Blackbox Observability of Features and Feature Interactions

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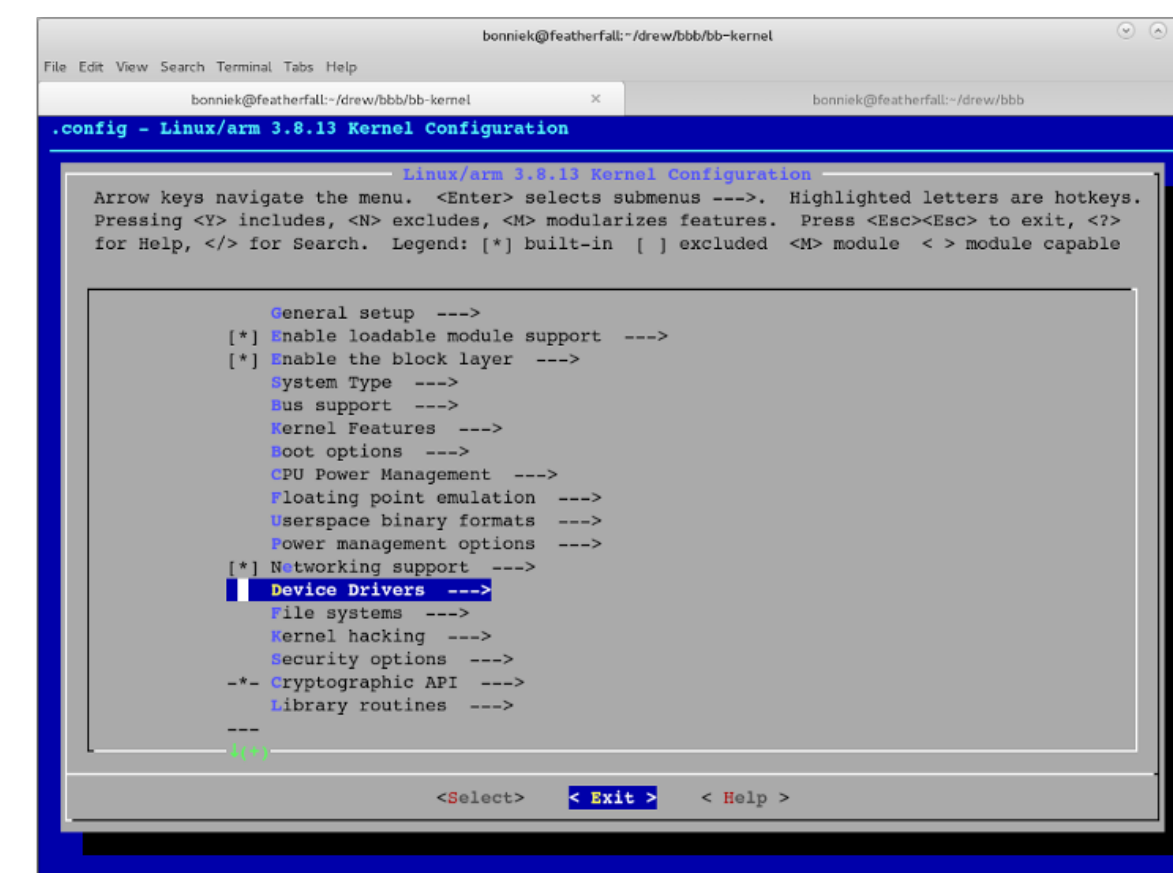VIRTUS IMPAVIDA

TU/e EINDHOVEN UNIVERSITY OF TECHNOLOGY

Software Configurations

Software Configurations

Software Configurations

Software Configurations

Performance Optimization

Predictive Modeling

Performance Optimization

Predictive Modeling

Performance Model

189392.754871324 * root + -5341.1497460973 * cells + -1097.39668559875 * post + 6852.58846993721 * GradientSolver + 752.542387648181 * BiCGSTABSolver + 1.88645994097499 * cells * post * post + 547.236997276589 * GradientSolver * pre * pre + -113.547148735501 * cells * GradientSolver + 0.706383967601375 * cells * cells * cells + 385.840181761216 * GradientSolver * post * post + 2.72707363219899 * cells * pre + -39.9822314861407 * BiCGSTABSolver * pre * pre + -11.9701281275527 * cells * GradientSolver * pre * pre + -8.2288112361045 * cells * GradientSolver * post * post + 112.152829956782 * post * SeqSOR
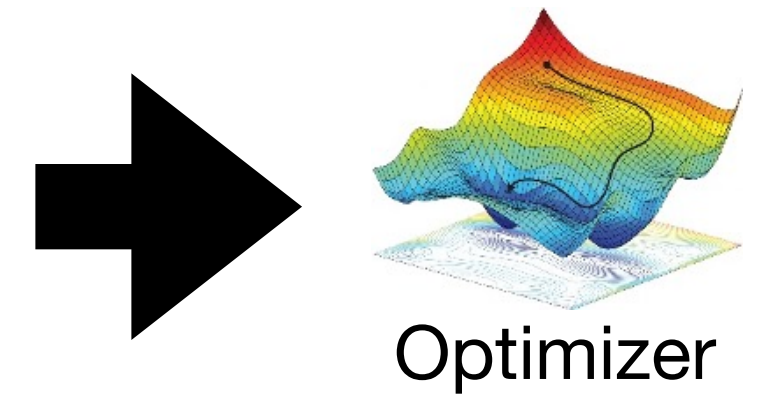
Performance Optimization

Predictive Modeling

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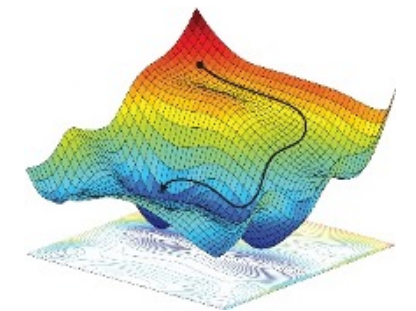

Optimizer

3

Performance Optimization

Predictive Modeling

Performance Model

189392.754871324 * root + -5341.1497460973 * cells + -1097.39668559875 * post + 6852.58846993721 * GradientSolver + 752.542387648181 * BiCGSTABSolver + 1.88645994097499 * cells * post * post + 547.236997276589 * GradientSolver * pre * pre + -113.547148735501 * cells * GradientSolver + 0.706383967601375 * cells * cells * cells + 385.840181761216 * GradientSolver * post * post + 2.72707363219899 * cells * pre + -39.9822314861407 * BiCGSTABSolver * pre * pre + -11.9701281275527 * cells * GradientSolver * pre * pre + -8.2288112361045 * cells * GradientSolver * post * post + 112.152829956782 * post * SeqSOR

Optimizer
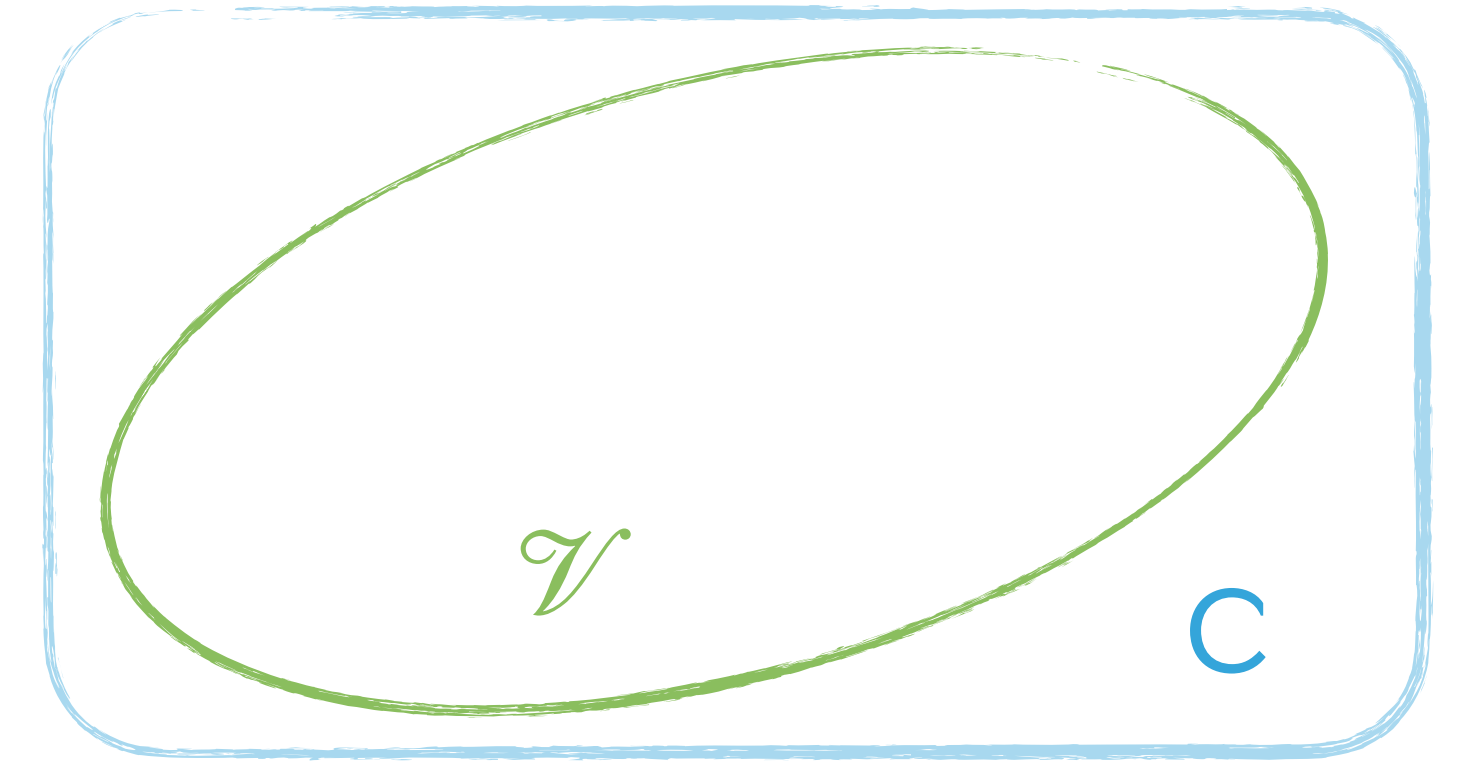

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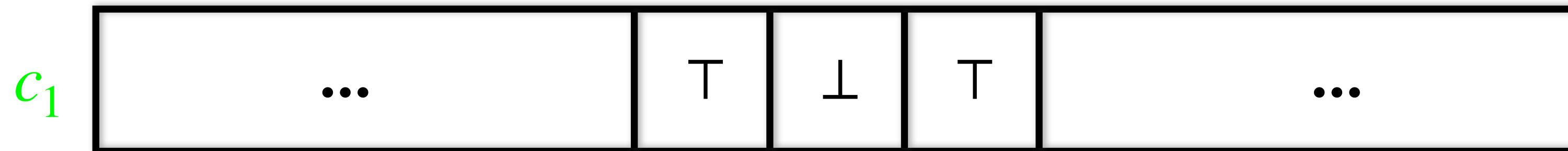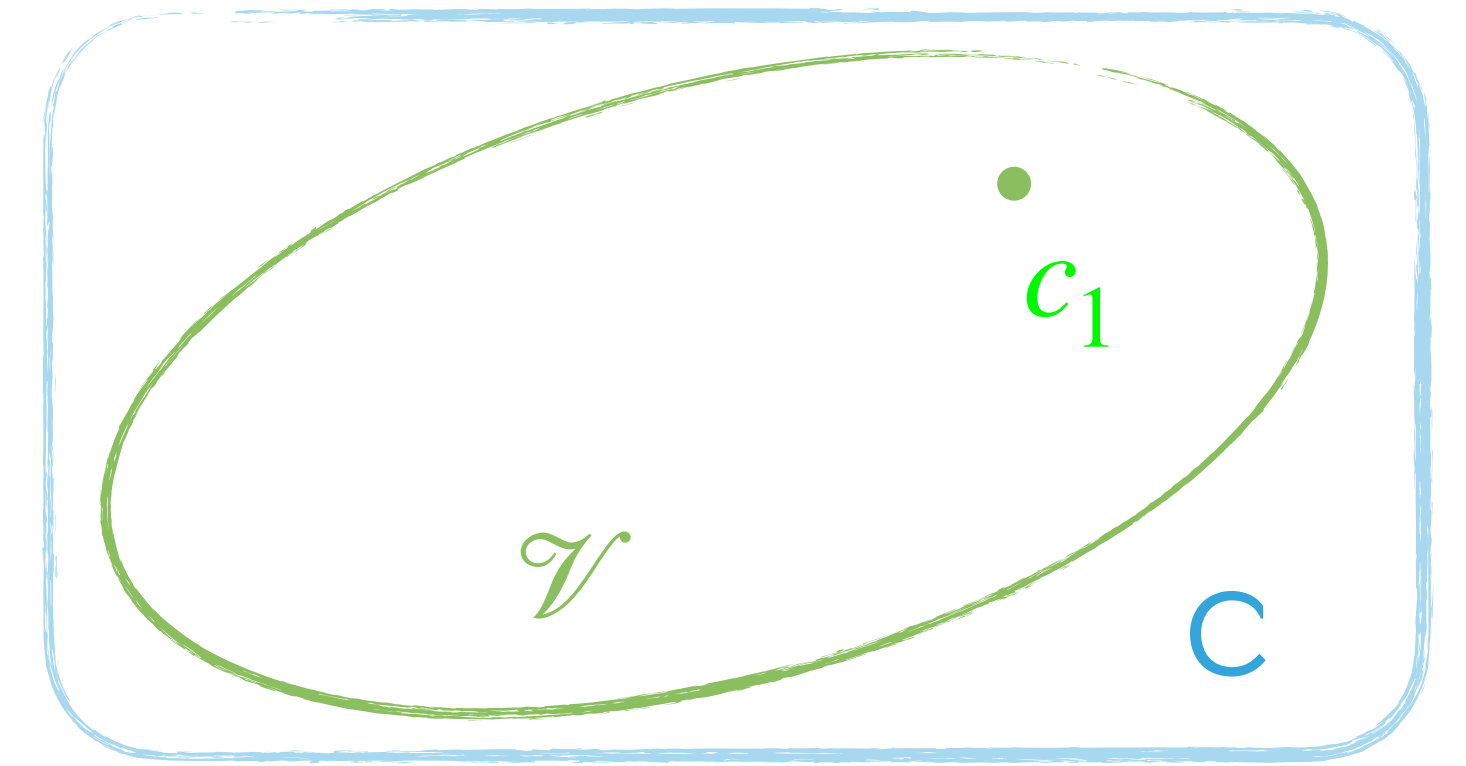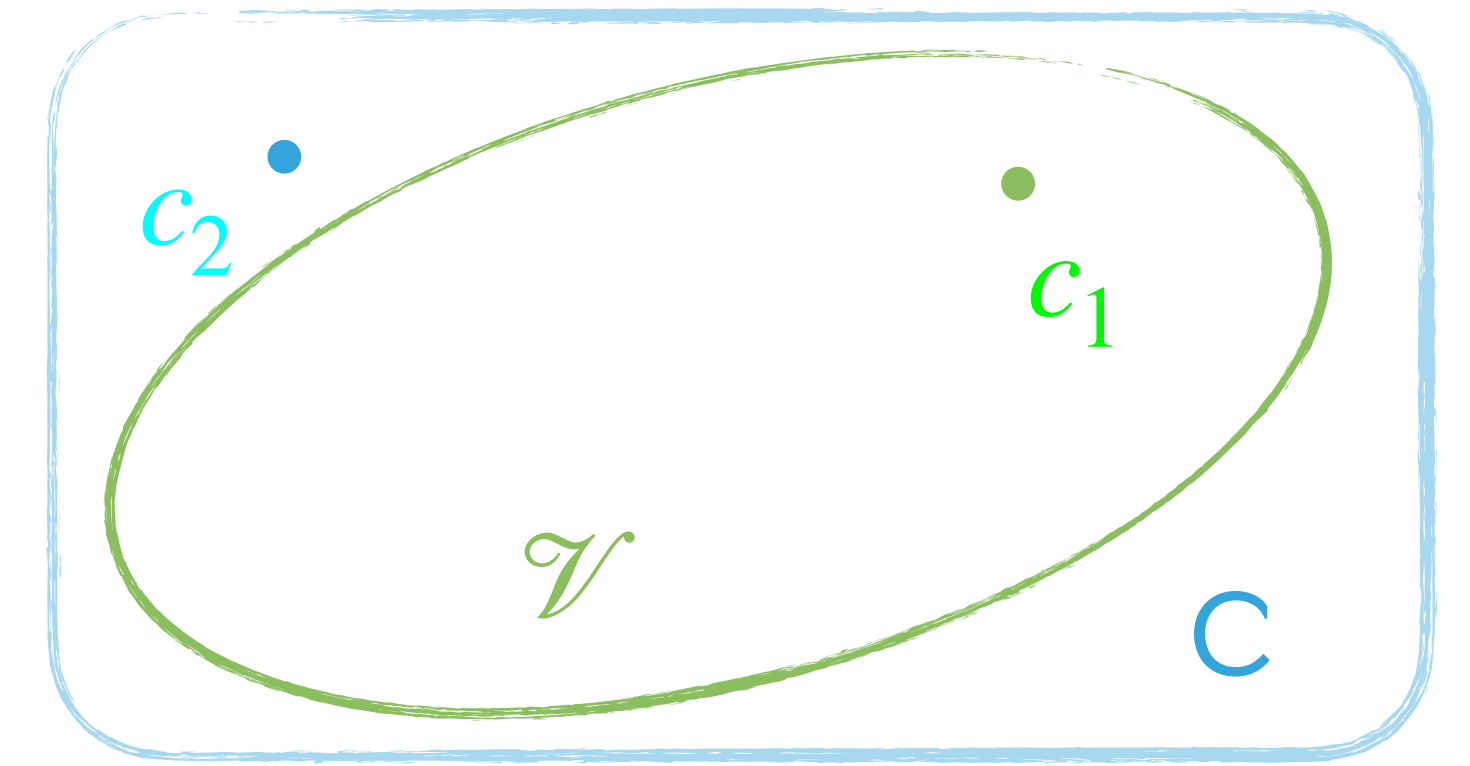
Are these models interpretable?

Observability

Observability

c_1 | ... | $\top$ | $\bot$ | $\top$ | ... |

Observability

Observability

c_1 | ... | $\top$ | $\bot$ | $\top$ | ... |

Observability

Observability

Observability in the Wild

	Direct observable	Indirect observable	Non-observable	Invalid

1-wise				
h264	14	16	4	34
ZipMe	12	3	3	18
VCL	42			42
Prevaylar	10	2	2	14
PKJab	12	8	4	24
Minepump	14	6	2	22
Lrzip	6	32		40
LinkedList	6	28	4	38
LLVM	20	2	2	24
Email	8	10	2	20
Elevator	16	1	1	18
Curl	16	9	3	28
CFDP	20	3	3	26
BSN	18	4		22
Apache	16	2	2	20

Observability in the Wild

1-wise

h264

ZipMe | 12 | 3 | 3 | 18

2-wise

	Direct observable			
h264	96	320	128	544
ZipMe	60	39	45	144
VCL	840			840
Prevaylar	38	20	24	84
PKJab	60	115	87	264
Minepump	88	85	43	220
Lrzip	114	520	125	760
LinkedList	38	481	163	684
LLVM	180	41	43	264
Email	28	108	43	180
Elevator	112	16	16	144
Curl	118	168	78	364
CFDP	134	46	44	87	312
BSN	138	68		220
Apache	110	32	36	180

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Observability in the Wild

h264	448	3094	1898	5440
ZipMe	160	217	295	672
VCL	10640			10640
Prevaylar	68	82	118	280
PKJab	166	735	841	1760
Minepump	324	542	406	1320
Lrzip	620	5642	2858	9120
LinkedList		4629	2943	7752
LLVM	959	380	420	1760
Email	60	522	374	960
Elevator	448	112	112	672
Curl	544	1441	926	2912
CFDP	386	574	301	1027	2288
BSN	596	112	504	108	1320
Apache	424	226	286	960

0.0 0.2 0.4 0.6 0.8 1.0

1-wise

2-wise

3-wise
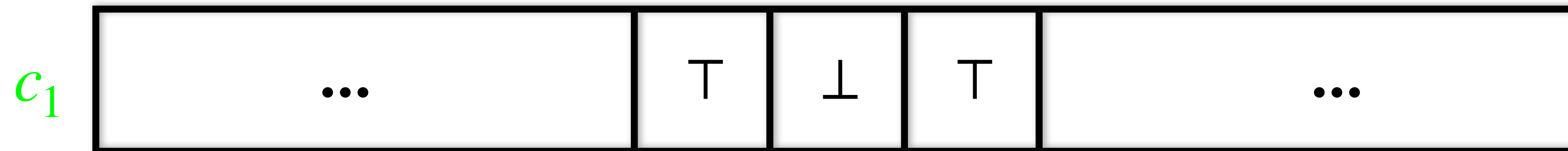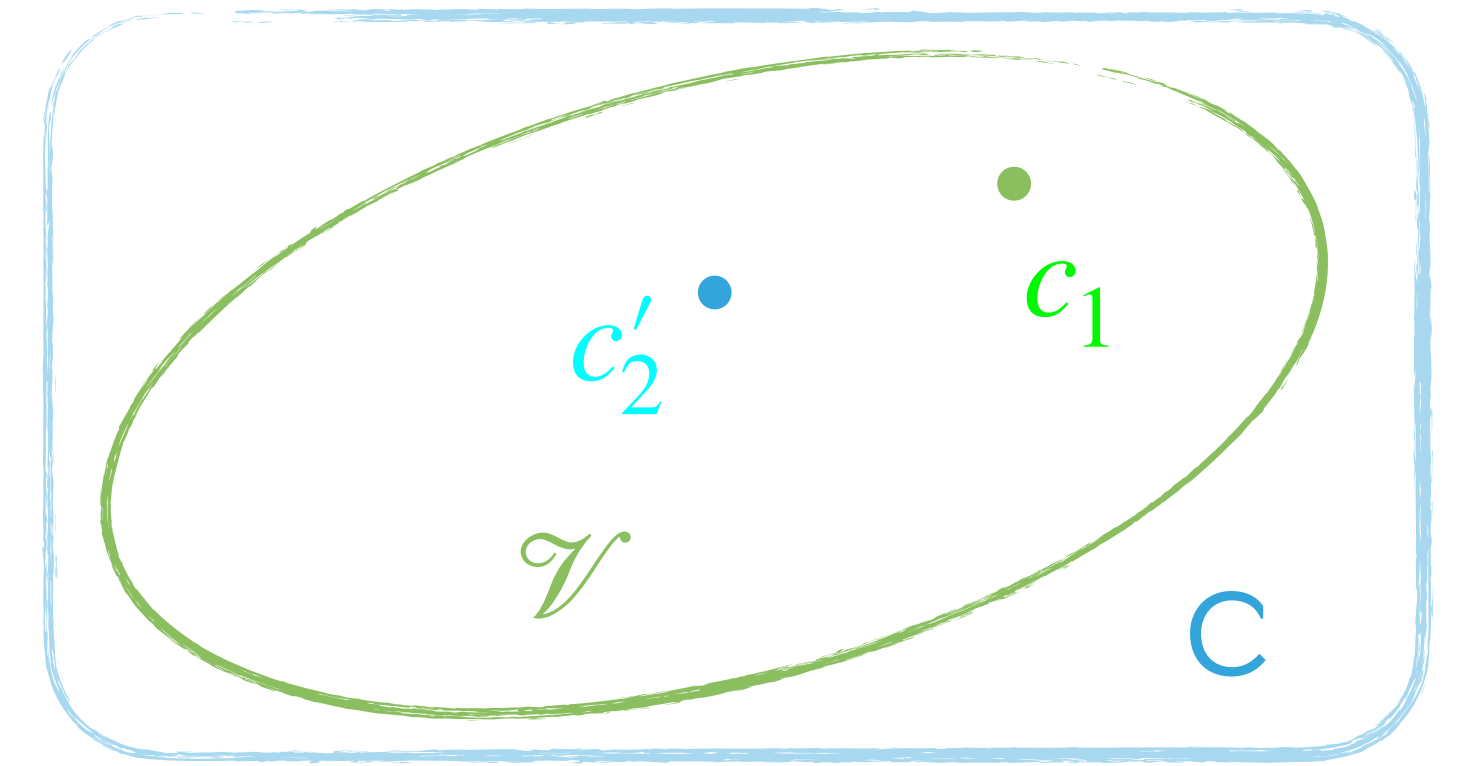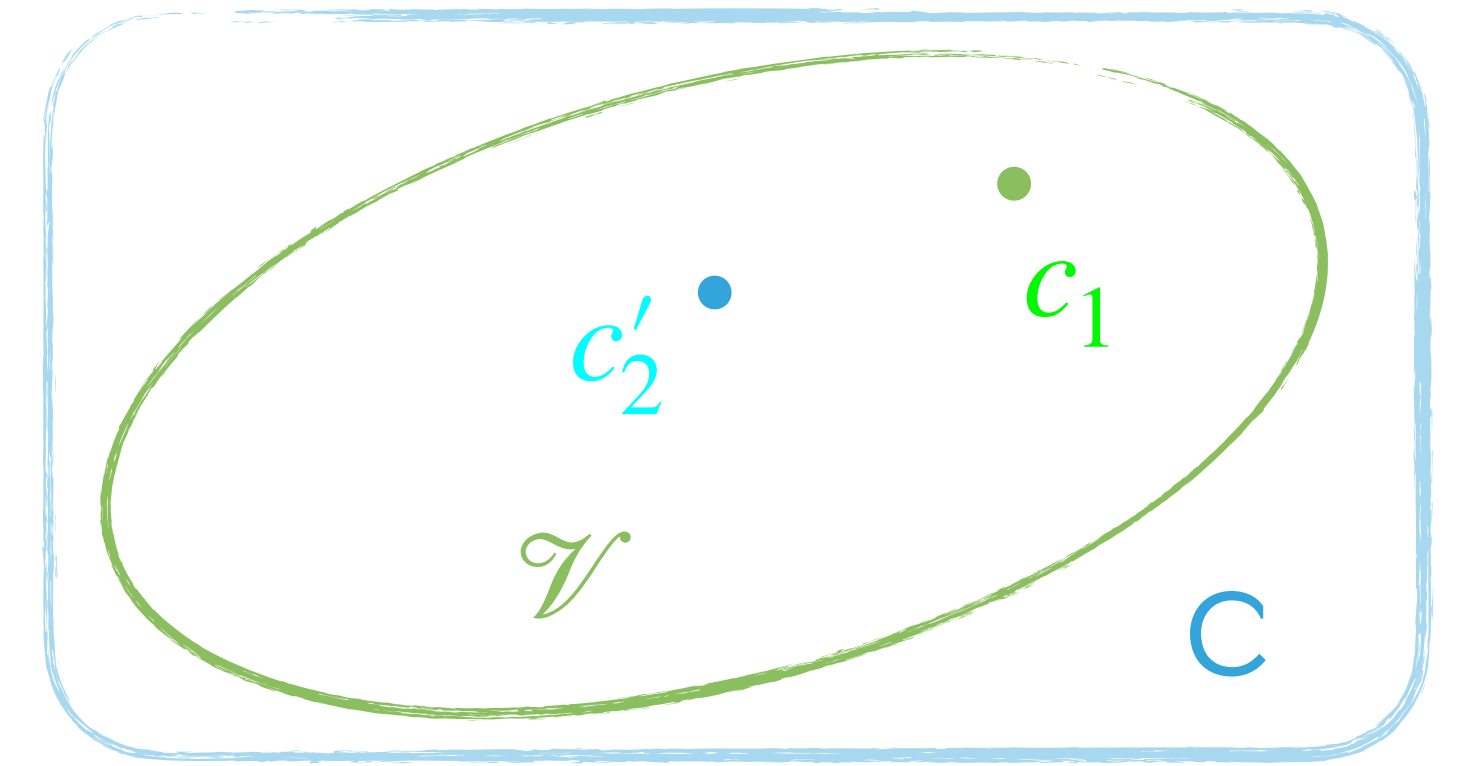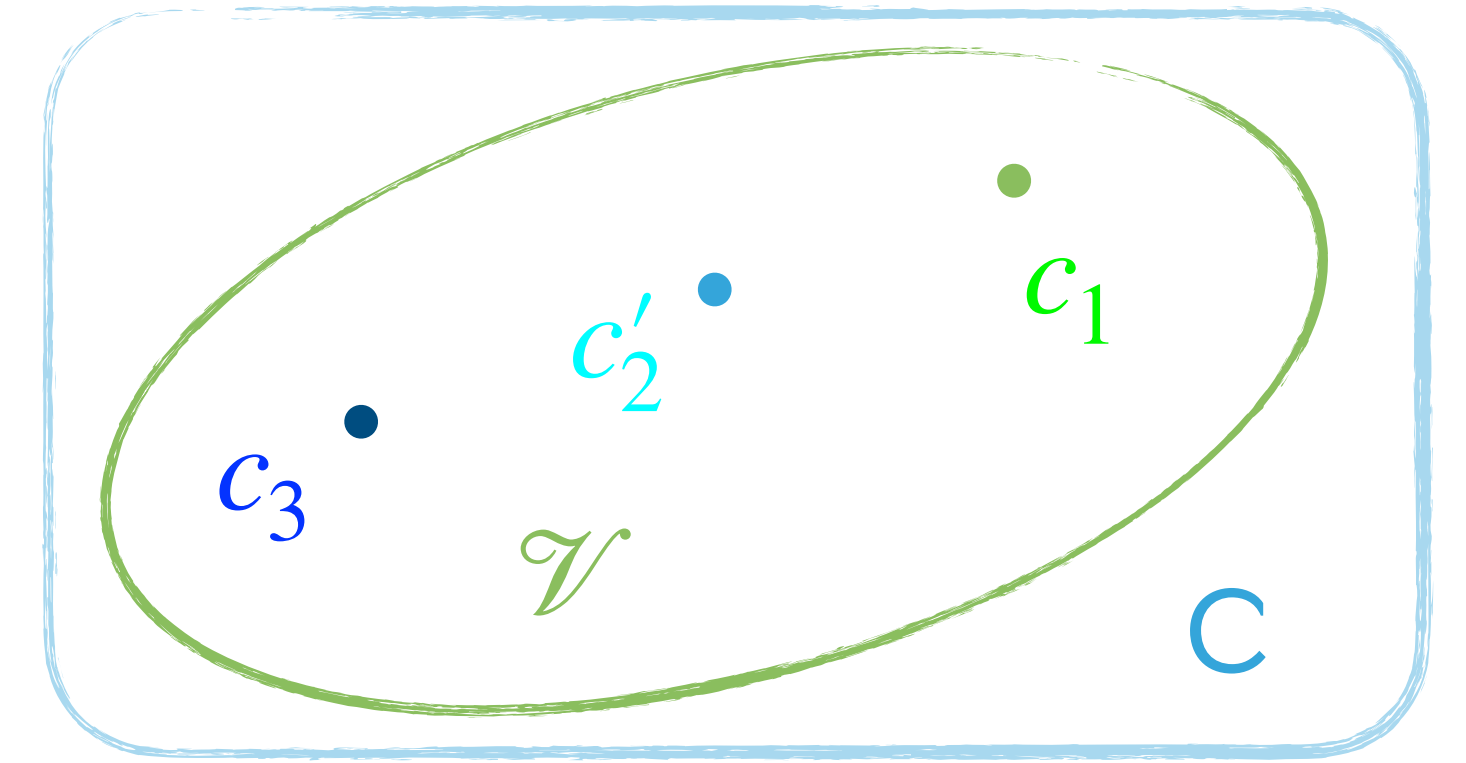
Observability in Performance Models

TABLE II

STATISTICS OVER GENERAL OBSERVABILITY IN STATE-OF-THE-ART PERFORMANCE-INFLUENCE MODELS

System	$|\mathcal{V}|$	$|\mathcal{F}|$	$|\mathcal{P}|$	$|\mathcal{P_V}|$	Max Size	$|\mathcal{D_O}|$	$|\mathcal{I_O}|$	$|\neg\mathcal{O}|$	Time [s]
BROTLI	180	30	166	166	2	0	0	166	21.85
FASTDOWNWARD	347	60	41	41	3	0	0	41	144.22
HSQLDB	864	29	21	21	3	0	0	21	201.26
LRZIP$_2$	1 440	27	220	220	3	0	0	220	6 777.10
MARIADB	972	21	35	35	3	4	0	31	275.07
MYSQL	972	21	25	25	3	4	0	21	144.08
OPENVPN	512	24	13	13	2	1	0	12	13.64
OPUS	6 480	31	66	66	5	0	0	66	309 561.33
POSTGRESQL	864	18	3	3	1	2	0	1	0.01
VP8	2 736	27	40	40	3	0	0	40	30 887.61
Z3	1 024	14	18	18	3	2	0	16	40.78

Non-observable features and feature interactions are prevalent in practice and need to be considered when interpreting blackbox analysis results.