TECHNISCHE UNIVERSITÄT DRESDEN

Fakultät Maschinenwesen · Institut für Strömungsmechanik · Professur für Turbomaschinen und Strahlantriebe

ProSi

Pro*babilistisches* **Si***mulationstool*

Matthias Voigt

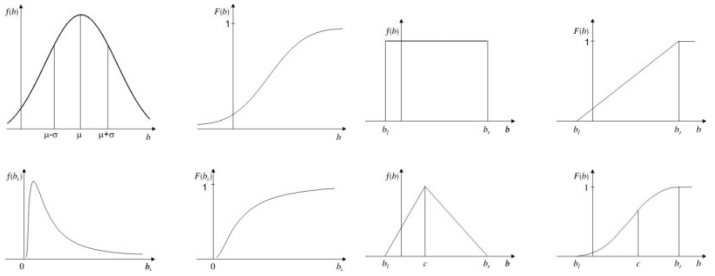
Historische Entwicklung:

- 2002 erste Programmteile zur Auswertung von probabilistischen Ergebnissen
- 2003 erste Version von ProSi (RSM)
- 2005 ProSi 1.1 unterstützt MCS und RSM auf allen Unix, Linux Rechnern
- 2007 ProSi 2.0
- Geplant 2008 ProSi 2.1 Windows + Unix

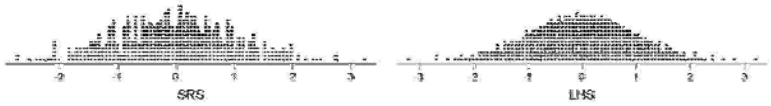
Probabilistische Methoden:

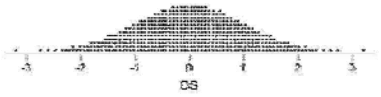
MCS

Verteilungen



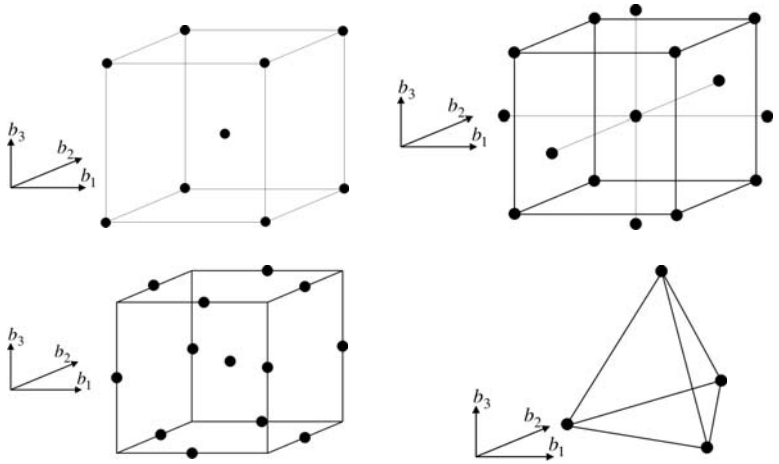
Samplingmethoden





Korrelationseinstellung

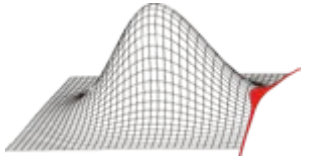
RSM



Box-Cox-Transformation

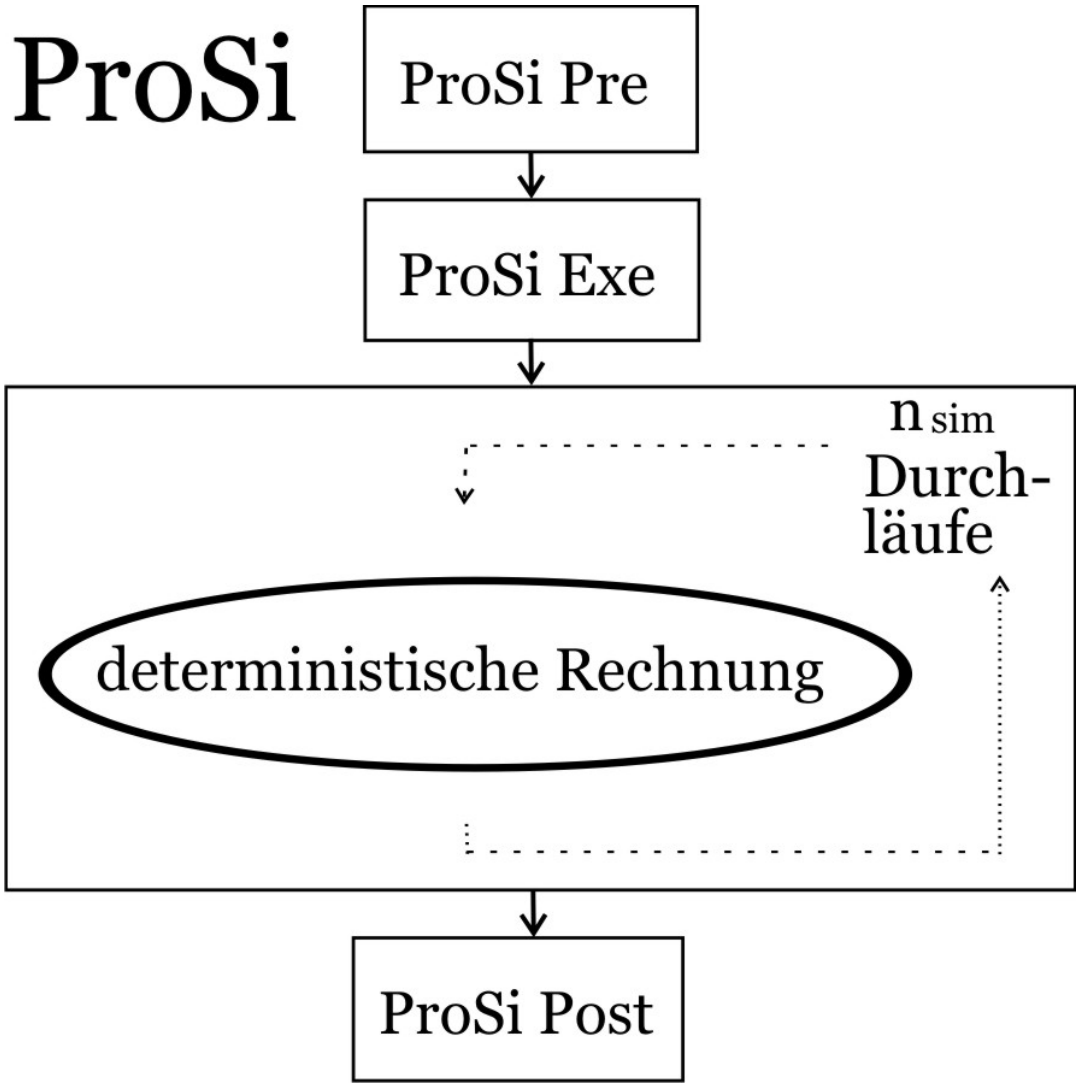
Filtermethode

Funktionsumfang von ProSi

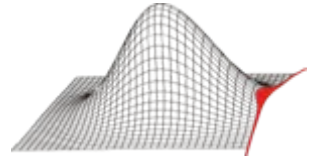


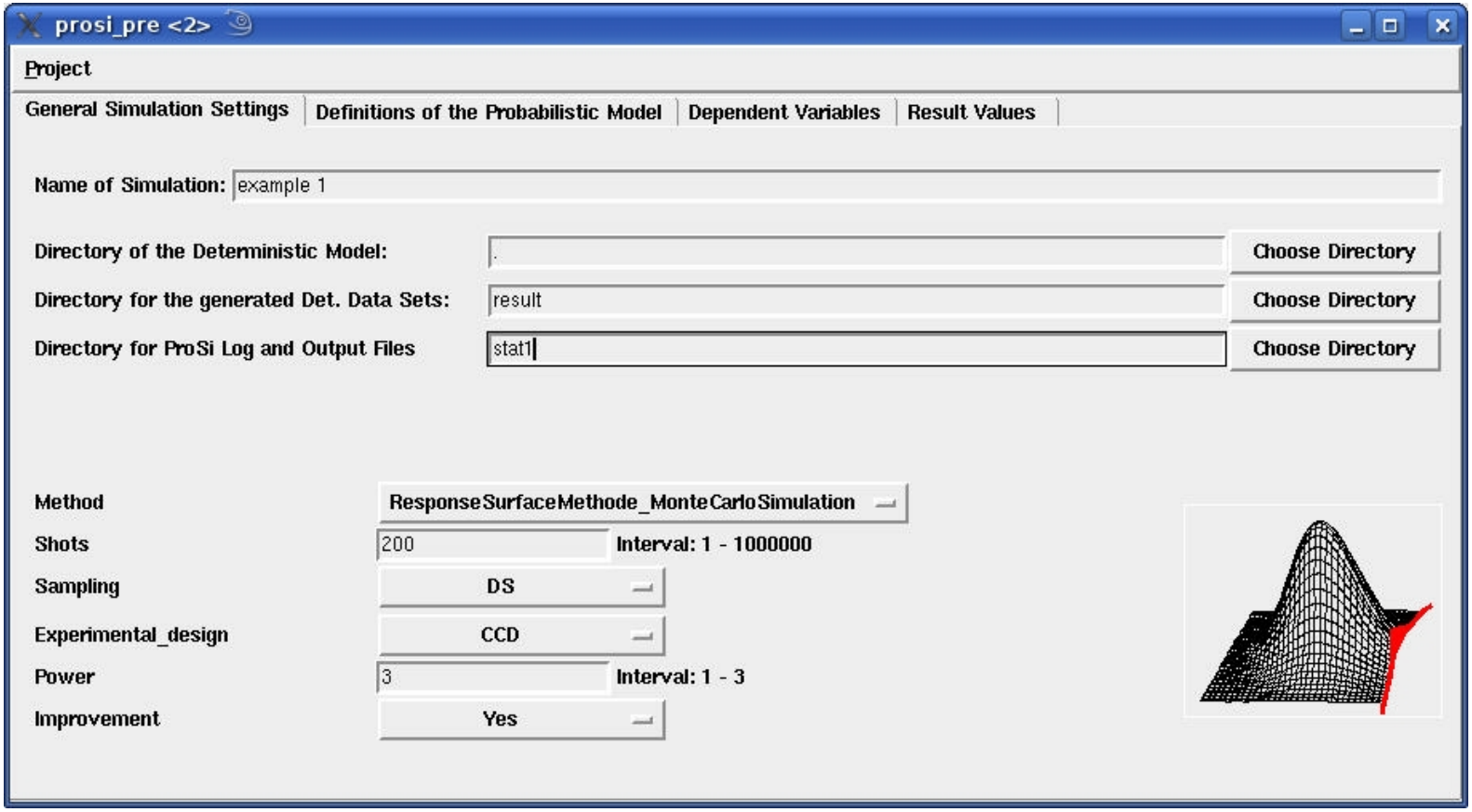
ProSi ermöglicht:

- Probabilistische Untersuchungen aller Systeme, die sich mit ASCII-Dateien steuern lassen
- Automatische parallele Berechnung der deterministischen Lösungen auf verschiedenen Computern
- Statistische Auswertung der Ergebnisse


ProSi
ProSi Pre
ProSi Exe
n sim
Durch-
läufe
deterministische Rechnung
ProSi Post

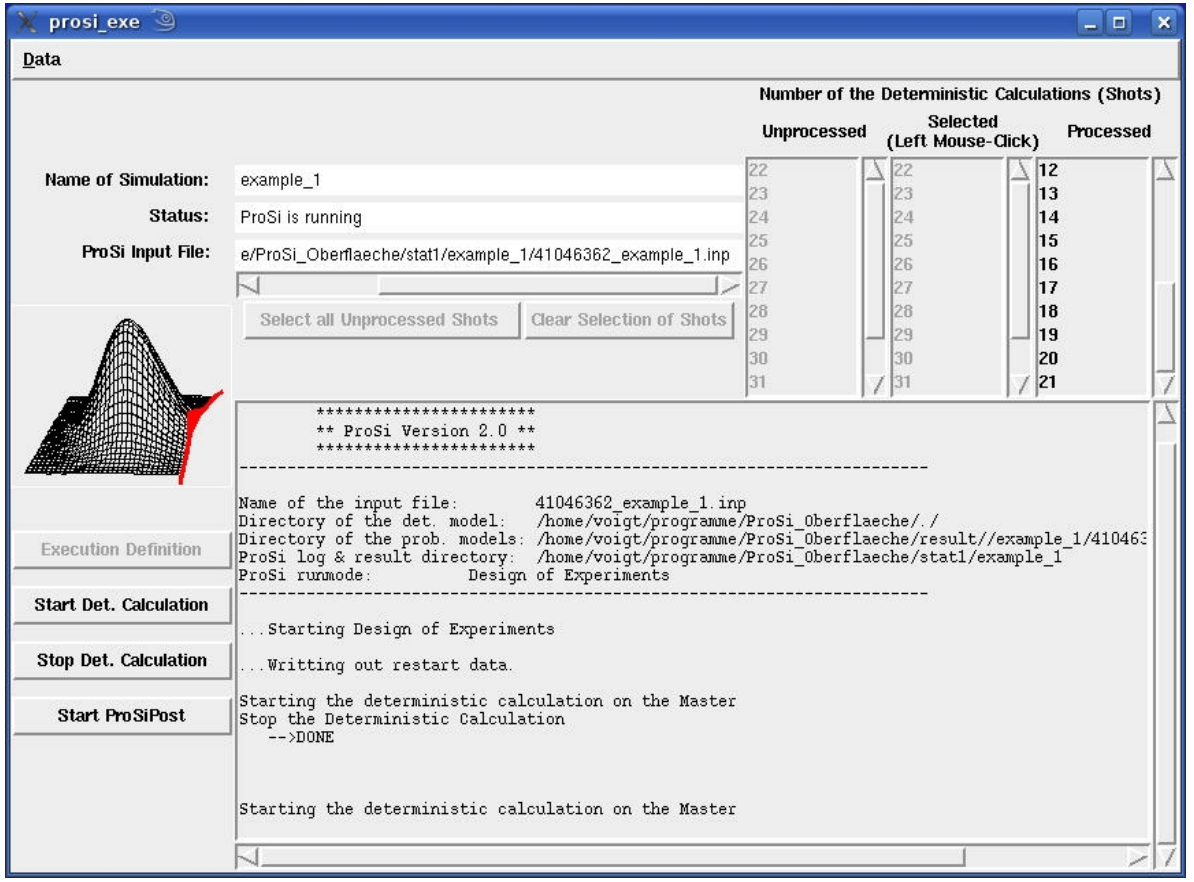
ProSi pre




prosi_pre <2>
Project
General Simulation Settings
Definitions of the Probabilistic Model
Dependent Variables
Result Values
Name of Simulation:
example 1
Directory of the Deterministic Model:
.
Choose Directory
Directory for the generated Det. Data Sets:
result
Choose Directory
Directory for ProSi Log and Output Files
stat1
Choose Directory
Method
ResponseSurfaceMethode_MonteCarloSimulation
Shots
200
Interval: 1 - 1000000
Sampling
DS
Experimental_design
CCD
Power
3
Interval: 1 - 3
Improvement
Yes

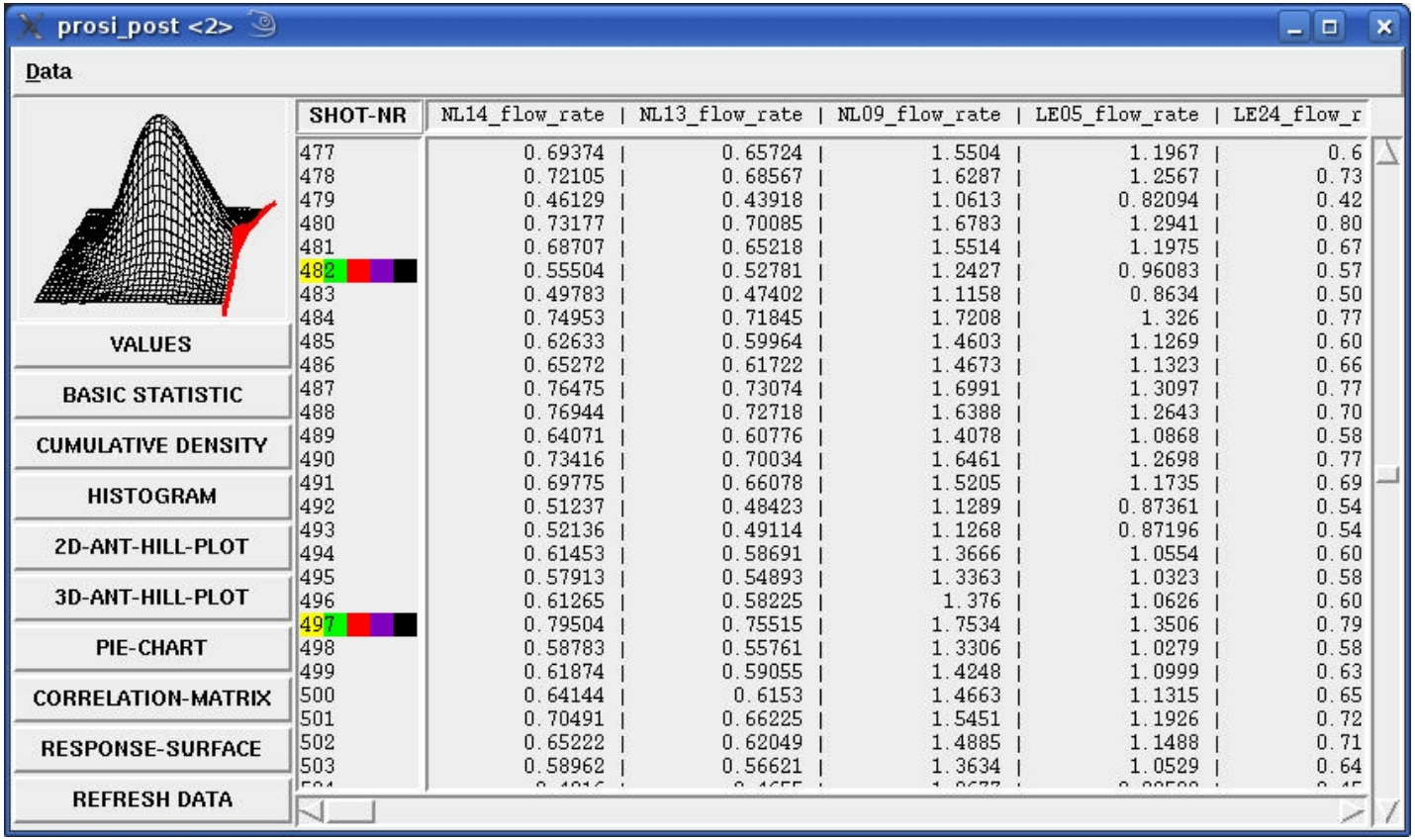
Durchführen der deterministischen Rechnungen:

- Definition der Rechner (Linux-Cluster)
- Steuerbar über eine graphische Oberfläche



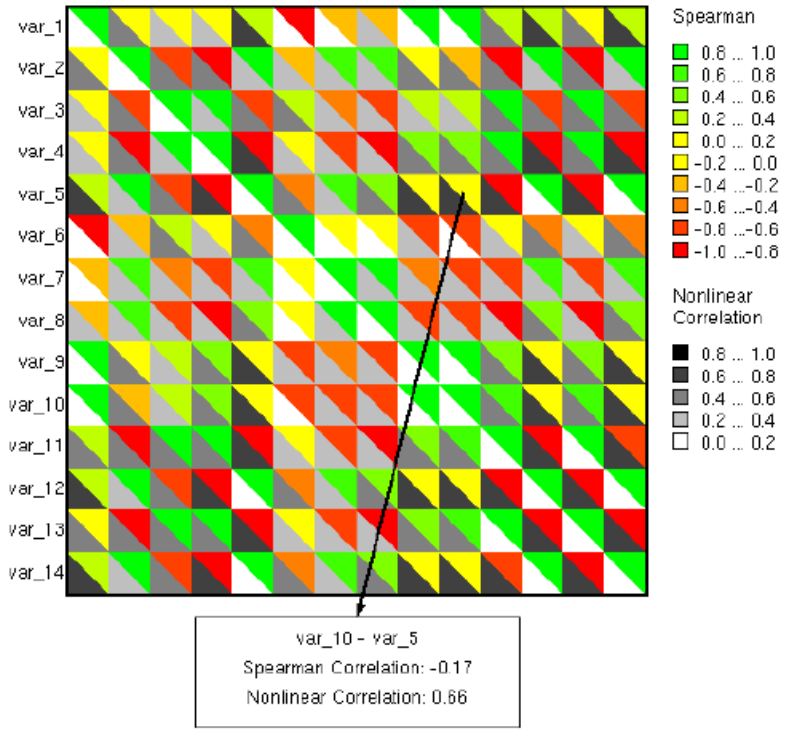
Postprozessing:

- Statistische Auswertung
- Reduzierung des Zeitaufwandes
- Verhindern von Auswertungsfehlern

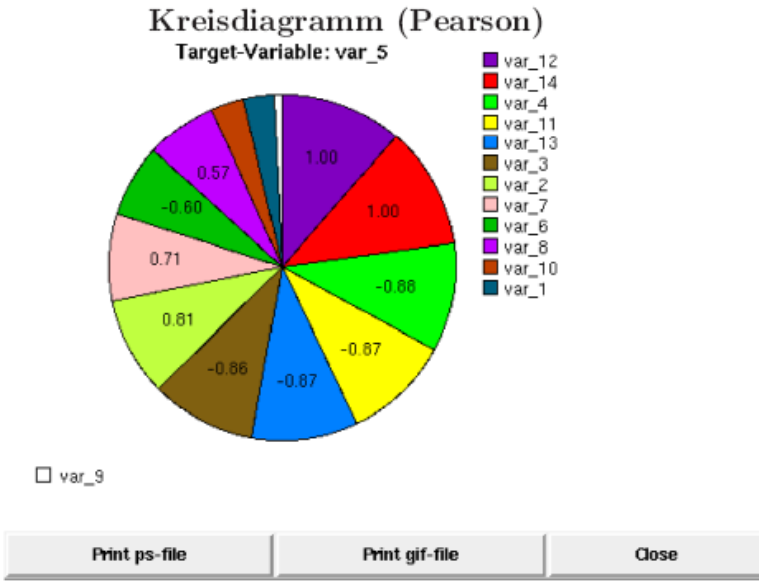


SHOT-NR	NL14_flow_rate	NL13_flow_rate	NL09_flow_rate	LE05_flow_rate	LE24_flow_r
477	0.69374	0.65724	1.5504	1.1967	0.6
478	0.72105	0.68567	1.6287	1.2567	0.73
479	0.46129	0.43918	1.0613	0.82094	0.42
480	0.73177	0.70085	1.6783	1.2941	0.80
481	0.68707	0.65218	1.5514	1.1975	0.67
482	0.55504	0.52781	1.2427	0.96083	0.57
483	0.49783	0.47402	1.1158	0.8634	0.50
484	0.74953	0.71845	1.7208	1.326	0.77
485	0.62633	0.59964	1.4603	1.1269	0.60
486	0.65272	0.61722	1.4673	1.1323	0.66
487	0.76475	0.73074	1.6991	1.3097	0.77
488	0.76944	0.72718	1.6388	1.2643	0.70
489	0.64071	0.60776	1.4078	1.0868	0.58
490	0.73416	0.70034	1.6461	1.2698	0.77
491	0.69775	0.66078	1.5205	1.1735	0.69
492	0.51237	0.48423	1.1289	0.87361	0.54
493	0.52136	0.49114	1.1268	0.87196	0.54
494	0.61453	0.58691	1.3666	1.0554	0.60
495	0.57913	0.54893	1.3363	1.0323	0.58
496	0.61265	0.58225	1.376	1.0626	0.60
497	0.79504	0.75515	1.7534	1.3506	0.79
498	0.58783	0.55761	1.3306	1.0279	0.58
499	0.61874	0.59055	1.4248	1.0999	0.63
500	0.64144	0.6153	1.4663	1.1315	0.65
501	0.70491	0.66225	1.5451	1.1926	0.72
502	0.65222	0.62049	1.4885	1.1488	0.71
503	0.58962	0.56621	1.3634	1.0529	0.64

Korrelationsmatrix



Print ps-file | Print gif-file | Return | Close



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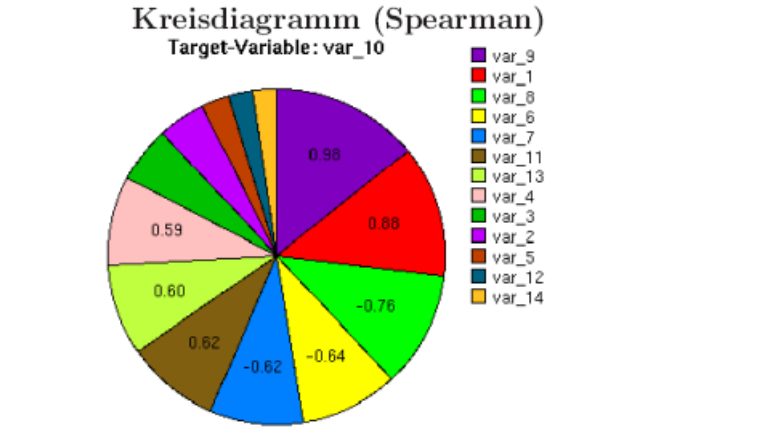

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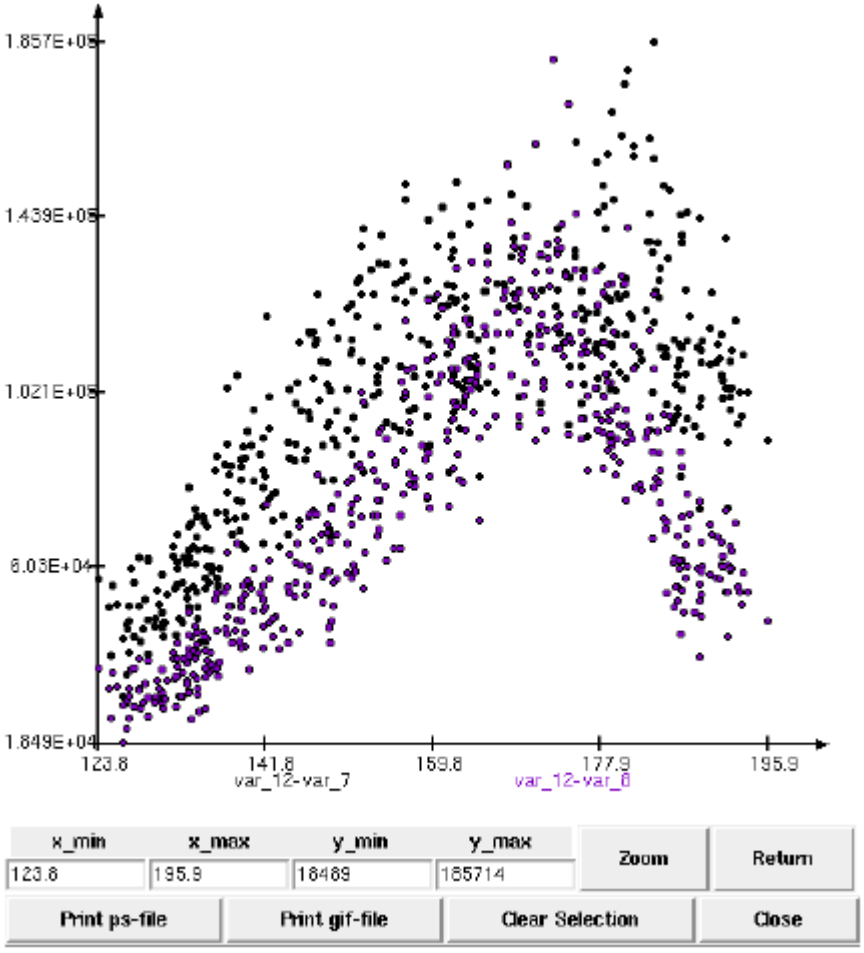
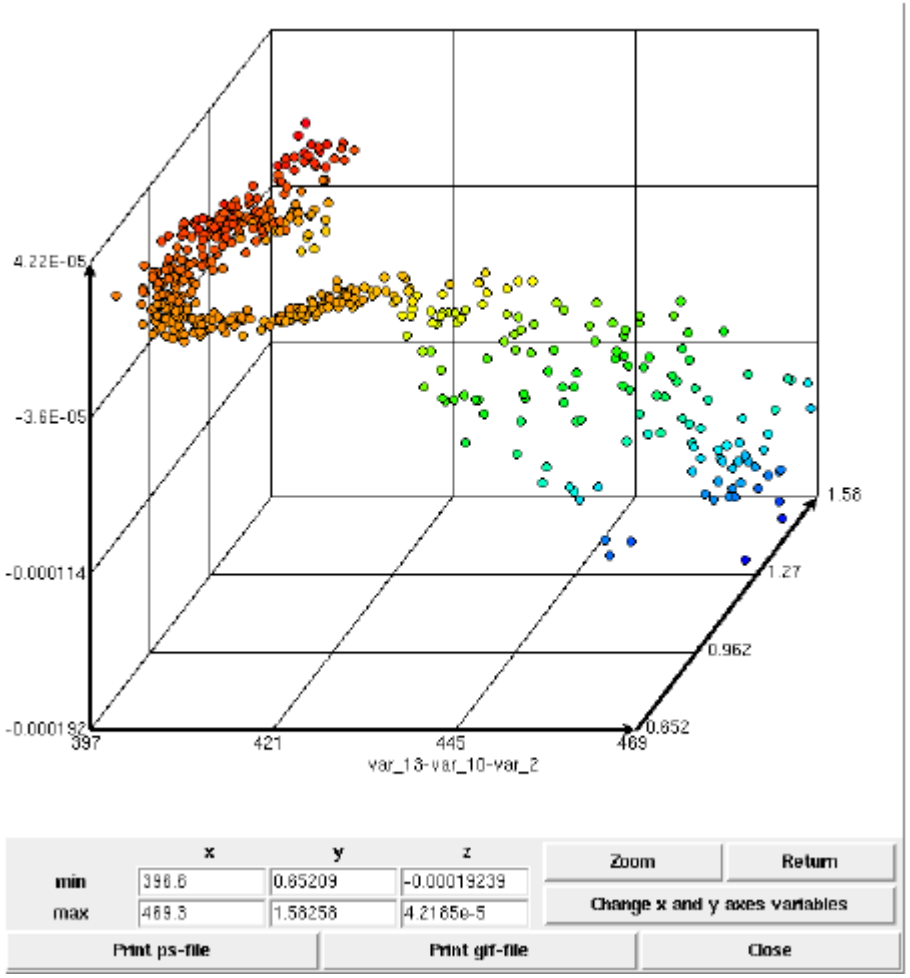
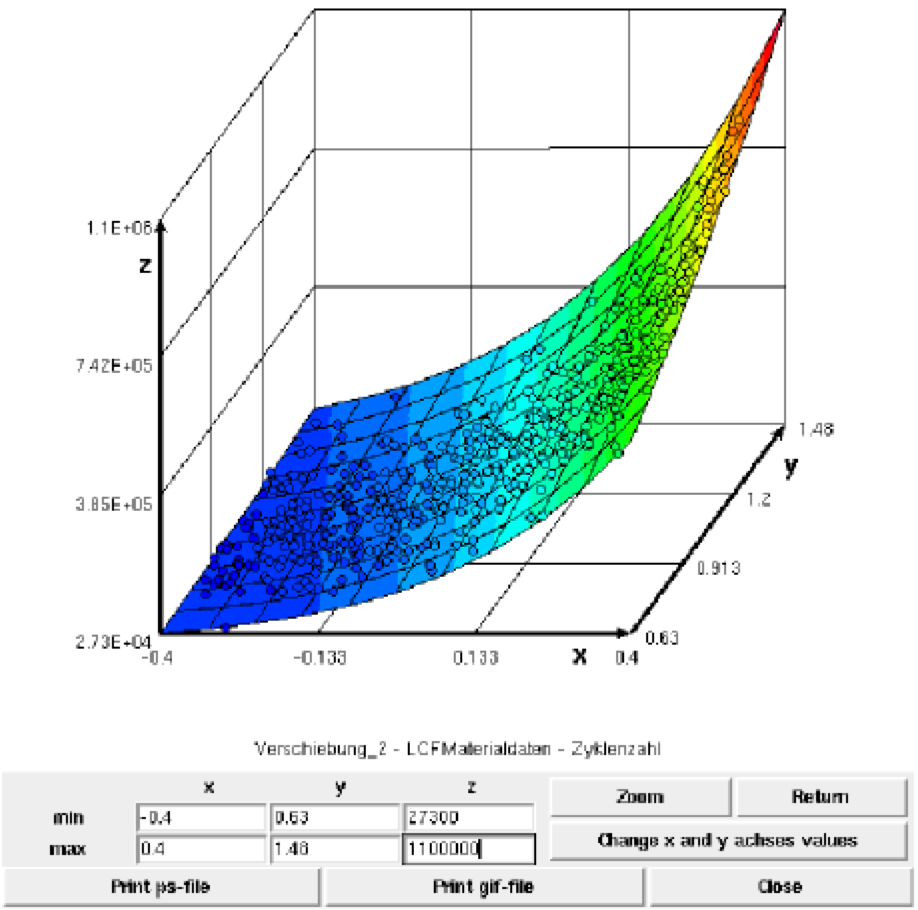
2D-Ant-Hill-Plot

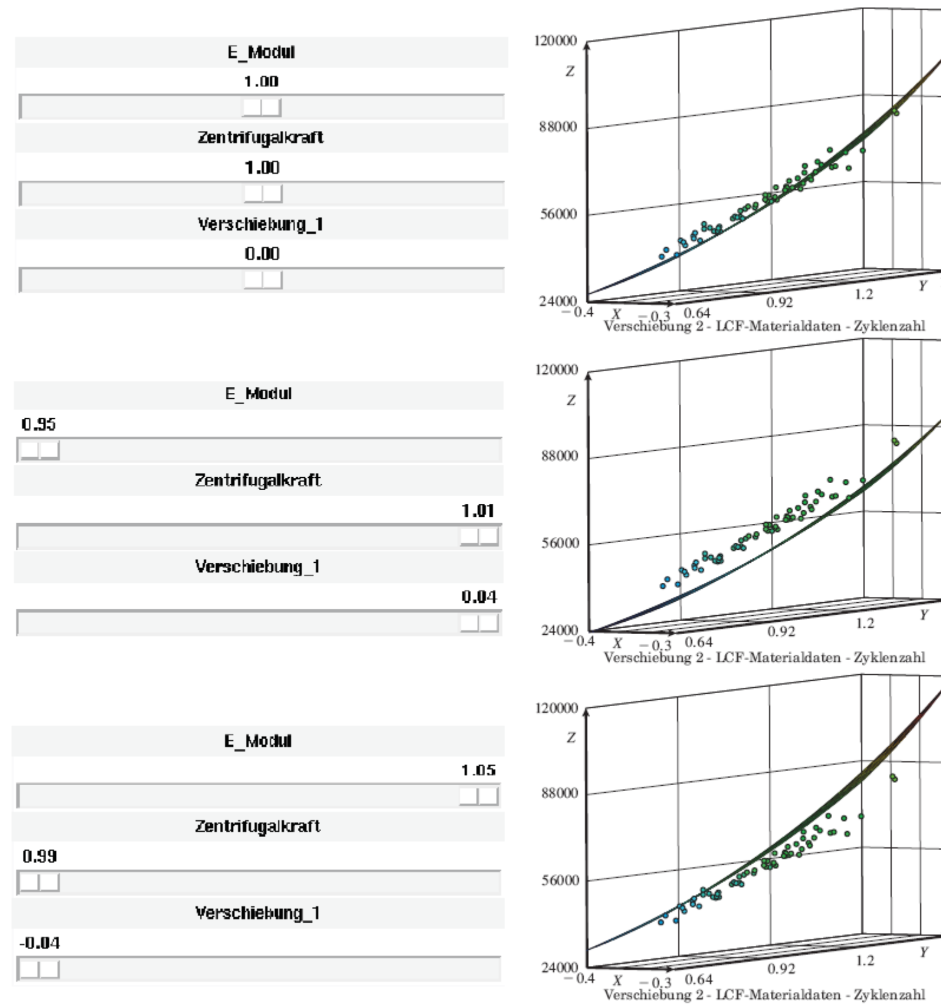


3D-Ant-Hill-Plot

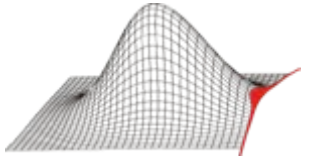


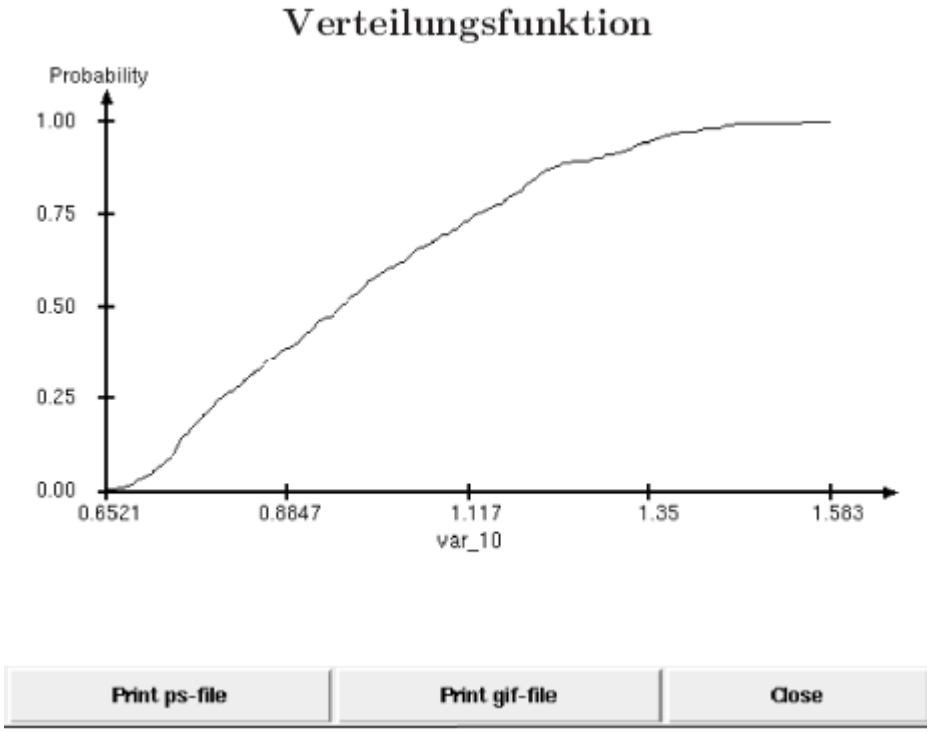
3D-Antwortflächen-Plot

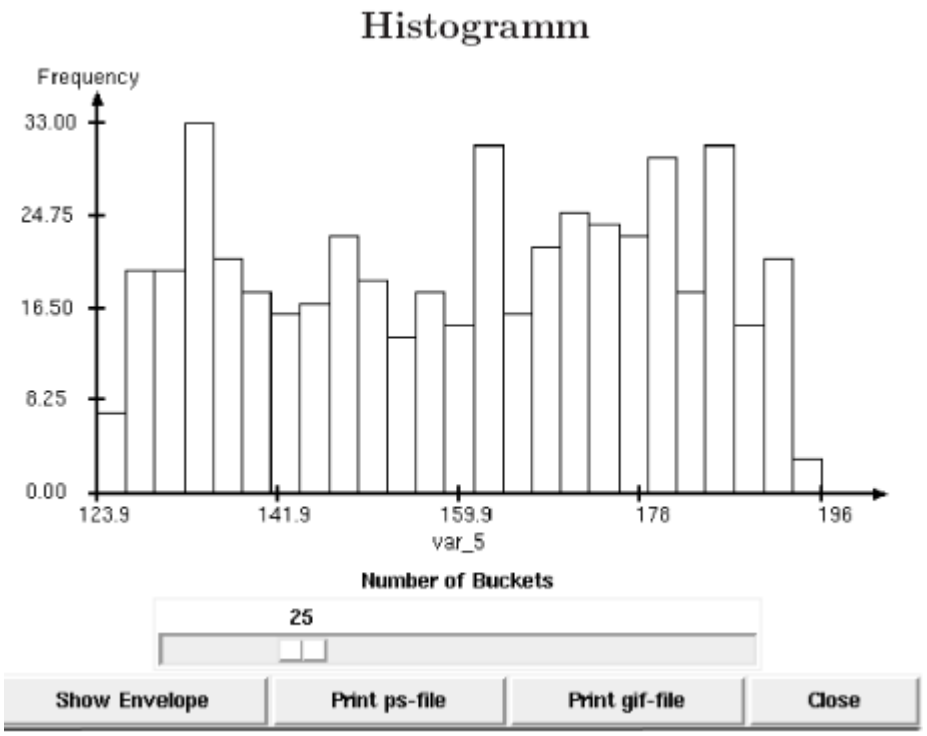




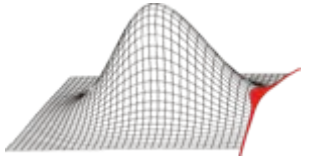
ProSi post




Verteilungsfunktion
Probability
1.00
0.75
0.50
0.25
0.00
0.6521
0.8847
1.117
1.35
1.583
var_10
Print ps-file
Print gif-file
Close


Histogramm
Frequency
33.00
24.75
16.50
8.25
0.00
123.9
141.9
159.9
178
196
var_5
Number of Buckets
25
Show Envelope
Print ps-file
Print gif-file
Close

Danksagung



ProSi entstand innerhalb der AG Turbo Vorhaben
„Probabilistische mechanische Auslegung von Turbinen“
und
„Entwicklung und Umsetzung von effizienten probabilistischen Methoden in der Auslegung von Turbinenschaufeln“
mit finanzieller Unterstützung von
ALSTOM, MTU, Rolls-Royce Deutschland
und
Bundesministerium für Wirtschaft und Technologie

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