Commuting Strategies for Product-line Reliability Analysis

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Commuting Strategies for Product-line Reliability Analysis

Type checking

Data-flow analysis

Control-flow analysis

Model checking

Theorem proving

...

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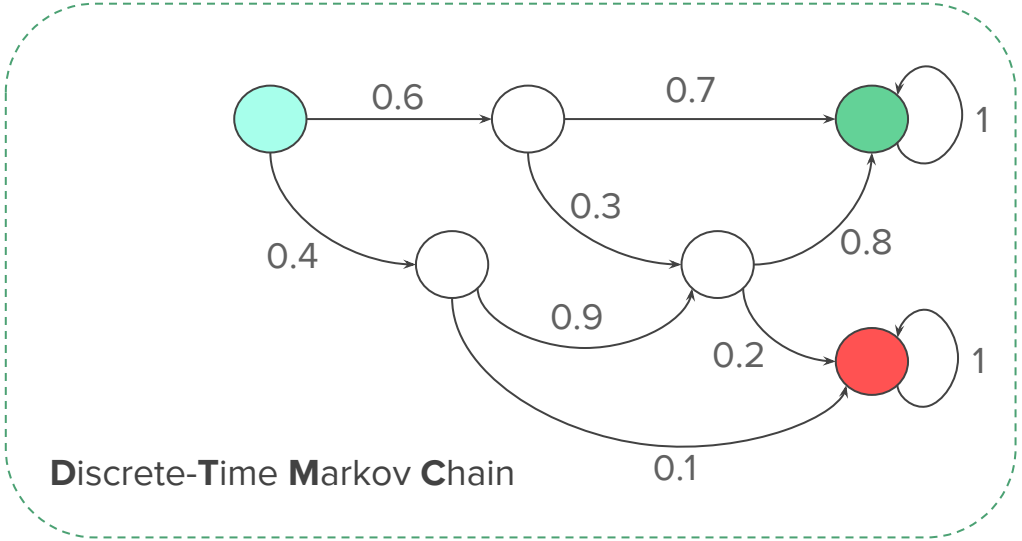
Commuting Strategies for Product-line Reliability Analysis

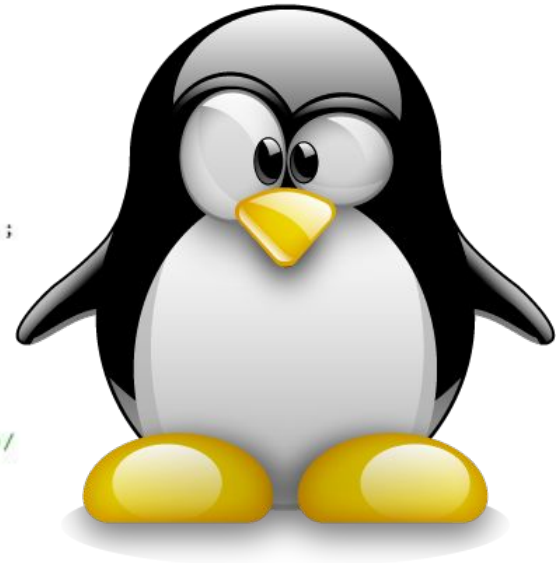


$$P_{=?} [\Diamond \textit{success}]$$

$$(0.6 * 0.7) + (0.6 * 0.3 * 0.8) + (0.4 * 0.9 * 0.8)$$

Commuting Strategies for Product-line Reliability Analysis

```
struct task_struct {
        volatile long state;    /* -1 unrunnable, 0 runnable, >0 stopped */
        void *stack;
        atomic_t usage;
        unsigned int flags;     /* per process flags, defined below */
        unsigned int ptrace;

#ifdef CONFIG_SMP
        struct llist_node wake_entry;
        int on_cpu;
        struct task_struct *last_wakee;
        unsigned long wakee_flips;
        unsigned long wakee_flip_decay_ts;

        int wake_cpu;
#endif
        int on_rq;

        int prio, static_prio, normal_prio;
        unsigned int rt_priority;
        const struct sched_class *sched_class;
        struct sched_entity se;
        struct sched_rt_entity rt;
#ifdef CONFIG_CGROUP_SCHED
        struct task_group *sched_task_group;
#endif

#ifdef CONFIG_PREEMPT_NOTIFIERS
        /* list of struct preempt_notifier: */
        struct hlist_head preempt_notifiers;
#endif

#ifdef CONFIG_BLK_DEV_IO_TRACE
        unsigned int btrace_seq;
#endif
```



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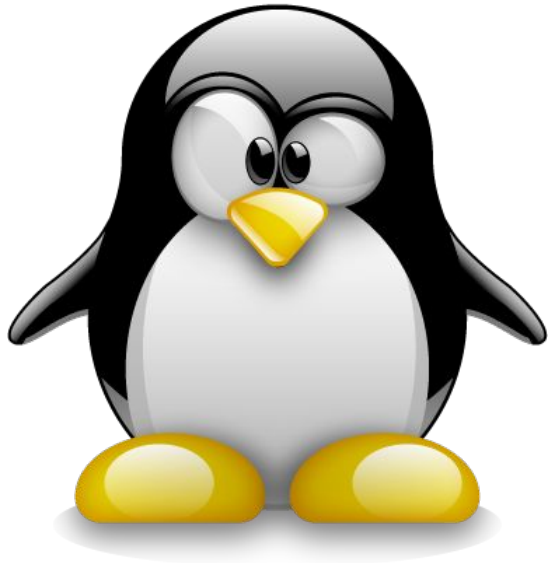
Products = O(2^{Options})

> 6.000 options



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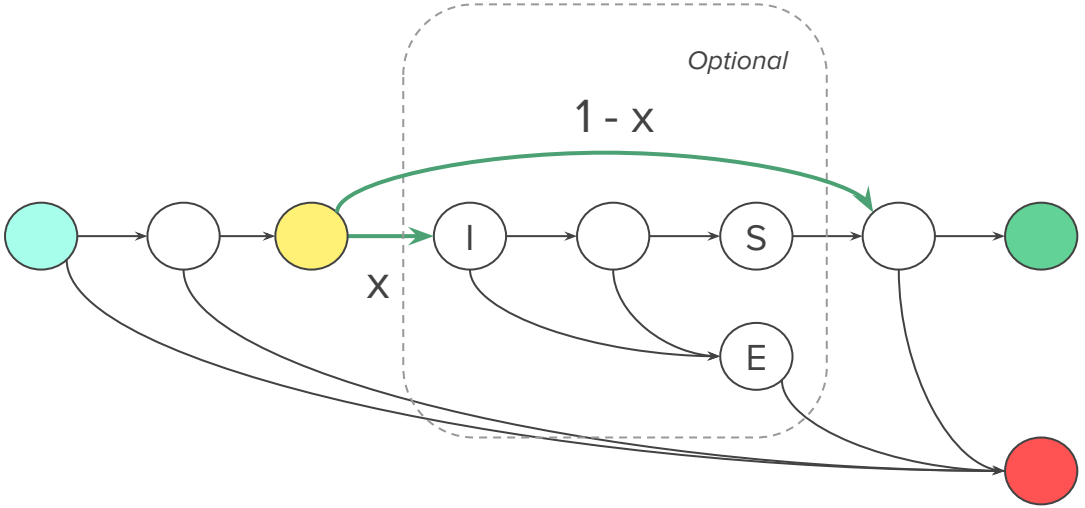

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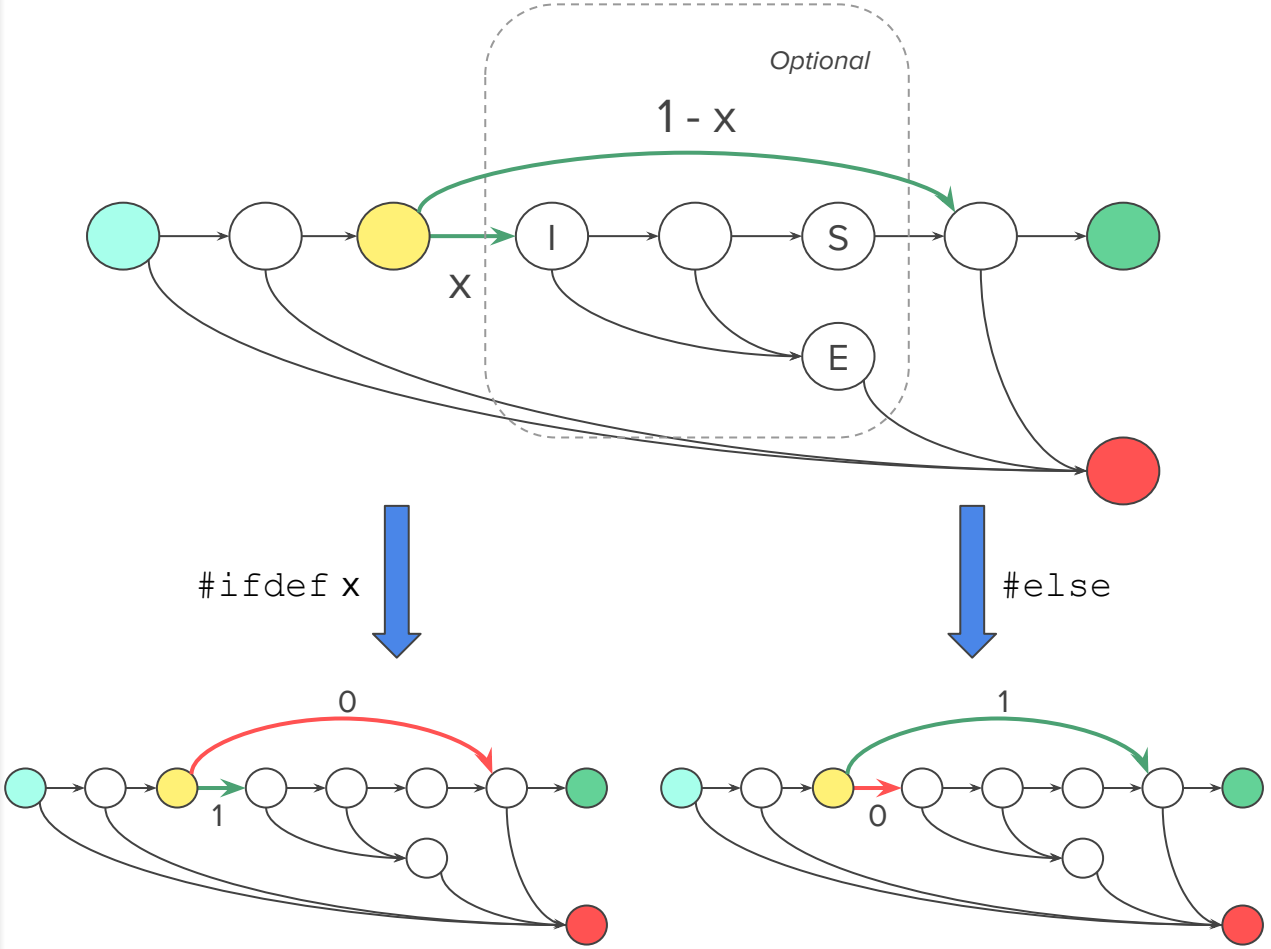

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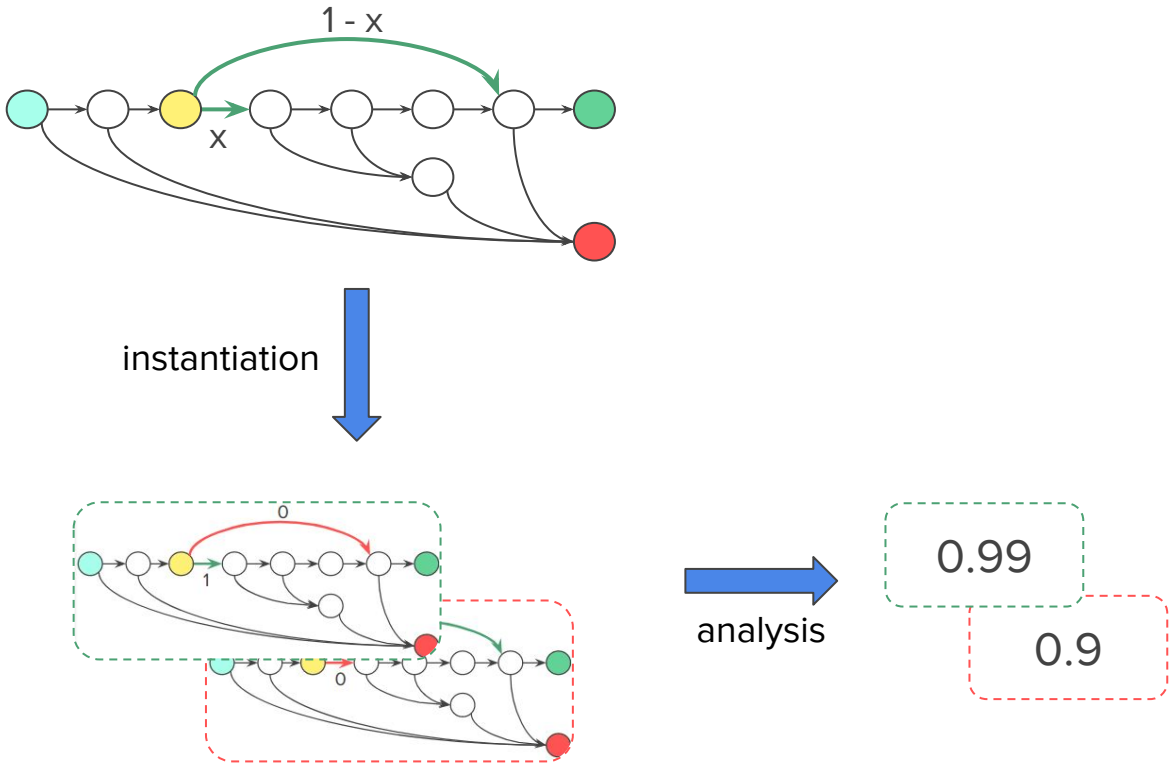
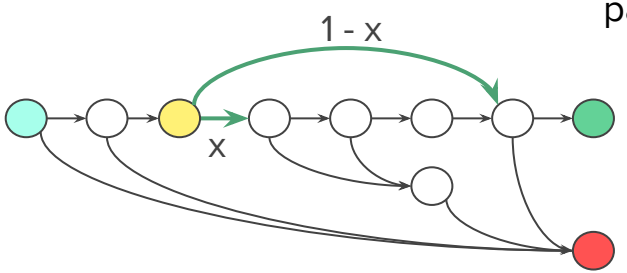


Commuting Strategies for Product-line Reliability Analysis



parametric analysis

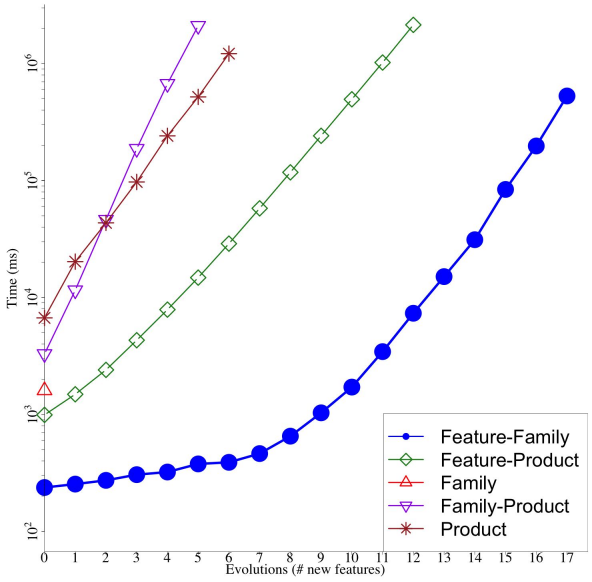
0.99*x + 0.9*(1-x)

evaluation

0.99

0.9

Commuting
Strategies
for
Product-line
Reliability
Analysis



Trade-offs

Space

Time

Simplicity

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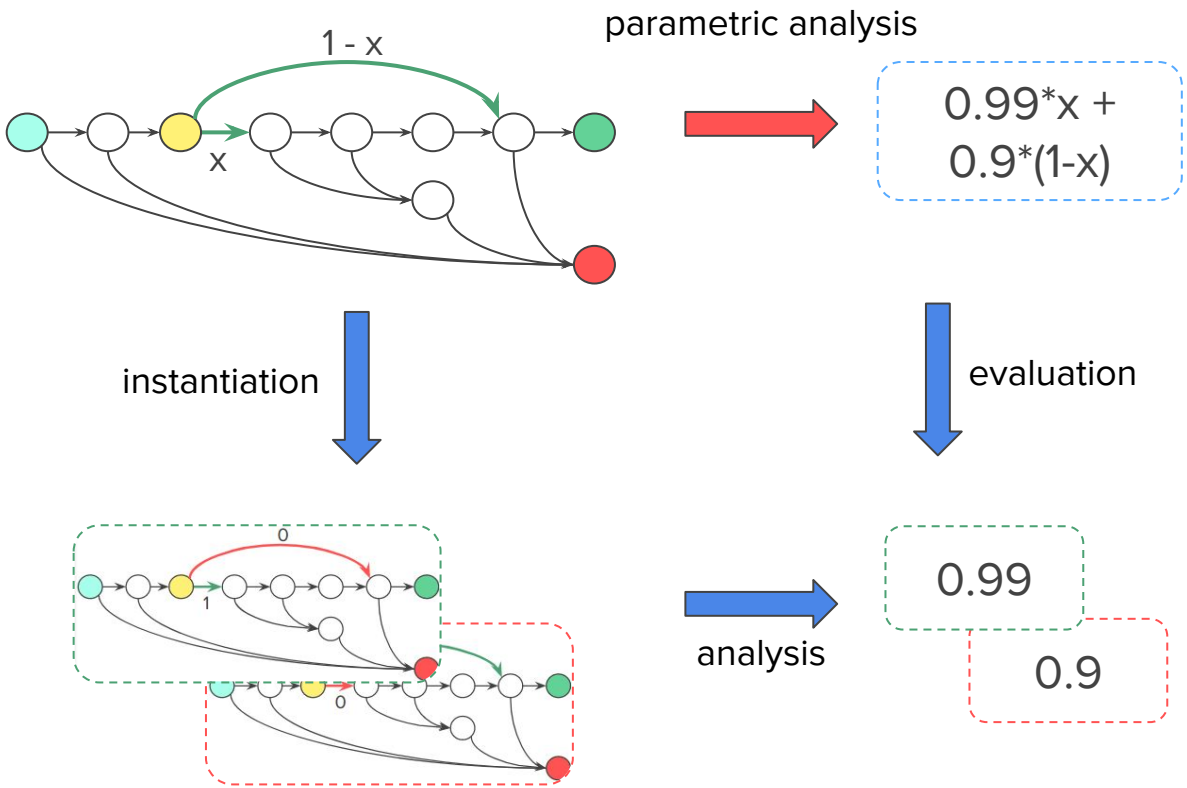
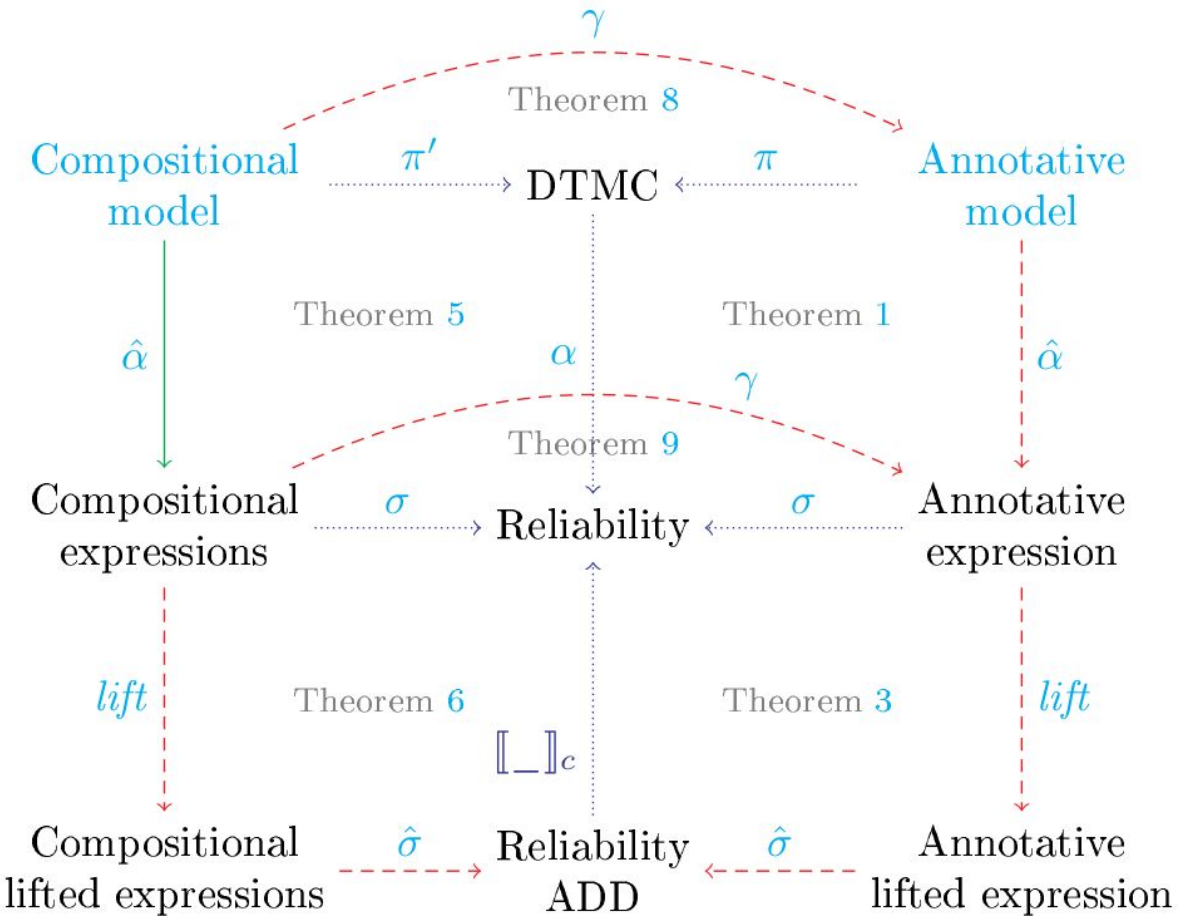
Commuting Strategies for Product-line Reliability Analysis



Commuting Strategies for Product-line Reliability Analysis



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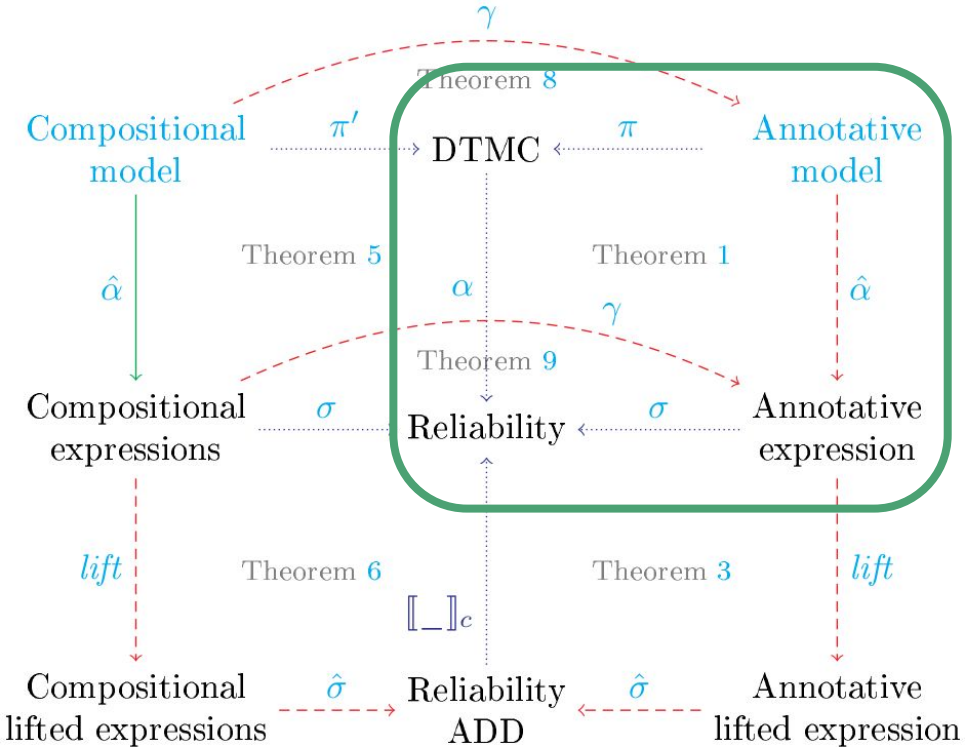

PVS

VS

Coq

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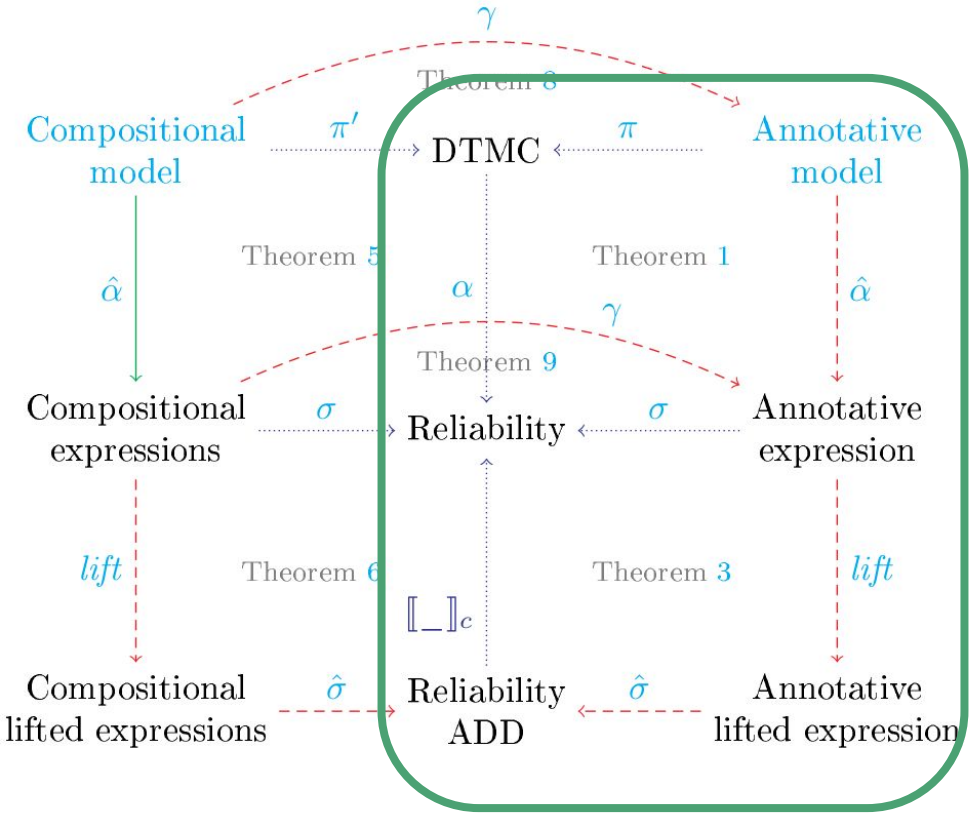
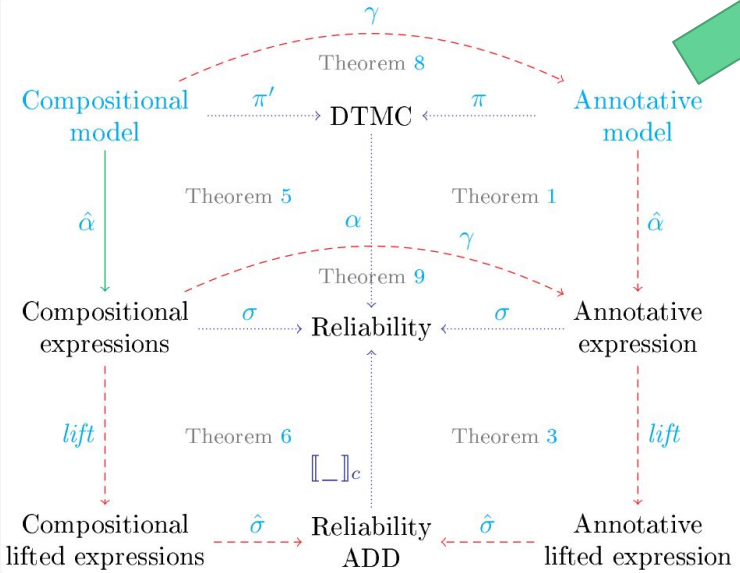


PVS

Commuting Strategies for Product-line ~~Reliability~~ Analysis



Type checking

Data-flow analysis

Control-flow analysis

Model checking *(other properties)*

Theorem proving

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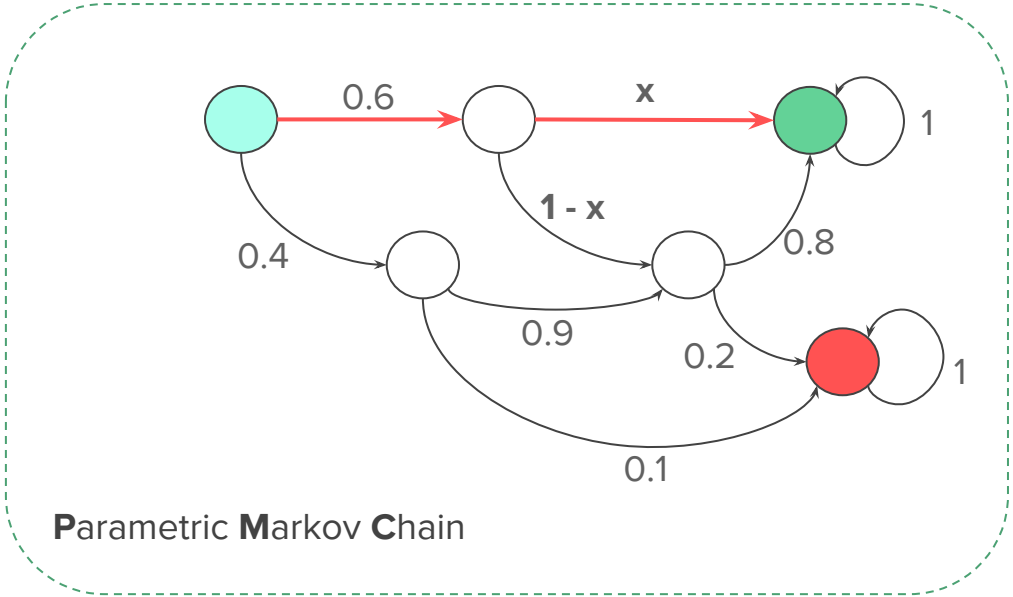
Thank you!

Backup Slides

Reliability Analysis of PMCs

R = 0.6 * x
+ 0.6 * (1-x) * 0.8
+ 0.4 * 0.9 * 0.8



Parametric **M**arkov **C**hain

Reliability Analysis of PMCs

R = 0.6 * x
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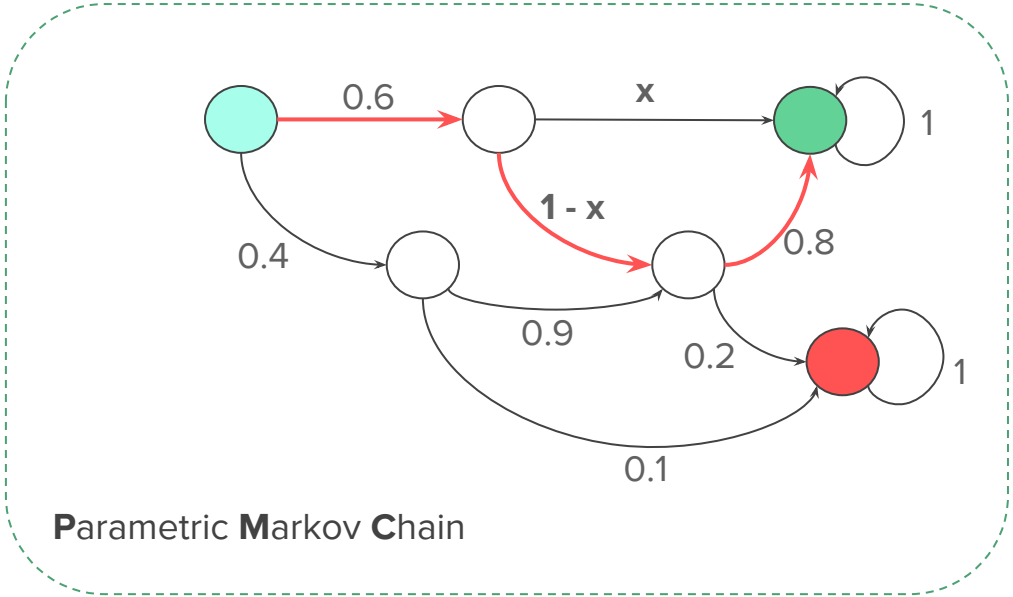
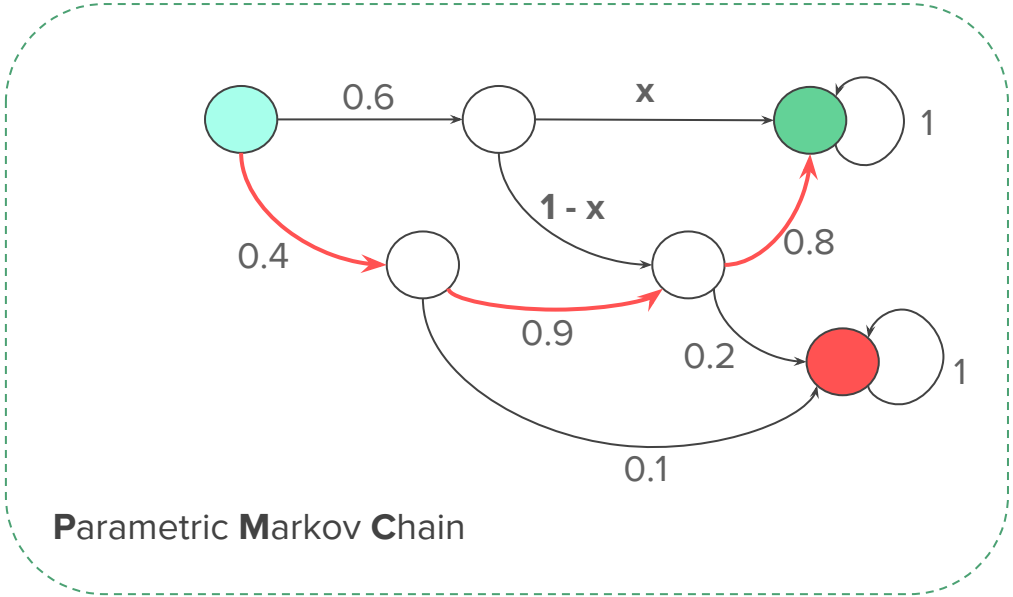


Reliability Analysis of PMCs

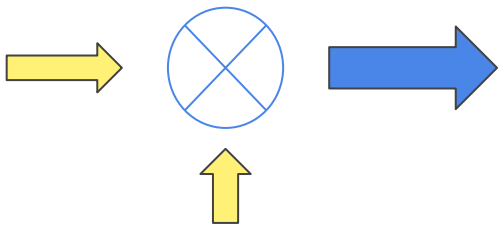
R = 0.6 * x
+ 0.6 * (1-x) * 0.8
+ 0.4 * 0.9 * 0.8



Parametric **M**arkov **C**hain

Expression Evaluation

0.98*x + 0.9*y + 0.01



Configuration	x	y
{ ..., F, ... }	0.8	0.01
{ ..., F, G, G1, ... }	0.5	0.5
{ ..., F, G, G2, ... }	0.01	1
...	...	...

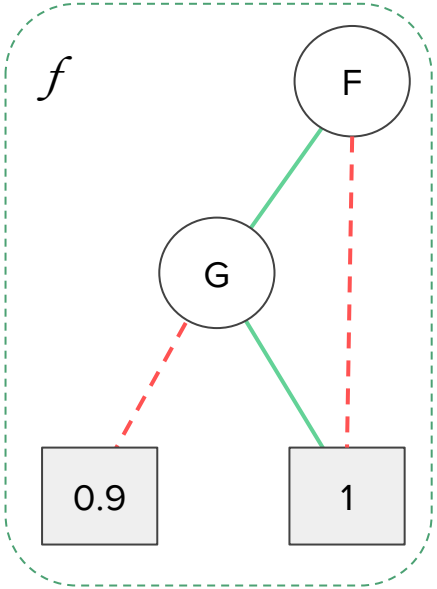
Configuration	R
{ ..., F, ... }	0.884
{ ..., F, G, G1, ... }	0.95
{ ..., F, G, G2, ... }	0.92
...	...

Algebraic **D**ecision **D**iagrams

$$f(F, G) = \begin{cases} 0.9 & \text{if } F \wedge \neg G \\ 1 & \text{otherwise} \end{cases}$$

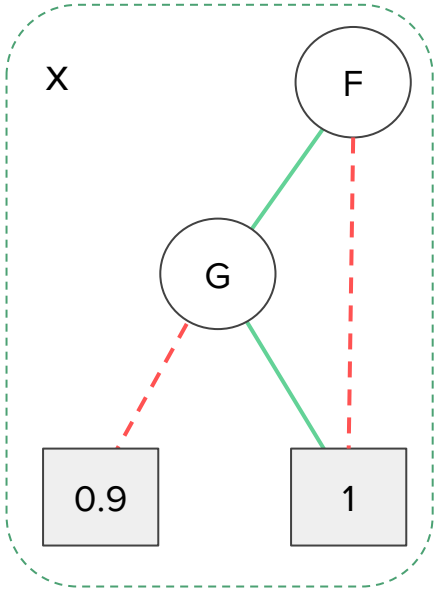
Features

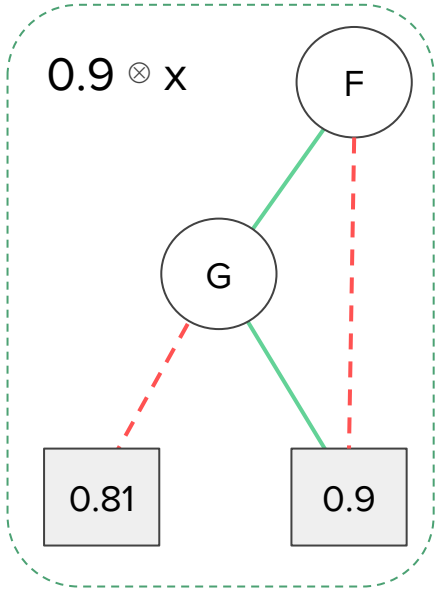
Presence condition



Expression Evaluation with ADDs

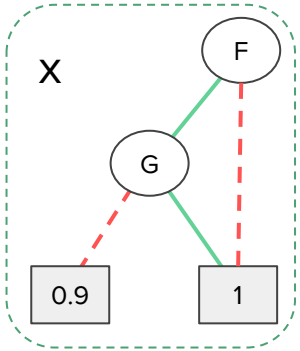
F	G	x
0	0	1
0	1	1
1	0	0.9
1	1	1

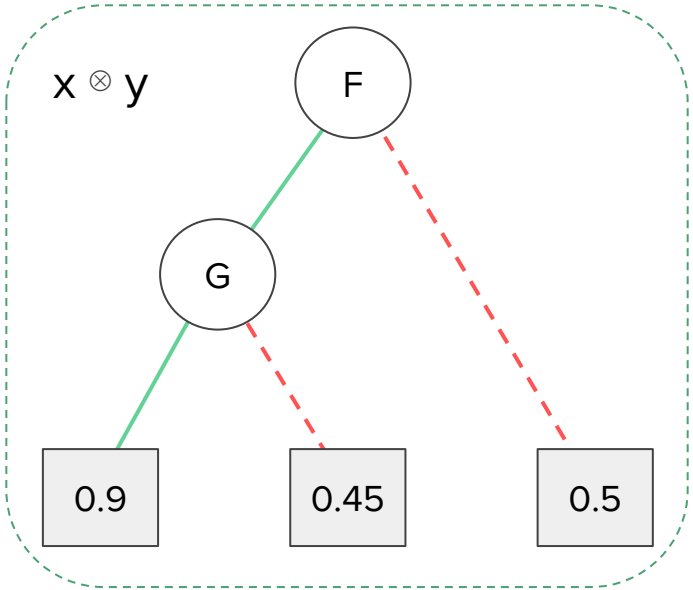




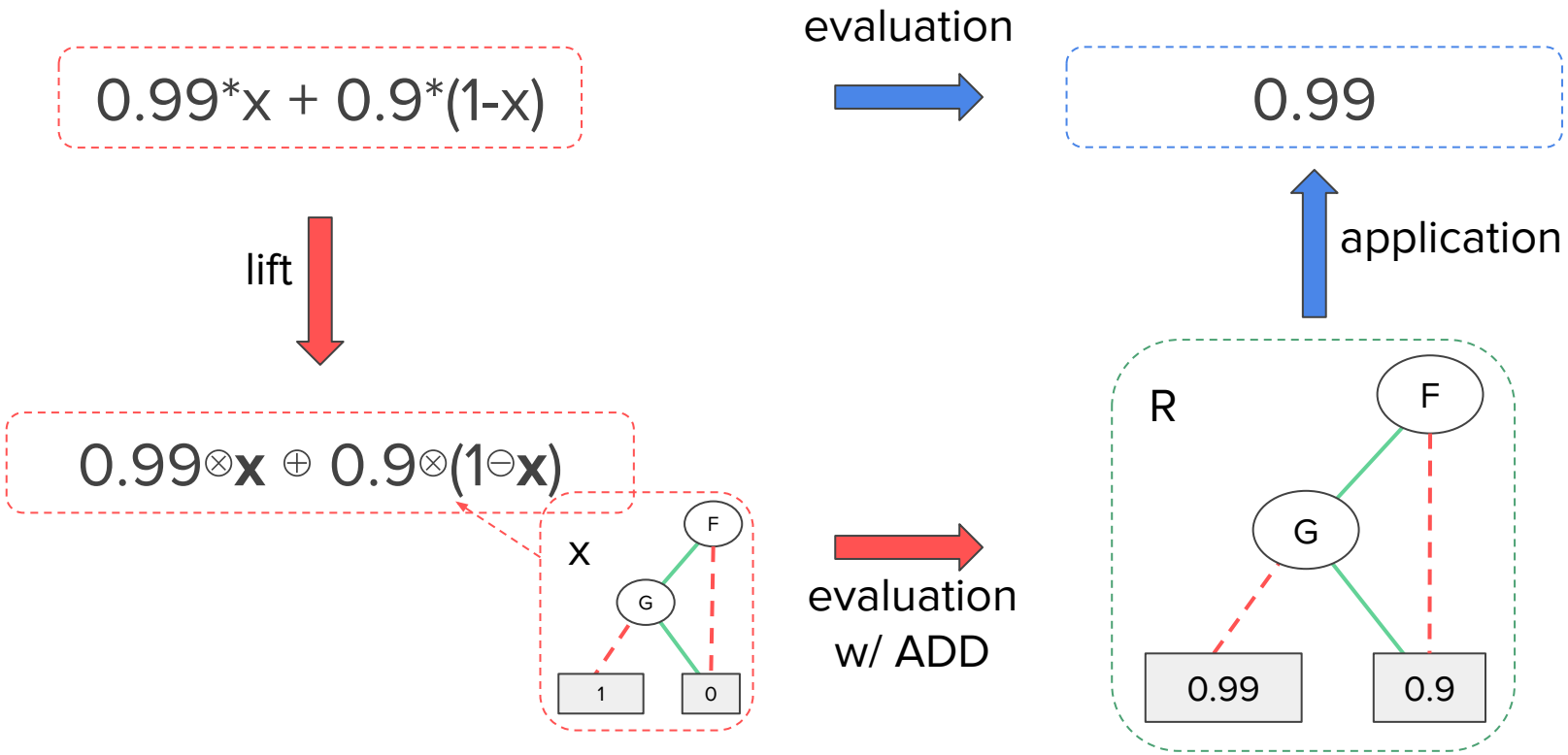
Expression Evaluation with ADDs

F	G	x	y	x⊗y
0	0	1	0.5	0.5
0	1	1	0.5	0.5
1	0	0.9	0.5	0.45
1	1	1	0.9	0.9





Alternative Strategies



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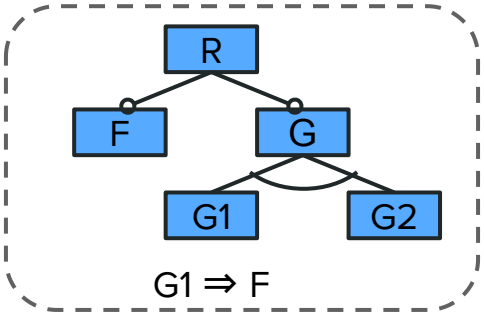
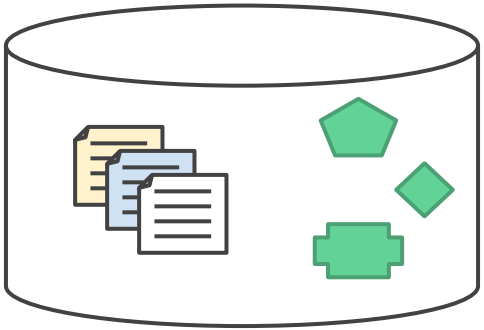
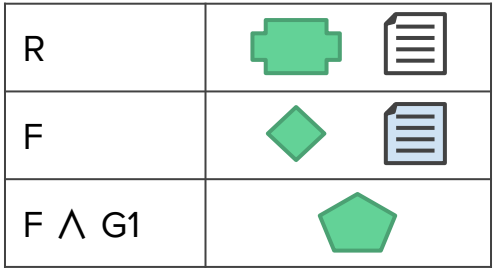


Valid configurations



Reusable parts



Assembly instructions

References

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Related Work

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