**A three-step, “brute-force” approach towards  
optimized affine spatial normalization**

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**Supplemental Material**

**Supplementary material: detailed listing of subject IDs from all datasets**

**Dataset 1**: From the NIH Study of normal brain development (NIH, Bethesda, MD, USA), URL: https://www.bic.mni.mcgill.ca/nihpd\_info/, 500 subjects with the following IDs were used: 1001, 1002, 1003, 1004, 1005, 1007, 1008, 1009, 1010, 1011, 1012, 1013, 1014, 1015, 1016, 1017, 1018, 1019, 1020, 1021, 1023, 1024, 1025, 1026, 1027, 1028, 1029, 1030, 1031, 1032, 1033, 1034, 1035, 1036, 1037, 1038, 1039, 1040, 1041, 1042, 1043, 1044, 1045, 1046, 1047, 1051, 1052, 1053, 1054, 1055, 1056, 1057, 1058, 1059, 1061, 1062, 1063, 1064, 1065, 1066, 1067, 1068, 1069, 1070, 1071, 1072, 1073, 1074, 1075, 1076, 1077, 1078, 1079, 1080, 1081, 1082, 1083, 1084, 1085, 1086, 1087, 1088, 1089, 1090, 1091, 1092, 1093, 1094, 1095, 1096, 1097, 1098, 1099, 1100, 1102, 1103, 1104, 1105, 1106, 1107, 1108, 1109, 1110, 1111, 1112, 1113, 1114, 1115, 1116, 1117, 1118, 1119, 1121, 1122, 1123, 1124, 1125, 1126, 1127, 1128, 1129, 1130, 1131, 1132, 1133, 1134, 1136, 1137, 1138, 1139, 1140, 1141, 1142, 1143, 1144, 1145, 1146, 1147, 1148, 1149, 1150, 1151, 1153, 1154, 1155, 1157, 1158, 1159, 1160, 1161, 1162, 1163, 1164, 1165, 1166, 1167, 1168, 1169, 1170, 1171, 1172, 1173, 1174, 1175, 1176, 1177, 1178, 1179, 1180, 1181, 1182, 1183, 1184, 1185, 1186, 1187, 1188, 1189, 1190, 1191, 1192, 1193, 1194, 1195, 1196, 1197, 1199, 1200, 1201, 1202, 1203, 1204, 1205, 1206, 1207, 1208, 1209, 1210, 1211, 1213, 1215, 1216, 1217, 1218, 1219, 1220, 1221, 1222, 1223, 1224, 1225, 1226, 1227, 1228, 1229, 1230, 1231, 1232, 1233, 1234, 1235, 1236, 1237, 1238, 1239, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 1247, 1248, 1249, 1250, 1251, 1252, 1253, 1254, 1255, 1257, 1258, 1259, 1260, 1262, 1263, 1264, 1265, 1266, 1267, 1268, 1269, 1270, 1271, 1272, 1273, 1274, 1275, 1276, 1277, 1278, 1279, 1280, 1281, 1282, 1283, 1284, 1285, 1286, 1287, 1288, 1289, 1290, 1291, 1292, 1294, 1295, 1297, 1298, 1299, 1300, 1301, 1302, 1303, 1304, 1305, 1306, 1307, 1308, 1309, 1310, 1311, 1312, 1313, 1314, 1315, 1316, 1317, 1318, 1319, 1320, 1321, 1322, 1323, 1324, 1325, 1326, 1328, 1329, 1330, 1331, 1332, 1333, 1334, 1335, 1336, 1337, 1338, 1339, 1340, 1341, 1342, 1343, 1344, 1346, 1348, 1349, 1350, 1351, 1352, 1353, 1354, 1355, 1356, 1357, 1358, 1359, 1360, 1361, 1362, 1363, 1364, 1365, 1366, 1367, 1368, 1369, 1370, 1371, 1372, 1373, 1374, 1375, 1376, 1377, 1378, 1379, 1380, 1381, 1382, 1383, 1384, 1385, 1386, 1387, 1388, 1389, 1390, 1391, 1392, 1393, 1394, 1395, 1396, 1397, 1398, 1399, 1400, 1401, 1402, 1403, 1404, 1405, 1406, 1407, 1408, 1409, 1410, 1411, 1413, 1414, 1415, 1416, 1417, 1418, 1419, 1420, 1421, 1422, 1423, 1424, 1425, 1426, 1427, 1428, 1429, 1430, 1431, 1432, 1433, 1435, 1436, 1437, 1438, 1439, 1441, 1443, 1444, 1445, 1446, 1447, 1448, 1450, 1451, 1452, 1453, 1454, 1455, 1457, 1458, 1459, 1462, 1463, 1464, 1465, 1466, 1469, 1470, 1471, 1472, 1473, 1475, 1476, 1477, 1478, 1479, 1480, 1481, 1482, 1483, 1484, 1485, 1486, 1487, 1488, 1489, 1490, 1491, 1494, 1495, 1496, 1498, 1499, 1500, 1501, 1502, 1503, 1504, 1505, 1506, 1507, 1508, 1510, 1511, 1513, 1514, 1515, 1516, 1517, 1518, 1519, 1521, 1522, 1525, 1528, 1531, 1532, 1533, 1534, 1538, 1542, 1543, 1546, 1547, 1550, 1551, 1552, 1553, 1555.

Please note: this manuscript reflects the views of the author and may not reflect the opinions or views of the Brain Development Cooperative Group Investigators or the NIH. The contract numbers for the NIH MRI study of normal brain development were N01-HD02-3343, N01-MH9-0002, and N01-NS-9-2314, 2315, 2316, 2317, 2319 and 2320. A listing of the participating sites and a complete listing of the study investigators can be found on p6 of the study protocol available at the homepage provided above.

**Dataset 2**: From the Cincinnati MR Imaging of NeuroDevelopment (C-MIND) study, URL: https://research.cchmc.org/c-mind/, 235 subjects with the following IDs were used: 00F011\_C, 00F012\_C, 00M002\_U, 00F001\_C, 00F015\_C, 00M003\_C, 00M016\_C, 00M018\_C, 00M042\_C, 00M065\_C, 00F037\_C, 00F020\_C, 00M002\_C, 00M048\_C, 00F007\_C, 00F036\_C, 00M050\_C, 00M055\_C, 00M034\_C, 01F011\_C, 01M001\_C, 01F043\_C, 01F032\_C, 01F033\_C, 01F038\_C, 01F020\_C, 01M005\_C, 01F037\_C, 01M035\_C, 01F015\_C, 01M029\_C, 01F014\_C, 01F036\_C, 01M014\_C, 01M002\_U, 01M008\_C, 02F003\_C, 01F044\_C, 02F023\_C, 02M005\_U, 02F031\_C, 02M034\_C, 02F020\_C, 02F029\_C, 02M022\_C, 02M015\_C, 02F011\_C, 02F043\_C, 02M018\_C, 02F028\_C, 02F021\_C, 02F022\_C, 02F044\_C, 02F035\_C, 02F016\_C, 03M033\_C, 03F011\_C, 03M035\_C, 02M021\_C, 03F025\_C, 03M005\_C, 03M017\_C, 03F033\_C, 03F026\_C, 03M011\_C, 03M034\_C, 03F034\_C, 03F001\_C, 03F003\_C, 03F017\_C, 03F023\_C, 04F022\_C, 03M001\_C, 03M019\_C, 04F019\_C, 04M005\_C, 04F001\_C, 04F007\_C, 04M002\_C, 04F018\_C, 05F017\_C, 05M004\_C, 05F003\_C, 05F016\_C, 05M003\_C, 05F015\_C, 05M002\_C, 05F006\_C, 05M001\_C, 05F002\_C, 05F012\_C, 06F014\_C, 06F010\_C, 06M018\_C, 06M011\_C, 06F003\_C, 06F004\_C, 06F016\_C, 06M007\_C, 06F015\_C, 06M014\_C, 06M002\_C, 06M008\_C, 07F004\_C, 07M005\_C, 07F001\_C, 07F012\_C, 07M007\_U, 07F003\_U, 07M008\_U, 07M006\_U, 07F002\_U, 07M014\_C, 07M009\_C, 07F010\_C, 07M002\_U, 07F002\_C, 07M017\_C, 07F003\_C, 08F020\_C, 07M005\_U, 07M008\_C, 08F013\_C, 07M010\_C, 08M008\_C, 07M003\_C, 08M002\_U, 08F004\_C, 08F010\_U, 08F016\_C, 08M011\_C, 08F007\_U, 08F005\_U, 08F010\_C, 08M002\_C, 08M012\_C, 08F005\_C, 08M003\_U, 09M005\_C, 08F003\_C, 08F006\_C, 08F008\_C, 08F014\_C, 08F019\_C, 08F006\_U, 08F009\_U, 08F017\_C, 08F021\_C, 08M004\_U, 08M010\_C, 08M017\_C, 08F008\_U, 08F015\_C, 08F002\_U, 09F002\_C, 09F004\_U, 09M003\_U, 09M007\_C, 09M004\_C, 09F010\_U, 09F002\_U, 09F006\_U, 09M004\_U, 09M014\_C, 09M021\_C, 09F017\_C, 09M002\_U, 09M005\_U, 09F005\_U, 09F009\_C, 09M013\_C, 09F007\_U, 09F009\_U, 09M001\_U, 09F012\_C, 10F002\_C, 10F005\_C, 10F001\_C, 10M002\_C, 10F006\_C, 10M004\_C, 11F007\_C, 11M002\_C, 11M005\_C, 11M001\_C, 11F004\_C, 11F008\_C, 11M007\_C, 12M002\_C, 12F007\_C, 12M008\_C, 12F001\_C, 12M007\_C, 12F004\_C, 12F005\_C, 12M003\_C, 13F005\_C, 13F003\_C, 13F004\_C, 13F007\_C, 13M003\_C, 13M018\_C, 13M015\_C, 13M001\_C, 13M004\_C, 14F006\_C, 14F003\_C, 14F002\_C, 14F001\_C, 14M012\_C, 14M006\_C, 14F009\_C, 14M014\_C, 15M022\_C, 15M015\_C, 15F001\_C, 15F002\_C, 15M013\_C, 16F007\_C, 15M005\_C, 16M010\_C, 16F005\_C, 16M002\_C, 16M007\_C, 16M014\_C, 17F002\_C, 17M004\_C, 17M010\_C, 17F004\_C, 17M003\_C, 18M001\_C, 18F004\_C, 18F011\_C, 18F002\_C, 18F012\_C.

Please note: data presented in this work was obtained from the database known as Cincinnati MR Imaging of NeuroDevelopment (C-MIND), provided by the Pediatric Functional Neuroimaging Research Network at https://research.cchmc.org/c-mind/. This Network and the resulting C-MIND database was supported by contract from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (HHSN275200900018C).

**Dataset 3:** From *The 1000 Functional Connectomes Project*, URL: <http://www.nitrc.org/ir/app/action/ProjectDownloadAction/project/fcon_1000>, 783 subjects with the following IDs were used: from Ann Arbor: 306, 4111, 4619, 5580, 7921, 11043, 13636, 13959, 15846, 16960, 18546, 18698, 20317, 26099, 28433, 30250, 30421, 33437, 34781, 38614, 39635, 39923, 42616, 43409, 45569, 45660, 46727, 47191, 47659, 49687, 50859, 51248, 53269, 53959, 56028, 56686, 57025, 57196, 59573, 62819, 64831, 64969, 66506, 70106, 72215, 72416, 73168, 73812, 75922, 78151, 82334, 85257, 86367, 87745, 90127, 90950, 96621, 97518, 98007, 99692. From Atlanta: 354, 368, 6870, 7145, 15817, 18219, 18702, 24972, 26938, 32093, 49816, 53122, 55652, 58250, 59806, 60499, 61442, 61902, 71337, 72096, 72971, 75153, 76280, 81596, 86323, 91049. From Baltimore: 17017, 19738, 23750, 23927, 29158, 30072, 31837, 37548, 52358, 54257, 54329, 73823, 76160, 77572, 80221, 81887, 85922, 86414, 90658, 90893, 91622, 94042, 96234. From Bangor: 31, 1903, 3557, 4097, 14388, 27519, 36736, 46870, 48632, 61418, 61908, 63767, 66585, 68050, 73082, 77520, 81464, 82625, 87568, 91556. From Beijing: 440, 1018, 1244, 2403, 4050, 4191, 5267, 6880, 6899, 7144, 7716, 7717, 8001, 8251, 8455, 8816, 8992, 10186, 10277, 10869, 10973, 11072, 11344, 12220, 14238, 15441, 16091, 16943, 17093, 17159, 17315, 17586, 17603, 17642, 17688, 18326, 18758, 18960, 19642, 19974, 20127, 20246, 20765, 20948, 21115, 22201, 22595, 22661, 22715, 22890, 26713, 28206, 28403, 28698, 28792, 28801, 28907, 28965, 29590, 29785, 30272, 30310, 30556, 30616, 30988, 31058, 31729, 32517, 32587, 33747, 33943, 33991, 34895, 34943, 35309, 35776, 35806, 36580, 36942, 37602, 38602, 39725, 40037, 40427, 41170, 41621, 42512, 42555, 42843, 43290, 44573, 45552, 46058, 46259, 46541, 48501, 48563, 48676, 49782, 50498, 50873, 50972, 50985, 51015, 51586, 52044, 52259, 53572, 53998, 54890, 55301, 55541, 55736, 55856, 56136, 56659, 56703, 56757, 58029, 58332, 58614, 59347, 59448, 61961, 62083, 62438, 62843, 62966, 64923, 65467, 65659, 66158, 66528, 66781, 66889, 67435, 67844, 68012, 68597, 69518, 69696, 71693, 72654, 72678, 73098, 73245, 73279, 73421, 74386, 74587, 75878, 76377, 77440, 80163, 80551, 80569, 80927, 81062, 81074, 82352, 82426, 82714, 82826, 82980, 83430, 83624, 83728, 85030, 85543, 85818, 86114, 87089, 87776, 88306, 88947, 89088, 89238, 89592, 89742, 89941, 91145, 91399, 91952, 92430, 92490, 92544, 92602, 92799, 92859, 93689, 93856, 94536, 95575, 95755, 96163, 97442, 98353, 98617. From Berlin: 6204, 6716, 12855, 18913, 23506, 27536, 27711, 27797, 28092, 33248, 38279, 40143, 47066, 47791, 49134, 54976, 57028, 67166, 75506, 77281, 85681, 86111, 91116, 91966, 95068, 97162. From Cambridge: 156, 294, 1361, 2591, 2953, 4187, 4270, 4491, 4665, 5306, 5453, 6037, 6272, 6987, 7413, 7798, 7902, 8204, 8588, 8723, 8947, 9015, 9397, 9633, 10268, 10619, 11388, 12346, 13093, 13187, 13216, 13902, 14183, 14194, 14278, 15172, 15258, 15432, 15905, 16122, 16390, 16846, 17584, 17737, 17772, 18295, 18449, 19717, 20389, 20543, 20563, 21755, 23780, 23869, 24670, 24757, 25044, 25058, 25099, 26348, 27065, 27230, 27613, 27796, 29044, 29425, 29800, 31522, 34586, 34741, 35430, 35512, 37374, 39053, 39065, 39142, 39737, 40635, 41567, 41773, 41814, 42146, 42253, 43304, 43358, 45344, 45354, 45604, 47162, 47231, 47278, 47498, 49259, 49998, 50272, 50454, 50953, 51050, 51172, 51512, 51671, 52036, 52300, 52442, 53059, 53107, 53193, 53296, 53615, 54846, 55114, 55660, 55874, 57221, 58360, 58470, 58682, 58874, 59434, 59729, 60578, 60797, 61185, 61209, 61436, 61753, 62383, 62424, 62732, 62908, 63412, 63661, 64308, 64985, 65373, 65682, 66351, 67117, 68101, 68425, 69287, 69315, 69397, 71849, 72068, 73317, 73399, 73477, 76631, 76745, 77337, 77435, 77598, 77989, 78547, 78552, 78614, 80557, 81289, 81524, 81562, 82113, 82213, 82435, 83409, 83683, 84064, 84256, 84504, 84845, 86115, 86637, 87846, 88445, 88464, 88853, 89107, 89435, 89894, 90059, 90674, 90681, 90699, 92288, 92393, 92440, 93269, 93488, 93609, 94304, 95187, 95644, 95959, 98528, 98624, 99085, 99330, 99462. From Cleveland: 2480, 7835, 12330, 13495, 17946, 18011, 18566, 19005, 20003, 22736, 22935, 26557, 28596, 34189, 46075, 46739, 47482, 50092, 58811, 61868, 64706, 65858, 67936, 75398, 76139, 80263, 82518, 85091, 92232, 97844, 99664. From ICBM: 448, 5208, 10582, 16607, 26183, 28808, 32549, 35262, 40217, 44077, 49215, 55114, 59914, 68850, 77431, 85442, 87217, 93262, 94945, 98802. From Leiden: 1553, 1787, 4484, 8518, 9796, 10481, 12255, 13537, 18456, 19281, 28473, 30943, 36743, 38454, 39335, 40907, 52853, 52922, 56299, 57187, 58194, 64642, 66131, 68050, 72247, 86034, 87320, 92061, 93194, 97690, 99856. From Milwaukee: 917, 9931, 14692, 16666, 17004, 17987, 18955, 21350, 23607, 24237, 28782, 30157, 36386, 39259, 44912, 45019, 45852, 46312, 49975, 50771, 51182, 53971, 55176, 56084, 56108, 56333, 56582, 58677, 58967, 59359, 61779, 63196, 64463, 67948, 73547, 75919, 76042, 76378, 77073, 84314, 87784, 87910, 91468, 93170, 98971, 99479, . From Munich: 9035, 26223, 26670, 28697, 28902, 31272, 36052, 50162, 64202, 66933, 70942, 72095, 74607, 81737, 96591, 96752. From Newark: 13411, 32580, 36023, 41006, 43517, 49705, 53422, 54933, 55760, 58526, 59397, 59799, 62985, 71042, 71743, 76647, 78225, 86204. From New York: 1912, 2503, 3951, 4856, 5208, 7578, 8595, 9539, 10011, 10582, 12486, 13384, 14299, 14465, 15213, 15758, 16607, 17078, 17109, 18638, 19579, 20676, 20691, 20732, 21212, 22349, 22608, 23844, 24528, 26267, 27123, 28795, 28808, 29216, 29353, 29935, 30247, 30623, 30860, 31554, 31671, 33062, 33581, 35262, 37864, 38088, 41546, 44395, 44515, 44979, 45217, 46856, 47087, 47633, 48803, 48830, 50559, 51309, 51677, 53461, 53710, 54828, 56734, 59796, 63915, 69779, 73035, 77203, 77903, 84371.

**Dataset 4:** From *The Information eXtraction from Images study*, URL: ‑[http://brain‑development.org/ixi-dataset/](http://braindevelopment.org/ixi-dataset/), 563 subjects with the following IDs were used: 002, 012, 013, 014, 015, 016, 017, 019, 020, 021, 022, 023, 024, 025, 026, 027, 028, 029, 030, 031, 033, 034, 035, 036, 037, 038, 039, 040, 041, 042, 043, 044, 045, 046, 048, 049, 050, 051, 052, 053, 054, 055, 056, 057, 058, 059, 060, 061, 062, 063, 064, 065, 066, 067, 068, 069, 070, 071, 072, 073, 074, 075, 076, 077, 078, 079, 080, 083, 084, 085, 086, 087, 089, 090, 091, 092, 093, 094, 095, 096, 097, 098, 099, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 118, 119, 120, 121, 122, 123, 126, 127, 128, 129, 130, 131, 132, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 148, 150, 151, 153, 154, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 188, 189, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 216, 217, 218, 219, 221, 222, 223, 224, 225, 226, 227, 229, 230, 231, 232, 233, 234, 236, 237, 238, 239, 240, 241, 242, 244, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 274, 275, 276, 277, 278, 279, 280, 282, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 324, 325, 326, 327, 328, 329, 330, 331, 332, 334, 335, 336, 338, 342, 344, 348, 350, 351, 353, 354, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 367, 368, 369, 370, 371, 372, 373, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 458, 459, 460, 461, 462, 463, 464, 465, 467, 468, 469, 470, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 510, 511, 512, 515, 516, 517, 518, 519, 521, 522, 523, 524, 525, 526, 527, 528, 531, 532, 533, 534, 535, 536, 537, 538, 539, 541, 542, 543, 544, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 558, 559, 560, 561, 562, 563, 565, 566, 567, 568, 569, 571, 572, 573, 574, 575, 576, 577, 578, 579, 582, 584, 585, 586, 587, 588, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 603, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 616, 617, 618, 619, 621, 622, 625, 626, 627, 629, 630, 631, 632, 633, 634, 635, 636, 639, 640, 641, 642, 644, 646, 648, 651, 652, 653, 662.