



Project Quick Facts

Coordinator:

- National Centre for Scientific Research "Demokritos" (Greece)

Partners:

- IBM (Israel)
- ETH Zurich (Switzerland)
- Technion Institute of Technology (Israel)
- University of Birmingham (UK)
- Centre National de la Recherche Scientifique (France)
- FeedZai S.A. (Portugal)

Duration: 36 months

Total cost: 4,334,779 €

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Concept and Objectives

Rapid business, economic, social and political changes are leading organizations to shift their thinking from reactive to proactive in order to detect opportunities and threats that could affect their business. Eliminating or mitigating an anticipated problem, or capitalizing on a forecast opportunity, can substantially improve our quality of life, and prevent environmental and economic damage. At the environmental level, changing traffic-light priority and speed limits to avoid traffic congestions will reduce carbon emissions, optimize transportation and increase the productivity of commuters. At the business level, making smart decisions ahead of time can become a differentiator leading to significant competitive advantage. For example, adding credit cards to watch lists as a result of forecasting fraud will reduce the cost inflicted by fraudulent activities on payment processing companies and merchants, and consequently lower credit card rates which can attract more customers.

SPEEDD will develop a prototype for proactive event-driven decision-making: decisions will be triggered by forecasting events-whether they correspond to problems or opportunities-instead of reacting to them once they happen. The decisions will be in real-time, in the sense that they will be taken under tight time constraints, and require on-the-fly processing of Big Data, that is, extremely large amounts of noisy data flooding in from different geographical locations, as well as historical data. In credit card fraud management, for example, it is necessary to forecast and act upon fraudulent activity in a matter of milliseconds, given tens of thousands of transactions per second taking place all over the world, as well as several months of historical data.

The SPEEDD methodology for proactive event-based decision-making comprises the following steps:

1. Big Data is continuously acquired from various types of sensor and fused in order to recognise, in real-time, events of special significance. To allow for sub-second recognition,

SPEEDD minimizes communication volume by moving as little data as possible from one place to another.

2. The events recognised are correlated with historical information to forecast problems and opportunities that may take place in the near future.
3. The forecast events along with the recognised events are leveraged for real-time operational decision-making.
4. Visual analytics tools prioritise and explain possible proactive actions, enabling human operators to reach and execute the correct decision.

SPEEDD proposes a highly adaptive system which is capable of learning from human reasoning and decision-making. Machine learning techniques extract supervision from human decision-making through visual analytics tools in order to continuously refine event recognition and forecasting models. The proposed approach is applicable to a wide range of domains where proactivity is useful. The SPEEDD technology will be tested in two such domains: Credit card fraud management and traffic management.



Fraud detection and forecasting is a needle in the haystack problem as fraudulent transactions constitute at most 0.1% of the total number of transactions. In 2010, fraud in the Single Euro Payments Area (that includes 27 EU member states) was estimated at 1.26 billion Euros. Furthermore, fraud is continuously evolving and therefore the fraud patterns are constantly updated (new fraud patterns appear on almost a weekly basis). Perfect recall (finding all fraud cases) and perfect precision (never raise a false alarm) are out of reach – the state-of-the-art recall and precision rates are about 60% and 10% respectively. At the same time, raising false alarms (that is, unnecessarily calling customers or blocking cards) is very costly in time and customer relationships. Missing true alarms is also very costly (in terms of lost money). SPEEDD will be able to successfully detect and forecast the ever evolving fraudulent activities as it will incorporate machine learning techniques supporting the continuous refinement of event patterns expressing fraud.

Traffic detection and forecasting requires the analysis of massive noisy data streams storming from various sensors, including fixed sensors installed in highways and mobile sensors such as smart phones and GPS traces, as well as large amounts of historical data. The goal of this use case is to forecast traffic congestions before they happen and make decisions in order to attenuate them. SPEEDD will forecast traffic congestions 5-20 minutes before they happen, and make decisions within 30 seconds of the forecast about adjustment of traffic light settings and speed limits. This will be achieved by enabling the fusion and assimilation of a multi-technology sensor network for real-time traffic data collection.

