Question 1- Colour Correlogram

The image is first quantised to 64 levels, then an iteration is performed through all pixels to find another pixel of the same quantised colour at a distance D. The distance D vector is taken as D=[1,3,5,7]. We then measure similarity between the colour correlograms of 2 images using the formula:

$$|I - I'|_\gamma \equiv \frac{1}{m} \sum_{i \in [m], k \in [d]} \frac{|\gamma_{C_i}^{(k)}(I) - \gamma_{C_i}^{(k)}(I')|}{1 + \gamma_{C_i}^{(k)}(I) + \gamma_{C_i}^{(k)}(I')}$$

The correlogram vector is of the form [(64x4)] X 1

[0.035399684295965066, 0.06300137933781826, 0.015496387330010308, 0.011945961826701391, 0.019250974748656766, 0.019011955920944523, 0.021486796699548356, 0.004516459931979225, 0.01824012428979041, 0.007429501894722165, 0.05486478007778071, 0.0020764760657500957, 0.03034543200163296, 0.0093565911931521, 0.013101219493977223, 0.0186833503284019, 0.026217377664686462, 0.012996648756853118, 0.011482862848008923, 0.017762086634365928, 0.0107658063648722, 0.01827000164325444, 0.022129159799025, 0.008649493827836731, 0.01795130987297145, 0.0025993297513706238, 0.011129314165351234, 0.044407706365370156, 0.009700180757988458, 0.01685082735371301, 0.013509543324652302, 0.033373003819321685, 0.0128572211073531, 0.00891341045010233, 0.011393230787616834, 0.015103002176067243, 0.010691112981212125, 0.014361047898377161, 0.007100851006617834, 0.008649493827836731, 0.011228905343564667, 0.006901668650190966, 0.005756370100736477, 0.0031321425548124946, 0.05140896619377455, 0.015909690719596057, 0.011836411530666613, 0.005602003774505654, 0.0050990683245278135, 0.006513263055158574, 0.01212024638574901, 0.006737343206138, 0.004491562137425867, 0.0032964679988646607, 0.05027362676214141, 0.006154734813590212, 0.0001344480905881357, 0.01253354977816065, 0.010043770322824804, 0.0001344480905881357, 0.05767325130339954, 0.0013843173771667305, 0.0001742845618735025, 0.0003884055950323920, 0.030410803989215678, 0.08679903957256062, 0.014512943644543511, 0.0081374099959927558, 0.016848454056003083, 0.01764334707323669, 0.018651304198182398, 0.00303206614821067, 0.016569831761302643, 0.006105106163289054, 0.05346270148899032, 0.0013931114735022004, 0.026149521834973655, 0.007465438543297085, 0.010866269493317163, 0.015061993460570848, 0.02183087626711683, 0.011194060428258856, 0.008325889747519032, 0.0146850338853879, 0.008284915880651321, 0.015094772554065017, 0.00673610313051816, 0.016127313999131355, 0.0025403794579813, 0.008407837481254456, 0.05431495791983873, 0.00758016537052678, 0.01397208860188714, 0.016659974268411606, 0.03777790525203026, 0.009374820739332454, 0.0068918044071491205, 0.010563062878496095, 0.01240686887543125, 0.0099892874234813, 0.0114153193093445, 0.005785510001720903, 0.007612944464020848, 0.010726958345966943, 0.004392398528218702, 0.0056298093076235398, 0.0025403797457983, 0.06523859082677068, 0.0159961976251546675, 0.010874464266690705, 0.006309975497627613, 0.004015438953035754, 0.0052200706389464648, 0.010710568799219857, 0.007080284194740594, 0.003892517352462 6185, 0.0025403797457983, 0.06645961205942849, 0.004949643117619583, 0.00010653205385605062, 0.012070901179227888, 0.009448573699694335, 9.01425071089659e-05, 0.08099714002409264, 0.0011800473657900 99, 0.0003195961615681518, 0.0003769595751829483], [0.025708606982371242, 0.09624524714828897, 0.013070342205323195, 0.009473297614932596, 0.01718587970964397, 0.01821206360179744 2, 0.017293899066712755, 0.0027977013480815762, 0.015976062910473557, 0.004655634289664708, 0.0529510888351925, 0.013934497061873488, 0.024315157276183892, 0.006653992395437262, 0.009430089872105082, 0.014388178361562393, 0.019011406844106463, 0.0098081576218458 35, 0.007129277566539924, 0.01302713446249568, 0.007064465952298652, 0.013178361562391981, 0.018363290701693742, 0.005887054960248877, 0.01636493259592119, 0.0024844452125820948, 0.00787461113031455 3, 0.05806040442447286, 0.006978050466643623, 0.013329588662288281, 0.01847131005876253, 0.03990235050120982, 0.008101451780159004, 0.00730210853784 9982, 0.00910603180089 8721, 0.012821897684064984, 0.010034998271690286, 0.011428447977877636, 0.005294740753543 0345, 0.007075267888005531, 0.00932207051503 6295, 0.00440718976840 6499, 0.006103093674 38645, 0.0023980292 7269270653, 0.0688299343242309, 0.01533874870376 7715, 0.0112988247493 95092, 0.006870031109574836, 0.004255962668510197, 0.00455841686 83027995, 0.009246456965088143, 0.00738852402350 5012, 0.004018320082958866, 0.002786899412374 6976, 0.07336674732111995, 0.00486087106809 5403, 9.721742136190805e-05, 0.01167689249913 5845, 0.010801935706878672, 2.16038714135734 5e-05, 0.08258079847908745, 0.00124222260629 10474, 0.00025924645696508814, 0.0004644832353957829], [0.025754250165590867, 0.10112082288920347, 0.013740795095912828, 0.008402924789277504, 0.0162733612997909, 0.01750717560424432, 0.0167928620 5956076, 0.0027793290647687573, 0.016065560995882956, 0.00411704352117615, 0.05388521630712885, 0.0012727768614361598, 0.02359832201254 5945, 0.0062080340792498405, 0.009428938789822981, 0.01215631777861475, 0.01810460147797966, 0.00941595127082 8733, 0.00632492175019806, 0.01290959388028105, 0.00737691078 8732029, 0.012883618842292556, 0.017637050794186787, 0.006182059041261348, 0.0151174721093029 6, 0.00210397807707 7938, 0.009117238333961063, 0.05813213501824747, 0.00706521033287 0111, 0.013013494032235022, 0.018143564034962402, 0.04235229944023793, 0.008182136966375313, 0.00701326025689 3126, 0.009156200890943803, 0.01258490590542 4887, 0.01062379053729366, 0.011909554917724068, 0.0055456706105432 68, 0.0072730106367780 56, 0.009130225852955 31, 0.00490928217982518 8, 0.00590923114238217 1, 0.002688416431809031 6, 0.06706754808628908, 0.015623985350078574, 0.011844617322752835, 0.00609114640830162 2, 0.00423393119212436 8, 0.004298868787095601, 0.00944192630881722 7, 0.00842889982726599 7, 0.003987168331233685, 0.003389742457498344, 0.07434055872306713, 0.005324882787641077, 7.792511396547918e-05, 0.013078431627206255, 0.011143291297063523, 7.792511396547918e-05, 0.07944465368780602, 0.0015195397223268438, 0.00023377534189643752, 0.00044157564580438196]]

The results of the retrieval are as follows:
Good Retrieved : 3.83
Ok Retrieved : 1.27
Bad Retrieved : 0.61

Question 2:
We use the LOG algorithm as a blob detector. The output is a list of blobs with their centre coordinates and radius. We calculate the Laplacian of gaussian of the image for different values for sigma to obtain different scales. We then iterate through all the points in all the scales to find the maxima's for all scales by comparing it with its neighbourhood in the 3D space (9 below, 9 above and 8 nearest neighbours).

The output vector for an image is as follows:
Each coordinate is of the form [Centre$_x$, Centre$_y$, Radius]

 [[8, 318, 1.414], [8, 331, 1.414], [8, 345, 1.414], [8, 362, 1.414], [8, 378, 1.414], [8, 388, 1.414], [8, 453, 1.414], [8, 465, 1.414], [8, 471, 1.414], [9, 9, 1.414], [9, 30, 1.414], [9, 42, 1.414], [9, 58, 1.414], [9, 65, 1.414], [9, 164, 1.414], [9, 171, 1.414], [9, 185, 1.414], [9, 194, 1.414], [9, 223, 1.414], [9, 239, 1.414], [9, 243, 1.414], [9, 277, 1.414], [9, 294, 1.414], [9, 310, 1.414], [9, 327, 1.414], [9, 338, 1.414], [9, 343, 1.414], [9, 348, 1.414], [9, 353, 1.414], [9, 382, 1.414], [9, 393, 1.414], [9, 478, 1.414], [10, 16, 1.414], [10, 39, 1.414], [10, 51, 1.414], [10, 55, 1.414], [10, 173, 1.414], [10, 181, 1.414], [10, 358, 1.414], [10, 395, 1.414], [11, 328, 1.414], [11, 368, 1.414], [12, 61, 1.414], [12, 248, 1.414], [12, 457, 1.414], [13, 32, 1.414], [13, 43, 1.414], [13, 158, 1.414], [13, 177, 1.414], [13, 218, 1.414], [13, 229, 1.414], [13, 283, 1.414], [13, 288, 1.414], [13, 305, 1.414], [13, 321, 1.414], [13, 360, 1.414], [13, 386, 1.414], [13, 450, 1.414], [13, 464, 1.414], [13, 480, 1.414], [14, 7, 1.414], [14, 20, 1.414], [14, 26, 1.414], [14, 41, 1.414], [14, 166, 1.414], [14, 210, 1.414], [14, 270, 1.414], [14, 299, 1.414], [14, 308, 1.414],

[14, 335, 1.414], [14, 381, 1.414], [14, 400, 1.414], [15, 10, 1.414], [15, 58, 1.414], [15, 245, 1.414], [15, 312, 1.414], [15, 333, 1.414], [15, 340, 1.414], [15, 345, 1.414], [15, 350, 1.414], [15, 356, 1.414], [15, 393, 1.414], [16, 14, 1.414], [16, 38, 1.414], [16, 47, 1.414], [16, 51, 1.414], [16, 60, 1.414], [16, 194, 1.414], [16, 206, 1.414], [16, 226, 1.414], [16, 238, 1.414], [16, 324, 1.414], [16, 338, 1.414], [16, 456, 1.414], [16, 470, 1.414], [16, 475, 1.414], [17, 31, 1.414], [17, 42, 1.414], [17, 155, 1.414], [17, 159, 1.414], [17, 183, 1.414], [17, 199, 1.414], [17, 214, 1.414], [17, 223, 1.414], [17, 242, 1.414], [17, 303, 1.414], [17, 309, 1.414], [17, 318, 1.414], [17, 368, 1.414], [17, 379, 1.414], [17, 463, 1.414], [17, 487, 1.414], [18, 29, 1.414], [18, 105, 1.414], [18, 150, 1.414], [18, 402, 1.414], [18, 414, 1.414], [19, 24, 1.414], [19, 146, 1.414], [19, 162, 1.414], [19, 171, 1.414], [19, 177, 1.414], [19, 279, 1.414], [19, 333, 1.414], [19, 337, 1.414], [19, 382, 1.414], [19, 399, 1.414], [19, 417, 1.414], [19, 468, 1.414], [20, 39, 1.414], [20, 175, 1.414], [20, 275, 1.414], [20, 291, 1.414], [20, 343, 1.414], [20, 359, 1.414], [20, 385, 1.414], [20, 396, 1.414], [20, 420, 1.414], [21, 51, 1.414], [21, 60, 1.414], [21, 157, 1.414], [21, 182, 1.414], [21, 195, 1.414], [21, 201, 1.414], [21, 209, 1.414], [21, 232, 1.414], [21, 294, 1.414], [21, 307, 1.414], [21, 312, 1.414], [21, 322, 1.414], [21, 351, 1.414], [21, 357, 1.414], [21, 455, 1.414], [21, 464, 1.414], [21, 480, 1.414], [22, 33, 1.414], [22, 85, 1.414], [22, 106, 1.414], [22, 110, 1.414], [22, 118, 1.414], [22, 124, 1.414], [22, 127, 1.414], [22, 140, 1.414], [22, 142, 1.414], [22, 218, 1.414], [22, 248, 1.414], [22, 282, 1.414], [22, 285, 1.414], [22, 336, 1.414], [22, 458, 1.414], [22, 462, 1.414], [23, 79, 1.414], [23, 95, 1.414], [23, 132, 1.414], [23, 136, 1.414], [23, 148, 1.414], [23, 153, 1.414], [23, 161, 1.414], [23, 171, 1.414], [23, 374, 1.414], [23, 380, 1.414], [23, 384, 1.414], [23, 389, 1.414], [23, 404, 1.414], [23, 412, 1.414], [23, 415, 1.414], [23, 426, 1.414], [24, 178, 1.414], [24, 299, 1.414], [24, 369, 1.414], [24, 440, 1.414], [24, 445, 1.414], [24, 483, 1.414], [26, 75, 1.414], [26, 136, 1.414], [26, 172, 1.414], [26, 218, 1.414], [26, 270, 1.414], [27, 79, 1.414], [27, 83, 1.414], [27, 95, 1.414], [27, 110, 1.414], [27, 115, 1.414], [27, 129, 1.414], [27, 142, 1.414], [27, 161, 1.414], [27, 174, 1.414], [27, 190, 1.414], [27, 195, 1.414], [27, 303, 1.414], [27, 329, 1.414], [27, 373, 1.414], [27, 383, 1.414], [27, 386, 1.414], [27, 396, 1.414], [27, 399, 1.414], [27, 406, 1.414], [27, 412, 1.414], [28, 20, 1.414], [28, 92, 1.414], [28, 101, 1.414], [28, 124, 1.414], [28, 131, 1.414], [28, 148, 1.414], [28, 178, 1.414], [28, 188, 1.414], [28, 214, 1.414], [28, 218, 1.414], [28, 248, 1.414], [28, 299, 1.414], [28, 357, 1.414], [28, 362, 1.414], [28, 389, 1.414], [28, 423, 1.414], [28, 426, 1.414], [28, 432, 1.414], [28, 438, 1.414], [29, 16, 1.414], [29, 28, 1.414], [29, 80, 1.414], [29, 104, 1.414], [29, 154, 1.414], [29, 180, 1.414], [29, 186, 1.414], [29, 201, 1.414], [29, 270, 1.414], [29, 321, 1.414], [29, 343, 1.414], [29, 367, 1.414], [29, 446, 1.414], [30, 14, 1.414], [30, 31, 1.414], [30, 70, 1.414], [30, 88, 1.414], [30, 120, 1.414], [30, 136, 1.414], [30, 152, 1.414], [30, 325, 1.414], [30, 329, 1.414], [30, 341, 1.414], [31, 12, 1.414], [31, 68, 1.414], [31, 76, 1.414], [31, 84, 1.414], [31, 190, 1.414], [31, 270, 1.414], [31, 371, 1.414], [32, 23, 1.414], [32, 36, 1.414], [32, 45, 1.414], [32, 99, 1.414], [32, 116, 1.414], [32, 125, 1.414], [32, 129, 1.414], [32, 171, 1.414], [32, 174, 1.414], [32, 188, 1.414], [32, 200, 1.414], [32, 208, 1.414], [32, 299, 1.414], [32, 303, 1.414], [32, 315, 1.414], [32, 335, 1.414], [32, 472, 1.414], [33, 41, 1.414], [33, 93, 1.414], [33, 108, 1.414], [33, 132, 1.414], [33, 145, 1.414], [33, 162, 1.414], [33, 248, 1.414], [33, 339, 1.414], [33, 348, 1.414], [33, 364, 1.414], [33, 392, 1.414], [33, 445, 1.414], [33, 469, 1.414], [34, 64, 1.414], [34, 80, 1.414], [34, 86, 1.414], [34, 157, 1.414], [34, 185, 1.414], [34, 218, 1.414], [34, 318, 1.414], [34, 343, 1.414], [34, 351, 1.414], [34, 369, 1.414], [34, 405, 1.414], [34, 414, 1.414], [34, 426, 1.414], [34, 478, 1.414], [35, 88, 1.414], [35, 102, 1.414], [35, 121, 1.414], [35, 138, 1.414], [35, 149, 1.414], [35, 270, 1.414], [35, 299, 1.414], [35, 309, 1.414], [35, 333, 1.414], [35, 340, 1.414], [35, 354, 1.414], [35, 448, 1.414], [36, 19, 1.414], [36, 49, 1.414], [36, 108, 1.414], [36, 115, 1.414], [36, 135, 1.414], [36, 165, 1.414], [36, 204, 1.414], [36, 335, 1.414], [36, 375, 1.414], [36, 412, 1.414], [36, 450, 1.414], [37, 12, 1.414], [37, 16, 1.414], [37, 22, 1.414], [37, 152, 1.414], [37, 200, 1.414], [37, 208, 1.414], [37, 303, 1.414], [37, 365, 1.414], [37, 369, 1.414], [37, 384, 1.414], [37, 401, 1.414], [37, 435, 1.414], [37, 470, 1.414], [38, 73, 1.414], [38, 86, 1.414], [38, 91, 1.414], [38, 127, 1.414], [38, 131, 1.414], [38, 137, 1.414], [38, 167, 1.414], [38, 319, 1.414], [38, 349, 1.414], [38, 425, 1.414], [38, 487, 1.414], [39, 71, 1.414], [39, 99, 1.414], [39, 160, 1.414], [39, 218, 1.414], [39, 248, 1.414], [39, 299, 1.414], [39, 312, 1.414], [39, 317, 1.414], [39, 376, 1.414], [39, 412, 1.414], [39, 421, 1.414], [40, 39, 1.414], [40, 64, 1.414], [40, 81, 1.414], [40, 102, 1.414], [40, 120, 1.414], [40, 143, 1.414], [40, 401, 1.414], [40, 481, 1.414], [41, 30, 1.414], [41, 37, 1.414], [41, 46, 1.414], [41, 60, 1.414], [41, 67, 1.414], [41, 84, 1.414], [41, 141, 1.414], [41, 186, 1.414], [41, 192, 1.414], [41, 270, 1.414], [41, 324, 1.414], [41, 334, 1.414], [41, 337, 1.414], [41, 357, 1.414], [41, 389, 1.414], [41, 413, 1.414], [41, 416, 1.414], [41, 487, 1.414], [42, 26, 1.414], [42, 57, 1.414], [42, 107, 1.414], [42, 113, 1.414], [42, 127, 1.414], [42, 169, 1.414], [42, 218, 1.414], [42, 342, 1.414], [42, 361, 1.414], [42, 371, 1.414], [42, 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Question 3:
We then implement the SURF descriptor which involves the following steps:
Steps involved in SURF algorithm
1)Scale-space Extrema Detection
2)Keypoint Localization
3)Orientation Assignment
4)Keypoint Descriptor
5) Keypoint Matching

##Have only implemented till orientation assignment