

## Author Index

*Please note: this index contains terms for all three volumes of the book. Only terms listed below with page numbers 2165–3148 are featured in this volume.*

- |   |  |
|---|--|
| Abaya, E., 2281                                     | Altman, E. I., 2378                      |
| Abbeel, P., 1997, 2110, 3136                        | Altman, N. S., 2280                      |
| Abdi, H., 2412                                      | Aly, M., 2486                            |
| Abramowitz, M., 292, 1253, 1347                     | Amari, S. I., 233, 584, 1638, 2108, 2445 |
| Abu-Mostafa, Y. S., 2686                            | Amblard, P. O., 1085                     |
| Achiam, J., 2110, 3136                              | Amit, Y., 2581                           |
| Adadi, A., 3061                                     | Anandkumar, A., 1734                     |
| Adali, T., 1085                                     | Ancona, M., 3061                         |
| Adamcık, M., 293                                    | Andersen, E. B., 189                     |
| Adams, R. P., 2836                                  | Andersen, S. K., 1795                    |
| Adebayo, J., 3061                                   | Anderson, B. D. O., 1201, 2202           |
| Adrain, R., 158, 1083, 2198                         | Anderson, C. W., 2108                    |
| Agarwal, A., 497, 585, 674                          | Anderson, J., 1203, 1467                 |
| Aggarwal, C. C., 2886                               | Anderson, T. W., 2205, 2378, 2412        |
| Aggoun, L., 1556, 1605                              | Andreae, J. H., 1957                     |
| Agmon, S., 496, 2519                                | Andrews, A. P., 1201                     |
| Agrawal, R., 1999                                   | Andrieu, C., 1401, 2834                  |
| Aguiar, P., 996, 2253                               | Andrychowicz, M., 1996, 3136             |
| Aharon, M., 2445                                    | Anouar, F., 2378                         |
| Aho, A. V., 1734                                    | Ans, B., 1637                            |
| Aiello, L. M., 2445                                 | Anthony, M., 2528, 2553                  |
| Ailon, N., 2201                                     | Antos, A., 2679                          |
| Aitken, A. C., 42, 1145                             | Antsaklis, P. J., 1202                   |
| Aizerman, M. A., 2634                               | Apostol, T., 591                         |
| Akaike, H., 1253                                    | Applebaum, S. P., 584                    |
| Akashi, H., 1402                                    | Archimedes, xxvii, 290                   |
| Akhtar, N., 3095                                    | Ariki, Y., 1556, 1605                    |
| Al-Baali, M., 466, 713                              | Arjovsky, M., 2961                       |
| Alacaoglu, A., 627, 631, 632, 638                   | Armijo, L., 418                          |
| Albert, A. E., 583, 713                             | Arnold, B. C., 159                       |
| Albert, J. H., 1467                                 | Arnold, V. I., 338                       |
| Aldrich, J., 1113, 1251                             | Aronszajn, N., xxxi, 2638                |
| Aleksandrov, V. M., 2108                            | Arora, S., 1735                          |
| Alghunaim, S. A., 430, 775, 996, 999, 1000,<br>2108 | Arrow, K. J., 430, 1849                  |
| Ali, S. M., 233                                     | Arsenin, V. Y., 2242                     |
| Allen, D. M., 2553                                  | Arthur, D., 2281                         |
| Allen-Zhu, Z., 873                                  | Artin, E., 1253                          |
| Allwein, E., 2486                                   | Arulampalam, S., 1401                    |
| Alon, N., 110, 123, 126, 2678                       | Arulkumaran, K., 2961                    |
| Alriksson, P., 942                                  | Asadi, K., 2108                          |
|   | Ash, R. B., 109, 232                     |

- Ashburner, J., 1347  
 Aslanides, J., 1997  
 Aström, K. J., 1201, 1894, 2202  
 Atchadé, Y. F., 775  
 Athalye, A., 3095  
 Athans, M., 941, 942  
 Atlas, L., 2487  
 Attar, R., 1401  
 Auer, P., 1999  
 Aurenhammer, F., 2280  
 Austin, J., 2778  
 Autonne, L., 45  
 Avriel, M., 323  
 Azizian, N., 775  
 Azoury, K. S., 293  
 Azulay, A., 2886  
 Azuma, K., 126
- Ba, J. L., 627, 631, 632, 3095  
 Babuska, R., 1957, 2042  
 Bacchus, F., 1734  
 Bach, F., 362, 418, 585, 775, 806, 809, 832,  
 996, 1515, 1734, 1795, 2248, 2249, 2445  
 Bach, S., 3061  
 Bachman, G., 2414, 2637  
 Baehrens, D., 3061  
 Baeza-Yates, R., 2280  
 Bagnell, J. A., 2108  
 Bahdanau, D., 3037, 3038  
 Bahl, L., 1556, 1605  
 Bai, Z., 1997  
 Bailer-Jones, C. A. L., 1346  
 Baird, L. C., 2043, 2108  
 Baker, J. K., 1556, 1605  
 Bakiri, G., 2486, 2779  
 Balakrishnan, N., 1116, 1347  
 Balakrishnan, V. K., 940  
 Banachiewicz, T., 42  
 Banerjee, A., 293  
 Banerjee, O., 1734, 1736  
 Banks, S. C., 2243  
 Bapat, R. B., 940  
 Barak, B., 1735  
 Baram, Y., 2487  
 Barankin, E. W., 189  
 Barber, D., 1467, 1677, 1795, 2634, 2646  
 Barkema, G. T., 1347  
 Barnett, A., 188  
 Barnett, V., 1259  
 Barron, A., 1254  
 Barry, D., 2836  
 Bartle, R. G., 591  
 Bartlett, P. L., 291, 496, 497, 585, 752, 2581,  
 2679, 2680, 2685, 2708  
 Barto, A. G., 1849, 1894, 1903, 1905, 1907,  
 1957, 1958, 1996, 2001, 2042, 2043, 2108
- Basharin, G. P., 1551  
 Bass, R. F., 111  
 Bather, J. A., 1894  
 Batzoglou, S., 1309  
 Bau, D., 43, 50  
 Baudat, G., 2378  
 Baum, L. E., 1309, 1556, 1604, 1605  
 Bauschke, H. H., 360, 362, 424, 539  
 Bay, J. S., 1202  
 Bayes, T., xxix, 110  
 Bazerque, J. A., 996  
 Beale, P. D., 111  
 Beaver, B. M., 2199  
 Beaver, R. J., 2199  
 Beck, A., 360, 362, 363, 423, 540, 541  
 Beckenbach, E. F., 638  
 Becker, S., 418, 540  
 Beckley, B. D., xxxix  
 Bedeian, A. G., xxvii  
 Beezley, J. D., 1203  
 Belkin, M., 2205  
 Bell, A. J., 1638  
 Bell, R., 586  
 Bellemare, M. G., 1997  
 Bellman, R. E., xxxi, 41, 638, 1202, 1605,  
 1848, 1894, 1903, 1905, 1907, 2042, 2672  
 Beltrami, E., 44  
 Ben-David, S., 713, 2336, 2488, 2583, 2675,  
 2678, 2679, 2685, 2686, 2701, 2702  
 Ben-Tal, A., 541  
 Benesty, J., 627  
 Bénézit, F., 942  
 Bengio, S., 3095, 3136  
 Bengio, Y., 584, 2553, 2778, 2779, 2830,  
 2831, 2886, 2960, 2961, 3037, 3038, 3136  
 Bengtsson, T., 1203  
 Bennett, K. P., 2486, 2518, 2551, 2552  
 Benveniste, A., 583, 713  
 Berg, H. C., 110  
 Berger, R. L., 188, 940, 941, 995, 1113, 1116,  
 1251, 1265  
 Berkowitz, J., 3037  
 Berkson, J., 1346, 1677, 1794, 2485  
 Berlinet, A., 2635  
 Berman, A., 46, 1555, 2445  
 Bernardo, J. M., 1113  
 Bernoulli, J., 121  
 Bernshstein, S. N., 110  
 Bernstein, D. S., 41, 65  
 Berrada, M., 3061  
 Bertsekas, D. P., 45, 290–292, 322, 323, 338,  
 362, 418, 496, 497, 540, 583, 674, 713,  
 752, 873, 941, 942, 1848, 1849, 1894,  
 1903, 1905, 1907, 1910, 1957, 1958, 2043  
 Besag, J., 1796  
 Bethard, S., 3037

- Bhambri, S., 3095  
 Bharath, A., 2961  
 Bhatia, R., 45  
 Bhatnagar, S., 1849, 1957, 2043, 2108  
 Bianchi, P., 423, 943  
 Biau, G., 2280, 2284  
 Bickel, P. J., 189, 2378  
 Bickel, S., 2488, 2491  
 Bien, J., 3061  
 Bienaymé, I. J., 110  
 Bienenstock, E., 1084, 2672  
 Biggio, B., 3095  
 Billings, S. A., 2446  
 Billingsley, P., 109, 112, 115, 119, 158, 257, 1551  
 Bilmes, J., 1309  
 Binmore, K., 337  
 Bioucas-Dias, J., 360, 540  
 Birkhoff, G. D., 257  
 Birlutiu, A., 1378  
 Bishop, C., 1113, 1309, 1347, 1378, 1677, 2310, 2378, 2380, 2412, 2416, 2417, 2486, 2634, 2778  
 Bjorck, A., 43, 2198, 2199  
 Bjorck, J., 2779  
 Blackwell, D., 1252  
 Blanc, G., 2336  
 Blatt, D., 941  
 Blei, D. M., 1467, 1515  
 Blight, B. J. N., 160  
 Bliss, C. I., 1346, 2485  
 Block, H. D., 2513, 2516  
 Blum, J. R., 583  
 Blumer, A., 2673  
 Blundell, C., 1997  
 Bochner, S., 109  
 Bollobas, B., 940  
 Bolstad, W. M., 1113, 1346, 1347, 2486  
 Boltzmann, L., 111  
 Bondy, A., 940  
 Boots, B., 2280  
 Bordes, A., 2634, 2640, 2778, 3136  
 Borel, E., 112  
 Borgelt, C., 1794  
 Borgwardt, K. M., 2962  
 Borwein, J. M., 424  
 Boser, B., 2551, 2552, 2831  
 Bottou, L., 418, 584, 585, 713, 715, 718, 775, 832, 876, 2634, 2640, 2778, 2961  
 Bouboulis, P., 2634, 2640  
 Boucheron, S., 110, 123, 2679, 2701  
 Bouman, C., 423  
 Bourlard, H., 2778  
 Bousquet, O., 110, 123, 584, 585, 2679, 2701  
 Boutillier, C., 2043, 2107  
 Bowling, S. R., 1347  
 Bowman, K. O., 1253  
 Box, G. E. P., 1113, 1251, 1346  
 Boyce, W. E., 338  
 Boyd, S., 290, 292, 322, 323, 328, 358, 360, 418, 540, 941, 942, 996, 2486, 2517  
 Boyen, X., 1378  
 Boyle, J. P., 424, 432  
 Bródy, F., 43  
 Braca, P., 943  
 Bradtke, S. J., 1849, 1957, 1958, 2043  
 Brailovsky, V., 2553  
 Braverman, E. M., 2634  
 Brazdil, P., 3136  
 Bredensteiner, E. J., 2486  
 Bredies, K., 362  
 Bregman, L. M., 293, 424  
 Breiman, L., 1084, 2336, 2553, 2581, 2672  
 Brent, R., 425  
 Brereton, R. G., 2310  
 Brezis, H., 360, 539  
 Bridle, J. S., 1996  
 Brin, S., 1551  
 Bromley, J., 2786, 3136  
 Brooks, S., 1347, 1796  
 Browder, F., 360, 539  
 Brown, G., 2581  
 Brown, L. D., 189  
 Brown, R., 111  
 Brown, W. M., 1085  
 Broyden, C. G., 421  
 Brualdi, R. A., 45  
 Bruck, R. E., 360, 539, 540  
 Bruckstein, A., 2445  
 Brueckner, M., 2488, 2491  
 Bruna, J., 3095  
 Brush, S. G., 1796  
 Brutzkus, A., 2336  
 Bubeck, S., 541, 543, 775, 1997  
 Buck, J. R., 109  
 Buck, R. C., 591  
 Bucklew, J. A., 627  
 Bucy, R. S., 1201, 1204  
 Budimich, M., 2526  
 Budka, M., 3136  
 Buhlmann, P., 1734, 2581  
 Bui, T. D., 2779  
 Buja, A., 2378, 2581  
 Burda, Y., 1997  
 Burges, C., 2551, 2552  
 Burt, C., 2412  
 Businger, P., 2198  
 Busoniu, L., 1957, 2042  
 Bussgang, J. J., 163  
 Butala, M., 1203  
 Butepage, J., 1467

- Caetano, T. S., 806  
 Cai, J., 364  
 Cai, T. T., 2446  
 Caines, P. E., 1252  
 Calafiore, G. C., 43, 45, 50  
 Callier, F. M., 1202  
 Campbell, S. L., 2445  
 Campbell, T., 1264  
 Candes, E. J., 50, 364, 2412, 2446  
 Canini, K., 1515  
 Cantelli, F. P., 2674  
 Cao, X. R., 1957, 2107  
 Capen, E., 1264  
 Caponnetto, A., 2678  
 Cappe, O., 1401, 1556, 1605  
 Cardoso, J. F., 1638  
 Carin, L., 2486  
 Carli, R., 942  
 Carlin, J., 1515  
 Carlini, N., 3095, 3096  
 Carpenter, J., 1401  
 Carrera, J. P., 43  
 Carroll, R., 1347  
 Caruana, R., 2353, 2779, 3095  
 Casella, G., 188, 189, 1347, 2835  
 Casey, R. G., 2336  
 Cassandra, A. R., 1894  
 Cassano, L., 1997, 2043, 2108  
 Cassella, G., 1113, 1116, 1251, 1265  
 Cassirer, A., 1997  
 Castanon, D., 293  
 Castillo, E., 159  
 Cattivelli, F. S., 943, 945, 996  
 Cauchy, A.-L., xxx, 418  
 Cavanaugh, J. E., 1254, 1271  
 Celik, Z. B., 3095  
 Censor, Y., 293  
 Ceppellini, R., 1309  
 Cesa-Bianchi, N., 585, 775, 1997, 1999, 2634, 2678  
 Cevher, V., 418, 540, 627, 631, 632, 638  
 Chávez, E., 2280  
 Cha, S., 46, 1555  
 Chakhchoukh, Y., 1309  
 Chambers, J., 3037  
 Chambers, R. A., 1957  
 Chan, R., 2248  
 Chandrasekaran, S., 2245, 2249  
 Chandrasekaran, V., 2412  
 Chang, K. W., 423  
 Chapman, S., 1552  
 Charnes, A., 2551, 2552  
 Chartrand, G., 940  
 Chatterjee, C., 2378  
 Chaudhuri, K., 630, 2280  
 Chellappa, R., 1796, 3095  
 Chen, C.-T., 1202  
 Chen, G., 362, 2280  
 Chen, H., 2107, 2245, 3095  
 Chen, J., 674, 878, 941, 943, 954, 998, 2043, 2253, 2445  
 Chen, L., 364  
 Chen, P., 293  
 Chen, R., 1401  
 Chen, S., 2243, 2446  
 Chen, S. S., 2445  
 Chen, Y., 293  
 Cheney, W., 424  
 Cherkassky, V., 2673  
 Chernoff, H., 110, 233, 2673  
 Chervonenkis, A. Y., 2551, 2552, 2673, 2678  
 Cheung, J. F., 1795  
 Cheung, S., 1796  
 Chevalier, P., 1085  
 Chi, E. C., 423  
 Chib, S., 1347, 1401, 1467  
 Chickering, D. M., 1734  
 Child, D., 2412  
 Cho, K., 3037, 3038  
 Choi, S., 1637, 3136  
 Chopin, N., 1401  
 Chopra, S., 2830, 3136  
 Choromanska, A., 873  
 Chow, C. K., 1113, 1734  
 Chowdhary, G., 1957, 2042, 2107  
 Christensen, C., 420  
 Christmann, A., 2551, 2552  
 Chung, F., 110, 123, 126  
 Chung, K. L., 109  
 Cichocki, A., 233, 1637, 1638, 2445  
 Cinlar, E., 1551, 1552  
 Ciochina, S., 627  
 Cipparrone, F. A. M., 2244, 2249, 2250  
 Claerbout, J. F., 2243  
 Claeskens, G., 1254  
 Clapp, R., 1264  
 Clark, D. S., 583, 713  
 Clark, P., 2353  
 Clark, W. A., 2042  
 Clarke, F. H., 291, 496, 752  
 Clemmensen, L., 2378  
 Cleveland, W. S., 2198  
 Clifford, P., 1401, 1796  
 Clune, J., 3095  
 Cobb, L., 1203  
 Cochran, W. G., 2553  
 Cochran, J. H., 159  
 Coddington, E. A., 338  
 Cohen, A., 466  
 Cohn, D., 2487

- Combettes, P. L., 358, 360, 362, 424, 432, 539, 540  
 Comon, P., 1085, 1637, 1638  
 Conconi, A., 585  
 Conn, A. R., 425  
 Consonni, G., 1467  
 Constantinescu, T., 42  
 Cook, D., 2553  
 Cooley, J. W., xxx  
 Cooper, G. F., 1734  
 Cormen, T. H., 1734, 1735  
 Cornfeld, I., 257  
 Cortes, C., 2487, 2488, 2551, 2552, 2581  
 Cotter, A., 291, 496  
 Cottle, R. W., 42, 323  
 Courant, R., 45  
 Courty, N., 2488  
 Courville, A., 584, 2778, 2831, 2886, 2960, 2961  
 Cover, T. M., 232, 1254, 2284, 2523, 2525, 2551, 2552, 2674  
 Cowell, R. G., 1794, 1795  
 Cox, D. D., 2639  
 Cox, D. R., 188, 1113, 1116, 1143, 1251, 2281, 2485, 2486, 2553  
 Cramer, H., 1251  
 Cramer, J. S., 1346, 2485, 2486  
 Crammer, K., 2486, 2488, 2634  
 Crane, R. B., 1085  
 Cresswell, A., 2961  
 Criminisi, A., 2581  
 Crisan, D., 1401  
 Cristianini, N., 2551, 2552, 2634, 2640  
 Crowder, H. P., 291, 496  
 Csiszár, I., 233, 235  
 Cucker, F., 2678  
 Cummins, F., 3037  
 Curran, J. M., 1346  
 Curry, H. B., 418  
 Curtis, F. E., 713, 718, 873, 876  
 Cybenko, G., 2778  
  
 d'Aspremont, A., 1734, 1736  
 Dahl, G. E., 2831  
 Dahleh, M. A., 2243  
 Dai, A. M., 2779  
 Dai, B., 2108  
 Dai, Y. H., 466  
 Daintith, J., xxxiv  
 Dale, A. I., 110  
 Dalenius, T., 2281  
 Daneshmand, A., 998  
 Daneshmand, H., 873, 874  
 Daniel, J. W., 466, 540  
 Daniely, A., 2336  
 Dantzig, G. B., 323  
  
 Darmois, G., 189  
 Darrell, T., 2280  
 Darwiche, A., 1677  
 Das, A., 942  
 Dasarathy, B. V., 2581  
 Dasgupta, S., 2280, 2487  
 Dattoro, J., 322, 424, 432  
 Daube-Witherspoon, M., 2445  
 Daubechies, I., 362, 423  
 Daunizeau, J., 1347  
 Davenport, W. B., 1113  
 Davidson, J., 116, 119  
 Davies, J., 337  
 Davis, G., 2446  
 Davis, P. J., 1253  
 Dayan, P., 1958, 1996, 2003, 2042  
 De Boer, P.-T., 2778  
 de Finetti, B., 1259  
 de Freitas, N., 1401, 2834  
 de Moivre, A., xxix  
 De Mol, C., 362, 423, 2242  
 De Pierro, A. R., 941  
 De Vito, E., 2242, 2678  
 De, S., 833  
 Dean, J., 3095  
 Debnath, L., 2638  
 Dechter, R., 1733  
 Defazio, A., 806, 832  
 Defrise, M., 362, 423  
 DeGroot, M. H., 940, 941, 995, 1113, 1116  
 Dekel, O., 2634  
 Del Moral, P., 1401  
 Delampady, M., 1254, 1271  
 Deller, J. R., 1309  
 Demir, G. K., 2378  
 Demmel, J., 45  
 Dempster, A. P., 1309  
 Demyanov, V. F., 540  
 Deng, J., 2779  
 Deng, L., 2831  
 Deo, N., 940  
 Derman, C., 1848, 1894  
 Descartes, R., 2280  
 Desoer, C. A., 1202  
 Detrano, R., xxxix, 1259, 2337  
 Devijver, P. A., 2553  
 Devlin, J., 3037  
 Devlin, S. J., 2198  
 Devroye, L., 2280, 2284, 2673, 2674, 2683, 2688, 2695, 2960  
 Dhillon, A., 2886  
 Diaconis, P., 188, 1638  
 Diamantaras, K. I., 2412  
 Diaz-Bobillo, I., 2243  
 Diestel, R., 1734

- Dietterich, T. G., 1084, 2486, 2553, 2581, 2672, 2779  
 Dieudonné, J., 591  
 Dijkstra, E. W., 1734, 1900  
 Dimakis, A. G., 943  
 DiPrima, R. C., 338  
 Dirichlet, G. L., 2280  
 Djuric, P., 1401  
 Do, C. B., 1309  
 Dobrushin, R. L., 2962  
 Dobson, A. J., 188  
 Doersch, C., 2961  
 Doksum, K. A., 189  
 Domingos, P., 1084, 2353, 2672  
 Domke, J., 806  
 Donahue, J., 2779  
 Dong, X., 1734  
 Dong, Y., 3095  
 Donini, M., 3061  
 Donnelly, P., 1515  
 Donoho, D. L., 358, 2243, 2445, 2446, 2450  
 Doob, J. L., 109, 256, 2353  
 Doshi-Velez, F., 3061  
 Doucet, A., 1401, 2834  
 Douglas, J., 362  
 Douglas, S. C., 234  
 Doursat, R., 1084, 2672  
 Dozat, T., 627  
 Drake, A. W., 1551, 1552  
 Draper, N. R., 2199  
 Dreyfus, S. E., 1894, 1910, 2042  
 Drineas, P., 118, 2201  
 Drissi, Y., 3136  
 Dror, G., 586  
 Drucker, H., 2581  
 Du, Q., 2281  
 Du, S. S., 873  
 Dua, D., 1085, 2378  
 Dubois, J.-M., 112  
 Dubois-Taine, B., 806  
 Duchi, J., 291, 324, 325, 362, 425, 496, 627, 631, 752, 775  
 Duda, R. O., 1113, 1309, 2280, 2378, 2380, 2513, 2551, 2552, 2778  
 Dudani, S. A., 2280  
 Dudley, R. M., 119, 2674, 2678  
 Dudoit, S., 2378  
 Duff, M., 1957  
 Dugundji, J., 360, 539  
 Dumitrescu, B., 2445  
 Dumoulin, V., 2961  
 Duncan, W. J., 42  
 Dunford, N., 2635  
 Dunham, W., 290  
 Dunn, J. C., 540  
 Durbin, R., 1556  
 Durrett, R., 109, 112, 119, 121, 255  
 Duttweiler, D. L., 2640  
 Duvaut, P., 1085  
 Dvoretzky, A., 583, 713, 1959  
 Dwilewicz, R. J., 290  
 Dwork, C., 630  
 Dyck, W., 65  
 Dykstra, R. L., 424, 432  
 Dziugaite, G. K., 2962  
 Eagon, J. A., 1556, 1605  
 Eaton, M. L., 2205  
 Eatwell, J., 292  
 Eckart, C., 44  
 Eckstein, J., 362  
 Eddy, S., 1263, 1556  
 Edgeworth, F. Y., 1251  
 Edwards, A. W. F., 110  
 Edwards, B. H., 337  
 Edwards, D., 1794  
 Efron, B., 2553, 2581  
 Egerstedt, M., 1734  
 Ehrenfeucht, A., 2673  
 Einstein, A., xxviii, 111  
 El Ghaoui, L., 43, 45, 50, 1734, 1736, 2245  
 Elad, M., 2445  
 Eldracher, M., 2961  
 Elfring, J., 1401  
 Elkan, C., 3037  
 Elliott, R. J., 1556, 1605  
 Elman, J. L., 3037  
 El-Yaniv, R., 2487  
 Emelianenko, M., 2281  
 Ene, V., 592  
 Engl, H. W., 2242  
 Engstrom, L., 3095  
 Erciyas, K., 940  
 Erdogmus, D., 2778  
 Eremin, I., 2519  
 Erhan, D., 3095, 3136  
 Ermoliev, Y. M., 291, 496  
 Ernst, D., 2042  
 Erbsoll, B., 2378  
 Ertekin, S., 2640  
 Erwin, E., 2310  
 Escalante, R., 424  
 Evensen, G., 1203  
 Everitt, B. S., 1309  
 Faber, V., 2281  
 Fang, C., 873  
 Farley, B. G., 2042  
 Farlow, S. J., 338  
 Fatemi, E., 499, 541  
 Fausett, L., 2310  
 Fawzi, A., 3095

- Fawzi, H., 3095  
 Fawzi, O., 3095  
 Fearnhead, P., 1401  
 Fedorov, V., 160, 2634  
 Fei-Fei, L., 1515, 3136  
 Feinberg, E. A., 1848, 1894  
 Feinberg, S. E., 110  
 Feingold, D. G., 45  
 Feller, W., 109, 112, 119, 255  
 Fenchel, W., 290, 292  
 Fercoq O., 423  
 Fergus, R., 3060, 3095, 3136  
 Fernandez-Delgado, M., 2677  
 Fiat, A., 2336  
 Field, D. J., 2445  
 Figueiredo, M., 360, 540, 2486  
 Fine, B., 43  
 Finn, C., 3136  
 Fischer, A., 2830  
 Fischer, H., 110, 158  
 Fischer, K. H., 1796  
 Fischer, P., 1999  
 Fischione, C., 942  
 Fisher, J., 2778  
 Fisher, R. A., xxxix, 111, 158, 187, 189,  
 1085, 1113, 1251, 1253, 1309, 2378  
 Fisher, W. D., 2281  
 Fix, E., 2279  
 Flaxman, A. D., 425  
 Fleisher, M., 2778  
 Fleming, W., 65  
 Fletcher, R., 2199  
 Fletcher, C. A. J., 1849  
 Fletcher, R., 323, 418, 421, 466  
 Foltin, B., 2961  
 Fomin, S., 257  
 Forgy, E. W., 2281  
 Forney, G. D., 1605  
 Fort, G., 775  
 Fort, J. C., 2310  
 Fourier, J., xxx  
 Fox, C. W., 1467  
 Fox, L., 466  
 Fox, R., 2108  
 Fréchet, G., 1202  
 Frank, E., 2281, 2353  
 Frank, I. E., 2248  
 Frank, M., 540  
 Frasconi, P., 2778, 3037  
 Fredrikson, M., 3095  
 Freedman, D., 1638, 2486  
 Freeman, R. A., 996  
 Freeman, W. T., 1795  
 Freund, Y., 2581, 2640, 2830  
 Frey, B. J., 1677, 1794, 1795  
 Fridlyand, J., 2378  
 Frieden, B. R., 1251, 1265  
 Friedman, J., 423, 1084, 1201, 1254, 1309,  
 1638, 1734, 2242, 2248, 2336, 2378,  
 2446, 2486, 2553, 2581, 2634, 2672, 2673  
 Friedman, N., 1677, 1734, 1794, 1795  
 Friston, K., 1347  
 Fritsche, C., 1203  
 Frobenius, G., 42, 1556  
 Frossard, P., 1734, 2445, 3095  
 Frosst, N., 3095  
 Fu, K. S., 583, 713  
 Fu, W. J., 423, 2248  
 Fu, X., 2445  
 Fujii, A., 2487  
 Fukunaga, K., 2280, 2378, 2380, 2673  
 Fukushima, M., 362  
 Fullagar, P. K., 2243  
 Funahashi, K., 2778  
 Furedi, Z., 2526  
 Furnkranz, J., 2486  
 Furrer, R., 1203  
 Gabor, D., 584  
 Gabriel, K. R., 2412  
 Gabrys, B., 3136  
 Gaddum, J. H., 1346, 2485  
 Gallager, R. G., 111, 1795  
 Gallant, S. I., 497, 2516  
 Gallot, S., 234  
 Galton, F., 2412  
 Gamerman, D., 1347  
 Ganapathi, V., 1734  
 Gantmacher, F. R., 41  
 Garcia, V., 189  
 Garcia-Pedrajas, N., 2486  
 Gardner, L. A., 583, 713  
 Garey, M. R., 1735  
 Garg, A., 2353  
 Gauchman, H., 941  
 Gauss, C. F., xxix, 157, 423, 1083, 1145,  
 1201, 2197, 2198  
 Ge, R., 873, 874  
 Geisser, S., 2553  
 Gelb, A., 1201, 1203  
 Gelfand, A. E., 1347, 2834  
 Gelfand, I. M., 41  
 Gelfand, S., 873  
 Gelman, A., 1515  
 Geman, D., 1347, 2248, 2581, 2834  
 Geman, S., 1347, 2834  
 Gentile, C., 585, 2634  
 George, E. I., 2835  
 Geramifard, A., 1957, 2042, 2107  
 Germain, P., 2488  
 German, S., 1084, 2672

- Gers, F. A., 3037, 3040  
 Gershgorin, S., 45  
 Geurts, P., 1084, 2672  
 Ghadimi, S., 627, 775  
 Ghahramani, Z., 1467, 2487, 2962  
 Ghavamzadeh, M., 1957, 2108  
 Ghosh, J. K., 1254, 1271  
 Giannakis, G. B., 996  
 Gibbs, J. W., 111, 231, 2832  
 Gilbert, A. C., 2446  
 Gilbert, J. C., 466  
 Gilks, W. R., 2834, 2836  
 Gilles, O., 112  
 Gillis, N., 2445  
 Gilpin, L., 3061  
 Gine, E., 2678  
 Gini, C., 2336  
 Girolami, M., 1638  
 Girosi, F., 160, 2634, 2639  
 Gladyshev, E. G., 583, 713, 720  
 Glivenko, V., 2674  
 Glorot, X., 2778, 2779  
 Glymour, C., 1678  
 Glymour, M., 1678  
 Gnedenko, B. V., 109  
 Godard, D. N., 2202  
 Godsil, C., 940  
 Godsill, S., 1401  
 Goffin, J.-L., 291, 496  
 Goh, V. S. L., 1085  
 Goldenstein, S. K., 2486  
 Goldfarb, D., 364, 421  
 Goldreich, O., 1735  
 Goldstein, A. A., 418, 424, 540  
 Goldstein, T., 833  
 Golub, G. H., 41, 43–45, 423, 466, 1556,  
2198, 2242, 2245  
 Gomez, V., 2108  
 Goode, B., 584  
 Goodfellow, I., 584, 2778, 2886, 2961, 3095,  
3096  
 Goodman, N., 160  
 Goodman, T. N. T., 255  
 Gordon, G. J., 713, 2108  
 Gordon, N., 1401  
 Gori, M., 2779  
 Gorodnitsky, I., 2445  
 Gorsuch, R. L., 2412  
 Gosavi, A., 1957  
 Gou, X., 293  
 Gower, R. M., 2201  
 Goyal, V., 109  
 Gradshteyn, I. S., 1347  
 Graff, C., 1085, 2378  
 Gram, J., 43  
 Granas, A., 360, 539  
 Grandvalet, Y., 2553  
 Grant, J. A., 2199  
 Graves, A., 3037  
 Gray, P. O., 1957  
 Gray, R. M., 2281  
 Greenberg, E., 1347  
 Greenside, P., 3061  
 Grenander, U., 256  
 Gretton, A., 2962  
 Grewal, M. S., 1201  
 Griffiths, T., 1514, 1515  
 Griffiths, L. J., 584  
 Grimmer, J., 1467, 1514  
 Grimmer, G., 112, 119, 1677, 1794, 1796,  
1803  
 Grimson, E., 1515  
 Grondman, I., 1957  
 Gross, J. L., 940  
 Grunwald, P., 1254  
 Gu, M., 2245  
 Gua, J., 2886  
 Gubin, L. G., 424  
 Guestrin, C., 3061  
 Guez, A., 2043  
 Guler, O., 362  
 Gunasekar, S., 2201, 2210  
 Gundelfinger, S., 65  
 Gunning, R. C., 2636  
 Gunzburger, M., 2281  
 Guo, G., 3095  
 Guo, R., 1678  
 Guo, Y., 2378  
 Gupta, A. K., 1116, 2205  
 Gupta, N. K., 1957  
 Gustafsson, F., 1203, 1401  
 Gustavsson, E., 628  
 Guttman, L., 42  
 Guyon, I., 2551, 2552  
 Györfi, L., 2280, 2673, 2674, 2683, 2688, 2695  
 Gürbüzbalaban, M., 715, 832, 833  
 Habrard, A., 2488  
 Hackbusch, W., 41  
 Hadsell, R. M., 2830  
 Haffner, P., 2778  
 Hager, W. W., 42  
 Hahn, G. J., 1116  
 Hald, A., 110  
 Hale, E. T., 362  
 Hall, M. A., 2281  
 Hall, T., 2197  
 Halmos, P. R., 41, 43, 189, 255, 2637, 2638  
 Halperin, I., 424  
 Hamill, T. M., 1203  
 Hammer, B., 2310



- Hammersley, J. M., 1251, 1262, 1796  
 Han, S.-P., 424  
 Hand, D. J., 1309, 2353  
 Handschin, J. E., 1401  
 Hanke, M., 2242  
 Hansen, E. A., 1894  
 Hansen, J. H. L., 1309  
 Hansen, L. K., 2581  
 Hansen, M., 1254  
 Hansen, P. C., 2242  
 Hanson, R. J., 2198  
 Har-Peled, S., 2281  
 Hardle, W., 2378  
 Hardt, M., 3061  
 Hardy, G. H., 110, 292, 638  
 Harley, T., 2279  
 Harman, H. H., 2412  
 Harmeling, S., 3136  
 Harrell, F. E., 2486  
 Harremoës, P., 233, 293  
 Harris, R., 2581  
 Harshbarger, S., 540  
 Hart, P. E., 1113, 1309, 2280, 2284, 2378,  
 2380, 2513, 2551, 2552, 2778  
 Hartemink, A., 2486  
 Hartigan, J. A., 2281, 2836  
 Hartley, H. O., 1309  
 Hartman, C., 1552  
 Hassibi, B., 255, 584, 775, 1084, 1143, 1145,  
 1201–1203, 2042, 2198, 2778  
 Hastie, T., 364, 542, 1084, 1201, 1254, 1309,  
 1734, 1736, 2205, 2242, 2336, 2378, 2412,  
 2421, 2486, 2553, 2581, 2634, 2672, 2673  
 Hastings, W. K., 945, 1347, 2832  
 Haussler, D., 2489, 2641, 2673, 2678, 2830  
 Hawkins, T., 43  
 Hayes, B., 1551, 1552  
 Haykin, S., 584, 714, 2202, 2213, 2310, 2513,  
 2778  
 Haynsworth, E. V., 41  
 Hazan, E., 291, 496, 541, 627, 631, 752  
 He, S., 721  
 Heath, J. L., xxvii, 290  
 Heath, R. W., 2448  
 Hebb, D. O., 2514  
 Hebden, M. D., 2199  
 Hecht-Nielsen, R., 2778  
 Hefny, A., 806  
 Heidari, H., 3061  
 Held, M., 291, 496  
 Hellinger, E., 233  
 Hellman, M. E., 2280  
 Helou, E. S., 941  
 Hendeby, G., 1203  
 Henderson, H. V., 41, 42  
 Hensel, K., 41  
 Hernaut, J., 1637  
 Herbrich, R., 2551, 2552, 2634, 2639, 2640  
 Hernan, M. A., 1678  
 Hernández-Lobato, J. M., 1378  
 Hero, A. O., 425, 941  
 Herskovits, E., 1734  
 Hertz, J. A., 1796  
 Heskes, T., 1378  
 Hestenes, M. R., 466  
 Hewitt, E., 591  
 Higham, N. J., 2198  
 Hilbe, J. M., 2486  
 Hild, H., 2779  
 Hildreth, C., 423  
 Hill, T. L., 111  
 Hille, E., 2638  
 Hills, M., 2553  
 Hinkley, D. V., 1143  
 Hinton, G., 627, 1467, 2778, 2831, 2886,  
 3037, 3095, 3136  
 Hiriart-Urruty, J.-B., 290, 322  
 Hjort, N. L., 1254  
 Hlawatsch, F., 1401  
 Ho, T. K., 2581  
 Ho, Y. C., 42, 2202  
 Hochreiter, S., 2778, 3037  
 Hodges, J. L., 2279  
 Hoeffding, W., 110, 2673  
 Hoerl, A., 2242, 2378  
 Hoerl, R. W., 2242  
 Hoff, M. E., xxx, 584  
 Hoff, P. D., 1113  
 Hoffman, M., 1467, 1515  
 Hogben, L., 41  
 Hogg, R. V., 1113, 1251  
 Holden, A. D. C., 2779  
 Holden, S. B., 2553  
 Hölder, O. L., 292  
 Holland, J. H., 1958  
 Hopcroft, J., 1734  
 Hopfield, J. J., 3037  
 Horn, R. A., 41, 45, 46, 50, 955, 1555  
 Hornik, K., 2778  
 Hosmer, D. W., 2486  
 Hospedales, T., 3136  
 Hostetler, L., 2280  
 Hotelling, H., 42, 2412  
 Hothorn, T., 2581  
 Householder, A. S., 42, 2198  
 Houtekamer, P. L., 1203  
 How, J. P., 1957, 2042, 2107  
 Howard, R. A., 1848, 1893, 1894, 1903, 1905,  
 1907, 1910  
 Hsieh, C. J., 423  
 Hsu, C.-W., 2486

- Hsu, D., 2487  
 Hu, C., 775  
 Hu, P., 1401  
 Hu, Y. F., 586, 2200  
 Huang, F.-J., 2830  
 Huang, J. Z., 2412  
 Huang, K., 112, 2445  
 Huang, X., 2779  
 Huang, X. D., 1556, 1605  
 Hubbard, B. B., 65  
 Hubbard, J., 65  
 Hubbard, S., 2310  
 Huber, P. J., 358, 1309, 1638, 2446  
 Huberty, C. J., 2378  
 Hudson, H. M., 159  
 Huetter, J.-C., 2205  
 Hughes, G. F., 2672  
 Huijbregts, C. J., 160, 2634  
 Hulin, D., 234  
 Hunt, E. B., 2336  
 Huo, X., 2446, 2450  
 Hurvich, C. M., 1254  
 Hurwicz, L., 430, 1849  
 Huskey, H. D., 466  
 Hyvarinen, A., 1637, 1638  
  
 Iba, W., 2353  
 Ichikawa, A., 1894  
 Igel, C., 2830  
 Ilyas, A., 3095  
 Ince, E. L., 338  
 Indyk, P., 2201, 2280  
 Ingenhousz, J., 111  
 Ingersoll, J., 159  
 Intriligator, M. D., 941  
 Ioffe, S., 2779  
 Irofti, P., 2445  
 Ising, E., 1796  
 Iskander, D. R., 2581  
 Isotalo, J., 42  
  
 Jaakkola, T., 1467, 1958–1960, 1996, 2001,  
 2003, 2042, 2107, 2489, 2641, 3061  
 Jack, M. A., 1556, 1605  
 Jackel, L. D., 2581  
 Jackson, J. E., 2412  
 Jaggi, M., 540  
 Jain, A., 1796  
 Jaitly, N., 2831  
 Jakovetic, D., 996  
 James, G., 1084, 2672  
 Jarnik, V., 1734  
 Jarrett, K., 2778, 2781  
 Jaynes, E. T., 232, 2353  
 Jeffreys, H., 2353  
 Jelinek, F., 1556, 1605  
  
 Jenatton, R., 362  
 Jensen, F., 1677, 1795  
 Jensen, J., 292  
 Jewell, N. P., 1678  
 Jha, S., 3095  
 Jiang, H., 3061  
 Jin, C., 873, 874  
 Jin, H., 2201  
 Jin, R., 427, 719  
 Jin, X.-B., 720  
 Jirstrand, M., 628  
 Joachims, T., 2486  
 Johansen, A. M., 1401  
 Johansson, B., 941, 942  
 Johansson, K. H., 942  
 Johansson, M., 941  
 John, F., 323  
 Johns, M. V., 2279  
 Johnson, C. R., 41, 45, 46, 50, 955, 1555  
 Johnson, D. S., 1735  
 Johnson, N. L., 1116, 1347  
 Johnson, R., 806, 832  
 Johnson, R. A., 2380  
 Johnson, W., 2201, 2353  
 Johnstone, I. M., 358, 2412  
 Jolliffe, I. T., 2412  
 Jones, M. C., 1638  
 Jonsson, A., 2108  
 Jordan, C., 44  
 Jordan, M. I., 1309, 1467, 1515, 1734, 1794,  
 1795, 1958–1960, 1996, 2001, 2003, 2042,  
 2107, 2110, 2353, 2487, 2680, 2834, 3038  
 Journal, A. G., 160, 2634  
 Ju, L., 2281  
 Juditsky, A., 419, 497, 541, 583, 627, 719, 775  
 Julier, S. J., 1204  
 Jutten, C., 1637, 1638  
  
 Kabadi, S. N., 873  
 Kabkab, M., 3095  
 Kaczmarz, S., 432, 588  
 Kaelbling, L. P., 1894, 1957, 1958  
 Kahan, W., 44  
 Kahane, J.-P., 2686  
 Kahn, H., 1347  
 Kahng, S. W., 2199  
 Kailath, T., xxxi, 42, 255, 584, 1084, 1143,  
 1145, 1201–1203, 2042, 2202, 2513, 2640,  
 2776, 2778  
 Kak, A. C., 2412  
 Kakade, S., 2108, 2685  
 Kalai, A., 2336  
 Kalai, A. T., 425  
 Kale, S., 627, 631, 632  
 Kalman, R. E., xxx, 1201

- Kalos, M. H., 1347  
 Kamp, Y., 2778  
 Kanal, L., 2279  
 Kandola, J., 2634  
 Kaniel, S., 466  
 Kannan, R., 118  
 Kappen, H. J., 1795  
 Kar, S., 942  
 Karhunen, J., 1638  
 Karhunen, K., 2413  
 Karush, W., 323  
 Kasiviswanathan, S. P., 2445  
 Kaski, S., 2310  
 Kass, R., 1515  
 Katzfuss, M., 1203  
 Katznelson, Y., 109, 2636  
 Kavukcuoglu, K., 2778  
 Kawaguchi, K., 873  
 Kay, S., 1113, 1116, 1143, 1201, 1251, 1252  
 Kearns, M., 2336, 2488, 2581, 2673  
 Kelley, C. T., 418, 422, 466  
 Kemperman, J. H. B., 235  
 Kendall, M., 1143  
 Kennard, R., 2378  
 Kennedy, R. A., 2638  
 Kenner, H., 1552  
 Kergosien, Y. L., 2779  
 Kesidis, G., 3095  
 Khan, U. A., 996  
 Khintchine, A., 2686  
 Khoshgoftaar, T. M., 2488  
 Kiebel, S. J., 1347  
 Kiefer, J., 425, 583, 713  
 Kifer, D., 630  
 Kim, B., 3061  
 Kim, J. H., 1795  
 Kim, S., 1401, 2486  
 Kimeldorf, G. S., 2639  
 Kingma, D. P., 627, 631, 632, 2961  
 Kingsbury, B., 2831  
 Kitagawa, G., 1254, 1401  
 Kittler, J., 2553  
 Kivinen, J., 2634, 2640  
 Kiwiel, K., 291, 496, 497, 752  
 Kjeldsen, T. H., 323  
 Kjellstrom, H., 1467  
 Klautau, A., 2486  
 Klein, R., 2280  
 Klopf, A. H., 1958  
 Kocay, W., 940  
 Koch, G., 2786, 3136  
 Kochenderfer, M. J., 1894  
 Koenigstein, N., 586  
 Koh, K., 2486  
 Kohavi, R., 1084, 2672  
 Kohler, J., 2779  
 Kohonen, T., 2310  
 Koivunen, V., 1309  
 Koller, D., 1378, 1677, 1734, 1794, 1795, 2487  
 Kollerstrom, N., 420  
 Kolmogorov, A. N., xxx, 109, 112, 1143, 1201, 1202, 1552  
 Koltchinskii, V., 2679, 2708  
 Konda, V. R., 2108, 2113  
 Konecny, J., 628, 806  
 Kong, A., 1401, 1402  
 Kong, E. B., 1084, 2672  
 Koning, R. H., 41  
 Konishi, S., 1254  
 Kononenko, I., 2353  
 Konukoglu, E., 2581  
 Koopman, B., 189  
 Koren, Y., 586, 2200  
 Kosambi, D. D., 2413  
 Kotz, S., 1116, 1347  
 Koutroumbas, K., 1113, 2486, 2778  
 Kouw, W. M., 2488  
 Kovacevic, J., 109  
 Kovoov, N., 325  
 Kraft, L. G., 232  
 Kreher, D. L., 940  
 Kreutz-Delgado, K., 2445  
 Kreyszig, E., 2414, 2638  
 Krishnan, T., 1309  
 Krishnaprasad, P., 2446  
 Krishnapuram, B., 2486  
 Krizhevsky, A., xxxix, 2762, 2778, 2779, 2781, 2886  
 Kroese, D. P., 1347, 2778  
 Krogh, A., 1556  
 Kruse, R., 1794  
 Kruskal, J. B., 1638, 1734  
 Kschischang, F. R., 1794  
 Kucera, L., 1734  
 Kucukelbir, A., 1467  
 Kulkarni, S., 2673  
 Kullback, S., 233, 235  
 Kullis, B., 293  
 Kumamoto, H., 1402  
 Kumar, S., 627, 631, 632  
 Kumar, V., 2281  
 Kundaje, A., 3061  
 Kung, S. Y., 2412  
 Kungurtsev, V., 998  
 Künsch, H. R., 1401  
 Kurakin, A., 3095  
 Kushner, H. J., 583, 713  
 Kuth, D., 110  
 Kwok, J. T., 775  
 Kwok, K., 3095

- Lachenbruch, P., 2553  
 Lacoste-Julien, S., 806, 832  
 Lacoume, J. L., 1085  
 Ladner, R., 2487  
 Lafferty, J., 1515  
 Lafontaine, J., 234  
 Lagoudakis, M. G., 1849, 2043  
 Laheld, B. H., 1638  
 Lai, T. L., 582, 1999  
 Laird, N. M., 1309  
 Lakshmivarahan, S., 1203  
 Lam, W., 1734  
 Lampert, C. H., 3136  
 Lan, G., 627, 775  
 Lancaster, P., 1202  
 Landau, L. D., 111  
 Landecker, W., 3061  
 Landgrebe, D., 2336  
 Lange, J., 2336  
 Lange, K., 423, 2110  
 Langford, J., 2108  
 Langley, P., 2353  
 Langville, A. N., 1551  
 Lanza, A., 2248  
 Laplace, P. S., xxix, 110, 1083, 1347, 2352  
 Larkin, F. M., 2639, 2640  
 Larochelle, H., 3136  
 Larranaga, P., 112  
 Larson, J., 425  
 Larson, R., 337  
 Larson, S., 2553  
 Lattimore, T., 1997  
 Lau, K. W., 2310  
 Laub, A. J., 41  
 Lauritzen, S., 1378, 1794, 1795  
 Lavielle, M., 2836  
 Law, A. M., 1894, 1910  
 Lawler, G. F., 111  
 Lawrence, D. A., 1202  
 Lawson, C. L., 2198  
 Lax, P., 41  
 Lay, D., 41, 45, 50  
 Lay, S., 41, 45, 50  
 Le, Q., 2779, 3037  
 Lebarbier, E., 2836  
 Lebedev, N. N., 1253  
 Le Bret, H., 2245  
 LeCun, Y., xxxix, 418, 775, 2581, 2778, 2779, 2830, 2831, 2886  
 Ledoux, M., 110, 123, 126, 2685  
 L'Ecuyer, P., 2108  
 Lee, D., 2445  
 Lee, H., 2336  
 Lee, J. D., 873  
 Lee, J. M., 234  
 Lee, M., 1957, 2108, 2445  
 Lee, P. M., 1113  
 Lee, S., 943, 1637, 1734  
 Lee, T. W., 1638  
 Lee, Y., 1201, 2486, 2551, 2552, 3136  
 Legendre, A. M., 2197  
 Legendre, A. M., 1083, 1201  
 Lehmann, E. L., 188, 189, 1116, 1251  
 Lehr, M. A., 2778  
 Lei, Y., 541  
 Leibler, R. A., 233  
 Leiserson, C. E., 1735  
 Leissa, A. W., 45  
 Lemaire, B., 358  
 Lemaréchal, C., 290, 322, 418  
 Lemeshow, S., 2486  
 Lemke, C., 3136  
 Lenz, W., 1796  
 Leon-Garcia, A., 109, 255, 2960  
 Lerner, A., 2551, 2552  
 Le Roux, N., 418, 775, 806, 809, 2830  
 Leshno, M., 2778  
 Lessard, L., 996  
 Levin, D. A., 1551, 1552  
 Levin, E., 2778  
 Levina, E., 2378  
 Levine, S., 1997, 2110, 3136  
 Levinson, N., xxx, 338  
 Levitin, E. S., 540  
 Levy, B. C., 1116  
 Levy, S., 2243  
 Lewin, J. W., 591  
 Lewin, K., xxvii  
 Li, A., 1467  
 Li, B., 2886  
 Li, M., 2336  
 Li, N., 996, 998  
 Li, Y., 873, 1378  
 Li, Z., 996, 999, 3136  
 Lian, X., 998  
 Liang, D., 2960  
 Liang, F., 1347  
 Liang, H., 2248  
 Liang, J., 806  
 Liberty, E., 2201  
 Lidstone, G. J., 2353  
 Liebling, T. M., 2280  
 Liese, F., 233  
 Lifshitz, E. M., 111  
 Limic, V., 111  
 Lin, C. J., 423, 2486  
 Lin, H.-T., 2686  
 Lin, L.-J., 1996  
 Lin, V. Y., 2778  
 Lin, Y., 500, 541, 2486, 2551, 2552

- Lin, Z., 873, 1997  
 Lindeberg, J. W., 158  
 Lindenbaum, M., 2487  
 Lindenstrauss, J., 2201  
 Lindsay, R. B., 45  
 Ling, Q., 996, 1002  
 Linhart, H., 1254  
 Link, D., 1551  
 Linsker, R., 2778  
 Linvill, W. K., 1202  
 Lions, P., 362  
 Lipschitz, R., 338  
 Lipster, R., 721  
 Lipton, Z. C., 3037  
 Littlewood, J. E., 110, 292, 638  
 Littman, M. L., 1894, 1957, 1958, 2108  
 Liu, C., 1347, 1734  
 Liu, J. S., 1401, 1402, 2834, 2836  
 Liu, S., 41, 425  
 Liu, W., 1894  
 Liu, Z., 2779  
 Ljung, L., 583, 713, 2202  
 Lloyd, S. P., 2281  
 Loève, M., 2413  
 Loeliger, H. A., 1794  
 Logan, D. L., 1849  
 Lojasiewicz, S., 290  
 Loog, M., 2488  
 Loomis, L. H., 2636  
 Lopes, C. G., 941, 943  
 Lopes, G. A. D., 1957  
 Lorenzo, P. D., 996, 998  
 Lowd, D., 3095  
 Lozano, J. A., 112  
 Lu, L., 110, 123, 126  
 Lu, T., 2043, 2107  
 Luce, R. D., 1996  
 Luenberger, D. G., 323, 418, 466, 2517, 2637  
 Lugosi, G., 110, 123, 585, 2280, 2673, 2674,  
 2679, 2683, 2688, 2695, 2701  
 Lukacs, E., 109  
 Luntz, A., 2553  
 Luo, W., 2446  
 Luo, Z., 360, 423, 540, 2634  
 Luroth, J., 65  
 Luthey-Schulten, 112  
 Luxemburg, W., 592  
 Luz, K., 2487  
 Lyapunov, A. M., xxix, 158  
 Lynch, K. M., 996  
 Lynch, S. M., 2834, 2836  
  
 Ma, S., 364, 2205  
 Ma, T., 873  
 Ma, W.-K., 2445  
 MacDonald, I. L., 1556, 1605  
  
 MacDuffee, C. C., 41  
 MacKay, D. J. C., 232, 1467, 1795, 2487,  
 2836  
 Mackenzie, D., 1678  
 Maclin, R., 2581  
 MacQueen, J. B., 2281  
 Macready, W. G., 2675  
 Macua, S. V., 2043  
 Madry, A., 3095  
 Maei, H. R., 1849, 2043  
 Magdon-Ismail, M., 2686  
 Magnello, M. E., 1309  
 Mahoney, M. W., 118, 2201  
 Maimon, O., 2336  
 Mairal, J., 362, 2445  
 Maitra, A., 189  
 Maitra, S., 1957  
 Makov, U., 1309  
 Malach, E., 2336  
 Mallat, S., 2445, 2446  
 Mammone, R. J., 3136  
 Mandal, S., 2205  
 Mandel, J., 1203  
 Mandic, D. P., 1085, 3037  
 Mandt, S., 1467  
 Mangasarian, O. L., xxxix, 2310, 2518, 2551,  
 2552  
 Mannor, S., 2778  
 Manoel, A., 1378  
 Mansour, Y., 2108, 2336, 2488  
 Mantey, P. E., 584  
 Mao, X., 996  
 Marano, S., 943  
 Margalit, T., 541  
 Marin, J., 2336  
 Marin, J. M., 1467  
 Markov, A. A., xxxi, 1145, 1551, 1552  
 Markovitch, S., 2487  
 Maron, M. E., 2353  
 Marroquin, J. L., 2280  
 Marschak, J., 2281  
 Marshall, A. W., 1347  
 Martens, J., 234  
 Marti, K., 583, 713  
 Martinetz, T., 2310  
 Martinez, A. M., 2412  
 Martinez, S., 996  
 Masani, P., 1202  
 Mason, L., 2581  
 Massart, P., 110, 123, 2678, 2701  
 Mateos, G., 996  
 Matta, V., 943, 1734  
 Mattout, J., 1347  
 Mattson, R. L., 584  
 Maybeck, P. S., 1201, 1203, 1378

- Mayne, D. Q., 1401  
 Mazumder, R., 364, 542, 1734  
 McAllester, D., 2108  
 McAuliffe, J. D., 1467, 1514, 2680  
 McClave, J. T., 2199  
 McCormick, G. P., 540  
 McCoy, J. F., 2243  
 McCullagh, P., 188, 2486, 2492  
 McCulloch, W., 2778  
 McDaniel, P., 3095  
 McDiarmid, C., 110, 123, 126, 2678  
 McDonald, J., 41, 45, 50  
 McEliece, R. J., 1795  
 McIrvine, E. C., 231  
 McKean, J., 1113, 1251  
 McLachlan, G. J., 1309, 2378, 2553  
 McLeish, D. L., 2638  
 McMahan, H. B., 425, 628  
 McMillan, B., 232  
 McQuarrie A. D. R., 1254  
 McSherry, F., 630  
 Meek, C., 3095  
 Mehotra, K., 2310  
 Mei, S., 2205  
 Meila, M., 1734  
 Meinshausen N., 1734  
 Melis, D. A., 3061  
 Mellendorf, S., 45  
 Melo, F. S., 2108  
 Mendel, J. M., 583, 713  
 Mendelson, S., 2679, 2685, 2708  
 Mendenhall, W., 2199  
 Meng, D., 3095  
 Mengersen, K., 1309  
 Menickelly, M., 425  
 Mercer, J., xxxi, 2635  
 Mercer, R., 1556, 1605  
 Mercier, B., 360, 362  
 Mertikopoulos, P., 775  
 Mesbahi, M., 942, 1734  
 Métivier, M., 583, 713  
 Metropolis, N., 1347, 1401, 2832  
 Meuleau, N., 1894  
 Meyer, C. D., 41, 45, 46  
 Meyn, S. P., 2108  
 Mezard, M., 1796  
 Mian, A., 3095  
 Michel, A.N., 1202  
 Michie, D., 1957  
 Mickey, M., 2553  
 Middleton, D., 1113  
 Miiikkulainen, R., 2310  
 Mika, S., 2378, 2412, 2640, 2643  
 Mikusinski, P., 2638  
 Milgate, M., 292  
 Milgram, M., 2778  
 Miller, D. J., 3095  
 Miller, K., 160  
 Miller, R. G., 1113  
 Minc, H., 46  
 Mine, H., 362  
 Minka, T., 233, 1378, 1515  
 Minkowski, H., 2516  
 Minnick, R. C., 2551, 2552  
 Minsky, M., 1957, 2513, 2779  
 Minty, G. J., 360, 539  
 Mirza, M., 2961  
 Misak, C., 1256  
 Mishra, N., 3136  
 Mitchell, H. L., 1203  
 Mitchell, T., 2336, 3136  
 Mitchison, G., 1556  
 Mitra, S., 41  
 Mitter, S., 873  
 Mnih, V., 2043  
 Moens, M.-F., 3037  
 Mohamed, A., 2831  
 Mohamed, S., 2961  
 Mohan, C. K., 2310  
 Mohri, M., 110, 123, 126, 2488, 2679, 2681,  
     2685, 2686, 2701, 2702  
 Mokhtari, A., 996  
 Monfardini, G., 2779  
 Monro, S., xxx, 582, 713  
 Montúfar, G., 2201  
 Montanari, A., 2205  
 Montavon, G., 3061  
 Monteleoni, C., 630, 2487  
 Mooij, J. M., 1795  
 Moon, T. K., 1309  
 Moore, A. W., 1957, 1958  
 Moore, B. C., 2412  
 Moore, E. H., 2638  
 Moore, J. B., 1201, 1556, 1605, 2202  
 Moosavi-Dezfooli, S. M., 3095  
 Moré, J. J., 466  
 Moreau, J. J., 292, 359, 496  
 Morgan, N., 2778  
 Morimoto, T., 233  
 Moritz, P., 2110  
 Morris, E. R., 3037  
 Morrison, W. J., 42  
 Morters, P., 111  
 Moskowitz, M., 65  
 Mosteller, F., 2553  
 Mota, J., 996, 2253  
 Motwani, R., 1551, 2201  
 Motzkin, T., 496, 2519  
 Moulines, E., 585, 775, 1401, 1556, 1605  
 Moura, J. M. F., 942  
 Moussouris, J., 1796  
 Mozer, M. C., 2528

- Mudholkar, G. S., 2412  
 Muehlelehner, G., 2445  
 Muir, F., 2243  
 Mulaik, S. A., 2412  
 Mulder, W. D., 3037  
 Mulier, F. M., 2673  
 Muller, K. R., 2378, 2412, 2640, 3061  
 Muma, M., 1309  
 Munkhdalai, T., 3136  
 Muroga, S., 2528  
 Murphy, K., 1378, 1795, 2491  
 Murty, K. G., 873  
 Murty, U., 940  
 Muthukrishnan, S., 2201
- Nachum, O., 326, 2108, 2112, 2117  
 Nadarajah, S., 1116  
 Nadeau, C., 2553  
 Nagaoka, H., 233  
 Nagar, D. K., 2205  
 Nagy, B. S., 2636  
 Nagy, G., 2336  
 Naik, D. K., 3136  
 Nakajima, S., 1467  
 Narasimha, R., 2413  
 Narici, L., 2414, 2637  
 Naryanan, A., 1515  
 Nascimento, V. H., 2244, 2249, 2250  
 Nash, S. G., 418  
 Nassif, R., 775, 943  
 Natanson, I. P., 591  
 Naumov, V. A., 1551  
 Navarro, G., 2280  
 Naylor, A. W., 2414  
 Neal, R., 160, 1467, 2634, 2780  
 Neapolitan, R. E., 1677  
 Neath, A. A., 1254, 1271  
 Nedic, A., 291, 496, 497, 675, 752, 941–943, 996, 998  
 Needell, D., 716  
 Nelder, J. A., 188, 2486, 2492  
 Nemeh, B., 586  
 Nemirovski, A. S., 291, 496, 497, 541, 674, 713, 752, 775  
 Nesterov, Y., 290, 291, 322, 338, 339, 360, 419, 423, 425, 427, 432, 496, 497, 540, 752, 775, 873  
 Neu, G., 2108  
 Neubauer, A., 2242  
 Neudecker, H., 41  
 Neuhoff, D. L., 2281  
 Neumaier, A., 2242  
 Newman, M. E. J., 1347  
 Newman, P., 292  
 Newton, I., 420
- Ney, H., 2778  
 Neyman, J., 189, 1116  
 Neyshabur, B., 2201  
 Ng, A. Y., 1515, 2353, 2486  
 Nguyen, A., 3095  
 Nguyen, P., 2831  
 Niblett, T., 2353  
 Nica, B., 940  
 Nichol, A., 3136  
 Nicholson, W. K., 43, 45, 50  
 Nickisch, H., 1378, 3136  
 Niculescu-Mizil, A., 2353  
 Nielsen, F., 189  
 Niemitalo, O., 2961  
 Nilsson, A., 628  
 Nilsson, N., 2279, 2778  
 Niranjana, M., 1996  
 Niss, M., 1796  
 Nissim, K., 630  
 Nocedal, J., 422, 466, 468, 713, 718, 876  
 Noether, M., 65  
 Norris, J. R., 591, 1551, 1552  
 Norvig, P., 2353  
 Novikoff, A. B. J., 2513, 2516  
 Nowak, R., 360, 540, 941  
 Nutini, J., 298, 423, 429  
 Nychka, D., 1203  
 Nyquist, H., xxx
- Obermayer, K., 2310  
 Obozinski, G., 362  
 O'Connor, D., 362  
 Odena, A., 2961  
 O'Donoghue, B., 1997  
 Ogilvie, M., xxxiv  
 O'Hagan, A., 160, 2634  
 Oja, E., 1637, 1638, 2310, 2412, 2415, 2515  
 Okabe, A., 2280  
 Okamoto, M., 110, 2673  
 Oldenburg, D., 2243  
 O'Leary, D. P., 466  
 Olesen, K. G., 1795  
 Olfati-Saber, R., 942  
 Ollila, E., 1309  
 Olshausen, B. A., 2445  
 Olshen, R. A., 2336, 2553  
 Olshevsky, A., 996, 998  
 Omura, J. K., 1605  
 Ondar, K. O., 112  
 Onsager, L., 1796  
 Onuchic, J. N., 112  
 Opitz, D., 2581  
 Oppenheim, A. V., 109  
 Opper, M., 1378, 1467  
 Ormerod, J. T., 1467  
 O'Rourke, J., 1552

- Ortega, J. M., 423  
 Ortiz-Boyer, D., 2486  
 Ortiz-Jimenez, G., 3095  
 Osband, I., 1997  
 Osborne, M. R., 2199  
 Osher, S., 499, 541, 2486  
 Osindero, S., 2778, 2961  
 Ostrovsky, R., 2281  
 O'Sullivan, F., 2639  
 Ott, L., 160  
 Owen, B. A., 1347  
 Owen, D., 159, 161, 1347  
 Ozair, S., 2961  
 Ozdaglar, A., 291, 496, 497, 675, 715, 752,  
 832, 833, 942  
 Ozmehmet, K., 2378
- Paarmann, L. D., 257  
 Paatero, P., 2445  
 Page, L., 1551  
 Paisley, J., 1467  
 Pakman, A., 2108  
 Palatucci, M., 3136  
 Paleologu, C., 627  
 Paley, R., 257  
 Paliogiannis, F., 65  
 Paliwal, K. K., 3037  
 Palomar, D., 996  
 Pan, R., 586  
 Pan, W., 775  
 Panchenko, D., 2679, 2708  
 Papadimitriou, C. H., 1735, 1894  
 Papernot, N., 3095  
 Papert, S., 2513, 2779  
 Papoulis, A., 109, 110, 255, 257, 1552, 2960  
 Pardalos, P. M., 325  
 Parikh, N., 358, 360, 540  
 Parisi, G., 1467, 1796  
 Park, C. H., 2378  
 Park, H., 1637, 2378  
 Parlett, B. N., 45  
 Parr, R., 1849, 2043  
 Parra, L. C., 1638  
 Parrilo, P., 715, 832, 833  
 Parzen, E., xxxi, 2640  
 Passty, G., 362  
 Patel, J. K., 159, 161, 1347  
 Paterek, 586  
 Pathria, R. K., 111  
 Pati, Y., 2446  
 Paul, D. B., 1556, 1605  
 Pazzani, M., 2353  
 Pearl, J., 109, 1677, 1678, 1734  
 Pearlmutter, B. A., 1638  
 Pearson, E., 1116  
 Pearson, J. B., 2243  
 Pearson, K., xxxi, 111, 1253, 1309, 2412  
 Pechyony, D., 2336  
 Pedersen, M. S., 65  
 Peel, D., 1309  
 Penny, W., 1347  
 Peres, Y., 111, 1551, 1552  
 Peretto, P., 2513, 2528  
 Pericchi, L., 1467  
 Perona, P., 1515, 3136  
 Perron, O., 1556  
 Pesquet, J.-C., 358, 360, 362, 432, 540  
 Peters, J., 2108  
 Petersen, K. B., 65  
 Petersen, K. E., 255, 257  
 Peterson, C., 1467  
 Peterson, D. W., 2280  
 Petrie, T., 1309, 1556, 1605  
 Pettis, B. J., 2517  
 Phillips, D. L., 2242  
 Phillips, R., 112  
 Piana, M., 2678  
 Picard, R., 2553  
 Picinbono, B., 109, 160, 1085  
 Pilasz, I., 586, 2200  
 Pillai, S. U., 46, 1555  
 Pinkus, A., 2778  
 Pinsker, M. S., 235  
 Pitman, E., 189  
 Pitt, M., 1401  
 Pitts, W., 2778  
 Plackett, R. L., 42, 1083, 1145, 2197, 2198  
 Platt, J. C., 2486  
 Pleiss, G., 3061  
 Plemmons, R. J., 46, 1555, 2445  
 Póczos, B., 806  
 Poggio, T., 160, 2634, 2639  
 Polak, E., 466, 540  
 Polikar, R., 2581  
 Pollaczek-Geiringer, H., 582  
 Pollard, D., 2674  
 Pollard, H., 338  
 Polson, N. G., 360  
 Pólya, G., 110, 158, 292, 638  
 Polyak, B. T., 290, 291, 322, 337, 339, 360,  
 418, 419, 426, 496, 497, 501, 540, 583,  
 627, 674, 713, 719, 720, 752, 873, 1851  
 Pomerleau, D., 3136  
 Ponce, J., 2445  
 Poole, D., 1733  
 Poole, G. D., 2445  
 Poon, C., 806  
 Poor, H. V., 1116  
 Porter, R., xxxiv  
 Pouget-Abadie, J., 2961  
 Poulin, B., 3061



- Pournin, L., 2280  
 Powell, M. J. D., 431, 466, 713  
 Pratt, J. W., 1113, 1251  
 Pratt, L., 3136  
 Precup, D., 1849, 2043  
 Price, E., 3061  
 Price, R., xxix, 110, 162  
 Principe, J., 2310, 2778  
 Priouret, P., 583, 713  
 Pritchard, J. K., 1515  
 Pritzel, A., 1997  
 Proakis, J. G., 1309  
 Prokhorov, Y. V., 112  
 Pugachev, V. S., 1083  
 Pukelsheim, F., 41  
 Puntanen, S., 41, 42  
 Puschel, M., 996, 2253  
 Pushkin, A. S., 1552  
 Puterman, M. L., 1894, 1910  
  
 Qian, G., 2836  
 Qian, J., 2310  
 Qu, G., 996, 998  
 Quenouille, M., 2553  
 Quinn, K., 1467  
 Qunilan, J. R., 2336  
  
 Rabbat, M. G., 941, 943, 1734  
 Rabi, M., 941  
 Rabiner, L. R., 1309, 1556, 1605  
 Rachford, H. H., 362  
 Radford, A. K., 2779  
 Radon, J., 2681  
 Raik, E. V., 424  
 Rakhlin, A., 2205  
 Ram, S. S., 497, 675, 752, 943  
 Ramage, D., 628  
 Ramanan, K., 942  
 Ramavajjala, V., 2779  
 Ramsey, F., 1256  
 Ranka, S., 2310  
 Rantzer, A., 942  
 Ranzato, M., 2778, 2830  
 Rao, B., 2445  
 Rao, C. R., 188, 1143, 1251, 1252, 2412  
 Rao, M., 293  
 Raphson, J., 420  
 Rasch, M., 2962  
 Rasmussen, C. E., 159–161, 2634, 2646  
 Ratsch, G., 2378, 2412, 2640  
 Ravi, S., 2779, 3136  
 Ravikumar, P., 497, 585  
 Rawat, W., 2886  
 Rawlik, K., 2108, 2117  
 Raydan, M., 424  
 Rayleigh, J. W. S., 45  
  
 Raymond, J., 1378  
 Re, C., 715, 832  
 Read, C. B., 159, 161, 1347  
 Recht, B., 715, 832  
 Reczko, M., 3037  
 Reddi, S. J., 627, 631, 632, 806, 873  
 Reddy, J. N., 1849  
 Redko, I., 2488  
 Redner, R., 1309  
 Reed, M., 2636  
 Reeves, C. M., 466  
 Regalia, P. A., 41  
 Reich, S., 360, 539  
 Reinsch, C., 44  
 Reneau, D. M., 1259  
 Renyi, A., 233  
 Rezaifar, R., 2446  
 Rezende, D. J., 2961  
 Rheinboldt, W., 423  
 Ribeiro, A., 996  
 Ribeiro, M. I., 2108  
 Ribeiro, M. T., 3061  
 Ribière, G., 466  
 Riccati, J. F., 1202  
 Richard, C., 943  
 Richardson, S., 2834, 2836  
 Richtárik, P., 423, 628, 2201  
 Riesz, F., 2636  
 Rifkin, R., 2486  
 Rigollet, P., 2205  
 Rios, L. M., 425  
 Ripley, B. D., 160, 2634  
 Rissanen, J., 1254  
 Ritter, H., 2310  
 Ritz, W., 45  
 Rivest, R. L., 1735  
 Rizk, E., 628, 875  
 Robbins, H., xxx, 582, 713, 1999  
 Robert, C., 1113, 1309, 1347  
 Roberts, S. J., 1467  
 Robins, J. M., 1678  
 Robinson, D. P., 873  
 Rocha, A., 2486  
 Rockafellar, R. T., 290–292, 322, 323, 358,  
     360, 362, 496, 539, 594, 752  
 Rodman, L., 1202  
 Rogers, L. C. G., 111  
 Rojas, R., 2581  
 Rokach, L., 2336, 2581  
 Roli, F., 3095  
 Romano, J. P., 1116  
 Romberg, J. K., 50, 2446  
 Romera-Paredes, B., 3136  
 Ronning, G., 1515  
 Root, W. L., 1113  
 Rosasco, L., 775, 2242, 2678

- Rosen, K., 1734  
 Rosenberg, C. R., 2486  
 Rosenberger, G., 43  
 Rosenblatt, F., xxx, 2513, 2514  
 Rosenbluth, A. W., 1401, 2832  
 Rosenbluth, M. N., 1401, 2832  
 Ross, S., 1551, 1552, 1894, 1910  
 Rossin, D. F., 1347  
 Rostamizadeh, A., 110, 123, 126, 2488, 2679, 2681, 2685, 2686, 2701, 2702  
 Roth, A., 630  
 Roth, D., 2353  
 Roth, M., 1203  
 Rouzair-Dubois, B., 112  
 Roy, D. M., 2962  
 Roy, N., 1957, 2042, 2107  
 Roy, S., 627  
 Roychowdhury, V. P., 2378, 2513, 2776  
 Royden, H. L., 590  
 Royle, G. F., 940  
 Rozanov, Y. A., 1796  
 Rozoner, L. I., 2634  
 Rozovskii, B., 1401  
 Rubin, D., 1309, 1515  
 Rubinov, A. M., 540  
 Rubinstein, R. Y., 1347, 2445, 2778  
 Rudin, C., 3061  
 Rudin, L. I., 499, 541  
 Rudin, W., 590, 2636  
 Rugh, W. J., 1202  
 Rumelhart, D. E., 2528, 2778, 3037  
 Rummery, G. A., 1996  
 Rupp, M., 584  
 Ruppert, D., 497, 583, 719  
 Rusakov, D., 2487  
 Russakovsky, O., 2779, 2886  
 Ruszczyński, A., 323  
 Ruzzo, W. L., 2412  
 Ryden, T., 1401, 1556, 1605  
 Ryu, E. K., 1000  
 Ryzhik, I. M., 1347  
  
 Saad, D., 1467  
 Sabin, M. J., 2281  
 Sackett, D., 1677, 1794  
 Sadeghi, P., 2638  
 Sadri, B., 2281  
 Safavian, S. R., 2336  
 Sahinidis, N. V., 425  
 Sahlin, N.-E., 1256  
 Sainath, T. N., 2831  
 Saitoh, S., 2638  
 Sajda, P., 2486  
 Sakurai, K., 3095  
 Salakhutdinov, R., 2778, 2779, 2831, 3136  
 Salamon, P., 2581  
 Saligrama, V., 293  
  
 Salimans, T., 2961  
 Salmond, D., 1401  
 Samadi, M., 873  
 Samangouei, P., 3095  
 Samaniego, F. J., 1259  
 Samanta, T., 1254, 1271  
 Samek, W., 3061  
 Samuel, A. L., 1958, 2042, 2108  
 Santana, R., 112  
 Santoro, A., 3136  
 Santos, A., 1734  
 Santosa, F., 2243  
 Santurkar, S., 2779  
 Sapiro, G., 2445  
 Sarabia, J. M., 159  
 Sarlós, T., 2201  
 Sarvarayndu, G. P. R., 2336  
 Sarwate, A. D., 630  
 Sauer, K., 423  
 Sauer, N., 2673, 2674, 2690  
 Saul, L., 1467  
 Saunders, M. A., 2243, 2445  
 Saunderson, N., 110  
 Savage, L. J., 189, 1113, 1251, 1259  
 Sawaki, K., 1894  
 Sayed, A. H., 42, 45, 46, 48, 159, 255, 291, 418, 423, 430, 496, 497, 583–585, 627, 628, 631, 674, 676, 677, 679, 713–717, 750, 754, 775, 806, 832, 833, 872–876, 878, 941–943, 945, 946, 949, 954, 996, 998–1000, 1083, 1084, 1143–1145, 1201–1203, 1401, 1734, 1851, 1997, 2042, 2043, 2108, 2197, 2198, 2202, 2213, 2244, 2249, 2250, 2253, 2445, 2581, 2778  
 Scaglione, A., 943  
 Scarselli, F., 2779  
 Schaal, S., 2108  
 Schafer, R., 109  
 Schaffer, C., 2675  
 Schapire, R. E., 2581, 2640  
 Scharf, L. L., 1085, 1113, 1201, 1251, 1252  
 Scheffer, T., 2488, 2491  
 Schein, A. I., 2487  
 Scheinberg, K., 425  
 Scheines, R., 1678  
 Scheuer, W. T., 2243  
 Schlaflfi, L., 2523  
 Schmetterer, L., 583  
 Schmidhuber, J., 2778, 2961, 3037, 3040, 3136  
 Schmidt, E., 43, 44  
 Schmidt, M., 418, 540, 775, 806, 809  
 Schmidt, S. F., 1203  
 Schneider, J., 2108  
 Schocken, S., 2778  
 Schoenberg, I. J., 496, 2519

- Schoenlieb, C., 806  
 Schoknecht, R., 2108  
 Scholkopf, B., 2378, 2412, 2551, 2552, 2634, 2639, 2640, 2962  
 Scholz, M., 2412  
 Schraudolph, N. N., 3037, 3040  
 Schreiber, R., 586  
 Schreier, P. J., 1085  
 Schulman, J., 2108, 2110, 3136  
 Schulten, K., 2310  
 Schur, I., 42  
 Schuster, M., 3037  
 Schutter, B., 2042  
 Schuurmans, D., 2043, 2107  
 Schwartz, L., 2635  
 Schwarz, G. E., 1254  
 Schweitzer, P., 1849  
 Schwenk, H., 2778  
 Schweppe, F. C., 1203  
 Scott, J. G., 360  
 Scutari, G., 996, 998  
 Seaman, K., 996  
 Searle, S. R., 41, 42  
 Sebban, M., 2488  
 Sebestyen, G., 2279, 2281  
 Seeger, M., 1378  
 Sefl, O., 584  
 Seidel, L., 423  
 Seidman, A., 1849  
 Sejnowski, T., 1638, 2042, 2486  
 Sell, G., 1556, 1605, 2414  
 Selvaraju, R. R., 3061  
 Seneta, E., 46, 112, 1551  
 Sengupta, B., 2961  
 Senior, A., 2831  
 Senne, K. D., 1204  
 Serfling, R. J., 123  
 Sethares, W. A., 627  
 Sethi, I. K., 2336  
 Settles, B., 2487  
 Seung, H., 2445  
 Shafer, G., 109, 1795  
 Shah, A. K., 1347  
 Shah, D., 2280  
 Shakarchi, R., 109  
 Shakhnarovich, G., 2280  
 Shalev-Shwartz, S., 291, 298, 325, 338, 496, 585, 713, 752, 775, 806, 2336, 2583, 2634, 2675, 2679, 2685, 2686, 2701, 2702  
 Shamir, O., 291, 496, 715, 752, 775, 832, 833  
 Shang, F., 806  
 Shanno, D. F., 421  
 Shannon, C. E., xxx, 231, 1552, 1996, 2042, 2336  
 Shapire, R., 2486  
 Shapiro, S. S., 1116  
 Shapley, L. S., 1894  
 Sharma, R., 627  
 Shawe-Taylor, J., 2551, 2552, 2634, 2640  
 Shcherbina, A., 3061  
 She, Q., 2961  
 Sheela, B. V., 2581  
 Shelah, S., 2673, 2690  
 Shemeneva, V. V., 2108  
 Shen, H., 2412  
 Shen, Z., 364  
 Shenoy, P. P., 1795  
 Shenton, L. R., 1253  
 Shephard, N., 1401  
 Sherman, J., 42  
 Sherstinsky, A., 3037  
 Sheskin, T. J., 1551, 1552, 1894  
 Shewchuk, J. R., 466  
 Sheynin, O. B., 1083  
 Shi, H.-J. M., 423  
 Shi, J., 2486  
 Shi, L., 1515  
 Shi, W., 996, 998, 999, 1002  
 Shimelevich, L. I., 1402  
 Shimodaira, H., 2488  
 Shin, M. C., 1894  
 Shiryayev, A. N., 110, 721  
 Shlens, J., 3095, 3096  
 Shor, N. Z., 291, 496, 497, 752  
 Shotton, J., 2581  
 Shreve, S., 1894  
 Shrikumar, A., 3061  
 Shwartz, A., 1848, 1894  
 Shynk, J. J., 627  
 Siahkamari, A., 293  
 Sibony, M., 360  
 Sibson, R., 1638  
 Sidiropoulos, N. D., 2445  
 Siemon, H. P., 2310  
 Silver, D., 1849, 1958, 2043  
 Silvey, S. D., 233  
 Simar, L., 2378  
 Simard, P., 2581, 3037  
 Simon, B., 2636  
 Simonyan, K., 3061, 3095  
 Sinai, Y. G., 257  
 Sincich, T. T., 2199  
 Singer, Y., 291, 325, 362, 496, 627, 631, 752, 2486, 2581, 2634  
 Singh, R. P., 41  
 Singh, S., 1957–1960, 2001, 2003, 2107, 2108, 3061  
 Singh, S. P., 1996, 2001, 2042  
 Singleton, R. C., 2551, 2552  
 Simiscalco, M., 1309  
 Siu, K.-Y., 2513, 2776  
 Slater, M., 323

- Slavakis, K., 2634, 2640  
 Slivkins, A., 1997  
 Slutsky, E., 116  
 Slymaker, F., 2279  
 Smale, S., 2678  
 Small, C. G., 2638  
 Smallwood, R. D., 1894, 1909  
 Smith, A., 630, 1113, 1309, 1347, 1401, 2834  
 Smith, C. A., 1309  
 Smith, D., 2279  
 Smith, F. W., 2518, 2551, 2552  
 Smith, H., 2199  
 Smith, J. E., 1264  
 Smith, R. L., 188, 189, 1113, 1116  
 Smith, S., 628  
 Smola, A. J., 806, 2412, 2551, 2552, 2634,  
     2639, 2640, 2962  
 Smolensky, P., 2528, 2831  
 Smoluchowski, M., 111  
 Snell, J., 3136, 3144  
 Snow, J., 2280  
 Söderström, T., 2202  
 Sofer, A., 418  
 Soh, Y. C., 998  
 Solla, S. A., 2778  
 Sondik, E. J., 1894, 1909  
 Sorenson, H. W., 1201  
 Sorenson, H. W., 1204, 2202  
 Soudry, D., 2201, 2554  
 Soules, G., 1309, 1556, 1605  
 Soumith, C., 2961  
 Southwell, R. V., 423  
 Spall, J. C., 583, 713  
 Speed, T. P., 2378  
 Speekenbrink, M., 1401  
 Spencer, J. H., 110, 123, 126  
 Speranzon, A., 942  
 Spiegelhalter, D. J., 1795, 2834, 2836  
 Spirling, A., 1467  
 Spirtes, P., 1678  
 Spokoiny, V., 425, 432  
 Springenberg, J. T., 2961  
 Sra, S., 806  
 Srebro, N., 291, 496, 716, 2201, 3061  
 Sridharan, K., 2685  
 Srivastava, K., 497, 675, 752, 943  
 Srivastava, N., 2778, 2779  
 Stadie, B. C., 1997  
 Stankovic, M. S., 943  
 Stankovic, S. S., 943  
 Stark, H., 109  
 Staudemeyer, R. C., 3037  
 Staudigl, M., 775  
 Stearns, S. D., 584, 714  
 Steffey, D., 1515  
 Stegun, I., 292, 1253, 1347  
 Stein, C., 159, 1735  
 Stein, E. M., 109  
 Steinbach, M., 2281  
 Steinbrecher, M., 1794  
 Steinhaus, H., 2281  
 Steinwart, I., 2551, 2552  
 Stensrud, D., 1203  
 Stephens, M., 1515  
 Stern, H., 1515  
 Stevens, M. A., 2336  
 Stewart, G. W., 44, 45, 1083, 2198  
 Stewart, W. J., 1551  
 Steyvers, M., 1514  
 Stiefel, E., 466  
 Stigler, S. M., 110, 158, 1083, 1309, 2197  
 Stinchcombe, M., 2778  
 Stipanovic, D. S., 943  
 Stirzaker, D., 112, 119  
 Stone, C., 2336, 2553, 2674  
 Stone, J. V., 1638  
 Stone, M., 2553  
 Stork, D. G., 1113, 1309, 2280, 2378, 2778  
 Strang, G., 41, 45, 50  
 Stratonovich, R. L., 1556, 1605  
 Street, W. N., xxxix, 2310  
 Strobach, P., 2202  
 Strohmer, T., 588, 2448  
 Stromberg, K., 591  
 Stroud, J. R., 1203  
 Stuart, A., 1143  
 Stuetzle, W., 2446, 2581  
 Styanc, G. P. H., 41, 42  
 Su, J., 3095  
 Suddarth, S. C., 2779  
 Sudderth, E. B., 1515  
 Suel, T., 46, 1555  
 Sugihara, K., 2280  
 Sugiyama, M., 1467  
 Sun, J., 45, 466, 720  
 Sun, Y., 996  
 Sundararajan, A., 996  
 Sundberg, R., 1309  
 Sung, F., 2786, 3136  
 Sutherland, W., 111  
 Sutskever, I., 627, 2778, 2779, 2886, 3037,  
     3095  
 Sutton, R. S., 1849, 1894, 1903, 1905, 1907,  
     1957, 1958, 1996, 2001, 2043, 2044,  
     2108, 2113  
 Svensén, M., 2310  
 Svetnik, V. B., 1402  
 Swami, A., 3095  
 Swerling, P., 1204  
 Swersky, K., 2962, 3136, 3144

- Switzer, P., 1638  
 Symeonidis, P., 586  
 Symes, W. W., 2243  
 Sysoyev, V. I., 2108  
 Szegő, G., 256  
 Szegedy, C., 2779, 3095, 3096  
 Szepesvari, C., 1849, 1957, 1997, 2043
- Tadić, V., 2042  
 Takác, M., 423  
 Takahashi, N., 45  
 Takahashi, T., 2445  
 Takayama, A., 323  
 Talagrand, M., 2685  
 Talwalkar, A., 110, 123, 126, 2679, 2681, 2685, 2686, 2701, 2702  
 Tan, L.-Y., 2336  
 Tan, P.-N., 2281  
 Tan, V. V. F., 1734  
 Tang, H., 998  
 Tanik, Y., 627  
 Tankard, J. W., 111, 1309, 2412  
 Tanner, R. M., 1795  
 Tao, T., 50, 2446  
 Tapia, R. A., 540  
 Tapper, U., 2445  
 Tatarenko, T., 998  
 Tauvel, C., 775  
 Taylor, H. L., 2243  
 Teboulle, M., 360, 362, 540, 541  
 Teh, Y.-W., 2778  
 Teller, A. H., 2832  
 Teller, E., 2832  
 Tellex, S., 1957, 2042, 2107  
 Temme, N. M., 1253  
 Tenenbaum, M., 338  
 Tesauro, G., 1958  
 Tetrushvili, L., 423  
 Tewari, A., 2685  
 Thakurta, A., 630  
 Thaler, R. H., 1245  
 Thanou, D., 1734  
 Theodoridis, S., 585, 1113, 1201, 1677, 2486, 2513, 2634, 2640, 2778  
 Thiran, P., 942  
 Thireou, T., 3037  
 Thomas, J. A., 232  
 Thomas, L. B., 2445  
 Thomas-Agnan, C., 2635  
 Thompson, K., 2353  
 Thompson, W. R., 1997  
 Thorndike, E., 1957  
 Thrun, S., 3136  
 Thuente, D. J., 466  
 Tiao, G. C., 1113, 1251, 1346
- Tibshirani, R., 364, 500, 541, 542, 1084, 1201, 1254, 1309, 1734, 2242, 2243, 2336, 2378, 2412, 2421, 2486, 2553, 2581, 2634, 2672, 2673, 3061  
 Tieleman, T., 627  
 Tikhonov, A. N., 2242  
 Tikk, D., 586, 2200  
 Tipping, M. E., 2412, 2416, 2417  
 Tishby, N., 2108  
 Titterton, D., 1309  
 Tolman, R. C., 111  
 Tomczak-Jaegermann, N., 2686  
 Tomioka, R., 2201, 2445  
 Tong, L., 1734  
 Tong, S., 2487  
 Torr, P. H. S., 3136  
 Torta, E., 1401  
 Tosic, I., 2445  
 Touri, B., 998  
 Toussaint, M., 2108, 2117  
 Towfic, Z. J., 941, 996, 1851, 2253, 2445  
 Tracy, D. S., 41  
 Traskin, M., 2581  
 Trefethen, L. N., 43, 50  
 Treves, F., 2637  
 Tribus, M., 231  
 Tripuraneni, N., 873  
 Tropp, J. A., 2446  
 Troutman, J. L., 591  
 Trudeau, R. J., 940  
 Trujillo-Barreto, N., 1347  
 Tsai, C. L., 1254  
 Tseng, P., 360, 362, 423, 540  
 Tsitsiklis, J. N., 45, 418, 540, 583, 674, 713, 873, 941, 942, 1894, 1957, 1958, 1960, 2001, 2042, 2044, 2108, 2113  
 Tsuda, K., 2640  
 Tsybakov, B., 2205  
 Tsyppkin, Y. Z., 582–584, 674, 713  
 Tu, S. Y., 941  
 Tucker, A. W., 323  
 Tugay, M. A., 627  
 Tukey, J. W., xxx, 1309, 1638, 2280, 2553, 2581  
 Turner, R. E., 1378
- Uffink, J., 111  
 Uhlmann, J. K., 1204  
 Ullman, J. D., 1734  
 Ulm, G., 628  
 Ultsch, A., 2310  
 Ungar, L. H., 2487  
 Uribe, C. A., 998  
 Utgoff, P. E., 2336  
 Uzawa, H., 1849

- Vajda, I., 233  
 Valiant, L., 2336, 2581, 2673  
 Vámos, T., 43  
 Van Camp, D., 1467  
 van de Molengraft, R., 1401  
 Van den Steen, E., 1264  
 van der Hoek, J., 1556, 1605  
 van der Merwe, R., 1204  
 van der Pas, P. W., 111  
 van der Sluis, A., 466  
 van der Vaart, A. W., 116, 119, 2674  
 van der Vorst, H. A., 45, 466  
 Van Erven, T., 233  
 van Hasselt, H., 1264, 2043  
 Van Huffel, S., 44  
 Van Hulle, M. M., 2310  
 Van Loan, C. F., 41, 43, 45, 423, 466, 1556, 2242  
 van Merriënboer, B., 3037  
 Van Roy, B., 1997, 2042, 2044, 2108  
 Van Scoy, B., 996  
 van Seijen, H., 1958, 1996  
 Van Trees, H. L., 1113, 1116, 1251, 1265  
 Vandenberghe, L., 290, 292, 322, 323, 328, 362, 418, 941, 2517  
 VanderPlas, J., 1259, 1263  
 Vandewalle, J., 44  
 Vanhoucke, V., 2831  
 Vapnik, V. N., 1201, 2486, 2487, 2551–2553, 2581, 2673, 2678  
 Varga, R. S., 45  
 Vargas, D. V., 3095  
 Varshney, P., 425  
 Vassilvitskii, S., 2281  
 Vaswani, A., 3037  
 Vazirani, U., 2673  
 Vedaldi, A., 3061, 3095  
 Veeravalli, V. V., 497, 675, 752, 943  
 Vehtari, A., 1378  
 Venkatesan, R., 2886  
 Venkatesh, S., 2673  
 Verhulst, P. F., 2484  
 Verma, G. K., 2886  
 Verri, A., 2678  
 Vershynin, R., 110, 123, 588  
 Vetterli, M., 109, 942  
 Vicente, L. N., 425  
 Vidyasagar, M., 2243, 2673  
 Vijayakumar, S., 2108, 2117  
 Vilalta, R., 3136  
 Villa, S., 775  
 Vincent, P., 2778, 2831, 2960  
 Vinyals, O., 3037, 3095, 3136, 3138  
 Virasoro, M. A., 1796  
 Viterbi, A. J., xxxi, 1605  
 Vlaski, S., 628, 679, 715, 716, 832, 872–876, 998, 1734  
 Volinsky, C., 586, 2200  
 von der Malsburg, C., 2310  
 von Mises, R., 582  
 von Neumann, J., 43, 47, 257, 424  
 Voronoi, G. F., 2280  
 Vovk, V., 109, 2634  
 Vu, B. C., 775  
 Wagner, D., 3095, 3096  
 Wagner, T., 1734  
 Wahba, G., 2242, 2486, 2551, 2552, 2639, 2640  
 Wainwright, M. J., 110, 123, 126, 291, 496, 497, 585, 752, 1467, 2679, 2701  
 Waissi, G. R., 1347  
 Wajs, V. R., 360, 362, 540  
 Wakefield, J., 1259  
 Wald, A., 1113  
 Walker, H., 1309  
 Walker, W., 2279  
 Wallace, D. L., 2553  
 Wallis, J., 420  
 Walsh, T. J., 1957, 2042, 2107  
 Walters, P., 257  
 Wan, E., 1204  
 Wand, M. P., 1467  
 Wang, C., 423, 1467  
 Wang, D., 2488  
 Wang, H., 293  
 Wang, J., 721  
 Wang, K., 1467  
 Wang, L., 2446  
 Wang, X., 1515  
 Wang, Y., 998, 2445  
 Wang, Z., 2886, 2961  
 Wansbeek, T., 41  
 Ward, I. R., 2779  
 Ward, R., 716  
 Ward, T. E., 2961  
 Warde-Farley, D., 2961, 3095  
 Warga, J., 423  
 Warmuth, M. K., 293, 2673  
 Wasserstein, L. N., 2962  
 Watanabe, K., 1467  
 Watkins, C., 1957, 1996, 2003  
 Watkins, C. J., 2486  
 Webb, A., 1113  
 Wedderburn, R., 2492  
 Weimer, M., 586  
 Weinert, H. L., 2640  
 Weiss, K., 2488  
 Weiss, N., 115, 1309, 1556, 1605  
 Weiss, Y., 1794, 1795, 2886  
 Welch, L. R., 1556, 1604, 1605, 2448

- Weldon, W. F. R., 1309  
 Wellekens, C. J., 2778  
 Welling, M., 2961  
 Wellner, J. A., 2674  
 Wen, Z., 1997  
 Werbos, P. J., 1957, 2778, 3037  
 Werner, D., 2635  
 Weston, J., 2378, 2486, 2634, 2640, 3136  
 Wetherhill, G. B., 583  
 Wets, R., 358, 594  
 Weyl, H., 45  
 White, D. J., 1894  
 White, H., 2778  
 White, T., 2961  
 Whitlock, P. A., 1347  
 Wibisono, A., 425  
 Wichern, D. W., 2380  
 Widrow, B., xxx, 584, 714, 1957, 2778  
 Wiener, N., xxx, 257, 1143, 1201, 1202  
 Wierstra, D., 2961  
 Wiewiora, E., 1849, 2043  
 Wikle, C. K., 1203  
 Wilby, W. P. Z., 584  
 Wild, S. M., 425  
 Wilkinson, D., 586  
 Wilkinson, J. H., 45, 466, 1556  
 Wilkinson, W., 1378  
 Willard, B. T., 360  
 Williams, C., 159–161, 2310, 2634, 2646, 2780  
 Williams, D., 111, 721  
 Williams, L. J., 2412  
 Williams, R. J., 2108, 2778, 3037  
 Williams, R. L., 1202  
 Williamson, R. C., 2634, 2640  
 Willshaw, D. J., 2310  
 Willsky, A., 1734  
 Willsky, A. S., 2202  
 Wilmer, E. L., 1551, 1552  
 Wilson, D. L., 2280  
 Winkler, R. L., 1264, 1346  
 Winograd, T., 1551  
 Winther, O., 1378, 1467  
 Wise, F., 2281  
 Witte, J. S., 2199  
 Witte, R. S., 2199  
 Witten, D., 2378  
 Witten, I. H., 1957, 2281  
 Wittenmark, B., 2202  
 Wolberg, W. H., xxxix, 2310  
 Wold, H., 1143, 1202  
 Wolfe, P., 291, 418, 466, 496, 540  
 Wolff, T. H., 2686  
 Wolfowitz, J., 425, 583, 713  
 Wolpert, D. H., 1084, 2672, 2675  
 Wolynes, P. G., 112  
 Wong, W. H., 1401, 1402  
 Wong, Y. K., 43  
 Woodbury, M., 42  
 Woodcock, R., 584  
 Wooding, R., 160  
 Woodruff, D. P., 2201  
 Woods, J. W., 109  
 Wortman, J., 2488  
 Wright, R. M., 1638  
 Wright, S. J., 422, 423, 466, 468, 713, 1678  
 Wu, C. F. J., 1309  
 Wu, G., 996, 1002  
 Wu, L., 1401  
 Wu, T. T., 423  
 Wu, X., 3095  
 Wu, Y., 2836  
 Wu, Z., 2779  
 Wyatt, J., 2581  
 Xavier, J., 996, 2253  
 Xia, X., 293  
 Xiang, Z., 3095  
 Xiao, L., 627, 775, 806, 942  
 Xie, C., 3095  
 Xie, L., 998  
 Xie, N., 3061, 3095  
 Xie, S., 2445  
 Xin, R., 996  
 Xu, B., 2961  
 Xu, D., 2778  
 Xu, J., 996, 998  
 Xu, L., 1309  
 Xu, M., 2836  
 Xue, L., 2412  
 Yamada, I., 45  
 Yamanishi, K., 2445  
 Yamashita, R., 2886  
 Yan, J., 721  
 Yan, M., 996, 999  
 Yang, C., 2248  
 Yang, H. H., 233, 1638  
 Yang, P., 996, 3095  
 Yang, S., 427, 719  
 Yao, H., 3136  
 Yao, X., 2581  
 Ye, Y., 323, 418  
 Yedida, J. S., 1795  
 Yellen, J., 940  
 Yeung, K. Y., 2412  
 Yin, G. G., 583, 713  
 Yin, H., 2310  
 Yin, M., 362  
 Yin, W., 423, 998, 1002, 2486

- Ying, B., 291, 496, 497, 627, 631, 674, 676,  
677, 679, 713, 715, 716, 750, 806, 832,  
833, 996, 1734, 2581  
 Ylvisaker, D., 188  
 Yosida, K., 358  
 Yosinski, J., 2779, 3061, 3095  
 Young, G., 44  
 Young, G. A., 188, 189, 1113, 1116  
 Young, N., 2638  
 Yu, B., 1254, 2581  
 Yu, D., 2831  
 Yu, H., 427, 719, 3136  
 Yu, Y., 2353, 3037  
 Yuan, K., 627, 631, 679, 713, 715, 716, 806,  
832, 833, 996, 1000, 2043  
 Yuan, M., 500, 541  
 Yuan, X., 3095  
 Yuan, Y., 466  
 Yudin, D. B., 291, 496, 541, 775  
 Yujia, L., 2962  
 Yun, S., 423  
 Yushkevich, A. P., 338  
  
 Zacks, S., 188, 189  
 Zadeh, L. A., xxx, 941, 1202  
 Zakai, M., 1083  
 Zalinescu, C., 298  
 Zareba, S., 627  
 Zaremba, W., 3095  
 Zaritskii, V. S., 1402  
 Zazo, S., 2043  
 Zdunek, R., 2445  
 Zehfuss, G., 41  
 Zeiler, M. D., 627, 3060  
 Zemel, R., 2778, 2962, 3136, 3144  
 Zeng, J., 998  
 Zenios, S., 293  
 Zenko, B., 2581  
  
 Zhang, C., 1467  
 Zhang, F., 42  
 Zhang, H., 2353  
 Zhang, J., 466, 720  
 Zhang, K., 1678  
 Zhang, N. L., 1733, 1894  
 Zhang, P., 940  
 Zhang, T., 291, 496, 716, 752, 775, 806, 832,  
873  
 Zhang, W., 2886, 3095  
 Zhang, Y., 362, 2445  
 Zhang, Z., 2445, 2446  
 Zhao, P., 716  
 Zhao, Q., 2445  
 Zhao, X., 717, 754, 943, 954, 996  
 Zheng, H., 2779  
 Zheng, Y., 873  
 Zhou, D., 541  
 Zhou, G., 2445  
 Zhou, H., 423  
 Zhou, J., 2779  
 Zhou, P., 2778  
 Zhou, Y., 586, 2200, 2779  
 Zhou, Z., 775, 2581  
 Zhu, M., 996  
 Zhu, S., 998  
 Zibriczky, D., 586, 2200  
 Zill, D. G., 338  
 Zinkevich, M., 713  
 Zinn, J., 2678  
 Zioupos, A., 586  
 Zipser, D., 3037  
 Zisserman, A., 3061, 3095  
 Zorich, V. A., 65  
 Zou, H., 2242, 2412, 2421  
 Zoubir, A. M., 1309, 2581  
 Zoutendijk, G., 466, 468, 713  
 Zucchini, W., 1254, 1556, 1605  
 Zulehner, W., 1849



## Subject Index

*Please note: this index contains terms for all three volumes of the book. Only terms listed below with page numbers 2165–3148 are featured in this volume.*

- 0/1–loss, 1094
- A2C algorithm, 2065
- absorbing chain, 1822
- absorbing state, 1811
- accelerated momentum, 614, 626
- acceptance ratio, 1341
- accumulating trace variable, 1944
- activation function, 2716, 2717
- active learning, 2471, 2487
- active path, 1663
- actor–critic algorithm, 2059, 2063, 2106
- actor-only algorithm, 2106
- AdaBoost, 2561, 2576
- AdaDelta, 608, 626
- AdaGrad, 599, 602, 626
- adaline, 557, 584
- ADAM, 599, 610, 626, 2744, 3096
- AdaMax, 612, 626
- adaptive gradient method, 599
- adaptive importance sampling, 703
- adaptive learning rate, 599, 604, 626
- ADMM, 996
- advantage actor–critic, 2065
- advantage function, 2063, 2110
- adversarial attack, 3065
- adversarial machine learning, 425, 433, 3065
- adversarial training, 3095
- affine classifier, 2654, 3042, 3078
- affine hull, 292
- affine–Lipschitz, 476, 497, 498, 677
- agreement, 935, 970
- AIC, 1238, 1266
- Akaike information criterion, 1238, 1253, 1266
- AlexNet, 2886
- algebraic connectivity, 908
- alignment score, 2992
- almost-sure convergence, 119
- $\alpha$ -divergence, 232
- alternating least-squares, 586, 2192, 2200
- alternating minimization, 2272
- alternating projection algorithm, 393, 412, 423, 431, 2518, 2553
- analysis step, 1188
- ancestor node, 1651
- AND function, 2517
- annotator, 2474
- antiferromagnetic, 1796
- aperiodic Markov chain, 1553, 1558
- a-posteriori error, 2191
- a-priori error, 2191
- Archimedes principle, xxvii
- arcing classifier, 2580
- ARMA process, 254
- Armijo condition, 400
- array algorithm, 1204, 1207
- Arrow–Hurwicz algorithm, 430, 1844, 1846, 1849, 2026
- assumed density filtering, 1375, 1378
- Atari game, 2043
- atom, 2425
- attention mechanism, 2991, 3037, 3038, 3138, 3140
- attention score, 2992, 3141
- attribute, 2313, 2315
- Aug-DGM algorithm, 977, 978
- auto-correlation sequence, 242
- auto-regressive random process, 258
- autoencoder, 2745, 2747, 2769, 2778, 2779, 2784, 2797
- automatic character recognition, 2845
- autonomous system, 627
- auxiliary particle filter, 1396
- average regret, 579, 633
- average reward, 2054, 2109
- averaged projections, 431
- averaging combination, 1558
- averaging rule, 909
- AVRG algorithm, 816, 827
- axioms of probability, 109
- Azuma inequality, 110, 126, 1997

- backgammon, 1841, 1851, 1957, 2107  
backpropagation, 852, 2739, 2778, 2779,  
2781–2784, 2876, 2887, 2924, 2950  
backpropagation through time, 2974, 2982,  
3009, 3018  
backtracking line search, 393, 398, 455  
backward view, 1945  
bagging, 2557, 2580, 2750  
bagging classifier, 1933  
balanced matrix, 944  
Banach fixed-point theorem, 347  
base function, 1227  
basis pursuit, 305, 350, 354, 472, 491, 569,  
571, 1706, 2243, 2247  
basis pursuit denoising, 2237, 2243  
batch algorithm, 383  
batch logistic regression, 384, 2459  
batch normalization, 2769, 2770, 2779  
batch perceptron, 473  
batch SOM, 2300  
batch subgradient method, 473  
Baum–Welch algorithm, 1517, 1537, 1563,  
1588, 1592, 1601  
Bayes rule, 78, 110  
Bayes classifier, 1062, 1092, 1097, 1098, 1113,  
1116, 2260, 2262, 2341, 2358  
Bayes risk, 1117, 2679  
Bayesian inference, 1092, 1113, 1211, 1319,  
1352  
Bayesian information criterion, 1238, 1253,  
1257, 1271  
Bayesian mixture of Gaussians, 1406  
Bayesian net, 1647  
Bayesian network, 85, 1643, 1647, 1682  
Bayesian reasoning, 1647  
Bayesian variational inference, 1320  
Bayesian view, 1256  
bearing, 1199, 1399  
behavior policy, 1952, 1979, 2020  
belief, 1174, 1383, 1682  
belief propagation, 1378, 1682, 1684, 1698,  
1771, 1794  
belief vector, 1880  
belief-MDP, 1882, 1894  
Bellman projected error, 2042  
Bellman equation, 1828, 1835, 1884, 1896  
Bellman optimality equation, 1828, 1835  
Berkson paradox, 1669, 1677, 1679  
Bernoulli distribution, 2343  
Bernoulli mixture model, 1302  
Bernstein inequality, 1997  
BERT method, 3037  
best linear unbiased estimator, 1141  
best matching unit, 2293  
beta distribution, 175, 185, 1096, 1116, 1217,  
1253, 1336, 1342, 1411  
BFGS method, 421  
bi-clustering, 2445  
bias, 1143  
bias selection, 1670  
bias–variance relation, 1072, 1083, 1088,  
1213, 1254, 2205, 2282, 2560, 2672  
biased coin, 1303  
BIBO stability, 248, 1177  
BIC, 1238, 1257, 1271  
bidirectional LSTM, 3026, 3037  
bidirectional RNN, 2994, 3037  
big data, xxix, 2185  
big- $O$  notation, 121, 355, 388, 576  
big- $\Theta$  notation, 388  
bijection, 521  
binary classification, 1097, 2464, 2716, 3078  
binary tree, 236  
binomial distribution, 170, 185, 1223, 1226  
binomial formula, 2641  
binomial theorem, 1226, 2693  
bioinformatics, 1556, 2551  
biostatistics, 1309  
bipartite, 1759  
bit, 196, 1246, 2320  
black-box attack, 3068, 3088  
blackjack, 1957  
blind separation, 1637  
block coordinate descent, 423  
block Kronecker product, 28, 41  
block maximum norm, 36, 45  
block RLS, 2191, 2208–2210  
blocked path, 1663  
BLUE estimator, 1141, 1144  
Bochner theorem, 2595, 2636, 2642  
Boltzmann constant, 105, 231  
Boltzmann distribution, 99, 100, 111, 190,  
1745, 1988, 2047, 2809  
Boltzmann exploration, 1987  
Boltzmann machine, 98, 1111, 2769, 2797,  
2830  
Boolean function, 2526  
Boolean variable, 197, 2315  
boosting, 1109, 2557, 2561, 2580  
bootstrap, 1255, 1933, 2557, 2561  
bootstrap particle filter, 1395  
bounded gradient disagreement, 875  
BPTT, 2974, 2982, 3009, 3018  
breast cancer dataset, 2307, 2310, 2539, 2607  
Bregman divergence, 233, 285, 292, 298, 319  
Bregman projection, 523  
bridge regression, 2248  
Brownian motion, 102, 110  
Brownian process, 2417

- Bryson–Frazier filter, 1182, 1206  
 burn-in period, 1341, 2833  
 Bussgang theorem, 163
- C4.5 algorithm, 2336  
 calculus of variations, 1202  
 canonical exponential family, 1226  
 canonical spectral factor, 1180  
 capacity, 2662  
 capacity of classifier, 2526  
 cardinality, 2271  
 CART algorithm, 2336  
 cascade, 1662  
 categorical distribution, 189  
 Cauchy sequence, 2637  
 Cauchy–Schwarz inequality, 32, 113, 332, 1266, 2640  
 causality, 84, 109, 1659, 1677  
 causation, 84, 1659, 1677  
 cavity function, 1358, 1372  
 centered Poisson equation, 2055  
 central limit theorem, xxix, 104, 120, 158  
 central processor, 621  
 centrality of a node, 911  
 centroid, 991  
 Ceres, 2198  
 change-point model, 2835  
 channel capacity, 308  
 Chapman–Kolmogorov equation, 1174, 1383, 1530  
 characteristic function, 99  
 characteristic polynomial, 96  
 Chebyshev inequality, 75, 109, 114, 122  
 Chernoff inequality, 1997  
 chess, 1841, 1851, 1957, 1996, 2042, 2107  
 chi-square distribution, 160, 1270  
 child node, 1651  
 choice axiom, 1996  
 cholera outbreak, 2280  
 Cholesky factor, 23  
 Cholesky factorization, 14  
 Chow–Liu algorithm, 1657, 1699, 1733  
 CIFAR-10 dataset, 2761, 2781  
 circular Gaussian distribution, 155, 1088  
 circular random variable, 155, 1084  
 circularity, 155, 160, 1084  
 class map, 2306, 2309  
 classification, 1595, 2260, 2290, 2341, 2728  
 classification-calibrated loss, 2680  
 classifier, 1097  
 client, 620  
 clipped cost, 2088  
 clipping, 3003  
 clipping function, 2089  
 clique, 1740  
 clique potential, 1742
- closed function, 263  
 closed set, 261  
 closed-loop matrix, 1161  
 closure of a set, 520  
 cloud computing, 903  
 clustering, 1278, 1290, 2270  
 clustering map, 2306  
 clutter, 1378  
 CNN, 2715, 2838  
 co-coercivity, 339, 371, 389, 1003  
 codeword, 2486  
 coding matrix, 2486  
 coefficient of determination, 2181  
 coercivity, 267  
 collaborative filtering, 562, 586, 2192, 2200, 2929  
 colored map, 2303  
 column span, 7  
 combination matrix, 905, 909  
 combining estimators, 1145  
 common cause, 1662  
 common effect, 1662  
 compact set, 594, 2516  
 compatible approximation, 2058  
 compatible features, 2058  
 competitive learning, 2293  
 complementary condition, 307, 314, 2543  
 complementary error function, 161  
 complete conditional, 1442  
 complete DAG, 1679  
 complete graph, 1679  
 complete space, 2638  
 completion-of-squares, 13, 1055, 1059  
 complex random variable, 106  
 compression, 2906, 2925  
 compressive sensing, 2445, 2449  
 computational complexity, 1734  
 computer vision, 1677, 1749, 2838, 2886  
 concentration inequality, 123  
 condition number, 20  
 conditional dependence, 1643  
 conditional distribution, 80  
 conditional entropy, 200, 2321  
 conditional GAN, 2955, 2961  
 conditional gradient algorithm, 540  
 conditional independence, 85, 88, 1644  
 conditional mean, 89  
 conditional mean estimator, 1058  
 conditional mutual information, 234, 1661  
 conditional pdf, 80  
 conditional probability table, 1647  
 conditional VAE, 2930  
 cone, 261  
 confidence interval, 1255  
 confidence region, 2179  
 congruence, 13, 41

- conic combination, 293  
 conic hull, 261  
 conjugate function, 281, 282, 292, 359, 988, 1844, 1847, 2256  
 conjugate gradient, 441, 448, 451, 453, 456, 465, 574, 705, 708, 719, 720, 2087  
 conjugate pair, 183  
 conjugate prior, 183  
 conjugate utility, 282, 292  
 conjugate vectors, 448  
 connected graph, 905, 908, 1558  
 consensus strategy, 921, 935, 936, 949, 970  
 conservation, 3056  
 conservation policy iteration, 2108  
 consistency relation, 2102  
 consistent classifier, 2673  
 consistent equations, 2171  
 consistent estimator, 1235, 1237  
 constant step size, 381  
 constrained estimator, 1139  
 constrained least-squares, 2205  
 constrained optimization, 302, 1150, 2228, 2233, 2250  
 context, 2992  
 continuous mapping theorem, 119  
 continuously differentiable function, 338  
 contraction, 347  
 contraction property, 89  
 contractive operator, 347, 365  
 contrastive divergence, 1752, 2805, 2820, 2825  
 contribution propagation, 3061  
 controllability, 1203  
 convergence in distribution, 119  
 convergence in mean, 119  
 convergence in probability, 117, 119, 164, 244  
 convergence of random variables, 119  
 convergence with probability one, 119, 244  
 conversion factor, 2191  
 convex cone, 261  
 convex function, 263  
 convex hull, 261, 292, 295, 2685  
 convex optimization, 302, 1844  
 convex quadratic program, 2542, 2608  
 convex set, 261  
 convex–concave saddle problem, 541  
 convolution, 91  
 convolution mask, 2839  
 convolutional neural network, 2715, 2778, 2838, 2839, 2887, 2909  
 coordinate descent, 402, 422, 493, 495, 573, 690, 764, 776  
 coordinate-ascent algorithm, 1415, 1482  
 coordinate-descent LASSO, 495  
 corrected AIC, 1254  
 correlation, 1677  
 correlation coefficient, 113  
 correlation layer, 2847  
 cosine similarity, 2785, 3038, 3141  
 cost function, 1054  
 counter-based exploration, 1997  
 counting theorem, 2520–2522  
 covariance form, 1163  
 covariance function, 152, 241, 2623  
 covariance matrix, 94, 96  
 covariate shift, 2478  
 crafting, 3072, 3077  
 Cramer–Rao bound, 1213, 1229, 1251, 1260, 1264  
 critic, 2962  
 critic-only algorithm, 2106  
 critical value, 2199  
 cross validation, 1238, 1248, 2239, 2546, 2552  
 cross-covariance matrix, 94  
 cross-entropy, 204, 208, 2489, 2754, 2755, 2778, 2784, 2887, 2984, 3021  
 cross-entropy training, 2984, 3021  
 cumulative distribution function, 116, 119, 133, 147, 1619, 2484  
 cumulative incoherence, 2448  
 cumulative reward, 1822  
 curse of dimensionality, 1644, 2307, 2650, 2672  
 curvature, 225  
 curvature tensor, 234  
 cycle, 943, 1648  
 cyclic projection algorithm, 424  
 DAG, 1648  
 DARE, 1178  
 data assimilation, 1203  
 data fusion, 47, 624, 1133, 1136, 1145  
 data preprocessing, 1615, 2383  
 data-driven method, 1111  
 $d$ -dependence, 1672  
 decaying step size, 392, 489, 514  
 decentralized algorithm, 949, 1000  
 decentralized learning, 902, 969  
 decentralized optimization, 902, 969  
 decentralized SGD, 925, 938, 941, 943  
 decentralized stochastic gradient descent, 925, 938, 941, 943  
 decision tree, 2313, 2336, 2561  
 decoder, 1070, 1071, 1320, 2391, 2906, 2909  
 decoding, 1534, 1563  
 DeconvNet, 3049, 3060  
 deconvolution, 2243  
 deep belief network, 2769, 2797, 2830  
 deep exploration, 1997  
 deep learning, 2779, 2797

- deep network, 111, 2715, 2720, 2722, 2768, 2839  
 deep  $Q$ -learning, 2009, 2033  
 deep reinforcement learning, 2092  
 deepfake, 2961  
 DeepFool, 3069, 3077, 3094  
 DeepLIFT, 3062  
 defense to adversarial attacks, 3091  
 defensive distillation, 3092, 3095  
 deflation, 2390  
 degree of bootstrapping, 1940  
 degree of node, 906  
 delta rule, 557, 584  
 delusional bias, 2043, 2107  
 denoising, 500, 541, 587, 2237, 2243  
 denoising autoencoder, 2747  
 dependent observations, 1586  
 derivative-free optimization, 425  
 descendant node, 1651  
 descent direction, 460, 708  
 descent lemma, 332  
 deterministic policy, 1856  
 dichotomy, 2520, 2662, 2688  
 dictionary learning, 2424, 2425, 2443  
 differential entropy, 192, 202, 1625  
 differential privacy, 628  
 diffusion, 102  
 diffusion coefficient, 104  
 diffusion learning, 921  
 diffusion strategy, 921, 925, 937, 949  
 digamma function, 176, 1218, 1253, 1500, 1723  
 DIGing algorithm, 975, 977, 998  
 dimensionality reduction, 2231, 2307, 2383, 2746  
 Dirac delta, 70  
 directed acyclic graph, 1648  
 directed graph, 907, 981  
 Dirichlet distribution, 174, 185, 1515, 2354  
 discount factor, 1822  
 discounted reward, 1822, 2052  
 discounted state distribution, 2109  
 discounted utility, 1821  
 discounted visitation function, 2078  
 discrete algebraic Riccati equation, 1178  
 discrete-time Fourier transform, 246  
 discriminant function, 1106, 2357, 2359  
 discriminative method, 1110, 2262  
 discriminative model, 1110, 2262, 2457  
 discriminator, 2935  
 dispersed exponential distribution, 190  
 distillation, 3092, 3095  
 distillation temperature, 3092  
 distilled network, 3092  
 distributed learning, 902, 969  
 distributed optimization, 902, 969  
 divergence, 196, 232  
 divergence theorem, 436  
 divide-and-conquer, 1575, 1605, 1827  
 DNA microarray, 2672  
 do operator, 84  
 document classification, 2341  
 domain adaptation, 2476, 2487  
 dominated convergence theorem, 212, 548, 590, 646, 2023  
 double descent, 2205  
 double  $Q$ -learning, 1996, 2043  
 doubly stochastic matrix, 38, 909, 944  
 Douglas–Rachford algorithm, 356, 365  
 dropout, 2724, 2779  
 $d$ -separation, 1672, 1754  
 D-SGD algorithm, 925  
 $\delta$ -smooth function, 645  
 DTFT, 246  
 dual averaging, 535  
 dual function, 306, 607, 1845  
 dual method, 903, 986  
 dual norm, 32, 48  
 dual problem, 312, 1844  
 dual space, 521  
 dual variable, 306  
 duality, 322  
 duality argument, 306  
 duality gap, 314  
 dying ReLU, 2719  
 Dykstra algorithm, 425, 432  
 dynamic programming, xxxi, 1575, 1604, 1783, 1786, 1827, 1861, 1894, 1897, 2042, 2672  
 early stopping, 2743  
 Earth mover distance, 2962  
 echo cancellation, 627  
 Eckart–Young theorem, 44, 50, 2200, 2397, 2434  
 ECOC method, 2486  
 edge, 904  
 edge detection, 2845  
 EEG signal, 1611  
 effective sample size, 1390  
 efficient estimator, 1213, 1229, 1237  
 eigen-decomposition, 3, 2385  
 eigenfilter, 1150  
 eigenvalue, 1  
 eigenvector, 1  
 Einstein–Smoluchowski relation, 104, 110  
 EKF algorithm, 1193, 1203  
 elastic-net regularization, 376, 2226, 2237, 2242  
 ELBO, 229, 1411, 1412, 1722, 1731, 2907  
 elevated terrain map, 2303

- eligibility trace, 1942, 1944, 1958  
 ellipsoid, 293, 2198  
 Elman network, 3037  
 ELU, 2719  
 EM algorithm, 1276, 1282, 1405, 1517, 1588, 2271, 2281  
 embedding, 2785, 2990, 3102  
 emission distribution, 1586  
 emission probability, 1382  
 emission probability kernel, 1879  
 emission probability matrix, 1689  
 empirical data distribution, 1220  
 empirical error, 2263  
 empirical risk, 376, 642, 683, 730  
 empirical risk minimization, 376, 852, 2654, 2657, 2913  
 EMSE, 589  
 encoder, 1070, 2391, 2909  
 encoder–decoder RNN, 2990, 3037, 3038  
 encoder–decoder, 1070  
 encoding, 2315  
 energy function, 845, 850, 1745, 2834  
 energy-based model, 2809  
 ensemble average, 243  
 ensemble Kalman filter, 1185, 1203, 1208  
 ensemble learning, 2557, 2564, 2580  
 entropy, 192, 196, 231, 326, 1625, 1699, 2033, 2320, 2336, 2338, 2353, 2683  
 enumeration method, 1685  
 epidemiology, 2280  
 epigraph, 327  
 episode, 3121  
 episodic MDP, 1822  
 epoch, 555  
 $\epsilon$ -insensitive loss, 2553  
 equality constraint, 302  
 equivalence, 2211  
 erf function, 161, 2779  
 erfc function, 161  
 ergodic in the mean, 244  
 ergodic process, 243, 257, 2055  
 ergodic theorem, 257, 2833  
 ergodicity, 243, 257  
 ERM, 376, 2657  
 error covariance matrix, 1162  
 error-correcting code, 1677, 1792, 1794  
 error-correcting output code, 2486  
 E-step, 1286  
 estimate, 1054  
 estimator, 1058, 1122  
 Euclidean geometry, 2170  
 Euler constant, 1253  
 event, 109  
 every-visit policy evaluation, 1925  
 evidence, 78, 1211, 1328, 1405, 1671, 1682, 1683  
 evidence lower bound, 1412, 2907  
 EXACT diffusion, 1000  
 excess kurtosis, 1627  
 excess mean-square error, 589  
 excess risk, 389, 391, 713, 2679  
 expectation maximization, 1276, 1319, 1711, 1715, 1717, 2271, 2281  
 expectation propagation, 1110, 1378, 1405  
 expected discounted reward, 2053  
 expected immediate reward, 2054  
 expected SARSA, 1974  
 experience replay, 1992, 1996  
 expert system, 1677  
 explainable learning, 3043  
 explaining away, 1669  
 exploding gradient, 3004  
 exploitation, 1986, 1996  
 exploration, 1985, 1986, 1996  
 exploration function, 1990  
 exploration model, 3118  
 exponential convergence, 387  
 exponential distribution, 114, 167, 188–190, 1312  
 exponential family of distributions, 1226  
 exponential loss, 1109, 2576  
 exponential LU, 2719  
 exponential mixture model, 1312  
 exponential risk, 1109, 2252  
 exponential weighting, 2188, 2209  
 extended Kalman filter, 1193, 1203  
  
 face recognition, 1556, 2435, 2551, 2886  
 factor, 1742, 2391  
 factor analysis, 2406, 2412  
 factor graph, 1643, 1647, 1740, 1756  
 factorial, 1253  
 factorization theorem, 1228  
 fake image, 2929, 2960  
 false alarm, 1115  
 false negative, 1115  
 false positive, 1115  
 far-sighted evaluation, 1823  
 fast causal inference, 1678  
 fast Fourier transform, xxx  
 fast gradient sign method, 3070, 3094  
 fast ICA, 1628  
 FBI, 1056  
 FCI algorithm, 1678  
 FDA, 2223, 2357, 2378, 2383, 2412, 2654  
 $F$ -distribution, 2199  
 $f$ -divergence, 232  
 feasible learning, 2662  
 feasible point, 303  
 feasible set, 327  
 feature map, 2847  
 feature selection, 2383

- feature vector, 1841  
 federated averaging, 623  
 federated learning, 619, 627, 631, 797, 875, 902  
 federated SVRG, 797  
 feedback neural network, 2716  
 feedforward neural network, 2715, 2716, 2721  
 Fenchel conjugate, 282, 359, 366, 2256  
 Fenchel–Young inequality, 296  
 ferromagnetic, 1796  
 few-shot learning, 3099, 3118, 3144  
 FFT, xxx  
 FGSM, 3069, 3070, 3094  
 filtration, 1402  
 financial model, 1326  
 fine tuning, 3099  
 finite difference method, 2048  
 finite precision, 1435, 2721  
 Finito algorithm, 806  
 firmly nonexpansive operator, 348, 357, 365  
 first-order ergodic, 244  
 first-order moment, 71  
 first-order optimization, 433  
 first-order stationarity, 854, 873  
 first-visit policy evaluation, 1924  
 Fisher discriminant analysis, 2223, 2262, 2341, 2357, 2365, 2380, 2383, 2643, 2654  
 Fisher information matrix, 181, 213, 601, 1230, 1456, 1458, 2071  
 Fisher kernel, 2641  
 Fisher–Neyman theorem, 188  
 Fisher ratio, 2369  
 fixed point, 341, 346, 360, 539, 1838  
 fixed-interval smoothing, 1181  
 fixed-lag smoothing, 1181, 1206  
 fixed-point iteration, 1839  
 fixed-point smoothing, 1181, 1206  
 fixed-point theorem, 2118  
 flat prior, 1273  
 Fletcher–Reeves algorithm, 456, 468, 574, 719, 720  
 FOCUS, 2443  
 FOMAML, 3132  
 forecast step, 1187  
 forgery, 2785  
 forget gate, 3005  
 forgetting factor, 2188  
 Forgy initialization, 2272  
 forward view, 1941, 1977  
 forward–backward splitting, 351  
 forward-backward recursions, 1517, 1535, 1537, 1538, 1688  
 Fourier transform, 2641  
 fourth-order moment, 137  
 Frank–Wolfe method, 540  
 fraud detection, 1556  
 Fredholm equation, 2242  
 free energy, 1746, 2811  
 frequentist approach, 1255  
 frequentist vs. Bayesian, 1255, 1256  
 Frobenius norm, 33, 2397  
 full context embedding, 3138  
 full rank, 8  
 functional causal model, 1678  
 fundamental theorem of algebra, 43, 50  
 fundamental theorem of calculus, 265, 330  
 fused LASSO, 500, 541, 587  
  
 gain matrix, 1161  
 Galerkin method, 1849  
 game theory, 946  
 gamma distribution, 161, 189, 1118, 1226  
 Gamma function, 1096, 1218, 1252, 1411, 2183, 2653  
 gamma function, 160, 185  
 GAN, 2905, 2935  
 gap, 1998  
 gated recurrent unit, 3034, 3039  
 Gauss–Markov field, 1708  
 Gauss–Markov theorem, 1141, 1144, 1213  
 Gauss–Southwell rule, 409, 423  
 Gaussian distribution, 74, 132, 155, 169, 177, 1066, 1214  
 Gaussian error function, 161, 2779  
 Gaussian graphical model, 1747  
 Gaussian kernel, 153, 159, 2592, 2594  
 Gaussian Markov field, 1746  
 Gaussian mask, 2845  
 Gaussian mixture model, 1111, 1277, 1280, 1287, 1517, 2271, 2281  
 Gaussian naïve classifier, 2351, 2355  
 Gaussian policy, 2109  
 Gaussian prior, 2242  
 Gaussian process, 150, 159, 2623, 2634, 2779  
 Gaussian RBM, 2834  
 Gaussian sketching, 2186  
 gene analysis, 1551  
 gene expression, 2427  
 general position, 2520, 2522  
 generalization, 2201, 2222  
 generalization error, 2264, 2661  
 generalization theory, 379, 2650, 2657, 3065  
 generalized linear model, 2492  
 generalized logistic distribution, 189  
 generalized portrait, 2551  
 generative adversarial network, 1111, 2905, 2935  
 generative graphical model, 2824  
 generative method, 1110, 2262  
 generative model, 1070, 1110, 1319, 1325, 1473, 1533, 1609, 2262, 2806, 2819, 2830

- generative network, 2905  
 generator, 2935  
 geodesic, 225  
 geophysics, 2243  
 geostatistics, 160, 2634  
 Gershgorin theorem, 38, 45  
 Gibbs inequality, 205  
 Gibbs distribution, 100, 190, 206, 1744, 1988, 2047, 2101, 2720  
 Gibbs phenomenon, 2832  
 Gibbs sampling, 1342, 2804, 2819, 2831  
 Gini coefficient, 2336  
 Gini gain ratio, 2325  
 Gini impurity, 2325, 2336, 2338  
 Gini index, 2325  
 GLASSO, 1708  
 GLM, 2492  
 global independence relation, 1662  
 global temperature, 2175, 2179  
 GMM, 1277  
 GO game, 1957, 1958, 2107  
 goodness-of-fit test, 1238  
 Google, 1531, 1958  
 gradient ascent, 971, 976, 980, 1845  
 gradient boosting, 2572  
 gradient correction TD, 2023  
 gradient descent, 375, 418, 971, 976, 980, 1845  
 gradient explosion, 3004  
 gradient  $\times$  input analysis, 3049  
 gradient noise, 574, 642, 860, 861  
 gradient operator, 2846  
 gradient perturbation, 852, 873  
 gradient TD, 2008  
 gradient vector, 59, 65  
 Gram–Schmidt procedure, 18, 43, 51, 449, 1158, 1620, 1631  
 Gramian matrix, 153, 2543, 2554, 2592, 2635  
 Granger causality test, 1678  
 graph, 903  
 graph learning, 1698, 1705  
 graph neural network, 2748, 2779  
 graphical LASSO, 1705, 1734, 1736  
 grayscale image, 2275, 2443, 2760, 2822, 2829, 2839, 2884, 2927, 3059, 3086, 3111  
 greedy exploration, 1985  
 greedy method, 2445, 2449, 3077  
 greedy strategy, 1855, 1996, 2830  
 group LASSO, 500, 541, 587  
 growing memory, 2188  
 growth function, 2688, 2690  
 GRU, 3034, 3039  
 GTD2 algorithm, 2019, 2025  
 guided backprop, 3048  
 guided backpropagation, 3048, 3060  
 Hadamard division, 2440  
 Hadamard matrix, 2187  
 Hadamard product, 66, 604, 1565, 2734, 2791, 2918, 2975  
 Hadamard sketching, 2186  
 Hahn–Banach theorem, 2778  
 halfspace, 293, 323  
 HALS, 2438  
 Hammersley–Clifford theorem, 1795, 1799  
 Hamming distance, 2487  
 hard assignment, 2272  
 hard decision, 1060, 1062  
 hard label, 3092  
 hard thresholding, 363  
 hard-margin SVM, 2530, 2533  
 harmonic mean, 1408  
 Harmonium, 2830  
 Hastings ratio, 1341  
 Hastings rule, 945  
 heart disease dataset, 1259, 1703, 2329, 2337, 2394, 2511  
 heatmap, 3042, 3046  
 heavy-ball implementation, 419, 426  
 Hebbian learning, 2412, 2415, 2514  
 Hebbian rule, 2514  
 Hellinger distance, 233, 236  
 Hermitian matrix, 39  
 Hessian matrix, 62, 65, 268, 2111  
 hidden Markov model, 1111, 1283, 1284, 1381, 1383, 1440, 1517, 1533, 1563, 1643, 1646, 1688, 1717  
 hidden variable, 1283, 1683  
 hierarchical alternating least-squares (HALS), 2438  
 hierarchical model, 1515  
 Hilbert space, 43, 2637, 2638  
 hinge loss, 271, 273, 2614  
 hinge risk, 376, 474, 2252  
 hit histogram, 2306  
 HMM, 1517, 1533, 1563  
 Hoeffding inequality, 110, 117, 123, 1263, 2673, 2679  
 Hoeffding lemma, 118, 123  
 Hölder inequality, 192, 638  
 Hopfield network, 3037  
 Hotelling transform, 2413  
 Huber function, 358, 363  
 Huber loss, 2784  
 Hughes effect, 2672  
 Hugin algorithm, 1795  
 human in the loop, 2474  
 Hurwitz matrix, 1851  
 hybrid distribution, 1360, 1372  
 hyperbolic secant, 2484  
 hyperbolic tangent, 2778  
 hypercube, 2526



- hyperparameter, 2546  
 hypothesis space, 2655  
 hypothesis testing, 1115
- ICA, 1609, 1637  
 ID3 algorithm, 2336  
 idempotent matrix, 2173  
 I-FGSM, 3072  
 iid process, 242  
 ill-conditioning, 2223, 2667  
 ill-posed problem, 2242  
 image denoising, 2445  
 image filtering, 2839  
 ImageNet, 2886  
 image processing, 2838  
 image recognition, 2886  
 image segmentation, 1299  
 immediate reward, 1818  
 immoral chain, 1676  
 implicit bias, 2195, 2197, 2201, 2210, 2553  
 implicit regularization, 2201, 2210, 2553  
 importance distribution, 1334  
 importance sampling, 552, 553, 588, 649, 653, 669, 701, 1333, 1347, 1385, 1954, 2076  
 importance weights, 1334, 1953, 2021, 2479  
 impurity, 231, 2336  
 impurity function, 2336  
 imputation, 561  
 incidence matrix, 907  
 incomplete information, 1311  
 incremental strategy, 430, 509, 919  
 independence map, 1653  
 independent component analysis, 1609, 1637  
 independent random variables, 83  
 independent sources, 1609  
 induced norm, 32  
 inductive bias, 2225, 2657  
 inductive inference, 379  
 inductive reasoning, 379  
 inequality constraint, 302  
 inequality recursion, 501, 590, 720  
 inertia, 12, 41  
 inertia additivity, 41  
 inference, 1054  
 information, 196  
 information gain ratio, 2323  
 inner-product space, 2637  
 innovations process, 1157  
 input gate, 3005  
 instance-weighting, 2481  
 instantaneous approximation, 550  
 integral equation, 2242  
 Internet-of-Things, 627  
 interpretability, 2179  
 interpretable learning, 3043  
 intersection of convex sets, 325, 412
- inverse gamma distribution, 191  
 inverse Wishart distribution, 2205  
 ion channel, 100  
 IoT, 627  
 iris dataset, 1063, 1085, 1102, 1296, 2363, 2378, 2393, 2463, 2506, 2510, 2537  
 IRLS, 2199  
 irreducible Markov chain, 1553  
 irreducible matrix, 46, 49, 947  
 Ising model, 1747, 1749, 1796  
 isolated word recognition, 1595  
 ISTA, 510, 2238, 2402, 2428  
 iterated fast gradient sign method, 3072  
 iterated soft-thresholding algorithm, 2402, 2428  
 iteration-dependent step size, 392, 489, 514  
 iterative decoding, 1792, 1794  
 iterative dichotomizer, 2336  
 iterative reweighted least-squares, 2199
- Jacobian matrix, 59, 1348, 3090  
 Jacobian saliency map approach, 3069, 3075, 3094  
 Jensen inequality, 279, 292, 646, 918  
 Jensen–Shannon divergence, 2942  
 Johnson–Lindenstrauss lemma, 2201  
 Johnson–Lindenstrauss transform, 2201  
 joint distribution, 77  
 joint pdf, 77  
 joint stationarity, 251  
 Jordan canonical form, 34, 47  
 Jordan network, 3038  
 JSMA, 3069, 3075, 3094  
 junction tree, 1759, 1795  
 junction tree algorithm, 1759, 1795
- Kaczmarz algorithm, 393, 432, 588, 2201  
 Kalman filter, 255, 1154, 2201, 2212  
 Karhunen–Loève transform, 2413  
 Karush–Kuhn–Tucker (KKT) conditions, 307, 322, 2250, 2541  
 KDDCup, 586  
 kelvin scale, 105  
 kernel, 2839  
 kernel-based learning, 2613  
 kernel-based perceptron, 2595  
 kernel-based SVM, 2603  
 kernel FDA, 2643  
 kernel function, 153, 2242  
 kernel method, 1112, 2587, 2591, 2592, 2715  
 kernel PCA, 2412, 2618, 2619, 2634  
 kernel ridge regression, 2610  
 kernel trick, 2636, 2637  
 $K$ -fold cross validation, 2547  
 Khintchine–Kahane inequality, 2686

- KKT conditions, 307, 322, 327, 607, 2250, 2251, 2541  
 KKT multiplier, 306  
 KL divergence, 196, 204, 232, 235, 1109, 1699, 2077  
*k*-means algorithm, 2270, 2280  
*k*-means clustering, 2260, 2280, 3144  
*k*-means++ clustering, 2273  
*k*-nearest neighbor, 2265  
*k*-NN rule, 2260, 2265, 2282  
 Kohonen map, 2290, 2310  
 Kraft inequality, 199, 236  
 krigging, 160, 2634  
 Kronecker product, 24, 41  
 Kruksal algorithm, 1734  
 Krylov sequence, 467  
 Krylov subspace, 467  
 K-SVD, 2444  
 Kullback–Leibler divergence, 196, 204, 232, 235, 1108, 2756  
 kurtosis, 1621, 1627, 1640
- $\ell_1$ -regularization, 376, 2226, 2230, 2242  
 $\ell_2$ -regularization, 376, 2225, 2226, 2242  
 $\ell_2$ -pooling, 2864  
 L2Boost, 2577  
 labeled data, 2471  
 Lagrange multiplier, 306, 1497  
 Lagrangian, 306, 607, 1844  
 language processing, 2838  
 language translation, 2967, 2990, 2995  
 language understanding, 1677  
 Laplace mechanism, 629  
 Laplace prior, 2242  
 Laplace distribution, 358, 629, 2231  
 Laplace method, 1110, 1328, 1346, 1405  
 Laplace smoothing, 1604, 1660, 1701, 2344, 2352, 2354, 2358  
 Laplacian, 906  
 Laplacian noise, 629  
 Laplacian rule, 909  
 Laplacian matrix, 906  
 LASSO, 350, 354, 472, 477, 491, 500, 510, 541, 569, 571, 587, 733, 750, 1706, 2237, 2243  
 latent class analysis, 1302  
 latent Dirichlet allocation, 1472, 1514  
 latent factor model, 2406  
 latent model, 2405  
 latent variable, 227, 562, 1283, 1319, 1518, 1519, 1683, 2391  
 law of effect, 1957  
 law of large numbers, xliii, 112, 117, 164, 1334, 1923, 2937  
 law of total expectations, 115  
 law of total probability, 81  
 lazy mirror descent, 535
- LDA, 1472, 2357, 2378  
 leaf, 1651, 2313  
 leaky ReLU, 2719  
 leaky LMS, 557  
 learning to learn, 3099  
 least-mean-squares-error estimator, 1058  
 least-squares, 157, 587, 1244, 2168, 2197, 2221  
 least-squares risk, 376  
 least-squares SARSA, 2031  
 least-squares TD, 2018  
 leave-one-out, 2549, 2552  
 left-stochastic matrix, 38, 50, 909, 944  
 Leibniz integral rule, 591  
 Lenz-Ising model, 1796  
 letter sequences, 1528  
 leverage score, 2186  
 Levinson algorithm, 255  
 Lidstone smoothing, 1604, 1660, 2345, 2353, 2358  
 likelihood, 78, 184, 215, 1211, 2906  
 likelihood ratio, 1099, 1117  
 limit superior, 687  
 line search method, 217, 235, 396, 443, 2083  
 linear autoencoder, 2747  
 linear classifier, 2654, 3042  
 linear combiner, 2717  
 linear convergence, 387  
 linear discriminant analysis, 2262, 2341, 2351, 2357, 2378, 2459  
 linear estimator, 1121, 2165  
 linear Gaussian model, 1068  
 linear model, 1134  
 linear operator, 43, 2413  
 linear prediction, 1143  
 linear program, 304, 2518  
 linear programming, 2552  
 linear regression, 136, 1121, 1169, 1244, 2165  
 linear search problem, 1734  
 linear separability, 2499, 2518, 2520, 2527  
 linearized Kalman filter, 1191, 1203  
 link function, 2493  
 Lipschitz condition, 332, 339, 367  
 Lipschitz constant, 332, 2962  
 Lipschitz continuity, 332, 337  
 Lipschitz continuous, 332, 497  
 Lipschitz gradient, 339  
 Lipschitz function, 120  
 little-*o* notation, 388, 576  
 living reward, 1814  
 LLMSE, 1122  
 Lloyd algorithm, 2270, 2281  
 LMS, xxx, 584  
 LMSE, 1058  
 local independence, 1653  
 local Markov property, 1753  
 local maximum, 601

- local minimum, 601  
 LOESS smoothing, 2175, 2198  
 log loss, 270, 2756  
 log-likelihood function, 216, 1276, 1618,  
   1623, 2811  
 log-partition function, 168, 1227  
 log-sum exponential, 2100  
 logistic density function, 1468  
 logistic distribution, 1751, 2484, 2818  
 logistic function, 1325, 1619, 2484  
 logistic loss, 270, 2614, 2639  
 logistic model, 1110  
 logistic regression, 244, 384, 457, 510, 558,  
   571, 619, 1106, 1110, 1333, 2201, 2262,  
   2341, 2353, 2457, 2474, 2482, 2485  
 logistic risk, 376, 2252  
 logit model, 1324, 1346, 1461, 2359, 2459,  
   2484  
 LogitBoost, 2578  
 long short-term memory, 2715, 2967, 3004,  
   3026  
 long-term model, 714  
 loopy belief propagation, 1771  
 loss function, 376, 853, 1092, 2677  
 low-rank approximation, 44  
 LOWESS smoothing, 2175, 2198  
 $\ell_p$ -pooling, 2864, 2887  
 LSTM, 2715, 2967, 3004, 3026, 3036  
 LTI system, 248  
 Luce choice axiom, 1996  
 Lyapunov equation, 26, 27, 41  
 Lyapunov recursion, 48
- machine precision, 2203  
 MAE estimator, 1094  
 magnetic field, 1796  
 Mahalanobis distance, 299, 630, 2362  
 majorization, 429, 2441  
 majorization–minimization, 429, 2442  
 MAML, 3130, 3136  
 manifold, 225  
 MAP estimator, 1094, 1113, 1174, 1247,  
   1257, 1575, 2227, 2231  
 margin, 2507  
 margin variable, 2669  
 marginal distribution, 80  
 marginal pdf, 80  
 Markov inequality, 109, 114, 122, 126, 552  
 Markov blanket, 1651, 1674, 1753  
 Markov chain, 39, 45, 1345, 1522, 1524, 1713,  
   1779  
 Markov chain Monte Carlo, 1110, 1258,  
   1333, 1347, 1405, 1515, 1722, 2834  
 Markov decision process, 1807, 1853, 1917,  
   1957, 1971, 2008, 2047
- Markov inequality, 125  
 Markov network, 1754  
 Markov process, 1815  
 Markov random field, 1754  
 martingale, 126, 1402  
 martingale difference, 126  
 mask, 2839  
 Massart lemma, 2678, 2701  
 matching network, 3111, 3136–3138  
 matching pursuit, 2446  
 matrix completion, 542, 561, 873  
 matrix factorization, 562, 586, 2192, 2200,  
   2201  
 matrix inversion formula, 1134  
 max-sum algorithm, 1782  
 maximal clique, 1741  
 maximum a-posteriori estimator, 1113, 1247,  
   1257, 1575, 2227, 2231  
 maximum clique problem, 1734  
 maximum entropy, 192, 209, 235  
 maximum likelihood, 157, 1113, 1211, 1251,  
   1309, 1319, 1617, 1711, 1712, 2169,  
   2460  
 maximum mean discrepancy, 2962  
 maximum of means, 1263  
 maximum-phase system, 253  
 McCulloch–Pitts model, 2513, 2515  
 McDiarmid inequality, 110, 126, 2678, 2707  
 MCMC method, 1258, 1333, 1347, 1365,  
   1405, 1515, 1722, 2834  
 MDC, 2360  
 MDL, 1238  
 MDP, 1957  
 mean, 71, 106  
 mean absolute error, 1083, 1094  
 mean estimation, 1142, 1143  
 mean field approximation, 1413, 1723, 1724,  
   1727  
 mean field theory, 1467, 2907  
 mean function, 152, 2623  
 mean-square convergence, 119  
 mean-square deviation, 552, 575, 589, 713  
 mean-square-error, 244, 1053–1055, 1058,  
   1082, 1121, 1122, 2165  
 mean-square-error convergence, 244, 686, 735  
 mean-square-error estimation, 1053  
 mean-value theorem, 124, 330, 337, 591, 1269  
 measure of similarity, 2785  
 measurement update, 1171, 1175, 1383  
 median, 1094, 1095, 1312, 2206  
 median filter, 1300  
 medical diagnosis, 1677, 2341, 2346  
 memoryless channel, 1793  
 Mercer theorem, 153, 2592, 2635  
 message passing, 1378, 1682, 1684, 1760  
 meta learning, 2763, 2779, 2786, 3099

- meta testing, 3127  
 meta training, 3125  
 method of moments, 1253  
 metric tensor, 225  
 metric space, 261  
 Metropolis–Hastings algorithm, 1333, 1339,  
 1347, 1405, 2832  
 Metropolis matrix, 1559  
 Metropolis ratio, 1341  
 Metropolis rule, 909  
 midpoint convex, 293  
 min-max problem, 2940  
 mini-batch, 550  
 mini-batch algorithm, 384  
 minimal I-map, 1655, 1676  
 minimum description length, 1238, 1253,  
 1254  
 minimum distance classifier, 2357, 2360, 2362  
 minimum mean-square-error, 1055, 1059,  
 1122, 2166  
 minimum-norm solution, 2171, 2210  
 minimum-phase system, 253  
 minimum-variance unbiased estimator, 1139,  
 1141, 1213, 1229  
 minorization–maximization, 2110  
 mirror descent, 391, 519, 524, 530, 540, 573,  
 771  
 mirror function, 521  
 mirror prox, 519, 771  
 misclassification, 1098  
 missed detection, 1115  
 missing data, 1283, 2355, 2379  
 mixing matrix, 1611  
 mixing probability, 1287  
 mixture model, 1276  
 mixture of learners, 2557, 2580  
 ML estimator, 1211  
 MMSE, 1055, 1059, 1122, 2166  
 MNIST dataset, 2275, 2282, 2443, 2760,  
 2822, 2829, 2884, 2927, 2934, 2958,  
 3059, 3086, 3111, 3134  
 mode, 1095  
 mode collapse, 2960, 2962  
 model-agnostic algorithm, 3130  
 model-based inference, 1111  
 model-based learning, 1918  
 modeling filter, 255, 1165  
 moment matching, 211, 1219, 1378  
 moment parameter, 181  
 momentum acceleration, 418, 426, 612  
 momentum method, 459, 614  
 momentum parameter, 614  
 monotone convergence theorem, 365  
 monotone function, 264  
 monotone gradient, 264  
 Monte Carlo method, 1333, 1921, 2834  
 Monte Carlo policy evaluation, 1920  
 Moore–Aronszajn theorem, 2637  
 moralization, 1744  
 Moreé–Thuente method, 456  
 Moreau decomposition, 292  
 Moreau envelope, 342, 358, 363, 366  
 Moreau–Yosida envelope, 358  
 moving average, 608, 610, 1244  
 MRF, 1754  
 MSD, 552, 589  
 MSE, 1055, 1122  
 M-step, 1286  
 multi-agent system, 39, 45, 903  
 multi-armed bandits, 1997  
 multiclass classification, 1105, 2322, 2464,  
 2486, 2716, 2728, 3081  
 multiclass logistic regression, 2485, 2491  
 multilabel classification, 2716, 2728  
 multilayer network, 2722  
 multilayer perceptron, 2715  
 multinomial distribution, 171, 185, 1223,  
 1311, 1515, 2343, 2355  
 multinomial logistic regression, 2459, 2486,  
 2491  
 multinomial replacement, 1401  
 multiplicative update algorithm, 2439  
 multiplicity, 47  
 multitage decision process, 1848, 1893,  
 1894  
 multitask learning, 2716, 2729, 2765, 2779,  
 2785  
 mutual incoherence, 2448, 2451  
 mutual information, 231, 1622, 1623, 1625,  
 1699, 2320, 2336  
 MVUE estimator, 1139, 1213, 1229  
 myopic evaluation, 1823  
  
 Nadam, 618  
 Naïve Bayes, 1649  
 Naïve Bayes classifier, 2341  
 Naïve policy evaluation, 1921  
 NAND function, 2517, 2776  
 NASA, 2175, 2179  
 nat, 196, 1246  
 natural exponential family, 1226  
 natural gradient, 216, 233, 1459, 2072, 2083  
 natural gradient method, 420, 601,  
 2108  
 natural gradient policy, 2071  
 natural language processing, 1481, 1514,  
 2967, 2990, 2995  
 natural parameter, 167, 181  
 natural parameter space, 180  
 nearest neighbor classifier, 1105  
 nearest-neighbor rule, 1112, 2260, 2265,  
 2279, 2282, 2284, 2599

- negative entropy function, 288, 294, 521, 525  
 negative hypothesis, 1115  
 negentropy, 1640  
 neocognitron, 2886  
 Nesterov momentum acceleration, 427, 615, 713  
 Netflix prize, 586, 2200  
 neural network, 557, 1112, 2499, 2715, 2779  
 neural Turing machine, 3136  
 neuron, 2716  
 Newton equations, 1170  
 Newton method, 217, 420, 426, 601, 1500, 1515  
 Newton-type recursion, 1628  
 Neyman–Pearson test, 1113  
 NMF, 2435  
 NN rule, 2260, 2279, 2282, 2284  
 no free lunch theorem, 2674  
 Nobel Prize, 1678, 1796  
 noise, 243, 1136, 1159  
 non-Bayesian inference, 1211  
 nonconvex optimization, 375, 852, 872  
 nonexpansive operator, 318, 348  
 nonexpansiveness, 762  
 nonlinear PCA, 1629  
 nonnegative matrix factorization, 2435, 2445  
 nonnegative orthant, 2436  
 nonnegative-definite matrix, 1, 5  
 nonparametric model, 2268  
 nonsingular code, 232  
 nonsmooth function, 341  
 NOR function, 2517  
 norm, 30  
 normal cone, 262, 293  
 normal distribution, 158  
 normal equations, 9, 1124, 1151, 2170  
 normalized mutual information, 2323  
 novel document detection, 2445  
 NP complete, 1734  
 NP complexity, 1734  
 NP-hard, 873, 921, 1734, 2280  
 nuclear norm, 33, 363, 542, 2210  
 null hypothesis, 1115  
 nullspace, 7, 944, 949  
  
 Occam razor principle, 1254, 2589  
 OCR, 2335  
 odds function, 1108, 2359  
 off-policy, 1335, 2105  
 off-policy learning, 1952, 1979, 1982, 2021, 2488  
 offset, 386, 1121, 2368  
 Oja rule, 2415, 2515, 2519  
 OMP, 50, 2448  
 on-policy, 1335  
 on-policy learning, 1952  
  
 one-hot encoding, 2315, 2931, 3067  
 one-point estimate, 433  
 one-shot learning, 3101  
 one-step reward, 1818  
 one-tailed test, 2183  
 one-versus-all, 2464, 2486, 2716, 3081  
 one-versus-one, 2464, 2486, 2716  
 online algorithm, 384, 547, 551, 730, 756, 779, 816, 1201  
 online Bayesian learning, 1375, 1378  
 online dictionary learning, 2425  
 online learning, 551  
 online mirror descent, 524, 530, 540  
 online policy evaluation, 1928  
 operator theory, 423  
 optical character recognition, 2335  
 optimal control, 1202  
 optimal importance sampling, 702  
 optimal policy, 1853  
 optimal trajectory, 1897  
 optimal transport, 2488  
 optimism in the face of uncertainty, 1991, 1997  
 optimistic initialization, 1985  
 OR function, 2517  
 oracle, 2474  
 Ornstein–Uhlenbeck kernel, 154, 159  
 orthant, 293  
 orthogonal complement space, 359, 2173, 2202  
 orthogonal matching pursuit, 50, 2445, 2448  
 orthogonal matrix, 3  
 orthogonal random variables, 92, 107  
 orthogonal vectors, 8  
 orthogonality condition, 2172, 2204  
 orthogonality principle, 1065, 1124, 1133  
 outlier, 1312, 1628, 2179, 2185, 2392, 2533  
 output gate, 3005  
 OvA strategy, 2464, 2486, 2716, 3081  
 over-determined least-squares, 2211  
 over-parameterized least-squares, 2195  
 overcomplete basis, 2243  
 overcomplete dictionary, 2427  
 overcomplete representation, 2747  
 overfitting, 1077, 1238, 1254, 2223, 2229, 2264, 2334, 2589, 2665, 3065  
 overflow, 1435, 2721  
 OvO strategy, 2464, 2468, 2486, 2716  
  
 PAC learning, 2660  
 PageRank, xxxi, 1531  
 pairwise independence, 1796  
 pairwise Markov network, 1749  
 Paley–Wiener condition, 256  
 parent node, 1651  
 Pareto optimality, 915, 941, 946

- Pareto solution, 915, 946  
 parity-check code, 1792  
 Parseval relation, 2641  
 partial information, 1225, 1311  
 partial optimization, 325  
 partially-observable MDP, 1879  
 particle, 1335  
 particle filter, 1154, 1174, 1191, 1204, 1380, 1393, 1400  
 partition function, 168, 1743, 2810  
 party cocktail problem, 1610  
 passive learning, 1920  
 path analysis, 1678  
 payoff, 2940  
 PC algorithm, 1678  
 PCA, 1629, 2223, 2373, 2383, 2411, 2654, 2747, 2770  
 P complexity, 1734  
 pdf, 70  
 peephole LSTM, 3039  
 penalty-based optimization, 935  
 perceptron, xxx, 473, 568, 584, 1112, , 2499, 2513, 2595  
 perceptron loss, 2614, 2639  
 perceptron risk, 376  
 Perron eigenvector, 39  
 Perron-Frobenius theorem, 45, 1533, 1553, 1555  
 Perron vector, 39, 50, 911, 944, 1532, 1556, 2020, 2044, 2053  
 PG-EXTRA algorithm, 999  
 PGM, 1647  
 phase transition, 1796  
 Phillips–Tikhonov regularization, 2242  
 photosynthesis, 111  
 piecewise linear, 1886  
 Pinsker inequality, 235  
 P-map, 1655  
 pmf, 69  
 pocket perceptron, 2509  
 pocket variable, 483, 497, 498, 738, 740, 2509  
 Poisson distribution, 173, 1260, 2835  
 Poisson equation, 1827, 1835, 1843  
 Poisson regression, 2492  
 Polak–Ribière algorithm, 457  
 Polak–Ribière–Powell algorithm, 457  
 policy evaluation, 1825  
 policy function, 1809  
 policy gradient, 215  
 policy gradient method, 2027, 2047, 2107  
 policy gradient theorem, 2057  
 policy improvement, 1878  
 policy iteration, 1866  
 Polyak momentum acceleration, 419, 426, 614, 713  
 Polyak–Ruppert averaging, 498, 560, 719  
 polygamma function, 1253  
 polyhedron, 293, 3083  
 polynomial kernel, 154, 2592–2594  
 polytree, 1697  
 POMDP, 1853, 1879, 1894  
 pool-based sampling, 2472  
 pooled statistics, 2358  
 pooling, 2860, 2887  
 positive hypothesis, 1115  
 positive orthant, 321  
 positive semi-definite matrix, 5  
 posterior, 78, 184  
 posterior distribution, 1319, 1320, 1352  
 potential function, 1740  
 power, 242  
 power spectral density, 246  
 power of a test, 1115  
 power spectral density, 245  
 power spectrum, 246  
 PPO, 2087, 2088, 2107  
 PPO-clip, 2090  
 PPO-penalty, 2088  
 precision matrix, 1356, 1707, 1746  
 preconditioned conjugate gradient, 452  
 preconditioning, 452  
 predictability minimization, 2961  
 predicted class, 3045, 3066  
 prediction, 1320, 1535, 1547, 1549  
 prediction step, 1175, 1384  
 predictive distribution, 1320, 1322, 1331, 1429, 2631  
 predictive modeling, 1068, 1070, 1319  
 predictor, 255  
 prefix code, 199  
 Prewitt mask, 2845  
 Price theorem, 162  
 Prim algorithm, 1734  
 primal feasible solution, 303  
 primal function, 313  
 primal graphical LASSO, 1736  
 primal method, 902, 935  
 primal problem, 312, 1844  
 primal variable, 303  
 primal–dual method, 903, 969  
 primal–dual problem, 311  
 primitive matrix, 39, 46, 49, 50, 905, 947, 1532, 1553, 1555  
 principal component, 2390  
 principal component analysis, 1629, 2223, 2373, 2383, 2411, 2654, 2747, 2770  
 principle of optimality, 1860, 1896  
 prior, 78, 184, 2227, 2232  
 privacy, 620, 903  
 privacy loss parameter, 629

- probabilistic graphical model, 85, 1643, 1647, 1682  
 probabilistic PCA, 2404  
 probability density function, 70, 77  
 probability mass function, 69  
 probability of error, 1105  
 probability simplex, 293, 326, 1883  
 probit model, 1324, 1346, 1365, 1461, 1462, 2484  
 probit regression, 2485, 2491  
 product of experts, 2816, 2831  
 profit function, 282, 292  
 projected Bellman equation, 1843  
 projected gradient method, 515  
 projection, 2171  
 projection gradient method, 499, 515, 540, 571, 579, 769  
 projection matrix, 2171  
 projection onto convex sets, 315, 323, 325, 423  
 projection pursuit, 1634, 2446  
 projection subgradient method, 499, 754  
 proper function, 263  
 proper random variable, 1084  
 proportionate LMS, 627  
 proposal distribution, 1334  
 protein folding, 101  
 prototypical network, 3136, 3137, 3144  
 proximal AVR algorithm, 831  
 proximal coordinate descent, 512, 573  
 proximal decentralized algorithm, 999  
 proximal EXACT diffusion, 1000  
 proximal gradient algorithm, 366, 507, 539  
 proximal LASSO, 541  
 proximal learning, 507  
 proximal logistic regression, 510, 2459  
 proximal operator, 341, 762  
 proximal point algorithm, 348, 360, 539  
 proximal policy optimization, 2074, 2087  
 proximal projection, 507  
 proximal SAGA algorithm, 802  
 proximal SVRG algorithm, 805  
 proximity operator, 341  
 pruning, 2334, 2335  
 pseudo-inverse, 21, 2171, 2210  
 pseudocount, 1997  
 pure distribution, 2325  
 Pythagoras relation, 321  
  
 $Q$ -function, 164, 1261  
 $Q$ -learning, 1982, 1996, 2043, 2106  
 QPSK, 107  
 QR decomposition, 18, 43, 2229  
 QR method, 18, 43, 2198, 2203  
 quadratic loss, 269, 2577, 2614, 2639  
  
 quadratic program, 304, 326  
 quantum mechanics, 43  
 quasi-Newton method, 421  
 query set, 3121  
 query variable, 1683  
  
 Rademacher complexity, 2678, 2685, 2701  
 Rademacher distribution, 2679  
 radial basis function, 153, 1841, 2594  
 Radon theorem, 2681  
 random forest, 2336, 2560, 2581  
 random partitioning, 2273  
 random reshuffling, 552, 652, 698, 782, 816, 818  
 random subsampling, 2186  
 random variable, 68, 71  
 random variable transformation, 1348  
 random vector, 93, 108  
 random walk, 102, 110  
 randomized algorithm, 118, 2186, 2200  
 randomized coordinate descent, 405, 429, 512, 573, 690  
 range space, 7  
 rank deficient, 8  
 Rao-Blackwell theorem, 1252, 1261  
 ratings matrix, 561  
 raw data, 621  
 Rayleigh distribution, 74, 114, 1095  
 Rayleigh–Ritz ratio, 3, 40, 1150, 2515  
 RBF kernel, 2594  
 RBM, 1749, 2802  
 re-parameterization trick, 2911  
 real-time recurrent learning, 3037  
 reasoning under uncertainty, 1647  
 receptive field, 2831, 2886  
 recommender system, 542, 561, 586, 2192, 2200, 2929  
 rectification layer, 2887  
 rectifier linear function, 2718, 2778, 2782, 2887  
 recurrent neural network, 2715, 2967, 3036  
 recursive least-squares, xxix, 2187  
 reduced-error pruning, 2335  
 reference input, 3062  
 region of convergence, 246  
 regression, 1121, 1169, 1244, 2165, 2198, 2728  
 regret, 390, 482, 513, 579, 633, 690, 737, 1998  
 regret analysis, 390, 482, 513, 576, 632, 690, 737  
 regularization, 376, 1258, 2174, 2221, 2225, 2226, 2230, 2242, 2461, 2504  
 regularized least-squares, 2243  
 REINFORCE algorithm, 2060, 2107  
 reinforcement learning, 215, 234, 1263, 1335, 1807, 1853, 1917, 1971, 2008, 2047  
 Relation network, 2786, 3112, 3136

- relation score, 2786, 3113
- relative entropy, 204, 232
- relative interior, 291
- relative-degree rule, 945
- relaxation method, 2518, 2553
- relaxation parameter, 365
- relevance, 3048
- relevance analysis, 3050, 3062
- relevance score, 3042, 3050
- ReLU, 2718
- Renyi divergence, 232
- Renyi entropy, 234
- replay buffer, 1992, 1996, 2105
- replication, 1482
- Representer theorem, 2613, 2637, 2638
- reproducing kernel Hilbert space, 2614, 2637, 2638
- Reptile algorithm, 3123, 3132, 3136
- resampling, 1390
- residual replacement, 1401
- residual resampling, 1391
- resolvent, 360
- responsibility score, 1288, 1289
- restricted Boltzmann machine, 111, 1111, 1749, 2769, 2797, 2802, 2820
- restricted isometry property, 50
- restricted strongly convex, 1002
- reward function, 1808
- RGB, 1299, 2299, 2856
- $\rho$ -norm, 34
- Riccati recursion, 1161, 1163, 1202
- ridge analysis, 2242
- ridge regression, 2226, 2242, 2610
- Riemann tensor, 225
- Riemannian geometry, 222, 234
- Riesz representation theorem, 2778
- right-stochastic, 1522
- RIP, 50
- risk, 375, 1054, 1092
- RKHS, 2637
- RLS algorithm, 2187, 2197
- RMSprop, 599, 607, 626
- RNN, 2715, 2967, 3036
- robotic swarm, 903
- robotics, 1957, 2107
- robust estimator, 1309
- robust least-squares, 2243, 2249
- robust PCA, 2412, 2416
- robust statistics, 1309, 1312
- robustness, 903
- root finding, 582
- root node, 1651, 2313
- RTRL, 3037
- rule of succession, 2352
- saddle point, 601, 857, 971, 976, 979, 1845
- saddle point problem, 311
- SAG algorithm, 806, 809, 834
- SAGA algorithm, 785, 789, 822
- saliency analysis, 3050
- saliency map, 3042, 3075
- sample mean estimator, 1142
- sample selection, 552
- sample space, 69, 109
- sampling, 1333, 1347, 2953
- sampling importance resampling filter, 1396
- sampling with replacement, 649, 651, 779, 782
- sampling without replacement, 649, 652, 782, 816, 818
- SARSA learning, 2026, 2063, 2106
- SARSA(0) algorithm, 1971, 1973, 2028
- SARSA( $\lambda$ ) algorithm, 1977, 2029
- Sauer lemma, 2521, 2673, 2683, 2688, 2690
- SBEED algorithm, 2105
- scheduling, 1771
- Schur algorithm, 255
- Schur complement, 11, 41, 146
- Schur matrix, 1851
- SCIgen, 1552
- scope, 1742
- score function, 181, 1230, 1456, 1458, 2050
- sea level, 2175
- secant equation, 422
- second law of thermodynamics, 111
- second-order moment, 72
- second-order stationarity, 855, 873
- seed, 2472
- seismic signal, 2243
- self-adjoint operator, 43, 2413
- self-loop, 904
- self-organizing map, 1112, 2290, 2310
- semi-martingale process, 721
- semi-supervised learning, 2274
- sensitivity, 629
- sensitivity analysis, 3042, 3046
- sensitivity factor, 2733, 2888, 3071
- sensitivity vector, 2917, 2948
- sentence analysis, 2988
- sentiment analysis, 2987, 2988, 3021
- separable data, 2588
- separating hyperplane theorem, 2516
- separating matrix, 1611
- separation theorem, 2516
- seq2seq, 2990
- sequence classification, 2987, 3021
- sequential data, 2967
- sequential importance sampling, 1389
- sequential Monte Carlo, 1380
- server, 621
- SGA, 551
- Shafer-Shenoy algorithm, 1795



- Shannon entropy, 234, 2353  
 shape parameter, 1096  
 shatter coefficient, 2523, 2683, 2688, 2690  
 shattering, 2662, 2689  
 short-term model, 878  
 shrinkage, 341, 343, 2225, 2228  
 Siamese network, 2785, 2786, 3101, 3136  
 sifting property, 70, 2284  
 sigma point, 1194  
 sigmoid function, 134, 1325, 2718, 2778  
 signal-to-noise ratio, 308  
 signature, 2785  
 significance level, 2183  
 similarity, 47, 2785  
 similarity score, 3141  
 simplex, 321, 324, 326, 521  
 singular value, 20  
 singular value decomposition, 20, 43, 52, 1638, 2196, 2211, 2392  
 singular vector, 20  
 sink node, 907  
 SIR filter, 1396  
 site function, 1354  
 skeleton, 1676  
 sketching, 2185, 2200  
 skewness, 1640  
 slack variable, 2534, 2552  
 Slater condition, 314  
 Slutsky theorem, 116, 1339  
 smooth function, 332, 379  
 smooth label, 2960  
 smooth maximum, 2100  
 smoother, 255  
 smoothing, 1181, 2213  
 smoothing filter, 1181, 2212  
 SNR, 1168  
 Sobel mask, 2845  
 social media, 1481, 1514  
 soft assignment, 2272  
 soft Bellman condition, 2033  
 soft Bellman equation, 2100  
 soft Bellman optimality equation, 2100  
 soft clustering, 1472  
 soft decision, 1060, 1062  
 soft label, 2960, 3092  
 soft learning, 2098  
 soft  $Q$ -learning, 2103  
 soft thresholding, 325, 341, 343, 349, 358, 932, 2234  
 soft-impute algorithm, 542  
 soft-margin SVM, 2530, 2533  
 softmax, 1988, 2047, 2486, 2720, 2730, 2736, 2769, 3045, 3066, 3101  
 softmax exploration, 1987  
 softmax layer, 2971, 3024  
 softmax policy, 1988, 2047  
 softmax regression problem, 2486  
 softplus, 2719, 2808, 3096  
 solitaire, 1957, 2107  
 SOM, 1112, 2290  
 source coding theorem, 198  
 source distribution, 2478  
 source node, 907  
 spam filtering, 1551, 2341, 2350  
 spanning tree, 1698  
 spark, 50, 2448  
 sparse coding, 2427  
 sparse dictionary learning, 2427  
 sparse PCA, 2399, 2412  
 sparse reward, 1997  
 sparse signal recovery, 2445, 2449  
 sparse vector, 2425  
 sparsity, 2242  
 spectrahedron, 543  
 spectral decomposition, 3  
 spectral factor, 253  
 spectral factorization, 252, 253, 255  
 spectral norm, 32  
 spectral theorem, 3, 42, 50, 192  
 speech processing, 2838, 2967  
 speech recognition, 1595  
 sphere packing problem, 2280  
 spherically invariant distribution, 156  
 spin glass, 1467  
 spin-glass energy function, 1796  
 square-root matrix, 22, 912  
 squared exponential kernel, 153, 2594  
 stabilizing solution, 1178, 1203  
 stacked autoencoders, 2797, 2830  
 standard deviation, 72  
 standard gradient policy, 2062  
 state, 2968  
 state estimator, 1882  
 state trajectory, 1382  
 state transition matrix, 1689  
 state transition probability, 1816  
 state value, 1827  
 state value function, 1807, 1821, 1825, 1853  
 state variable, 1519  
 state vector, 1159  
 state-action value function, 1807, 1821, 1833, 1853  
 state-space model, 1154, 1159, 1202  
 stationarity, 241, 243  
 stationary probability distribution, 1556  
 stationary random process, 241, 243  
 statistical inference, 1116  
 statistical learning theory, 2658  
 statistical mechanics, 99, 231  
 statistical physics, 1467, 1796  
 steady-state distribution, 1345  
 steepest descent, 396, 418

- Stein equation, 26  
 Stein lemma, 143, 159, 164, 165, 182, 1361  
 step size, 382  
 stochastic approximation, 549, 582  
 stochastic conjugate gradient, 574, 705  
 stochastic coordinate descent, 573, 764, 776  
 stochastic difference equation, 1961  
 stochastic Fletcher–Reeves, 574  
 stochastic game, 1893  
 stochastic gradient algorithm, 384, 547, 548, 683, 860  
 stochastic gradient TD, 2008  
 stochastic matrix, 45, 1522  
 stochastic mirror descent, 573, 756  
 stochastic optimization, 551  
 stochastic projection gradient, 571, 756, 776  
 stochastic proximal algorithm, 512, 569, 756, 775  
 stochastic risk, 377, 642, 683, 730  
 stochastic risk minimization, 377, 852  
 stochastic subgradient algorithm, 565, 730, 775  
 stochastic variational inference, 1460  
 streaming data, 552, 649, 653  
 strict saddle point, 857  
 strictly convex function, 265  
 strictly monotone function, 265  
 stride, 2843  
 strong duality, 314, 987  
 strong law of large numbers, 112, 121, 257  
 strongly connected graph, 905, 947, 1558  
 strongly convex function, 266  
 strongly monotone function, 267  
 structural risk minimization, 2550  
 Student  $t$ -distribution, 2182  
 stump, 2317, 2319  
 sub-Gaussianity, 1627  
 subdifferential, 272  
 subgradient, 272, 471  
 subgradient method, 471, 496  
 sublinear convergence, 392  
 sublinear rate, 497  
 submultiplicative property, 30  
 subset sum problem, 1734  
 successive projection method, 423  
 sufficient statistic, 187, 1227, 1228, 1251, 1252  
 sum-product algorithm, 1682, 1684, 1761  
 sun problem, 2355  
 super-Gaussianity, 1627  
 supervised learning, 1917, 1971, 2008, 2047  
 support function, 297  
 support set, 3101, 3121  
 support vector, 2533, 2539, 2544  
 support vector machine, 322, 473, 750, 1112, 2201, 2353, 2486, 2499, 2530, 2551, 2669, 3078  
 supporting hyperplane theorem, 2516  
 surrogate loss function, 2668, 2677, 2680  
 surrogate model, 3088  
 surrogate risk function, 2668, 2677  
 survival of the fittest, 1391  
 suspicious behavior, 3089  
 SVD, 20, 43, 52, 1638, 2211, 2392  
 SVM, 474, 2486, 2530, 2551  
 SVM for regression, 2540  
 SVRG algorithm, 793, 830  
 Sylvester equation, 27  
 Sylvester law of inertia, 13  
 symmetric distribution, 2698  
 symmetric matrix, 1  
 symmetrization, 2695  
 synaptic weight, 2514  
 synthetic image, 2960  
 systematic replacement, 1401  
 systematic resampling, 1402  
 tanh function, 2718  
 Tanner graph, 1793  
 target class, 3068  
 target distribution, 1336, 2478  
 target misclassification, 3066, 3070  
 target model, 3125  
 target policy, 1952, 1979, 2020  
 target tracking, 1170  
 target variable, 2540  
 targeted attack, 3068  
 Taylor series, 420, 807  
 Taylor theorem, 814  
 $t$ -distribution, 2183  
 TD learning, 1928, 2008, 2018, 2063, 2106  
 TD(0) algorithm, 1928, 2010  
 TD( $\lambda$ ) algorithm, 1940, 1958, 2014  
 TD-Gammon, 1957  
 telescoping sequence, 518  
 telescoping sum, 724  
 temporal difference learning, 1928, 1931, 1936  
 tensor, 1300, 2857  
 tensor decomposition, 873  
 terminal node, 2313  
 tessellation, 2280  
 test data, 2222  
 test error, 2661  
 text processing, 2551  
 text segmentation, 2341  
 Thompson sampling, 1997  
 Tikhonov regularization, 2242  
 time average, 243  
 time update, 1171, 1175, 1384  
 topic modeling, 174, 1440, 1472, 1677, 2435

- topology-preserving mapping, 2291  
 torque, 72  
 torus, 225  
 total relevance, 3055  
 total variation, 233, 500, 541, 587, 750  
 trace, 24, 47  
 Tracy–Singh product, 41  
 training data, 2167, 2222  
 training error, 2172, 2263  
 transfer learning, 2478, 2763, 2779, 3099  
 transferability, 3089, 3094  
 Transformer, 3037  
 transition probability, 1382, 1808  
 translation equivariance, 2886  
 translation invariance, 2839, 2886  
 tree, 1697, 2313  
 triangle inequality, 30  
 triangular factorization, 12  
 triangulated graph, 1795  
 trigamma function, 1500  
 TRPO, 2077, 2107, 2110  
 true class, 3045  
 true online TD( $\lambda$ ) algorithm, 1949, 1958, 2015  
 truncated Gaussian, 1426, 1469  
 trust region optimization, 2077  
 trust region policy optimization, 2074  
 turbo code, 1677  
 Turing machine, 3136  
 two timescale, 942  
 two-player game, 2943  
 two-point estimate, 433  
 type-I error, 1115  
 type-II error, 1115
- UDA algorithm, 983  
 UKF algorithm, 1194, 1203  
 unbiased estimator, 1140, 1213, 1237  
 uncertainty, 1647  
 uncertainty sampling, 2473  
 uncorrelated random variables, 92, 107  
 under-determined least-squares, 2195, 2211  
 undercomplete dictionary, 2427  
 underfitting, 1077, 2229, 2588, 2665  
 underflow, 1435, 2721  
 undirected graph, 904, 1378, 1643, 1740  
 unified decentralized algorithm, 983  
 unified distance matrix, 2305  
 uniform sampling, 552, 651, 779, 782  
 uniformly continuous function, 338  
 uninformative prior, 1273  
 uniquely decodable code, 232  
 unit-circle controllability, 1203  
 unitary matrix, 40  
 universal approximation theorem, 2777, 2778, 2797
- universal consistency, 2673  
 unlabeled data, 2473  
 unmixing matrix, 1611  
 unscented Kalman filter, 1194, 1203  
 unsupervised clustering, 1472  
 unsupervised learning, 1290, 2290, 2745, 2769  
 unsupervised method, 1609, 2383  
 untargeted attack, 3068  
 upper confidence bound, 1991  
 user–item matrix, 561
- VAE, 2905  
 validation, 1535, 1547  
 validation set, 2547  
 value function, 1821, 1825  
 value function approximation, 2008  
 value iteration, 1853, 1858, 1886  
 value vector, 1829  
 vanilla gradient, 2072  
 vanishing gradient problem, 584, 2743, 2768, 2778, 3004, 3050  
 vanishing step size, 392, 489, 514, 747  
 Vapnik–Chervonenkis bound, 2523, 2553, 2658, 2672, 2694  
 variable elimination method, 1686, 1691  
 variable step-size LMS, 627  
 variance, 71, 106  
 variance reduction, 779, 789  
 variance within, 2367  
 variance-reduced algorithm, 660, 779, 789, 816  
 variational autoencoder, 563, 1111, 2905  
 variational factor, 1411  
 variational inference, 234, 1070, 1110, 1258, 1405, 1467, 1711, 1723, 1727, 2907  
 VC dimension, 2553, 2662, 2690  
 vector estimation, 1131  
 vector quantization, 2306  
 vector space, 2637  
 velocity vector, 614  
 vertex, 904  
 video analysis, 2967  
 Viterbi algorithm, 1517, 1534, 1537, 1563, 1574, 1596, 1604, 1786, 1894  
 volatility model, 1401  
 von Neumann trace inequality, 47  
 Voronoi cell, 2283  
 Voronoi diagram, 2268, 2280  
 voting model, 1429
- Wasserstein GAN, 2962, 2964  
 Wasserstein distance, 2962  
 water filling, 308  
 weak classifier, 2562  
 weak convergence, 119  
 weak duality, 314, 327

- weak law of large numbers, 112, 117, 121, 164
- weak saddle point, 857
- weak union, 89
- web crawler, 1531
- web search, 1531, 1551
- weight matrix, 909
- weighted graph, 1734
- weighted least-squares, 2169, 2174, 2177, 2204, 2243
- weighted nearest neighbor rule, 2264, 2266
- Welch bound, 2448
- Weyl theorem, 37, 45
- white noise, 243, 1159
- white-box attack, 3068
- whitening, 1616
- whitening filter, 255, 1165
- wide-sense stationary process, 241
- Wiener filter, 1177, 1180
- Wiener process, 2416
- Wiener-Hopf technique, 1143
- winning neuron, 2293
- Wishart distribution, 2205
- Witness algorithm, 1894
- Wolfe conditions, 455, 468
- XNOR, 2517
- XOR, 2517, 2527, 2591, 2715, 2781
- Yahoo music dataset, 586
- Young inequality, 636
- zero-shot learning, 3136
- zero-sum game, 2940
- zeroth-order optimization, 425, 433, 585
- ZIP codes, 2885
- Zoutendijk condition, 461, 468, 709
- $z$ -spectrum, 246, 1180