

		particle				saddle				probabilistic-lambda-calculus		probabilistic-prolog		backprop		
		FF	FR	RF	RR	FF	FR	RF	RR	F	R	F	R	Fs	Fv	R
VLAD	STALIN ∇	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FORTRAN	ADIFOR	2.05	■	■	■	5.44	■	■	■	■	■	■	■	15.51	3.35	■
	TAPENADE	5.51	■	■	■	8.09	■	■	■	■	■	■	■	14.97	5.97	6.86
C	ADIC	■	■	■	■	■	■	■	■	■	■	■	■	22.75	5.61	■
C++	ADOL-C	■	■	■	■	■	■	■	■	■	■	■	■	12.16	5.79	32.77
	CppAD	■	■	■	■	■	■	■	■	■	■	■	■	54.74	■	29.24
	FADBAD++	93.32	■	■	■	60.67	■	■	■	■	■	■	■	132.31	46.01	60.71
ML	MLTON	78.13	111.27	45.95	32.57	114.07	146.28	12.27	10.58	129.11	114.88	848.45	507.21	95.20	■	39.90
	OCAML	217.03	415.64	352.06	261.38	291.26	407.67	42.39	50.21	249.40	499.43	1260.83	1542.47	202.01	■	156.93
	SML/NJ	153.01	226.84	270.63	192.13	271.84	299.76	25.66	23.89	234.62	258.53	2505.59	1501.17	181.93	■	102.89
HASKELL	GHC	209.44	■	■	■	247.57	■	■	■	■	■	■	■	■	■	■
SCHEME	BIGLOO	627.78	855.70	275.63	187.39	1004.85	1076.73	105.24	89.23	983.12	1016.50	12832.92	7918.21	743.26	■	360.07
	CHICKEN	1453.06	2501.07	821.37	1360.00	2276.69	2964.02	225.73	252.87	2324.54	3040.44	44891.04	24634.44	1626.73	■	1125.24
	GAMBIT	578.94	879.39	356.47	260.98	958.73	1112.70	89.99	89.23	1033.46	1107.26	26077.48	14262.70	671.54	■	379.63
	IKARUS	266.54	386.21	158.63	116.85	424.75	527.57	41.27	42.34	497.48	517.89	8474.57	4845.10	279.59	■	165.16
	LARCENY	964.18	1308.68	360.68	272.96	1565.53	1508.39	126.44	112.82	1658.27	1606.44	25411.62	14386.61	1203.34	■	511.54
	MIT SCHEME	2025.23	3074.30	790.99	609.63	3501.21	3896.88	315.17	295.67	4130.88	3817.57	87772.39	49814.12	2446.33	■	1113.09
	MzC	1243.08	1944.00	740.31	557.45	2135.92	2434.05	194.49	187.53	2294.93	2346.13	57472.76	31784.38	1318.60	■	754.47
	MzSCHEME	1309.82	1926.77	712.97	555.28	2371.35	2690.64	224.61	219.29	2721.35	2625.21	60269.37	33135.06	1364.14	■	772.10
	SCHEME->C	582.20	743.00	270.83	208.38	910.19	913.66	82.93	69.87	811.37	803.22	10605.32	5935.56	597.67	■	280.93
	SCMUTILS	4462.83	■	■	■	7651.69	■	■	■	7699.14	■	83656.17	■	5889.26	■	■
	STALIN	364.08	547.73	399.39	295.00	543.68	690.64	63.96	52.93	956.47	1994.44	15048.42	16939.28	435.82	■	281.27

All run times normalized relative to a unit run time for STALIN ∇ on the corresponding example except that run times for backprop-Fv are normalized relative to a unit run time for STALIN ∇ on backprop-Fs.

Pre-existing AD tools are named in blue. Others were implemented by us.

- not implemented but could implement
- not implemented in pre-existing AD tool
- can't implement

		particle				saddle			
		FF	FR	RF	RR	FF	FR	RF	RR
VLAD	STALIN ∇	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FORTRAN	ADIFOR	2.05	■	■	■	5.44	■	■	■
	TAPENADE	5.51	■	■	■	8.09	■	■	■
C++	FADBAD++	93.32	■	■	■	60.67	■	■	■
ML	MLTON	78.13	111.27	45.95	32.57	114.07	146.28	12.27	10.58
	OCAML	217.03	415.64	352.06	261.38	291.26	407.67	42.39	50.21
	SML/NJ	153.01	226.84	270.63	192.13	271.84	299.76	25.66	23.89
HASKELL	GHC	209.44	■	■	■	247.57	■	■	■
SCHEME	BIGLOO	627.78	855.70	275.63	187.39	1004.85	1076.73	105.24	89.23
	CHICKEN	1453.06	2501.07	821.37	1360.00	2276.69	2964.02	225.73	252.87
	GAMBIT	578.94	879.39	356.47	260.98	958.73	1112.70	89.99	89.23
	IKARUS	266.54	386.21	158.63	116.85	424.75	527.57	41.27	42.34
	LARCENY	964.18	1308.68	360.68	272.96	1565.53	1508.39	126.44	112.82
	MIT SCHEME	2025.23	3074.30	790.99	609.63	3501.21	3896.88	315.17	295.67
	MzC	1243.08	1944.00	740.31	557.45	2135.92	2434.05	194.49	187.53
	MzSCHEME	1309.82	1926.77	712.97	555.28	2371.35	2690.64	224.61	219.29
	SCHEME->C	582.20	743.00	270.83	208.38	910.19	913.66	82.93	69.87
	SCMUTILS	4462.83	■	■	■	7651.69	■	■	■
	STALIN	364.08	547.73	399.39	295.00	543.68	690.64	63.96	52.93

All run times normalized relative to a unit run time for STALIN ∇ on the corresponding example.

Pre-existing AD tools are named in blue. Others were implemented by us.

■ not implemented but could implement

■ not implemented in pre-existing AD tool

■ can't implement

		probabilistic- lambda-calculus		probabilistic- prolog	
		F	R	F	R
VLAD	STALIN ∇	1.00	1.00	1.00	1.00
ML	MLTON	129.11	114.88	848.45	507.21
	OCAML	249.40	499.43	1260.83	1542.47
	SML/NJ	234.62	258.53	2505.59	1501.17
HASKELL	GHC	■	■	■	■
SCHEME	BIGLOO	983.12	1016.50	12832.92	7918.21
	CHICKEN	2324.54	3040.44	44891.04	24634.44
	GAMBIT	1033.46	1107.26	26077.48	14262.70
	IKARUS	497.48	517.89	8474.57	4845.10
	LARCENY	1658.27	1606.44	25411.62	14386.61
	MIT SCHEME	4130.88	3817.57	87772.39	49814.12
	MzC	2294.93	2346.13	57472.76	31784.38
	MzSCHEME	2721.35	2625.21	60269.37	33135.06
	SCHEME->C	811.37	803.22	10605.32	5935.56
	SCMUTILS	7699.14	■	83656.17	■
	STALIN	956.47	1994.44	15048.42	16939.28

All run times normalized relative to a unit run time for STALIN ∇ on the corresponding example.

Pre-existing AD tools are named in blue. Others were implemented by us.

■ not implemented but could implement, including FORTRAN, C, and C++

■ not implemented in pre-existing AD tool

■ can't implement

		backprop		
		Fs	Fv	R
VLAD	STALIN ∇	1.00	■	1.00
FORTRAN	ADIFOR	15.51	3.35	■
	TAPENADE	14.97	5.97	6.86
C	ADIC	22.75	5.61	■
C++	ADOL-C	12.16	5.79	32.77
	CppAD	54.74	■	29.24
	FADBAD++	132.31	46.01	60.71
ML	MLTON	95.20	■	39.90
	OCAML	202.01	■	156.93
	SML/NJ	181.93	■	102.89
HASKELL	GHC	■	■	■
SCHEME	BIGLOO	743.26	■	360.07
	CHICKEN	1626.73	■	1125.24
	GAMBIT	671.54	■	379.63
	IKARUS	279.59	■	165.16
	LARCENY	1203.34	■	511.54
	MIT SCHEME	2446.33	■	1113.09
	MzC	1318.60	■	754.47
	MzSCHEME	1364.14	■	772.10
	SCHEME->C	597.67	■	280.93
	SCMUTILS	5889.26	■	■
	STALIN	435.82	■	281.27

All run times normalized relative to a unit run time for STALIN ∇ on the corresponding example except that run times for **backprop-Fv** are normalized relative to a unit run time for STALIN ∇ on **backprop-Fs**.

Pre-existing AD tools are named in **blue**. Others were implemented by us.

■ not implemented but could implement

■ not implemented in pre-existing AD tool

■ can't implement