

# INDEX

---

- ACE 3, 6, 8, 12  
Achieser 501, 515  
Ackermann 166, 177  
adaline 204, 205  
Aizerman 503, 512, 515  
Alexander 363, 375, 380  
algebra 99, 105, 106, 108-13, 116-20, 321, 535  
ALGOL-60 27, 28, 80, 90, 93, 95, 100, 101, 105, 116, 126, 304, 424, 471  
Allen, C. D. 79, 96  
Allen, J. 321, 536, 551  
Alt 416, 431  
Amarel 219, 220, 235, 520, 525, 527, 529  
Anderson, A. R. 550, 552  
Anderson, D. B. 96, 551 --  
Andreae 463, 477, 492, 523, 528, 529  
Andrews 165, 176, 325, 326, 328, 336  
Antony 464, 492  
Arbib 473, 492  
Arnoult 462  
association analysis 361, 368, 370  
associative net 351, 355-8  
Ashcroft 59, 77, 79, 96  
Atlas 470  
Attneave 451, 462  
Austin 203, 208  
automata theory 99, 105, 106  
    generalized 106  
Averbach 543, 552  
  
B5000 118  
Balashek 492  
Banerji 520, 529  
Bar-Hillel 219, 236, 540, 552  
Barrow 555, 562  
Baumert 228, 236  
Becker 528, 529  
Bekić 64, 120  
Belar 466, 493  
Bellman 372, 374, 380  
Belnap Jr, N. D. 550, 552  
Bennett 336  
Bird 120  
  
Birkhoff 49, 52, 136, 154, 163  
Blaydon 502, 503, 509, 512, 515  
Bloom 476, 493  
Blum, H. 427, 431, 440  
Blum, J. 524, 530  
boundary analysis 438, 447, 453, 454  
Braithwaite 540, 552  
Braverman 503, 512, 515  
Bruner 203, 208  
Buchanan 176, 253, 280  
Buneman 351, 359, 383, 406  
Bursky 220, 236  
Burstall 35, 37, 70, 77, 79, 80, 96, 105, 120, 154, 163, 182, 200, 219, 236, 281, 298, 520, 529, 551  
Butler 413, 431  
  
Cahn 432  
Cameron 462  
Carnap 176, 177  
Carson 151, 177, 181, 182, 200, 321, 325, 327, 328, 336, 515, 553  
Cashin 492, 523, 528, 529  
Chambers 317, 318, 522, 531  
chess 5, 13, 23, 219, 256, 257, 289, 303  
Chien 499, 503, 515  
Chinthayamma 322, 331, 336  
Chomsky 175, 177, 383, 390  
chromosome 411-34, 435-61  
Church 4, 23, 63, 77  
Church's theorem 136  
Churchman 280  
Clegg 438, 462  
Clowes 476, 492, 529  
Cohn 105, 120  
Colby 528, 530  
combinatory logic 125  
computation  
    rule 27  
    sequence 28-30, 34  
conic  
    section 411ff.  
    skeleton 419, 421, 427, 428  
Conway 462

## INDEX

- Cooper, D. C. 59, 60, 77  
 Cooper, F. S. 493  
 Coriell 543, 552  
 correlograph 351-5, 357, 358  
 Court Brown 412, 431  
 Cox 493  
 Crocker 219, 236  
 cross-resolution 147, 148, 151  
 Cuenod 496, 515  
 Curry 125, 132
- Darlington 165, 166, 177  
 Davidson 540, 552  
 de Bakker 64, 70  
 Dekker 47, 52  
 Delattre 493  
 Delfino 280  
 DENDRAL 176, 253ff.  
 Denes 470, 492, 543, 552  
 Dersch 471, 492  
 De Soto 529, 530  
 Deutsch 523, 528, 530  
 Devyaterikov 503, 515  
 diagonal search 173, 181, 189, 190, 192, 193,  
 197, 200  
 directed graph *see* graph  
 Djerassi 255, 263, 280  
 Doran 183, 200, 207, 208, 219-21, 236,  
 282, 290, 298, 301, 304, 307, 309, 311,  
 312, 318, 519, 520, 524, 528, 530, 551,  
 552  
 Doshita 493  
 Dudley 471, 492  
 Duffield 255, 280
- Eastlake 219, 236  
 Elcock 203, 208  
 ENIAC 6  
 entropy 361, 363-79  
 epsilon operator 126  
 equation schema 60-3, 66, 71, 73, 74  
 E-resolution 127  
 Ernst 302, 318, 519, 520, 530  
 error 219, 225, 228, 230-2, 437, 441,  
 498-510, 512, 514  
 ESOTERIC 463, 468, 472, 474, 477-9, 485-90  
 evaluation function 221, 233, 291, 302-5,  
 307, 309, 311, *see also* heuristic  
 Evans, E. F. 466, 476, 493  
 Evans, H. J. 412, 431, 451, 462  
 Evans, T. G. 520, 530
- Faddeeva 507, 515  
 Fant 466, 492  
 Farrow 462  
 fast Fourier transform 403, 458  
 Feigenbaum 176, 219, 236, 253, 280, 530  
 Feldman 203, 204, 208, 530, 543, 552  
 Feller 228, 236
- Fenichel 337-9, 345  
 Feys 125, 132  
 FIDAC 416  
 first-order logic 27, 59-63, 72, 73, 76, 79,  
 80, 95, 125, 132, 153, 165, 170, 175,  
 205, 237, 250, 322, 323, 525, 529, 535,  
 541-3, 545, 547, 549-51, 553  
 fixpoint induction 59, 60, 66, 67, 70, 73,  
 74, 77  
 Fleming 220, 236, 520, 531  
 Florentin 79, 96  
 Floyd 59, 60, 65, 71, 73, 77, 79, 96, 149,  
 151, 228, 236  
 FORTRAN IV 507  
 Fogel 203, 208  
 Freddy 555-7, 563-5  
 Freeman 451, 462  
 Friedman 524, 530  
 Fu 499, 503, 515
- Galanter 527, 531  
 Gallus 413, 431, 437, 438, 443, 448, 455,  
 456, 462  
 Gandy 1  
 Garland 540, 553  
 Gelernter 525, 530  
 Gerstman 493  
 Gips 208  
 Gödel 4, 23, 166  
 Gödel's theorem 4  
 Gold 466, 492  
 Goldberg 462  
 Golomb 228, 236  
 Good 375, 380  
 Goodman 537, 538, 551, 552  
 Goodnow 203, 208  
 Gould 535, 552  
 GPS 219, 267, 269, 270, 520, 521, 524-6  
 grammar 204, 383 ff, 474, 478  
 graph 254, 260, 298, 413, 447  
   bar 253, 272  
   directed 99-104, 108, 148, 219, 224, 547  
   matching 276, 277  
   of function 74  
   problem 303, 304, 307, 312, 520-3  
   resolution 406, 407  
   search 181  
   theorem-proving 181-5  
   traverser 207, 211, 213, 220, 222, 223,  
   233, 281, 282, 290-4, 297, 300, 301 ff,  
   498, 520-2, 524, 527  
 Grau 322, 331, 332, 334, 336  
 Green, C. C. 79, 80, 96, 165, 166, 177, 182,  
 187, 200, 237, 252, 323, 336, 520,  
 525-7, 530, 533, 534, 540, 541, 543,  
 551, 552  
 Green, D. K. 462  
 Green, H. 493  
 Greenblatt 219, 236, 256

- Gregory 566  
 Grzegorzczuk 546, 549, 550, 552  
 GT 4 301, 305, 307, 311  
 Guard 321, 334, 336, 536, 539, 540, 552  
 Guiliano 416, 431  
 Guzmán 476, 492
- Hall 495, 496, 501, 502, 512, 514, 515  
 Halle 466, 492  
 Halmos 418, 432  
 Hammersley 500, 515  
 Handel 529, 530  
 Handscomb 499, 500, 515  
 Hart 181, 187-9, 195, 196, 198, 200, 220, 221, 233, 236  
 Hayes 27, 32, 165, 173, 176, 177, 182, 200, 203, 208, 526, 528-31, 533, 540, 543, 546, 552  
 Heicke 493  
 Heikin 63, 64  
 heuristic 77, 181, 188, 189, 191, 192, 194, 195, 197-99, 220-7, 229, 233-5, 256, 265, 274, 278, 291, 316, 497, 519-22, 524, 525, 528, 536, 539, *see also* evaluation function  
   search 181, 219, 222, 224, 282, 302, 303  
 HEURISTIC DENDRAL, *see* DENDRAL  
 Hext 301, 318  
 Heydorn 374  
 higher order logic 95, 123, 125, 132, 166, 181, 243, 535, 537, 538  
 Hilbert 126, 166, 177  
 Hilditch 384, 390, 413, 416, 427, 432, 446, 462  
 Hill 463, 466, 470, 472, 475, 477, 479, 480, 490-2  
 Himsworth 301, 318  
 Hoare 79, 96  
 Holmes 465, 492  
 Hooke 301, 302, 308, 318  
 Hormann 519, 524, 530  
 Horning 208  
 HPA 221-34  
 Hu 416, 432  
 Hubel 466, 492  
 Hubermann 526, 530  
 Hungerford 462  
 Hunt 519, 532, 536, 553  
 Huttenlocher 529, 530  
 hyper-resolution 168, 535  
 hysteresis 469, 472, 479-83, 485, 486, 491
- IBM 360 327  
 IBM 704 118  
 IBM 7094 431  
 ICL 4130 173, 307, 555-7  
 induction 153, 162, 165, 170, 175, 176, 179, 203-6, 497, *see also* fixpoint, mathematical, recursion, transfinite
- Inoue 493  
 intuitionistic logic 549, 550, 553, 554
- Jacobs 416, 432  
 Jakobson 466, 492  
 Jeeves 301, 302, 308, 318
- Karp 104, 106, 118, 120  
 Kashyap 502, 503, 509, 512, 515  
 Kendall 502, 505, 515  
 Kerse 96  
 Khinchin 364, 377, 380  
 Kieburztz 326, 327, 336  
 Kilmer 524, 530  
 Kirsch 427, 432  
 Kleene 27, 32, 118, 552, 553  
 Kline 496, 515  
 Knaster-Tarski theorem 60, 64, 65  
 König's lemma 46, 188  
 Kopf 493  
 Kowalski 165, 173, 176, 177, 181, 182, 200, 551  
 Kozdrowicki 220, 236  
 Kripke 546, 547, 549, 552  
 Kuehner, 176, 192, 200  
 Kullback 375, 380
- Lambert 368, 369, 380  
 lambda calculus 123-5, 128, 129, 131, 132, 535  
 Lanczos 502, 515  
 Landin 80, 96, 99, 105, 116, 120  
 lattice 40, 48-51, 56, 60, 64, 65, 68, 70, 76, 135, 136, 140-6, 163, 172, 173, 175, 179, 321  
 Lauchli 538, 552  
 Lauer 80, 96  
 Lawrence 464, 492  
 Lechner 398, 408  
 Lederberg 254, 280  
 Ledley 404, 408, 413, 416, 432, 437, 462  
 Lee 165, 177  
 Levan 411, 432  
 Levien 238, 252  
 Lewis 540, 552  
 Liberman 466, 492, 493  
 Lin 310, 318  
 Lindenbaum algebra 154  
 Lindsay 238, 252  
 LISP 69, 70, 93, 126, 132, 204, 205, 226, 254, 257-9, 261, 262, 264, 269, 275, 276, 278, 279, 323, 325, 327, 337-40, 344
- list  
   processing 80, 93, 453  
   structure 69, 277  
 Littlepage 438, 462

## INDEX

- logic, *see* combinatory, first-order, higher-order, intuitionistic, modal, partial function, second-order  
 London 529, 530  
 Longuet-Higgins 313, 318, 351, 359  
 Loveland 165, 177, 325, 326, 336  
 Łukasiewicz 32, 37, 542, 552  
 Luckham 39, 41, 42, 44, 45, 51, 52, 59, 77, 321, 323-8, 336, 536, 551  
  
 McBride 337  
 Maccacaro 366, 380  
 McCarthy 27, 28, 32, 40, 45, 52, 60, 61, 69, 71, 74, 77, 79, 80, 97, 203, 208, 226, 236, 282, 526, 528, 530, 531, 533, 534, 538, 540, 543, 546, 551, 552  
 McCormick 427, 432  
 McCulloch 524, 530  
 Mackay 473, 492  
 MacLane 49, 52, 154, 163  
 Malmnäs 553, 554  
 Manna 27, 28, 59-61, 71, 73-5, 77, 79, 80, 97  
 Maron 238, 252  
 Marril 476, 493  
 Marsh 281, 291, 298, 305, 318, 520, 522, 530  
 Martin 477, 493  
 mass spectrometry 253 ff  
 Massey 541, 550, 552  
 mathematical induction 60, 65, 70, 84  
 Mattingly 492  
 Mayall 462  
 Mead 301, 318  
 Meltzer 96, 163, 165, 177, 200, 408, 497, 551  
 memo function 281-8, 290, 291, 293, 295, 297, 298, 455, 522  
 Mendelsohn 413, 432, 436, 439, 462  
 Michie 183, 200, 207, 208, 219-21, 235, 236, 281, 282, 290, 291, 298, 301, 302, 308, 311-13, 317, 318, 498, 520, 522, 524, 527, 529, 530, 531, 551, 566  
 Miller, G. A. 465, 527, 531  
 Miller, W. F. 235  
 Milner 39, 42, 52, 77  
 Minski 104, 120, 219, 236, 383, 390, 408, 524, 525, 531, 538, 543, 551, 552  
 modal logic 540-2, 544-7, 549, 553, 554  
 Montague 546, 549, 552, 553  
 Montanaro 443, 462  
 Moore 222, 236  
 Moorhead 416, 432  
 Moray 476, 493  
 Morris 127, 132  
 Morrison 337  
 Moses 520, 531  
 Mowshowitz 370, 380  
 Multi-POP 555-7, 562  
  
 Murphy 543, 553  
 Murray 203, 208  
  
 Nagy 510, 512, 514, 515  
 Narasimhan 427, 432  
 Neisser 477, 493  
 Nelder 301, 318  
 Nelson 493  
 Neurath 413, 432, 437, 455, 456, 462  
 Newell 219, 236, 302, 318, 519, 524, 530-1  
 Nilsson 181, 187-9, 195, 196, 198, 200, 220, 221, 233-7, 252, 323, 336, 510, 512, 514, 515, 520, 524, 525, 528, 531  
  
 Occam's razor 206, 479  
 O'Connor 466, 493  
 Oglesby 336  
 Oldfield 220, 236, 520, 531  
 Olson 466, 493  
 organic chemistry 253 ff  
 Ortony 313, 318  
 Owens 203, 208  
  
 P1-deduction 173, 325  
 Painter 70, 77, 79, 97  
 Paley 405, 408  
 Papert 383, 390, 408, 524, 531  
 paramodulation 125, 127, 165, 171, 328, 329, 334  
 Park 39, 41, 42, 44, 45, 51, 52, 59  
 partial function 27-9, 32, 33-6, 39, 59, 65, 71, 74, 116, 304  
     logic 27, 30  
 PAT 464  
 Patau 427, 432  
 Paterson 39-42, 44, 45, 48, 51, 52, 59, 60, 78  
 path search 136, 148  
 Paton 411, 428, 432, 512  
 pattern search 301, 302, 308, 310  
 PDP 8 470  
 PDP 10 257, 327  
 Pease 403, 408  
 Pengelly 337  
 perceptron 204, 384, 464  
 Perry 462  
 Pfaltz 427, 428, 432  
 Philbrick 427, 432  
 Pierce 175  
 Pitrat 168, 177  
 Plotkin 138, 153, 176, 177  
 Pnueli 28, 59-61, 71, 73-5, 77  
 Pohl 181, 188, 200, 219, 220, 235, 236, 298, 520, 531  
 Polyak 408  
 polygraph 105, 108, 109, 113, 114, 116, 119  
 POP-2 126, 173, 192, 281, 282, 283, 285, 291, 298, 299, 305-7, 562

- Popplestone 97, 98, 153, 163, 203, 207,  
 208, 281, 290, 298, 497, 520, 522,  
 527, 531  
 Post 47, 149, 151  
 Post's correspondence problem 136, 149,  
 150  
 Potter 468, 493  
 Powell 308, 318  
 Prawitz 535, 553, 554  
 predicate calculus, *see* logic  
 Prewilt 462  
 Pribram 527, 531  
 Prior 542, 553  
 program scheme 39-42, 44-6, 48, 49, 51,  
 52, 59, 60, 71, 77, 106  
 property structure 237-40, 242, 250  
 Propoi 503, 515  
 PROSE 176  
  
 Quillian 528, 532  
 Quine 536, 537, 539, 541, 544, 553  
 Quinlan 302, 318, 519, 522, 532, 536, 553  
  
 Raphael 181, 187-9, 195, 196, 198, 200,  
 220, 221, 233, 236-8, 252, 323, 336,  
 524, 528, 531  
 Ray 432  
 recursion  
   equation scheme 40, 45, 48, 51  
   induction 34, 60, 65, 71, 74, 75  
 recursive function theory 39, 40, 44, 46-8,  
 65  
 Reddy 466, 469, 470, 471, 493  
 Reder 208  
 Regliosi 455, 462  
 representation problem 211, 512, 520  
 Rescher 540, 553  
 Rescigno 366, 380  
 resolution 406, 407, 436  
   principle 96, 125, 127-9, 135, 136, 146,  
   147, 165-73, 181, 182, 185-7, 189, 200,  
   237, 240, 322, 324, 325, 525, 528, 535,  
   541  
 retina 383-5, 387, 391, 395, 404-6, 408,  
 409, 511, 512, 565  
 Reynolds 135, 151, 153, 154, 163, 328  
 Robertson 280  
 Robinson, G. 127, 132, 151, 165, 177, 181,  
 182, 201, 321, 322, 324, 325, 327, 328,  
 334, 336, 535, 553  
 Robinson, J. A. 95, 97, 123, 125, 131-3,  
 135-8, 147, 151, 154, 155, 159, 163,  
 165, 166, 168, 171, 173, 177, 181, 182,  
 200, 201, 237, 252, 322-5, 336, 535,  
 551, 553  
 robot 1, 12, 187, 519-25, 527, 528, 534,  
 536-9, 541-8, 550, 551, 555-7, 560,  
 562-5  
 Rogers, C. A. 515  
  
 Rogers Jr, H. 43, 46, 48, 52, 65, 78  
 Rosenbloom 125, 133  
 Rosenfeld 427, 428, 432  
 Ross 301, 308, 318, 498, 520, 522, 531  
 Rozonoer 503, 512, 515  
 Ruddle 432  
 Russel 22  
 Rutovitz 413, 417, 431, 432, 435, 436, 447,  
 454, 462, 512  
  
 Sage 496, 515  
 Sakai 464, 493  
 Salmon 428, 432  
 Salter 555  
 Samuel 203, 208, 219, 236, 281, 293, 297,  
 298, 301, 307, 317, 318, 477, 493, 522,  
 532  
 San Diego problem 526  
 Sandewall 182, 183, 200, 220, 236, 303,  
 312, 318, 519, 520, 525, 532  
 Sayers 3  
 Schnelle 493  
 Schofield 311, 318  
 Schönfinkel 123-6, 131-3  
 Schreider 408  
 Schroll 255, 280  
 Scott 64, 70  
 search strategy 181-3, 186-8, 190-2, 198,  
 199, 266-8, 270, 290, 322  
 Searle 395, 512  
 Sebestyen 510, 512, 514, 515  
 second-order logic 60-3, 68, 70, 166, 537,  
 538  
 Selfridge 477, 493  
 sequential logic 477  
 set of support 181, 325-7, 535  
 Settle 336  
 Shalla 336  
 Shannon 367  
 Shaw 219, 236, 302, 318, 519, 524, 531  
 Shearme 492  
 Sibert 127, 133, 182, 200  
 Siefkes 538, 553  
 signature table 317, 477  
 Simon 219, 236, 302, 318, 519, 524, 531,  
 538, 548, 553  
 simplex 301  
 SIR 237  
 skeletonizing 435, 446, 462  
 Slagle 165, 177, 182, 220, 236, 237, 252  
 Smith, D. C. 528, 530  
 Smith, I. 95, 173, 176, 192, 200  
 Smith, P. 462  
 speech 463-6, 468, 472, 477-9, 485, 489  
 Spendley 301, 318  
 Spicer 431  
 Spinelli 478, 493  
 Steedman 390  
 STELLA 463-5, 523

## INDEX

- Stone 438, 440, 462  
 Strachey 80, 88, 96, 97  
 Strawson 533, 551, 553  
 structural induction 70  
 Stuart 502, 505, 515  
 subsumption 148, 153, 154, 159, 162, 182, 327-9  
 Sutherland 176, 253, 280  
 Sweeney 451, 462  
 systems theory 495, 497 ff.  
 Szewczyk 431  
 Sz-Nagy 500, 501, 515
- Tarski 78  
 Taylor 515  
 television 12, 13, 396, 528, 556, 559, 560, 564  
 Thatcher 106, 120  
 theorem proving 1, 59, 84, 95, 96, 98, 125, 127, 129, 132, 135, 165, 166, 168-71, 173, 174, 176, 181-6, 195, 207, 237, 276, 321, 323, 520, 525, 528, 534-6, 539, 540, 544, 551  
 Tillman 471, 493  
 Tjio 411, 432  
 Toda 523, 532, 551, 553  
 topology 383-5, 390, 406  
 Tou 368, 374, 380  
 transfinite induction 70  
 transformational system 135, 136, 147-50  
 Travis 524, 532  
 tree 182-6, 221, 233, 277, 298, 305, 383, 384, 390-3, 406, 408, 447, 453  
   binary 227-32  
   generation 268, 274  
   labelled 105, 106, 113, 118  
   lookahead 290, 293, 295-7, 306, 317, 548  
   planning 294, 521, 522  
   proof 326-33  
   regular 225, 226  
   search 299, 300, 308, 311, 521  
   tree search 136, 148, 181, 182, 183, 186, 189  
   Turing 1, 3, 4, 7, 23  
   Turing machine 6-9, 12, 18, 40, 42, 44, 48, 51, 52, 55  
   Tsypkin 503, 515
- Uhr 464, 478, 493  
 Ungeheuer 493  
 Urban 432
- Van Emden 288, 361, 512  
 Vicens 471, 493  
 Vigor 176, 177  
 Vossler 464, 478, 493
- Wacker 463  
 Wagner 503, 515  
 Waldinger 165, 177  
 Walsh, J. L. 396, 408  
 Walsh, M. J. 203, 208  
 Walsh function 395-406, 514  
 Wang 27, 32  
 Watanabe 366-8, 374, 380  
 Waterman 274, 280  
 Weiner 48, 51, 52  
 Whitfield 466, 476, 493  
 Widrow 204, 208  
 Wiener 514  
 Wiesel 466, 492  
 Williams 368, 369, 380  
 Willshaw 351, 359  
 Wright 106, 120  
 Wos 127, 132, 151, 177, 181, 182, 200, 321, 322, 324, 325, 327, 328, 336, 535, 553
- Yarbus 543, 553
- Zadell 493

## **MACHINE INTELLIGENCE, VOLS 1, 2, 3, 4**

---

The contents of Machine Intelligence, Volumes 1 to 4, are detailed in the following pages.



# MACHINE INTELLIGENCE 1 (1967)

## CONTENTS

---

PREFACE	v
INTRODUCTION	ix
ABSTRACT FOUNDATIONS	
1 Linear graphs and trees. H.I.SCOINS	3
2 Mathematical proofs about computer programs. D.C.COOPER	17
THEOREM PROVING	
3 Beth-tree methods in automatic theorem-proving. R.J.POPPLESTONE	31
4 The resolution principle in theorem-proving. D.LUCKHAM	47
MACHINE LEARNING AND HEURISTIC PROGRAMMING	
5 Tree-searching methods with an application to a network design problem. R.M.BURSTALL	65
6 Experiments with a learning component in a Go-Moku playing program. E.W.ELCOCK and A.M.MURRAY	87
7 An approach to automatic problem-solving. J.DORAN	105
8 Complete solution of the 'Eight-Puzzle'. P.D.A.SCHOFIELD	125
9 Strategy-building with the Graph Traverser. D.MICHIE	135
COGNITIVE PROCESSES: METHODS AND MODELS	
10 Networks as models of word storage. G.R.KISS	155
11 Will seeing machines have illusions? R.L.GREGORY	169
PATTERN RECOGNITION	
12 Perception, picture processing and computers. Dr M. B. CLOWES	181
13 Automatic speech recognition: a problem for machine intelligence. D.R.HILL	199
PROBLEM-ORIENTED LANGUAGES	
14 Simply partitioned data structures: the compiler-compiler re-examined. R.A.BROOKER and J.S.ROHL	229
15 The third-order compiler: a context for free man-machine communication. R.B.E.NAPPER	241
16 Principles for implementing useful subsets of advanced programming languages. G.F.COULOURIS	257
17 Interrogation languages. J.M.FOSTER	267
SUBJECT INDEX	277
AUTHOR INDEX	278

# MACHINE INTELLIGENCE 2 (1968)

## CONTENTS

---

PREFACE	v
INTRODUCTION	ix
ABSTRACT FOUNDATIONS	
1 Semantics of assignment. R.M.BURSTALL	3
2 Some transformations and standard forms of graphs, with applications to computer programs. D.C.COOPER	21
3 Data representation—the key to conceptualisation. D.B.VIGOR	33
MECHANISED MATHEMATICS	
4 An approach to analytic integration using ordered algebraic expressions. L.I.HODGSON	47
5 Some theorem-proving strategies based on the resolution principle. J.L.DARLINGTON	57
MACHINE LEARNING AND HEURISTIC PROGRAMMING	
6 Automatic description and recognition of board patterns in Go-Moku. A.M.MURRAY and E.W.ELCOCK	75
7 A five-year plan for automatic chess. I.J.GOOD	89
8 New developments of the Graph Traverser. J.DORAN	119
9 BOXES: an experiment in adaptive control. D.MICHIE and R.A. CHAMBERS	137
10 A regression analysis program incorporating heuristic term selection. J.S.COLLINS	153
COGNITIVE PROCESSES: METHODS AND MODELS	
11 A limited dictionary for syntactic analysis. P.BRATLEY and D.J.DAKIN	173
PROBLEM-ORIENTED LANGUAGES	
12 POP-1: an on-line language. R.J.POPPLESTONE	185
13 Self-improvement in query languages. J.M.FOSTER	195
14 POP-2 reference manual. R.M.BURSTALL and R.J.POPPLESTONE	205
INDEX	250

# MACHINE INTELLIGENCE 3 (1968)

## CONTENTS

---

INTRODUCTION	ix
MATHEMATICAL FOUNDATIONS	
1 The morphology of prex – an essay in meta-algorithmics. J.LASKI	3
2 Program schemata. M.S.PATERSON	19
3 Language definition and compiler validation. J.J.FLORENTIN	33
4 Placing trees in lexicographic order. H.I.SCOINS	43
THEOREM PROVING	
5 A new look at mathematics and its mechanization. B.MELTZER	63
6 Some notes on resolution strategies. B.MELTZER	71
7 The generalized resolution principle. J.A.ROBINSON	77
8 Some tree-parsing strategies for theorem proving. D.LUCKHAM	95
9 Automatic theorem proving with equality substitutions and mathematical induction. J.L.DARLINGTON	113
MACHINE LEARNING AND HEURISTIC PROGRAMMING	
10 On representations of problems of reasoning about actions. S.AMAREL	131
11 Descriptions. E.W.ELCOCK	173
12 Kalah on Atlas. A.G.BELL	181
13 Experiments with a pleasure-seeking automaton. J.E.DORAN	195
14 Collective behaviour and control problems. V.I.VARSHAVSKY	217
MAN-MACHINE INTERACTION	
15 A comparison of heuristic, interactive, and unaided methods of solving a shortest-route problem. D.MICHIE, J.G.FLEMING and J.V. OLDFIELD	245
16 Interactive programming at Carnegie Tech. A.H.BOND	257
17 Maintenance of large computer systems – the engineer's assistant. M.H.J.BAYLIS	269
COGNITIVE PROCESSES: METHODS AND MODELS	
18 The syntactic analysis of English by machine. J.P.THORNE, P.BRATLEY and H.DEWAR	281
19 The adaptive memorization of sequences. H.C.LONGUET-HIGGINS and A.ORTONY	311
PATTERN RECOGNITION	
20 An application of Graph Theory in pattern recognition. C.J.HILDITCH	325

**CONTENTS TO VOLUME 3--*Continued***

**PROBLEM-ORIENTED LANGUAGES**

21	Some semantics for data structures. D. PARK	351
22	Writing search algorithms in functional form. R. M. BURSTALL	373
23	Assertions: programs written without specifying unnecessary order. J. M. FOSTER	387
24	The design philosophy of POP-2. R. J. POPPLESTONE	393

	<b>INDEX</b>	403
--	--------------	-----

# MACHINE INTELLIGENCE 4 (1969)

## CONTENTS

---

### MATHEMATICAL FOUNDATIONS

- 1 Program scheme equivalences and second-order logic. D.C.COOPER 3  
2 Programs and their proofs: an algebraic approach.  
R.M.BURSTALL and P.J.LANDIN 17  
3 Towards the unique decomposition of graphs. C.R.SNOW and  
H.I.SCOINS 45

### THEOREM PROVING

- 4 Advances and problems in mechanical proof procedures. D.PRAWITZ 59  
5 Theorem-provers combining model elimination and resolution.  
D.W.LOVELAND 73  
6 Semantic trees in automatic theorem-proving. R.KOWALSKI and  
P.J.HAYES 87  
7 A machine-oriented logic incorporating the equality relation.  
E.E.SIBERT 103  
8 Paramodulation and theorem-proving in first-order theories with  
equality. G.ROBINSON and L.WOS 135  
9 Mechanizing higher-order logic. J.A.ROBINSON 151

### DEDUCTIVE INFORMATION RETRIEVAL

- 10 Theorem proving and information retrieval. J.L.DARLINGTON 173  
11 Theorem-proving by resolution as a basis for question-answering  
systems. C.CORDELL GREEN 183

### MACHINE LEARNING AND HEURISTIC PROGRAMMING

- 12 Heuristic dendral: a program for generating explanatory hypotheses  
in organic chemistry. B.BUCHANAN, G.SUTHERLAND and  
E.A.FEIGENBAUM 209  
13 A chess-playing program. J.J.SCOTT 255  
14 Analysis of the machine chess game. I.J.GOOD 267  
15 PROSE - Parsing Recogniser Outputting Sentences in English.  
D.B.VIGOR, D.URQUHART and A.WILKINSON 271  
16 The organization of interaction in collectives of automata.  
V.I.VARSHAVSKY 285

### COGNITIVE PROCESSES: METHODS AND MODELS

- 17 Steps towards a model of word selection. G.R.KISS 315  
18 The game of hare and hounds and the statistical study of literary  
vocabulary. S.H.STOREY and M.A.MAYBREY 337  
19 The holophone - recent developments. D.J.WILLSHAW and  
H.C.LONGUET-HIGGINS 349

**CONTENTS TO VOLUME 4—Continued**

**PATTERN RECOGNITION**

- 20 Pictorial relationships – a syntactic approach. M.B.CLOWES 361  
21 On the construction of an efficient feature space for optical character  
recognition. A.W.M.COOMBS 385  
22 Linear skeletons from square cupboards. C.J.HILDITCH 403

**PROBLEM-ORIENTED LANGUAGES**

- 23 Absys 1: an incremental compiler for assertions; an introduction.  
J.M.FOSTER and E.W.ELCOCK 423

**PRINCIPLES FOR DESIGNING INTELLIGENT ROBOTS**

- 24 Planning and generalisation in an automaton/environment system.  
J.E.DORAN 433  
25 Freddy in toyland. R.J.POPPLESTONE 455  
26 Some philosophical problems from the standpoint of artificial  
intelligence. J.McCARTHY and P.J.HAYES 463

**INDEX**

505



