

Figure 1: timing-pattern

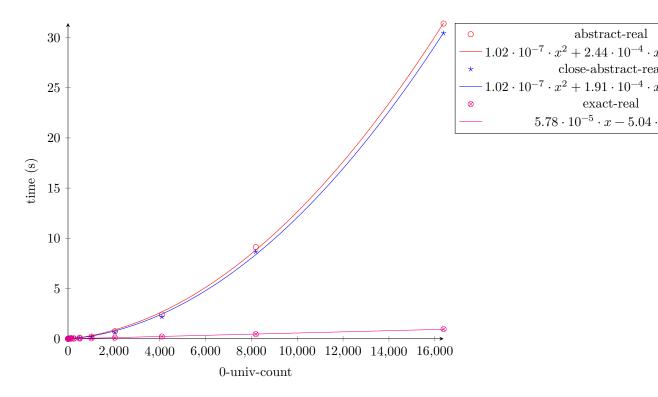


Figure 2: timing-n-polymorphic-universes param-1-n $\,0\,$

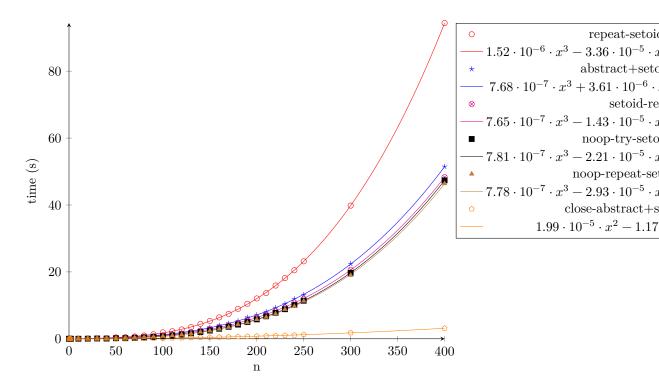


Figure 3: timing-repeat-setoid-rewrite-under-binders

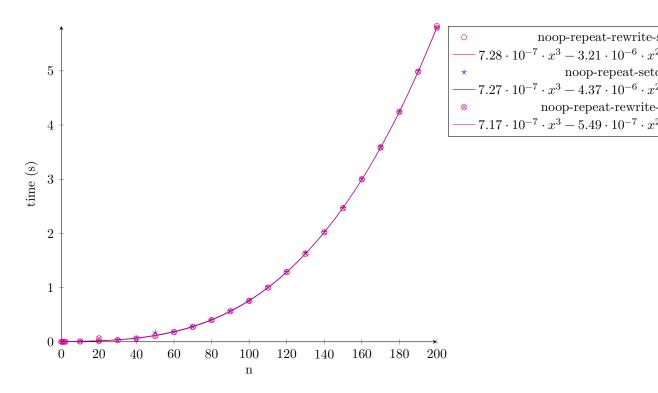
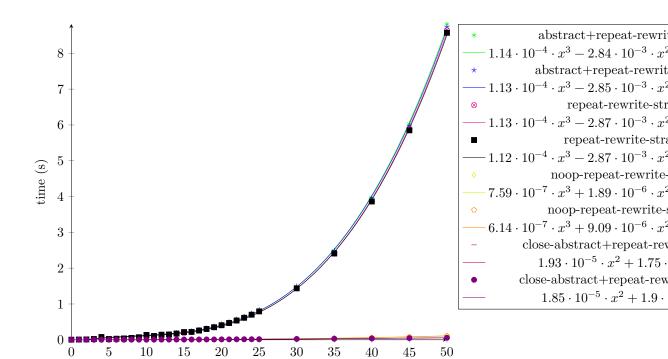
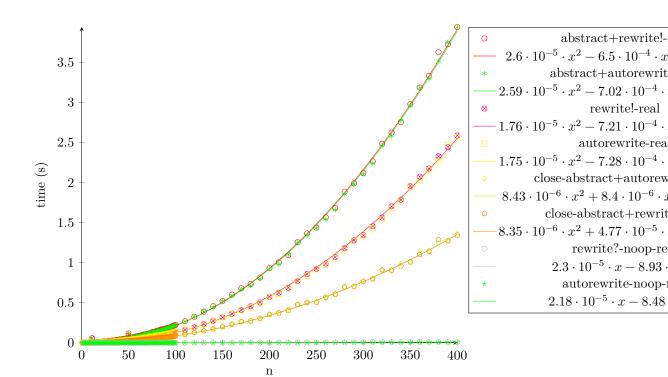


Figure 4: timing-repeat-setoid-rewrite-under-binders-noop

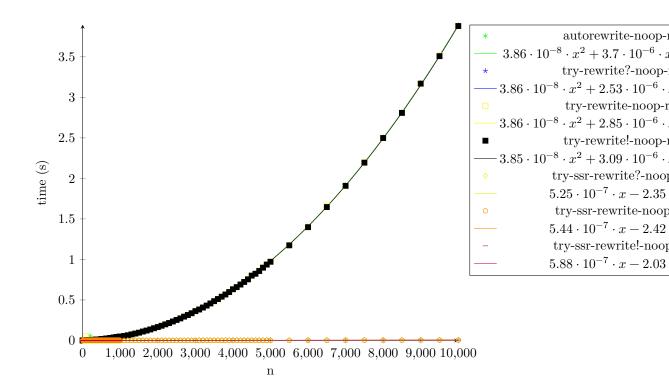


 $Figure \ 5: \ timing-rewrite-strat-under-binders$

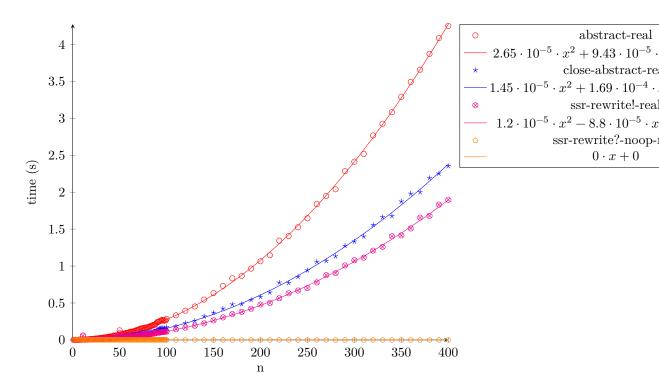
n



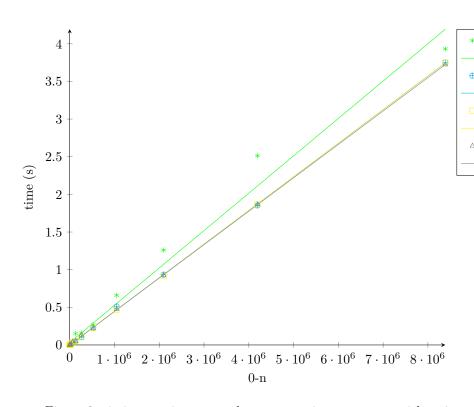
 $Figure \ 6: \ timing-rewrite-repeated-app-autorewrite \\$



Figure~7:~timing-rewrite-repeated-app-autorewrite-noop



 ${\bf Figure~8:~timing\text{-}rewrite\text{-}repeated\text{-}app\text{-}ssrrewrite}$



try-ssr-rewrite!-cold-noop-rea

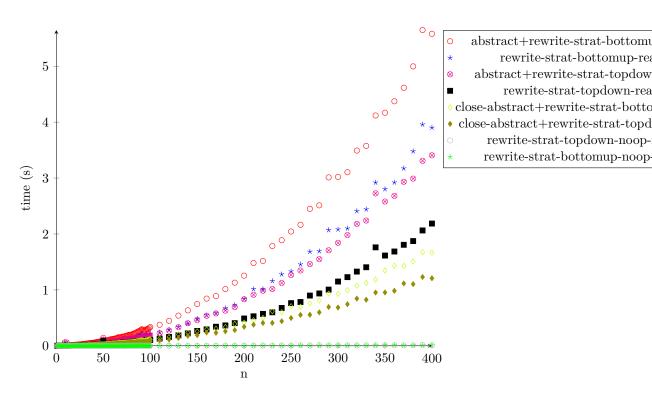
 $4.96 \cdot 10^{-7} \cdot x + 3.03 \cdot 10^{-2}$ try-ssr-rewrite-noop-real

 $\begin{aligned} &4.47\cdot 10^{-7}\cdot x - 6.52\cdot 10^{-4}\\ &\text{try-ssr-rewrite?-noop-real} \end{aligned}$

 $\begin{array}{l} 4.47 \cdot 10^{-7} \cdot x - 2.44 \cdot 10^{-3} \\ \text{try-ssr-rewrite!-noop-real} \end{array}$

 $4.44\cdot 10^{-7}\cdot x + 8.56\cdot 10^{-4}$

Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn $\ 1$



rewrite-strat-bottomup-rea

abstract + rewrite - strat - topdowrewrite-strat-topdown-rea

rewrite-strat-topdown-nooprewrite-strat-bottomup-noop-

 $Figure~10:~timing\mbox{-rewrite-repeated-app-rewrite-strat}$

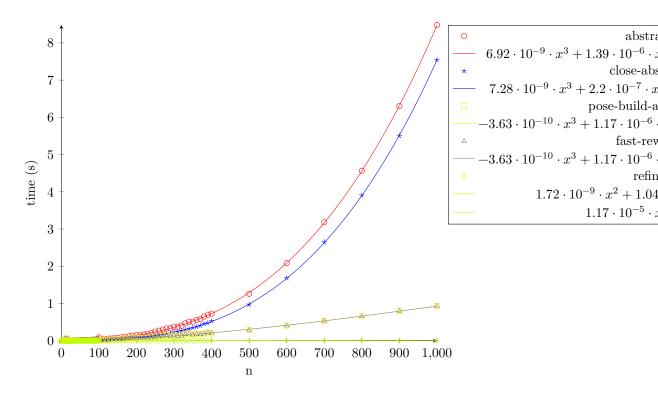
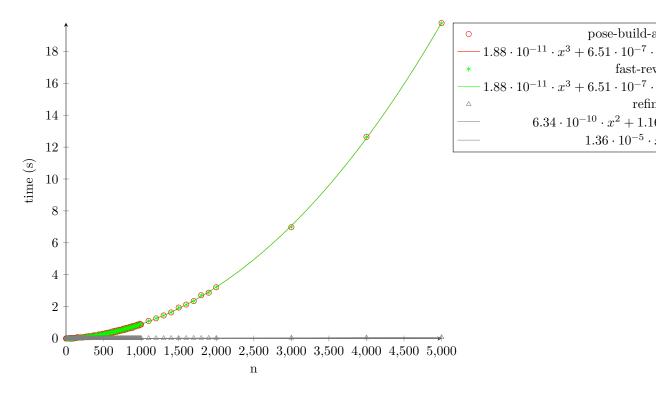


Figure 11: timing-rewrite-repeated-app-fast-rewrite



Figure~12:~timing-rewrite-repeated-app-fast-rewrite-no-abstract

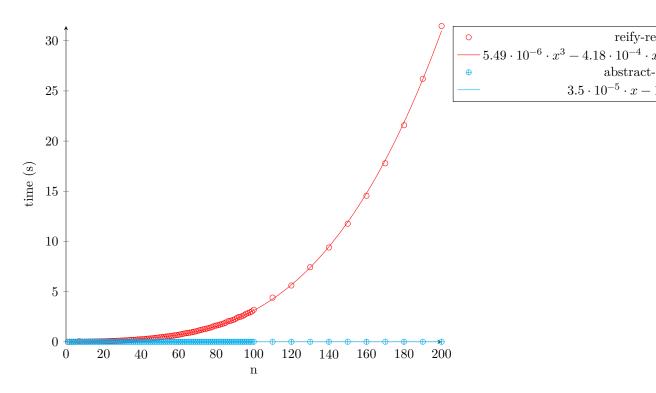


Figure 13: timing-typeclass-reification-let-in-HOAS

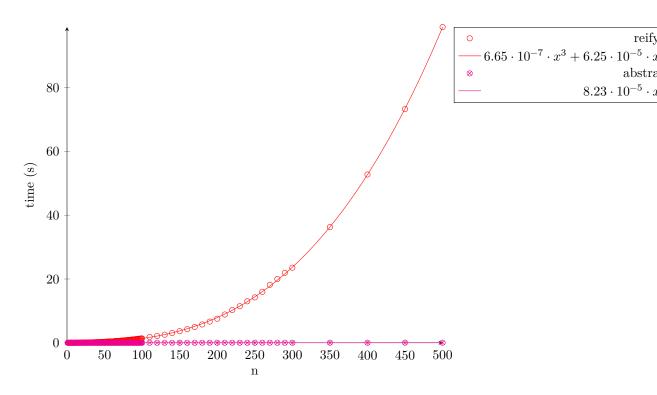


Figure 14: timing-typeclass-reification-let-in-PHOAS

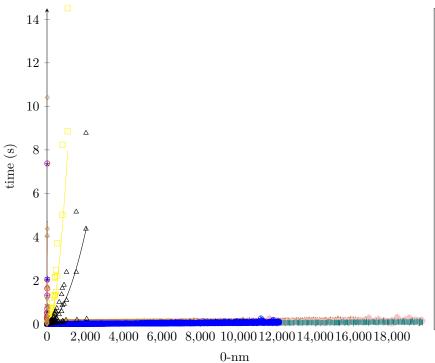


Figure 15: timing-rewrite-lift-lets-map param-1-n 1, param-2-m 1

```
rewrite-strat(bottomup-bot
                                                              4.82 \cdot 10^{-3} exp (0.46 \cdot (
                           rewrite-strat(topdown-bot
                                                              5.01 \cdot 10^{-3} \exp{(0.46 \cdot (
                                                                                                                           cps+cbn-real
                6.97 \cdot 10^{-6} \cdot x^2 - 1.02 \cdot 10^{-4}
                                                                              cps+native-compute
1.11 \cdot 10^{-10} \cdot x^2 + 4.58 \cdot 10^{-6} \cdot 
                                                                                                                        cps+lazy-real
 2.15 \cdot 10^{-10} \cdot x^2 + 4.29 \cdot 10^{-6} \cdot 
                                                                                                                           cps+cbv-real
1.06 \cdot 10^{-10} \cdot x^2 + 3.43 \cdot 10^{-6} \cdot 
                                                                                         cps+vm-compute-
 1.72\cdot 10^{-10}\cdot x^2 + 5.08\cdot 10^{-6}\cdot \\
                                                                                                                     cps+simpl-real
    8.99 \cdot 10^{-7} \cdot x^2 + 3.06 \cdot 10^{-4} \cdot x^2
                                                                                                        setoid-rewrite-re
     -6.05 \cdot 10^{-3} \cdot x^3 + 0.19 \cdot x^2 -
```

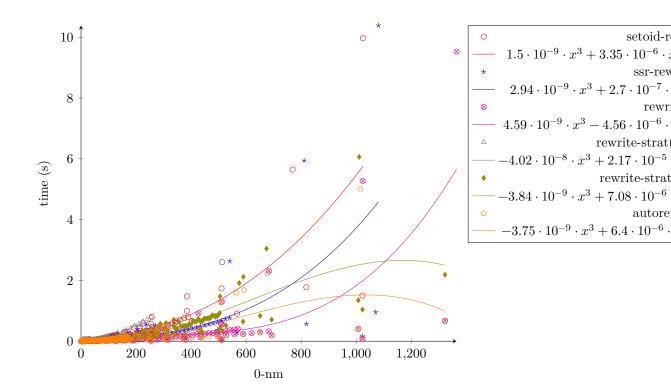
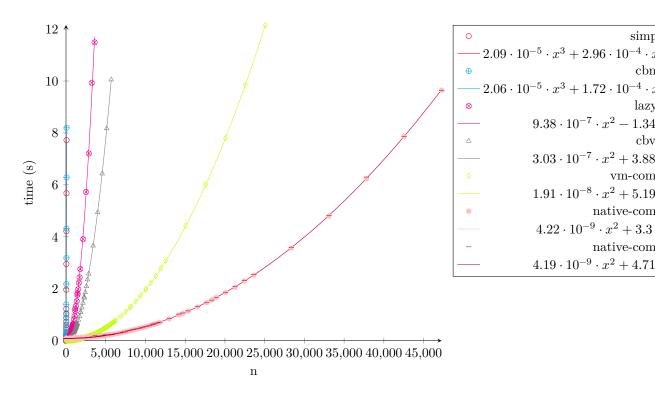


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



simp

vm-com

native-com

native-com

 $9.38 \cdot 10^{-7} \cdot x^2 - 1.34$

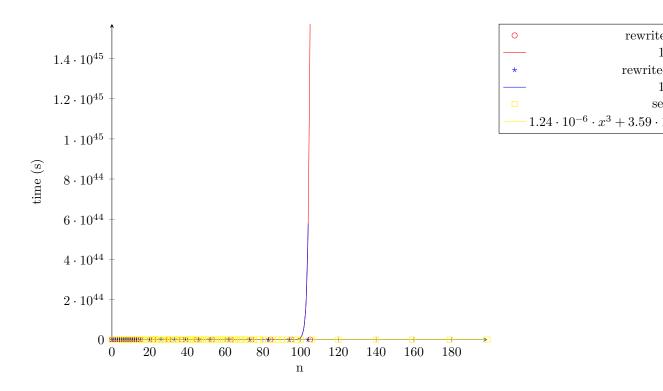
 $3.03 \cdot 10^{-7} \cdot x^2 + 3.88$

 $1.91 \cdot 10^{-8} \cdot x^2 + 5.19$

 $4.22 \cdot 10^{-9} \cdot x^2 + 3.3$

 $4.19\cdot 10^{-9}\cdot x^2 + 4.71$

Figure 17: timing-sieve-of-eratosthenes



rewrite

Figure 18: timing-rewrite-under-lets-plus-0 $\,$

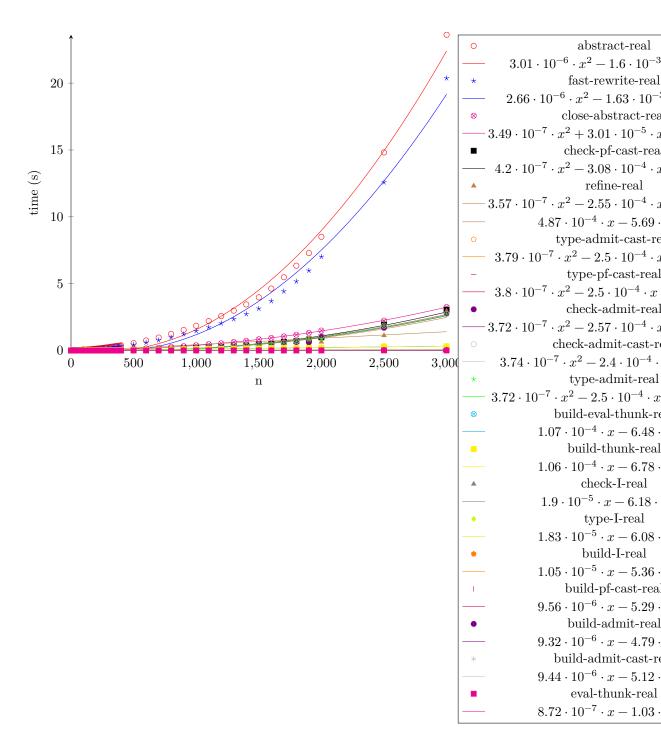


Figure 19: timing-rewrite-repeated-app-fast-rewrite-ltac2