Clustering basic benchmark

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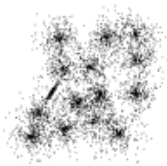
S-sets

S1 **S2**



S3 **S4**

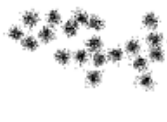
Synthetic 2-d data with N=5000 vectors and k=15 Gaussian clusters with different degree of cluster overlap

P. Fränti and O. Virmajoki, "Iterative shrinking method for clustering problems", *Pattern Recognition*, 39 (5), 761-765, May 2006. (Bibtex)

S1: ts txt
S2: ts txt
S3: ts txt
S4: ts txt

Ground truth centroids and partitions: zip
s3 and s4 updated 4.2.2015

A-sets



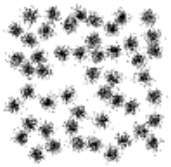
A1 N=3000, k=20

A2 N=5250, k=35

Synthetic 2-d data with increasing number of clusters (k). There are 150 vectors per cluster.

I. Kärkkäinen and P. Fränti, "Dynamic local search algorithm for the clustering problem", *Research Report A-2002-6* (pdf)(Bibtex)

A1: ts txt
A2: ts txt
A3: ts txt

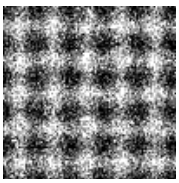


A3
N=7500,
k=50

Ground truth centroids: cb and txt
Ground truth partitions: pa

Birch-sets

Synthetic 2-d data with N=100,000 vectors and k=100 clusters



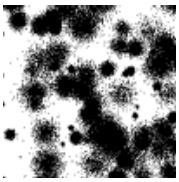
Birch1

Birch2

Zhang et al., "BIRCH: A new data clustering algorithm and its applications", *Data Mining and Knowledge Discovery*, 1 (2), 141-182, 1997. (Bibtex)

Data sets (TS and TXT), ground truth centroids (CB and TXT) and partitions (PA):

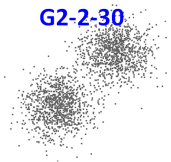
Birch1: Clusters in regular grid structure ts txt cb gt pa
Birch2: Clusters at a sine curve ts txt cb gt pa
Birch3: Random sized clusters in random locations ts txt cb gt



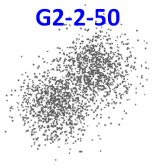
Birch3

Birch2 subsets: Varying N=1,000-1,000,000 ts txt
Varying k=1-100 ts txt

G2 sets



G2 datasets



N=2048,
k=2
D=2-1024
var=10-100

Gaussian clusters datasets with varying cluster overlap and dimensions.
txt (17 MB) ts (50 MB)

P. Fränti R. Mariescu-Istodor and C. Zhong, "XNN graph" *IAPR Joint Int. Workshop on Structural, Syntactic, and Statistical Pattern Recognition* Merida, Mexico, LNCS 10029, 207-217, November 2016. (Bibtex)

Ground truth centroids: cb and txt
Ground truth partitions: pa

DIM-sets (high)

dim032
D=32

dim064
D=64

High-dimensional data sets N=1024 and k=16 Gaussian clusters.
Clusters are well separated even in the higher dimensional cases.

P. Fränti, O. Virmajoki and V. Hautamäki, "Fast agglomerative clustering using a k-nearest neighbor graph", *IEEE Trans. on Pattern Analysis and Machine Intelligence*, 28 (11), 1875-1881, November 2006. (Bibtex)

dim128 D=128 **dim256** D=256

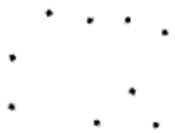
dim512 D=512 **dim1024** D=1024

Ground truth centroids: cb and txt

Data sets in TS and TXT, ground truth partitions in PA format:

dim032: ts txt pa
dim064: ts txt pa
dim128: ts txt pa
dim256: ts txt pa
dim512: ts txt pa
dim1024: ts txt pa

DIM-sets (low)



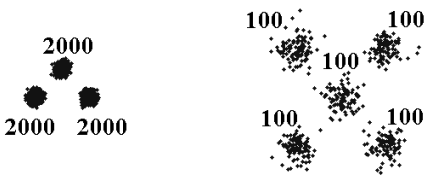
Dim2

Synthetic data with Gaussian clusters.
N=1351-10126 vectors in k=9 clusters in 2-15 dimensional space

I. Kärkkäinen and P. Fränti, "Gradual model generator for single-pass clustering", *Pattern Recognition*, 40 (3), 784-795, March 2007. (Bibtex)

ts txt

Unbalance



Unbalance
N=6500, k=8

Synthetic 2-d data with N=6500 vectors and k=8 Gaussian clusters
ts txt

M. Rezaei and P. Fränti, "Set-matching measures for external cluster validity", *IEEE Trans. on Knowledge and Data Engineering*, 28 (8), 2173-2186, August 2016. (Bibtex)

Ground truth centroids: cb and txt
Ground truth partitions: pa

Other clustering datasets

To cite the datasets please use the original articles.

Image data


Bridge
(256x256)

N=4096,
D=16

4x4 pixel blocks ts txt
4x4 binarized pixel blocks ts txt
4x4 pixel blocks: 25% randomly sampled (for training) ts txt
4x4 pixel blocks: 75% randomly sampled (for testing) ts txt


House
(256x256)

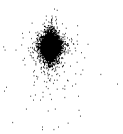
N=34112,
D=3

RGB-values, quantized to 5 bits per color ts txt
RGB-values, 8 bits per color ts txt


Miss America
(360x288)

N=6480,
D=16

4x4 pixel blocks from the difference image of frame 1 and 2 ts txt
4x4 pixel blocks from the difference image of frame 2 and 3 ts txt

Europe
(vector)

Europe
N=169308,
D=2

Differential coordinates of Europe map ts txt
original

P. Fränti, M. Rezaei and Q. Zhao, "Centroid index: cluster level similarity measure", *Pattern Recognition*, 47 (9), 3034-3045, September 2014, 2014. (Bibtex)

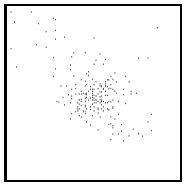
KDDCUP04Bio set

KDDCUP04Bio
N=145751,
k=2000, D=74

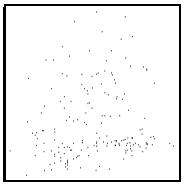
KDDCUP04Bio biology dataset.

KDDCUP04Bio: ts txt

UCI datasets



Thyroid



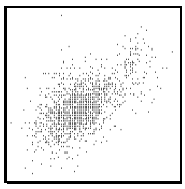
Wine

UCI datasets original source is http://archive.ics.uci.edu/ml/

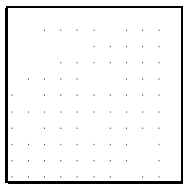
Breast-Cancer-Wisconsin: We have removed features 1 (sample id) and 11 (class label). All missing values are given value 1.

N=215, k=2, D=5
ts txt

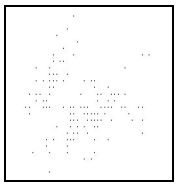
N=178, k=3, D=13
ts txt



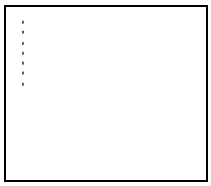
Yeast
N=1484, k=10, D=8
txt
ts integer



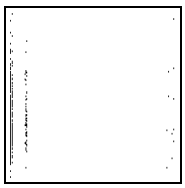
Breast
N=699, k=2, D=9
ts txt



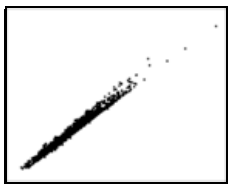
Iris
N=150, C=3, D=4
ts txt labels



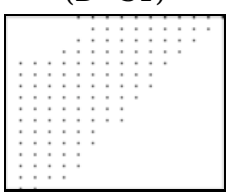
Glass
N=214, k=7, D=9,
ts txt labels



Wdbc
N=569, k=2, D=32
ts full numeric (D=31)

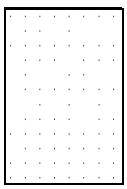


leaves
N=1600, k=100, D=64
zip



Letter
N=20000, k=26, D=16
zip

Categorical



Census
N=1000-512000, D=68
zip

Categorical attributes from Public Use Microdata Samples (PUMS) person records. Includes subsets of size 1000, 2000, 4000, ..., 512000. Source

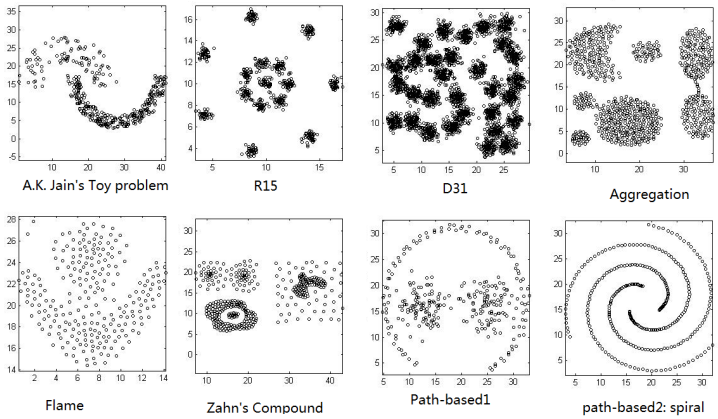
Worms

Worms
N=105,600,
k=35, D=2
N=105,000,
k=25, D=64

Synthetic 2-d and 64-d data with worm like shapes.
Dataset and MATLAB generation scripts:
worms.zip

S. Sieranoja and P. Fränti, "Fast and general density peaks clustering", Pattern Recognition Letters, 128, 551-558, December 2019. (pdf)

Shape sets



Third column is the label.

Aggregation
N=788, k=7, D=2

Aggregation: txt
A. Gionis, H. Mannila, and P. Tsaparas, Clustering aggregation. *ACM Transactions on Knowledge Discovery from Data (TKDD)*, 2007. 1(1): p. 1-30.

Compound
N=399, k=6, D=2

Compound: txt
C.T. Zahn, Graph-theoretical methods for detecting and describing gestalt clusters. *IEEE Transactions on Computers*, 1971. 100(1): p. 68-86.

Pathbased
N=300, k=3, D=2

Pathbased: txt
H. Chang and D.Y. Yeung, Robust path-based spectral clustering. *Pattern Recognition*, 2008. 41(1): p. 191-203.

Spiral
N=312, k=3, D=2

Spiral: txt
H. Chang and D.Y. Yeung, Robust path-based spectral clustering. *Pattern Recognition*, 2008. 41(1): p. 191-203.

D31
N=3100, k=31,
D=2

D31: txt
C.J. Veenman, M.J.T. Reinders, and E. Backer, A maximum variance cluster algorithm. *IEEE Trans. Pattern Analysis and Machine Intelligence* 2002. 24(9): p. 1273-1280.

R15
N=600, k=15,

R15: txt
C.J. Veenman, M.J.T. Reinders, and E. Backer, A

D=2

maximum variance cluster algorithm. *IEEE Trans. Pattern Analysis and Machine Intelligence*, 2002. 24(9): p. 1273-1280.

Jain
N=373, k=2, D=2

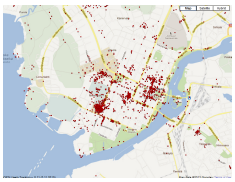
Jain: txt
A. Jain and M. Law, Data clustering: A user's dilemma. *Lecture Notes in Computer Science*, 2005. 3776: p. 1-10.

Flame
N=240, k=2, D=2

Flame: txt
L. Fu and E. Medico, FLAME, a novel fuzzy clustering method for the analysis of DNA microarray data. *BMC bioinformatics*, 2007. 8(1): p. 3.

Mopsi locations

User locations (Finland)
N=13467, D=2



User locations (Joensuu)
N=6014, D=2

User locations until 2012 (FINLAND)
User locations: cb txt

User locations until 2012 (JOENSUU)
User locations Joensuu: ts txt

Mopsi datasets

Miscellaneous

t4.8k
N=8000, k=6, D=2
t4.8k.txt

t4.8k: G. Karypis, E.H. Han, V. Kumar, CHAMELEON: A hierarchical 765 clustering algorithm using dynamic modeling, *IEEE Trans. on Computers*, 32 (8), 68-75, 1999.

ConfLongDemo
N=164,860, k=11, D=3
txt

ConfLongdemo has eight attributes, of which only three numerical attributes are included here.

MNIST
N=10000, k=10, D=748
txt

MNIST includes 10 handwriting digits and contains 60,000 477 training patterns and 10,000 test patterns of 784 dimensions.

MiniBooNE
N=130,065, D=50
txt

MiniBooNE

Related links

- Programming interface (modu*.zip) to handle data sets (cb/ts-format)
- Software for converting data sets to text