sample analysis using a set of 400 verified fraud cases.

The testing procedure has shown a 19.5% probability of false positive (type 1 error; but note that we have no absolute certainty about good claims) and a remarkable 3.3% probability of false negative (type 2 error).

At the moment, the SVN is composed of 500 000 communities (clusters of nodes), 60% made up of 4 nodes (2 subjects and 2 claims), 2% made up of more than 26 nodes, and the average community made up of 10 nodes.

6. Conclusions

The struggle against frauds in the insurance market is one of the fundamental missions of IVASS, given its implications for reducing costs and prices and reinforcing the general trust between insurers and their clients.

The AIA public system and its detection tools are certainly a significant step forward, available to all insurance companies, the Police and the Courts.

Future developments include the enlargement of databases, more powerful analytics and the extension of AIA's scope to the underwriting phase.