# Package 'OrdCD'

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**Type** Package

**Title** Ordinal Causal Discovery

**Version** 1.1.0

**Date** 2023-01-09

**Description** Algorithms for ordinal causal discovery. This package aims to enable users to discover causality for observational ordinal categorical data with greedy and exhaustive search. See Ni, Y., & Mallick, B. (2022) <https://proceedings.mlr.press/v180/ni22a/ni22a.pdf> ``Ordinal Causal Discovery. Proceedings of the 38th Conference on Uncertainty in Artificial Intelligence, (UAI 2022), PMLR 180:1530–1540".

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**Encoding** UTF-8

**RoxygenNote** 7.2.1

**Imports** gRbase, MASS, bnlearn, igraph, stats

**URL** https://github.com/nySTAT/OrdCD

**BugReports** https://github.com/nySTAT/OrdCD/issues

**NeedsCompilation** no

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**Repository** CRAN

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## R topics documented:

OCD *Causal Discovery for Ordinal Categorical Data*

## Description

Estimate a causal directed acyclic graph (DAG) for ordinal categorical data with greedy or exhaustive search.

## Usage

```
OCD(
  y,
  search = "greedy",
  ic = "bic",
  link = "probit",
  G = NULL,
  nstart = 1,
  verbose = FALSE
)
```

## Arguments

| | |
|---|---|
| y | a data frame with each column being an ordinal categorical variable, which must be a factor. |
| search | the search method used to find the best-scored DAG. The default search method is "greedy". When the number of nodes is less than 4, "exhaust" search is available. |
| ic | the information criterion (AIC or BIC) used to score DAGs. The default is "bic". |
| link | the link function for ordinal regression. The default is "probit". Other choices are "logistic", "loglog", "cloglog", and "cauchit". |
| G | a list of DAG adjacency matrices that users want to restrict their search on for the "exhaust" search. The default is "NULL" meaning no restriction imposed on the search. |
| nstart | number of random graph initializations for the "greedy" search. |
| verbose | if TRUE, messages are printed during the run of the greedy search algorithm. |

## Value

A list with two elements, gam and ic_best. gam is an estimated DAG adjacency matrix whose (i,j)th entry is 1 if j->i is present in the graph and 0 otherwise. ic_best is the correponding information criterion value.

## Examples

```
set.seed(2020)
n=1000 #sample size
q=3 #number of nodes
y = u = matrix(0,n,q)
u[,1] = 4*rnorm(n)
y[,1] = (u[,1]>1) + (u[,1]>2)
for (j in 2:q){
  u[,j] = 2*y[,j-1] + rnorm(n)
  y[,j]=(u[,j]>1) + (u[,j]>2)
}
A=matrix(0,q,q) #true DAG adjacency matrix
A[2,1]=A[3,2]=1
y=as.data.frame(y)
for (j in 1:q){
  y[,j]=as.factor(y[,j])
}

G=OCD(y) #estimated DAG adjacency matrix
print(A)
print(G)
```

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