

CerebroMatic: a versatile toolbox for spline-based MRI template creation

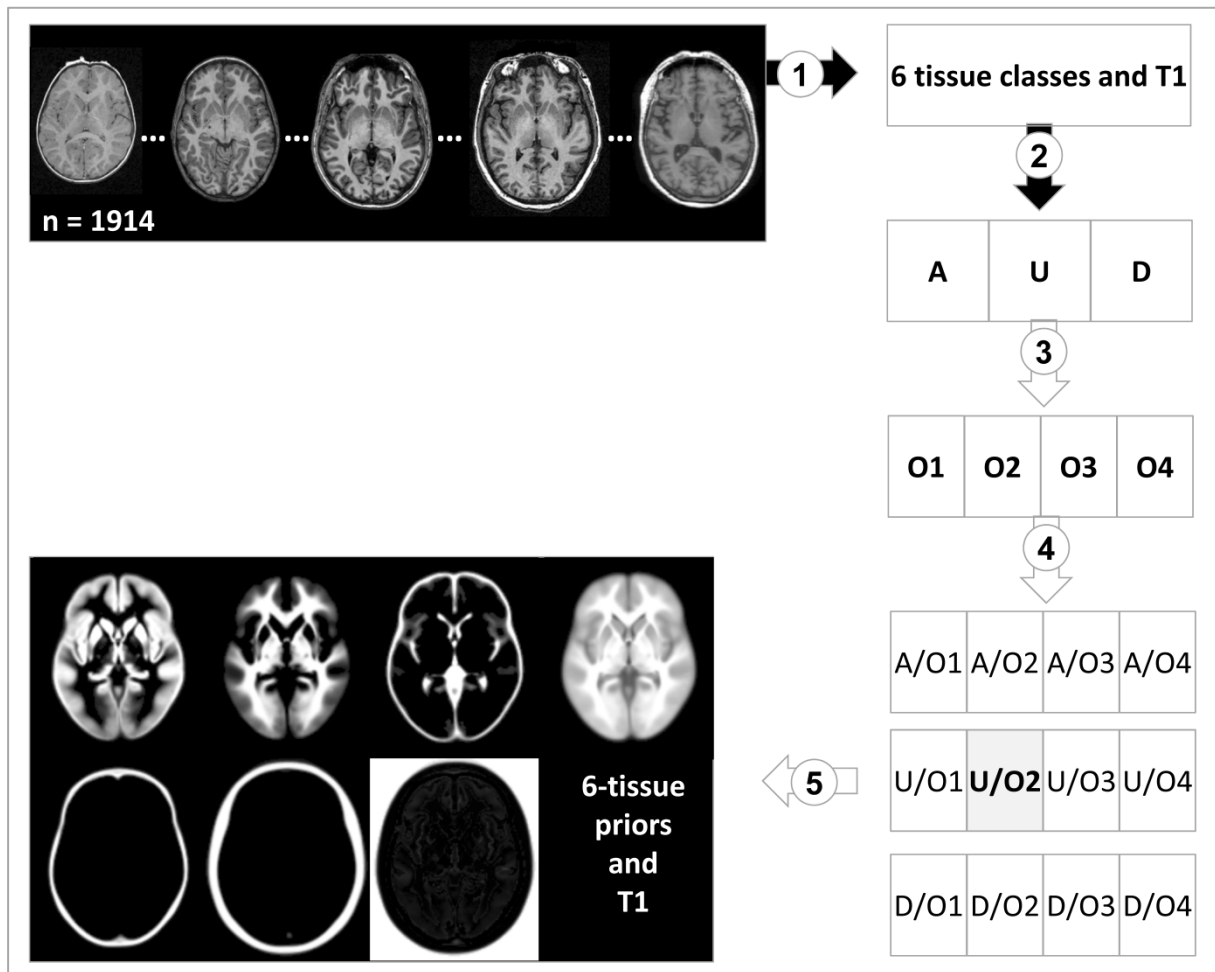
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Supplementary Material S1

Supplementary Figure 1: overview of the data processing and analysis pipeline

The complete dataset of 1914 images (covering the age range from 13 months to 75 years) is segmented into 6 tissue classes [step 1], applying three different spatial normalization approaches: affine only (A), unified segmentation (U), and DARTEL (D) [step 2]. In the multivariate adaptive regression spline analysis stage, four data processing options are evaluated (O1-O4) [step 3], resulting in a total of 12 datasets which were compared with regard to their performance [step 4]. Following the identification of the best-performing approach (U/O2, shaded), the statistical parameters determined at each voxel can be used to generate a 6-class tissue prior and a matching T1 dataset [step 5].

Supplementary material: CMIND authorship consortium names and affiliations

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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: <http://pediatricmri.nih.gov/nihpd/info/index.html>, subjects with the following IDs were

used: 1001, 1002, 1003, 1004, 1005, 1007, 1008, 1009, 1010, 1011, 1012, 1013, 1014, 1015, 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, 1055, 1056, 1057, 1058, 1059, 1061, 1062, 1063, 1064, 1065, 1066, 1067, 1068, 1069, 1070, 1071, 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, 1104, 1105, 1106, 1107, 1108, 1109, 1110, 1111, 1112, 1113, 1114, 1116, 1118, 1119, 1121, 1122, 1123, 1124, 1125, 1126, 1127, 1128, 1129, 1130, 1131, 1132, 1133, 1134, 1136, 1138, 1139, 1140, 1141, 1142, 1143, 1144, 1145, 1146, 1147, 1148, 1149, 1150, 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, 1186, 1187, 1188, 1189, 1190, 1191, 1192, 1193, 1194, 1195, 1196, 1197, 1199, 1200, 1201, 1202, 1203, 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, 1244, 1245, 1246, 1247, 1248, 1249, 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, 1280, 1281, 1282, 1284, 1285, 1287, 1288, 1289, 1290, 1291, 1292, 1294, 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,

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Dataset 2: From Cincinnati MR Imaging of NeuroDevelopment (C-MIND),

URL: <https://research.cchmc.org/c-mind/>, subjects with the following IDs were used:

00M034_C, 01F011_C, 01F014_C, 01F015_C, 01F020_C, 01F032_C, 01F033_C, 01F036_C, 01F037_C, 01F043_C, 01F044_C, 01M001_C, 01M002_U, 01M005_C, 01M008_C, 01M029_C, 01M035_C, 02F003_C, 02F011_C, 02F016_C, 02F020_C, 02F021_C, 02F022_C, 02F023_C, 02F028_C, 02F029_C, 02F031_C, 02F035_C, 02F043_C, 02F044_C, 02M015_C, 02M018_C, 02M021_C, 02M022_C, 02M034_C, 03F001_C, 03F003_C, 03F011_C, 03F017_C, 03F023_C, 03F025_C, 03F026_C, 03F033_C, 03F034_C, 03M001_C, 03M005_C, 03M011_C, 03M017_C, 03M019_C, 03M033_C, 03M034_C, 03M035_C, 04F001_C, 04F018_C, 04F019_C, 04F022_C, 04M005_C, 05F002_C, 05F003_C, 05F006_C, 05F012_C, 05F015_C, 05F016_C, 05F017_C, 05M001_C, 05M002_C, 05M003_C, 05M004_C, 06F004_C, 06F010_C, 06F014_C, 06F015_C, 06F016_C, 06M002_C, 06M007_C, 06M008_C, 06M011_C, 06M014_C, 06M018_C, 07F001_C, 07F002_C, 07F002_U, 07F003_C, 07F003_U, 07F004_C, 07F010_C, 07F012_C, 07M002_U, 07M003_C, 07M005_C, 07M005_U, 07M006_U, 07M007_U, 07M008_C, 07M008_U, 07M009_C, 07M010_C, 07M014_C, 07M017_C, 08F002_U, 08F003_C, 08F004_C, 08F005_C, 08F005_U, 08F006_C, 08F006_U, 08F007_U, 08F008_C, 08F008_U, 08F009_U, 08F010_C, 08F010_U, 08F013_C, 08F014_C, 08F015_C, 08F016_C, 08F017_C, 08F019_C, 08F020_C, 08F021_C, 08M002_C, 08M002_U, 08M003_U, 08M004_U, 08M008_C, 08M010_C, 08M011_C, 08M012_C, 08M017_C, 09F002_C, 09F002_U, 09F004_U, 09F005_U, 09F006_U, 09F007_U, 09F009_C, 09F009_U, 09F010_U, 09F012_C, 09F017_C, 09M001_U, 09M002_U, 09M003_U, 09M004_C, 09M004_U, 09M005_C, 09M005_U, 09M007_C, 09M013_C, 09M014_C, 09M021_C, 10F001_C, 10F002_C, 10F005_C, 10F006_C, 10M002_C, 10M004_C, 11F004_C, 11F007_C, 11F008_C, 11M001_C, 11M002_C, 11M005_C, 11M007_C, 12F001_C, 12F004_C, 12F005_C, 12F007_C, 12M002_C,

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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,

subjects with the following IDs were used: from Ann Arbor : 00306, 04111, 04619, 07921, 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, 51248, 53269, 53959, 56028, 56686, 57025, 59573, 62819, 64831, 64969, 70106, 72215, 73812, 75922, 78151, 82334, 85257, 86367, 90950, 96621, 97518, 98007, 99692; from Atlanta: 00354, 00368, 06870, 07145, 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: 00031, 01903, 03557, 04097, 14388, 27519, 36736, 46870, 48632, 61418, 61908, 63767, 66585, 68050, 73082, 77520, 81464, 82625, 87568, 91556; from Beijing: 00440, 01018, 01244, 02403, 04050, 04191, 05267, 06880, 06899, 07144, 07716, 07717, 08001, 08251, 08455, 08816, 08992, 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,

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93488, 93609, 94304, 95187, 95644, 95959, 98528, 98624, 99085, 99330, 99462; from Cleveland: 02480, 07835, 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: 00448 , 05208 , 10582 , 16607 , 26183 , 28808 , 32549 , 35262 , 40217 , 44077 , 49215 , 55114 , 59914 , 68850 , 77431 , 85442 , 94945 , 98802 , from Leiden: 01553, 01787, 04484, 08518, 09796, 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: 00917, 09931, 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 Munchen: 09035, 26223, 26670, 28697, 28902, 31272, 36052, 50162, 64202, 66933, 70942, 72095, 74607, 81737, 96591, 96752, from Newark: 32580, 36023, 41006, 43517, 49705, 53422, 54933, 55760, 58526, 59397, 59799, 62985, 71042, 71743, 76647, 78225, 86204; from New York: 01912, 02503, 03951, 04856, 05208, 07578, 08595, 09539, 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, 33062, 33581, 35262, 37864, 38088, 41546, 44395, 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 IXI-Dataset, Biomedical Image Analysis Group (Imperial College, London, UK), URL: <http://biomedic.doc.ic.ac.uk/brain-development/index.php?n=Main.Datasets>,

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, 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, 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, 238, 239, 240, 241, 242, 244, 246, 247, 248, 249, 250, 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, 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, 449, 450, 451, 452, 453, 454, 455, 456, 458, 459, 460, 461, 463, 465, 467, 468, 469, 470, 473, 474, 475, 477, 478, 479,

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