SmileX

An ActiveX Decision-Analytic Reasoning Engine and Its Application to Evaluation of Credit Applicants

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Contents

- Organisation
- Probabilistic Reasoning
- SmileX
- Creditworthiness
- Demonstration
- Conclusions

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  - Acquiring the Numbers
  - Applications
- Demonstration
- Conclusions

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Organisation

- TU Delft
  - Knowledge Based Systems Group
- University of Pittsburgh
  - Decision Systems Laboratory
  - GeNIe and SMILE

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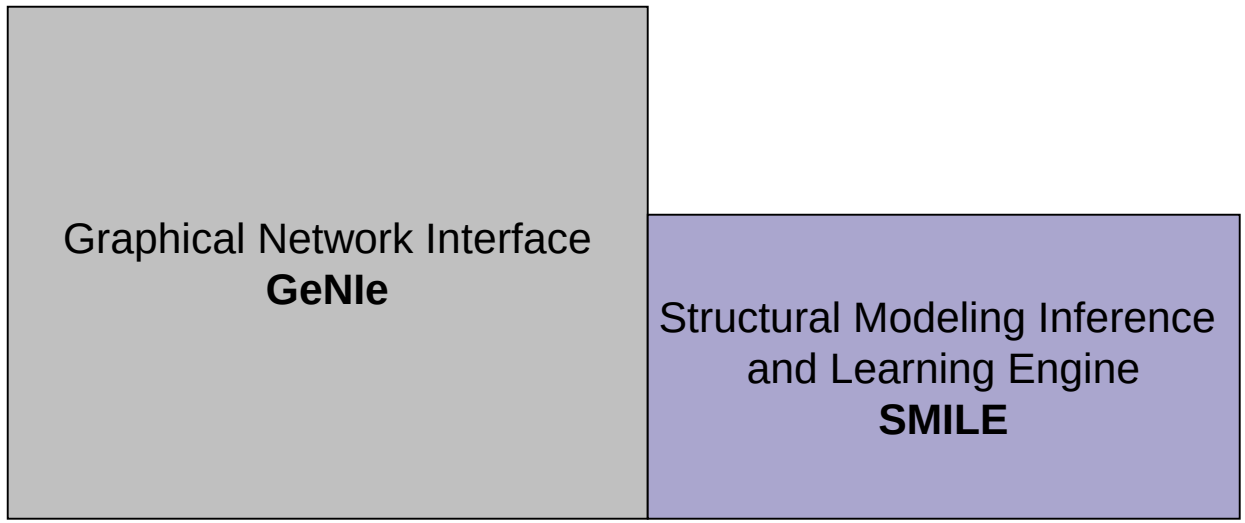
GeNIe and SMILE



User-interface

C++ Library

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Probabilistic Reasoning

- Bayesian Networks
  - Nodes
  - Causal Relations
  - Inference
- Influence Diagrams
  - Temporal Relations
  - Values

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Bayes Theorem

$$\mathbf{P}(A|B) = \frac{\mathbf{P}(A \text{ and } B)}{\mathbf{P}(B)}$$

Of:

$$\mathbf{P}(A|B) = \mathbf{P}(B|A) * \frac{\mathbf{P}(A)}{\mathbf{P}(B)}$$

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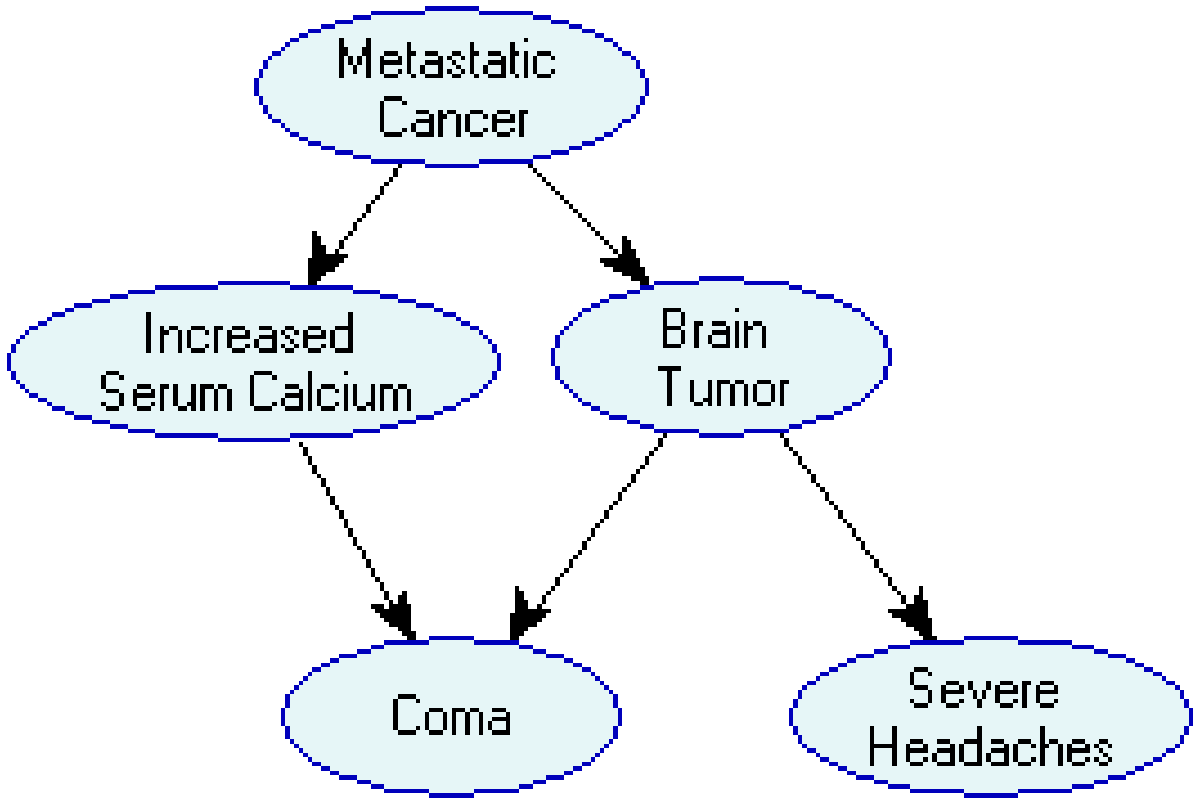
Bayesian Network



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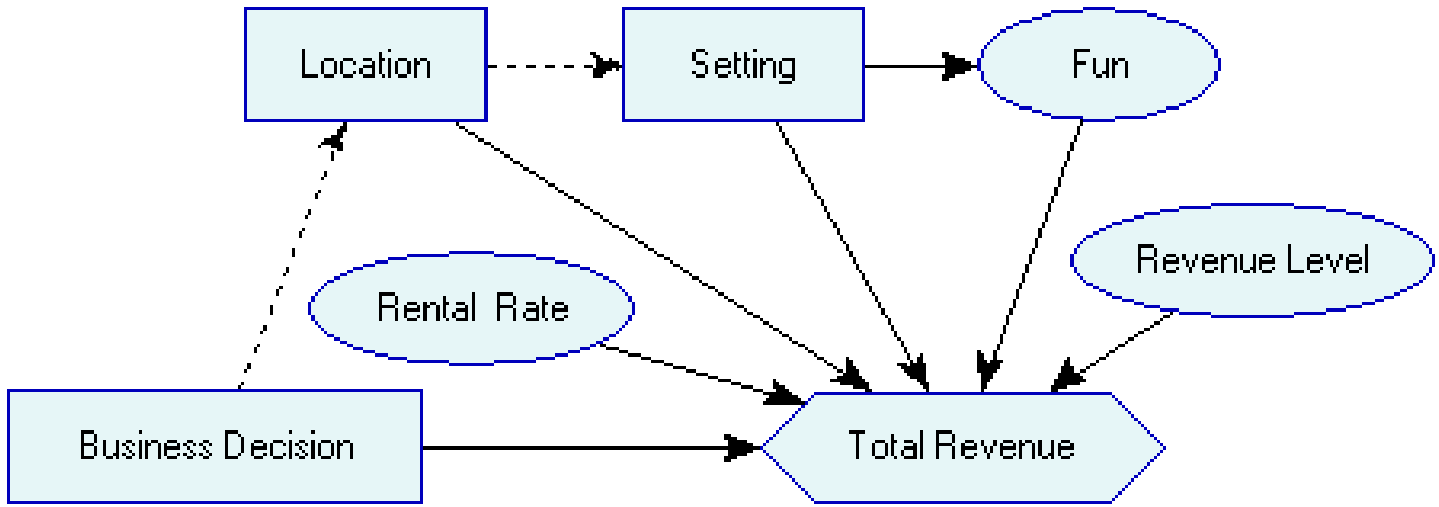
Influence Diagram



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SmileX

- Requirements
- Rewriting or Wrapping?
- Client-Server Schemes
- ActiveX
- Applications

SmileX - Requirements

- Making AI Algorithms of SMILE accessible for non-C++ programmers
- Enable web-developers to use AI in their Web-applications
- Creating an Easy-access version of SMILE

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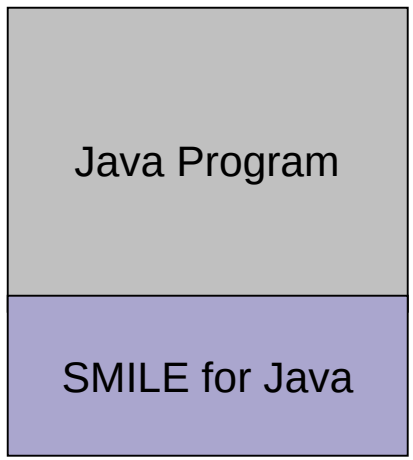
SmileX - Rewriting or Wrapping?

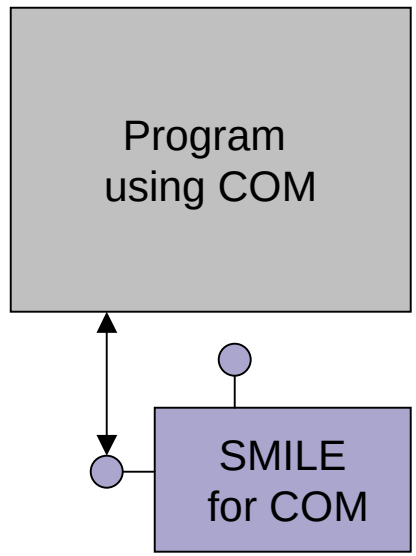
- Rewriting
  - Java
  - Component Object Model (COM)
- Wrapping
  - Java Native Interface (JNI)
  - ActiveX

Rewriting

Java

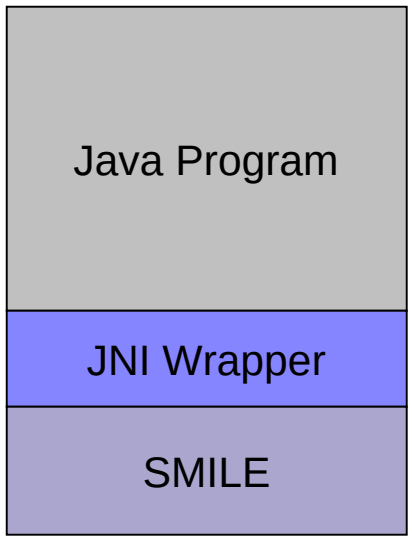


COM

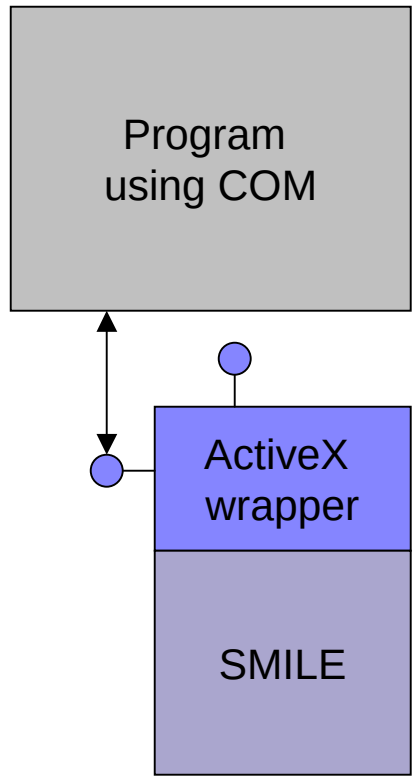


Wrapping

Java Native Interface



ActiveX



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SmileX - Client/Server Schemes

- Classic Approach

  Algorithms Run on Server

- ActiveX/JNI model

  Algorithms Run on Client

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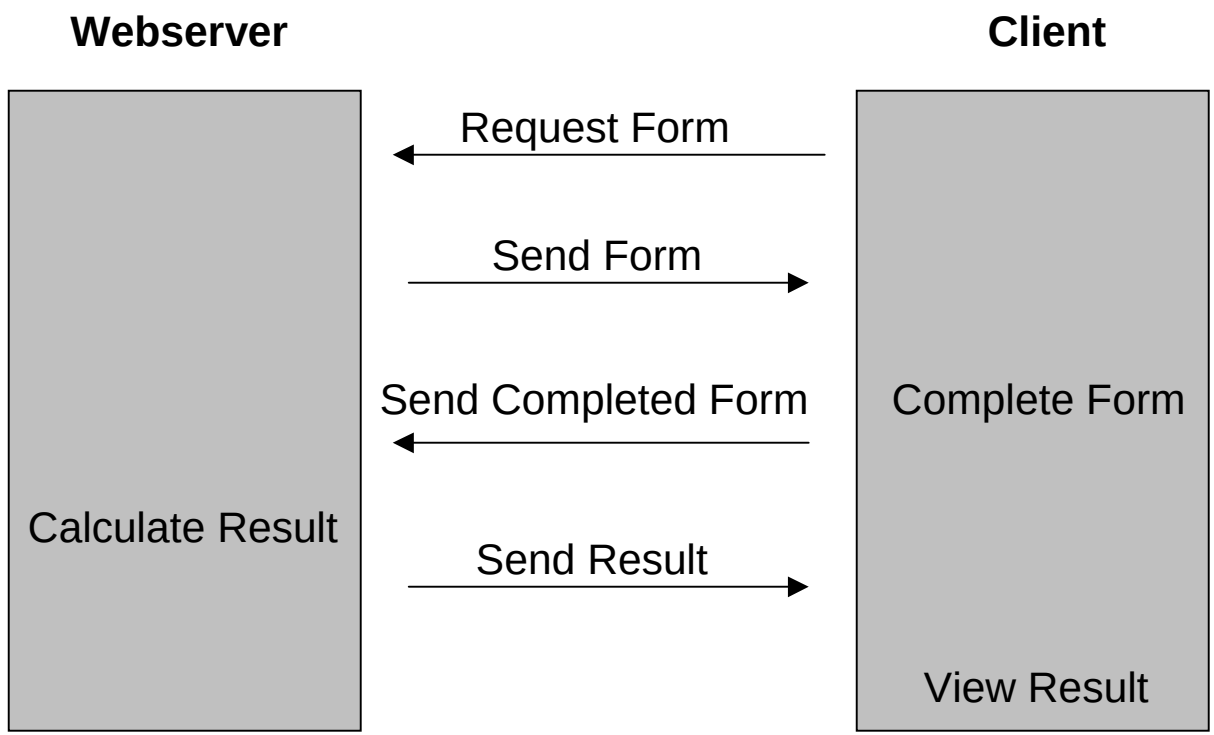
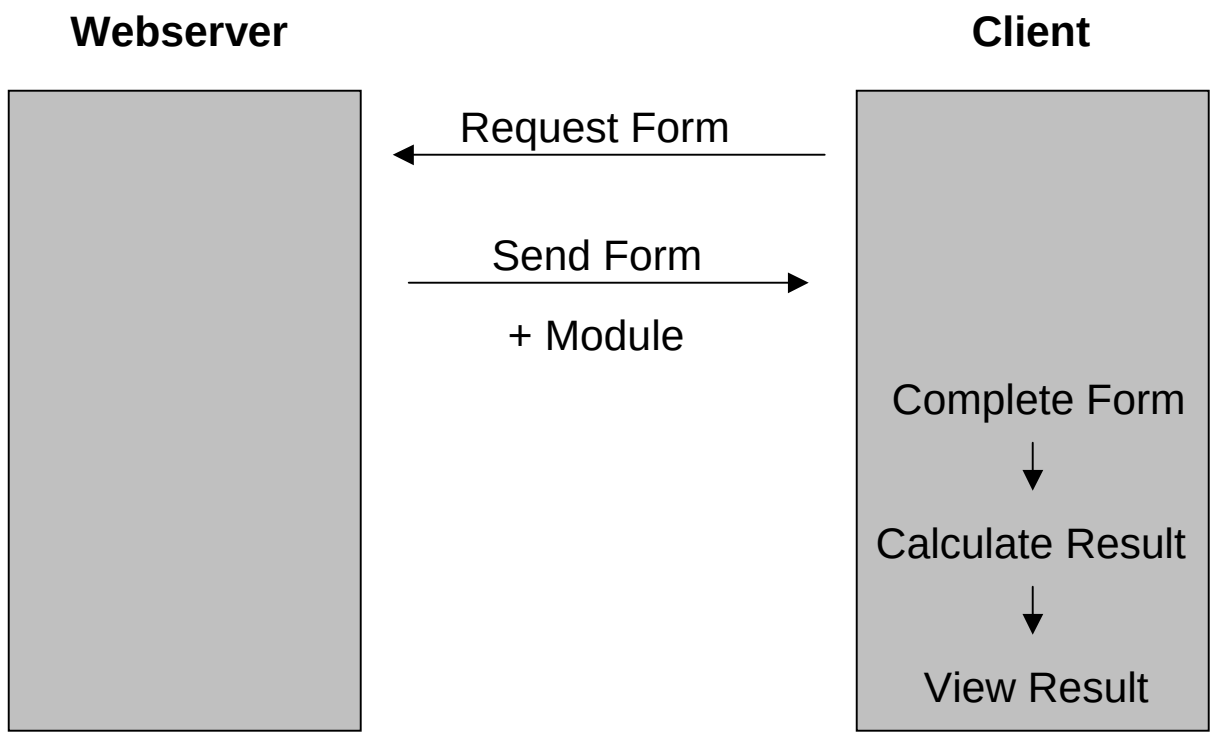
Classic Approach



JNI/ActiveX Approach



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SmileX - ActiveX

- ActiveX as an Extension to COM
- Advantages
  - Programming Environments
  - Scripting
- Disadvantage
  - Platform Dependent, tied to Microsoft Products

SmileX - Applications

- Hazardous Materials (Web)
- Lawfirm (Visual Basic)
- Credit Evaluation (Web + Excel)

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Creditworthiness

- Problem description
- Approaches
- The Six C's
- Bayesian Model
- Acquiring the Numbers
- Applications

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Credit - Problem Description

- Environment
- Objective : Making Profit
- Decision : Grant or Deny Loan
- Decision-makers

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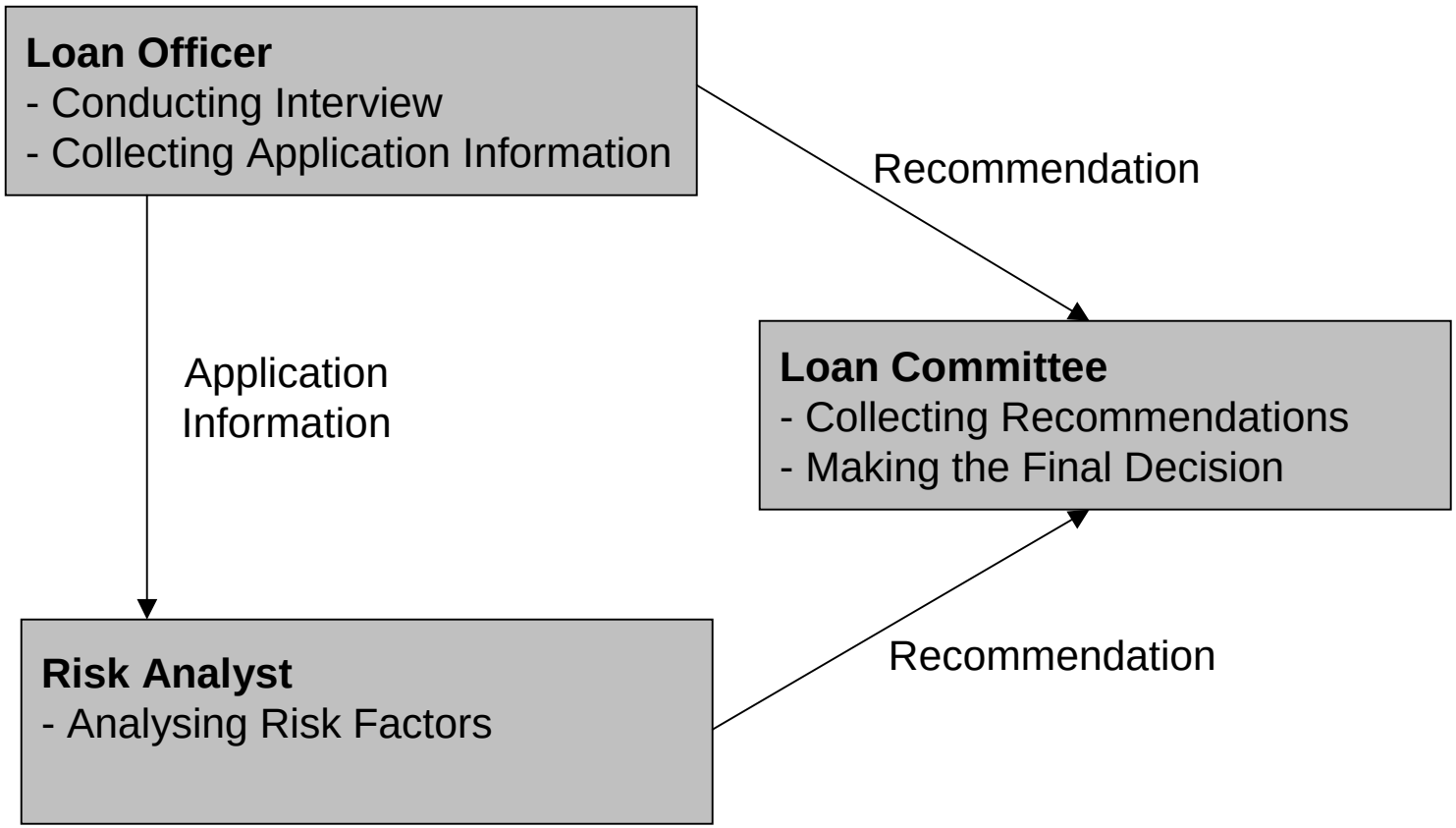
Decision Makers



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Credit - Approaches

- Human Judgement
- Neural Network
- Bayesian Network

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Human Judgement

- Advantages
  - Personal Interaction
  - ‘Open’ for Special Cases
- Disadvantages
  - Complexity
  - Inconsistency
  - Inconvenience
  - Expensive

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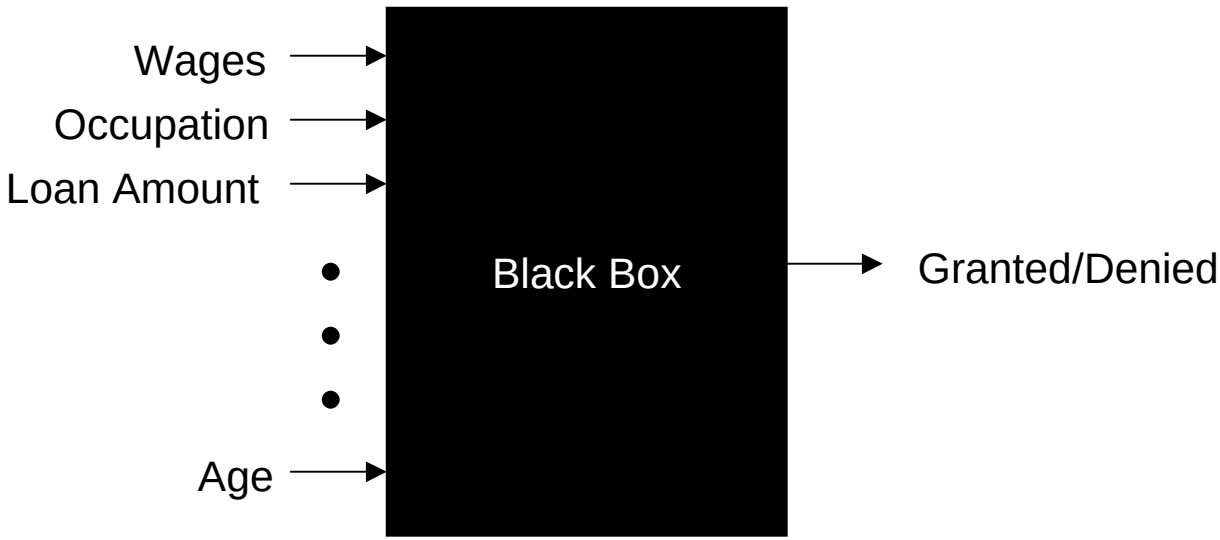
Neural Network



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Neural Networks

- Advantages
  - Consistent
  - Easy to Learn
  - No Model/Expert Knowledge Needed
- Disadvantages
  - Only Testcases Where Credit was Granted
  - Black Box
  - Special Cases

Bayesian Network

- Advantages
  - Consistent
  - Insight in Decision Process
  - Not Dependent on Learning
  - DSL has Great Expertise

- Disadvantages
  - Number of Definition Values
  - Requires Model/Expert Knowledge

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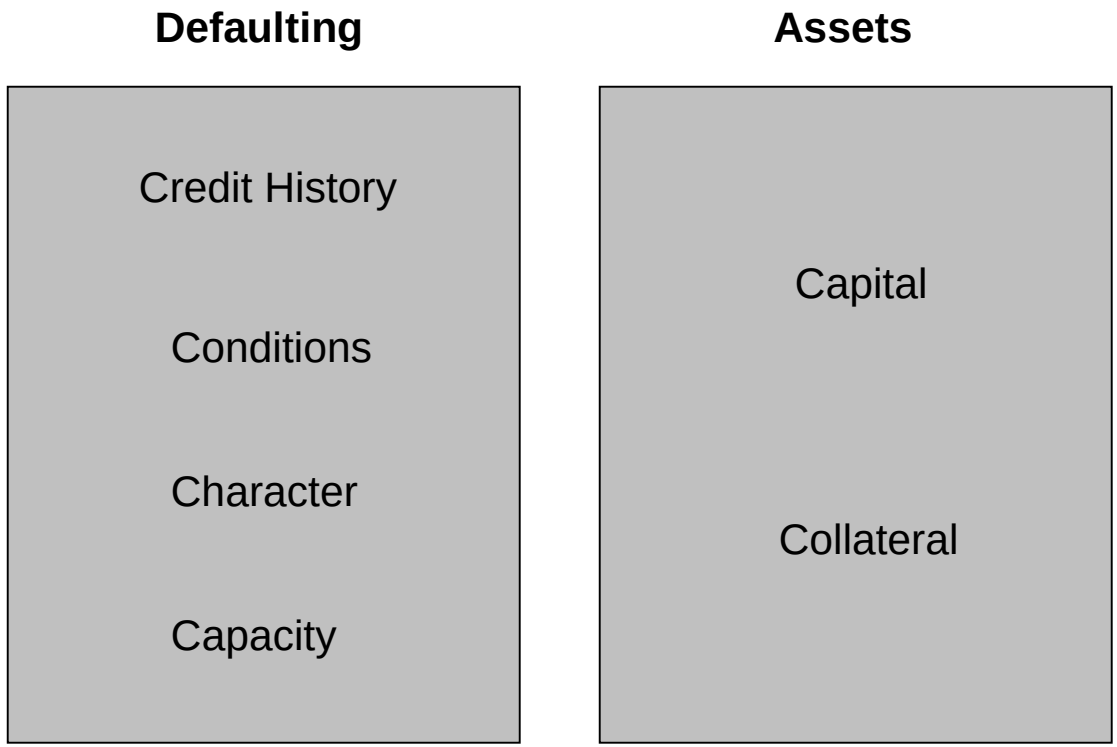
Credit - The Six C's



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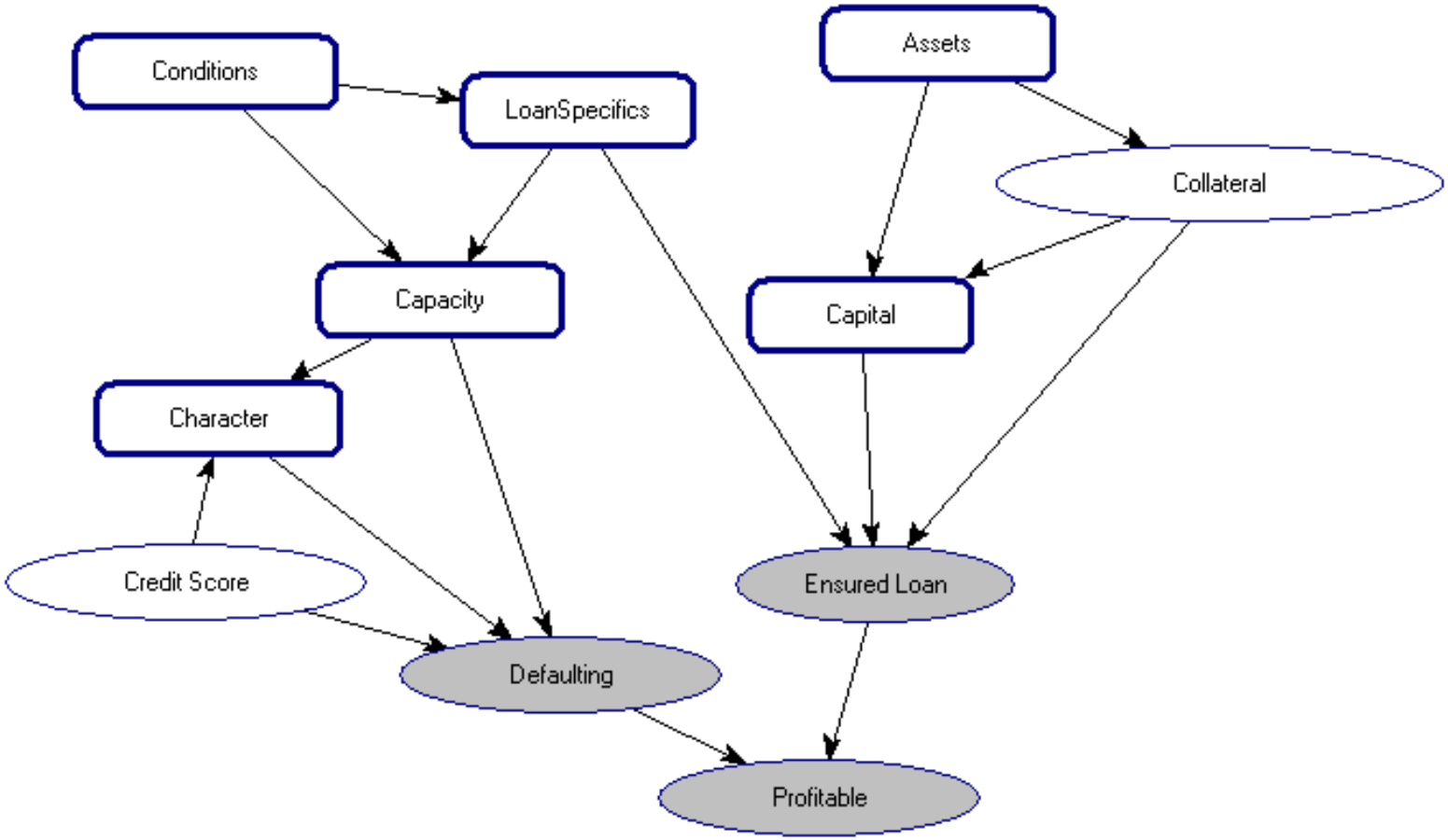
Credit - Bayesian Model



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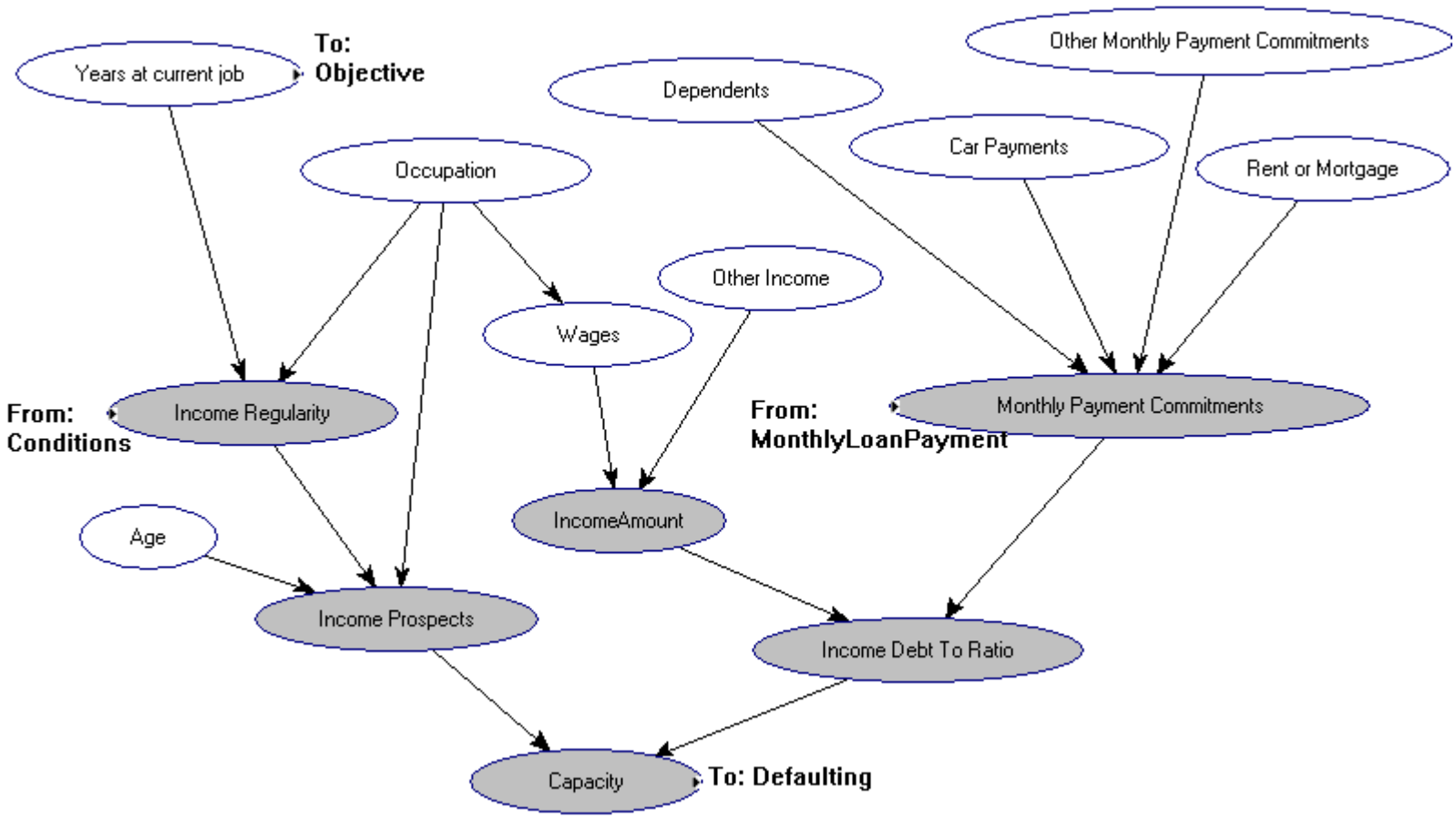
Submodel Capacity



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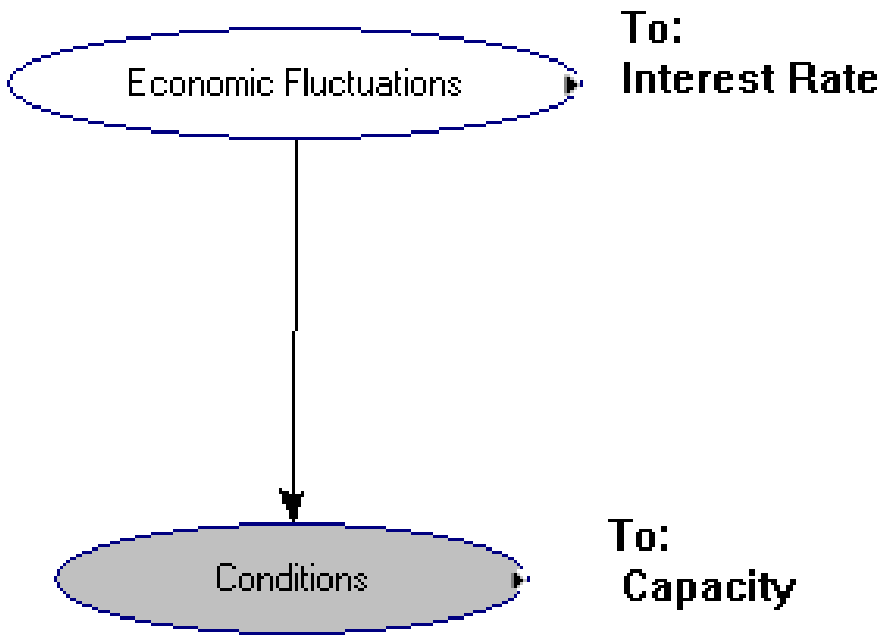
Submodel Conditions



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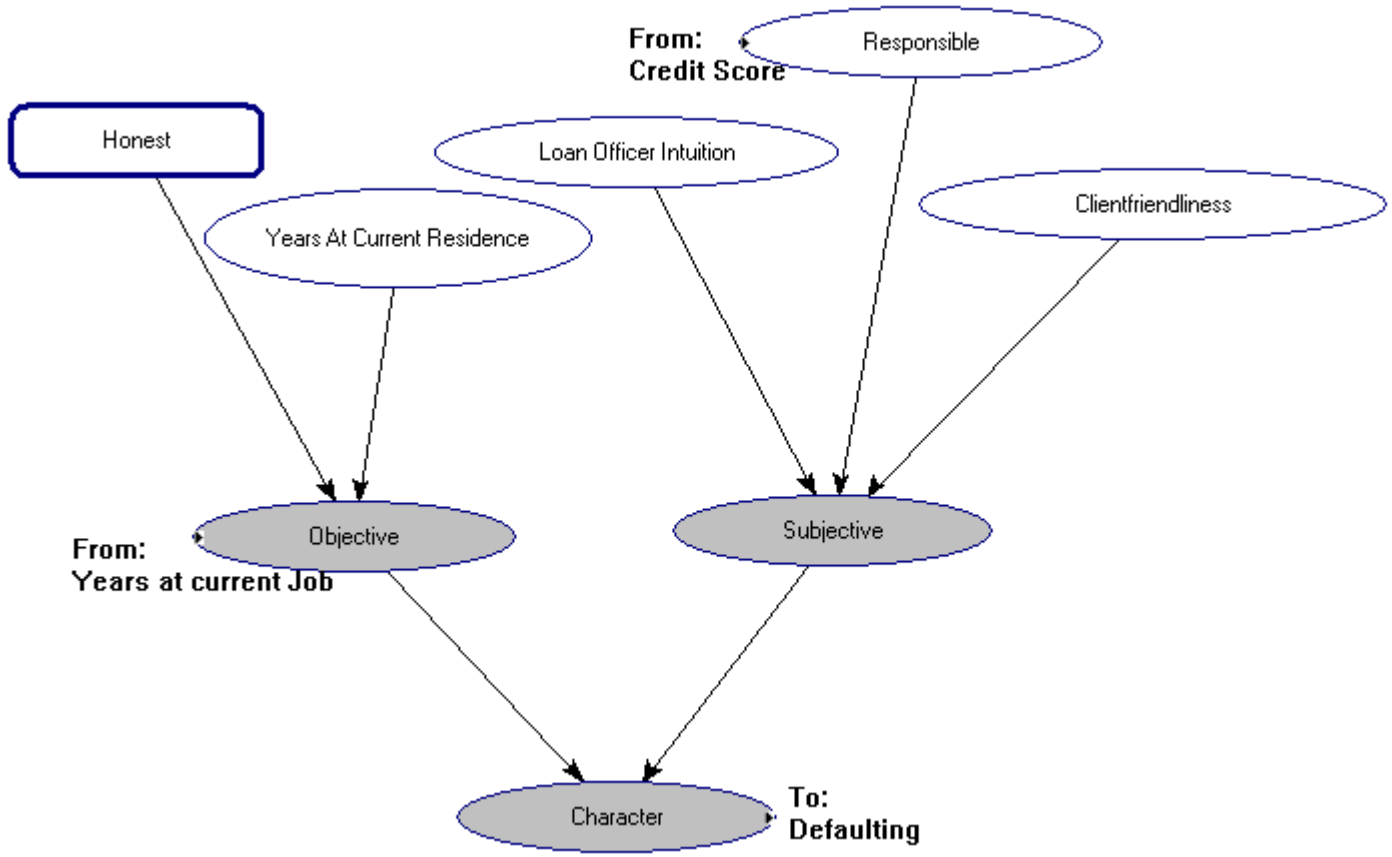
Submodel Character



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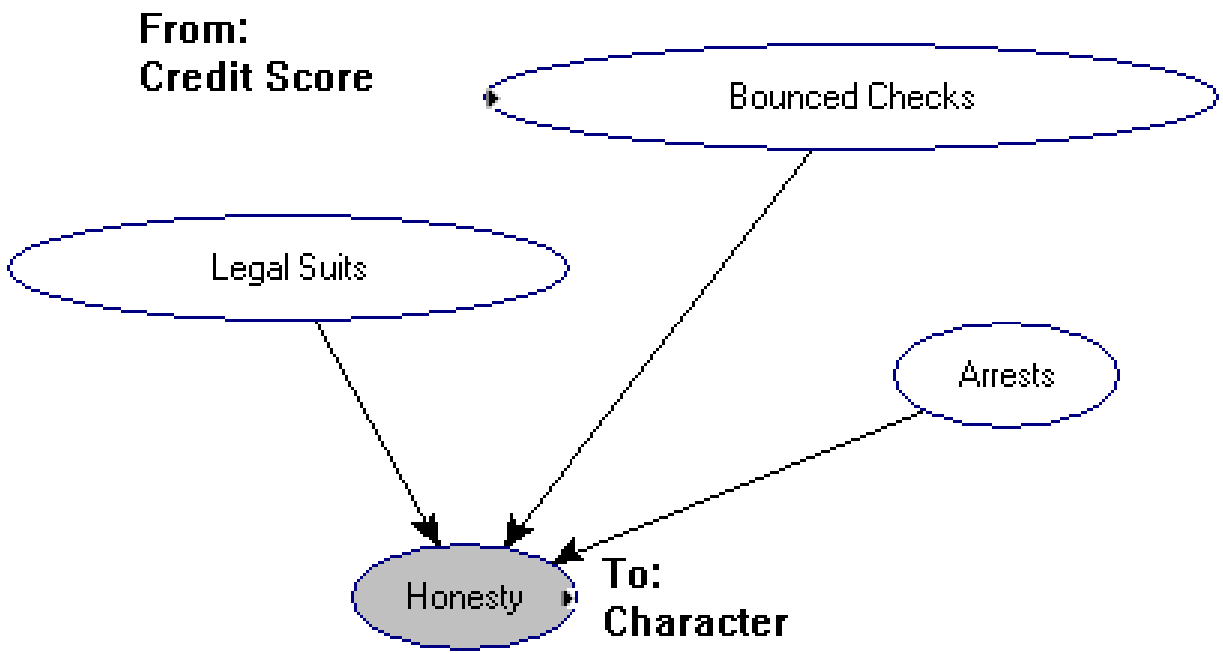
Submodel Honesty



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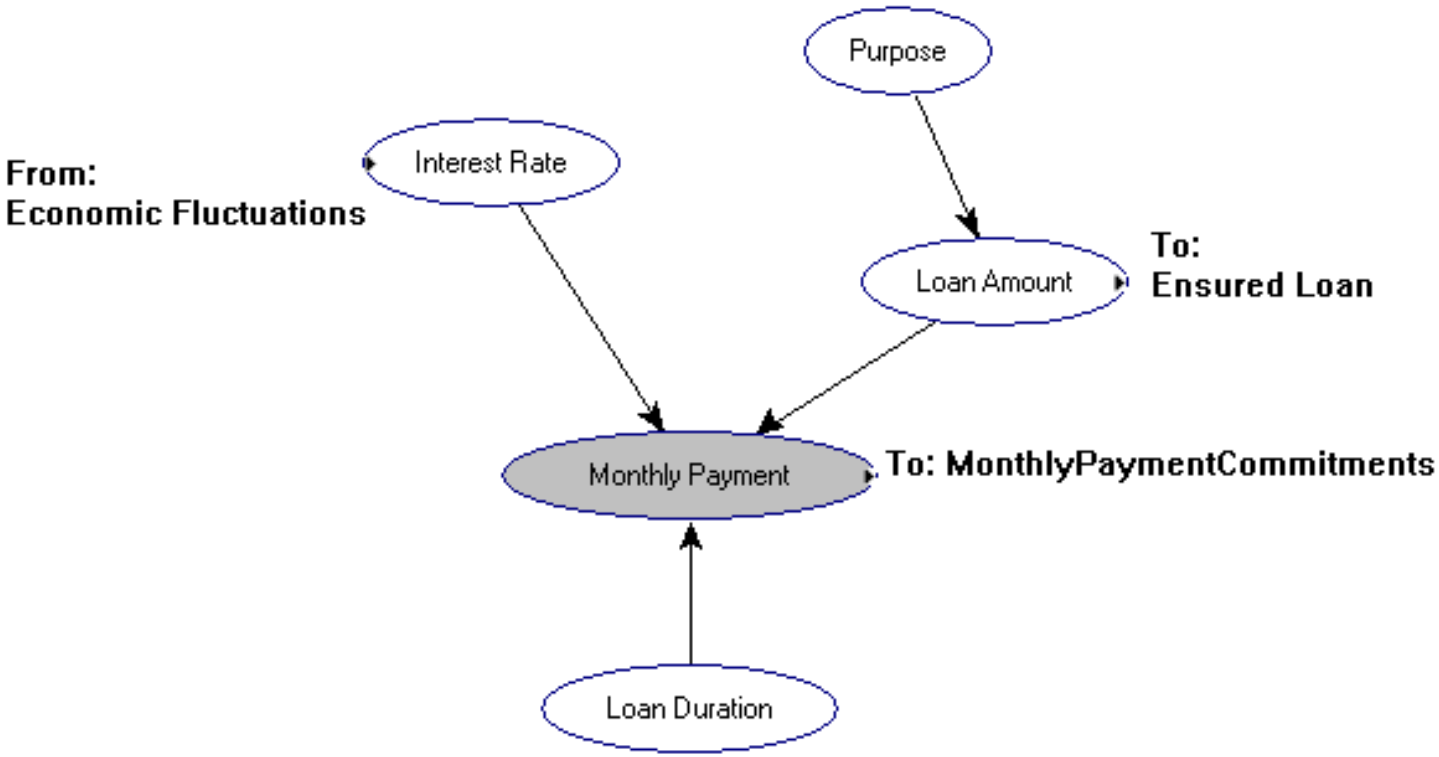
Submodel Loan Specifics



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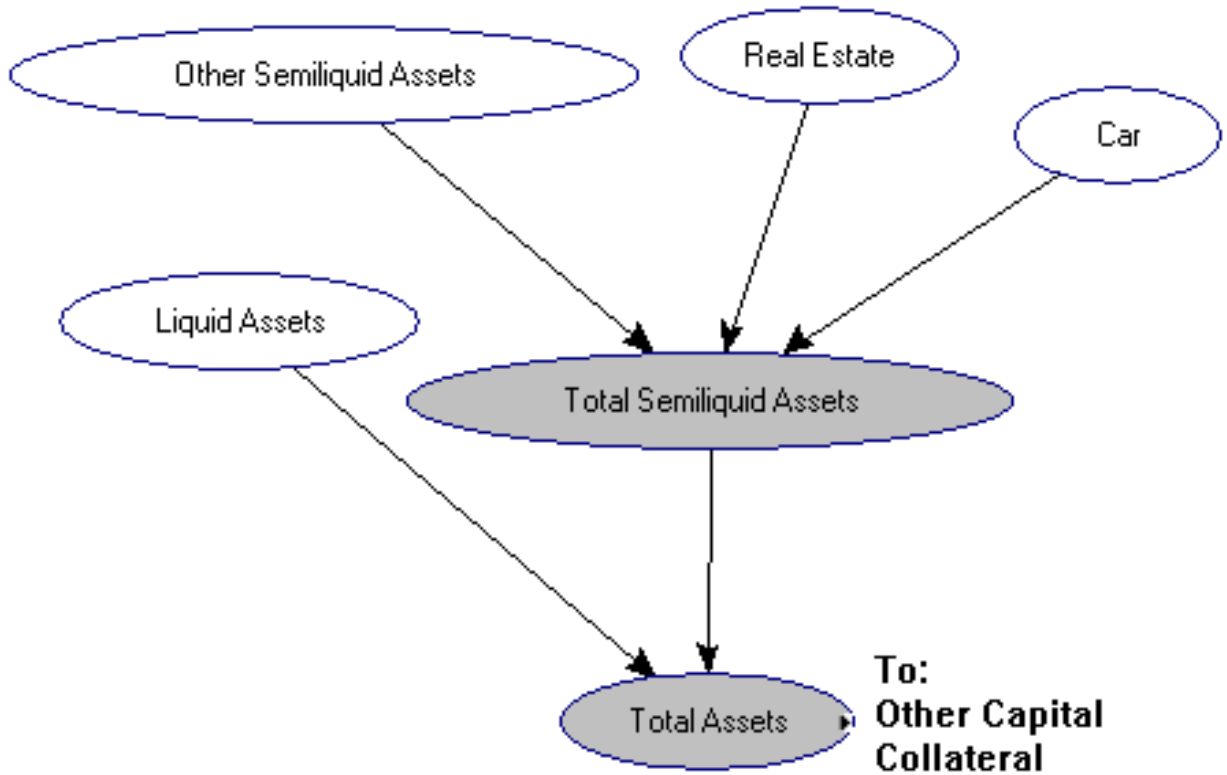
Submodel Assets



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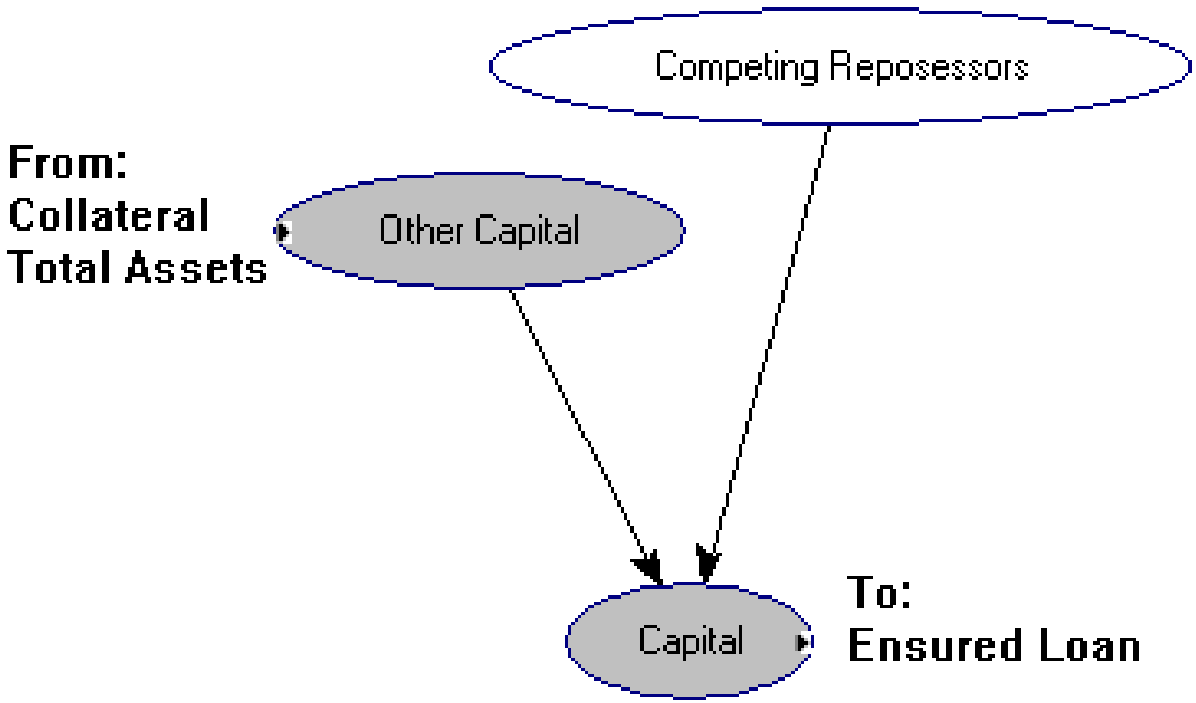
Submodel Capital



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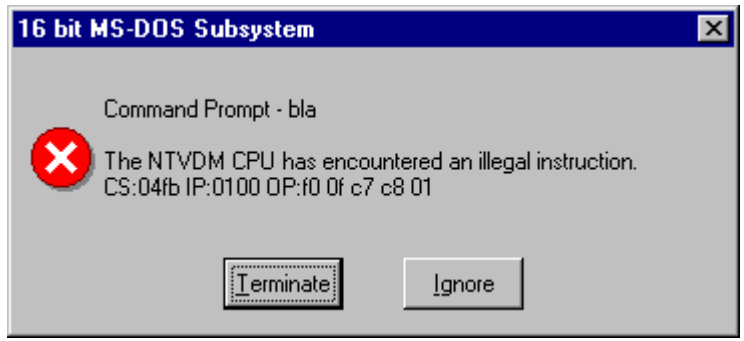
Credit - Acquiring the Numbers

- General Sources
  - Literature
  - WWW
- Expert Knowledge
  - Assessment of Uncertainties
- Prototype
  - Learned from Test Data

Credit - Applications

- WWW interface for Client
- Excel Interface for Bank

Demonstration



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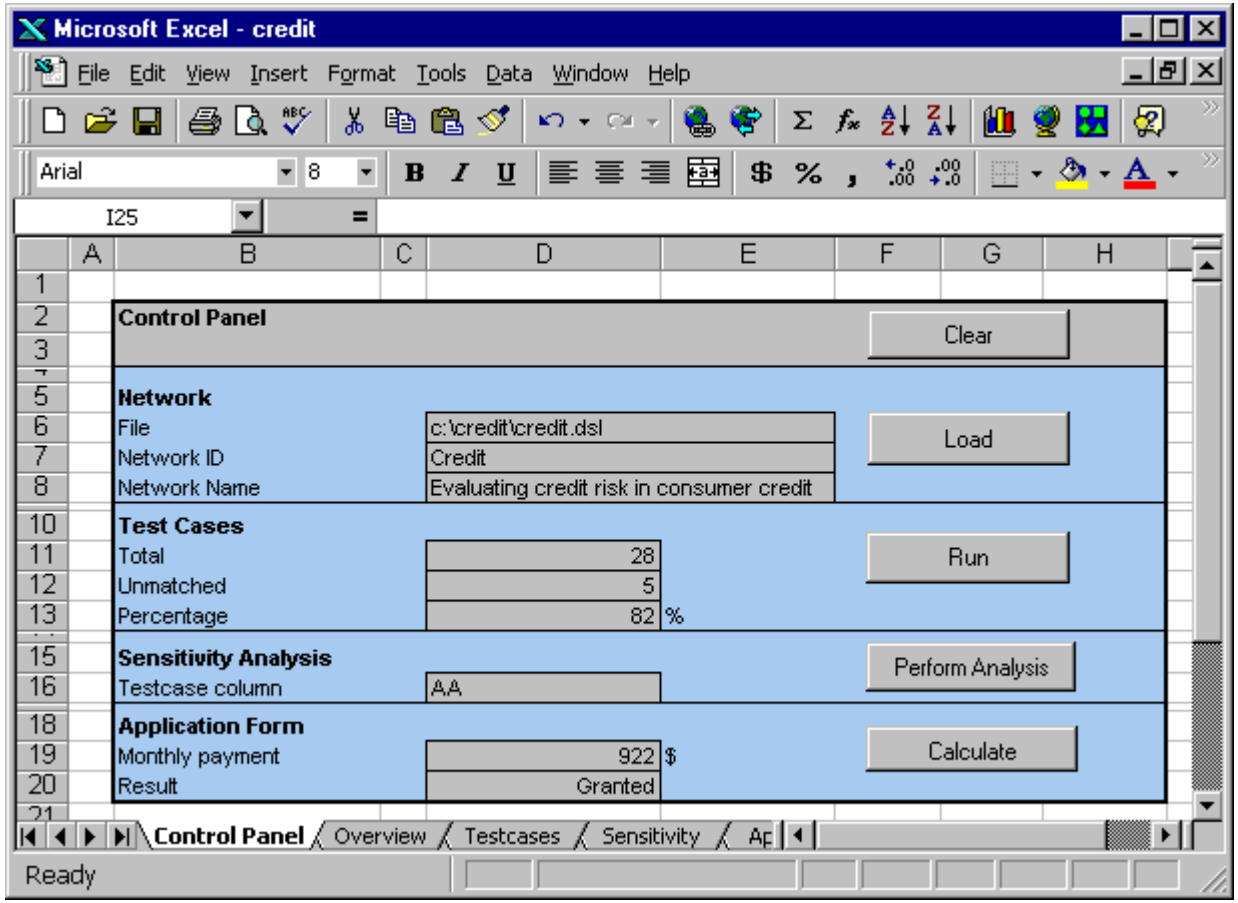
Control Panel



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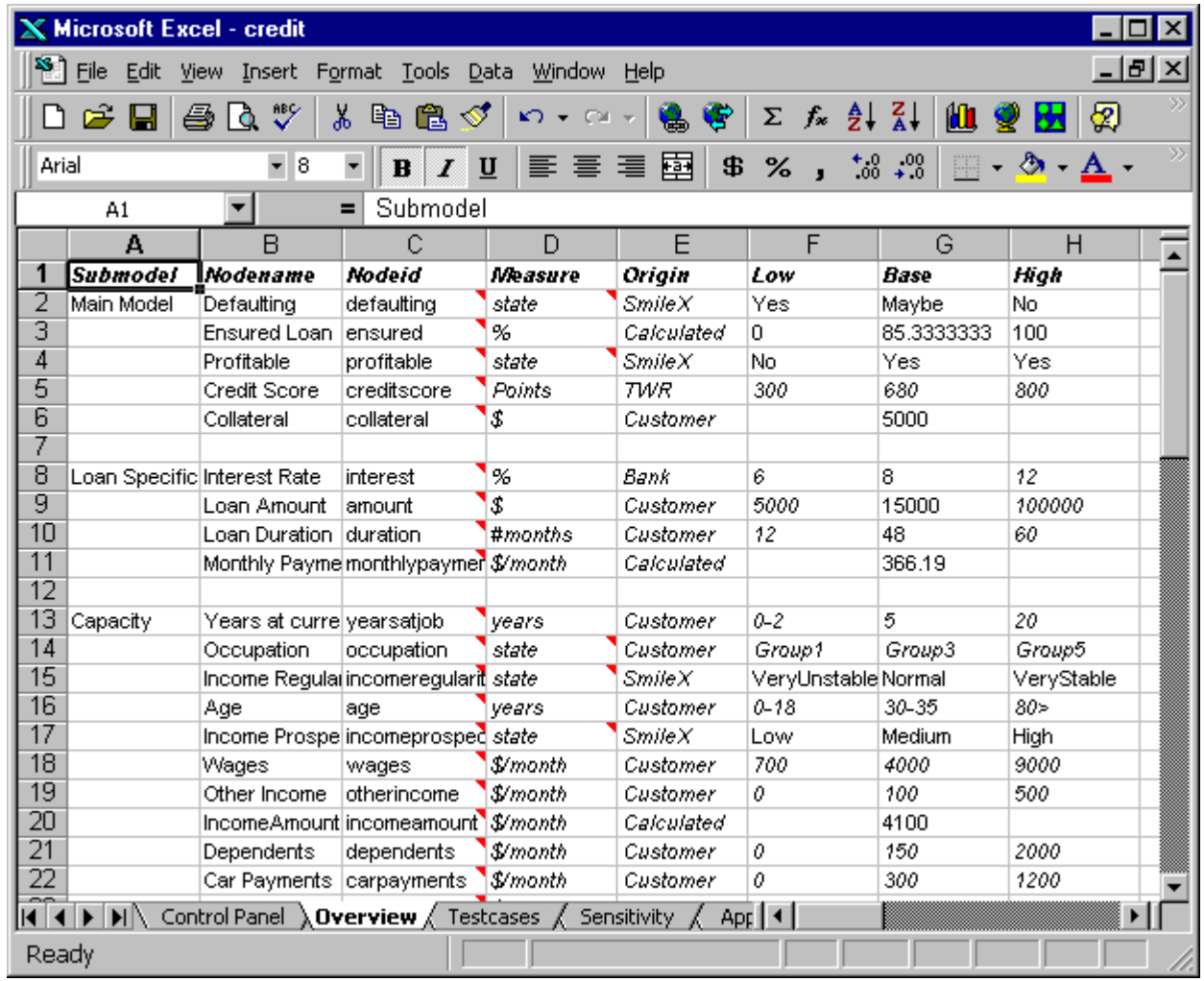
Overview



Microsoft Excel - credit

File Edit View Insert Format Tools Data Window Help

Arial 8

A1 = Submodel

	A	B	C	D	E	F	G	H
1	**Submodel**	**Nodename**	**Nodeid**	**Measure**	**Origin**	**Low**	**Base**	**High**
2	Main Model	Defaulting	defaulting	state	SmileX	Yes	Maybe	No
3		Ensured Loan	ensured	%	Calculated	0	85.3333333	100
4		Profitable	profitable	state	SmileX	No	Yes	Yes
5		Credit Score	creditscore	Points	TWR	300	680	800
6		Collateral	collateral	$	Customer		5000	
7								
8	Loan Specific	Interest Rate	interest	%	Bank	6	8	12
9		Loan Amount	amount	$	Customer	5000	15000	100000
10		Loan Duration	duration	#months	Customer	12	48	60
11		Monthly Payme	monthlypaymer	$/month	Calculated		366.19	
12								
13	Capacity	Years at curre	yearsatjob	years	Customer	0-2	5	20
14		Occupation	occupation	state	Customer	Group1	Group3	Group5
15		Income Regula	incomeregularit	state	SmileX	VeryUnstable	Normal	VeryStable
16		Age	age	years	Customer	0-18	30-35	80>
17		Income Prospe	incomeprospec	state	SmileX	Low	Medium	High
18		Wages	wages	$/month	Customer	700	4000	9000
19		Other Income	otherincome	$/month	Customer	0	100	500
20		IncomeAmount	incomeamount	$/month	Calculated		4100	
21		Dependents	dependents	$/month	Customer	0	150	2000
22		Car Payments	carpayments	$/month	Customer	0	300	1200

Control Panel | Overview | Testcases | Sensitivity | App

Ready

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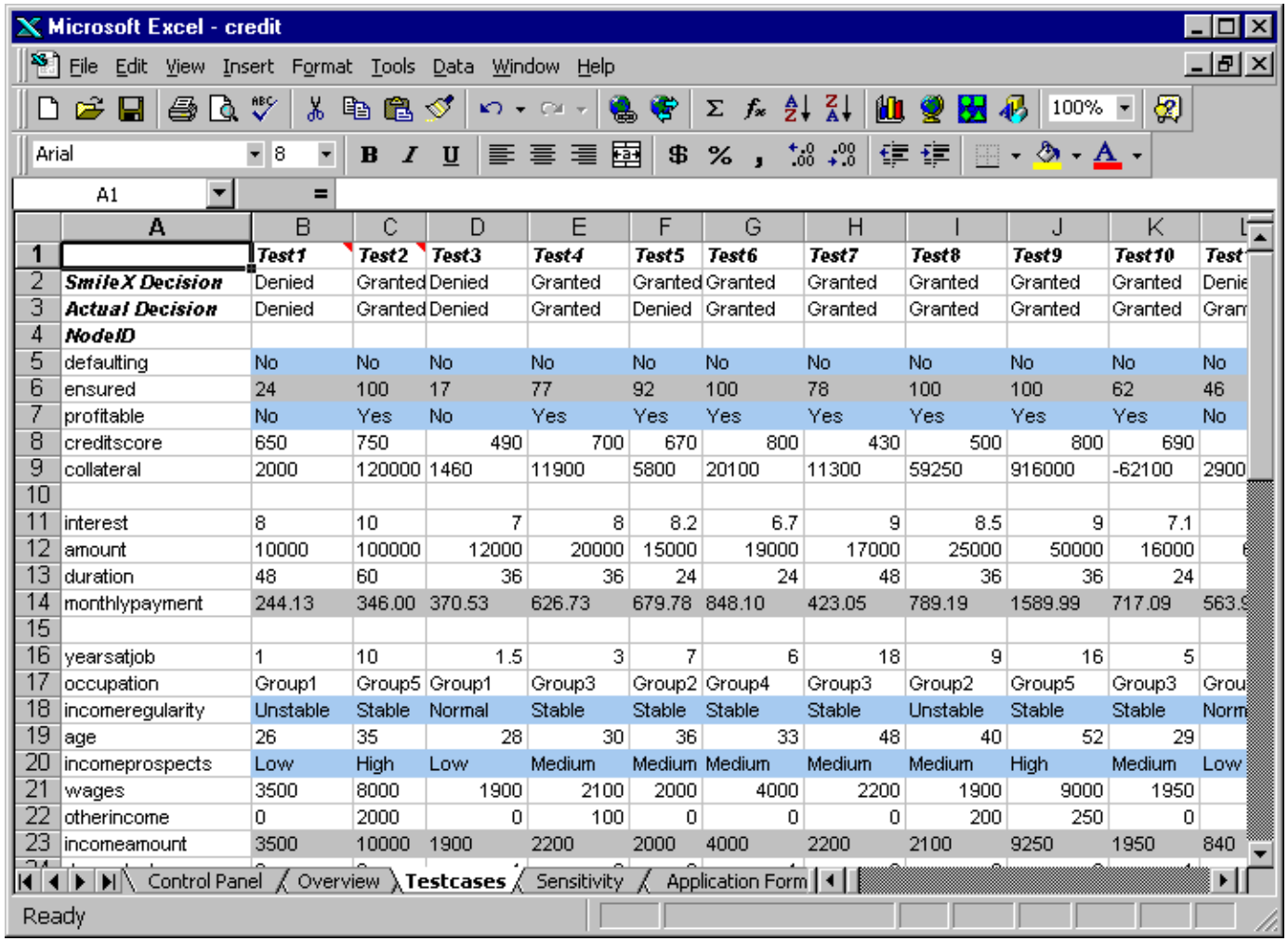
Testcases



	A	B	C	D	E	F	G	H	I	J	K	L
1		*Test1*	*Test2*	*Test3*	*Test4*	*Test5*	*Test6*	*Test7*	*Test8*	*Test9*	*Test10*	*Test*
2	***SmileX Decision***	Denied	Granted	Denied	Granted	Granted	Granted	Granted	Granted	Granted	Granted	Denie
3	***Actual Decision***	Denied	Granted	Denied	Granted	Denied	Granted	Granted	Granted	Granted	Granted	Gran
4	***NodeID***											
5	defaulting	No	No	No	No	No	No	No	No	No	No	No
6	ensured	24	100	17	77	92	100	78	100	100	62	46
7	profitable	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
8	creditscore	650	750	490	700	670	800	430	500	800	690	
9	collateral	2000	120000	1460	11900	5800	20100	11300	59250	916000	-62100	2900
10												
11	interest	8	10	7	8	8.2	6.7	9	8.5	9	7.1	
12	amount	10000	100000	12000	20000	15000	19000	17000	25000	50000	16000	
13	duration	48	60	36	36	24	24	48	36	36	24	
14	monthlypayment	244.13	346.00	370.53	626.73	679.78	848.10	423.05	789.19	1589.99	717.09	563.9
15												
16	yearsatjob	1	10	1.5	3	7	6	18	9	16	5	
17	occupation	Group1	Group5	Group1	Group3	Group2	Group4	Group3	Group2	Group5	Group3	Grou
18	incomeregularity	Unstable	Stable	Normal	Stable	Stable	Stable	Stable	Unstable	Stable	Stable	Norm
19	age	26	35	28	30	36	33	48	40	52	29	
20	incomeprospects	Low	High	Low	Medium	Medium	Medium	Medium	Medium	High	Medium	Low
21	wages	3500	8000	1900	2100	2000	4000	2200	1900	9000	1950	
22	otherincome	0	2000	0	100	0	0	0	200	250	0	
23	incomeamount	3500	10000	1900	2200	2000	4000	2200	2100	9250	1950	840

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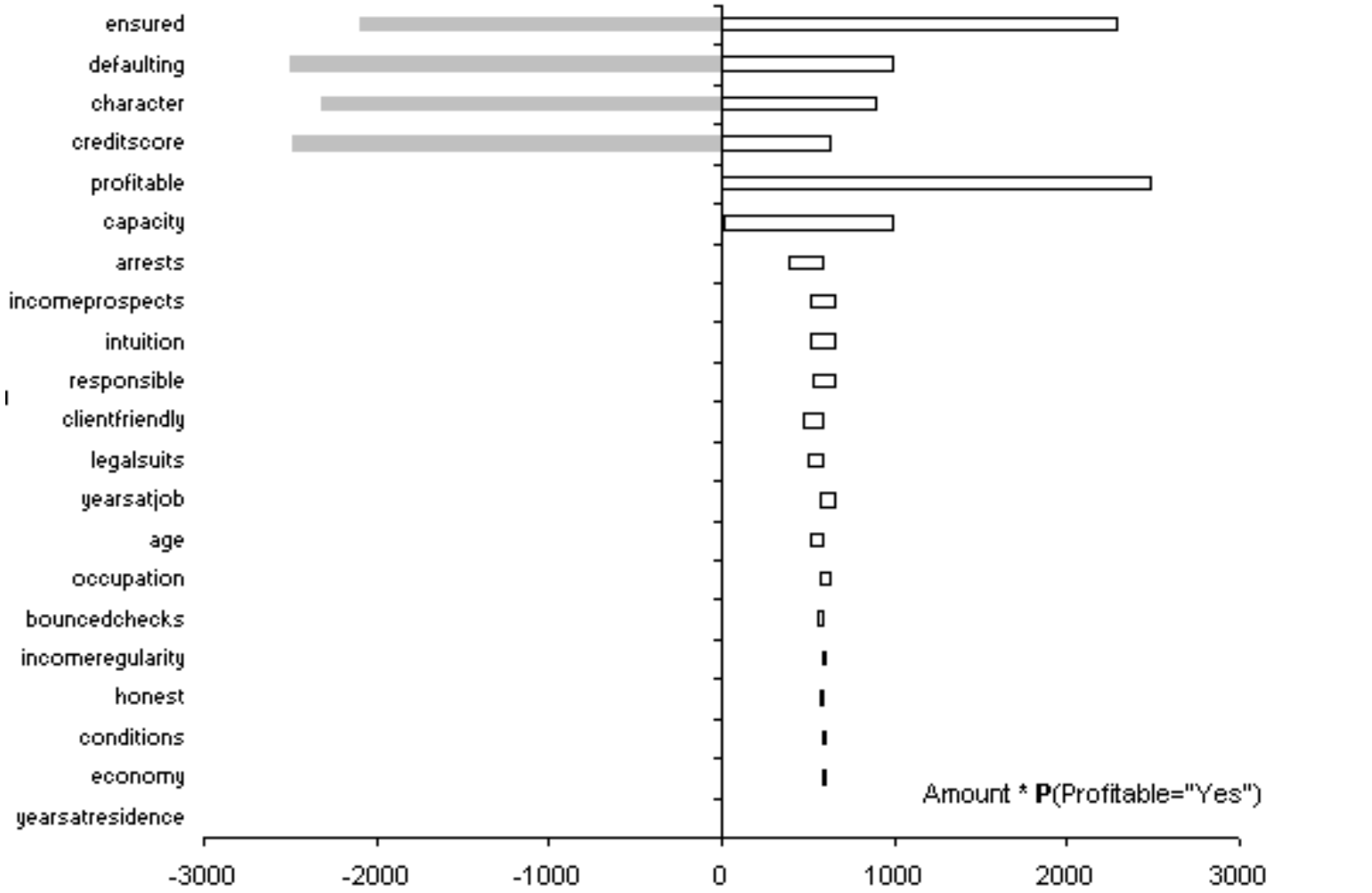
Sensitivity - Creditscore



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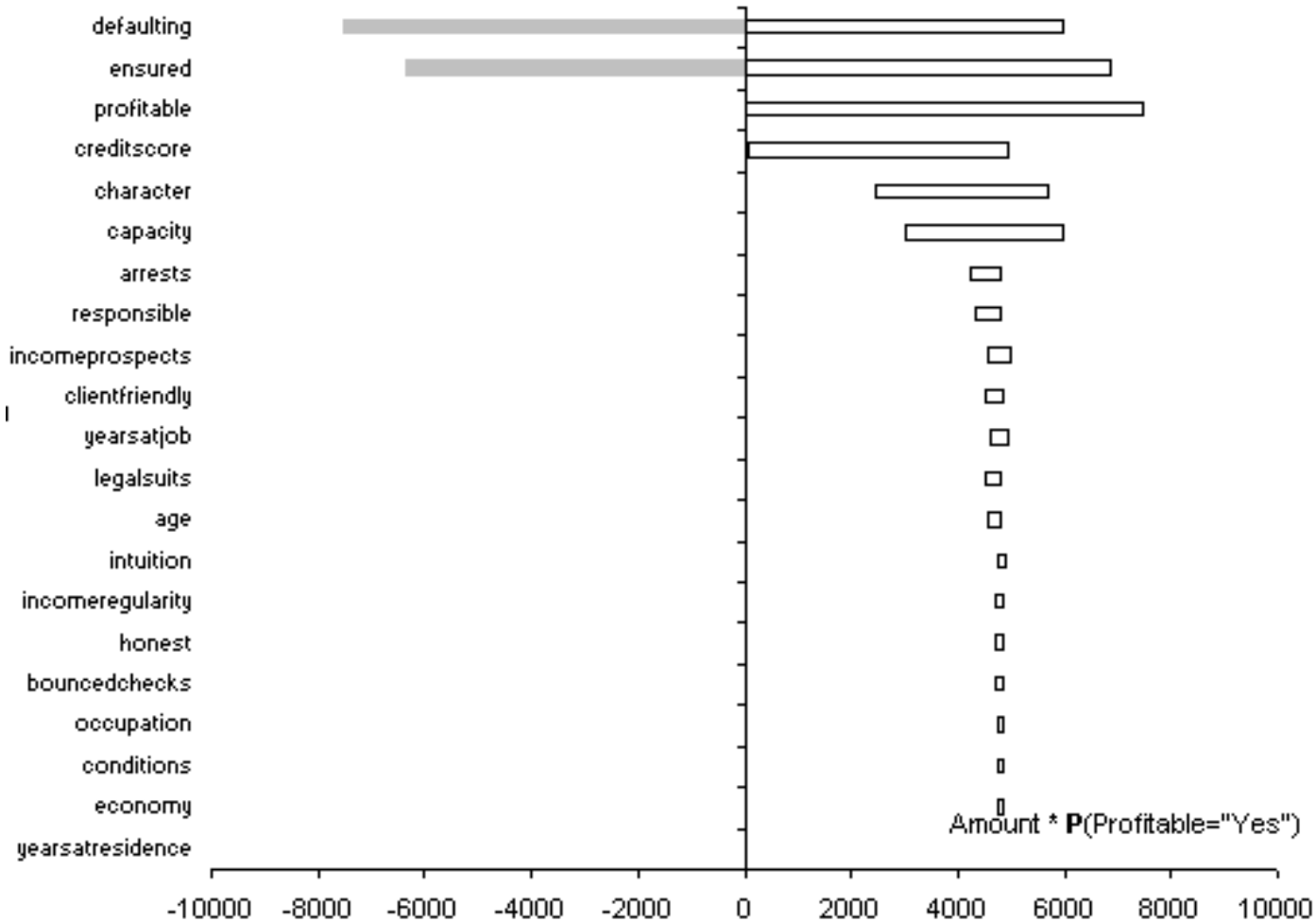
Sensitivity - Ensured



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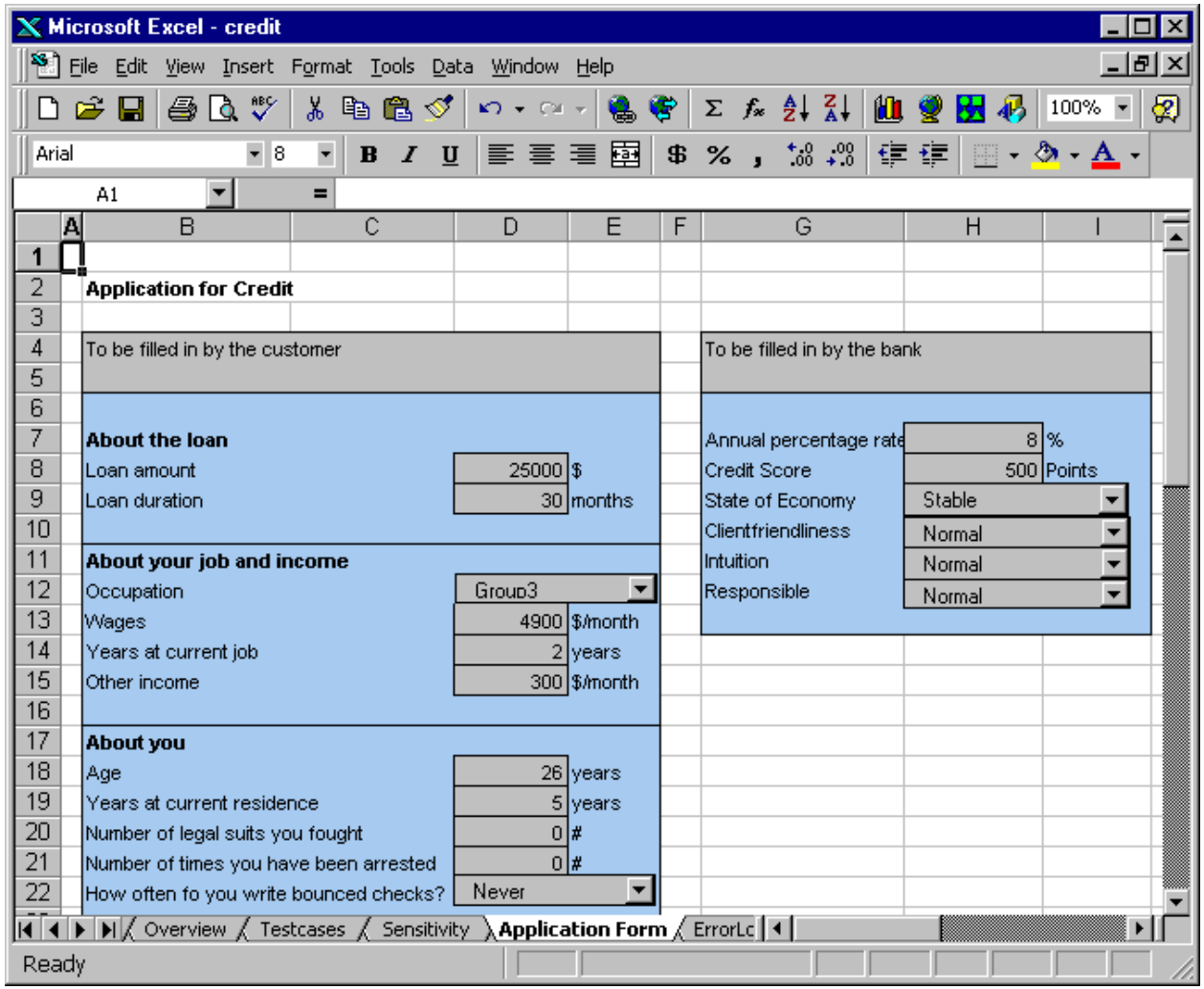
Excel - Application Form



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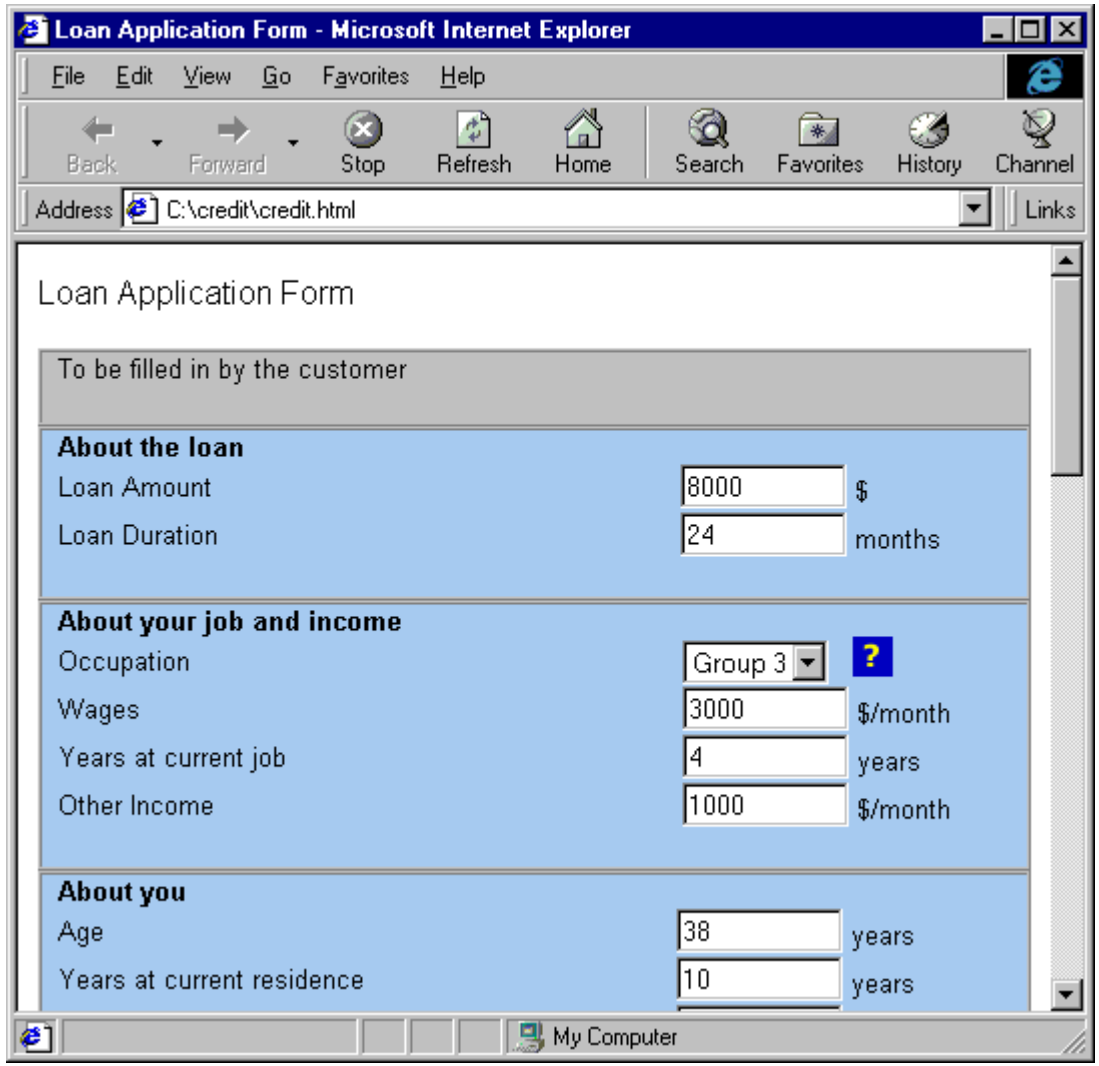
WWW - Application Form



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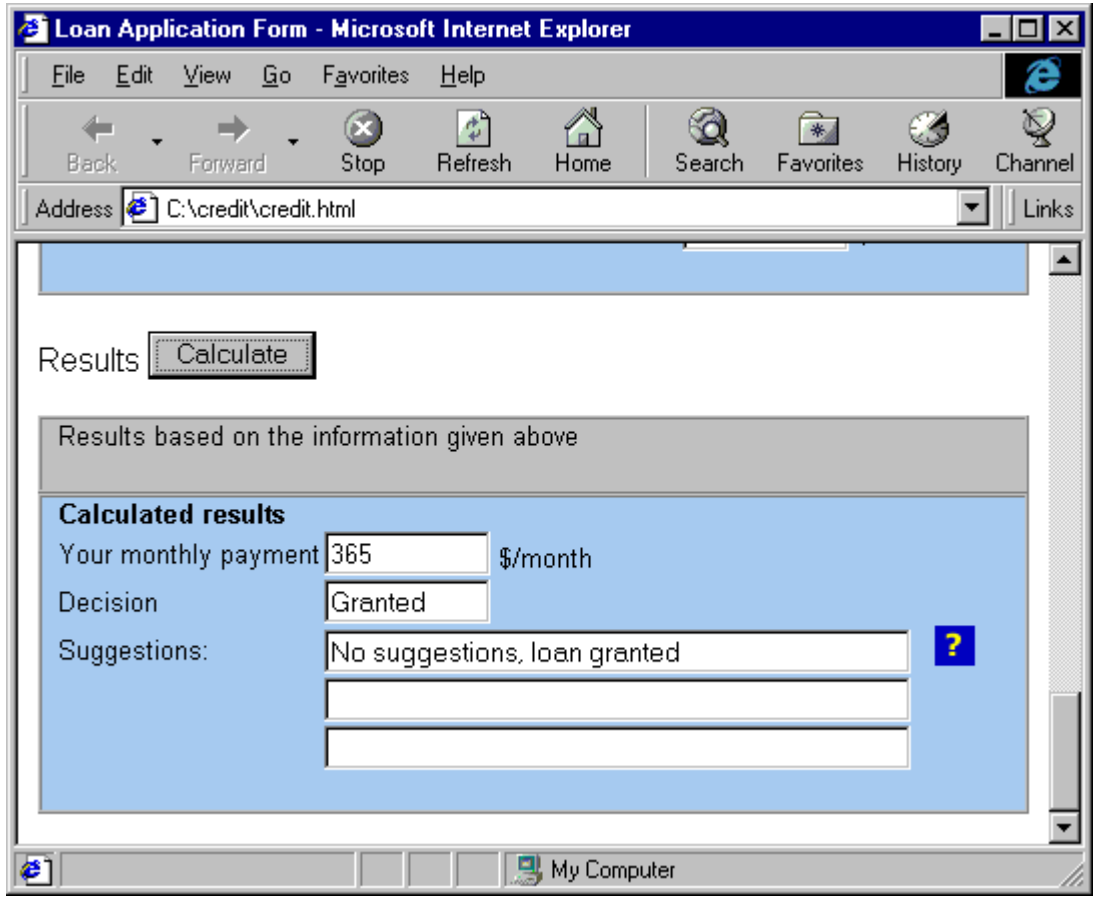
WWW - Granted



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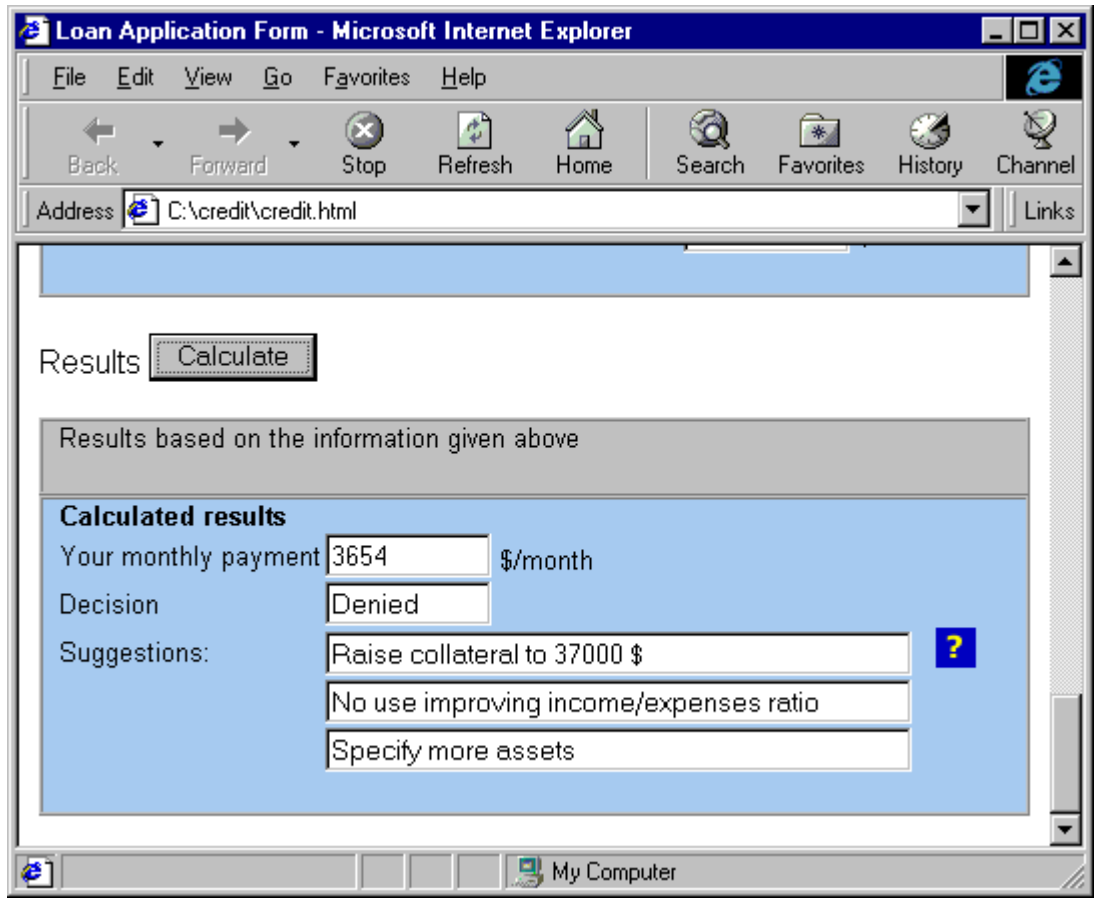
WWW - Denied



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Conclusions

- SmileX
- Creditworthiness Model
- Future Plans
- Broad Perspective

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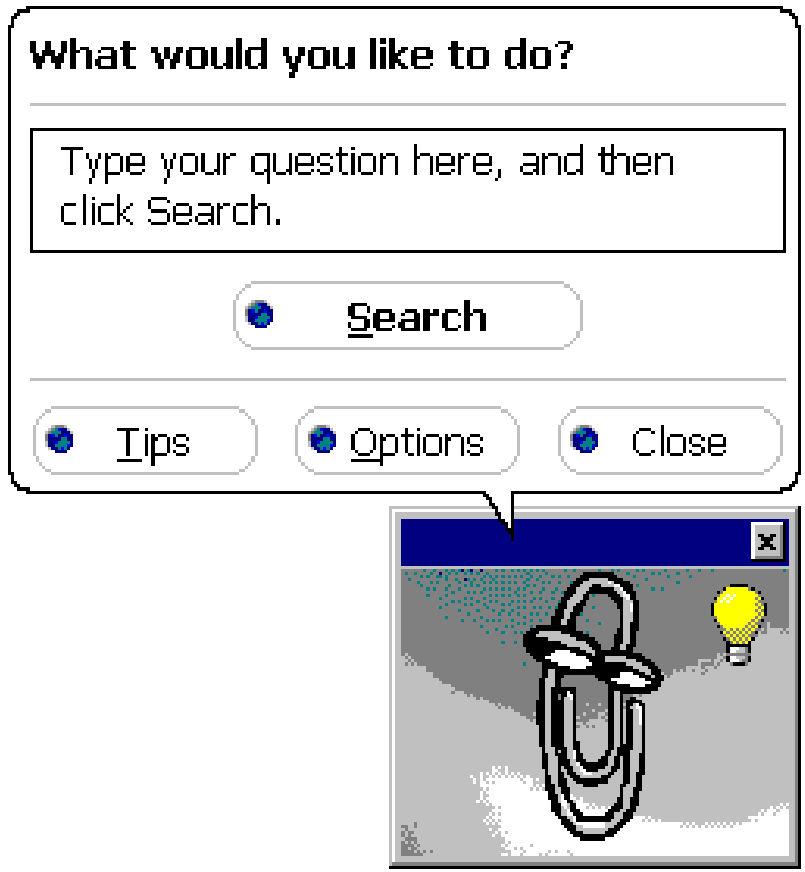
Questions?



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Eerst even op het cijfer wachten

Dan gaan we daarna echt feesten!

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