

Index

a

- abbreviated injury scale (AIS) 403
- abdomen 327
- acoustic 80, 81
- adaptive/adaptivity 88, 91, 92, 166, 261, 266, 281, 429, 485
- additive 14, 18, 30, 32, 68, 230, 434
- adiabatic 80, 84, 208
- adventitia 303, 355, 384
- aggregate 14, 231, 250, 251, 252, 254, 255, 256, 347
- algorithm 31, 83, 88, 100, 173, 206, 213, 214, 259, 300, 389, 394, 408, 469
- aligned 305, 315, 343, 357
- amorphous 18, 223, 260, 272, 273, 274, 275, 278, 279
- analytical 13, 17, 21, 34, 36, 37, 45, 48, 81, 83, 115, 117, 131, 154, 179, 207, 215, 336, 486
- aneurysm 4, 5, 8, 13, 17, 300, 303, 477, 396, 400
- angioplasty (PTCA) 468
- angular 40, 84, 106, 107, 219, 250, 263, 287, 372
- anisotropic/anisotropy 10, 23, 35, 36, 305, 309, 310, 316, 319, 320, 321, 322, 337, 349, 355, 356, 379, 383, 403, 426, 427, 433, 472, 477,
- aorta 11, 19, 319, 467, 477, 478, 479
- aortic 11, 17, 18, 303, 304, 336, 337, 338, 339, 340, 343, 355
- arbitrary Lagrangian-Eulerian (ALE) 17, 83, 84, 88, 89, 90, 91, 477, 479
- armchair 231, 233, 234, 235, 236, 237, 238, 239, 240, 241, 244, 245
- arterial 18, 300, 303, 383, 384, 388, 477
- artery/arteries 8, 13, 19, 83, 103, 300, 303, 355, 384, 386, 387, 389, 396, 397, 398, 399, 400, 401, 467, 468, 469, 471, 472, 473, 477, 479
- artificial intelligence (AI) 19, 467, 483, 484, 487
- artificial neural networks (ANN) 484, 485, 486
- artificial tissue 6, 9
- asymptotic 39, 45, 113, 117, 174, 175, 177, 178, 192, 206
- atomic/atomistic 13, 14, 18, 28, 167, 171, 172, 195, 196, 207, 211, 212, 213, 214, 215, 216, 217, 218, 219, 221, 222, 223, 224, 225, 227, 241, 242, 258, 259, 260, 261, 262, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 278, 279, 281, 282, 284, 285, 288, 289, 290, 292, 293
- atomistic to continuum (AtC) 261, 270, 271
- austenite 469, 471
- axon 304, 305, 310, 402, 403, 407, 409, 410, 411, 413, 414, 417, 418, 419, 420, 421

b

- backward finite difference method (bFDM) 93, 94, 95

- balloon 6, 13, 103, 468, 469, 471, 472, 473
 - basis function 103, 104, 105, 107, 108, 109, 133, 134, 135, 136, 137, 139, 145, 147, 148, 149, 151, 152, 153, 167, 290
 - bell shaped 155
 - biaxial 36, 37, 38, 39, 344, 345
 - bimaterial 114, 125, 126
 - biochemistry 3, 9
 - biofluid 7, 8
 - biological 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 15, 17, 53, 59, 63, 195, 230, 300, 303, 305, 307, 326, 423, 433, 446
 - biology 3, 4, 16
 - biomechanics 3, 4, 5, 9, 13, 15, 16, 17, 18, 23, 299, 359, 402, 423, 446, 469, 483
 - biomolecule 3, 8, 9, 12, 18, 195
 - bioprosthetic 303, 336
 - biosolid 6
 - biosystem 3, 6, 8, 9, 12, 405, 487
 - bleeding 302, 359
 - blending function 123, 269
 - blood flow 5, 8, 11, 13, 15, 19, 83, 303, 337, 433, 468, 477, 479
 - blood vessel 6, 9, 13, 426, 427, 436, 447, 448
 - Boltzman 206, 209, 275
 - bond 28, 195, 215, 216, 219, 220, 221, 224, 225, 227, 232, 242, 243, 246, 257, 292
 - bone 5, 6, 7, 9, 306, 327, 328, 329, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 450, 454, 456, 458, 459, 462, 463, 464, 465
 - Born-Mayer potential 219
 - brain 4, 17, 18, 300, 304, 305, 309, 401, 402, 403, 404, 405, 406, 407, 408, 409, 411, 412, 413, 414, 415, 416, 417, 420, 423, 484
 - breakage 28, 243
 - Brendsen method 206, 207, 208
 - bridging domain method (BDM) 18, 172, 260, 261, 267, 268, 270, 282
 - bridging scale method (BSM) 18, 172, 260, 261, 271, 272, 282
 - brittle 42, 43, 49, 243, 434, 435
 - B-spline 133, 134, 135
 - buckling 231, 234, 235, 236, 237, 238, 239, 240, 241
 - bulk 61, 62, 74, 216, 226, 317, 362, 369, 406, 409, 415, 417
- C**
- calcium silicate hydrate (CSH) 14, 230, 242, 243, 244, 245, 246
 - callus 447, 448, 451, 452, 453, 454, 458, 459, 462, 466
 - cancellous 427, 447, 448, 464
 - canonical 73, 204, 205, 206, 208, 209
 - capillaries 8, 448
 - capsule 10, 480, 481, 482
 - carbon nanotube (CNT) 14, 18, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258
 - cardiac arrhythmias 487
 - cardiovascular 5, 6, 7, 8, 13, 17, 468, 469
 - cartilage 429, 447, 448, 450, 452, 454, 456, 462, 463, 464
 - Cauchy-Born 261, 263, 276, 277, 284
 - Cauchy-Green tensor 64, 65, 68, 307
 - cavity 423, 428, 475
 - cell 3, 4, 5, 7, 8, 9, 11, 12, 15, 84, 100, 102, 142, 160, 161, 163, 177, 178, 199, 211, 212, 227, 230, 242, 299, 301, 303, 304, 305, 312, 313, 316, 319, 336, 340, 343, 344, 346, 347, 348, 349, 350, 351, 359, 360, 361, 362, 363, 365, 366, 367, 368, 369, 370, 371, 373, 374, 375, 376, 402, 407, 423, 426, 427, 428, 429, 447, 448, 450, 451, 453, 454, 455, 456, 460, 461, 462, 463, 464, 467, 476, 477, 479, 484
 - cell aspect ratio (CAR) 348, 350, 351
 - cellular 12, 301, 303, 313, 319, 336, 347, 360, 361, 362, 364, 402, 407, 423, 427, 447, 448
 - cement 14, 28, 230, 242, 244, 245, 246, 247, 248, 249, 250, 251, 256, 257, 426, 436, 440, 441, 443
 - CEMHYD3D 248

- central finite difference method (cFDM) 93, 94, 95, 96, 98
- cerebellum 304
- cerebrospinal fluid 304, 403
- cerebrum 304
- chain 18, 56, 58, 111, 227, 228, 242, 273, 304, 425
- characteristic 7, 10, 12, 14, 15, 40, 45, 53, 59, 72, 75, 105, 122, 125, 128, 129, 132, 163, 167, 171, 195, 199, 203, 215, 225, 226, 235, 246, 261, 299, 300, 302, 313, 337, 344, 353, 354, 379, 406, 424, 425, 427, 428, 429, 469, 485
- charge 218, 219
- CHARMM potential 221
- chemical 4, 6, 8, 9, 53, 83, 195, 215, 229, 248, 360, 361, 365, 423, 427, 449, 450
- chondrocyte 429, 447, 448, 449, 450, 451, 452, 453, 454, 456, 459, 462, 463, 464, 465
- circular 36, 37, 38, 266, 293, 305, 372, 379, 380
- circumferential 44, 337, 338, 339, 343, 344, 345, 346, 348, 349, 350, 384
- Clausius-Duham 34, 322
- clot 359, 468
- CNT-reinforced 14, 230, 242, 243, 245, 247, 249, 250, 251, 252, 254, 255, 256, 257
- coarse scale 269, 272
- cohesive 114, 425, 430, 437, 441
- collagen 6, 11, 15, 18, 230, 300, 301, 302, 303, 305, 313, 316, 321, 322, 332, 334, 336, 338, 339, 340, 343, 360, 361, 363, 365, 367, 368, 369, 370, 374, 377, 378, 379, 381, 383, 384, 385, 387, 389, 390, 391, 394, 396, 397, 400, 423, 424, 425, 426, 428
- compatibility 122, 123, 268, 270, 271, 281, 481
- complex 4, 6, 7, 8, 9, 10, 11, 12, 13, 18, 31, 45, 59, 69, 72, 83, 99, 125, 162, 171, 193, 196, 203, 231, 242, 259, 287, 288, 304, 305, 336, 356, 394, 402, 429, 433, 487
- compliance 24, 26, 55, 125, 243, 470
- complicated 6, 8, 10, 13, 39, 72, 83, 88, 97, 99, 102, 123, 147, 148, 171, 186, 187, 219, 235, 273, 300, 316, 469, 478
- composite 4, 6, 11, 114, 230, 300, 303, 304, 305, 309, 315, 402, 433, 469
- composition 18, 19, 30, 32, 64, 68, 151, 274, 276, 301, 305, 309, 314, 336, 387, 417, 423, 428, 434, 487
- compressible/compressibility 28, 61, 69, 70, 71, 72, 74, 75, 76, 78, 79, 80, 83, 84, 309, 311, 312, 315, 316, 318, 319, 322, 337, 349, 355, 389, 393, 434
- compression 28, 74, 235, 241, 248, 249, 251, 252, 433, 468
- computational 7, 13, 14, 15, 16, 17, 18, 19, 23, 34, 82, 88, 91, 100, 102, 112, 113, 123, 142, 154, 171, 172, 181, 182, 183, 184, 185, 186, 187, 188, 195, 196, 215, 226, 247, 248, 259, 262, 270, 299, 300, 303, 390, 391, 392, 394, 432, 467, 476, 485
- computational fluid dynamics (CFD) 7, 8, 477
- computational homogenization 15, 18, 172, 181, 182, 183, 184, 185, 186, 187, 188, 300, 390, 391, 392, 394, 432, 476
- concentration 36, 37, 38, 81, 83, 360, 361, 364, 367, 368, 370, 377, 378, 396, 407, 429, 437, 439, 441, 448, 449, 451, 452, 454, 455, 456, 459, 461, 464, 465, 466, 473, 478
- concrete 14, 18, 28, 230, 231, 250, 251, 252, 254, 255, 256, 257, 258
- concurrent 15, 18, 167, 171, 172, 258, 259, 260, 261, 263, 265, 267, 269, 271, 272, 273, 274, 275, 277, 279, 281, 283, 285, 287, 289, 291, 293, 295, 436
- configuration 63, 64, 65, 66, 67, 68, 84, 85, 88, 89, 90, 91, 92, 131, 132, 182, 183, 184, 203, 211, 224, 227, 228, 235, 276, 277, 278, 279, 287, 290, 293, 294, 307, 308, 310, 337, 339, 391, 439, 467, 473, 479, 480, 483
- conjugate gradient 226, 228
- conservation 78, 85, 87, 90

- conservative 48, 78, 198, 199, 213
- consistency 14, 122, 153, 156, 166, 267
- consistent 31, 105, 120, 121, 153, 178, 185, 187, 202, 203m 243, 259, 276, 361, 387, 471, 476
- constituent 3, 6, 8, 9, 10, 11, 15, 28, 53, 56, 58, 59, 230, 242, 249, 299, 301, 321, 328, 330, 334, 336, 345, 384, 389, 408, 414, 433, 436
- constitutive equation 4, 6, 31, 32, 34, 36, 60, 62, 67, 68, 79, 91, 128, 314, 406, 411, 469, 472
- constitutive law 18, 24, 29, 30, 31, 33, 84, 90, 111, 289, 299, 307, 315, 433, 472
- constrained 61, 158, 159, 161, 261, 262, 263, 264, 270, 275, 282, 284, 417, 436, 445
- contact 114, 131, 404, 469, 471, 472, 473
- continuity 18, 76, 77, 78, 81, 105, 108, 113, 114, 115, 116, 117, 120, 122, 123, 143, 145, 146, 147, 151, 168, 169, 186, 287, 407, 432
- continuous 31, 105, 123, 134, 136, 145, 146, 150, 151, 154, 155, 158, 168, 186, 214, 216, 260, 261, 269, 274, 276, 277, 278, 300, 428, 429, 484
- continuum mechanics 17, 23, 24
- contraction 302, 360, 361, 362, 363, 364, 374, 375, 376, 377, 378, 379, 381, 382, 383, 384, 385
- control point 133, 134, 136, 137, 138, 139
- convection 17, 23, 72, 73, 75, 76, 77, 79, 81, 82, 83, 100, 101, 102, 365, 366
- conventional 3, 6, 7, 8, 11, 13, 14, 17, 33, 34, 60, 64, 65, 81, 102, 103, 105, 115, 118, 120, 131, 132, 141, 166, 168, 169, 173, 177, 186, 188, 191, 195, 203, 256, 260, 263, 265, 272, 275, 278, 282, 283, 284, 286, 289, 300, 390, 474
- convergence 160, 182, 192, 216, 226, 372, 458, 486
- conversion 360, 366, 368, 431, 436
- convolutional neural networks (CNN) 485
- cornea-sclera 475
- coronary 8, 468, 492
- corpus collosum 406, 417
- corrected SPH (CSPM) 157, 166
- correction/corrective 156, 157, 284
- cortical 423, 425, 426, 427, 428, 429, 433, 437, 440, 441, 442, 448, 464
- Coulomb potential 218
- coupled 7, 12, 14, 15, 16, 17, 59, 83, 86, 87, 171, 172, 213, 229, 230, 259, 260, 261, 270, 299, 300, 321, 324, 326, 364, 367, 369, 370, 372, 394, 429, 435, 449, 452, 455, 456, 458, 477
- coupled atomistic and discrete dislocation (CADD) 260, 261
- coupled Lagrangian-Eulerian (CLE) 17, 83, 86
- coupled Lagrangian-Lagrangian (CLL) 87
- covalent 215, 220, 221, 246
- crack growth/extension/propagation 37, 42, 43, 44, 45, 49, 52, 113, 121, 130, 133, 251, 432, 436, 437, 440, 441, 443, 445, 446
- crack tip opening displacement (CTOD) 48, 49
- cracking 18, 36, 125, 244, 429, 430, 442, 443
- creep 53, 54, 55, 58, 246, 360, 362, 451, 453
- criteria/criterion 15, 29, 38, 41, 42, 43, 44, 48, 49, 52, 75, 121, 192, 222, 226, 323, 372, 403, 410, 434, 441, 458
- critical 15, 37, 41, 43, 44, 75, 172, 230, 299, 300, 336, 340, 343, 344, 346, 347, 348, 356, 359, 403, 407, 435, 475, 476
- crystalline 28, 195, 219, 222, 260, 261, 272, 273, 279
- current configuration 63, 64, 66, 277, 278, 307, 310, 391
- cut-off 216, 220, 232
- cycle 49, 50, 350, 352, 469, 480
- cyclic 50, 230, 231, 257, 258, 428, 429
- d**
- damage 3, 5, 14, 17, 18, 23, 28, 31, 32, 33, 34, 35, 36, 70, 102, 114, 195, 230, 249, 250, 252, 253, 254, 257, 299, 300, 302, 303, 305, 316, 319, 321, 322, 323, 324, 325, 326, 327, 328, 329, 336, 349, 350, 352, 353, 354, 355, 356, 357, 358, 359, 361, 362, 363, 365, 367, 372, 375, 376, 378,

- 379, 380, 383, 396, 401, 402, 403, 410, 411, 414, 428, 429, 430, 431, 433, 434, 435, 436, 437, 446, 447, 448, 466, 468, 469, 476, 477, 487
- damping 211
- Darcy's law 60
- dashpot 53, 54, 55, 56, 58, 481
- decomposed 43, 64, 67, 68, 191, 224, 309
- decomposition 30, 32, 64, 68, 151, 274, 276, 309, 314, 434
- deep learning (DL) 19, 467, 483, 484, 485, 486, 487
- defect 14, 31, 32, 35, 36, 37, 38, 39, 195, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 244, 245, 247, 256, 282, 288, 289, 290, 383
- deformation gradient 63, 63, 67, 68, 132, 133, 182, 183, 184, 185, 187, 224, 260, 263, 274, 276, 277, 278, 279, 281, 284, 285, 291, 307, 309, 310, 314, 390, 393, 396, 397, 407, 411, 436
- degenerated 37, 39, 209
- degradation 18, 23, 302, 303, 321, 365, 383, 384, 450, 464, 466
- degraded 383, 384, 385, 386, 387, 388, 396, 397, 400, 401, 447, 472
- dendrite 305
- density 31, 32, 44, 66, 68, 69, 70, 71, 76, 78, 79, 83, 127, 181, 201, 202, 204, 205, 208, 209, 221, 222, 260, 263, 269, 274, 283, 321, 361, 363, 364, 365, 366, 367, 368, 369, 370, 372, 374, 375, 376, 377, 378, 379, 381, 382, 383, 405, 423, 429, 448, 449, 450, 451, 452, 453, 454, 456, 459, 462, 462, 463, 464, 465
- dermis 300, 301, 364, 366, 368, 369
- deviatoric 29, 69, 309, 311, 314, 316, 319, 321, 325, 471
- differentiation 8, 68, 71, 72, 175, 213, 217, 218, 219, 274, 312, 314, 317, 321, 366, 367, 447, 451, 452, 453, 454, 459, 462, 463, 486
- diffusion 4, 7, 8, 17, 23, 61, 72, 73, 75, 77, 79, 81, 82, 83, 100, 101, 102, 364, 365, 366, 368, 370, 429, 448, 449, 450, 451, 453, 455, 456
- Dirac delta function 154, 155, 222
- disadvantage 156, 269
- discharge 60, 61
- discontinuity 18, 113, 114, 115, 116, 117, 120, 122, 151, 287, 432
- discontinuous 31, 105, 136, 150, 151, 186, 216
- discretization 62, 103, 110, 111, 118, 135, 163, 164, 275, 282
- discretized 62, 86, 87, 90, 94, 102, 112, 119, 139, 154, 158, 159, 161, 165, 273, 289, 370, 456, 458
- disease 4, 8, 12, 17, 300, 303, 336, 429, 467, 468, 474, 487
- dislocation 129, 130, 260, 261, 266
- disorder 5, 12, 13, 272, 278, 478
- disordered concurrent multiscale method (DCMM) 18, 172, 260, 261, 272, 273, 274, 278, 279
- dispersal 356, 365, 366, 449, 451, 453
- dispersed 248, 303, 305
- dissection 12, 17, 299, 355, 356, 357
- distribution function 40, 83, 190, 201, 202, 203, 208, 209, 210, 222
- divergence 99, 100, 162
- DNA 7, 9, 195
- dog bone 306, 327, 328, 329
- domain partitioning 259, 267
- double wall carbon nanotube (DWCNT) 233, 234, 235, 236, 237, 238, 239, 240, 241
- double-scale 175, 178
- drug delivery 3, 7, 10, 17, 19, 467, 479, 480, 481
- ductile/ductility 31, 48, 49, 231, 243, 251, 258
- e**
- effective 5, 27, 29, 31, 32, 36, 43, 48, 60, 176, 220, 249, 272, 470, 476
- elasticity 17, 23, 24, 27, 28, 31, 36, 39, 46, 71, 72, 113, 174, 177, 178, 243, 244, 245, 310, 311, 312, 314, 316, 320, 321, 325, 362, 435
- elastoplastic 29, 30, 31, 32, 36, 48, 68, 125, 131, 257, 433, 434

- elastoplastic fracture mechanics (EPFM) 48, 49
 element free Galerkin method (EFG) 18, 37, 144, 158, 159, 160, 161, 162
 ellipsoidal 305, 347, 348
 elliptical hole 36, 37
 elongation 308, 346, 348, 403
 embedded atom potential (EAM) 220, 221, 265
 energy dissipation/ dissipative mechanism 37, 231, 251
 enriched 18, 113, 114, 115, 116, 118, 120, 121, 122, 123, 129, 132, 136, 138, 167, 172, 190, 191, 192, 193, 260, 288, 289, 292, 293
 enriched multiscale method (EMM) 18, 167, 172, 260, 288, 293
 enrichment 114, 115, 116, 117, 121, 122, 123, 124, 125, 126, 127, 129, 130, 131, 132, 136, 137, 138, 139, 145, 169, 170, 173, 188, 190, 191, 192, 193, 287, 288, 289, 290, 292
 ensemble 202, 203, 204, 205, 206, 207, 208, 210, 212, 228, 232, 243, 279
 entropy 34, 72, 197, 205, 206, 204, 275, 280, 470
 epidermis 300
 equation of state (EOS) 76, 78, 79, 80, 81
 equilibrium 7, 43, 48, 60, 62, 66, 67, 92, 109, 117, 118, 158, 162, 163, 164, 182, 190, 195, 196, 197, 199, 202, 203, 207, 212, 218, 219, 222, 224, 227, 228, 232, 243, 274, 279, 361, 369, 370
 equivalent 14, 31, 33, 46, 47, 57, 58, 69, 101, 137, 166, 167, 174, 202, 208, 212, 221, 229, 231, 233, 246, 274, 287, 292, 324, 326, 362, 403, 414, 434, 436
 ergodic hypothesis 202
 Eulerian 17, 65, 83, 84, 85, 86, 88, 89, 90, 123
 evolution 13, 31, 32, 35, 85, 124, 199, 200, 202, 323, 324, 326, 433, 434, 435, 467
 excessive 15, 88, 276, 305, 402, 414
 expansion 157, 175, 178, 213, 470, 473
 explicit 10, 25, 31, 34, 89, 95, 116, 177, 191, 200, 202, 204, 263, 270, 274, 322, 324, 325, 356
 exponential 56, 58, 207, 218, 314, 316, 324, 355
 extended finite element method (XFEM) 18, 37, 85, 93, 105, 113, 114, 115, 117, 118, 119, 120, 121, 122, 123, 124, 125, 127, 129, 131, 132, 136, 140, 145, 158, 257, 429, 432, 437, 441, 442, 443
 extended isogeometric analysis (IGA and XIGA) 18, 37, 93, 121, 133, 134, 135, 136, 137, 138, 139, 140, 141
 extracellular matrix (ECM) 12, 301, 303, 313, 319, 347, 348, 349, 360, 361, 362, 363, 364, 365, 367, 368, 369, 370, 371, 372, 373, 374, 379, 384, 387, 389, 391, 407, 409, 413, 417, 447, 448
 eye 15, 17, 19, 467, 474, 475, 476, 477
- f**
- failure 3, 6, 8, 28, 37, 49, 50, 384, 400, 429, 432, 433, 435, 436, 509
 fatigue 4, 10, 23, 37, 49, 50, 51, 52, 53, 429, 435
 femoral neck 432
 femur 429, 432, 435, 436, 443, 444, 445, 446
 fibre 6, 11, 12, 14, 15, 18, 114, 230, 233, 257, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 327, 328, 329, 330, 332, 333, 334, 335, 336, 338, 339, 340, 343, 344, 349, 351, 352, 353, 354, 355, 356, 357, 358, 360, 361, 377, 383, 384, 385, 387, 389, 390, 391, 393, 394, 396, 397, 400, 402, 407, 426, 472
 fibril 6, 11, 18, 299, 301, 313, 314, 315, 316, 328, 330, 331, 332, 334, 338, 389, 424, 425, 426, 428
 fibrin clot 359
 fibrinolysis 359
 fibroblast 301, 302, 360, 361, 363, 364, 365, 366, 367, 368, 369, 370, 372, 374, 375, 376, 377, 379, 381, 382

- fibrosa 303, 319, 336, 343, 344, 345, 346, 347, 348, 350
- fibrous tissue 299, 300, 306, 307, 316, 319, 355, 387, 389, 395, 477
- fine scale 269, 271, 272
- finite difference method (FDM) 17, 93, 94, 95, 96, 97
- finite element method (FEM) 18, 37, 85, 93, 102, 103, 104, 105, 106, 110, 112, 113, 114, 116, 118, 119, 120, 142, 143, 147, 158, 257, 259, 262, 263, 267, 268, 271, 275, 286, 288, 289, 430, 432
- finite point method (FPM) 158, 164, 165, 166
- finite volume method (FVM) 18, 93, 99, 100, 102
- first-order 48, 124, 178, 183, 188, 199
- flexibility 190, 215, 301
- flow 4, 5, 7, 8, 11, 13, 15, 17, 19, 23, 30, 35, 37, 59, 60, 61, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 143, 303, 337, 355, 423, 433, 468, 477, 479
- fluctuation 77, 177, 178, 182, 184, 186, 188, 190, 243, 272, 393
- fluid viscosity 130
- fluid-solid (structure) interaction (FSI) 11, 17, 83, 84, 85, 86, 88, 467, 474, 475, 477, 478, 479
- flux 79, 83, 99, 101, 102, 364, 365, 366, 449, 451, 453, 477
- folded 305, 306, 467, 479, 480
- forward finite difference method (fFDM) 93, 94, 96,
- fracture 4, 6, 7, 17, 23, 28, 36, 37, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 53, 114, 115, 121, 125, 130, 132, 195, 231, 233, 245, 248, 261, 305, 355, 402, 403, 429, 430, 432, 433, 435, 436, 437, 441, 443, 445, 446, 447, 448, 458, 459, 462, 464, 465, 466
- fracture energy release rate 39, 43, 47, 441, 445
- fracture mechanics 7, 17, 23, 28, 36, 37, 39, 40, 41, 45, 48, 115, 132
- free atom 262, 267, 270
- free energy 34, 36, 73, 197, 210
- free surface 74, 83, 84, 88, 143, 154
- friction 77, 207, 208
- Fung 3, 316, 330, 344, 385
- g**
- Galerkin 18, 37, 62, 144, 158, 159, 162
- gas dynamics 72, 74, 78, 154
- gel-like matrix 6, 316
- generative adversarial networks (GAN) 485
- genetic algorithm (GA) 300, 389, 390, 391, 394, 408
- geometric 6, 37, 40, 93, 114, 121, 123, 133, 135, 136, 197, 292, 347, 423, 431, 478
- Gibbs 73, 197, 208, 210
- glass transition 228, 229
- glaucoma 15, 467, 474
- globule 242, 243
- gradient 7, 63, 64, 65, 67, 68, 120, 132, 133, 182, 183, 184, 185, 186, 187, 188, 193, 224, 226, 228, 260, 261, 263, 271, 273, 274, 276, 277, 278, 279, 281, 284, 285, 288, 291, 307, 309, 310, 314, 326, 360, 387, 390, 393, 396, 397, 407, 411, 436, 464
- grain 221, 248
- grey matter 304, 403
- grid 93, 98, 99, 120, 134, 160, 304, 469
- Griffith 37, 42, 43, 300, 301, 359
- growth factor 8, 303, 359, 360, 361, 364, 365, 367, 368, 370, 372, 374, 377, 378, 379, 381, 384, 429, 447, 448, 449, 450, 451, 452, 454, 455, 456, 459, 461, 462, 464, 465, 466
- h**
- Hamiltonian 197, 198, 199, 202, 204, 206, 207, 211
- handshake 260, 267, 268, 269, 270
- hard tissue 8, 17, 19, 424, 426, 428, 429, 433, 435, 446, 447, 467
- hardening 28, 29, 34, 35, 36, 131, 246, 257, 305, 433, 434, 471
- Hardy stress 225
- haversian canal 440, 441

head injury criterion (HIC) 403

healing 5, 7, 8, 17, 18, 81, 114, 300, 302, 359, 360, 361, 362, 364, 372, 374, 375, 377, 378, 379, 429, 430, 446, 447, 448, 449, 456, 458, 459, 462, 463, 464, 465

heart 4, 5, 7, 8, 11, 13, 15, 17, 18, 229, 230, 299, 303, 316, 336, 340, 423

heat 42, 79, 80, 81, 195, 204, 207, 210, 223, 273, 279, 280, 305, 327, 328, 470, 483

Heaviside 113, 116, 121, 122, 136, 138, 139, 191, 287

Helical/helix 6, 9, 301, 305, 306, 387, 425, 469

Helmholtz 34, 73, 197, 209, 210

hemodynamic 5, 13

heterogeneous 5, 6, 171, 172, 186, 193, 423, 424, 427, 429, 432, 436, 440, 441

hexahedral 431, 436, 440

hierarchical 301, 313, 328, 330, 336, 341, 383, 384, 386, 387, 390, 403, 407, 423, 424, 425, 426, 427, 428

Hill-Mandel principle 183, 185, 187, 394

hole 5, 6, 11, 29, 36, 37, 38, 105, 143, 158, 166, 186, 201, 202, 211, 212, 213, 243, 259, 261, 271, 273, 274, 293, 387, 405, 426, 441, 448, 472,

Holzapfel model 299, 344, 389, 390, 393, 472

homeostasis 302, 359

homogeneous 69, 125, 330, 431

homogenization 15, 16, 18, 171, 172, 173, 174, 176, 177, 178, 181, 182, 183, 184, 185, 186, 187, 188, 190, 192, 193 194, 195, 211, 229, 300, 390, 391, 392, 394, 432, 436, 476

homogenized 14, 171, 172, 173, 176, 177, 178, 179, 182, 183, 190, 389, 390, 391, 394, 440, 441, 472

HPC-Lab 17

hydraulic diffusivity 61

hydraulic fracture 125, 130

hyperelastic 11, 18, 28, 63, 68, 69, 70, 71, 72, 299, 300, 305, 306, 307, 309, 310, 312, 313, 314, 316, 321, 327, 328, 330, 332, 337, 338, 344, 349, 355, 387, 389, 392, 393, 403, 406, 408, 411, 413, 435, 469, 472, 477

i

IKN stress 224, 225

impact 6, 14, 210, 257, 300, 304, 402, 403, 428, 429, 432, 436

implant 10, 17, 469, 487

inclined 44, 99, 301, 384, 387, 389, 396, 472

incompatibility 122, 123

incompressible/ incompressibility 28, 69, 70, 71, 74, 76, 80, 83, 309, 311, 312, 315, 316, 318, 319, 322, 337, 349, 355, 389, 393

increment 30, 31, 32, 61, 65, 124, 184, 185, 226, 247, 277, 390, 404

independent atom 261, 262, 263, 264, 265, 267, 268, 280, 282, 284, 285

inequality 34, 322

infinite 36, 37, 38, 39, 40, 48, 55, 63, 143, 200, 202

inflammation 302, 359, 360, 447

influence domain 137, 264

inhomogeneity 10, 37, 38, 182, 184

initial configuration 63, 66, 132, 182, 183, 184, 227, 277, 287, 307, 483

initial nominal intraocular pressure (IOP) 475

injury/injured 6, 17, 302, 360, 374, 402, 403

instantaneous 204, 206, 415, 417, 419

intact 37, 230, 235, 237, 238, 239, 240, 241, 244, 245, 247, 256, 321, 355, 362, 363, 372, 385

integrated 10, 112, 119, 120, 200, 260

integration 36, 69, 71, 95, 101, 102, 112, 113, 119, 120, 121, 124, 140, 141, 142, 148, 153, 160, 161, 163, 164, 183, 184, 185, 186, 203, 213, 214, 215, 353, 369, 386, 455,

interaction 3, 4, 6, 7, 9, 11, 14, 15, 17, 47, 83, 85, 87, 89, 91, 102, 195, 207, 215, 216, 218, 221, 227, 232, 242, 243, 292, 314, 315, 362, 434, 467, 469, 471, 474, 477, 479

interatomic potential 171, 196, 212, 213, 214, 215, 216, 221, 224, 264, 274, 284, 293

- intercellular 303, 360
interface 5, 39, 84, 85, 114, 115, 116, 117,
123, 124, 125, 126, 127, 172, 246, 259,
260, 267, 268, 269, 270, 272, 315, 319,
intermediate 276, 277, 278
internal pressure 305, 384, 402, 469
interpolation 102, 103, 104, 105, 106, 116,
122, 139, 146, 148, 149, 150, 151, 152,
153, 155, 159, 167, 168, 263
interstitial cell 4, 312, 319, 336, 347
interstitial matrix 436, 443
intima 303, 355, 384, 472
intracellular 303, 360
intrinsic 60, 326
invariant 68, 69, 210, 307, 308, 309, 314, 338
irregular 250, 272, 273, 275, 280, 458
isochoric 311, 316
isoparametric 103, 135
isotropic 23, 27, 28, 32, 34, 35, 36, 45, 69,
124, 125, 126, 127, 243, 249, 250, 299,
300, 305, 309, 310, 311, 312, 315, 316,
317, 318, 319, 320, 321, 322, 337, 338,
344, 349, 355, 356, 379, 383, 403, 426,
427, 433, 434, 435, 472, 47
iterative 182, 192, 226, 272, 274, 372, 394,
408, 458, 484, 485
- j**
J integral 46, 47
Jacobian 46, 64, 111, 136, 307
- k**
Kelvin model 55, 58, 59
kernel 154, 155, 156, 157, 166
kinematic 36, 74, 89, 173, 183, 186, 187, 188,
189, 190, 192, 433
kinetic 42, 198, 206, 207, 210, 212, 214, 248,
274
Kronecker delta 69, 106, 134, 139, 146, 150,
155, 168
- l**
Lagrange 65, 69, 108, 139, 140, 158, 160,
161, 270, 310, 414, 434
Lagrangian 17, 65, 66, 83, 84, 86, 87, 88, 89,
90, 91, 92, 108, 132, 197, 198, 199, 212,
270, 310, 391
Lamellae/lamellar 426, 427, 428
lamina cribrosa 17
laminar 75, 77
LAMMPS 228, 231
Langevin thermostat 206, 210
large deformation 17, 23, 63, 64, 65, 68, 84,
114, 132, 143, 182, 183, 224, 265, 299,
330, 355, 357, 387, 434, 471
large strain 23, 63, 102, 246, 300, 390
lattice 195, 242, 260, 261, 265, 287, 427
layer 4, 6, 11, 74, 77, 242, 250, 299, 300, 303,
305, 319, 336, 342, 343, 344, 345, 346,
347, 348, 350, 355, 384, 385, 387, 388,
389, 390, 396, 403, 423, 426, 472, 477,
484, 485, 486
leaflet 4, 11, 15, 299, 303, 304, 337, 339, 340,
341, 342, 343
length scale 14, 75, 171, 218, 326, 336, 424
level set method (LSM) 85, 123, 124
ligament 18, 299, 313, 349, 350, 351, 352,
354
Liouville operator/ theorem 199, 202
localization 184, 188, 190, 191, 233, 251, 252
localized 233, 281, 282, 287, 289, 387, 436,
437, 473, 475
long term 10, 300, 375, 415, 416, 419, 420,
421
loss function 485, 486
lung 7, 8, 83, 423
- m**
machine learning (ML) 483, 484, 487
macro-based 28, 186, 188, 189, 436
macromolecule 221, 301
macroscale 14, 15, 18, 102, 171, 172, 176,
177, 178, 181, 182, 183, 184, 185, 186,
190, 191, 192, 200, 201, 223, 225, 230,
257, 299, 344, 386, 387, 389, 390, 391,
392, 394, 400, 403, 406, 408, 410, 425,
428, 429, 430, 433, 474, 475, 477
macroscopic 28, 52, 171, 176, 177, 178, 179,
181, 187, 188, 193, 196, 200, 202, 203,
224, 260, 481,
macroscopic atomistic ab initio dynamics
(MAAD) 260
mapping 89, 91, 151, 290, 307

- martensite 469, 470, 471
- mass 5, 6, 7, 61, 72, 78, 81, 85, 87, 90, 171, 196, 207, 222, 258, 272, 277, 278, 304
- material configuration 89, 90, 92
- mathematical homogenization 174, 177
- matrix metalloproteinase (MMP) 303, 321
- maturation 302, 359
- maximum entropy 274, 275, 280
- Maxwell model 54, 56, 58, 417, 481
- mean square displacement function (MSD) 223
- mechanical properties 6, 10, 18, 241, 242, 243, 244, 245, 248, 249, 250, 251, 256, 299, 337, 425, 426, 429, 433, 473
- media 23, 37, 60, 114, 127, 172, 276, 277, 278, 299, 302, 303, 355, 356, 357, 359, 360, 384, 385, 387, 390, 472,
- medial tissue 299, 355, 357
- membrane 5, 8, 81, 195, 304, 403
- mesenchymal stem cell (MSC) 429, 447, 448, 451, 452, 453, 456, 459, 461, 462
- meshfree 142
- meshless 18, 37, 93, 99, 142, 143, 144, 148, 154, 158, 160, 162, 164, 166, 167, 260, 274, 276, 277, 279, 281, 478
- meshless local Petrov-Galerkin method (MLPG) 18, 37, 158, 162, 163, 164
- mesoscale 14, 18, 229, 230, 249, 250, 251, 255, 256, 257, 429, 431, 436, 437
- micro-based 173, 188, 190, 192, 193, 195
- microcanonical 204, 205, 209,
- micro-computed tomography (μ -CT) 436
- microcrack 31, 38
- microdefect 31, 32, 35, 37, 39
- micromechanics 17, 28
- micromodelling 4, 14, 200, 407, 411
- microorganism 300
- microscale 4, 6, 14, 15, 18, 82, 171, 172, 173, 174, 176, 177, 178, 179, 181, 182, 183, 184, 185, 186, 188, 190, 191, 200, 201, 223, 226, 230, 247, 248, 249, 250, 274, 277, 299, 300, 386, 387, 389, 390, 391, 393, 394, 403, 407, 408, 409, 410, 413, 417, 429, 432, 433, 435, 436, 438, 439, 440, 443, 476
- microstructure 4, 5, 6, 10, 11, 15, 18, 19, 28, 31, 171, 172, 173, 174, 176, 177, 178, 179, 186, 188, 190, 192, 300, 303, 304, 305, 327, 387, 389, 391, 394, 396, 400, 403, 407, 414, 429, 431, 435, 436, 469, 474
- midbrain 304
- mid-side 45, 46
- mineral 423, 424, 425, 426, 427, 428, 429, 447
- mixed mode 41, 44, 47
- mobilization 322, 356
- molecular dynamics (MD) 18, 171, 195, 196, 203, 207, 210, 211, 212, 213, 215, 216, 218, 222, 223, 224, 226, 227, 228, 231, 232, 242, 243, 244, 258, 271, 272, 278, 279, 280, 281, 283, 290
- molecular statics (MS) 226, 246, 263, 265, 282, 284, 286, 287, 288, 289, 293, 295, 296
- molecule 3, 8, 9, 12, 18, 171, 195, 196, 211, 215, 221, 243, 301, 425
- momentum 66, 78, 85, 90, 198, 207, 212, 214, 224
- monomer 11, 227, 301, 313
- Monte Carlo (MC) 203, 210
- Mooney-Rivlin 71, 300, 312, 344, 348, 411, 412, 413, 414, 472
- Morse potential 218, 246
- motion 7, 18, 72, 76, 77, 78, 81, 89, 123, 156, 197, 198, 199, 202, 203, 204, 207, 208, 210, 211, 212, 213, 226, 336, 361
- moving least square (MLS) 143, 144, 145, 146, 147, 148, 149, 150, 158, 159, 160, 161, 163, 165, 261, 278
- multiaxial 29, 31, 44, 394
- multiphase 6, 10
- multiple scale 11, 171, 229, 424, 429, 435, 436, 487
- multiplicative 68, 276, 309
- multiscale 3, 7, 8, 11, 12, 13, 14, 15, 16, 17, 18, 19, 23, 3, 102, 167, 171, 172, 211, 221, 229, 230, 231, 247, 256, 258, 259, 260, 261, 265, 266, 267, 271, 272, 273, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 293, 299, 300, 312, 313, 316,

- 328, 336, 340, 341, 347, 383, 384, 386,
387, 388, 390, 394, 396, 401, 402, 403,
407, 414, 423, 430, 432, 435, 436, 467,
472, 474, 476, 477, 483, 487
- multiwalled (MWCNT) 231, 232, 235
- muscle 300, 301, 303, 304, 360, 423, 447
- muscular rectus sheath 327
- myelin 305
- myofibroblast 302, 303, 360, 361, 363, 364,
365, 366, 367, 368, 369, 370, 376, 377,
379, 382
- n**
- nano 10, 14, 18, 102, 154, 171, 195, 196, 229,
230, 231, 233, 234, 241, 242, 243, 245,
256, 260, 261, 265, 287, 293, 424, 428,
479, 483
- Navier-Stokes 75, 76, 77, 78, 79
- nearly incompressible 69, 70, 311, 312, 319,
349, 355
- neo-Hookean 70, 71, 132, 299, 300, 309, 310,
311, 314, 315, 318, 319, 344, 355, 389,
390, 393, 403, 406, 409, 414, 477
- nerve cell 4, 12, 304, 305, 402, 426, 476
- nerve chain/system 300, 304, 414, 433
- neurological 7, 195
- neuromusculoskeletal system 487
- neuron 304, 305
- neutral 35, 43, 324
- Newtonian 76, 78, 79, 196, 211
- Newton-Raphson 192, 372, 394, 417, 458
- NiTi SMA 17
- non-convex 226, 275
- non-equilibrium 203, 224
- nonlinear 11, 12, 23, 28, 29, 46, 65, 82, 97,
102, 114, 132, 141, 166, 179, 182, 213,
257, 288, 370, 372, 387, 417, 456, 458,
486
- non-local 39, 186, 299, 321, 326, 349, 355
- non-slip 84, 86
- normal tension glaucoma (NTG) 474
- normalization 151, 201
- Nose-Hoover thermostat 206, 207,
208, 210
- Nucleoside 9
- NURBS 133, 134, 135, 138, 139
- NVE 202, 204, 205, 206, 208, 222
- NVT 202, 204, 206, 208, 209, 210, 222, 228,
232, 243
- O**
- objectivity 65, 67, 68, 215
- opening 41, 48, 49, 187, 191, 192, 443, 444,
482
- optical nerve head (ONH) 15, 467, 474, 475,
476, 477
- optimization/optimized 423, 424, 485, 486,
487
- order of continuity 123, 145, 186
- organ 3, 4, 6, 7, 8, 9, 10, 15, 17, 49, 59, 230,
300, 304, 307, 316, 336, 337, 338, 341,
342, 344, 402, 423, 425, 427, 428, 432,
433, 474, 479, 480
- organism 3, 8, 300, 359, 361, 466
- orientation 44, 242, 243, 248, 301, 333, 335,
338, 339, 340, 355, 358, 384, 389, 403,
426, 427
- orthogonal 25, 64, 99, 124, 227, 272
- orthopaedic 4, 5, 6, 469
- orthotropic 25, 44, 45, 114, 125, 126, 127,
425, 426, 427, 433
- oscillating 150, 186, 222
- oscillation 126, 160, 174, 208, 272
- osteoblast 423, 429, 447, 448, 450, 451, 452,
453, 454, 456, 459, 462, 463, 464, 466
- osteoclast 423, 429, 447, 462, 464
- osteocyte 423, 429, 448, 462
- osteoporosis 429
- oxygen 8, 9, 243
- P**
- pad atom 267, 268
- pair potential 216, 217, 218, 219,
220, 221
- parallel 29, 31, 55, 56, 301, 327, 328, 330,
333, 349, 396, 426
- parametric space 106, 133, 134, 135, 136
- particle 13, 18, 37, 81, 83, 84, 89, 154, 155,
156, 157, 158, 166, 171, 196, 197, 198,
199, 200, 202, 204, 205, 206, 207, 209,
210, 211, 212, 213, 215, 218, 222, 248,
467, 478

- partition function 205, 209, 210
- partition of unity 105, 113, 114, 122, 134, 150, 169
- paste 14, 231, 242, 244, 245, 246, 247, 248, 256
- peeling 299, 355, 357
- penalty 70, 161, 162, 311, 312, 316, 319, 337, 484, 486
- perfectly plastic 28
- perforated 299, 350, 352, 354
- periodic 173, 174, 175, 176, 177, 178, 181, 183, 204, 211, 212, 216, 242, 265, 344, 347, 407, 411, 417, 436
- permeability 10, 60
- phase 10, 83, 85, 87, 90, 114, 195, 199, 200, 201, 202, 203, 205, 208, 209, 210, 220, 222, 223, 225, 228, 242, 243, 247, 248, 250, 279, 359, 360, 375, 377, 400, 423, 435, 437, 441, 446, 447, 448, 463, 467, 469, 470, 471, 473, 474, 481, 482, 485
- phase average 201, 202, 203, 209
- phase space 199, 200, 201, 202, 203, 205, 210
- physical space 106, 137, 141, 204
- physics-informed neural network (PINN) 483, 485, 486
- physiological 7, 11, 12, 15, 299, 300, 302, 303, 305, 359, 361, 423, 428, 429
- plague 321, 467, 468, 472
- plane strain 26, 27, 128
- plane stress 26, 27, 248
- plastic 17, 23, 28, 29, 30, 31, 32, 35, 36, 37, 43, 48, 49, 51, 63, 67, 68, 102, 125, 131, 195, 246, 257, 423, 433, 434
- point interpolation method (PIM) 148, 149, 150, 151, 152, 153, 154, 167, 168
- Poisson 200, 245, 246, 248, 362, 437, 441, 445
- polar distribution 121, 141
- polyconvex 319
- polycrystalline 28, 261
- polyethylene 227, 228
- polymer 10, 18, 19, 219, 221, 223, 227, 260, 272, 313, 467, 479, 481
- polynomial 120, 145, 147, 148, 149, 150, 153, 167, 326
- polynomial PIM (PPIM) 148, 149, 150, 153, 167
- pore 23, 60, 61, 62, 428
- poroelastic 17, 23, 59, 60, 433
- porosity 12, 31, 60, 248, 250
- porous 5, 6, 23, 59, 60, 61, 62, 83, 102, 172, 173, 242, 247, 426, 427, 433, 435, 436, 437
- potential energy 43, 198, 213, 215, 226, 246, 265, 269, 270, 274
- potential function 18, 81, 215, 216
- power of singularity 130
- prescribed 83, 84, 109, 129, 139, 158, 162, 181, 184, 185, 269, 379, 392, 393, 411
- pressure 7, 11, 15, 28, 60, 61, 62, 69, 72, 74, 75, 76, 77, 78, 79, 80, 84, 130, 165, 200, 204, 205, 207, 229, 243, 279, 299, 300, 303, 304, 305, 311, 312, 336, 337, 339, 340, 341, 342, 343, 348, 350, 351, 363, 384, 396, 397, 398, 399, 400, 402, 434, 467, 468, 469, 473, 474, 475, 476, 477, 478
- prestress 379, 380
- primary open angle glaucoma (POAG) 474
- principle 15, 17, 18, 19, 33, 34, 37, 72, 183, 185, 187, 196, 199, 394, 470, 473, 475
- probabilistic 200, 201, 202
- probability density 201, 202, 204, 205, 208
- proliferation 302, 359, 360, 366, 368, 448, 451, 452, 453, 454, 462, 463
- Prony 56, 58
- propagation 8, 31, 39, 42, 44, 45, 49, 52, 85, 114, 121, 130, 133, 251, 432, 435, 436, 437, 440, 441, 443, 445, 446
- properties 6, 10, 12, 14, 18, 33, 59, 72, 105, 129, 171, 172, 193, 195, 219, 231, 241, 242, 243, 244, 245, 248, 249, 250, 251, 256, 257, 299, 310, 327, 329, 337, 345, 348, 350, 351, 355, 356, 359, 389, 390, 394, 406, 408, 409, 411, 412, 413, 425, 426, 429, 433, 436, 437, 440, 441, 445, 467, 470, 472, 473, 474, 479, 482
- protein 7, 8, 9, 195, 272, 301, 303, 305, 313, 321, 359, 360, 425, 428
- proximal femur 432

pseudo invariant 308
 pseudo-atom 221, 227
 PU 105, 114, 115, 134, 150, 169
 pull-out 244, 246
 pulmonary 8
 pulsatile 19, 477, 479
 pure 41, 65, 66, 91, 92, 480, 483, 484

q

quadrature 112, 113, 120, 140, 141, 148, 160, 161, 163, 269
 quadrilateral 106, 108, 112, 441
 quasi-brittle 434, 435
 quasi-continuum (QC) 18, 172, 260, 261, 262, 263, 264, 265, 266, 282, 287, 288, 289, 293, 294, 295, 296
 quasi-static 43, 132, 226, 257, 258, 361, 404, 406

r

radial 40, 44, 132, 148, 151, 152, 153, 167, 222, 290, 326, 337, 338, 339, 343, 344, 345, 346, 348, 349, 350, 472
 radial basis function (RBF) 148, 151, 152, 153, 167, 290
 radial distribution function (RDF) 222, 223
 radial PIM (RPIM) 148, 151, 152, 153, 167, 168
 radial-polynomial PIM (RPPIM) 148, 153, 154
 random 82, 151, 203, 210, 211, 242, 247, 248, 285, 305, 315, 365, 366, 417, 426, 449, 451, 453, 485, 486
 rate 10, 17, 23, 28, 37, 39, 42, 43, 44, 47, 48, 52, 54, 57, 59, 65, 66, 67, 68, 74, 76, 79, 90, 91, 160, 182, 188, 228, 248, 273, 279, 281, 324, 325, 340, 364, 365, 366, 367, 368, 369, 377, 378, 403, 421, 441, 445, 447, 449, 450, 451, 452, 453, 454, 455, 464
 recursive (recurrent) neural networks (RNN) 485
 recursive 57, 59, 134, 369, 455, 485
 reference configuration 65, 68, 88, 89, 90, 91, 92, 182, 391
 regularized 91, 92

reinforced 14, 230, 231, 242, 243, 244, 245, 247, 249, 250, 251, 252, 254, 255, 256, 257, 258, 305, 315, 319, 344, 426
 relaxation 53, 54, 55, 56, 228, 415, 417, 418, 419, 420, 421
 remodelling 360, 428, 429, 431, 447, 448, 464
 repair 9, 302, 359, 360, 429, 446, 447
 representative 32, 35, 171, 172, 173, 174, 211, 262, 300, 332, 334, 336
 representative volume element (RVE) 171, 172, 173, 174, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 190, 191, 192, 193, 194, 211, 212, 244, 245, 246, 256, 300, 319, 330, 336, 344, 346, 347, 348, 349, 386, 387, 388, 389, 390, 393, 394, 395, 396, 397, 398, 399, 400, 401, 407, 408, 409, 410, 411, 412, 413, 414, 417, 418, 419, 420, 421, 436
 reproduce 45, 55, 105, 106, 114, 153, 200, 215
 reproducing kernel particle method (RKPM) 156
 reproduction 115, 137, 359, 360, 375
 repulsion 218
 residual 49, 62, 145, 146, 162, 270
 resistance 6, 14, 42, 74, 77, 257, 360, 445
 reversible 28, 80, 324
 Reynolds number 75, 77
 Richardson approximation 98
 right Cauchy-Green deformation tensor 307
 risk 13, 300, 355, 400, 411, 429, 476
 RNA 7, 9
 rotation 64, 65, 66, 227, 357, 404
 roughness 195, 265, 436
 rupture 114, 231, 233, 300, 327, 355, 384, 396, 400, 443, 447

S

saturation 324, 449, 455, 462, 464
 scaffold 447
 scar 5, 359
 scratch 37, 302, 359
 second order 35, 48, 49, 65, 69, 157, 184, 185, 186, 187, 214, 307, 308, 434
 secretion 359, 360

- seismic 14, 83, 257, 258
 self-expandable 469
 self-expanding 471, 473
 self-healing 300, 359
 sequential 14, 15, 18, 171, 172, 229, 230, 485
 serendipity 108
 shape function 46, 62, 103, 104, 105, 106,
 107, 108, 109, 110, 115, 119, 132, 139,
 143, 145, 146, 147, 148, 150, 152, 153,
 154, 155, 158, 159, 160, 161, 163, 165,
 166, 167, 168, 169, 191, 263, 268, 270,
 272, 273, 275, 280, 287, 290, 370, 394,
 456
 shape memory alloy (SMA) 10, 17, 114, 172,
 173, 467, 468, 469, 470, 471, 473, 474
 shape memory effect (SME) 6, 13, 467, 469
 shape memory polymer (SMP) 10, 19, 467,
 479, 480, 481, 482, 483
 sharp crack 36, 48, 148
 shear 27, 28, 41, 42, 74, 77, 79, 97, 114, 127,
 180, 243, 245, 305, 314, 315, 317, 319,
 330, 332, 334, 356, 362, 369, 389, 402,
 403, 406, 409, 410, 415, 417, 440, 441,
 443,
 sheath 305, 327, 328
 shock wave 80, 154
 short term 415, 419, 420
 sign function 116
 signal transmission 305
 signed distance function 115, 124, 191
 silicate-cement-hydrate (CSH) 14, 230, 242,
 243, 244, 245, 246
 simplified 12, 13, 26, 27, 40, 43, 48, 74, 80,
 82, 87, 99, 116, 127, 130, 131, 154, 163,
 179, 314, 386, 387, 388, 394, 404, 433,
 436, 455, 458, 459, 472, 477
 simultaneously 7, 41, 52, 172, 234, 260, 286,
 303, 360, 486
 single-scale 6, 14, 182, 430
 singularity 18, 37, 40, 114, 116, 120,
 130, 131
 skeleton 60, 360, 427
 skin 6, 9, 18, 299, 300, 301, 302, 313, 315,
 359, 370, 372, 375, 379, 380, 381,
 385, 403
 skull 305, 402, 403, 428
 sliding contact 114, 131, 404
 slope 28, 31, 51, 96, 257
 smoothed particle hydrodynamics (SPH)
 18, 37, 84, 154, 155, 156, 157, 158,
 166, 478
 smoothing/smoothness 47, 147, 150, 154,
 155, 166
 soft tissue 5, 11, 12, 17, 18, 83, 299, 300, 301,
 302, 304, 305, 306, 309, 311, 313, 314,
 316, 321, 327, 328, 330, 337, 349, 355,
 357, 359, 361, 383, 384, 390, 396, 435,
 469, 471, 472, 473, 477
 softening 173, 188, 244, 355, 434
 software 102, 142, 158, 171, 258, 404,
 405, 432
 solid mechanics 6, 8, 17, 23, 83
 source/sink 82, 100
 space-time 114, 429
 spatial 65, 66, 76, 89, 91, 93, 166, 174, 224,
 251, 252, 253, 254, 255, 256, 290, 310,
 360, 361
 specific heat 79, 80, 470
 spongiosa 303, 336, 343, 344, 345
 spongy 423, 426, 427
 spring 53, 54, 55, 56, 58, 100, 101, 246
 spurious 272
 stabilization 165, 166
 stable 9, 39, 43, 52, 156, 447
 state variable 15, 31, 34, 35
 static 43, 74, 75, 109, 117, 125, 132, 156, 218,
 226, 246, 257, 258, 263, 283, 287, 293,
 361, 404, 406
 stationary 46, 82, 202, 468
 statistical 18, 171, 173, 196, 200, 201, 202,
 203, 204, 205, 208, 209, 211, 212, 224
 steady state 77, 78, 82, 100, 200
 stent 5, 6, 13, 17, 19, 103, 467, 468, 469, 470,
 471, 472, 473, 474, 479
 step function 116
 stick/slip 39, 131
 Stillinger-Weber (SW) potential 219, 220,
 279
 stochastic 206, 210
 storage 9, 61, 428

- straight 6, 14, 90, 92, 97, 106, 120, 141, 147, 301, 403
 strain energy 33, 34, 43, 44, 68, 69, 70, 71, 246, 260, 263, 269, 274, 283, 291, 310, 314, 315, 316, 319, 323, 325, 337, 344, 355, 392, 293
 strain measure 64, 65
 strain rate 74, 76, 79, 228, 248, 281, 420, 421
 strength 4, 36, 37, 40, 42, 49, 50, 52, 231, 243, 244, 245, 249, 251, 252, 254, 255, 256, 301, 302, 303, 306, 313, 321, 333, 360, 425, 427, 430
 stress intensity factor (SIF) 37, 39, 40, 41, 42, 43, 45, 47, 48, 52
 stress measure 49, 50, 51, 66, 67, 224, 225
 stretch 64, 65, 66, 227, 228, 242, 301, 302, 306, 308, 327, 328, 330, 341, 345, 350, 352, 361, 363, 368, 389, 390, 396, 397, 414, 435
 strip 372, 375, 379, 459
 strong form 85, 86, 90, 93, 97, 109, 118, 138, 158, 162, 163, 164, 165, 166, 177, 182, 370, 371, 456
 structured 93, 98, 100, 160, 273, 287, 353,
 subcellular 12
 sub-quad 120
 sub-triangle 120, 141
 sub-triangulation 120, 141
 superelastic 172, 467, 469
 support domain 134, 136, 137, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 159, 160, 161, 163, 164, 165, 167, 168, 277
 surface energy 42, 43
 SW defect 231, 232, 235, 236, 237, 239, 240, 245
 SWCNT 231
 symmetric 36, 64, 65, 66, 67, 71, 95, 155, 157, 164, 224, 313, 458
 symmetry 25, 44, 156, 215, 433
 synthesized 8, 9, 10, 487
- t**
- tailored 3, 9, 14, 142
 tangential 30, 84, 114
 tear 41, 42, 233, 302, 359, 435, 468
 temperature 49, 53, 72, 74, 76, 78, 79, 84, 200, 204, 205, 206, 207, 210, 222, 228, 229, 232, 243, 261, 273, 279, 304, 469, 471, 480, 482, 485
 temporal 93, 361, 419, 459, 462, 463, 464, 466
 tendon 18, 299, 301, 313, 315, 328, 330
 tensile 28, 36, 37, 38, 39, 40, 42, 44, 74, 156, 228, 231, 232, 233, 234, 241, 242, 243, 244, 245, 247, 249, 250, 251, 252, 253, 254, 255, 256, 279, 280, 287, 299, 301, 302, 305, 306, 307, 313, 395, 396, 397, 402, 411, 432, 434, 436, 441, 442
 Tersoff potential 220, 232, 233, 242
 tetrahedral 431, 437, 438, 439, 440, 443,
 thermodynamics 34, 42, 72, 78, 79, 196, 200, 210
 thermomechanical 114, 480
 thermostat 206, 207, 208, 210
 thickness 233, 248, 250, 300, 303, 342, 344, 346, 348, 396, 400
 third-order 214
 three-body 216, 219, 274, 279
 three-dimensional 6, 27, 34, 46, 58, 112, 151, 246, 248, 261, 344, 404, 405, 427,
 threshold 356, 357, 485
 time integration 95, 124, 213, 214, 215, 369, 455
 time-dependent 28, 198, 201, 417, 428
 tip enrichment 116, 117, 121, 122, 124, 125, 126, 127, 129, 130, 131, 136, 137, 138, 139, 145, 170, 192, 193, 287
 tissue engineered 303, 336, 340
 toughness 14, 41, 44, 45, 53, 130, 429
 trabecular 423, 425, 426, 427, 428, 429, 432, 433, 435, 436, 437, 438, 439, 440
 tracking 85, 123
 traction 39, 46, 47, 66, 103, 109, 110, 113, 117, 118, 125, 131, 138, 139, 158, 161, 162, 177, 181, 191, 218, 224, 226, 269, 274, 288, 292, 302, 360, 361, 362, 363, 364, 369, 374, 375, 376, 377, 378, 379, 381, 382, 383, 384, 385, 392, 393, 436, 440, 487

transfer 5, 7, 8, 92, 224, 480, 485
 transformation 91, 92, 99, 136, 141, 142,
 151, 220, 467, 469, 470, 471, 473, 474,
 486
 transition 75, 123, 168, 172, 195, 228, 229,
 259, 260, 261, 268, 270, 394, 481
 transport 82, 83, 223, 360
 transverse isotropy 317
 trapezoidal rule 369, 455
 traumatic brain injury (TBI) 17, 402
 triangular 106, 107, 263, 287
 trochanter 432
 tropocollagen 301, 425
 Tsai formulation 224, 226
 tubular 303
 tumour 5, 17
 turbulent 75
 two dimensional 29, 77, 98, 137, 151, 212,
 248, 437, 459
 two-body 216, 217, 219

u

ultimate 13, 257, 303, 336, 340, 474, 483
 uncoupled 171, 229, 321, 324, 326
 undamaged 32, 33, 319, 328, 329, 331, 333,
 335, 375
 unfolded configuration 467, 479, 480
 unidirectional 28, 37, 408, 417
 uniform 11, 37, 38, 39, 76, 81, 94, 99, 133,
 156, 186, 224, 225, 228, 284, 327, 337,
 339, 340, 384, 394, 436, 437, 469
 unit cell 177, 212, 242
 University of Tehran 17
 unstable 43, 156
 updated Lagrangian 87, 310

v

vacancy 231, 232, 235, 236, 237, 238, 239,
 240, 241, 245
 valve 5, 11, 13, 15, 17, 18, 229, 230, 299, 303,
 304, 316, 336, 337, 340, 343
 van der Waals 80, 215, 227, 246
 variable node element (VNE) 18, 93, 166,
 167, 168, 169, 170, 281, 282, 283, 287,
 289, 290, 291

variable node multiscale method (VNMM)
 18, 167, 172, 260, 281, 282, 283, 286,
 287, 288, 289, 293, 294, 295, 296
 vascular system 5, 7, 8, 13, 427, 468
 vein 8, 467, 468, 469, 473, 477, 478
 velocity autocorrelation function
 (VAF) 222
 velocity Verlet (VV) 208, 213, 214
 ventricle 11, 336
 ventricularis 303, 319, 336, 343, 344, 345,
 346, 347, 348, 350
 virial stress 225, 288
 virtual crack 42
 virtual density 370, 456
 virtual displacement 370, 456
 viscoelastic 17, 18, 23, 53, 54, 56, 57, 58, 59,
 65, 70, 300, 326, 361, 362, 414, 415,
 417, 481, 482
 viscosity 12, 28, 54, 60, 74, 75, 76, 77, 79,
 130, 316, 362, 369
 viscous 8, 10, 53, 54, 74, 75, 76, 77, 78, 79,
 84, 361, 362, 428, 477
 vitreous pressure 15, 467, 474
 volume fraction 193, 248, 249, 250, 254, 417,
 419, 420, 421, 470
 volumetric 61, 70, 309, 311, 314, 316, 319,
 337, 361, 362, 363, 368
 von Mises 29, 193, 195, 357, 358, 394, 395,
 397, 398, 399, 400, 401, 407, 408, 410,
 411, 412, 413, 414, 415, 416, 433, 436,
 437, 438, 439, 441, 442, 443, 445, 446,
 473, 476, 482, 483
 Voronoi 264
 voxel 431, 436, 437, 438, 440

w

weak discontinuity 117
 weak form 62, 103, 110, 118, 139, 158, 159,
 161, 162, 163, 164, 178, 179, 190, 370,
 456
 weakly compressible 76
 weakly coupled 259
 wedge 39, 131, 132
 weight function 144, 145, 146, 147, 148, 150,
 154, 225, 268, 278, 370, 456

weighted least square (WLS) 143, 272
white matter 304, 310, 403
work conjugate 61, 185, 187, 188, 189,
190, 323
wound 18, 81, 302, 359, 360, 361, 372, 375,
377, 378, 379, 449

y

yield surface 29, 30, 433
yielding stress 28

z

Zener-Maxwell 481
zigzag 231, 233, 234, 235, 237, 238, 239, 240,
241, 244, 245

 μ

μ ic 248

