

Voraussagen helfen – Predictive Analytics für die öffentliche Hand

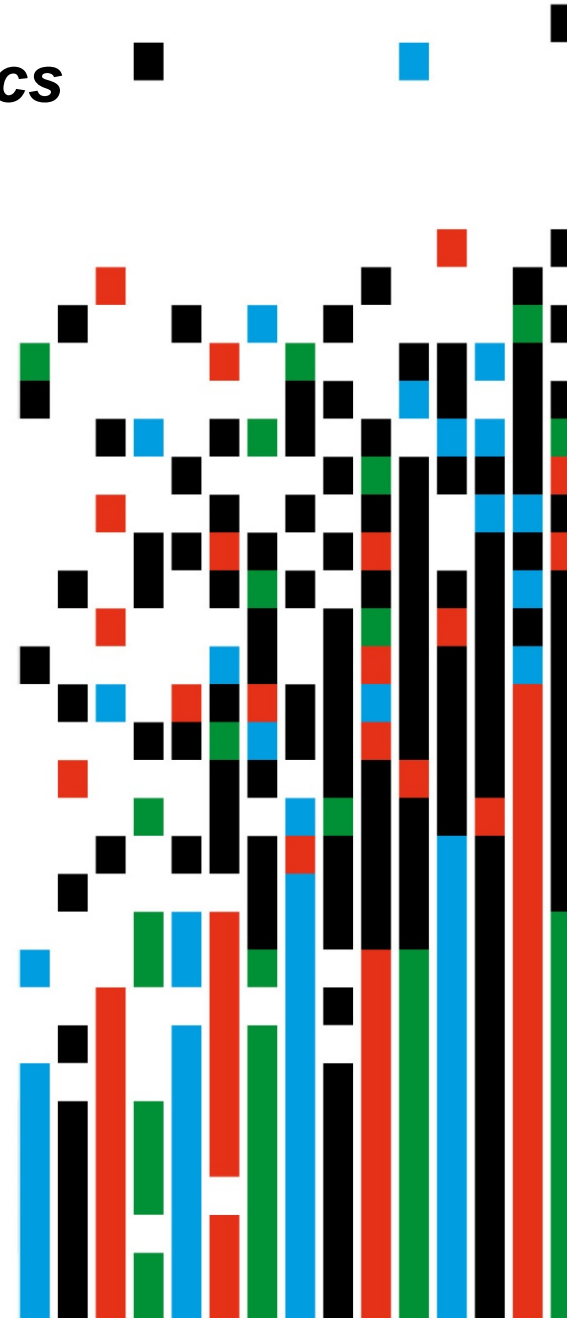
IBM Cognos Government Forum 2011
Bellevue Palace in Bern

Dienstag, 18. Januar 2011

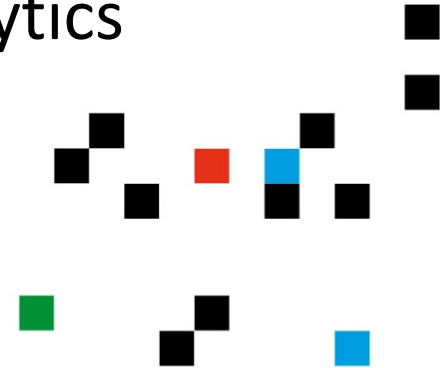
Josef Schmid
Mitinhaber, SPSS (Schweiz) AG



ibm.com/cognos/ch/de/gov



SPSS – der Leader in Predictive Analytics



Predictive Analytics: Defined

Predictive analytics helps connect data to effective action by drawing reliable conclusions about current conditions and future events.

Predictive analytics, like enterprise resource planning (ERP) and customer relationship management (CRM), is both a business process and a set of related technologies. Predictive analytics leverages an organization's business knowledge by applying sophisticated analytic techniques to enterprise data. The resulting insights can lead to actions that demonstrably change how people behave as customers, employees, patients, students, and citizens.

The predictive analytics process begins by exploring how specific business issues relate to data describing people's characteristics, attitudes, and behavior. These numeric and free-form data sets, which originate from both internal systems and third party providers, are cleansed, transformed, and evaluated using statistical, mathematical, and other algorithmic techniques. These techniques generate models for classification, segmentation, forecasting, pattern recognition, sequence and association detection, anomaly identification, profiling, propensity scoring, rule induction, text mining, and advanced visualization.

Combining predictive analytics models with organizational business knowledge provides insight into such critical issues as customer acquisition and retention, up-selling and cross-selling, fraud detection, and outcome improvement. Through measuring uncertainty surrounding these issues, predictive analytics enables proactive risk management, refining key decision making processes through controlled, iterative testing of potential actions and their likely intended—and unintended—consequences. These findings and their corresponding business rules can then be deployed within front-line operational systems to identify new revenue opportunities, measurable cost savings, repeatable process improvements, and sustainable competitive advantages.

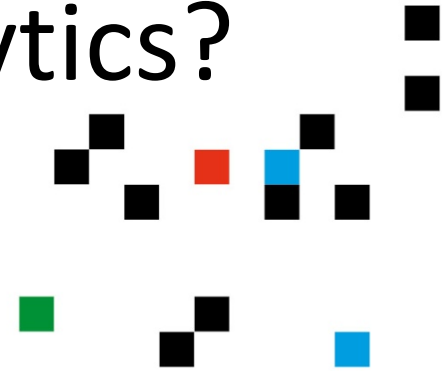
Predictive analytics carries strategic and tactical ramifications for organizations that recognize the inherent value locked within their existing enterprise data. Strategically, predictive analytics provides a quantitative foundation for rapidly identifying, objectively evaluating, and confidently pursuing new market opportunities. Tactically, predictive analytics identifies precisely whom to target, how to reach them, when to make contact, and what messages should be communicated.

“Predictive analysis helps connect data to effective action by drawing reliable conclusions about current conditions and future events.”

- Gareth Herschel, Research Director, Gartner, Inc., Feb. 2003



Was sind Predictive Analytics?



Gibt es eine Formel, um den Bordeauxpreis eines neuen Jahrgangs zu berechnen?



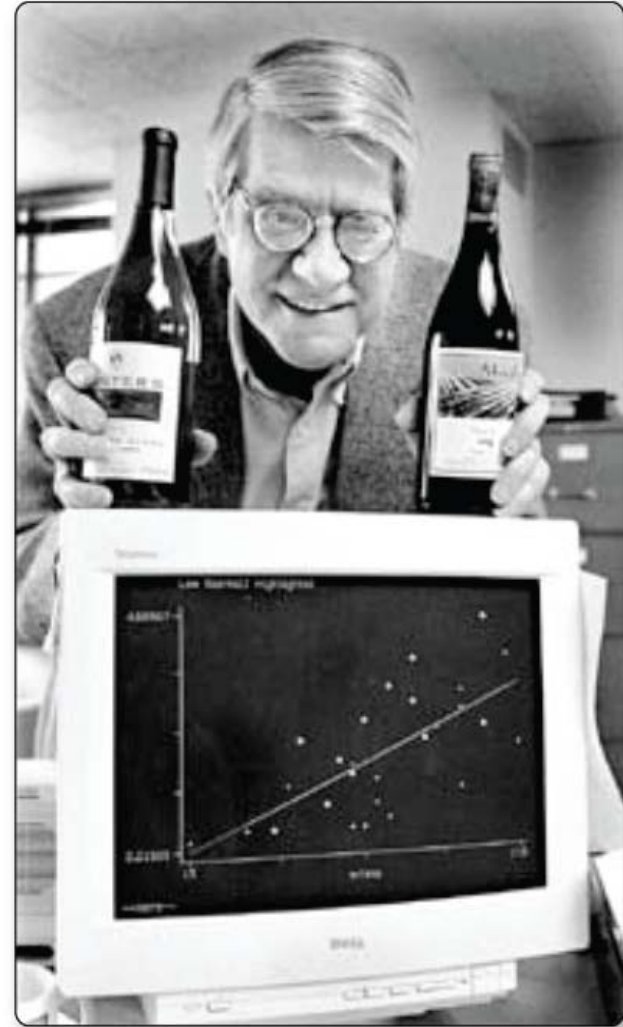
Weinqualität =

12.145

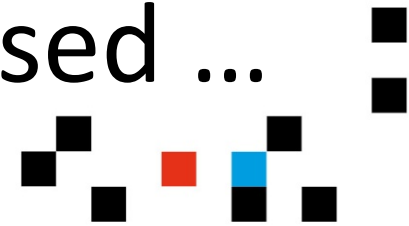
+ 0.00117 x (Regen im Winter)

+ 0.0614 x (mittlere Wachstumstemp.)

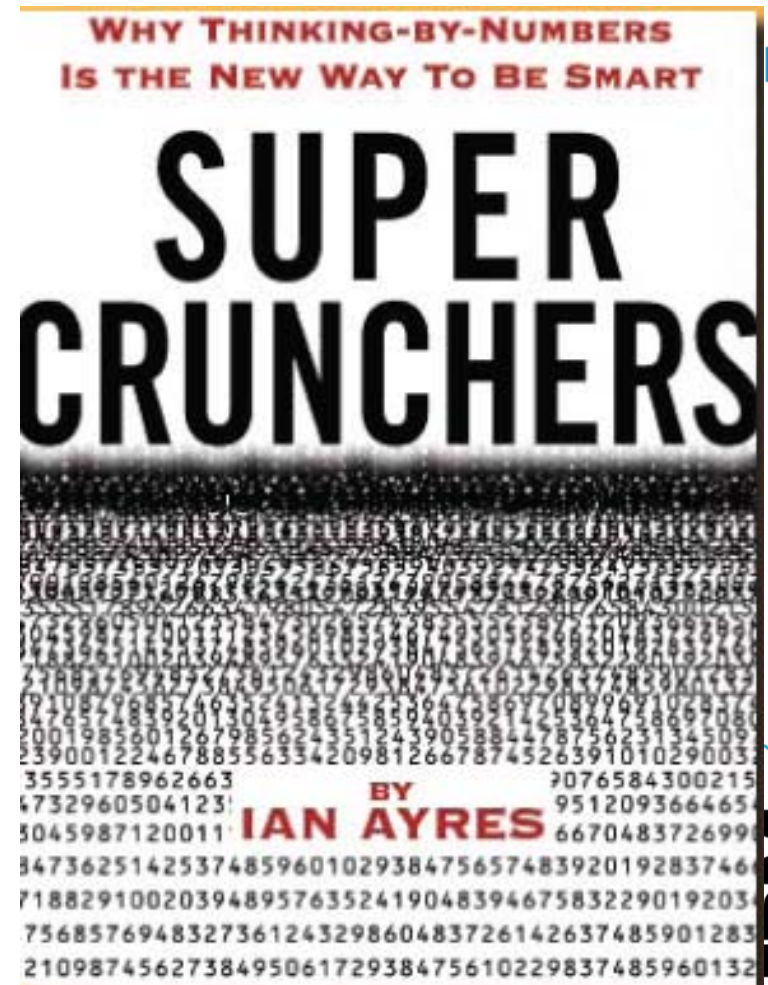
- 0.00386 x (Regen während der Erntezeit)



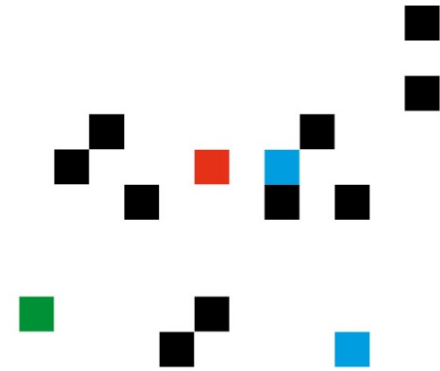
Robert Parker was not amused ...



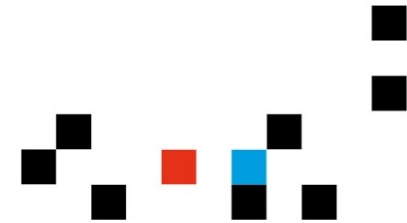
- „A Neanderthal way of looking at wine“
- „An absolute total shame“
- „It’s so absurd as to be laughable.“



Algorithmen finden sich überall ...



Algorithmen und Mathematik werden common sense ...



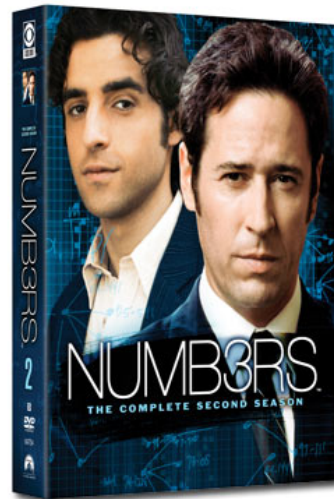
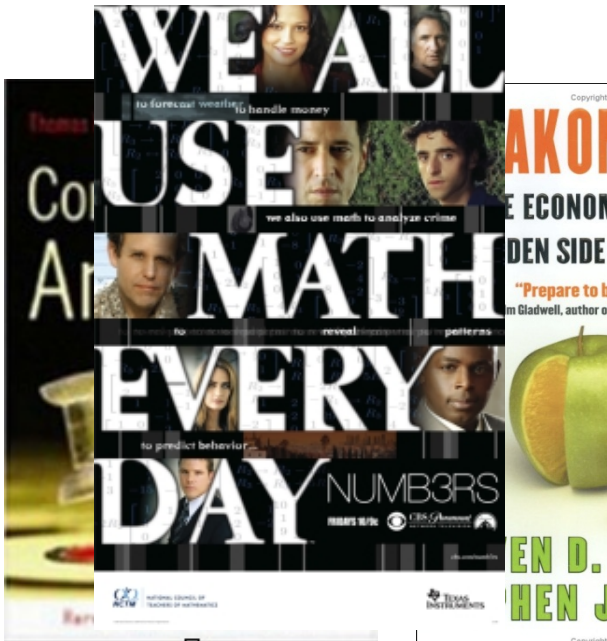
- **Wissenschaft vs Zufall**
- **Zahlen!!**



January 2006

November 2006

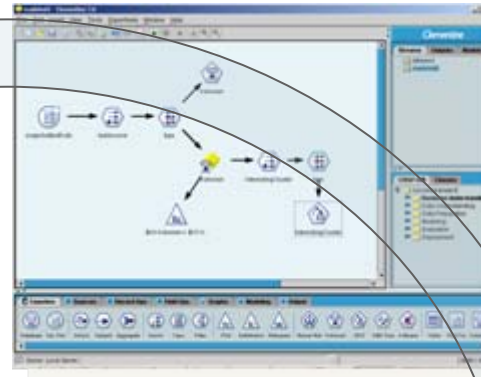
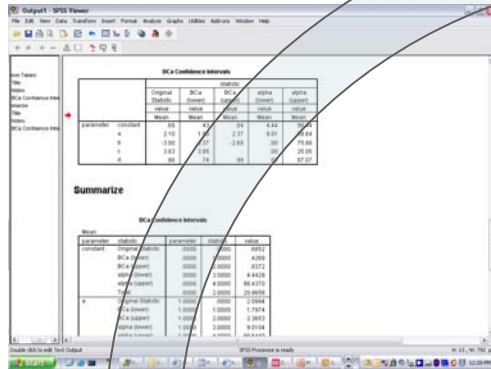
September 2007



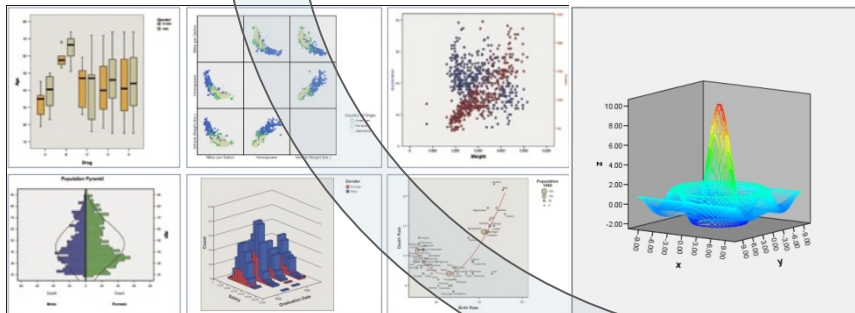
SPSS macht die Power der Algorithmen einfach und schnell zugänglich...

- Integration

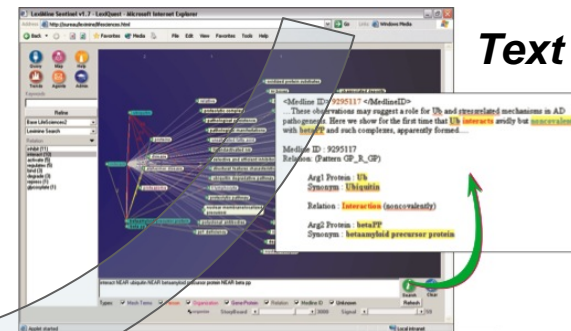
Modeler



Statistics



Visualization



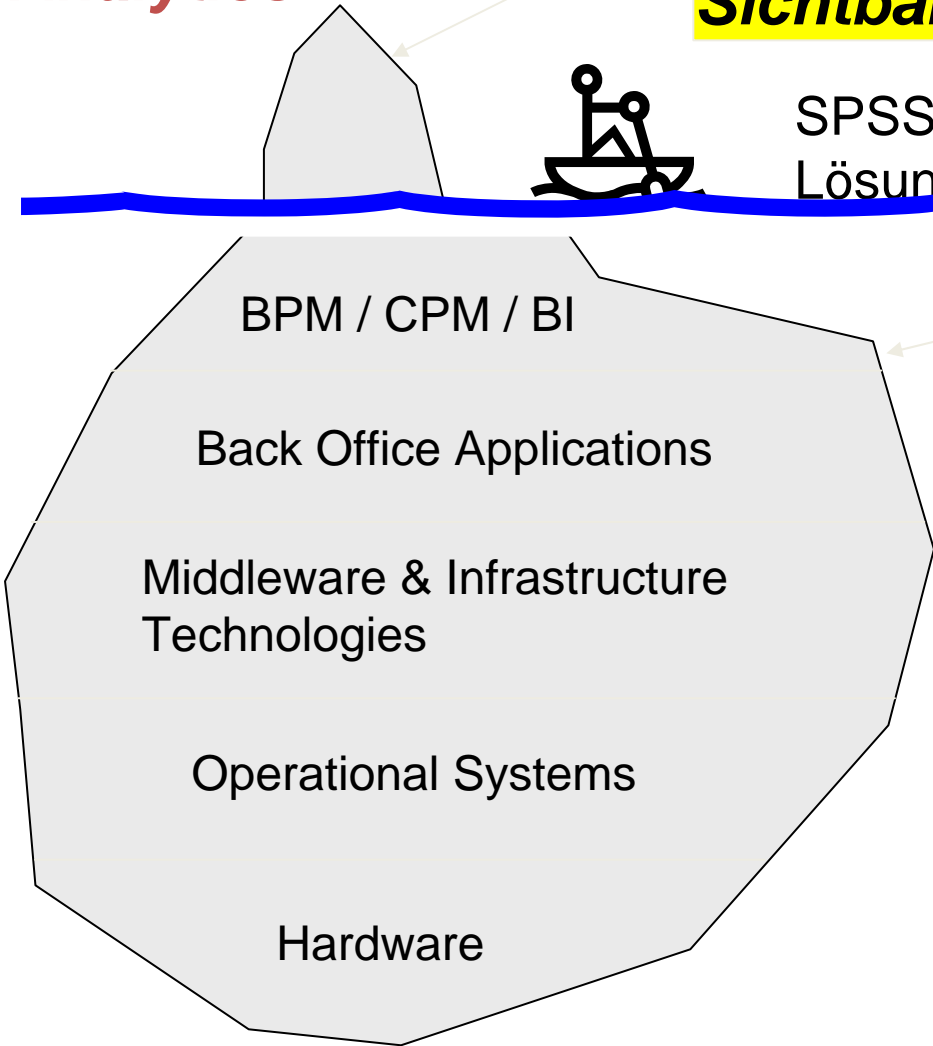
Predictive Analytics:

Predictive Analytics

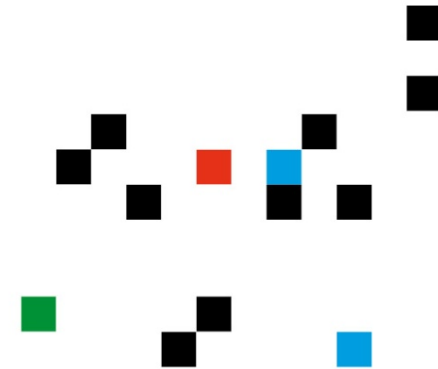
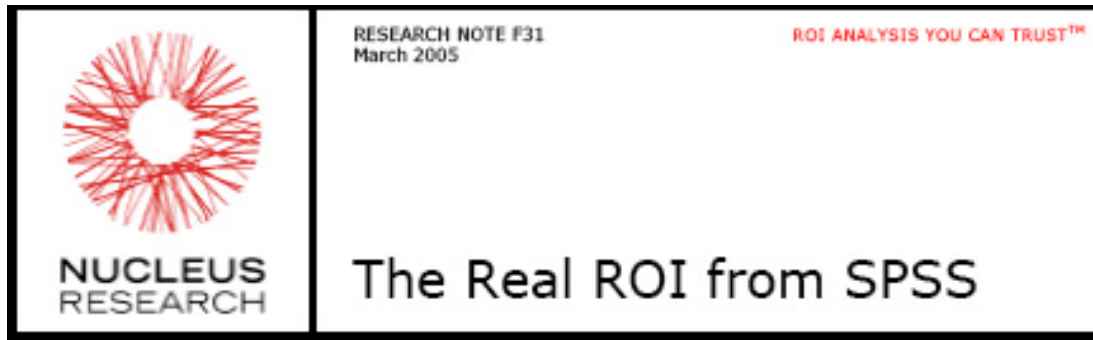
Die Spitze des Eisbergs

Sichtbarer ROI

SPSS ist der kritische Teil einer Lösung



Bestehende IT Investitionen

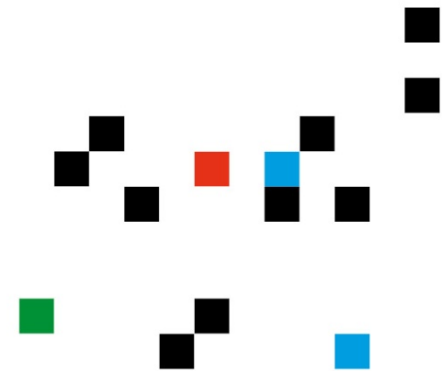
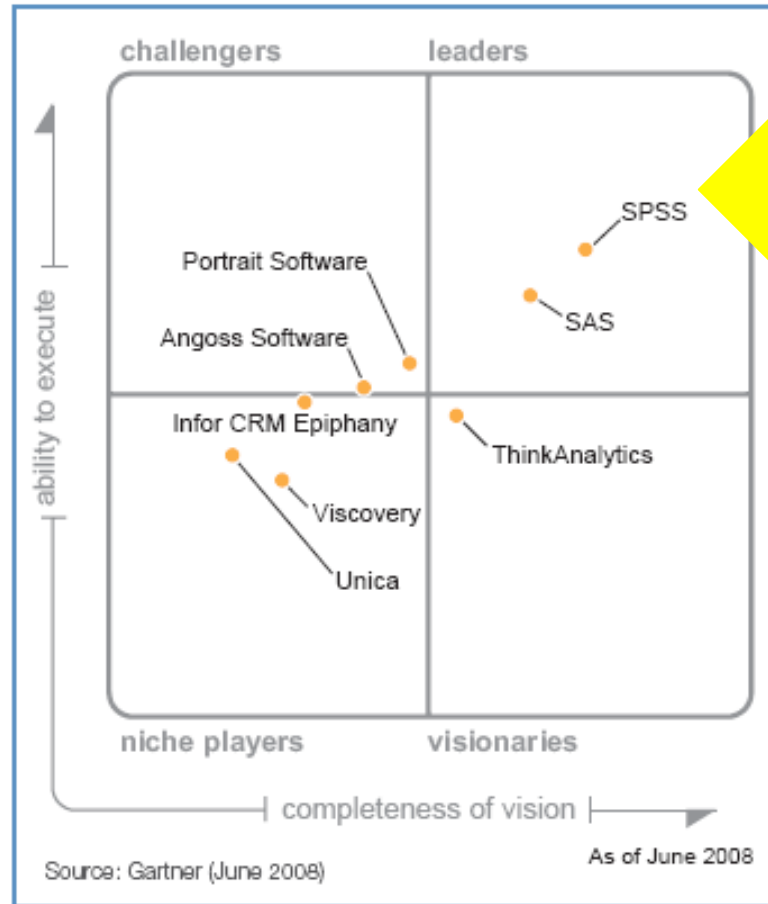


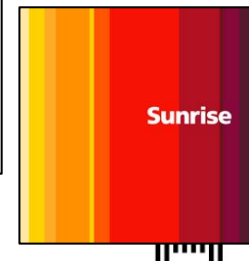
- 94% of customers achieved a positive ROI, payback in 10.7 months
- Over 90% of users attributed an increase in productivity to SPSS
- 81% of projects were deployed on time, 75% on or under budget

“This is one of the highest ROI scores Nucleus has ever seen in its Real ROI series of research reports”

***Rebecca Wettemann, VP of Research,
Nucleus Research***

Gartner ...





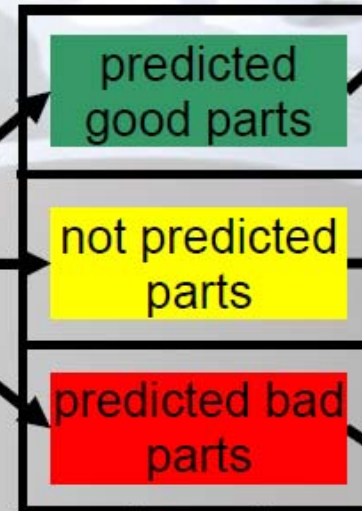
BMW Group plant Landshut

Product portfolio



- Production exchange engines
14000 per year
- Production propeller shafts
more than one million per year
- Production plastic exterior
bumper, side panels & carbon fibre components
- Production plastic interior
instrument panels & middle consoles
- Alloy foundry
cylinder heads & crank cases for engines

Overview about future activities



normal part
handling
without
inspection

normal part
handling with
inspection

no part
handling

Predictive Analytics und Öffentliche Verwaltung

- ... überall da, wo aus Daten «gelernt» werden muss, z.B.
 - Steuerverwaltung – verdächtige Fälle identifizieren
 - Polizei – Problemschwerpunkte voraussagen / Einsatzplanung
 - Polizei – Täterprofilierung
 - Qualitätssicherung im Gesundheitswesen
 - Betrugsbekämpfung Sozialversicherungen
 - ...





DIRECTIONS

European Conference

$$\beta, \theta) = \log |V(\theta)| + r(\theta)' (V(\theta))^{-1} r(\theta) + n \log(2\pi)$$

$$\frac{n!}{(n-x)!} p^x (1-p)^{n-x}$$

$$F =$$

$$R_{CS}^2 = 1 - \left(\frac{L(\hat{\pi})}{L(\hat{\pi})} \right)^2$$

Helping Make Tax Collection More Efficient

Mads Krogh Nielsen
Danish Central Customs and Taxes Authority

$$\begin{bmatrix} \beta \\ \gamma \end{bmatrix} = \begin{bmatrix} X'R^{-1}X & X'R^{-1}Z \\ Z'R^{-1}X & Z'R^{-1}Z \end{bmatrix}^{-1} \begin{bmatrix} X'R^{-1}y \\ Z'R^{-1}y \end{bmatrix}$$



National Audit: Report and Budgetary analysis

National Audit, august 2003

- ***“The IT based structures are insufficient”***

Budgetary analysis, march 2004

- ***“... a need for simplification of rules as well as improved systems support”***

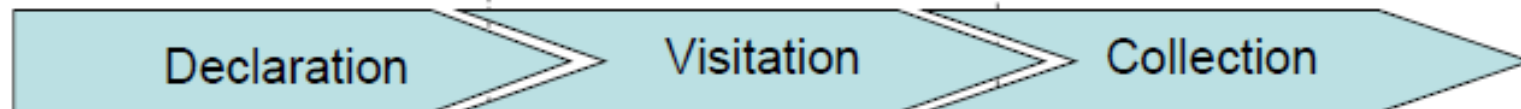
The procedure – before and after the EFI project

Before the EFI project

The arrear (there are +250 different arrears) arrives from SKAT, the police, Danish Television, Tribunals, municipalities, National Train etc.

1500 Collectors moves around on piles of debtors (there are +600.000 of those), and attempts to prioritize amongst them.

Collectors makes time consuming collection and surveillance work and tries in vain to make it all in time.



After the EFI project

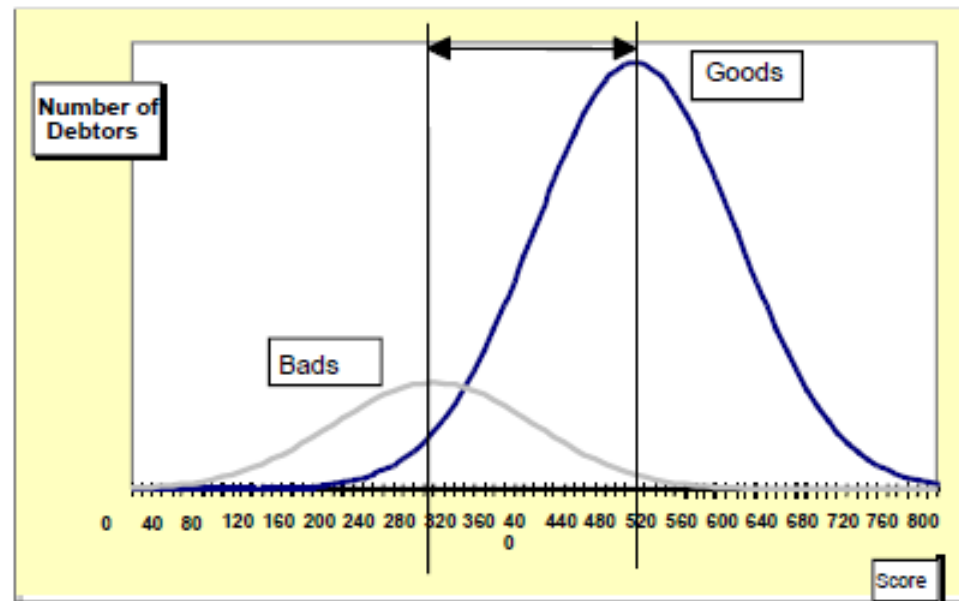
No difference

A daily updated credit score sorts the customers an automatically places them on a track with no interference from a collector.

Most of the collections are done automatically. Surveillance happens automatically. Collectors are being warned when there is a need for manua activityl. Resources are being booked automatically.

Distinct between 'Good/Bad'

- Some characteristics were not used because of the law or for ethical reasons.
- The score is a measure of the probability of being a "good" or a "bad" performer.
- If the scorecard is doing well, the typical "bad"s will score worse than the typical "good"s.





Analysis of +200 various parameters:

Following parameters was significant:

AGE_YRS
 COMMUNE_CODE
 MARITAL_STATUS
 N_family_members_household
 N_CHILD
 NUMBER_OWNED_HOUSES
 AVG_OWNERSHIP_SHARE
 RELATIONSHIP_TO_COMPANY
 NUMBER_OWNED_CARS

DUNN&BRADSTREETSCORE_20080101
 TOTAL_ARREAR_OPEN_BOD
 LARGESTUDENTDEBT
 TOTAL_ARREAR_OPEN_BOD
 TOTAL_AGREEMENT_BOD_2
 TOTAL_HOUSES_VALUE
 "AKTIVER"
 TOTAL_AMOUNT_AGREE_BOD
 TOTAL_AMOUNT_PAID_AGREE_BOD
 ARREAR

These improvements results in following:

- A very impressive automatized handling of the collection process.
- An intuitive R&D process due to the Modeler software.
- Significant reductions in the collection costs due to automatization.
- Higher service level due to standardization and better ressource allocation.

West Midlands Police Department

Resurrecting (and solving!) cold case files

Background

- 2nd largest police force in the UK, serving ~2.63 million residents in 348 sq miles

Business goals

- Gain insight in unsolved criminal cases
- Quickly and easily find key case patterns and trends

Solution

- Identify coinciding characteristics between physical descriptions of the criminal and their modus operandi (MOs)
- Analyze/Investigate the behavior of prolific repeat offenders, and identify crimes that seem to fit their behavioral pattern

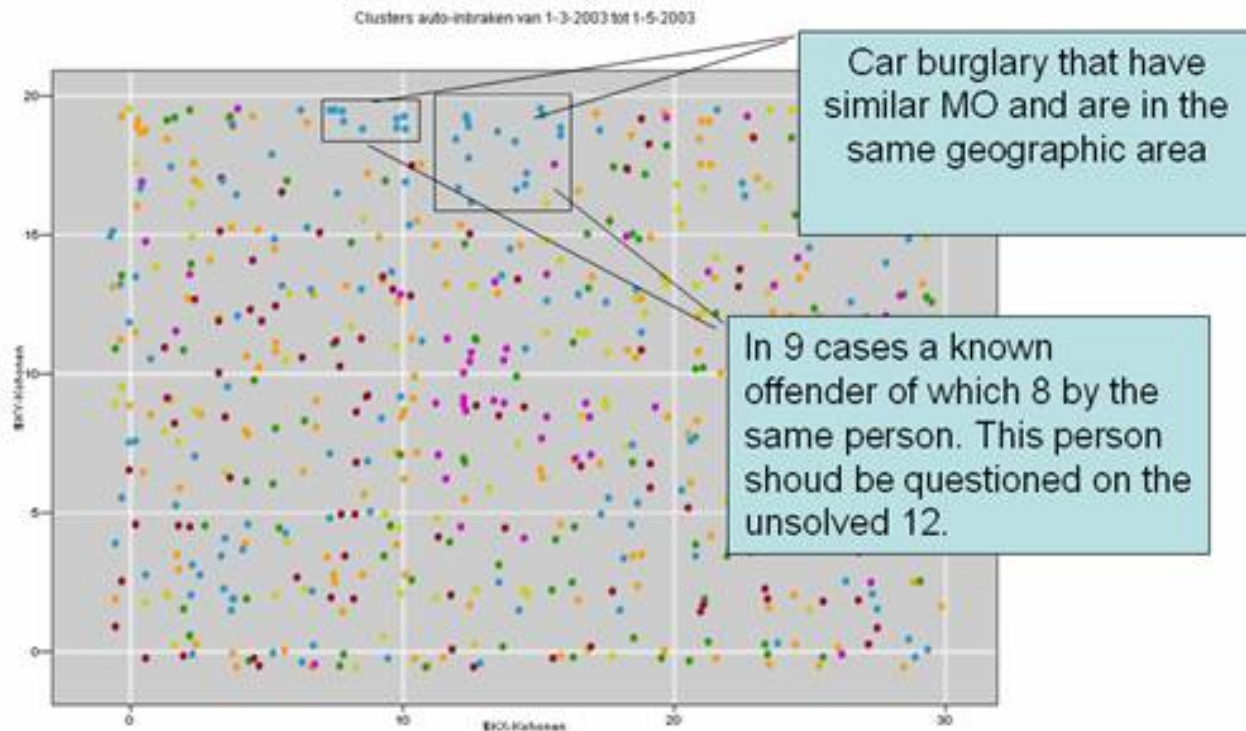


Results

- Matched unsolved cases with known perpetrators
- Better targeting and “catching” of repeat offenders

Profiling Repeat Offenders

Matching unsolved cases to Known Offenders



Criminal Career Path

Pers_id HKS

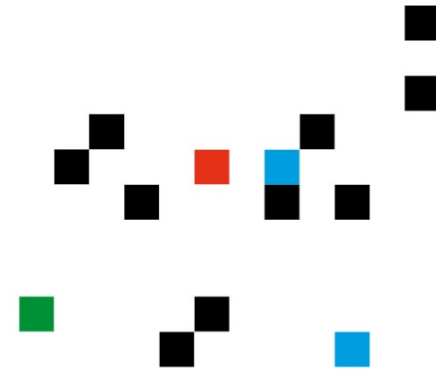
File Generate

Sort by: Confidence 44

Instances	Support	Confidence	Consequent	Antecedent 1	Antecedent 2	Antecedent 3	Antecedent 4
63	0.209	0.955	diefstal d.m.v. braak	overige gekw. diefstal	diefstal d.m.v. braak		
62	0.206	0.912	diefstal d.m.v. braak	eenvoudige diefstal	diefstal d.m.v. braak	eenvoudige diefstal	diefstal d.m.v. braak
61	0.203	0.910	diefstal d.m.v. braak	eenvoudige diefstal	diefstal d.m.v. braak	eenvoudige diefstal	diefstal d.m.v. braak
67	0.223	0.905	diefstal d.m.v. braak	diefstal d.m.v. braak	eenvoudige diefstal	eenvoudige diefstal	
69	0.229	0.896	diefstal d.m.v. braak	diefstal d.m.v. braak	diefstal d.m.v. braak	eenvoudige diefstal	diefstal d.m.v. braak
64	0.213	0.889	diefstal d.m.v. braak	diefstal d.m.v. braak	diefstal d.m.v. braak	eenvoudige diefstal	diefstal d.m.v. braak
86	0.286	0.887	diefstal d.m.v. braak	diefstal d.m.v. braak	diefstal d.m.v. braak	diefstal d.m.v. braak	diefstal d.m.v. braak
61	0.203	0.884	diefstal d.m.v. braak	eenvoudige diefstal	eenvoudige diefstal	eenvoudige diefstal	
68	0.226	0.883	diefstal d.m.v. braak	diefstal d.m.v. braak	eenvoudige diefstal	eenvoudige diefstal	
83	0.276	0.874	diefstal d.m.v. braak	eenvoudige diefstal	eenvoudige diefstal		
75	0.249	0.872	diefstal d.m.v. braak	diefstal d.m.v. braak	diefstal d.m.v. braak	eenvoudige diefstal	diefstal d.m.v. braak
72	0.239	0.867	diefstal d.m.v. braak	diefstal d.m.v. braak	eenvoudige diefstal	eenvoudige diefstal	
85	0.282	0.867	diefstal d.m.v. braak	diefstal d.m.v. braak	eenvoudige diefstal	diefstal d.m.v. braak	
61	0.203	0.847	diefstal d.m.v. braak	eenvoudige diefstal	diefstal d.m.v. braak	eenvoudige diefstal	diefstal d.m.v. braak
66	0.219	0.846	diefstal d.m.v. braak	overige gekw. diefstal			
77	0.256	0.846	diefstal d.m.v. braak	diefstal d.m.v. braak	eenvoudige diefstal	diefstal d.m.v. braak	
98	0.326	0.845	diefstal d.m.v. braak	diefstal d.m.v. braak	eenvoudige diefstal		
88	0.226	0.840	diefstal d.m.v. braak	heling/schuldheling	diefstal d.m.v. braak		
86	0.286	0.835	diefstal d.m.v. braak	diefstal d.m.v. braak	eenvoudige diefstal	diefstal d.m.v. braak	
62	0.206	0.827	diefstal d.m.v. braak	diefstal met geweld			
70	0.233	0.824	diefstal d.m.v. braak	diefstal d.m.v. braak	diefstal d.m.v. braak	eenvoudige diefstal	diefstal d.m.v. braak
103	0.342	0.811	diefstal d.m.v. braak	diefstal d.m.v. braak	eenvoudige diefstal		
63	0.209	0.808	eenvoudige diefstal	overige gekw. diefstal			
127	0.422	0.804	diefstal d.m.v. braak	eenvoudige diefstal			
81	0.269	0.802	diefstal d.m.v. braak	heling/schuldheling			
61	0.203	0.792	diefstal d.m.v. braak	overige vernieling			
68	0.226	0.773	diefstal d.m.v. braak	heling/schuldheling	diefstal d.m.v. braak		
97	0.322	0.729	diefstal d.m.v. braak	diefstal d.m.v. braak	diefstal d.m.v. braak	diefstal d.m.v. braak	
69	0.229	0.726	eenvoudige diefstal	eenvoudige diefstal	eenvoudige diefstal		
133	0.442	0.719	diefstal d.m.v. braak	diefstal d.m.v. braak	diefstal d.m.v. braak		
185	0.615	0.675	diefstal d.m.v. braak	diefstal d.m.v. braak			

Model Summary Annotations

OK Cancel Apply Reset

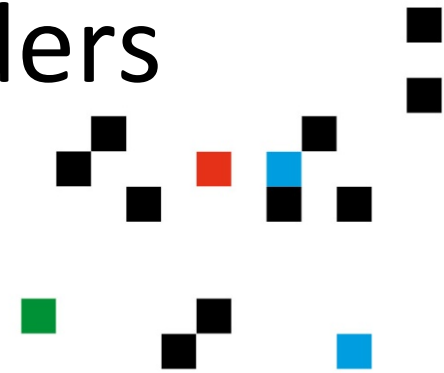


Predicting future offenders

Top 20 voorspelde toekomstige daders in jaar vanaf 1-5-2003

	PersoonsID	Voorspelling incident	Betrouwbaarheid voorspelling
1	88012	Ja	0.859
2	41037	Ja	0.859
3	16223	Ja	0.859
4	91746	Ja	0.859
5	35948	Ja	0.859
6	67790	Ja	0.859
7	86142	Ja	0.859
8	3888	Ja	0.859
9	91435	Ja	0.859
10	22001	Ja	0.859
11	19383	Ja	0.859
12	19365	Ja	0.859
13	6275	Ja	0.859
14	54413	Ja	0.859
15	1230	Ja	0.859
16	46815	Ja	0.859
17	26976	Ja	0.859
18	14207	Ja	0.859
19	94828	Ja	0.859
20	32705	Ja	0.859

Table Annotations



Richmond Police Department

Effective force deployment = less cost, less crime

Background

- Established in 1807 as one of the first official law enforcement agencies in the US
- City of Richmond, Virginia is divided into 12 policing sectors, serving ~200,000 residents

Business goals

- Proactively reduce crime by using existing data to predict & staff likely “hot spots”
- Present officers with real-time data displayed in geographic maps
- Reduce staffing costs

Solution

- Merge and analyze data resources that do not traditionally coexist (weather, events...)
- Build model to characterize and predict criminal activity, incl. locales/times
- Display results in an inter-active GIS



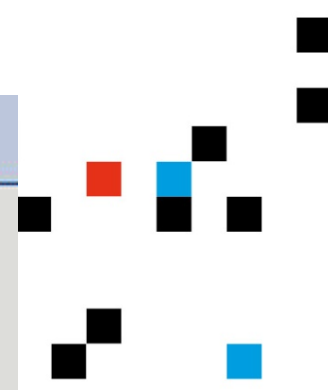
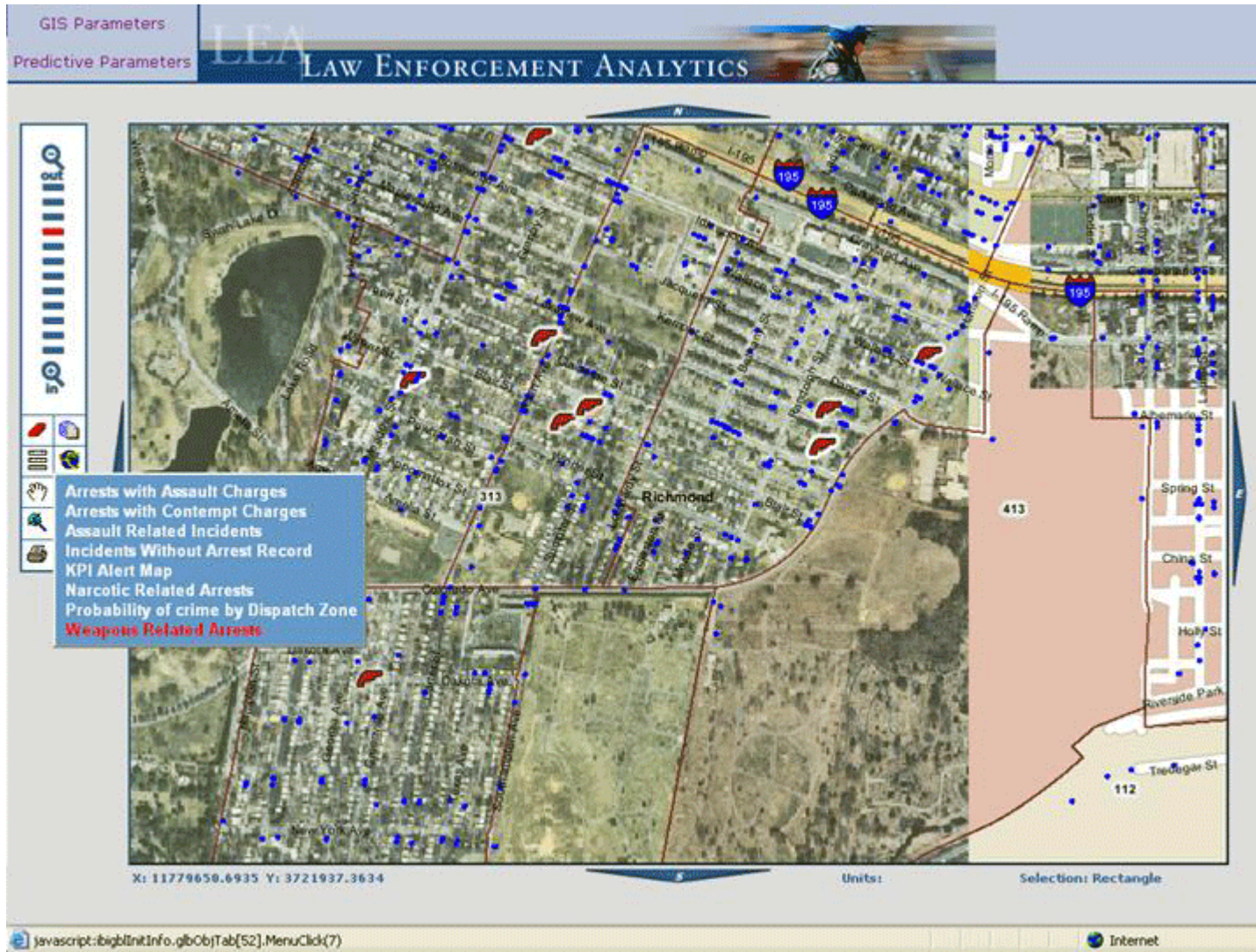
Results

- Proven model identifies actionable crime patterns
- Reduced crime
- Reduced staffing costs

E.g.: New Year's Eve (2003/4)

- 49% reduction in random gunfire incidents
- 246% increase in weapons seized
- Saved \$15,000 in overtime costs

Richmond, descriptive system



Richmond, predictive system

Richmond, facts of the results:

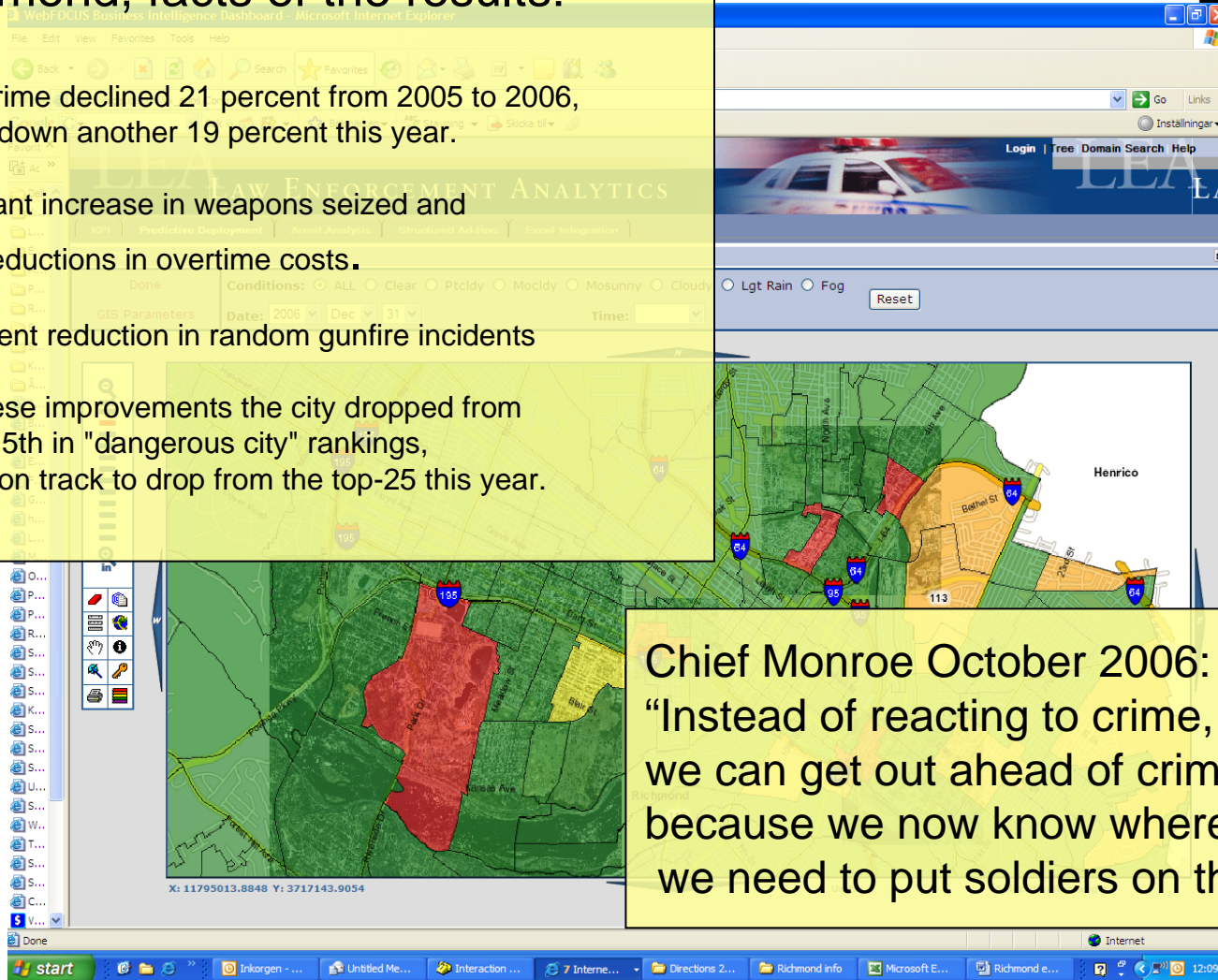
Major crime declined 21 percent from 2005 to 2006, and it's down another 19 percent this year.

Significant increase in weapons seized and

Great reductions in overtime costs.

49-percent reduction in random gunfire incidents

With these improvements the city dropped from fifth to 15th in "dangerous city" rankings, and it's on track to drop from the top-25 this year.



Chief Monroe October 2006:
"Instead of reacting to crime,
we can get out ahead of crime
because we now know where and when
we need to put soldiers on the street."



Beispiele von SPSS Kunden in den Bereichen Defense, Intelligence, Security und Law Enforcement



Defensie



NAVAL
POSTGRADUATE
SCHOOL



Ministerie van Binnenlandse Zaken en Koninkrijksrelaties



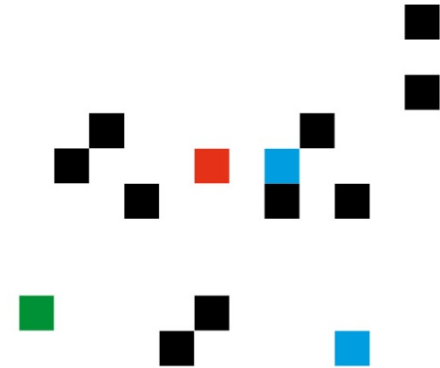
Greater Manchester
POLICE



Department of Health and Human Services
Centers for Disease Control and Prevention



- SPSS (Schweiz) AG gegründet 1996
- Consulting, Training und Software
- Consulting – Data Mining – Modelling – Beispiele:
 - Swiss Fundraising Direct Mail Panel
 - Orange Communications S.A. since 1999 (~ 40 models churn, cross-, upselling, risk, customer segmentation, collection path, still ongoing)
 - PostFinance (CRM models, prediction customer development)
 - Swisscom (e.g. Customer behavior on the Website)
 - Comparis (On line customer analytics)
 - Helvetia Insurances (HR solution with predictive models)
 - Orell Füssli Wirtschaftsinformationen (predictive models and segmentations)
 - Nespresso
 - Marionnaud
- Consulting fokussiert auf Predictive / Advanced Analytics
- Coaching – Know How Transfer



Kontakt

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CH-8044 Zürich

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info@spss.ch

www.spss.ch



The screenshot shows the SPSS Schweiz website homepage. At the top left is the SPSS (Schweiz) AG logo. To its right are navigation links: "français", "Kontakt", and "E-Letter". A search bar with a "Go" button is also present. Below the navigation is a main banner with the headline "SPSS Schweiz - Enabling the Predictive Enterprise". The banner features a woman's portrait, a paragraph of text about predictive analytics, and a link to "Grosse Zeitersparnis für das Swisscom Marketing dank innovativem Decision Management". Below the banner are three promotional boxes: "Business Analytics Forum", "NEU IBM SPSS Statistics 19", and "Neu: IBM SPSS Modeler 14". At the bottom, there are three columns of content: "SPSS setzt Standards" with a list of technologies, "SPSS@work" with a list of training topics, and "Good things" with a list of resources and a link to the SPSS website.

SPSS (Schweiz) AG

français Kontakt E-Letter Search Go

Home Dienstleistungen Software & Solutions Fachbücher Kurse Veranstaltungen Support

> SPSS Schweiz - Enabling the Predictive Enterprise

Entscheidungsrelevante Informationen sollten in allen Abteilungen Ihres Unternehmens oder Ihrer Organisation zur Verfügung stehen. Predictive analytics solutions von SPSS machen dies möglich.

Grosse Zeitersparnis für das [Swisscom Marketing dank innovativem Decision Management](#)

[Mehr Informationen zu SPSS Schweiz](#)

[Alle unsere Kundenberichte anschauen](#)

swisscom

Business Analytics Forum

NEU IBM SPSS Statistics 19

Neu: IBM SPSS Modeler 14

von Bäumen, Clustern Modellen

SPSS setzt Standards

Technologien

- [Statistik](#)
- [Online-Befragungen](#)
- [Enterprise Feedback Management](#)
- [Analytisches CRM](#)

SPSS@work

- [Einfache Patienten-Verwaltung bei der Psychiatrischen Klinik Wil](#)
- [Kieser Training kämpft gegen Rückenschmerzen und Muskelschwund](#)

Good things

- [Direkt zu SPSS Statistics](#)
- [SPSS Statistics kostenlos testen](#)
- Lösungen und SPSS-Patches: www.spss.com (login mit 2x spssswitzerland)

