

Modeling extreme values with a GEV mixture probability distributions

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```
source("./src/estimate_gev_mixture_model_parameters.R")
source("./src/plot_gev_mixture_model_pdf.R")
source("./src/generate_gev_sample.R")
source("./src/plot_normalized_gev_mixture_model_pdf.R")
source("./src/calculate_gev_inverse_cdf.R")
source("./src/calculate_gev_mixture_model_inverse_cdf.R")
source("./src/calculate_gev_mixture_model_cdf.R")

n <- 10000

nlargest <- 1000

#x <- generate_gev_sample(n = n, loc = 1, scale = 0.5, shape = 0.1)
x <- rnorm(n = n)

gev_mixture_model <- estimate_gev_mixture_model_parameters(x,
                                                             nsloc = NULL,
                                                             std.err = FALSE,
                                                             block_sizes = NULL,
                                                             minimum_nblocks = 50,
                                                             nlargest = nlargest,
                                                             confidence_level = 0.95,
                                                             log_mv = TRUE,
                                                             log_pw = TRUE,
                                                             trace = TRUE)

## iter: 0 f-value: 0.177980208584727 pgrad: 0.853356525539112
## iter: 10 f-value: 0.016516029746572 pgrad: 0.0120712977513535
## iter: 20 f-value: 0.0164756351361383 pgrad: 0.0120314851809251
## iter: 30 f-value: 0.0164094260863119 pgrad: 0.0119776028165485
## iter: 40 f-value: 0.0162513521251769 pgrad: 0.0118732801445815
## iter: 50 f-value: 0.015916994740855 pgrad: 0.0116732311841027
## iter: 60 f-value: 0.0155576853629453 pgrad: 0.011456634172248
## iter: 70 f-value: 0.0152110369487963 pgrad: 0.0112438054758365
## iter: 80 f-value: 0.014876946934557 pgrad: 0.0110348760770005
## iter: 90 f-value: 0.0145549610062173 pgrad: 0.0107672215733081
## iter: 100 f-value: 0.0142446397905044 pgrad: 0.00968676975184177
## iter: 110 f-value: 0.0142008753132774 pgrad: 0.00958803745366726
## iter: 120 f-value: 0.0141763978362612 pgrad: 0.00956134082254254
## iter: 130 f-value: 0.0141315053956398 pgrad: 0.00952304364897447
## iter: 140 f-value: 0.0140121627960945 pgrad: 0.00944387784966538
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## iter: 150 f-value: 0.0138134938763977 pgrad: 0.00932130225686695
## iter: 160 f-value: 0.0136141953627531 pgrad: 0.00919712671138523
## iter: 170 f-value: 0.0134200902720165 pgrad: 0.00895368915187497
## iter: 180 f-value: 0.0132073205643863 pgrad: 0.00761635887316917
## iter: 190 f-value: 0.0131748907198041 pgrad: 0.00722294679600685
## iter: 200 f-value: 0.0131693125416204 pgrad: 0.00713756058202067
## iter: 210 f-value: 0.0131638000829557 pgrad: 0.00705836199907511
## iter: 220 f-value: 0.013158300169665 pgrad: 0.00698383410916281
## iter: 230 f-value: 0.0131527487587821 pgrad: 0.00691250776299573
## iter: 240 f-value: 0.0131470575480164 pgrad: 0.00684281486371627
## iter: 250 f-value: 0.0131410927324594 pgrad: 0.00677286541731575
## iter: 260 f-value: 0.0131346347833411 pgrad: 0.00670004332624699
## iter: 270 f-value: 0.0131272894091107 pgrad: 0.00662013744607978
## iter: 280 f-value: 0.0131182545099014 pgrad: 0.00652510599346015
## iter: 290 f-value: 0.0131055646160389 pgrad: 0.00639590572922713
## iter: 300 f-value: 0.0130931916219669 pgrad: 0.00629211057363543
## iter: 310 f-value: 0.0130888913730386 pgrad: 0.00628509981096401
## iter: 320 f-value: 0.0130830812802344 pgrad: 0.00627770970120481
## iter: 330 f-value: 0.0130734017216692 pgrad: 0.00626873461470742
## iter: 340 f-value: 0.0130505499860338 pgrad: 0.00625471514134543
## iter: 350 f-value: 0.0130025970107464 pgrad: 0.00623198676885567
## iter: 360 f-value: 0.0129493241346159 pgrad: 0.0062073615830614
## iter: 370 f-value: 0.012896384838806 pgrad: 0.00618280371152014
## iter: 380 f-value: 0.0128438556280118 pgrad: 0.00615834134746943
## iter: 390 f-value: 0.0127917338346923 pgrad: 0.00613397430696333
## iter: 400 f-value: 0.0127400162949079 pgrad: 0.006109702219848
## iter: 410 f-value: 0.0126886998659585 pgrad: 0.00608552471619195
## iter: 420 f-value: 0.0126377814295599 pgrad: 0.00606144142749757
## iter: 430 f-value: 0.0125872578916737 pgrad: 0.00603745198670277
## iter: 440 f-value: 0.012537126182317 pgrad: 0.00601355602817411
## iter: 450 f-value: 0.0124873832553802 pgrad: 0.00598975318770456
## iter: 460 f-value: 0.0124380260884353 pgrad: 0.00596604310250343
## iter: 470 f-value: 0.0123890516825584 pgrad: 0.00594242541119611
## iter: 480 f-value: 0.0123404570621411 pgrad: 0.00591889975381371
## iter: 490 f-value: 0.0122922392747112 pgrad: 0.0058954657717899
## iter: 500 f-value: 0.0122443953907578 pgrad: 0.00587212310795732
## iter: 510 f-value: 0.0121969225035401 pgrad: 0.00584887140653617
## iter: 520 f-value: 0.0121498177289276 pgrad: 0.00582571031313711
## iter: 530 f-value: 0.0121030782052067 pgrad: 0.00580263947474707
## iter: 540 f-value: 0.0120567010929208 pgrad: 0.00577965853973145
## iter: 550 f-value: 0.0120106835746888 pgrad: 0.00575676715782431
## iter: 560 f-value: 0.0119650228550357 pgrad: 0.00559366517379045
## iter: 570 f-value: 0.0119302796005655 pgrad: 0.00527169499254976
## iter: 580 f-value: 0.0119249407523897 pgrad: 0.00526534119797634
## iter: 590 f-value: 0.0119138804134625 pgrad: 0.00525665443801282
## iter: 600 f-value: 0.0118861518612309 pgrad: 0.0052421760191988
## iter: 610 f-value: 0.0118493064344785 pgrad: 0.00522461362207732
## iter: 620 f-value: 0.0118123949625558 pgrad: 0.00520700047429212
## iter: 630 f-value: 0.0117757263332758 pgrad: 0.00518944531068594
## iter: 640 f-value: 0.0117393009559286 pgrad: 0.00517194865703946
## iter: 650 f-value: 0.0117031172247939 pgrad: 0.00515451032275099
## iter: 660 f-value: 0.0116671735325456 pgrad: 0.005137130113474
## iter: 670 f-value: 0.0116314682824786 pgrad: 0.00511980783548427
## iter: 680 f-value: 0.0115959998885111 pgrad: 0.00510254329570298

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## iter: 690 f-value: 0.0115607667751129 pgrad: 0.0048462725498345
## iter: 700 f-value: 0.0115398391793801 pgrad: 0.00456093494936505
## iter: 710 f-value: 0.0115384135635914 pgrad: 0.00455237595057084
## iter: 720 f-value: 0.011536929264036 pgrad: 0.00454496746000116
## iter: 730 f-value: 0.011535343539546 pgrad: 0.00453843277343075
## iter: 740 f-value: 0.0115335828135115 pgrad: 0.00453251530344834
## iter: 750 f-value: 0.0115315077080542 pgrad: 0.00452695033661304
## iter: 760 f-value: 0.0115288131431757 pgrad: 0.00452141023838176
## iter: 770 f-value: 0.0115246644492003 pgrad: 0.00451536785170076
## iter: 780 f-value: 0.0115159595427127 pgrad: 0.00450771230288816
## iter: 790 f-value: 0.0114945076250979 pgrad: 0.00449668764719469
## iter: 800 f-value: 0.0114665813333646 pgrad: 0.00448404695626453
## iter: 810 f-value: 0.011438601388698 pgrad: 0.00447138503241257
## iter: 820 f-value: 0.0114107764123215 pgrad: 0.00445875825554487
## iter: 830 f-value: 0.011383107001005 pgrad: 0.00444616692794425
## iter: 840 f-value: 0.0113555922925043 pgrad: 0.00443361095273709
## iter: 850 f-value: 0.0113282314197989 pgrad: 0.00442109023068399
## iter: 860 f-value: 0.0113010235206653 pgrad: 0.00440860466280768
## iter: 870 f-value: 0.0112739677377127 pgrad: 0.00439615415040695
## iter: 880 f-value: 0.0112470632183562 pgrad: 0.00438373859505858
## iter: 890 f-value: 0.0112203091147931 pgrad: 0.00437135789861648
## iter: 900 f-value: 0.0111937045839724 pgrad: 0.00435901196320904
## iter: 910 f-value: 0.0111672487875656 pgrad: 0.00434670069123849
## iter: 920 f-value: 0.0111409408919517 pgrad: 0.0040826513446211
## iter: 930 f-value: 0.0111253093175706 pgrad: 0.00378224701938285
## iter: 940 f-value: 0.0111240967261606 pgrad: 0.0037769248698441
## iter: 950 f-value: 0.0111226996327526 pgrad: 0.00377202094301388
## iter: 960 f-value: 0.0111209533455099 pgrad: 0.00376729178840451
## iter: 970 f-value: 0.0111184437401746 pgrad: 0.00376240175089304
## iter: 980 f-value: 0.0111137726941247 pgrad: 0.00375676846042555
## iter: 990 f-value: 0.0111016776586541 pgrad: 0.00374946320816072
## iter: 1000 f-value: 0.0110815741022807 pgrad: 0.00374074305151428
## iter: 1010 f-value: 0.0110608931097228 pgrad: 0.00373191089021419
## iter: 1020 f-value: 0.0110403046643594 pgrad: 0.00372309854187475
## iter: 1030 f-value: 0.0110198133773764 pgrad: 0.00371430701287206
## iter: 1040 f-value: 0.0109994188193799 pgrad: 0.00370553626013037
## iter: 1050 f-value: 0.0109791205339025 pgrad: 0.00369678623458669
## iter: 1060 f-value: 0.0109589180664633 pgrad: 0.00368805688725832
## iter: 1070 f-value: 0.0109388109647245 pgrad: 0.00367934816927751
## iter: 1080 f-value: 0.0109187987784861 pgrad: 0.00367066003189293
## iter: 1090 f-value: 0.010898881059672 pgrad: 0.00366199242646864
## iter: 1100 f-value: 0.0108790573623207 pgrad: 0.0036533453044823
## iter: 1110 f-value: 0.0108593272425768 pgrad: 0.0036447186175273
## iter: 1120 f-value: 0.0108396902586806 pgrad: 0.00363611231731109
## iter: 1130 f-value: 0.0108201459709576 pgrad: 0.00362752635565555
## iter: 1140 f-value: 0.0108006939418096 pgrad: 0.00361896068449641
## iter: 1150 f-value: 0.0107813337357022 pgrad: 0.00361041525588235
## iter: 1160 f-value: 0.01076206491916 pgrad: 0.00360189002197686
## iter: 1170 f-value: 0.0107428870607509 pgrad: 0.00359338493505357
## iter: 1180 f-value: 0.0107237997310823 pgrad: 0.00358489994750255
## iter: 1190 f-value: 0.0107048025027866 pgrad: 0.00357643501182381
## iter: 1200 f-value: 0.0106858949505135 pgrad: 0.00356799008063002
## iter: 1210 f-value: 0.0106670766509232 pgrad: 0.00355956510664657
## iter: 1220 f-value: 0.0106483471826715 pgrad: 0.00355116004271006

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## iter: 1230 f-value: 0.0106297061264068 pgrad: 0.00354277484176979
## iter: 1240 f-value: 0.0106111530647536 pgrad: 0.00353440945688377
## iter: 1250 f-value: 0.010592687582308 pgrad: 0.00352606384122234
## iter: 1260 f-value: 0.0105743092656282 pgrad: 0.0035177379480672
## iter: 1270 f-value: 0.0105560177032229 pgrad: 0.00350943173080953
## iter: 1280 f-value: 0.0105378124855425 pgrad: 0.0035011451429503
## iter: 1290 f-value: 0.0105196932049756 pgrad: 0.00349287813810251
## iter: 1300 f-value: 0.0105016594558279 pgrad: 0.0034846306699855
## iter: 1310 f-value: 0.0104837108343269 pgrad: 0.0034764026924311
## iter: 1320 f-value: 0.010465846938601 pgrad: 0.00346819415937738
## iter: 1330 f-value: 0.0104480673686803 pgrad: 0.00346000502487387
## iter: 1340 f-value: 0.0104303717264784 pgrad: 0.00300971737171973
## iter: 1350 f-value: 0.0104249767483478 pgrad: 0.00276784130332364
## iter: 1360 f-value: 0.0104243858759738 pgrad: 0.00273660244990526
## iter: 1370 f-value: 0.0104238023216592 pgrad: 0.00270983277042691
## iter: 1380 f-value: 0.0104232243920631 pgrad: 0.00268686968160414
## iter: 1390 f-value: 0.0104226505893126 pgrad: 0.00266714619214603
## iter: 1400 f-value: 0.0104220794267309 pgrad: 0.00265017678818535
## iter: 1410 f-value: 0.0104215092458276 pgrad: 0.00263554534273347
## iter: 1420 f-value: 0.0104209380149787 pgrad: 0.00262289473057065
## iter: 1430 f-value: 0.0104203630847052 pgrad: 0.00261191786338977
## iter: 1440 f-value: 0.0104197808619877 pgrad: 0.00260234988118047
## iter: 1450 f-value: 0.0104191863404785 pgrad: 0.00259396124136502
## iter: 1460 f-value: 0.0104185723711639 pgrad: 0.00258655142940856
## iter: 1470 f-value: 0.0104179284466667 pgrad: 0.0025799429570087
## iter: 1480 f-value: 0.0104172385194908 pgrad: 0.00257397518272751
## iter: 1490 f-value: 0.0104164767479779 pgrad: 0.00256849721720587
## iter: 1500 f-value: 0.0104155983292915 pgrad: 0.0025633586488758
## iter: 0 f-value: 0.177980208584727 pgrad: 0.853356525539112
## iter: 10 f-value: 0.0148904808745826 pgrad: 0.0111208340349231
## iter: 20 f-value: 0.0137847829071712 pgrad: 0.0918508163662956
## iter: 30 f-value: 0.0124966546288499 pgrad: 0.0193601209160939
## iter: 40 f-value: 0.0124096169583755 pgrad: 0.005720676164024
## iter: 50 f-value: 0.0118256688202246 pgrad: 0.00874019123275627
## iter: 60 f-value: 0.0117862397163269 pgrad: 0.00517164334130216
## iter: 70 f-value: 0.0115779743653704 pgrad: 0.00508893389437498
## iter: 80 f-value: 0.0111381591513354 pgrad: 0.00423642218333864
## iter: 90 f-value: 0.0110484600399126 pgrad: 0.00372291584987905
## iter: 100 f-value: 0.0102931321421189 pgrad: 0.00522936799892953
## iter: 110 f-value: 0.0102798591808577 pgrad: 0.00251174468015652
## iter: 120 f-value: 0.0104294668892665 pgrad: 0.025995203035836
## iter: 130 f-value: 0.0101235547099642 pgrad: 0.00911427177924784
## iter: 140 f-value: 0.0100859489569268 pgrad: 0.00319558766098105
## iter: 150 f-value: 0.010081326085537 pgrad: 0.001120416501322
## iter: 160 f-value: 0.010080757796428 pgrad: 0.000392833265619008
## iter: 170 f-value: 0.0100806879367057 pgrad: 0.000137732686366965
## iter: 180 f-value: 0.0100806793488571 pgrad: 4.82909533238152e-05
## Successful convergence.
## iter: 0 f-value: 0.221052805326838 pgrad: 0.909090909090909
## iter: 10 f-value: 0.0990828571759875 pgrad: 0.145699618434884
## iter: 20 f-value: 0.0713330372432604 pgrad: 0.123270702304469
## iter: 30 f-value: 0.0518234140388592 pgrad: 0.099463155353744
## iter: 40 f-value: 0.0375032104882873 pgrad: 0.15535209595742
## iter: 50 f-value: 0.0373245410300004 pgrad: 0.144031544668052

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## iter: 60 f-value: 0.0371580116500296 pgrad: 0.135182467026881
## iter: 70 f-value: 0.0369954444075927 pgrad: 0.128150742712242
## iter: 80 f-value: 0.0368288525130721 pgrad: 0.122183946810691
## iter: 90 f-value: 0.0366464121773918 pgrad: 0.117230689790636
## iter: 100 f-value: 0.0364210978269835 pgrad: 0.112844295310678
## iter: 110 f-value: 0.036043254396454 pgrad: 0.108278102030623
## iter: 120 f-value: 0.0320926317493761 pgrad: 0.0969824647885573
## iter: 130 f-value: 0.0238165226268847 pgrad: 0.0763573812095516
## iter: 140 f-value: 0.0193790238819223 pgrad: 0.0623155775162049
## iter: 150 f-value: 0.0179930993943306 pgrad: 0.0505764328254205
## iter: 160 f-value: 0.0179520672184054 pgrad: 0.0483818357656113
## iter: 170 f-value: 0.0179019744405778 pgrad: 0.0463264759941295
## iter: 180 f-value: 0.0178272179300348 pgrad: 0.0441873125232421
## iter: 190 f-value: 0.0175818021895508 pgrad: 0.0425674586759794
## iter: 200 f-value: 0.0155509075425813 pgrad: 0.0358884318073929
## iter: 210 f-value: 0.0143988590181833 pgrad: 0.0311998712855412
## iter: 220 f-value: 0.0135177590939083 pgrad: 0.0258221323094635
## iter: 230 f-value: 0.0128736193372711 pgrad: 0.0211721241374879
## iter: 240 f-value: 0.0124718216744791 pgrad: 0.0174284270870084
## iter: 250 f-value: 0.0121678077007178 pgrad: 0.0151842477499732
## iter: 260 f-value: 0.0121435990096132 pgrad: 0.0154455077489475
## iter: 270 f-value: 0.0120047630179772 pgrad: 0.0135233795284702
## iter: 280 f-value: 0.0119903017245452 pgrad: 0.0129627060705776
## iter: 290 f-value: 0.011875729167634 pgrad: 0.011595235200242
## iter: 300 f-value: 0.0117666697433981 pgrad: 0.0103192666545281
## iter: 310 f-value: 0.0116825758369284 pgrad: 0.00928938318628392
## iter: 320 f-value: 0.011614872159814 pgrad: 0.00831991635058044
## iter: 330 f-value: 0.0115587866603611 pgrad: 0.00745057930133952
## iter: 340 f-value: 0.0115109306486427 pgrad: 0.00670105267562149
## iter: 350 f-value: 0.0114688950747482 pgrad: 0.00605222255162668
## iter: 360 f-value: 0.0114565466799454 pgrad: 0.0061102801139114
## iter: 370 f-value: 0.0114560782635908 pgrad: 0.00617749272525597
## iter: 380 f-value: 0.0114555626353106 pgrad: 0.00623907936599111
## iter: 390 f-value: 0.0114549708363114 pgrad: 0.00629631525953311
## iter: 400 f-value: 0.0114542430637935 pgrad: 0.00635067733210232
## iter: 410 f-value: 0.0114532226505087 pgrad: 0.006404089630558
## iter: 420 f-value: 0.0114512216140231 pgrad: 0.00645813597044409
## iter: 430 f-value: 0.0114356431789195 pgrad: 0.00635807538779465
## iter: 440 f-value: 0.0114038764076723 pgrad: 0.00603417158687863
## iter: 450 f-value: 0.0113731736243587 pgrad: 0.00575301526035965
## iter: 460 f-value: 0.0113429807192508 pgrad: 0.00550779189400707
## iter: 470 f-value: 0.0113127517343665 pgrad: 0.00529251482049575
## iter: 480 f-value: 0.0112818661738723 pgrad: 0.00510182450973173
## iter: 490 f-value: 0.011249502728779 pgrad: 0.00493075480185318
## iter: 500 f-value: 0.0112144012289523 pgrad: 0.0047744041315953
## iter: 510 f-value: 0.0111743103074669 pgrad: 0.00462733583221631
## iter: 520 f-value: 0.0111243774633905 pgrad: 0.00452751719953231
## iter: 530 f-value: 0.011059734063939 pgrad: 0.00459744660586355
## iter: 540 f-value: 0.011017854748143 pgrad: 0.00462478855716758
## iter: 550 f-value: 0.0109814199091766 pgrad: 0.00464315344537625
## iter: 560 f-value: 0.010933886271514 pgrad: 0.00465259484978957
## iter: 570 f-value: 0.0109308804866703 pgrad: 0.00465762124890971
## iter: 580 f-value: 0.0108789639529254 pgrad: 0.00464751814526561
## iter: 590 f-value: 0.0108785810072144 pgrad: 0.00465053922770288

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## iter: 600 f-value: 0.0108781318125949 pgrad: 0.00465343578538092
## iter: 610 f-value: 0.0108775580614084 pgrad: 0.00465632559971572
## iter: 620 f-value: 0.0108766775606083 pgrad: 0.00465946101462325
## iter: 630 f-value: 0.0108739974516835 pgrad: 0.00466381923768597
## iter: 640 f-value: 0.0107445383515642 pgrad: 0.00458625187069939
## iter: 650 f-value: 0.0107442873816401 pgrad: 0.00459443905900046
## iter: 660 f-value: 0.0107440345113753 pgrad: 0.00460171590226985
## iter: 670 f-value: 0.0107437790158301 pgrad: 0.00460819098946605
## iter: 680 f-value: 0.0107435199636922 pgrad: 0.00461396187986039
## iter: 690 f-value: 0.0107432562080345 pgrad: 0.00461911394708021
## iter: 700 f-value: 0.0107429861037732 pgrad: 0.00462372558801045
## iter: 710 f-value: 0.0107427072974923 pgrad: 0.00462786915481327
## iter: 720 f-value: 0.0107424165924229 pgrad: 0.00463160940471597
## iter: 730 f-value: 0.0107421093224466 pgrad: 0.00463500542713129
## iter: 740 f-value: 0.0107417776442926 pgrad: 0.00463812112296391
## iter: 750 f-value: 0.0107414090074502 pgrad: 0.00464101665557812
## iter: 760 f-value: 0.0107409798635358 pgrad: 0.00464376463261342
## iter: 770 f-value: 0.0107404388353668 pgrad: 0.00464646381976248
## iter: 780 f-value: 0.0107396325371596 pgrad: 0.00464930661678298
## iter: 790 f-value: 0.0107375578608406 pgrad: 0.00465284231282449
## iter: 800 f-value: 0.0105413042653027 pgrad: 0.00466545287093988
## iter: 810 f-value: 0.0105410587916714 pgrad: 0.00465855562774665
## iter: 820 f-value: 0.0105408103450169 pgrad: 0.00465239802490995
## iter: 830 f-value: 0.0105405579446167 pgrad: 0.00464688933166092
## iter: 840 f-value: 0.0105403001275799 pgrad: 0.00464194631912123
## iter: 850 f-value: 0.0105400351796826 pgrad: 0.0046374971870862
## iter: 860 f-value: 0.0105397602958604 pgrad: 0.00463347048229589
## iter: 870 f-value: 0.0105394717085622 pgrad: 0.0046298034046064
## iter: 880 f-value: 0.0105391634638854 pgrad: 0.00462643164151041
## iter: 890 f-value: 0.0105388262806417 pgrad: 0.00462329339900365
## iter: 900 f-value: 0.0105384429956797 pgrad: 0.0046203095658105
## iter: 910 f-value: 0.0105379799375065 pgrad: 0.00461738056091832
## iter: 920 f-value: 0.01053735180958 pgrad: 0.00461432423363111
## iter: 930 f-value: 0.0105362152236143 pgrad: 0.00461063401315343
## iter: 940 f-value: 0.010472414285985 pgrad: 0.0045448754907887
## iter: 950 f-value: 0.0104714816263053 pgrad: 0.00456232028008869
## iter: 960 f-value: 0.0104711852248868 pgrad: 0.00456554402869258
## iter: 970 f-value: 0.0104708640440809 pgrad: 0.00456849971205481
## iter: 980 f-value: 0.010470504715041 pgrad: 0.00457124806757525
## iter: 990 f-value: 0.0104700817167277 pgrad: 0.00457385915600405
## iter: 1000 f-value: 0.010469536898102 pgrad: 0.00457643400763648
## iter: 1010 f-value: 0.0104686858549049 pgrad: 0.00457915898696955
## iter: 1020 f-value: 0.010465752053106 pgrad: 0.00458247984066262
## iter: 1030 f-value: 0.010340981452539 pgrad: 0.00462855364042539
## iter: 1040 f-value: 0.0103407498473996 pgrad: 0.00461845405038484
## iter: 1050 f-value: 0.0103405173859365 pgrad: 0.00460947541973022
## iter: 1060 f-value: 0.0103402836269936 pgrad: 0.00460148583851137
## iter: 1070 f-value: 0.0103400480266351 pgrad: 0.00459436811354136
## iter: 1080 f-value: 0.0103398098952646 pgrad: 0.00458801758106771
## iter: 1090 f-value: 0.0103395684015008 pgrad: 0.00458234158950965
## iter: 1100 f-value: 0.0103393223677819 pgrad: 0.00457725545755214
## iter: 1110 f-value: 0.0103390701483547 pgrad: 0.00457268210512304
## iter: 1120 f-value: 0.0103388097512725 pgrad: 0.00456855519955073
## iter: 1130 f-value: 0.010338537820798 pgrad: 0.0045648063107251

```

```

## iter: 1140 f-value: 0.0103382497678857 pgrad: 0.00456137543771515
## iter: 1150 f-value: 0.0103379381420235 pgrad: 0.00455819861180423
## iter: 1160 f-value: 0.0103375904193232 pgrad: 0.00455520876700571
## iter: 1170 f-value: 0.0103371830918969 pgrad: 0.00455232070316461
## iter: 1180 f-value: 0.0103366623013498 pgrad: 0.00454939772091699
## iter: 1190 f-value: 0.0103358628062952 pgrad: 0.00454614592498849
## iter: 1200 f-value: 0.0103333743743267 pgrad: 0.0045411105904654
## iter: 1210 f-value: 0.010033699768066 pgrad: 0.00449322900934745
## iter: 1220 f-value: 0.0100334794709672 pgrad: 0.00440280355359574
## iter: 1230 f-value: 0.0100332604527638 pgrad: 0.00432264908980029
## iter: 1240 f-value: 0.0100330423060151 pgrad: 0.00431917839877566
## iter: 1250 f-value: 0.0100328246714181 pgrad: 0.00433278676352634
## iter: 1260 f-value: 0.010032607229019 pgrad: 0.00434484619053135
## iter: 1270 f-value: 0.0100323896531002 pgrad: 0.00435553721403974
## iter: 1280 f-value: 0.0100321716188555 pgrad: 0.00436501746521979
## iter: 1290 f-value: 0.0100319527572889 pgrad: 0.00437342847227476
## iter: 1300 f-value: 0.0100317326387031 pgrad: 0.00438089542704392
## iter: 1310 f-value: 0.0100315107535798 pgrad: 0.00438752955053438
## iter: 1320 f-value: 0.0100312864625905 pgrad: 0.0043934301162396
## iter: 1330 f-value: 0.0100310589156517 pgrad: 0.00439868587103562
## iter: 1340 f-value: 0.010030826975778 pgrad: 0.00440337694337681
## iter: 1350 f-value: 0.0100305891902665 pgrad: 0.0044075736384516
## iter: 1360 f-value: 0.0100303433404639 pgrad: 0.00441134282827296
## iter: 1370 f-value: 0.0100300865324167 pgrad: 0.00441474143542625
## iter: 1380 f-value: 0.0100298140859327 pgrad: 0.00441782842473942
## iter: 1390 f-value: 0.0100295188508952 pgrad: 0.00442065750640533
## iter: 1400 f-value: 0.0100291885346481 pgrad: 0.00442328670850126
## iter: 1410 f-value: 0.0100287999305713 pgrad: 0.0044257816098827
## iter: 1420 f-value: 0.0100282997626373 pgrad: 0.00442823698795526
## iter: 1430 f-value: 0.010027518270187 pgrad: 0.00443083092469997
## iter: 1440 f-value: 0.0100248422140945 pgrad: 0.00443393935992636
## iter: 1450 f-value: 0.00991526233578761 pgrad: 0.00914231346381211
## iter: 1460 f-value: 0.00991468458356152 pgrad: 0.00816337090435632
## iter: 1470 f-value: 0.00991421122311296 pgrad: 0.00737132642623728
## iter: 1480 f-value: 0.00991380615622386 pgrad: 0.00673028582270119
## iter: 1490 f-value: 0.00991344578257344 pgrad: 0.00621123403702195
## iter: 1500 f-value: 0.00991311464628044 pgrad: 0.00579071322638824
## iter: 0 f-value: 0.221052805326838 pgrad: 0.909090909090909
## iter: 10 f-value: 0.0598330477881705 pgrad: 0.276601939183102
## iter: 20 f-value: 0.0517838300351476 pgrad: 0.0995962734271535
## iter: 30 f-value: 0.0204532964546295 pgrad: 0.0728362168906653
## iter: 40 f-value: 0.0166007446012626 pgrad: 0.0392081474802859
## iter: 50 f-value: 0.0139448934804651 pgrad: 0.0435650194891775
## iter: 60 f-value: 0.0129694538061667 pgrad: 0.0373296985754654
## iter: 70 f-value: 0.0123771790679941 pgrad: 0.0231575950977154
## iter: 80 f-value: 0.012038976321714 pgrad: 0.0130733866111451
## iter: 90 f-value: 0.0118057866304535 pgrad: 0.0123411034104632
## iter: 100 f-value: 0.0116174461625885 pgrad: 0.0112271883680012
## iter: 110 f-value: 0.0115214583356063 pgrad: 0.00773958701972899
## iter: 120 f-value: 0.0114533011839936 pgrad: 0.00550205705865736
## iter: 130 f-value: 0.0113707039080242 pgrad: 0.00513826652450217
## iter: 140 f-value: 0.0112520567937681 pgrad: 0.0101710279318393
## iter: 150 f-value: 0.0112173262112534 pgrad: 0.00531914464080646
## iter: 160 f-value: 0.0111116387883174 pgrad: 0.00467488840883384

```

```

## iter: 170 f-value: 0.0110799794079837 pgrad: 0.00464752715478857
## iter: 180 f-value: 0.0109106819332039 pgrad: 0.00950822151265035
## iter: 190 f-value: 0.0109044931313208 pgrad: 0.00483650441527805
## iter: 200 f-value: 0.0108768860509247 pgrad: 0.00477631857459176
## iter: 210 f-value: 0.0107262245747569 pgrad: 0.0291393490234714
## iter: 220 f-value: 0.0107028089366294 pgrad: 0.00582867402563675
## iter: 230 f-value: 0.0106625039432071 pgrad: 0.0118012350109123
## iter: 240 f-value: 0.0106572831503815 pgrad: 0.00517154759988037
## iter: 250 f-value: 0.0106090561981512 pgrad: 0.00451869231111129
## iter: 260 f-value: 0.0105627997704457 pgrad: 0.00472118993205539
## iter: 270 f-value: 0.0104614490146434 pgrad: 0.00882263869166761
## iter: 280 f-value: 0.0104551608471217 pgrad: 0.00453806068461193
## iter: 290 f-value: 0.0104044644029554 pgrad: 0.00459911758771389
## iter: 300 f-value: 0.0103424775000279 pgrad: 0.00755155444469646
## iter: 310 f-value: 0.0099569734652526 pgrad: 0.0906556118699715
## iter: 320 f-value: 0.00979228214291445 pgrad: 0.0108476933788483
## iter: 330 f-value: 0.00978421633597183 pgrad: 0.0040579093305268
## iter: 340 f-value: 0.00974909675902864 pgrad: 0.00550918840495213
## iter: 350 f-value: 0.00971155746463015 pgrad: 0.004190856767114
## iter: 360 f-value: 0.00968203788943579 pgrad: 0.00427558522677417
## iter: 370 f-value: 0.00955428909902171 pgrad: 0.00607598928263819
## iter: 380 f-value: 0.00949023032126044 pgrad: 0.0125600630827081
## iter: 390 f-value: 0.00948267134538066 pgrad: 0.00407595061868717
## iter: 400 f-value: 0.00945781408452619 pgrad: 0.00403181161752098
## iter: 410 f-value: 0.00935787247435729 pgrad: 0.00628609036345701
## iter: 420 f-value: 0.00933766733287337 pgrad: 0.00501154861418185
## iter: 430 f-value: 0.00929837645148809 pgrad: 0.00385530117457983
## iter: 440 f-value: 0.00902758967056701 pgrad: 0.00534007439540829
## iter: 450 f-value: 0.00899464770739329 pgrad: 0.00384924629786193
## iter: 460 f-value: 0.0089877249627724 pgrad: 0.00540091009242072
## iter: 470 f-value: 0.00896543104296427 pgrad: 0.00399207915278049
## iter: 480 f-value: 0.00890627105062749 pgrad: 0.00467568167963101
## iter: 490 f-value: 0.00887403673112892 pgrad: 0.0042704492690902
## iter: 500 f-value: 0.00880594096149354 pgrad: 0.00371011798540322
## iter: 510 f-value: 0.00877844274696209 pgrad: 0.00370117604966963
## iter: 520 f-value: 0.00869187089707189 pgrad: 0.00571953678573744
## iter: 530 f-value: 0.00866522015789732 pgrad: 0.00362892424285949
## iter: 540 f-value: 0.00865261380679733 pgrad: 0.00353377561876828
## iter: 550 f-value: 0.00846234756077121 pgrad: 0.0177336019798146
## iter: 560 f-value: 0.00846093400613193 pgrad: 0.0102154377475788
## iter: 570 f-value: 0.0084538731290676 pgrad: 0.00317186657770469
## iter: 580 f-value: 0.00843072843507296 pgrad: 0.00340045279260959
## iter: 590 f-value: 0.00830136930165625 pgrad: 0.0328858244991686
## iter: 600 f-value: 0.00827990332146367 pgrad: 0.00442430458588716
## iter: 610 f-value: 0.00826785496786987 pgrad: 0.00482756994391503
## iter: 620 f-value: 0.00825605125863948 pgrad: 0.00332206171599347
## iter: 630 f-value: 0.00822858319925396 pgrad: 0.00347546376226748
## iter: 640 f-value: 0.00820358111959129 pgrad: 0.00327855678080674
## iter: 650 f-value: 0.00818881723086623 pgrad: 0.00324884493960176
## iter: 660 f-value: 0.00816294419635713 pgrad: 0.003254134782818
## iter: 670 f-value: 0.00812658592079843 pgrad: 0.00421154738109353
## iter: 680 f-value: 0.0081139687737887 pgrad: 0.00330717222357668
## iter: 690 f-value: 0.00808234596829086 pgrad: 0.00326932739040664
## iter: 700 f-value: 0.00786991072605025 pgrad: 0.0128458319723205

```



```

## iter: 710 f-value: 0.00786599826096805 pgrad: 0.00416432388861587
## iter: 720 f-value: 0.00785015136384478 pgrad: 0.00574899874812107
## iter: 730 f-value: 0.00784859398616078 pgrad: 0.00298313103097114
## iter: 740 f-value: 0.00781732081074598 pgrad: 0.00310950993599735
## iter: 750 f-value: 0.00779572781439942 pgrad: 0.00311393782992786
## iter: 760 f-value: 0.00755298010987539 pgrad: 0.00359296700705602
## iter: 770 f-value: 0.00754005682941537 pgrad: 0.00341162063395267
## iter: 780 f-value: 0.0075343826149095 pgrad: 0.00344135436968085
## iter: 790 f-value: 0.00750951347028892 pgrad: 0.00310164377110195
## iter: 800 f-value: 0.0075033481127835 pgrad: 0.00309133734139538
## iter: 810 f-value: 0.00747372373633524 pgrad: 0.00433290198417824
## iter: 820 f-value: 0.00747246454016574 pgrad: 0.00307169309663829
## iter: 830 f-value: 0.00744976584349858 pgrad: 0.00300674186166144
## iter: 840 f-value: 0.00743724195953044 pgrad: 0.0030695454511509
## iter: 850 f-value: 0.00742720583246284 pgrad: 0.00301935260069625
## iter: 860 f-value: 0.00741232528410654 pgrad: 0.00282166139519424
## iter: 870 f-value: 0.00740067632485398 pgrad: 0.00283945469459029
## iter: 880 f-value: 0.00738869561752151 pgrad: 0.00284912333742976
## iter: 890 f-value: 0.0073707995263364 pgrad: 0.00301450161274003
## iter: 900 f-value: 0.00736456968592381 pgrad: 0.00398168142554112
## iter: 910 f-value: 0.00736251490397933 pgrad: 0.00286391250883639
## iter: 920 f-value: 0.00734076098116408 pgrad: 0.00294400610660606
## iter: 930 f-value: 0.00733417198390161 pgrad: 0.00285232064313118
## iter: 940 f-value: 0.00731488607100594 pgrad: 0.00283354571143513
## iter: 950 f-value: 0.00717368786705533 pgrad: 0.0465945944990266
## iter: 960 f-value: 0.00713235819309342 pgrad: 0.00456419480804759
## iter: 970 f-value: 0.00713064400583636 pgrad: 0.00265048932454603
## iter: 980 f-value: 0.00712647022587269 pgrad: 0.00254869758652998
## iter: 990 f-value: 0.00711670810122668 pgrad: 0.00263843255181795
## iter: 1000 f-value: 0.00711472115155467 pgrad: 0.00271743821238585
## iter: 1010 f-value: 0.00710626246767916 pgrad: 0.00259072673578808
## iter: 1020 f-value: 0.00709195423993049 pgrad: 0.00636663757304368
## iter: 1030 f-value: 0.00709040085033405 pgrad: 0.00271342640956013
## iter: 1040 f-value: 0.00708440589180918 pgrad: 0.00274509437642007
## iter: 1050 f-value: 0.00706573812867941 pgrad: 0.00259322603213091
## iter: 1060 f-value: 0.00703469051914232 pgrad: 0.0128555374213597
## iter: 1070 f-value: 0.00702874458331472 pgrad: 0.00260721896437782
## iter: 1080 f-value: 0.00702166736158313 pgrad: 0.00280968801827025
## iter: 1090 f-value: 0.00700452194352769 pgrad: 0.00288781669584293
## iter: 1100 f-value: 0.00700367795207215 pgrad: 0.00260489301244676
## iter: 1110 f-value: 0.00696737270989455 pgrad: 0.0304608584276835
## iter: 1120 f-value: 0.00694462760457332 pgrad: 0.00436452021690392
## iter: 1130 f-value: 0.00694317548267491 pgrad: 0.00256249656585028
## iter: 1140 f-value: 0.00693715890024524 pgrad: 0.00254267118523022
## iter: 1150 f-value: 0.0069189946699316 pgrad: 0.00280013145225189
## iter: 1160 f-value: 0.00691706131734788 pgrad: 0.0026362630902681
## iter: 1170 f-value: 0.00691038777607087 pgrad: 0.00248781825373606
## iter: 1180 f-value: 0.00689938592804702 pgrad: 0.00249236303470624
## iter: 1190 f-value: 0.00689465896678908 pgrad: 0.00248163182216066
## iter: 1200 f-value: 0.00688259692739267 pgrad: 0.00476726998661592
## iter: 1210 f-value: 0.00688160079496943 pgrad: 0.00243925485947227
## iter: 1220 f-value: 0.00687381174296956 pgrad: 0.00221045168280476
## iter: 1230 f-value: 0.00685421009055642 pgrad: 0.00396180189585837
## iter: 1240 f-value: 0.00685337924618855 pgrad: 0.00229701825847178

```

```

## iter: 1250 f-value: 0.00685061998681728 pgrad: 0.0022599162891162
## iter: 1260 f-value: 0.00684694232847875 pgrad: 0.00231750108831369
## iter: 1270 f-value: 0.00683804936271901 pgrad: 0.00245077338342314
## iter: 1280 f-value: 0.00683719604069893 pgrad: 0.00226702796292388
## iter: 1290 f-value: 0.00671468872497997 pgrad: 0.0108335687997843
## iter: 1300 f-value: 0.00671215440139744 pgrad: 0.00227438447242267
## iter: 1310 f-value: 0.00670930133064111 pgrad: 0.00212799690918242
## iter: 1320 f-value: 0.00670838771063075 pgrad: 0.00206875418416275
## iter: 1330 f-value: 0.00670563039129917 pgrad: 0.00207685528930829
## iter: 1340 f-value: 0.00670287787291262 pgrad: 0.00205284415479245
## iter: 1350 f-value: 0.00669953603411477 pgrad: 0.00207407741733651
## iter: 1360 f-value: 0.00669692986367538 pgrad: 0.00202948818051979
## iter: 1370 f-value: 0.00669185579524876 pgrad: 0.00222086849489367
## iter: 1380 f-value: 0.00668963110871684 pgrad: 0.00211453779543991
## iter: 1390 f-value: 0.00668709646587916 pgrad: 0.00209953388875805
## iter: 1400 f-value: 0.00668465008008465 pgrad: 0.00206169670167089
## iter: 1410 f-value: 0.00668153171787548 pgrad: 0.00224824492211828
## iter: 1420 f-value: 0.00668023499850865 pgrad: 0.00218311055431153
## iter: 1430 f-value: 0.00667780328795542 pgrad: 0.00216652080679602
## iter: 1440 f-value: 0.00667442039059133 pgrad: 0.00218927262603252
## iter: 1450 f-value: 0.00667076693093889 pgrad: 0.00222646880388322
## iter: 1460 f-value: 0.00665855680375632 pgrad: 0.0021766461578745
## iter: 1470 f-value: 0.00665694251409258 pgrad: 0.00219747104771939
## iter: 1480 f-value: 0.00665050902377035 pgrad: 0.00219485150395926
## iter: 1490 f-value: 0.0066419226296087 pgrad: 0.00233916240399468
## iter: 1500 f-value: 0.00663491146389973 pgrad: 0.00231577080283862
## iter: 0 f-value: 0.221052805326838 pgrad: 0.909090909090909
## iter: 10 f-value: 0.0118036848089322 pgrad: 0.0145125328759166
## iter: 20 f-value: 0.0116143287551212 pgrad: 0.0101271759629114
## iter: 30 f-value: 0.0317959407861968 pgrad: 0.757772160351201
## iter: 40 f-value: 0.030497157595848 pgrad: 0.74210028191009
## iter: 50 f-value: 0.00983726474549546 pgrad: 0.0359876957449514
## iter: 60 f-value: 0.0200810004860273 pgrad: 0.645795387705607
## iter: 70 f-value: 0.00879732178394598 pgrad: 0.0104946097345807
## iter: 80 f-value: 0.00874162016967584 pgrad: 0.0322650174053616
## iter: 90 f-value: 0.042794158576465 pgrad: 0.874072153974836
## iter: 100 f-value: 0.00816313719286287 pgrad: 0.00335527926156728
## iter: 110 f-value: 0.0080569688242327 pgrad: 0.00389721454691716
## iter: 120 f-value: 0.0105400089112623 pgrad: 0.391196673451353
## iter: 130 f-value: 0.00793768255513799 pgrad: 0.0122805495917568
## iter: 140 f-value: 0.00762067735542764 pgrad: 0.0121740262981412
## iter: 150 f-value: 0.0182100969553395 pgrad: 0.636089317253035
## iter: 160 f-value: 0.00748162067231964 pgrad: 0.00376072602961973
## iter: 170 f-value: 0.0074220555014156 pgrad: 0.00666101627625426
## iter: 180 f-value: 0.0116991742349984 pgrad: 0.499285819916741
## iter: 190 f-value: 0.0070719943392188 pgrad: 0.0125920364028162
## iter: 200 f-value: 0.0073021851166327 pgrad: 0.160000114001862
## iter: 210 f-value: 0.00912310007605068 pgrad: 0.375353869166983
## iter: 220 f-value: 0.00667781022435975 pgrad: 0.0133596780923304
## iter: 230 f-value: 0.00666009677341328 pgrad: 0.00262741257640842
## iter: 240 f-value: 0.00663583320007166 pgrad: 0.0120400009087012
## iter: 250 f-value: 0.00924457984391016 pgrad: 0.396120387458885
## iter: 260 f-value: 0.00870767789728867 pgrad: 0.365334497743859
## iter: 270 f-value: 0.0064680049347368 pgrad: 0.00415466739440539

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```

## iter: 280 f-value: 0.0105321677758269 pgrad: 0.494731242234545
## iter: 290 f-value: 0.0100049610720473 pgrad: 0.472943703990297
## iter: 300 f-value: 0.0138186968354243 pgrad: 0.592761490222173
## iter: 310 f-value: 0.0061948919175648 pgrad: 0.00281016669244903
## iter: 320 f-value: 0.0061706381348664 pgrad: 0.00212017979561652
## iter: 330 f-value: 0.00616827414035668 pgrad: 0.00704115651516501
## iter: 340 f-value: 0.0107474908446146 pgrad: 0.532241659603696
## iter: 350 f-value: 0.0125816701692326 pgrad: 0.598977576555581
## iter: 360 f-value: 0.00614581950865829 pgrad: 0.00554042945439337
## iter: 370 f-value: 0.00608134537245152 pgrad: 0.00172849502858019
## iter: 380 f-value: 0.00609402879224919 pgrad: 0.00526959780262271
## iter: 390 f-value: 0.00604952428629928 pgrad: 0.0208657086454901
## iter: 400 f-value: 0.00703458436137554 pgrad: 0.236470025313701
## iter: 410 f-value: 0.00967751611895991 pgrad: 0.48007895409873
## iter: 420 f-value: 0.00594564325411851 pgrad: 0.00155625849486292
## iter: 430 f-value: 0.00593376934025122 pgrad: 0.00156743362322442
## iter: 440 f-value: 0.00589188095655883 pgrad: 0.0014577545529898
## iter: 450 f-value: 0.00660617244255302 pgrad: 0.201903042528244
## iter: 460 f-value: 0.00588814244141845 pgrad: 0.0233527718840268
## iter: 470 f-value: 0.00587263680761971 pgrad: 0.00174480251987907
## iter: 480 f-value: 0.00585885006519701 pgrad: 0.0027288524840996
## iter: 490 f-value: 0.00584693148567402 pgrad: 0.00140324245398071
## iter: 500 f-value: 0.00583211458415129 pgrad: 0.00179729239538751
## iter: 510 f-value: 0.0058240735793989 pgrad: 0.00153549349148574
## iter: 520 f-value: 0.00581403709829301 pgrad: 0.00149207431537957
## iter: 530 f-value: 0.00579150670040858 pgrad: 0.00135753096851332
## iter: 540 f-value: 0.00579293872380642 pgrad: 0.00188229611427171
## iter: 550 f-value: 0.00607142552317501 pgrad: 0.129346326173459
## iter: 560 f-value: 0.00575940904734696 pgrad: 0.0128624495115464
## iter: 570 f-value: 0.00642533611188862 pgrad: 0.206814983979993
## iter: 580 f-value: 0.00570795473615402 pgrad: 0.00165186526475258
## iter: 590 f-value: 0.00568797575842208 pgrad: 0.00233064043127862
## iter: 600 f-value: 0.00570354733853615 pgrad: 0.0371855278927313
## iter: 610 f-value: 0.00574952133191243 pgrad: 0.0616879074652015
## iter: 620 f-value: 0.00601261389322443 pgrad: 0.127203818031167
## iter: 630 f-value: 0.00565570975879268 pgrad: 0.021779790465613
## iter: 640 f-value: 0.00564619888380736 pgrad: 0.000828631645381939
## iter: 650 f-value: 0.00563992828573555 pgrad: 0.00118204648799514
## iter: 660 f-value: 0.00666098465161958 pgrad: 0.216122996464075
## iter: 670 f-value: 0.00563190437515216 pgrad: 0.000738429558166387
## iter: 680 f-value: 0.00562621913280783 pgrad: 0.000804985986636586
## iter: 690 f-value: 0.00560374531576061 pgrad: 0.000875192584685269
## iter: 700 f-value: 0.00559818463147247 pgrad: 0.000759276934696573
## iter: 710 f-value: 0.00556743788763344 pgrad: 0.000793419694281705
## iter: 720 f-value: 0.00555491450030265 pgrad: 0.000803098527853208
## iter: 730 f-value: 0.00555372038753195 pgrad: 0.00238844477261102
## iter: 740 f-value: 0.00554260298796829 pgrad: 0.000964361068904336
## iter: 750 f-value: 0.00553967730095845 pgrad: 0.000605217126414814
## iter: 760 f-value: 0.00554355267337512 pgrad: 0.00183805165059181
## iter: 770 f-value: 0.00553949061690592 pgrad: 0.00517092436893118
## Successful convergence.

```

```
names(gev_mixture_model)
```

```
## [1] "data"
```

```

## [2] "data_largest"
## [3] "block_sizes"
## [4] "equivalent_block_sizes"
## [5] "rejected_block_sizes"
## [6] "block_maxima_indexes_object"
## [7] "gev_models_object"
## [8] "extremal_indexes"
## [9] "normalized_gev_parameters_object"
## [10] "weighted_normalized_gev_parameters_object"
## [11] "identic_weights_mw"
## [12] "pessimistic_weights_mw"
## [13] "pessimistic_weights_pw_shape"
## [14] "pessimistic_weights_pw_scale"
## [15] "pessimistic_weights_pw_loc"
## [16] "automatic_weights_mw"
## [17] "automatic_weights_mw_statistics"
## [18] "automatic_weights_pw_shape"
## [19] "automatic_weights_pw_scale"
## [20] "automatic_weights_pw_loc"
## [21] "automatic_weights_pw_statistics"

gev_mixture_model$block_sizes

## [1] 10 11 12 13 14 15 16 17 18 19 20

gev_mixture_model$normalized_gev_parameters_object

##           loc_star      scale_star      shape_star
## 10 1.180399743401083 0.667445127250672 -0.216962155063532
## 11 1.192336224987749 0.652549243358429 -0.214785741907019
## 12 1.205849521102029 0.637732832395915 -0.206187493026991
## 13 1.265458737051933 0.619544869157828 -0.206800102014219
## 14 1.085029556981179 0.723897224092731 -0.240617936418741
## 15 1.227649077478720 0.609748697210775 -0.197155578693372
## 16 1.057345709776979 0.731771178306135 -0.238812440817355
## 17 1.577797006808085 0.425140051982429 -0.117922425530432
## 18 0.974581354409016 0.792468640640622 -0.259466571031497
## 19 0.722007867474274 1.010967499512901 -0.325362305383457
## 20 1.009756155832240 0.814325107408905 -0.280702440943181

gev_mixture_model$weighted_normalized_gev_parameters_object

##           loc_star      scale_star      shape_star
## identic_weights      1.13620099593666 0.698690042847031 -0.227706835529982
## pessimistic_weights 1.17806294065337 0.718968633534225 -0.225166146842437
## automatic_weights   1.44716366792221 0.457735077067039 -0.117922425530432

gev_mixture_model$automatic_weights_mw

##           10           11           12           13
## 0.0000000000000000 0.0000000000000000 0.0000000000000000 0.0000000000000000
##           14           15           16           17
## 0.0000000000000000 0.665460411309261 0.0000000000000000 0.334539588690739
##           18           19           20
## 0.0000000000000000 0.0000000000000000 0.0000000000000000

```

```
gev_mixture_model$automatic_weights_mw_statistics
```

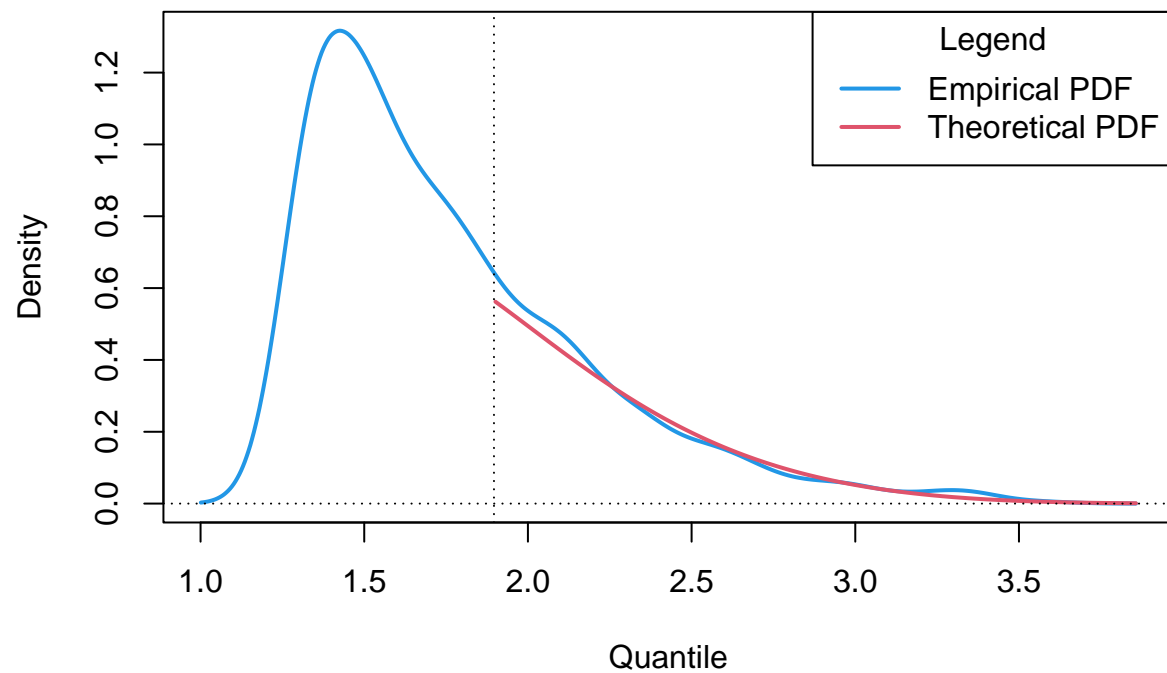
```
## $function_value
## [1] 0.01008067856721
##
## $gradient_value
## [1] 2.85943454373383e-05
##
## $function_reduction
## [1] 0.167899530017517
##
## $number_iterations
## [1] 1686
##
## $convergence
## [1] 0
##
## $message
## [1] "Successful convergence"
```

```
gev_mixture_model$automatic_weights_pw_statistics
```

```
## $function_value
## [1] 0.0055390396255099
##
## $gradient_value
## [1] 8.47456259212009e-06
##
## $function_reduction
## [1] 0.215513765701328
##
## $number_iterations
## [1] 3775
##
## $convergence
## [1] 0
##
## $message
## [1] "Successful convergence"
```

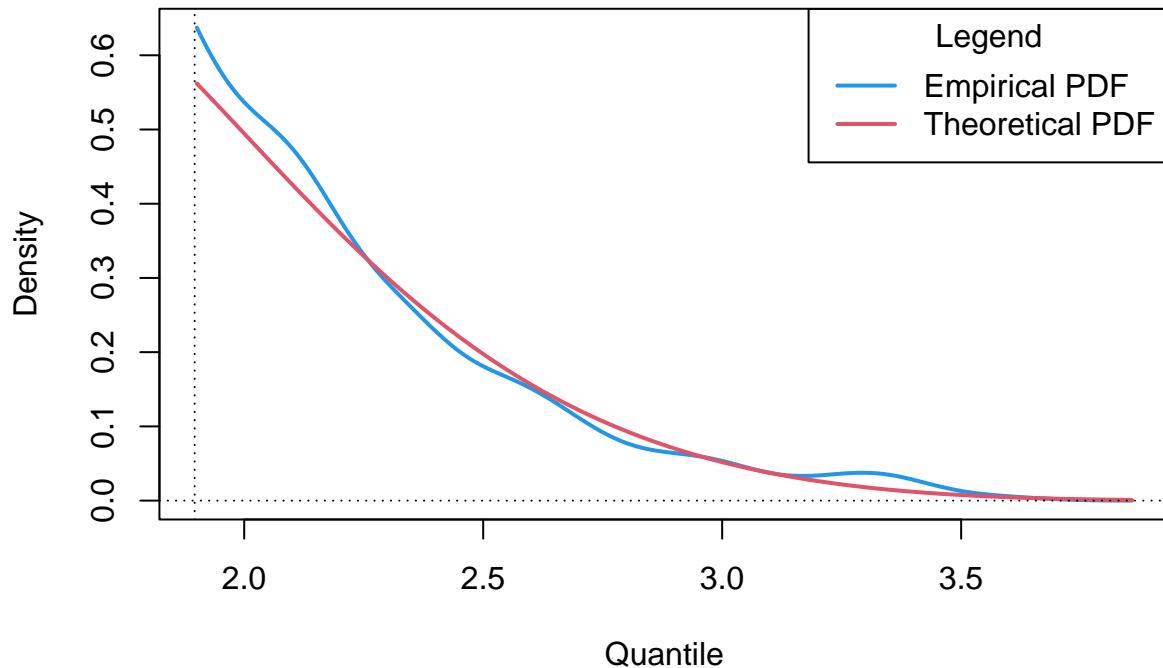
```
plot_gev_mixture_model_pdf(gev_mixture_model,
                           type = "automatic_weights",
                           model_wise = TRUE,
                           zoom = FALSE,
                           xlab = "Quantile",
                           ylab = "Density",
                           main = "Probability Density Function (PDF) Plot")
```

bility Density Function (PDF) Plot : automatic_weights – model_wise = TRUE : zoo



```
plot_gev_mixture_model_pdf(gev_mixture_model,  
  type = "automatic_weights",  
  model_wise = TRUE,  
  zoom = TRUE,  
  xlab = "Quantile",  
  ylab = "Density",  
  main = "Probability Density Function (PDF) Plot")
```

Ability Density Function (PDF) Plot : automatic_weights – model_wise = TRUE : zoc



```

gev_mixture_model_parameters <- gev_mixture_model$normalized_gev_parameters_object

shapes <- gev_mixture_model_parameters$shape_star
scales <- gev_mixture_model_parameters$scale_star
locations <- gev_mixture_model_parameters$loc_star

weights <- gev_mixture_model$automatic_weights_mw

#
p <- 0.95

q_initial_guesses <- sapply(1:length(weights), function(j) calculate_gev_inverse_cdf(p = p,
                                                                                      loc = locations[j],
                                                                                      scale = scales[j],
                                                                                      shape = shapes[j]))

q_initial_guesses

## [1] 2.64175364363720 2.62520974564678 2.62231124733478 2.64039908372025
## [5] 2.62132347314048 2.59841767265660 2.61402861790055 2.64311258093824
## [9] 2.61560096540202 2.64706401297776 2.65051545445380

range(q_initial_guesses)

## [1] 2.5984176726566 2.6505154544538

block_size <- max(gev_mixture_model$block_sizes)
y <- gev_mixture_model$data_largest
threshold <- find_threshold_associated_with_given_block_size(x = y, block_size = block_size)

```

```

library(evd)

data <- y[y > threshold]

M3 <- fgev(data, prob = 0.95)

M3

##
## Call: fgev(x = data, prob = 0.95)
## Deviance: 90.7488023809861
##
## Estimates
##      quantile      scale      shape
## 1.922576286634 0.198310461963 0.340437697411
##
## Standard Errors
##      quantile      scale      shape
## 0.00975950564206 0.01218405732956 0.06986723101810
##
## Optimization Information
##   Convergence: successful
## Function Evaluations: 65
## Gradient Evaluations: 13

M4 <- fgev(data)

M4

##
## Call: fgev(x = data)
## Deviance: 90.7488026701074
##
## Estimates
##      loc      scale      shape
## 2.104146565777 0.198314304228 0.340445742676
##
## Standard Errors
##      loc      scale      shape
## 0.0140109634943 0.0121831202276 0.0698716839473
##
## Optimization Information
##   Convergence: successful
## Function Evaluations: 67
## Gradient Evaluations: 12

Fn <- ecdf(y)

p <- seq(from = Fn(threshold), to = 0.999, length.out = 20)
p

## [1] 0.701000000000000 0.716684210526316 0.732368421052632 0.748052631578947
## [5] 0.763736842105263 0.779421052631579 0.795105263157895 0.810789473684211
## [9] 0.826473684210526 0.842157894736842 0.857842105263158 0.873526315789474
## [13] 0.889210526315789 0.904894736842105 0.920578947368421 0.936263157894737
## [17] 0.951947368421053 0.967631578947368 0.983315789473684 0.999000000000000

```



```
quantiles <- calculate_gev_mixture_model_inverse_cdf(p = p*0.1, locations, scales, shapes, weights, ite
```

```
quantiles
```

```
## [1] 0.876644389282018 0.881406051647020 0.886098608061482 0.890724779734860
## [5] 0.895287127967437 0.899788066650276 0.904229873556944 0.908614700565232
## [9] 0.912944582928962 0.917221447704429 0.921447121422848 0.925623337088754
## [13] 0.929751740574614 0.933833896473419 0.937871293463800 0.941865349235840
## [17] 0.945817415020323 0.949728779759315 0.953600673951837 0.957434273204707
```

```
probaility <- calculate_gev_mixture_model_cdf(q = quantiles, locations, scales, shapes, weights)
```

```
probaility
```

```
## [1] 0.0701000000000000 0.0716684210526316 0.0732368421052630 0.0748052631578947
## [5] 0.0763736842105263 0.0779421052631577 0.0795105263157896 0.0810789473684210
## [9] 0.0826473684210528 0.0842157894736844 0.0857842105263159 0.0873526315789473
## [13] 0.0889210526315789 0.0904894736842103 0.0920578947368420 0.0936263157894736
## [17] 0.0951947368421052 0.0967631578947367 0.0983315789473684 0.0999000000000001
```

```
qnorm(p = p)
```

```
## [1] 0.527278791439508 0.573019369900915 0.619991842033896 0.668374236427926
## [5] 0.718374645462989 0.770239402477233 0.824264167978341 0.880809286378071
## [9] 0.940321583807025 1.003366190605948 1.070674551002344 1.143219739889629
## [13] 1.222340347465152 1.309956575262244 1.408976539846756 1.524140232935929
## [17] 1.664035860967863 1.847071060314614 2.127622188291079 3.090232306167813
```

```
calculate_gev_inverse_cdf(p = p*0.1, loc = 2.52214, scale = 0.5222, shape = 0.1487)
```

```
## [1] 2.04704864576757 2.05082608071144 2.05455715735433 2.05824370453814
## [5] 2.06188744538342 2.06549000547116 2.06905292024001 2.07257764168813
## [9] 2.07606554445718 2.07951793136610 2.08293603845361 2.08632103958138
## [13] 2.08967405064320 2.09299613342025 2.09628829911788 2.09955151161514
## [17] 2.10278669045481 2.10599471359863 2.10917641996952 2.11233261180067
```

```
calculate_gev_inverse_cdf(p = p, loc = 1, scale = 0.5, shape = 0.1)
```

```
## [1] 1.54519616882743 1.58097321060849 1.61860059907953 1.65832648480524
## [5] 1.70044777858763 1.74532400031750 1.79339635588865 1.84521459754289
## [9] 1.90147580387572 1.96308201987432 2.03122890156810 2.10754769742410
## [13] 2.19434415751605 2.29502593155008 2.41492943609364 2.56309506962005
## [17] 2.75667954702242 3.03469566363171 3.52271486709944 5.97581256378162
```