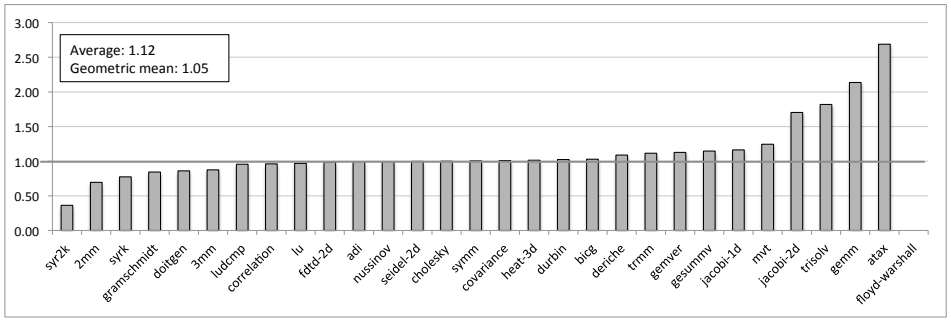
SCEV checks vs. clean Polly (using newest back-end)

GOAL: show how SCEV checks improve the newest version of Polly
BASE: llvm -O3 + old version of Polly (times improvement factor of newest Polly)
OPT: same as base plus SCEV alias checks (times improvement factor of newest Polly)

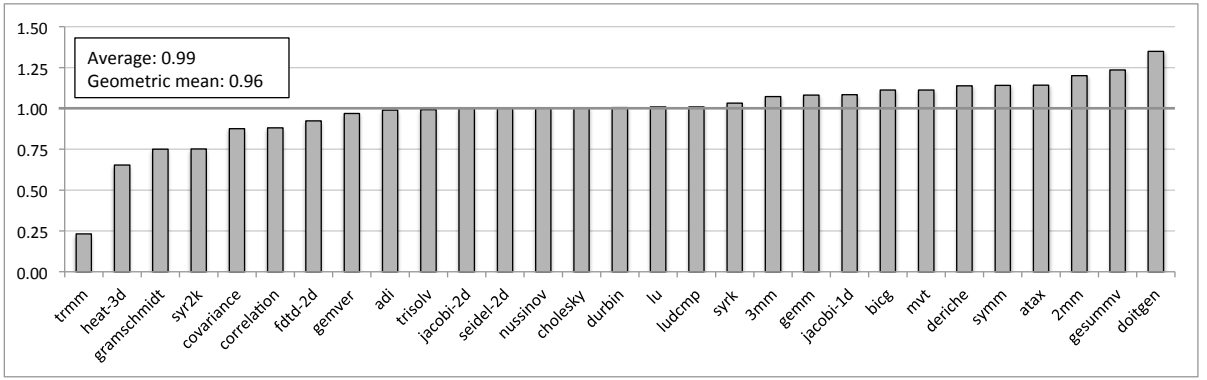
benchmark	base	opt	base improvement factor	opt improvement factor	(opt*factor)/(base*factor)
syr2k	7.915418333	2.671141667	1.00	1.08	0.36
2mm	3.305413333	2.477566167	1.08	1.00	0.70
syrk	1.090688333	0.897848333	1.06	1.00	0.77
gramschmidt	5.560098667	5.145542	1.13	1.03	0.84
doitgen	0.837505333	0.683899167	1.01	1.07	0.86
3mm	4.624393333	4.281411167	1.02	0.97	0.87
ludcmp	4.5316565	4.3435605	0.99	0.99	0.96
correlation	3.863947667	3.702578667	1.00	1.00	0.96
lu	5.2506245	5.098458667	0.97	0.97	0.97
fdtd-2d	3.173447333	3.1331675	1.00	1.00	0.99
adi	23.96234133	23.882095	1.00	1.00	0.99
nussinov	4.014873833	3.976555833	1.07	1.07	0.99
seidel-2d	32.83572133	32.83416	0.97	0.97	1.00
cholesky	1.763446833	1.7602835	1.01	1.01	1.00
symm	2.958127	2.9487755	0.87	0.87	1.00
covariance	4.028980167	3.8727905	1.04	1.09	1.01
heat-3d	4.617384333	4.625200333	0.99	1.01	1.01
durbin	0.004442667	0.004481333	0.98	1.00	1.02
bicg	0.01511	0.015437667	1.00	1.01	1.03
deriche	0.242455833	0.264599667	0.96	0.95	1.09
trmm	1.211482167	1.321353167	1.01	1.04	1.11
gemver	0.025373	0.026704167	1.00	1.07	1.13
gesummv	0.006498333	0.007399	1.00	1.01	1.15
jacobi-1d	0.001695833	0.001697833	0.89	1.04	1.16
mvt	0.017265	0.0210715	1.00	1.02	1.25
jacobi-2d	3.120814	5.410435	1.00	0.99	1.70
trisolv	0.002892833	0.005379167	1.02	1.00	1.82
gemm	0.892556	1.914641333	1.01	1.00	2.13
atax	0.008421167	0.019246667	1.00	1.18	2.69
floyd-warshall	27.809084	27.84690767	--	--	--



SCEV checks vc. "restrict" keyword

GOAL: show how close SCEV checks are from perfect alias info (restrict flags)
BASE: llvm -O3 + old version of Polly + PolyBench 4.0 restrict flag
OPT: llvm -O3 + old version of Polly + SCEV alias checks

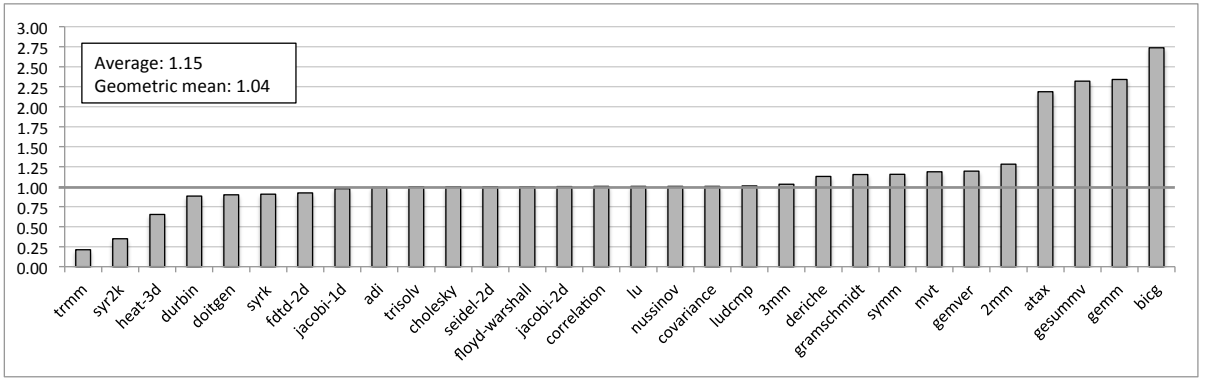
benchmark	base	opt	opt/base
trmm	5.573406167	1.294951833	0.23
heat-3d	7.071602333	4.6177365	0.65
gramschmidt	7.980723	5.992364167	0.75
syr2k	3.5520055	2.668348167	0.75
covariance	4.037067	3.533783667	0.88
correlation	4.204679167	3.704267833	0.88
fdtd-2d	3.397201	3.138483333	0.92
gemver	0.029535333	0.028624333	0.97
adi	24.08226133	23.81995667	0.99
trisolv	0.0054025	0.005359167	0.99
jacobi-2d	5.426918	5.424541833	1.00
seidel-2d	32.8370535	32.83565733	1.00
nussinov	3.989937333	4.0031735	1.00
cholesky	1.760818333	1.768398333	1.00
durbin	0.004287	0.004309833	1.01
lu	5.095018	5.138480333	1.01
ludcmp	4.3906105	4.430287833	1.01
syrk	0.868999333	0.896913333	1.03
3mm	4.313294667	4.624373	1.07
gemm	1.768572	1.913572667	1.08
jacobi-1d	0.001540167	0.0016695	1.08
bicg	0.0134475	0.014955	1.11
mvt	0.018785667	0.020895833	1.11
deriche	0.2315205	0.263484833	1.14
symm	2.618633667	2.988160333	1.14
atax	0.016713333	0.019097167	1.14
2mm	2.4998	3.000841833	1.20
gesummv	0.005998667	0.007408167	1.23
doitgen	0.5079575	0.6853675	1.35



SCEV checks vc. "restrict" keyword (+LICM)

GOAL: show how close SCEV checks are from perfect alias info (restrict flags) (+LICM)
BASE: llvm -O3 + old version of Polly with LICM enabled + PolyBench 4.0 restrict flag
OPT: llvm -O3 + old version of Polly with LICM enabled + SCEV alias checks

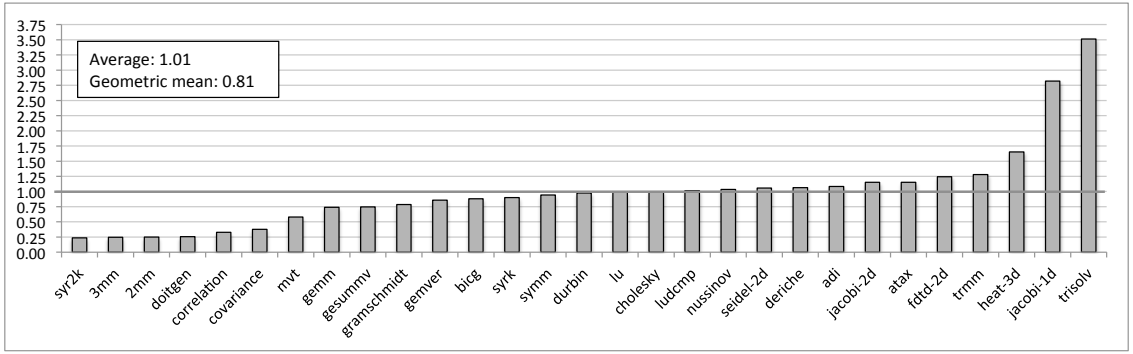
benchmark	base	opt	opt/base
trmm	5.576712167	1.190294333	0.21
syr2k	7.618215667	2.672062	0.35
heat-3d	7.071044667	4.615276833	0.65
durbin	0.0044505	0.003935333	0.88
doitgen	0.763710333	0.685829333	0.90
syrk	0.989901833	0.898025667	0.91
fdtd-2d	3.420682167	3.155227667	0.92
jacobi-1d	0.001556833	0.0015195	0.98
adi	24.13284033	23.8974285	0.99
trisolv	0.005426833	0.005415667	1.00
cholesky	1.761800167	1.760130667	1.00
seidel-2d	32.83547517	32.833828	1.00
floyd-warshall	27.83157317	27.83838	1.00
jacobi-2d	5.401973167	5.415514667	1.00
correlation	3.967243	3.982390167	1.00
lu	5.136347167	5.160002667	1.00
nussinov	4.008574	4.027589167	1.00
covariance	3.792665	3.811043667	1.00
ludcmp	4.380240167	4.421205333	1.01
3mm	4.351346833	4.480433833	1.03
deriche	0.238244333	0.268736333	1.13
gramschmidt	6.6223295	7.633569667	1.15
symm	2.5791005	2.981706167	1.16
mvt	0.0176745	0.020967	1.19
gemver	0.023846333	0.028486667	1.19
2mm	2.569253167	3.292185833	1.28
atax	0.008695333	0.019021667	2.19
gesummv	0.003177167	0.007369833	2.32
gemm	0.824501167	1.929169667	2.34
bicg	0.005658167	0.015483333	2.74



ISL checks using PolyBench scalar bounds and stripmine

GOAL: test if scalar bounds and stripmining improve the performance of ISL checks
BASE: llvm -O3 + newest version of Polly + PolyBench 4.0 SCALAR_BOUNDS flag + -poly-vectorizer=stripmine
OPT: same as base with ISL alias checks

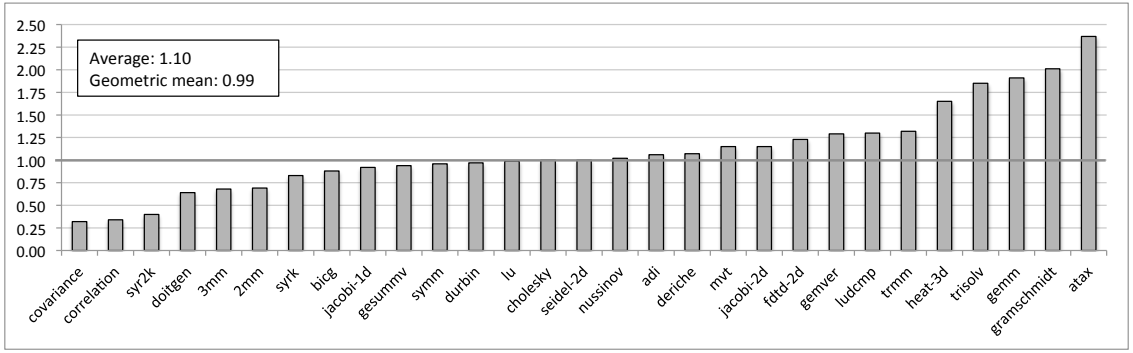
benchmark	base	opt	opt/base
syr2k	7.903619667	1.863261833	0.24
3mm	4.418683167	1.088604833	0.25
2mm	3.037517833	0.754684167	0.25
doitgen	0.843496833	0.215198667	0.26
correlation	3.890977833	1.272248333	0.33
covariance	3.713853833	1.406045333	0.38
mvt	0.017450333	0.010107833	0.58
gemm	0.850088667	0.628264333	0.74
gesummv	0.006521667	0.004870333	0.75
gramschmidt	6.788691667	5.325532167	0.78
gemver	0.024655167	0.021173	0.86
bicg	0.015116667	0.013303333	0.88
syrk	1.098245833	0.988476667	0.90
symm	2.846250667	2.6866425	0.94
durbin	0.0114635	0.011191333	0.98
lu	15.51228733	15.37033967	0.99
cholesky	1.790142	1.789144333	1.00
ludcmp	5.7247635	5.801096	1.01
nussinov	4.865378333	5.030201	1.03
seidel-2d	31.70665517	33.51123033	1.06
deriche	0.233013	0.248118667	1.06
adi	21.7588515	23.56520117	1.08
jacobi-2d	3.022316333	3.479252833	1.15
atax	0.008427833	0.0097115	1.15
fdtd-2d	3.140360833	3.909218333	1.24
trmm	1.281759167	1.641307	1.28
heat-3d	4.608482667	7.614112	1.65
jacobi-1d	0.001535667	0.004327167	2.82
trisolv	0.0028855	0.010135333	3.51



ISL checks using PolyBench scalar bounds

GOAL: test if scalar bounds improve the performance of ISL checks
BASE: llvm -O3 + newest version of Polly + PolyBench 4.0 SCALAR_BOUNDS flag
OPT: same as base with ISL alias checks

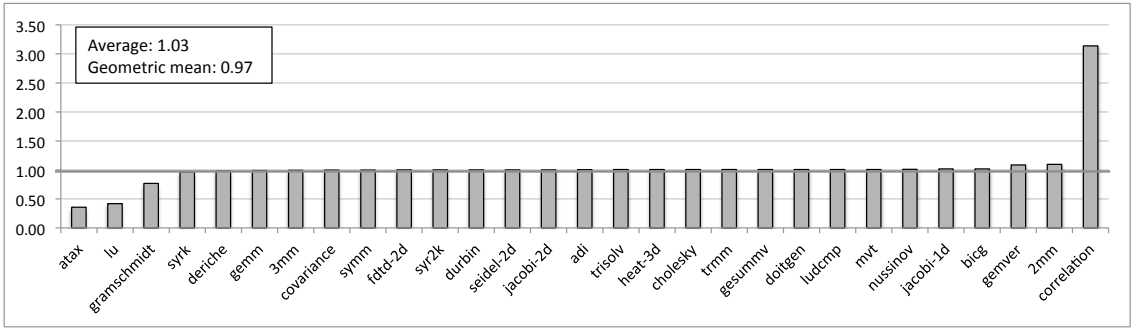
benchmark	base	opt	opt/base
covariance	4.056187833	1.279142333	0.32
correlation	3.722899833	1.281405833	0.34
syr2k	8.3675715	3.387505167	0.40
doitgen	0.832951333	0.529927667	0.64
3mm	5.014919667	3.408345167	0.68
2mm	3.024564667	2.081196833	0.69
syrk	1.095163667	0.909188333	0.83
bicg	0.015134667	0.013359667	0.88
jacobi-1d	0.001631667	0.0015005	0.92
gesummv	0.006496833	0.006090667	0.94
symm	2.946344167	2.831070167	0.96
durbin	0.004482	0.0043465	0.97
lu	9.114853167	9.043035333	0.99
cholesky	1.781603833	1.7737795	1.00
seidel-2d	31.70602917	31.7222795	1.00
nussinov	4.034847833	4.101323333	1.02
adi	21.79025683	23.11893967	1.06
deriche	0.2296285	0.2453195	1.07
mvt	0.017279833	0.019805833	1.15
jacobi-2d	3.017126667	3.466296833	1.15
fdtd-2d	3.125947833	3.836848	1.23
gemver	0.024594167	0.031714167	1.29
ludcmp	4.468471833	5.8037235	1.30
trmm	1.173646333	1.5443325	1.32
heat-3d	4.612868333	7.5919175	1.65
trisolv	0.002886833	0.005342167	1.85
gemm	0.887863833	1.6952525	1.91
gramschmidt	4.5271085	9.1093105	2.01
atax	0.0084175	0.019970167	2.37



Fusion=max vs. fusion=min

GOAL: compare the two fusion strategies in Polly
BASE: llvm -O3 + Polly "-polly-opt-fusion=min" (dafault)
OPT: llvm -O3 + Polly "-polly-opt-fusion=max"

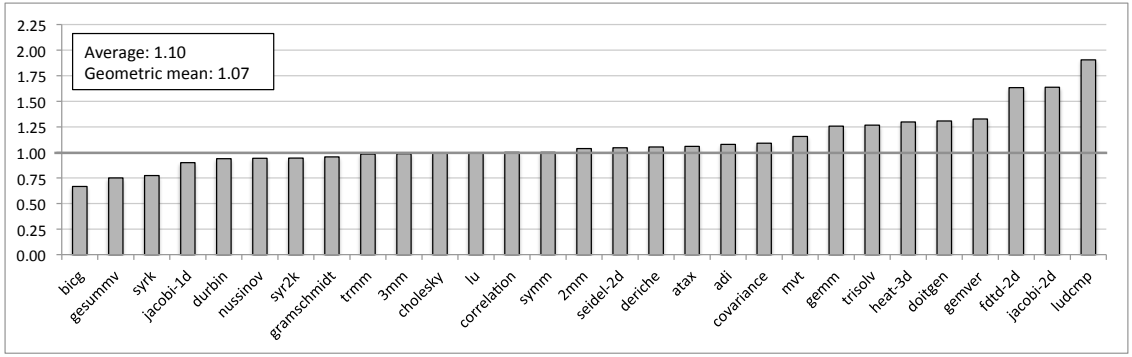
benchamrk	base	opt	opt/base
atax	0.019938833	0.007101	0.36
lu	9.236660667	3.862074	0.42
gramschmidt	5.816794667	4.469195	0.77
syrk	0.908754833	0.876463167	0.96
deriche	0.249972333	0.245374833	0.98
gemm	1.695126833	1.675488167	0.99
3mm	4.429467167	4.396003167	0.99
covariance	1.2810665	1.277064333	1.00
symm	2.838568167	2.8300425	1.00
fdtd-2d	2.839239333	2.835603	1.00
syr2k	3.387947833	3.383892333	1.00
durbin	0.004455	0.0044535	1.00
seidel-2d	31.73745933	31.73766	1.00
jacobi-2d	3.504085667	3.5081705	1.00
adi	23.10212917	23.13704383	1.00
trisolv	0.005331167	0.005361167	1.01
heat-3d	8.307063667	8.356000667	1.01
cholesky	1.770091167	1.781728	1.01
trmm	1.544343333	1.555320333	1.01
gesummv	0.006108833	0.006153	1.01
doitgen	0.5847785	0.589202667	1.01
ludcmp	5.7094395	5.753783333	1.01
mvt	0.019794667	0.019956	1.01
nussinov	5.580557	5.632622167	1.01
jacobi-1d	0.001516333	0.001540833	1.02
bicg	0.013205167	0.013427667	1.02
gemver	0.0307015	0.0332975	1.08
2mm	2.0926165	2.289311833	1.09
correlation	1.281755333	4.024156833	3.14



ISL checks using MINI_DATASET

GOAL: show how ISL checks improve Polly when using the MINI_DATASET
BASE: llvm -O3 + newest version of Polly + PolyBench MINI_DATASET
OPT: same as base using ISL checks

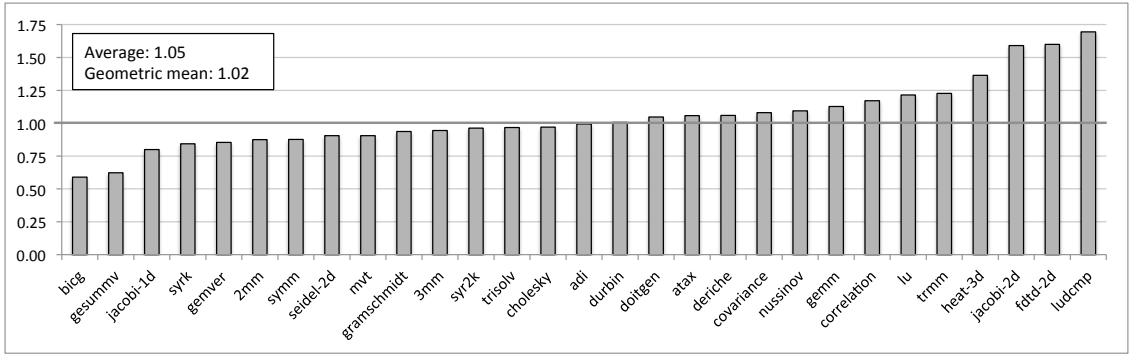
benchmark	base	opt	opt/base
bicg	7.50E-06	5.00E-06	0.67
gesummv	4.00E-06	3.00E-06	0.75
syrk	1.62E-05	1.25E-05	0.77
jacobi-1d	1.67E-06	1.50E-06	0.90
durbin	1.37E-05	1.28E-05	0.94
nussinov	9.73E-05	9.17E-05	0.94
syr2k	4.75E-05	4.48E-05	0.94
gramschmidt	3.02E-05	2.88E-05	0.96
trmm	1.03E-05	1.02E-05	0.98
3mm	2.65E-05	2.62E-05	0.99
cholesky	1.93E-05	1.92E-05	0.99
lu	5.60E-05	5.58E-05	1.00
correlation	2.85E-05	2.85E-05	1.00
symm	1.75E-05	1.75E-05	1.00
2mm	1.82E-05	1.88E-05	1.04
seidel-2d	0.000491	0.000513167	1.05
deriche	0.000113167	0.000119167	1.05
atax	5.67E-06	6.00E-06	1.06
adi	0.000287333	0.000309667	1.08
covariance	2.42E-05	2.63E-05	1.09
mvt	5.33E-06	6.17E-06	1.16
gemm	1.68E-05	2.12E-05	1.26
trisolv	2.50E-06	3.17E-06	1.27
heat-3d	9.83E-05	0.000127667	1.30
doitgen	1.68E-05	2.20E-05	1.31
gemver	9.67E-06	1.28E-05	1.33
fdtd-2d	4.50E-05	7.35E-05	1.63
jacobi-2d	5.73E-05	9.38E-05	1.64
ludcmp	3.55E-05	6.77E-05	1.91



ISL checks using SMALL_DATASET

GOAL: show how ISL checks improve Polly when using the SMALL_DATASET
BASE: llvm -O3 + newest version of Polly + PolyBench SMALL_DATASET
OPT: same as base using ISL checks

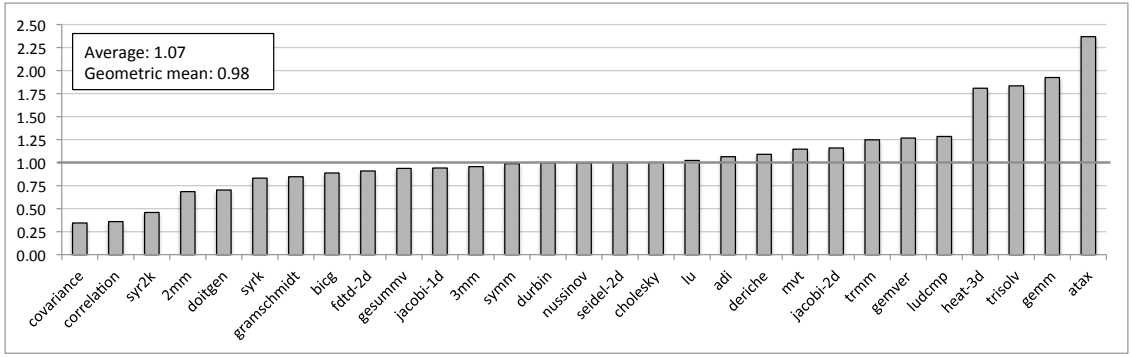
benchmark	base	opt	opt/base
bicg	6.30E-05	3.72E-05	0.59
gesummv	3.67E-05	2.28E-05	0.62
jacobi-1d	1.08E-05	8.67E-06	0.80
syrk	0.0002755	0.000232167	0.84
gemver	6.92E-05	5.90E-05	0.85
2mm	0.000427167	0.000374	0.88
symm	0.0003665	0.000321333	0.88
seidel-2d	0.010352	0.009362333	0.90
mvt	4.75E-05	4.30E-05	0.91
gramschmidt	0.000575333	0.000538667	0.94
3mm	0.000743667	0.000702333	0.94
syr2k	0.000979	0.000942667	0.96
trisolv	2.05E-05	1.98E-05	0.97
cholesky	0.0004195	0.000406833	0.97
adi	0.006177667	0.006139833	0.99
durbin	3.03E-05	3.05E-05	1.01
doitgen	0.000546333	0.000572167	1.05
atax	4.07E-05	4.30E-05	1.06
deriche	0.000644333	0.0006825	1.06
covariance	0.0005135	0.000554333	1.08
nussinov	0.00201	0.002197667	1.09
gemm	0.000377667	0.000425833	1.13
correlation	0.0004995	0.000585167	1.17
lu	0.0010405	0.001264	1.21
trmm	0.000200333	0.000245833	1.23
heat-3d	0.001793333	0.002445167	1.36
jacobi-2d	0.000982333	0.001561667	1.59
fdtd-2d	0.000663667	0.001061167	1.60
ludcmp	0.000704667	0.001194	1.69



ISL checks using LARGE_DATASET

GOAL: show how ISL checks improve Polly when using the LARGE_DATASET
BASE: llvm -O3 + newest version of Polly + PolyBench LARGE_DATASET
OPT: same as base using ISL checks

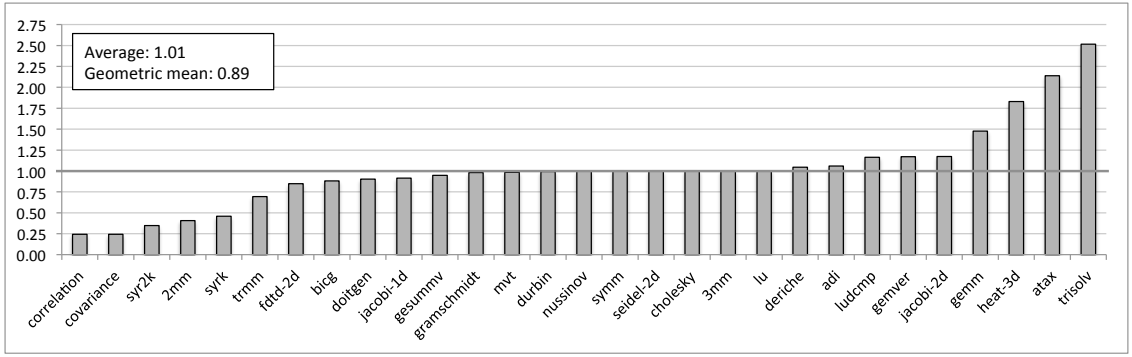
benchmark	base	opt	opt/base
covariance	3.722561833	1.2787245	0.34
correlation	3.559901	1.280831333	0.36
syr2k	7.389355833	3.386544833	0.46
2mm	3.0531375	2.092729167	0.69
doitgen	0.847093167	0.594431667	0.70
syrk	1.092948333	0.909672333	0.83
gramschmidt	9.435812833	7.978360167	0.85
bicg	0.015105	0.013417	0.89
fdtd-2d	3.120160333	2.834613333	0.91
gesummv	0.006497333	0.0060865	0.94
jacobi-1d	0.001622	0.001526833	0.94
3mm	4.4498345	4.258156833	0.96
symm	2.739922667	2.709632167	0.99
durbin	0.004427	0.004411333	1.00
nussinov	5.590243667	5.5822425	1.00
seidel-2d	31.71664217	31.71643667	1.00
cholesky	1.767848667	1.769516	1.00
lu	9.024532667	9.231515	1.02
adi	21.68059067	23.0598705	1.06
deriche	0.228566	0.249008333	1.09
mvt	0.017209333	0.019743667	1.15
jacobi-2d	3.0149505	3.4956025	1.16
trmm	1.236980167	1.544116	1.25
gemver	0.024408833	0.030922	1.27
ludcmp	4.446111667	5.712678333	1.28
heat-3d	4.610855167	8.340341	1.81
trisolv	0.002906	0.0053335	1.84
gemm	0.880081	1.694186	1.93
atax	0.008417	0.019937833	2.37



ISL checks using EXTRALARGE_DATASET

GOAL: show how ISL checks improve Polly when using the EXTRALARGE_DATASET
BASE: llvm -O3 + newest version of Polly + PolyBench EXTRALARGE_DATASET
OPT: same as base using ISL checks

benchmark	base	opt	opt/base
correlation	53.790069	13.06961117	0.24
covariance	53.759789	13.06642633	0.24
syr2k	91.33565667	31.84775533	0.35
2mm	38.5364405	15.71177967	0.41
syrk	19.17168767	8.804479833	0.46
trmm	19.4594845	13.51901783	0.69
fdtd-2d	28.87494533	24.47030817	0.85
bicg	0.015152333	0.013365333	0.88
doitgen	5.586791167	5.042810833	0.90
jacobi-1d	0.0067335	0.0061585	0.91
gesummv	0.029876833	0.028299167	0.95
gramschmidt	45.6584225	44.76879067	0.98
mvt	0.0790125	0.077709833	0.98
durbin	0.017686	0.017552167	0.99
nussinov	98.46035383	98.367725	1.00
symm	29.34668167	29.34485933	1.00
seidel-2d	254.1916097	254.1964385	1.00
cholesky	15.008915	15.010891	1.00
3mm	51.99206817	52.00174433	1.00
lu	91.005839	91.18203567	1.00
deriche	0.886942833	0.926378667	1.04
adi	174.039755	184.3079828	1.06
ludcmp	69.84024767	81.326767	1.16
gemver	0.102490667	0.119963	1.17
jacobi-2d	27.94528033	32.81459183	1.17
gemm	10.6594275	15.7466265	1.48
heat-3d	42.77926933	78.29150067	1.83
atax	0.00842	0.018014833	2.14
trisolv	0.011226667	0.028248167	2.52



ISL checks vs. clean LLVM -O3

GOAL: show how ISL checks improve classic LLVM optimizations
BASE: llvm -O3
OPT: llvm -O3 + Polly with optimizer set to "none" + ISL checks

benchmark	base	opt	opt/base
bicg	0.015112	0.005673833	0.38
gesummv	0.006499333	0.002534833	0.39
gramschmidt	8.118533333	5.6335165	0.69
syrk	1.090546167	0.9164675	0.84
atax	0.008419	0.0071	0.84
gemm	0.8756265	0.743942667	0.85
doitgen	0.8418215	0.738933833	0.88
jacobi-1d	0.001598333	0.001487833	0.93
symm	2.8951485	2.718040833	0.94
heat-3d	4.613135833	4.370372667	0.95
gemver	0.024582333	0.023411167	0.95
3mm	4.276504833	4.118975	0.96
mvt	0.017256167	0.016773667	0.97
fdtd-2d	3.117066833	3.078905833	0.99
syr2k	7.8135665	7.7259775	0.99
cholesky	1.772414	1.770624833	1.00
seidel-2d	32.82216017	32.8193445	1.00
trmm	1.239295667	1.2401665	1.00
lu	5.204024333	5.222135333	1.00
2mm	2.837406333	2.8504855	1.00
jacobi-2d	3.022830833	3.053557167	1.01
durbin	0.004409	0.004467833	1.01
trisolv	0.002886833	0.002951167	1.02
deriche	0.227656333	0.2340685	1.03
correlation	3.551343833	3.701448667	1.04
adi	21.55960867	23.2147015	1.08
covariance	3.7068855	4.196906	1.13
ludcmp	4.373699	5.504482667	1.26
nussinov	4.0979	5.583183167	1.36