Aufgabe 7-1

Aufgabe 7-3

$\varepsilon = 1.1$ minPts$= 2$

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$\varepsilon = 4.1$ minPts$= 5$

$\varepsilon = 4.1$ minPts$= 4$

DBSCAN and Single-Link

Data Mining Tutorial

Session 5: Clustering

Erich Schubert, Eirini Ntoutsi

Ludwig-Maximilians-Universität München

2012-06-21 — KDD class tutorial

Convergence of PAM

Let:

- M_i = model (= set of medoids) after the ith iteration.
- $TD(M_i)$ = cost of model M_i.

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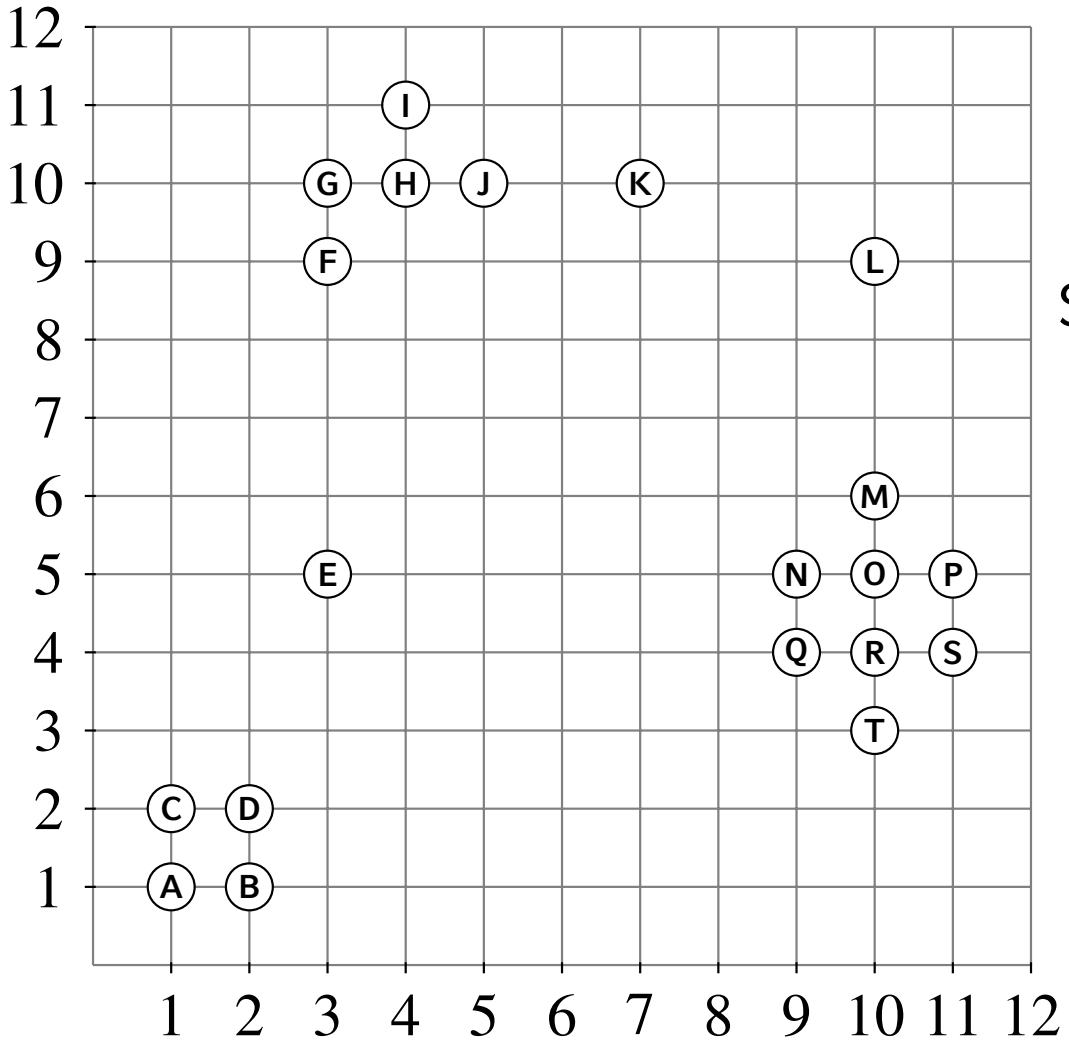
DBSCAN

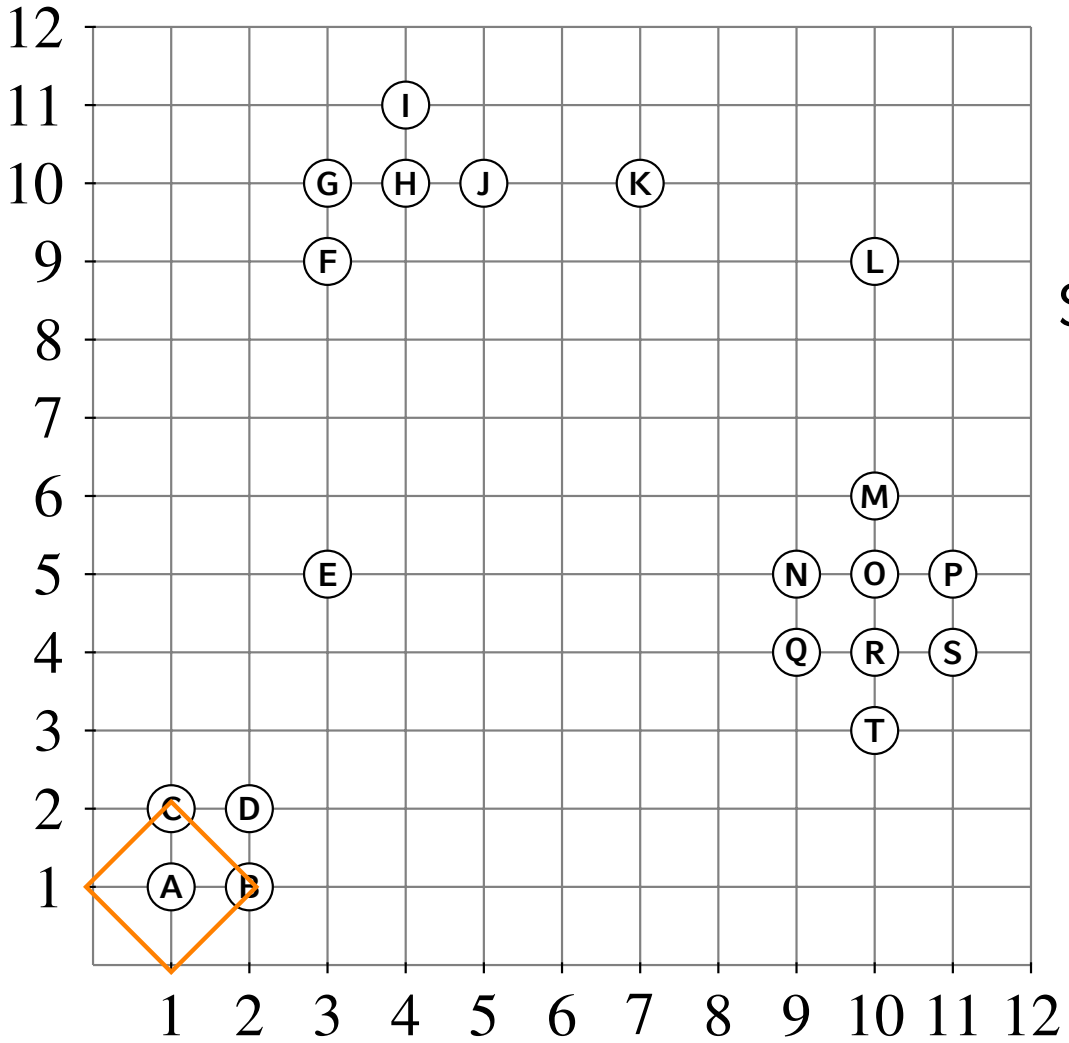


$\varepsilon = 1.1$

$minPts = 2$

Seed list:

DBSCAN



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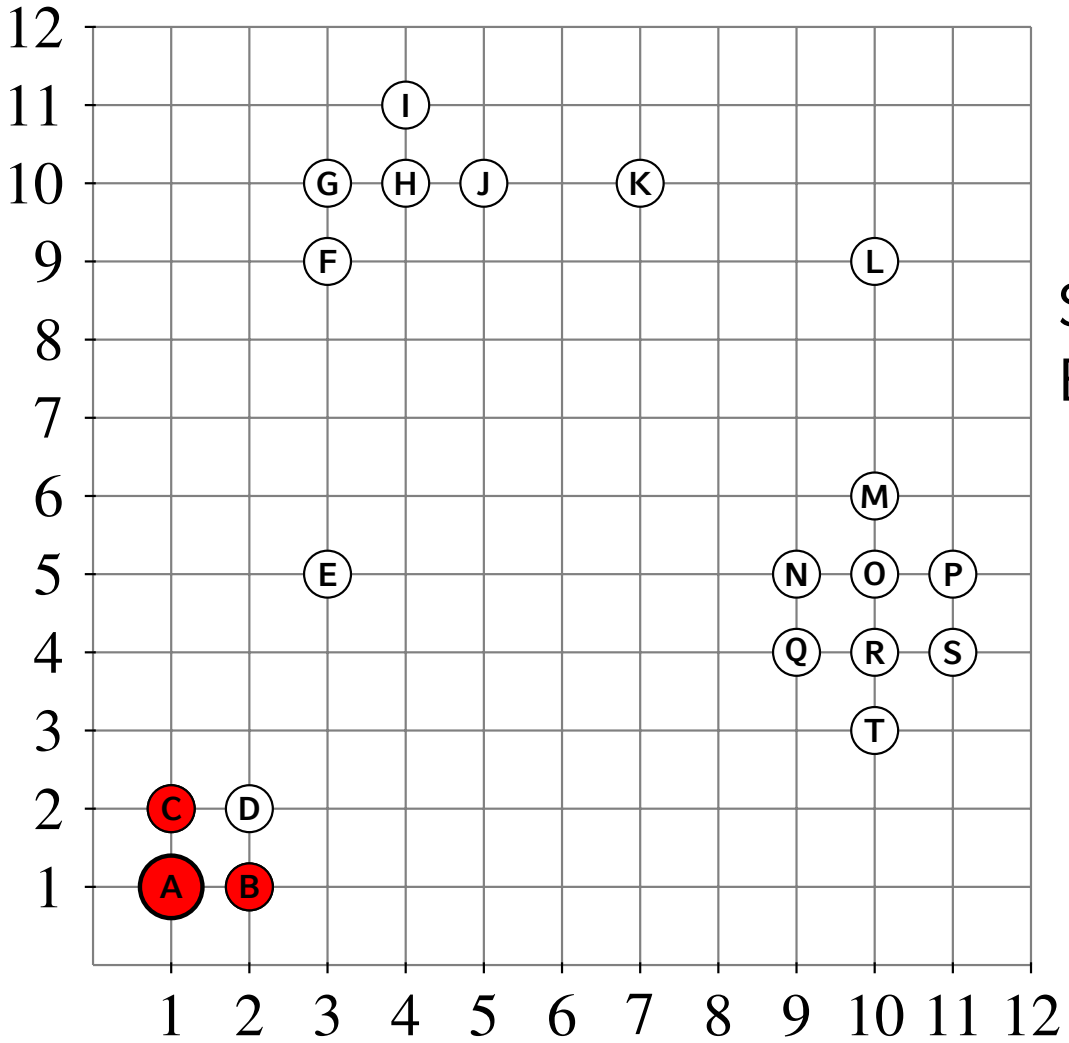
Seed list:

DBSCAN

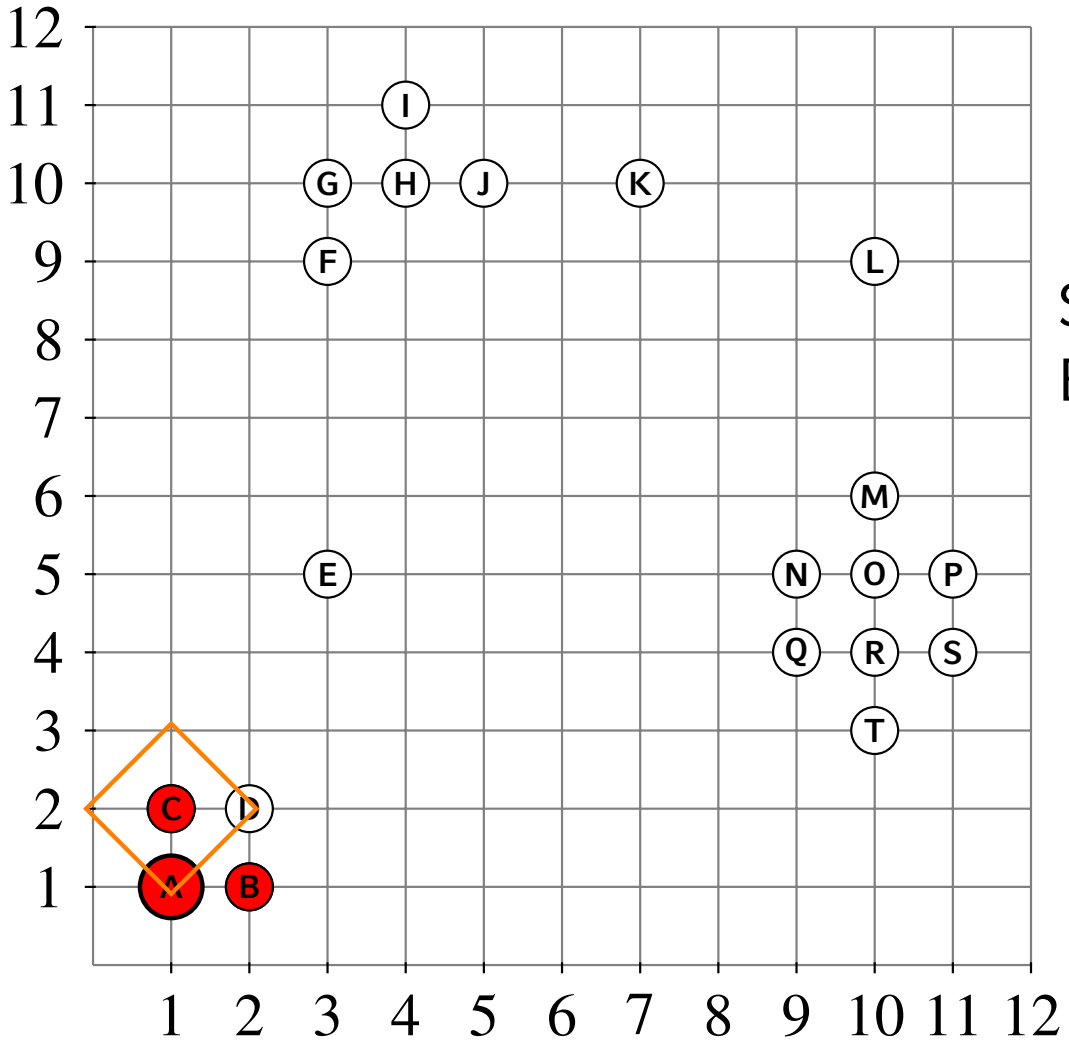


$\varepsilon = 1.1$

$minPts = 2$

Seed list:
BC

DBSCAN

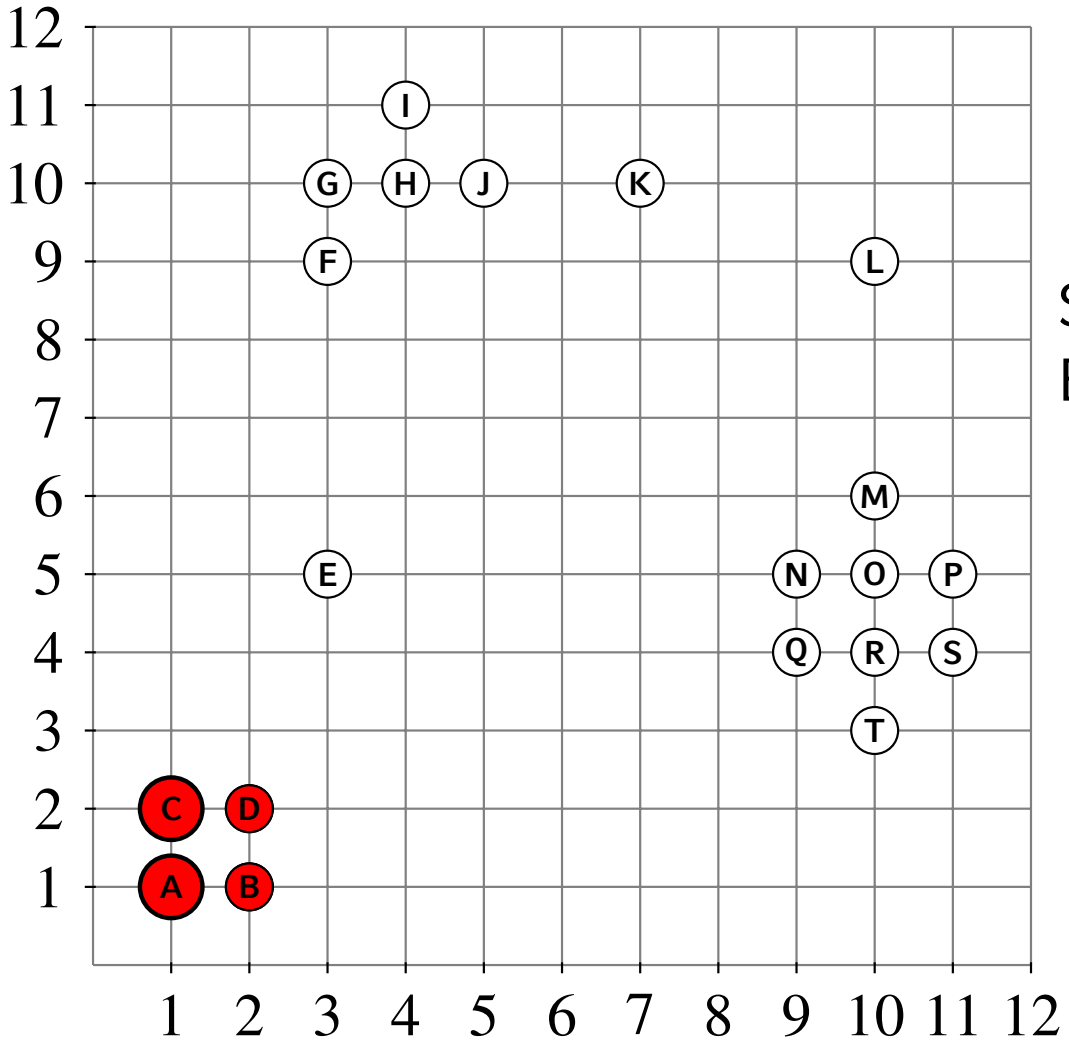


$\varepsilon = 1.1$

$minPts = 2$

Seed list:
B

DBSCAN

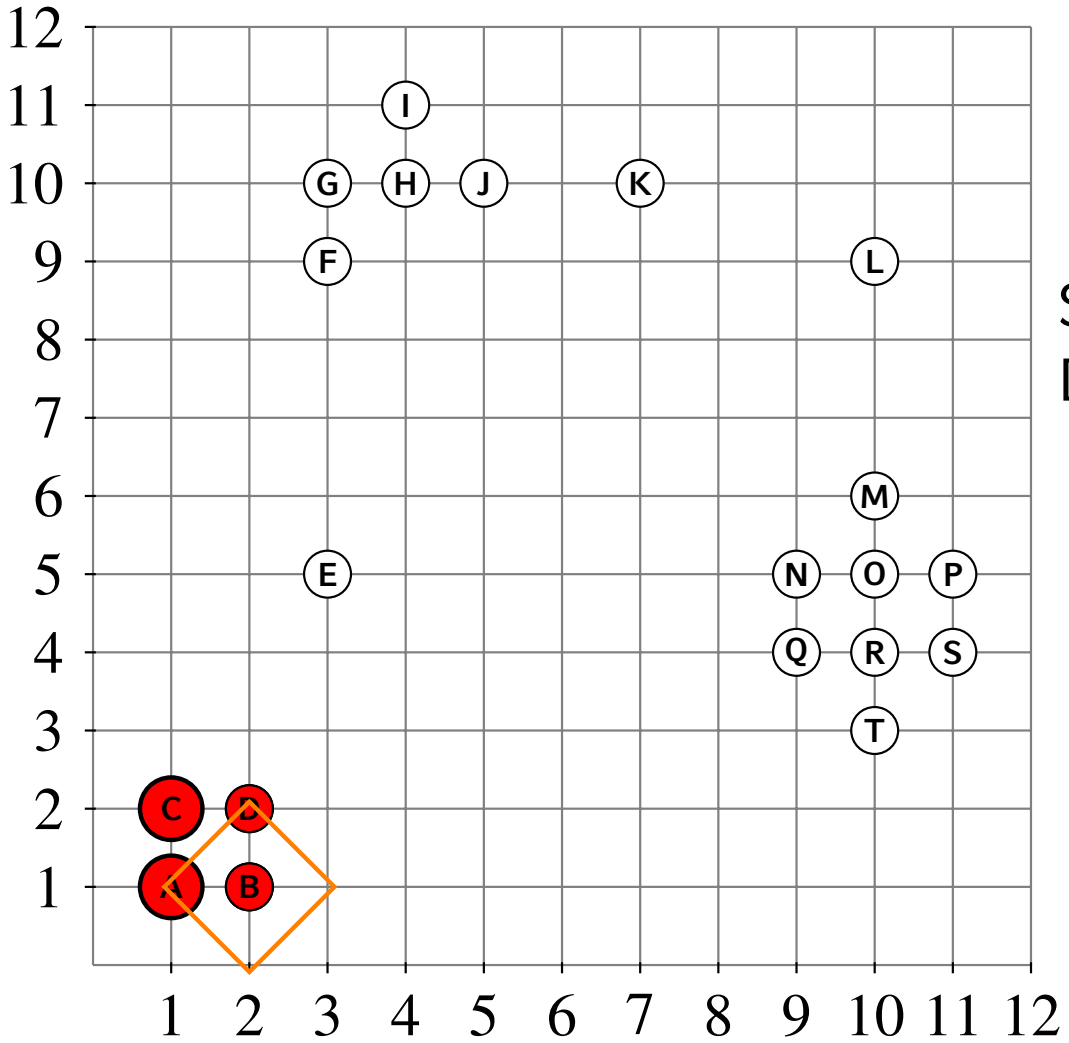


$\varepsilon = 1.1$

$minPts = 2$

Seed list:
BD

DBSCAN

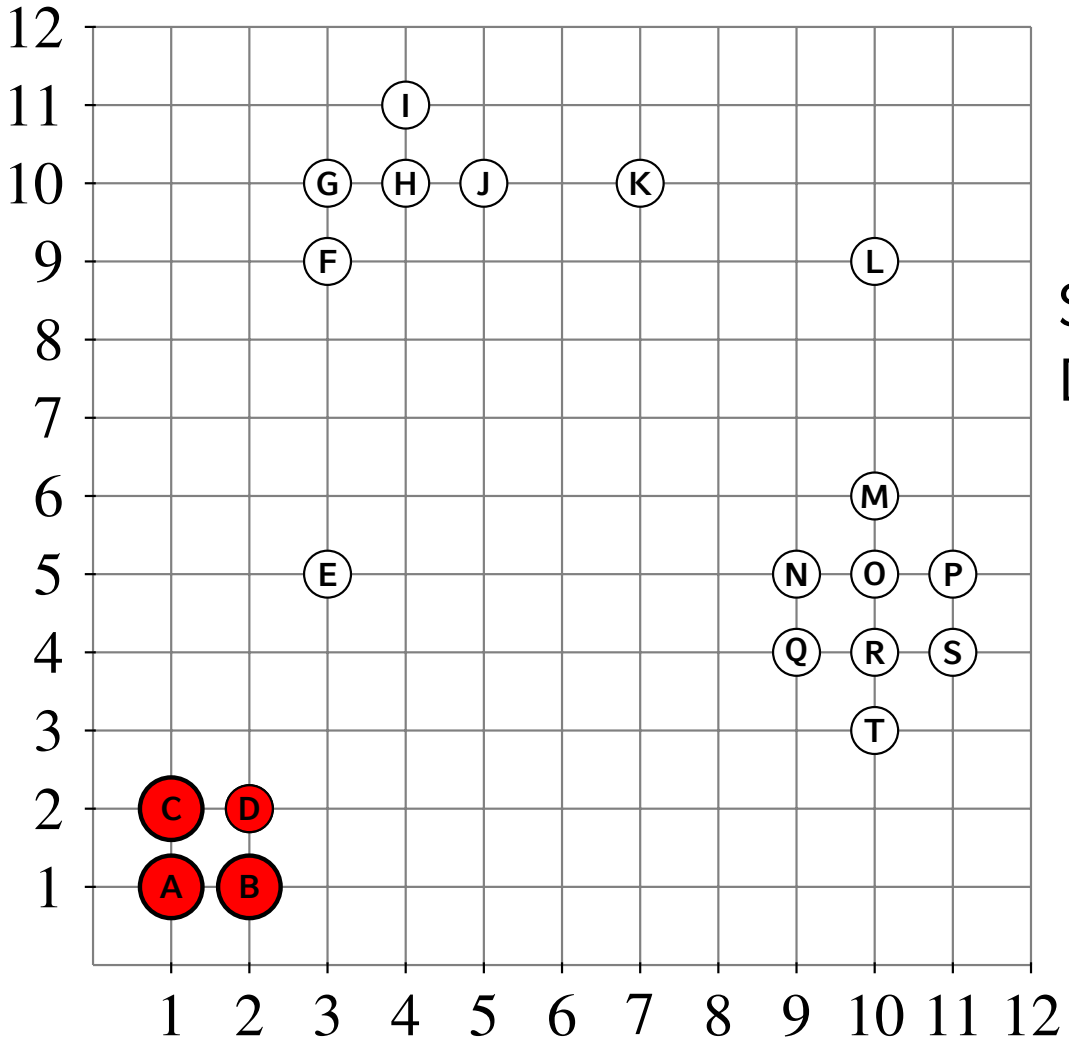


$\varepsilon = 1.1$

$minPts = 2$

Seed list:
D

DBSCAN

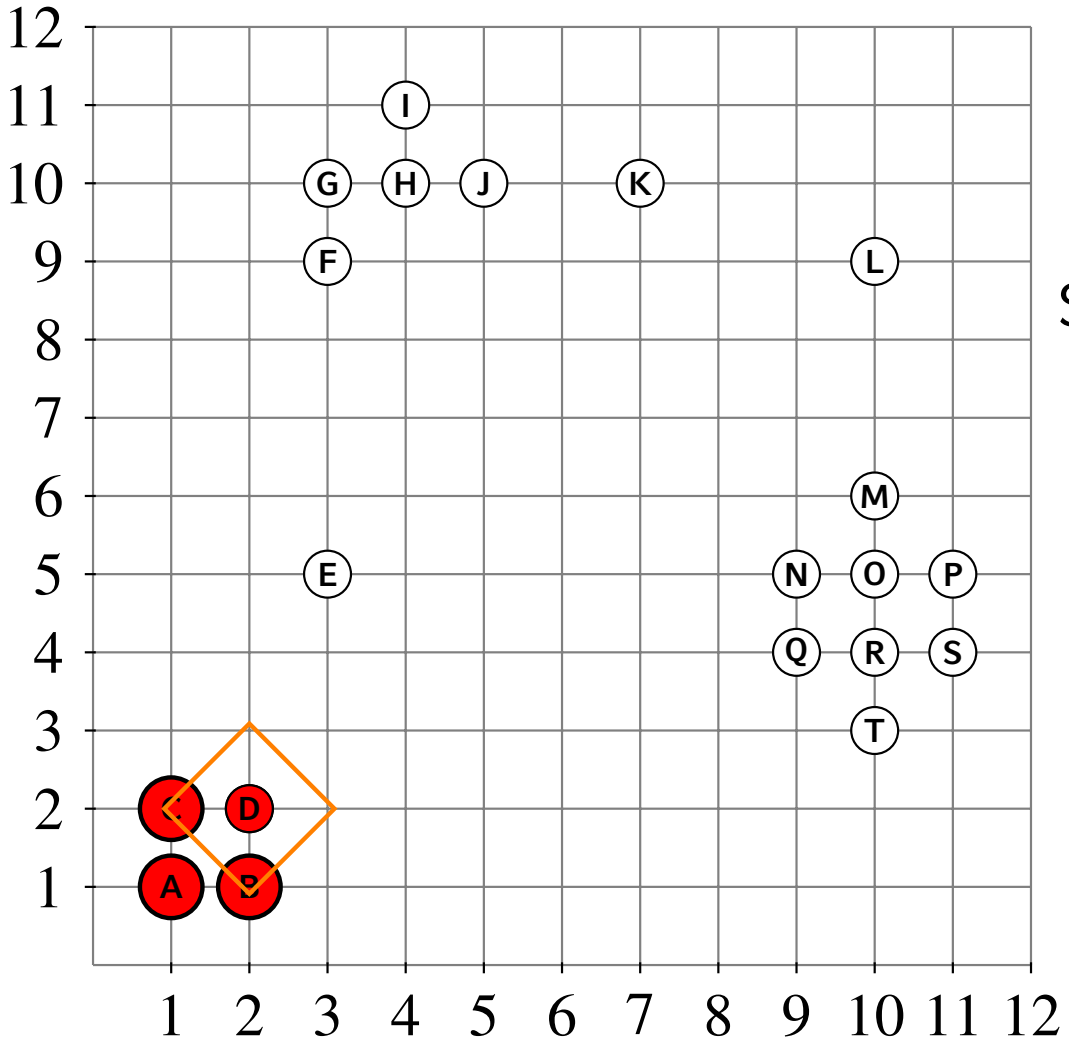


$\varepsilon = 1.1$

$minPts = 2$

Seed list:
D

DBSCAN



$\varepsilon = 1.1$

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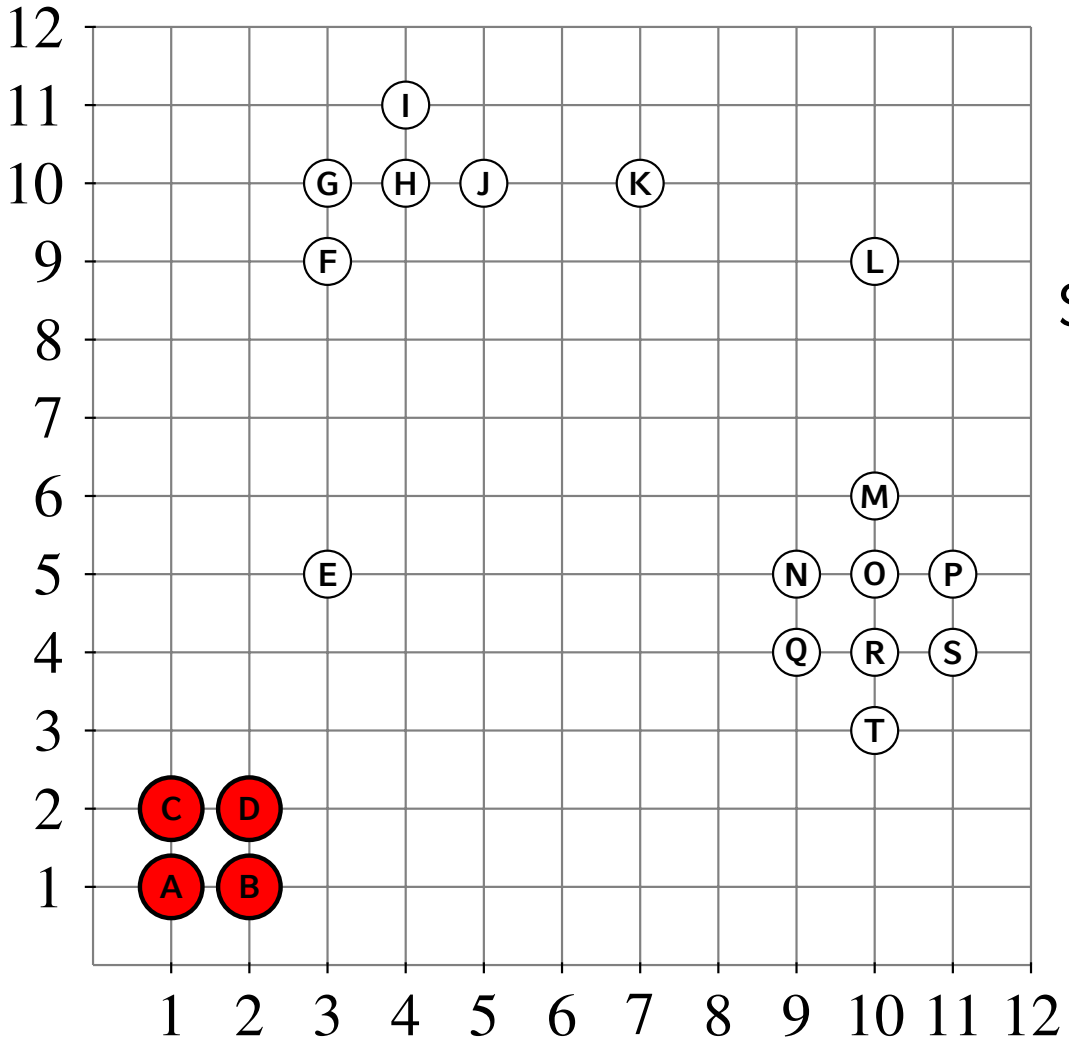
Seed list:

DBSCAN



$\varepsilon = 1.1$

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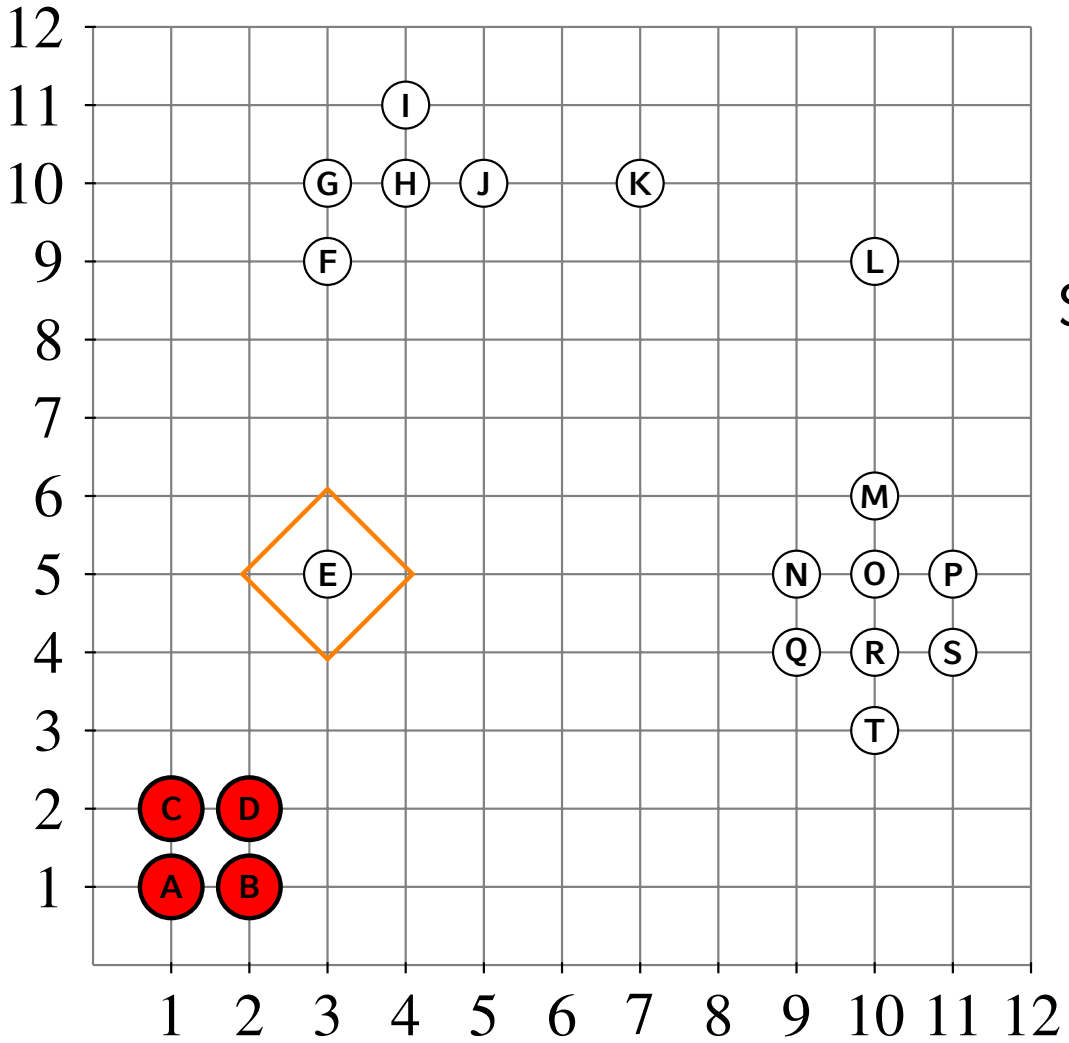
Seed list:

DBSCAN



$\varepsilon = 1.1$

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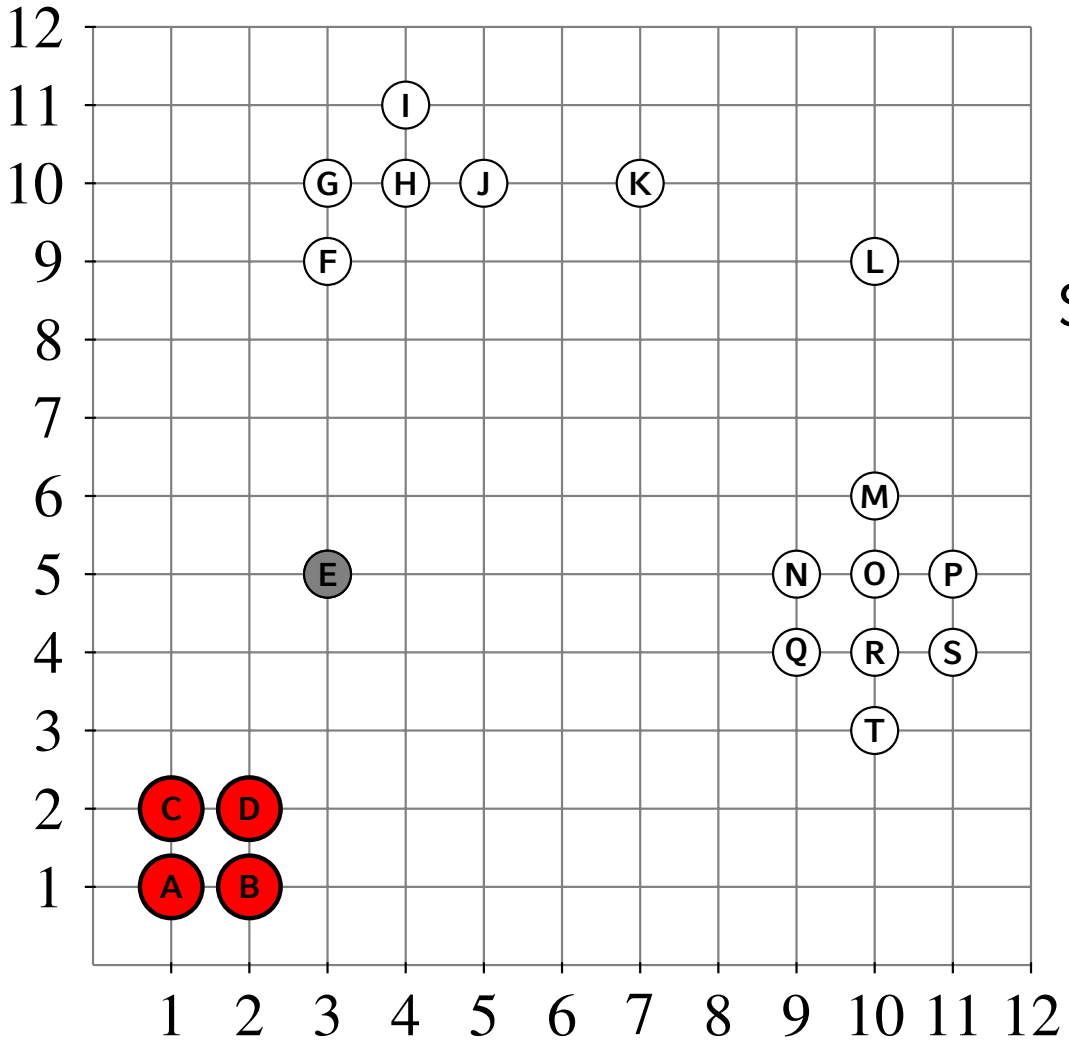
Seed list:

DBSCAN



$\varepsilon = 1.1$

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Seed list:

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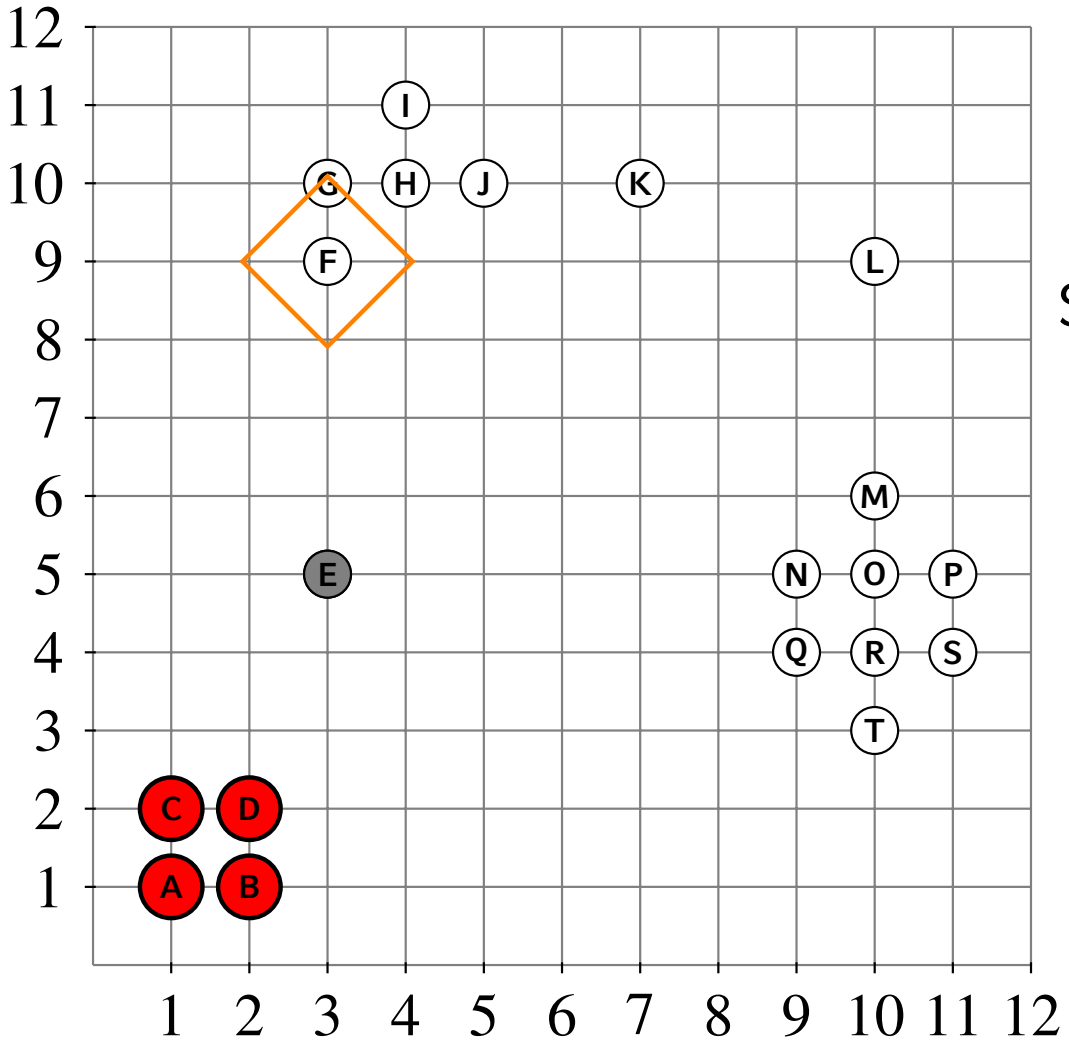

$\varepsilon = 1.1$

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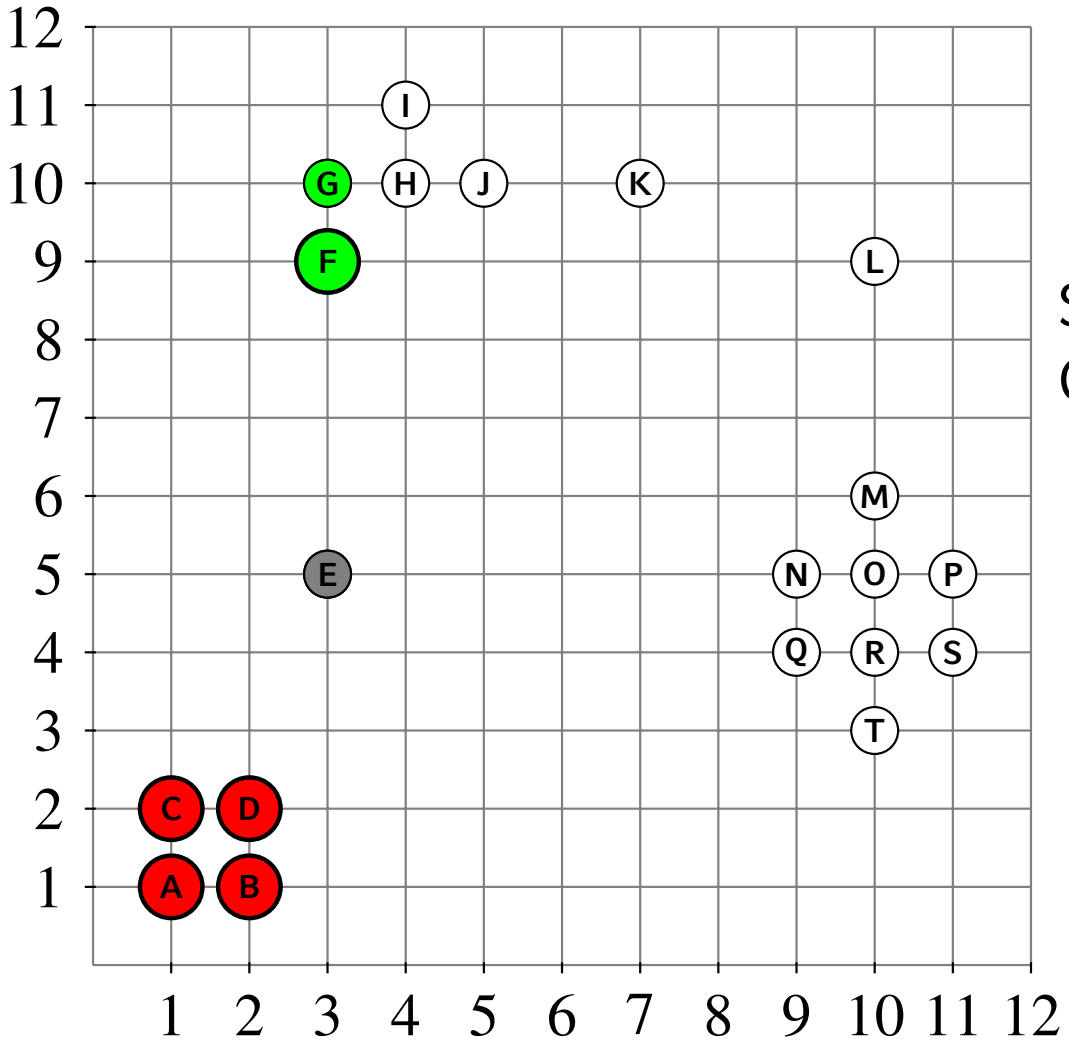
Seed list:

DBSCAN



$\varepsilon = 1.1$

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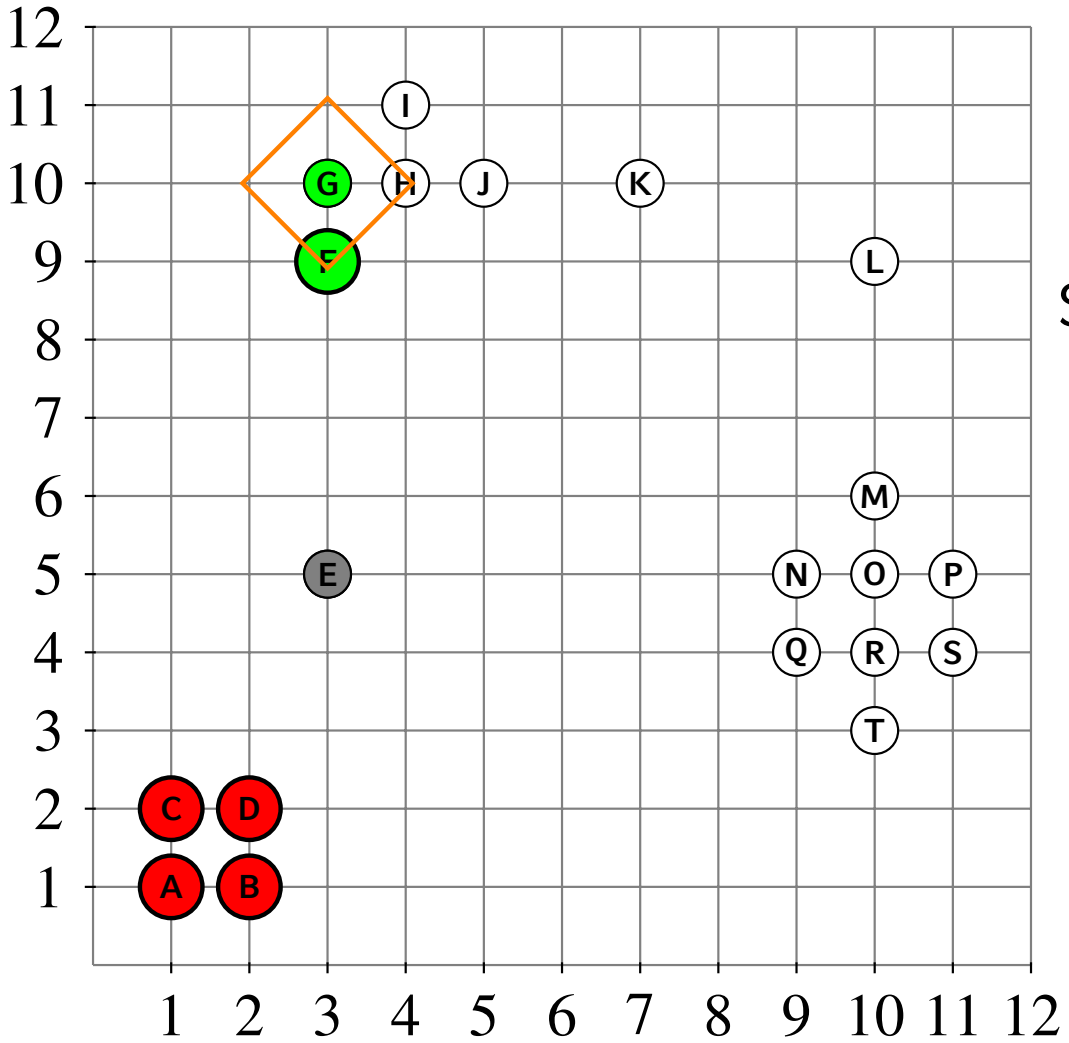
Seed list:
G

DBSCAN



$\varepsilon = 1.1$

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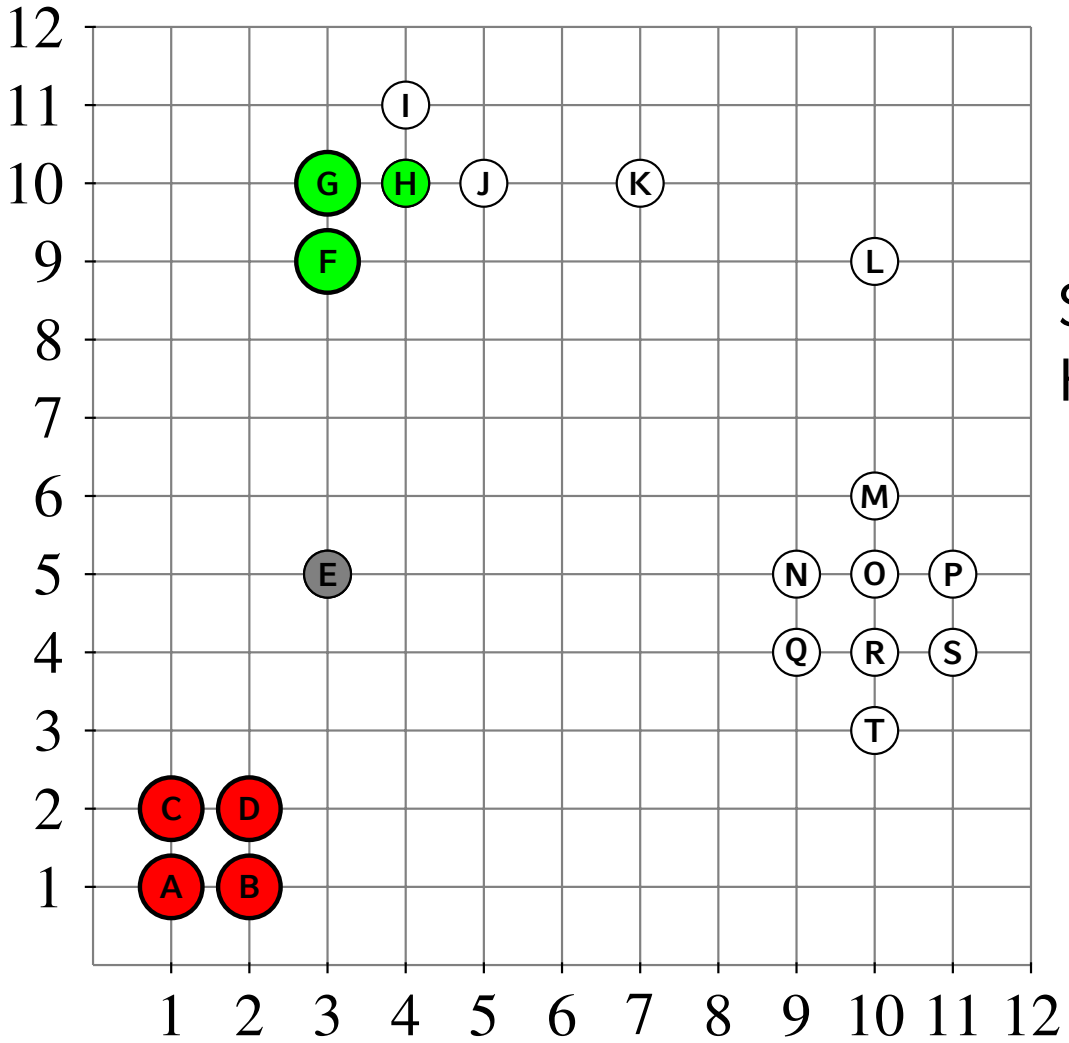
Seed list:

DBSCAN



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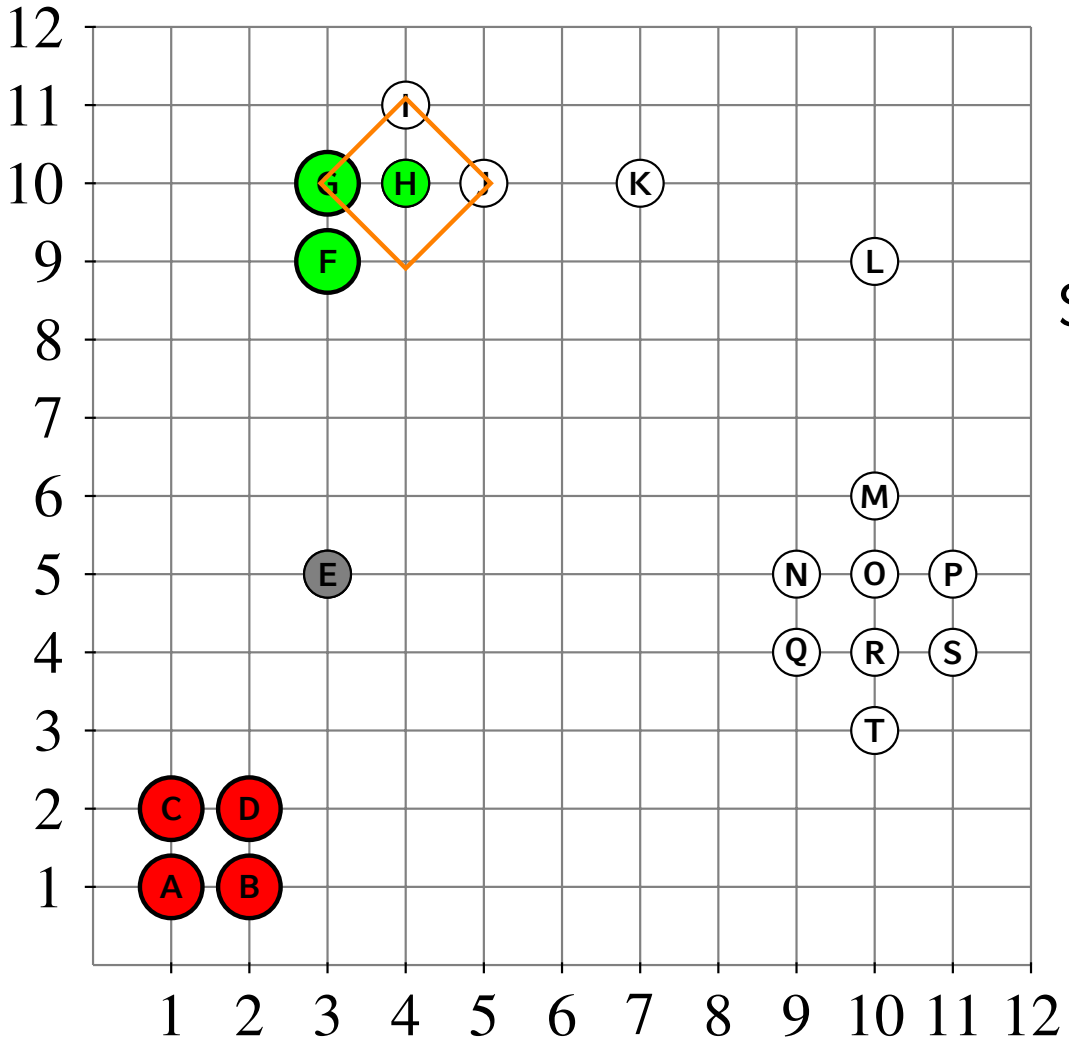
Seed list:
H

DBSCAN



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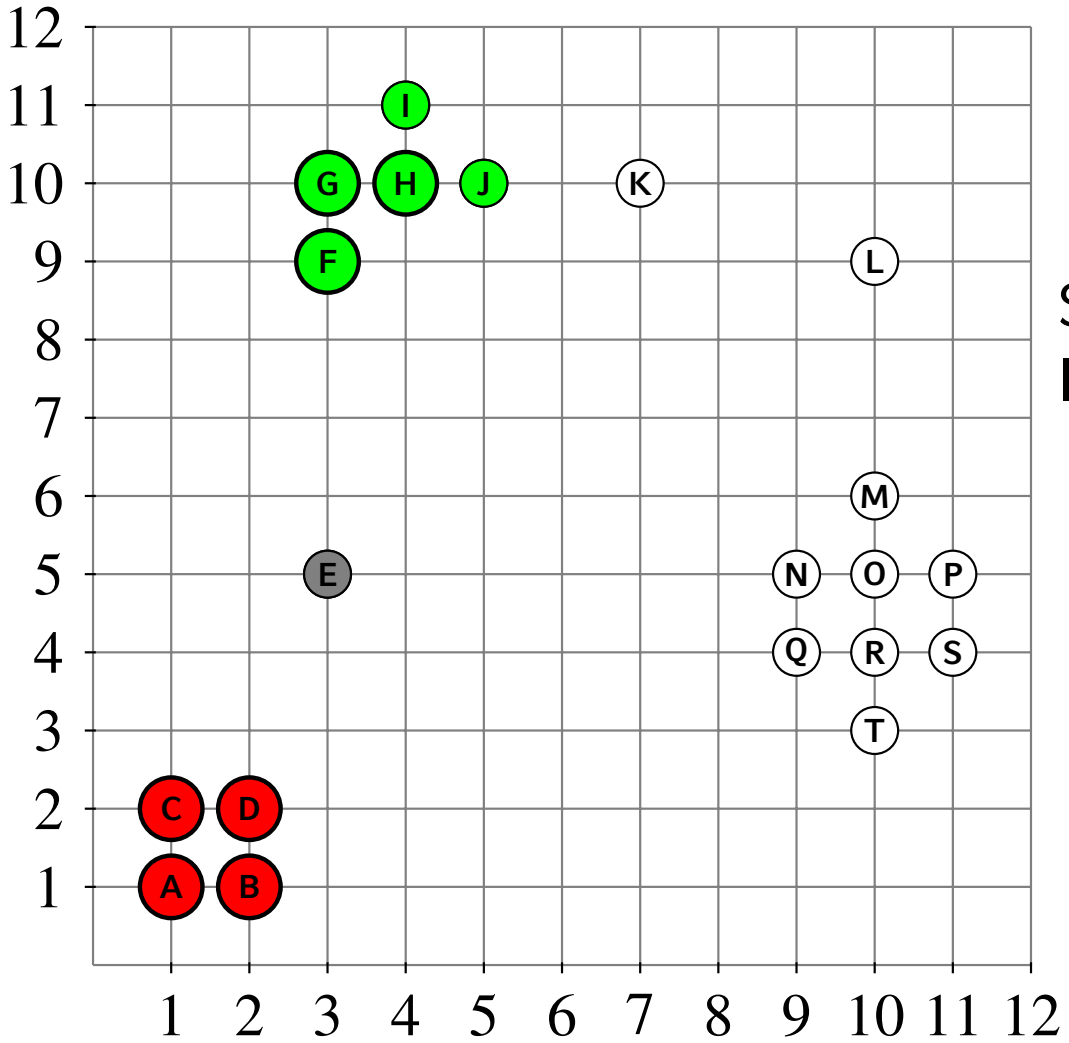

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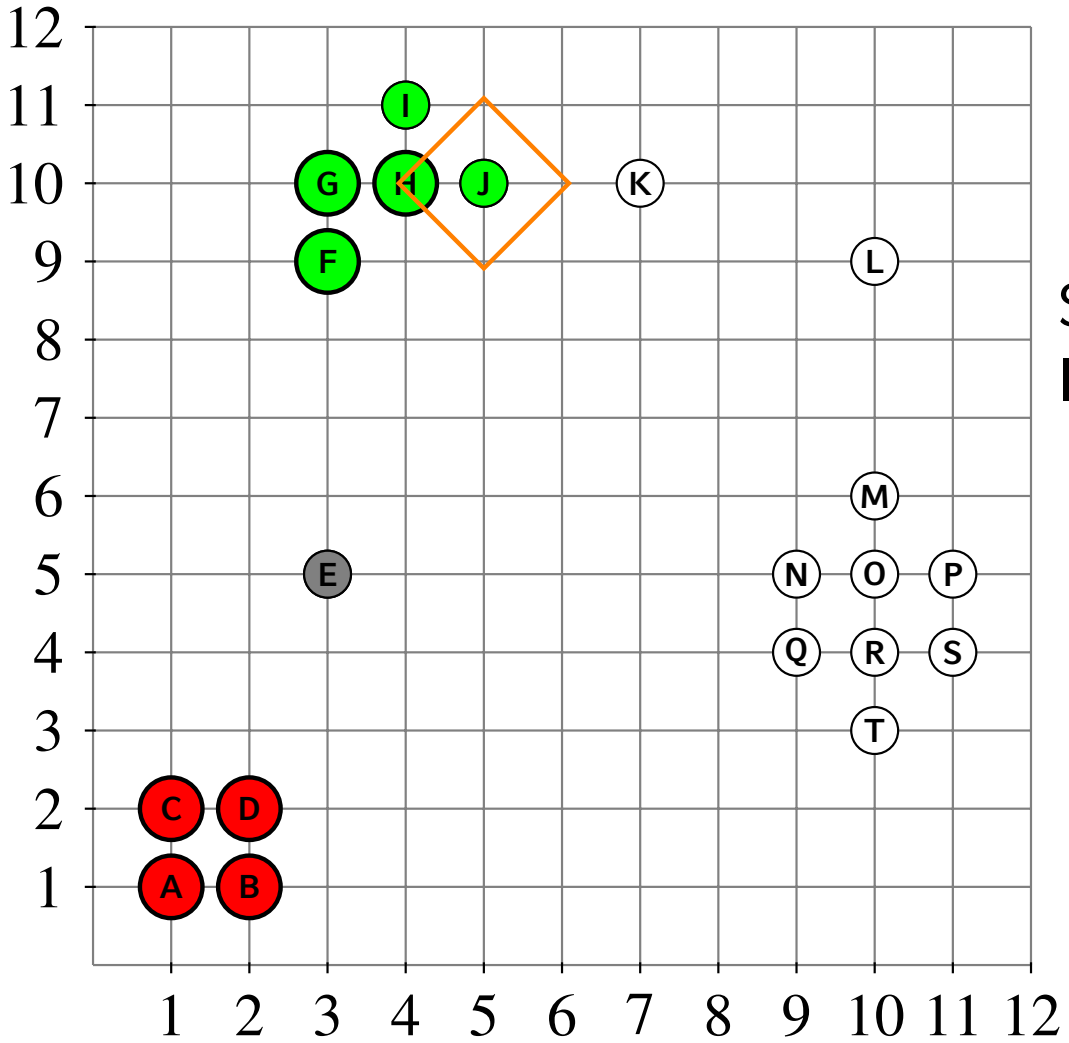
IJ

DBSCAN



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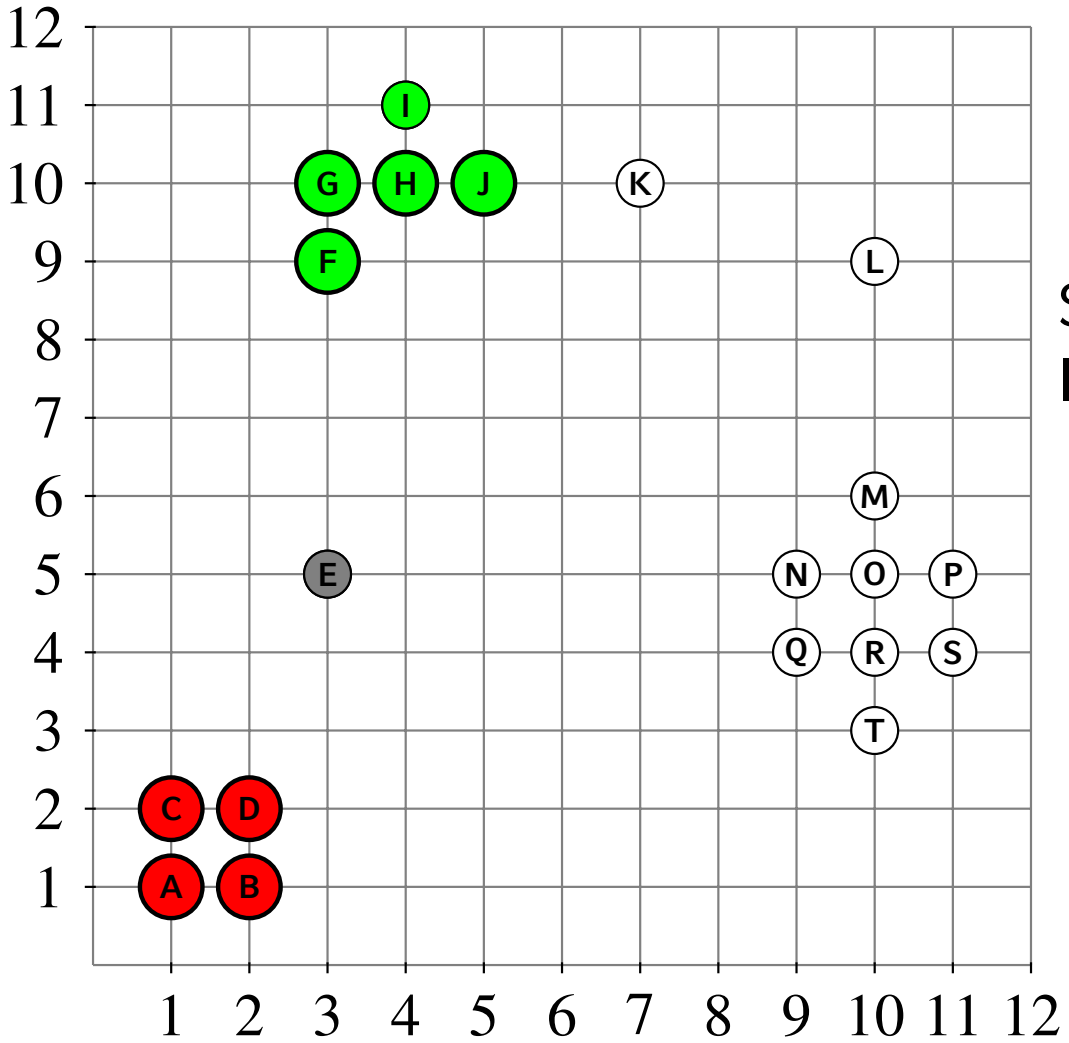

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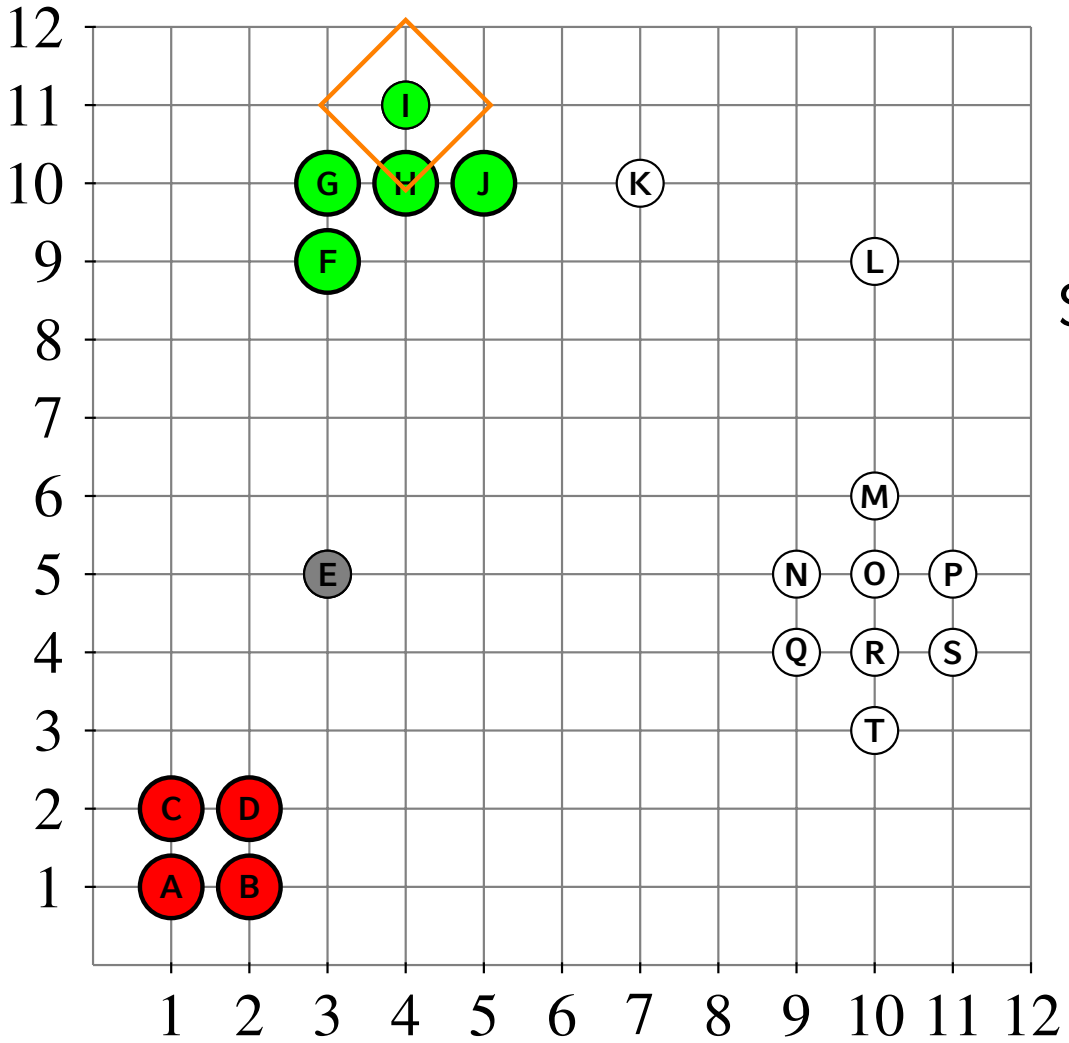

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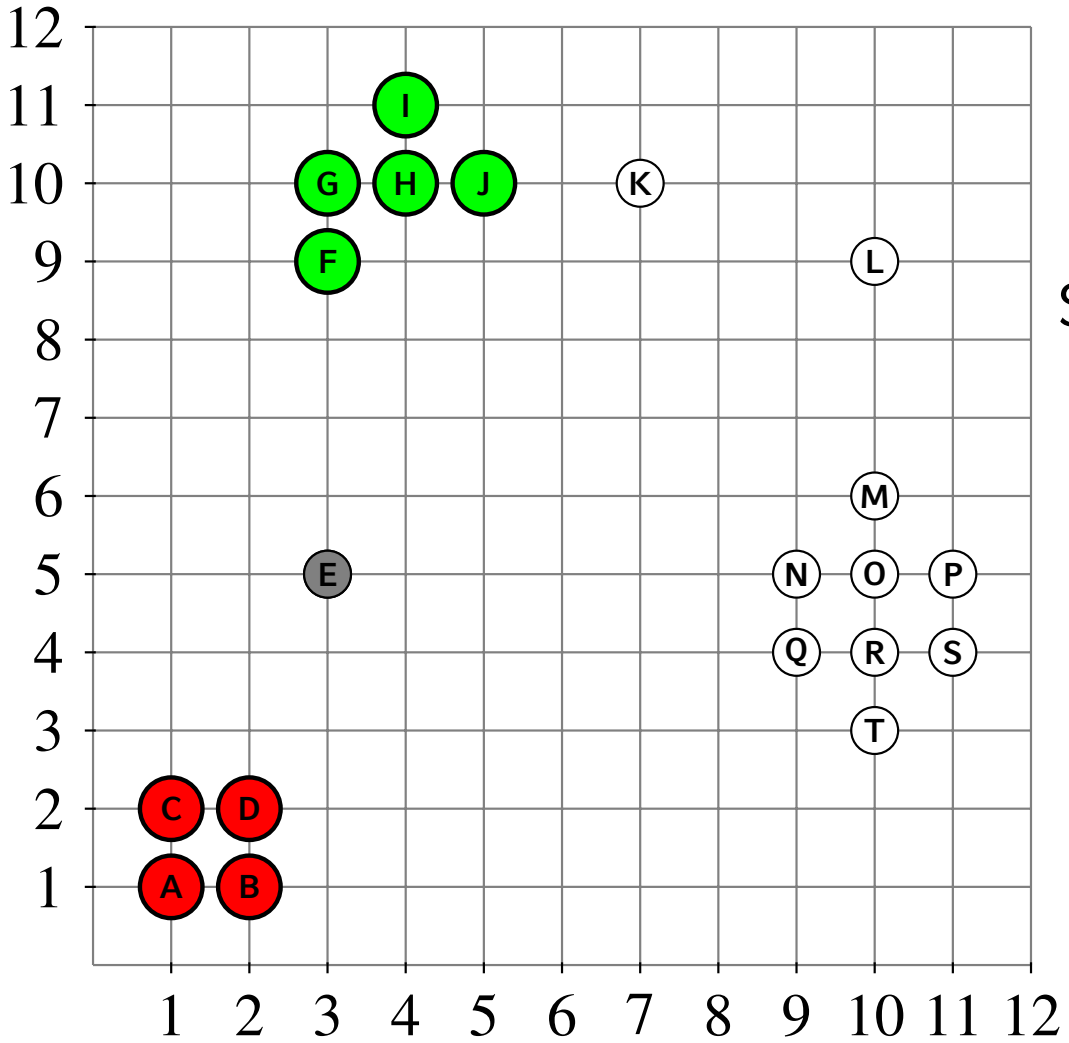

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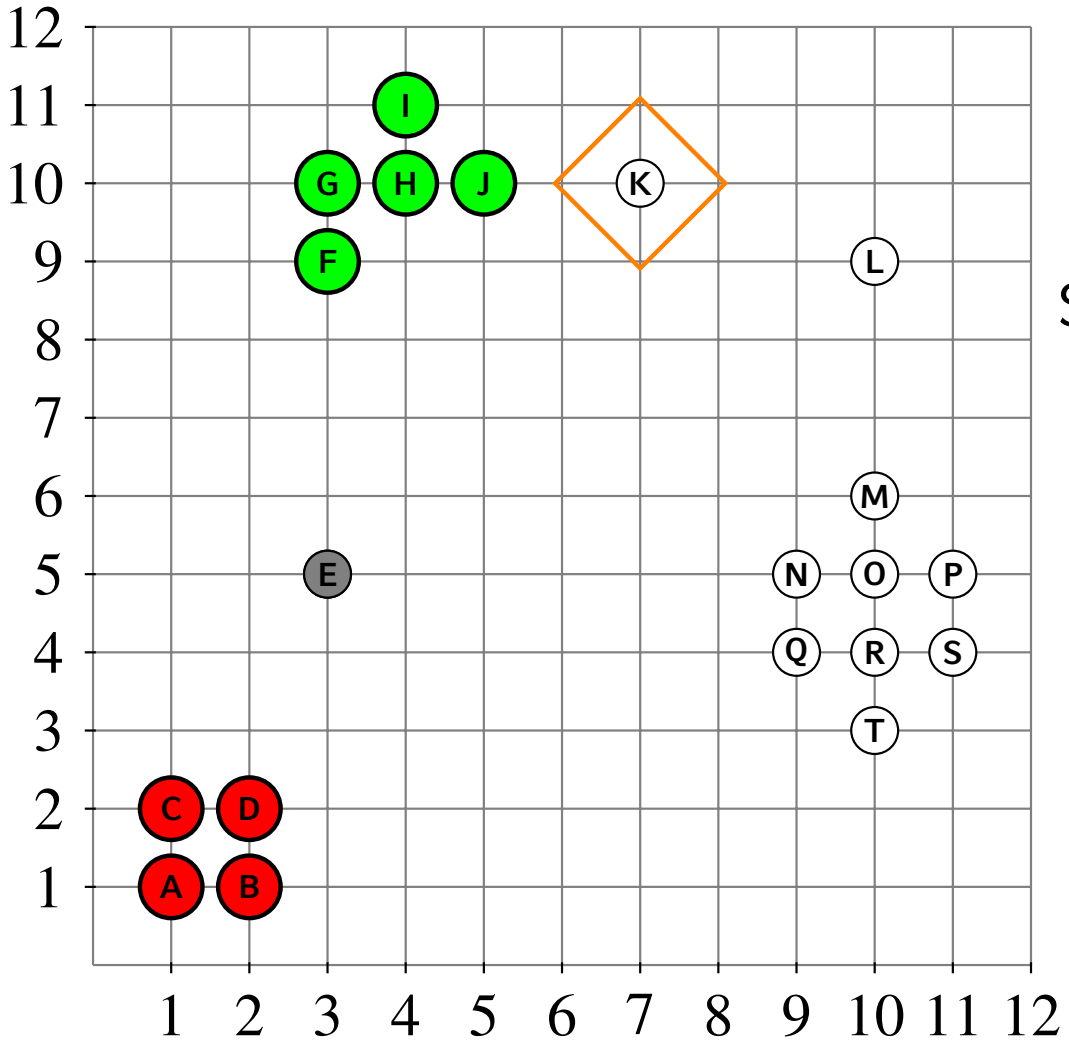

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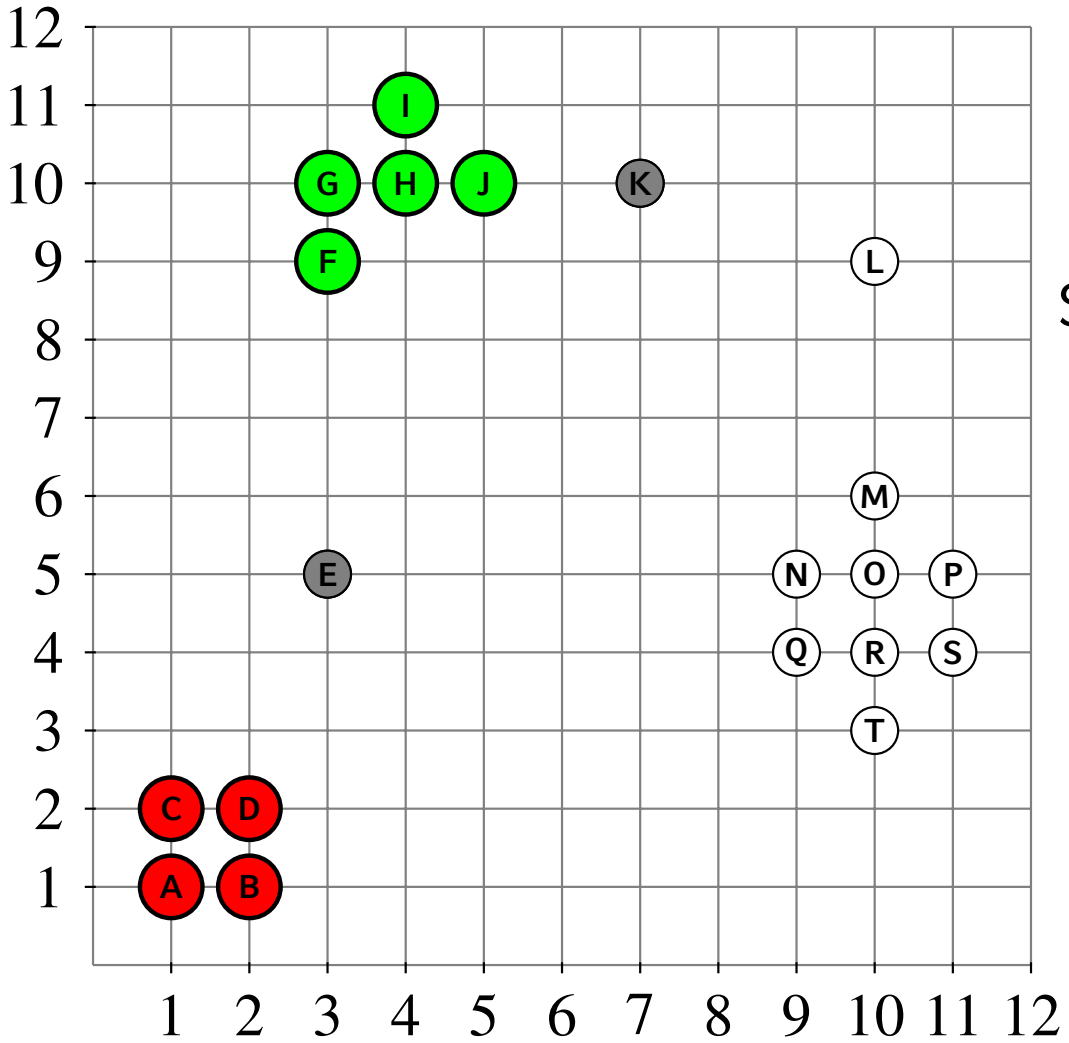

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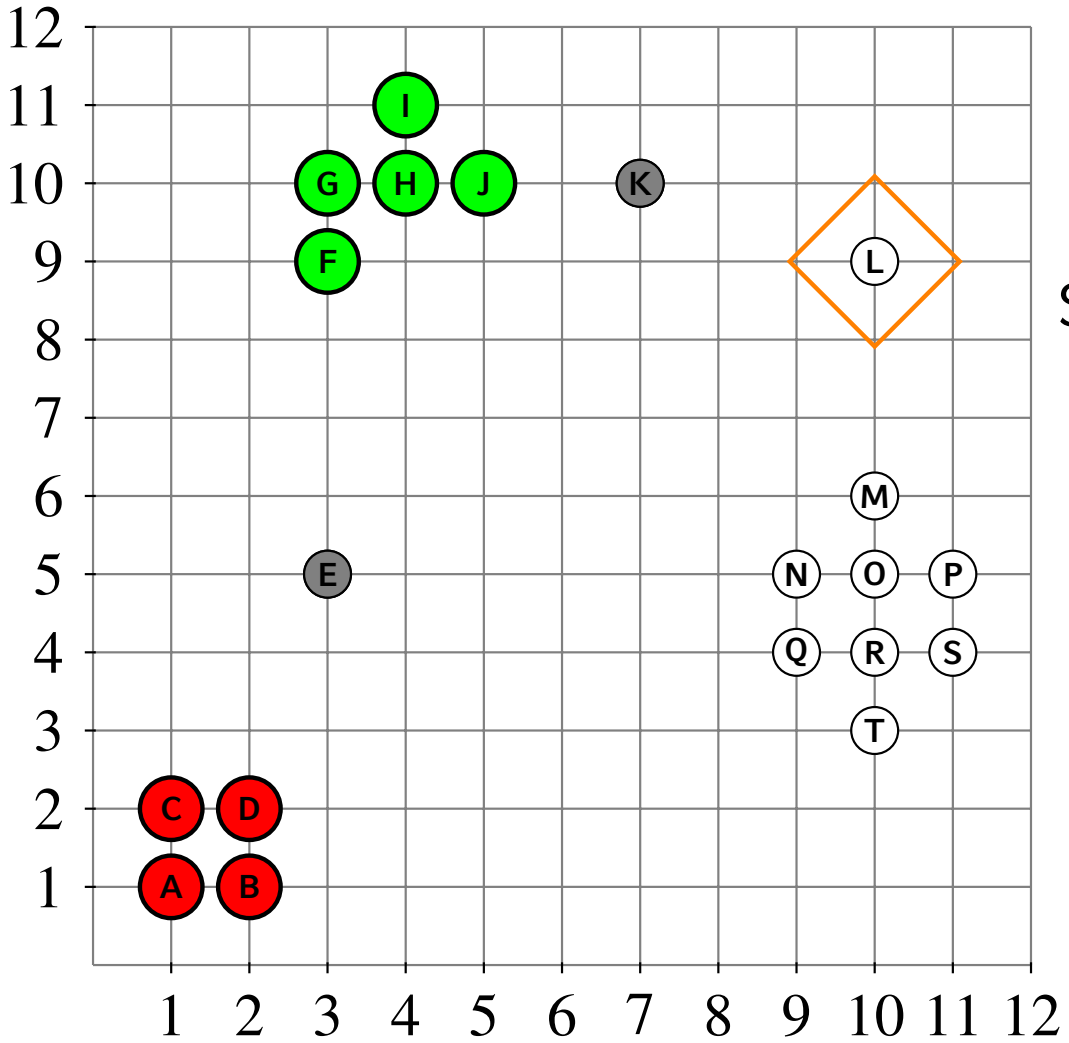

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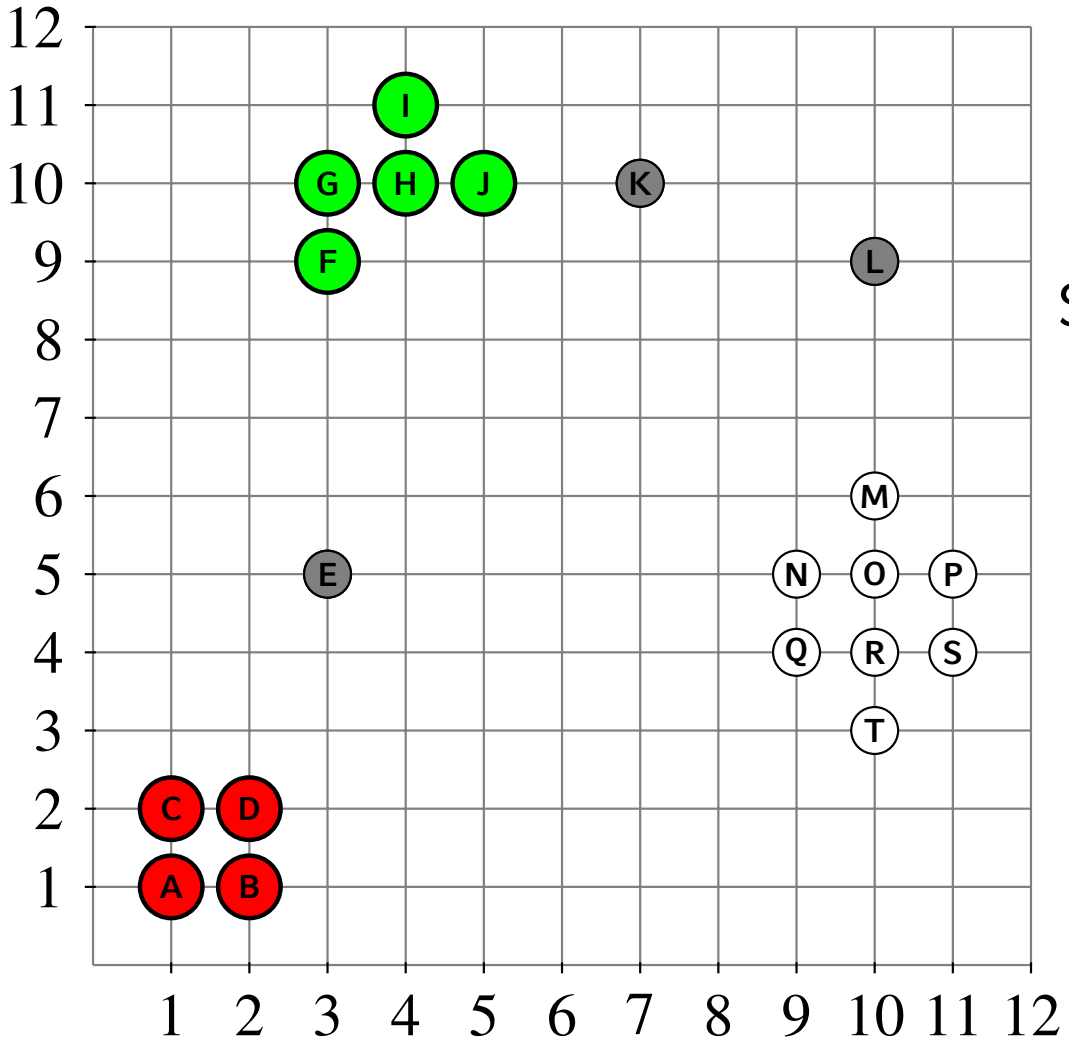

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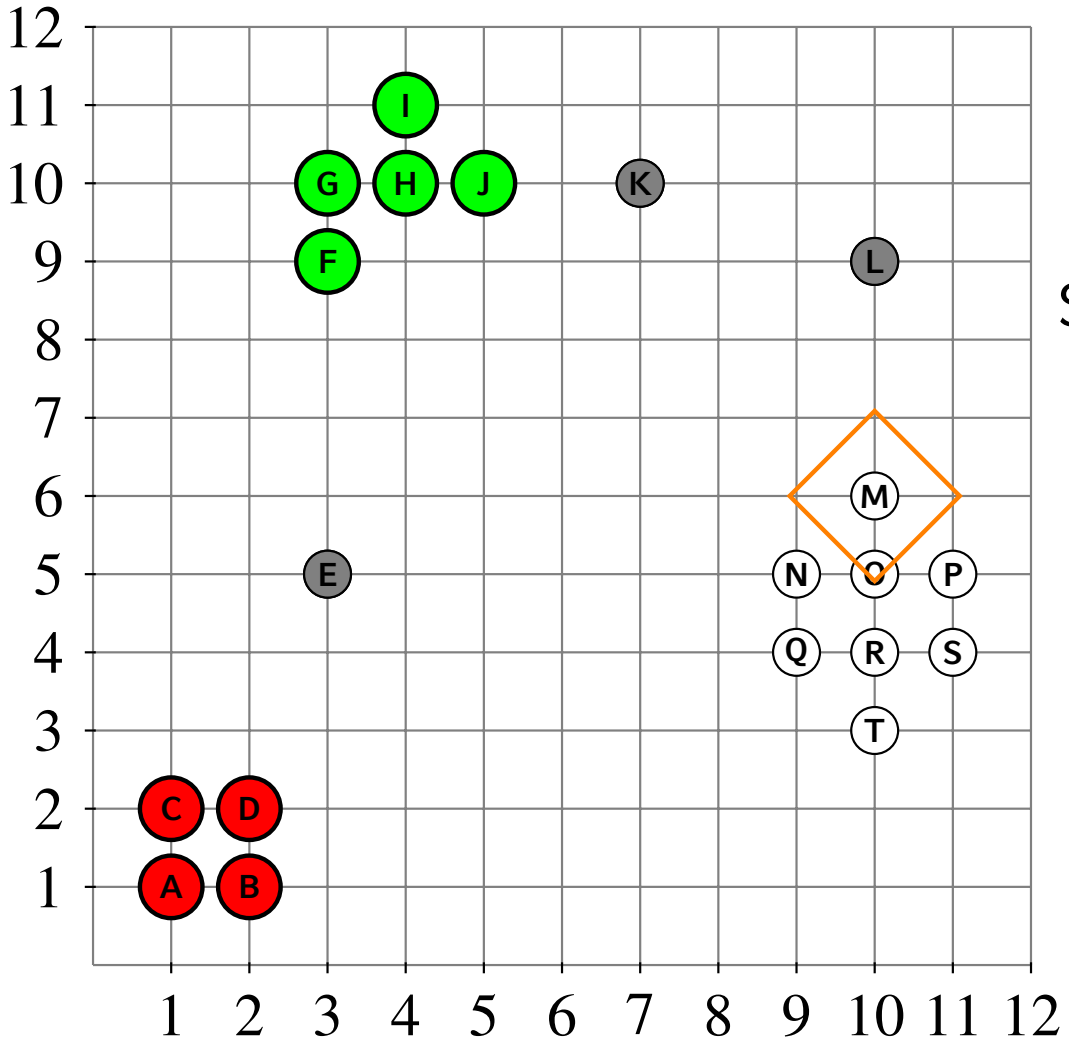

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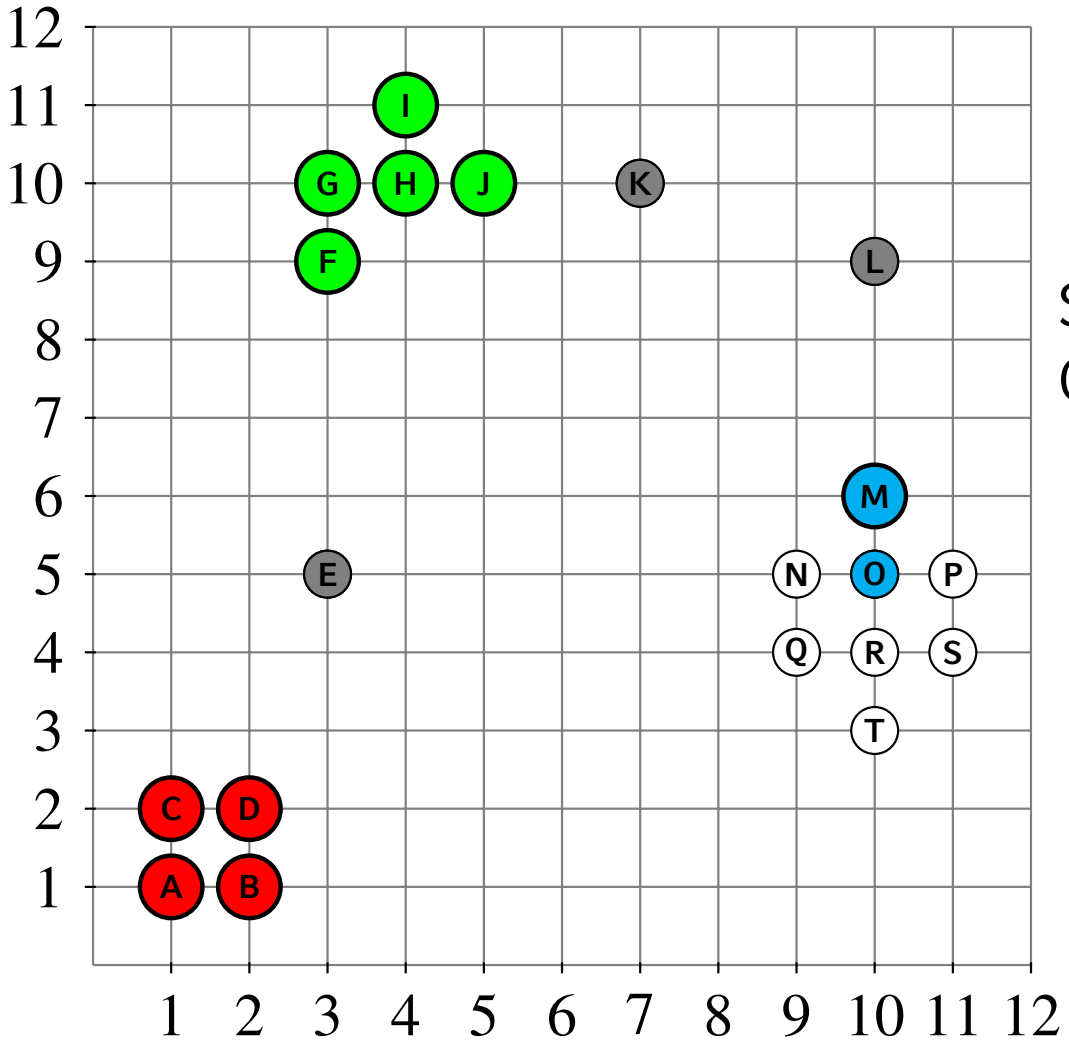

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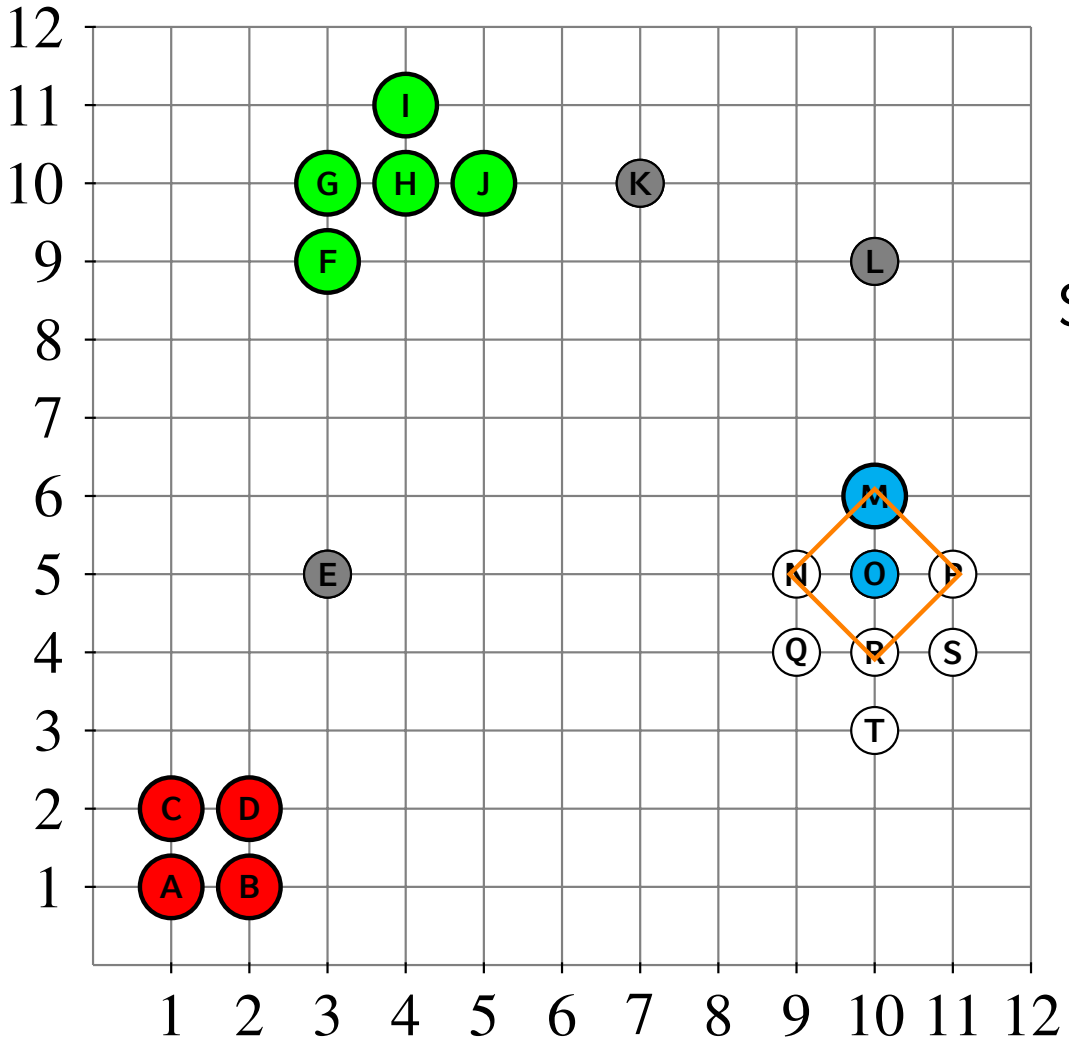
Seed list:
O

DBSCAN



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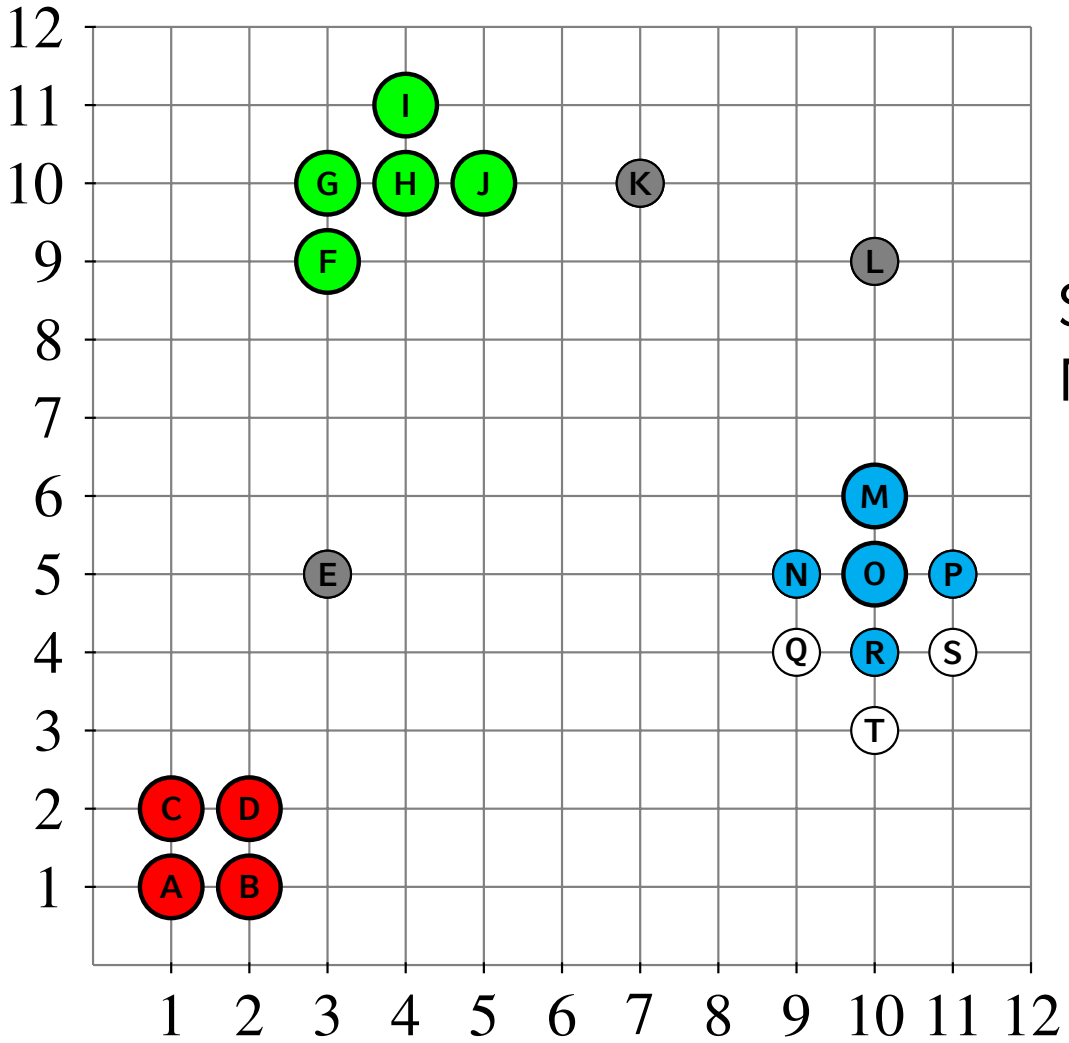

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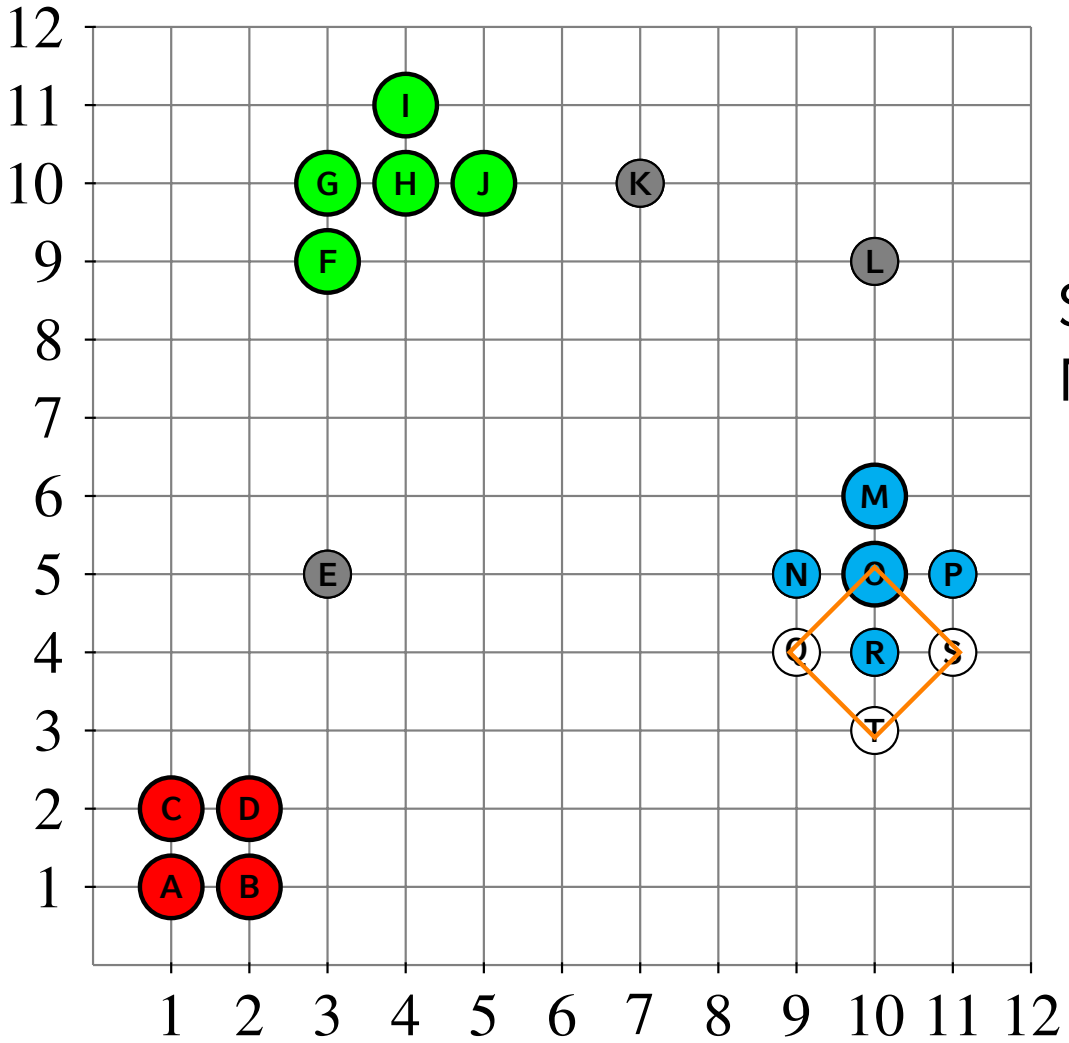
Seed list:
NPR

DBSCAN



$\varepsilon = 1.1$

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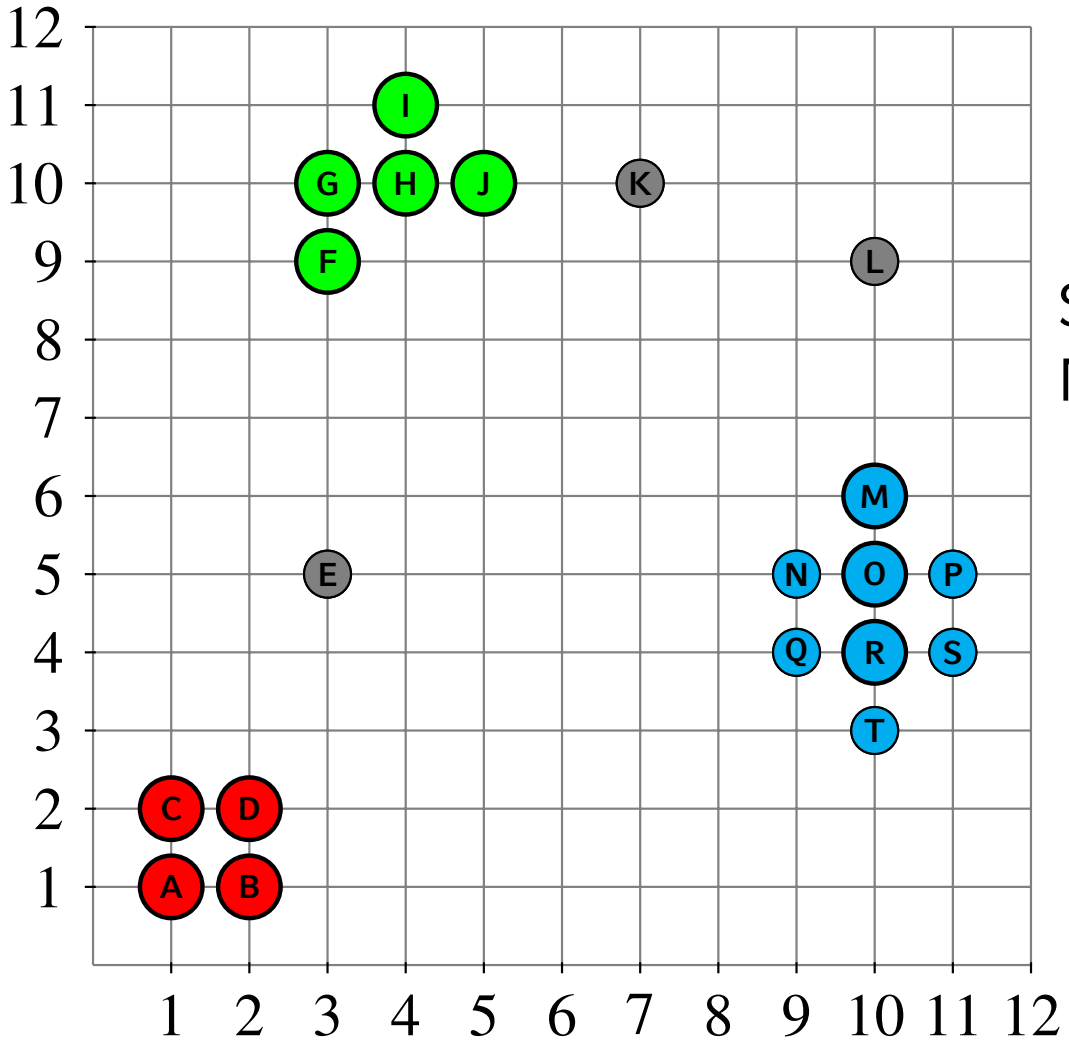
Seed list:
NP

DBSCAN

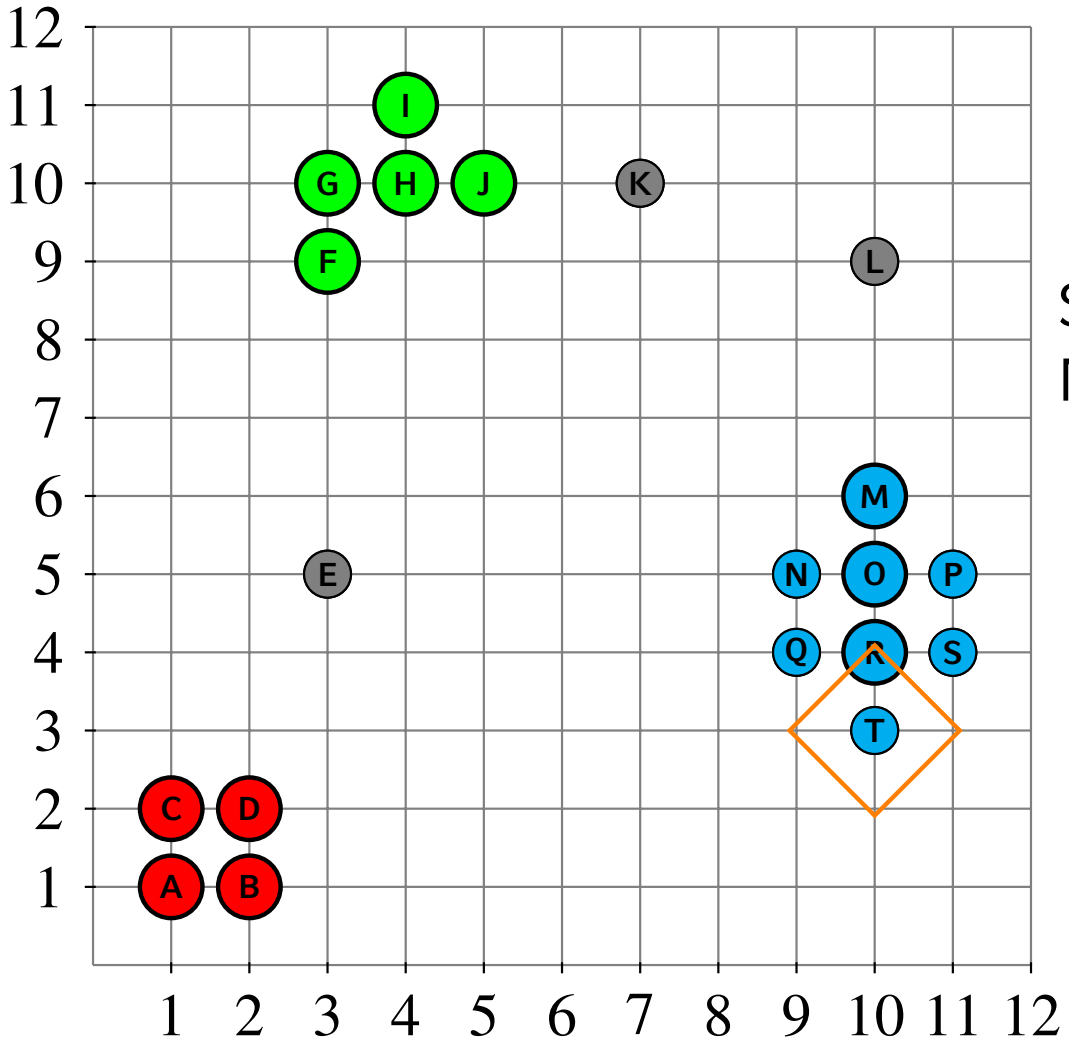


$\varepsilon = 1.1$

$minPts = 2$

Seed list: NPQST

DBSCAN

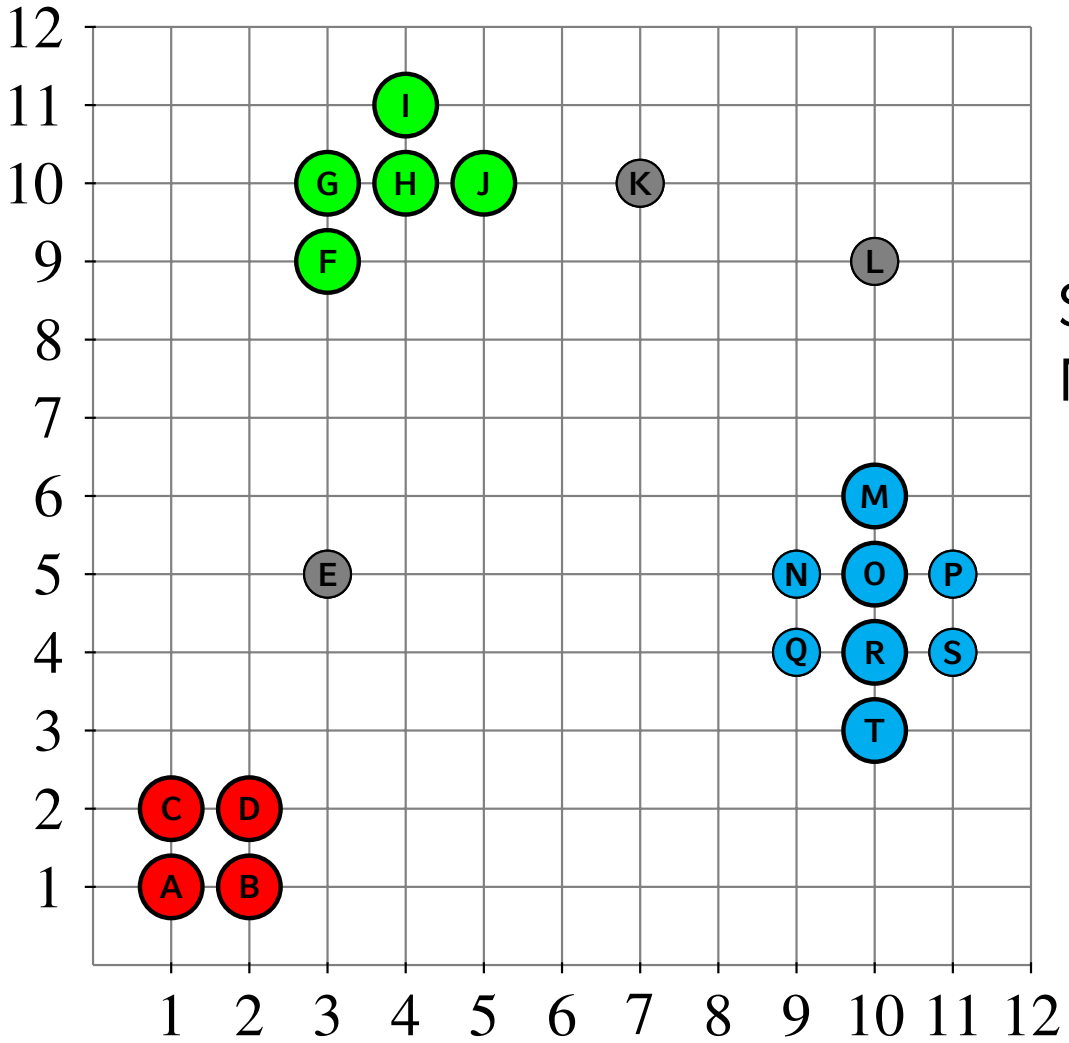


$\varepsilon = 1.1$

$minPts = 2$

Seed list: NPQS

DBSCAN



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Seed list: NPQS

DBSCAN

Data Mining Tutorial

E. Schubert, E. Ntoutsi

Aufgabe 7-1

Aufgabe 7-3

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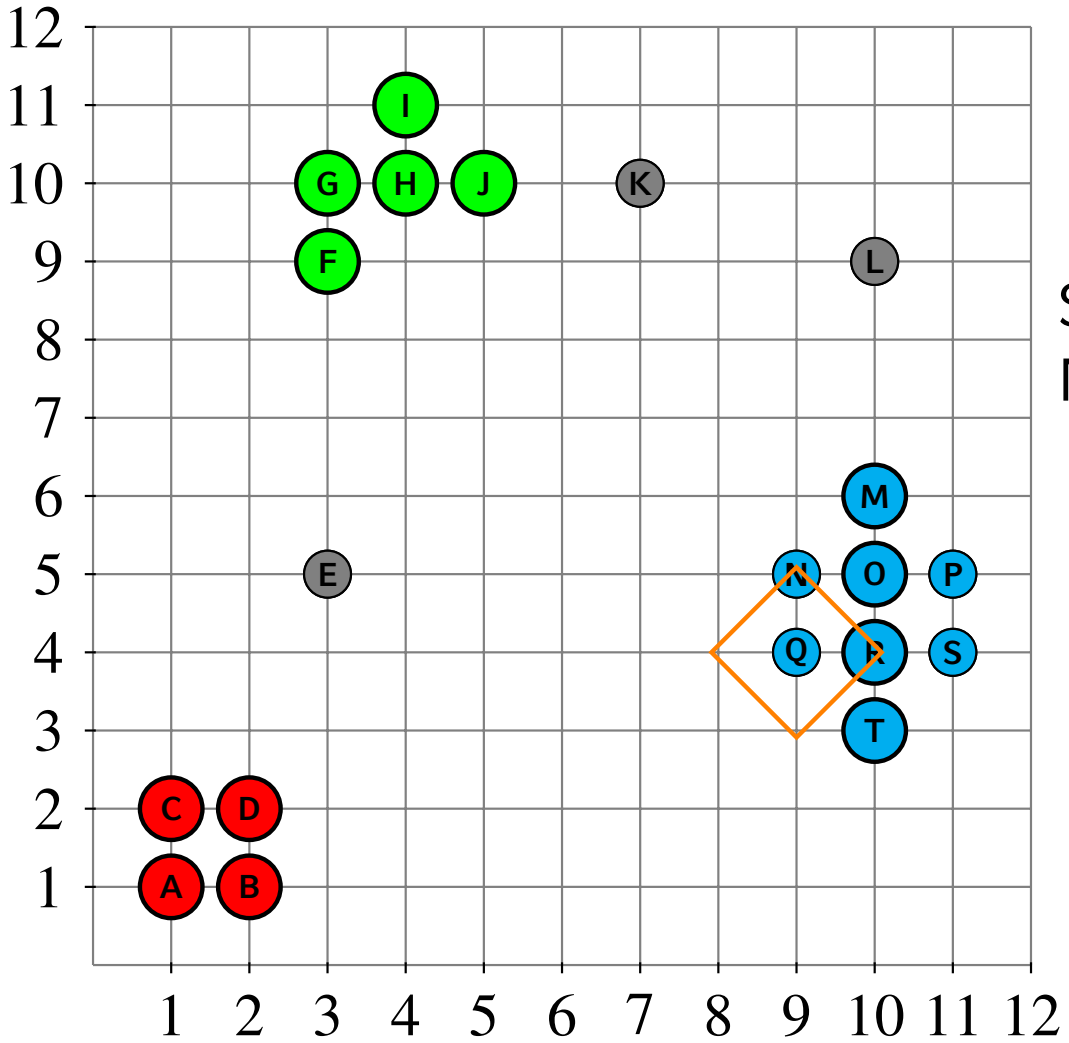
DBSCAN and Single-Link



$\varepsilon = 1.1$

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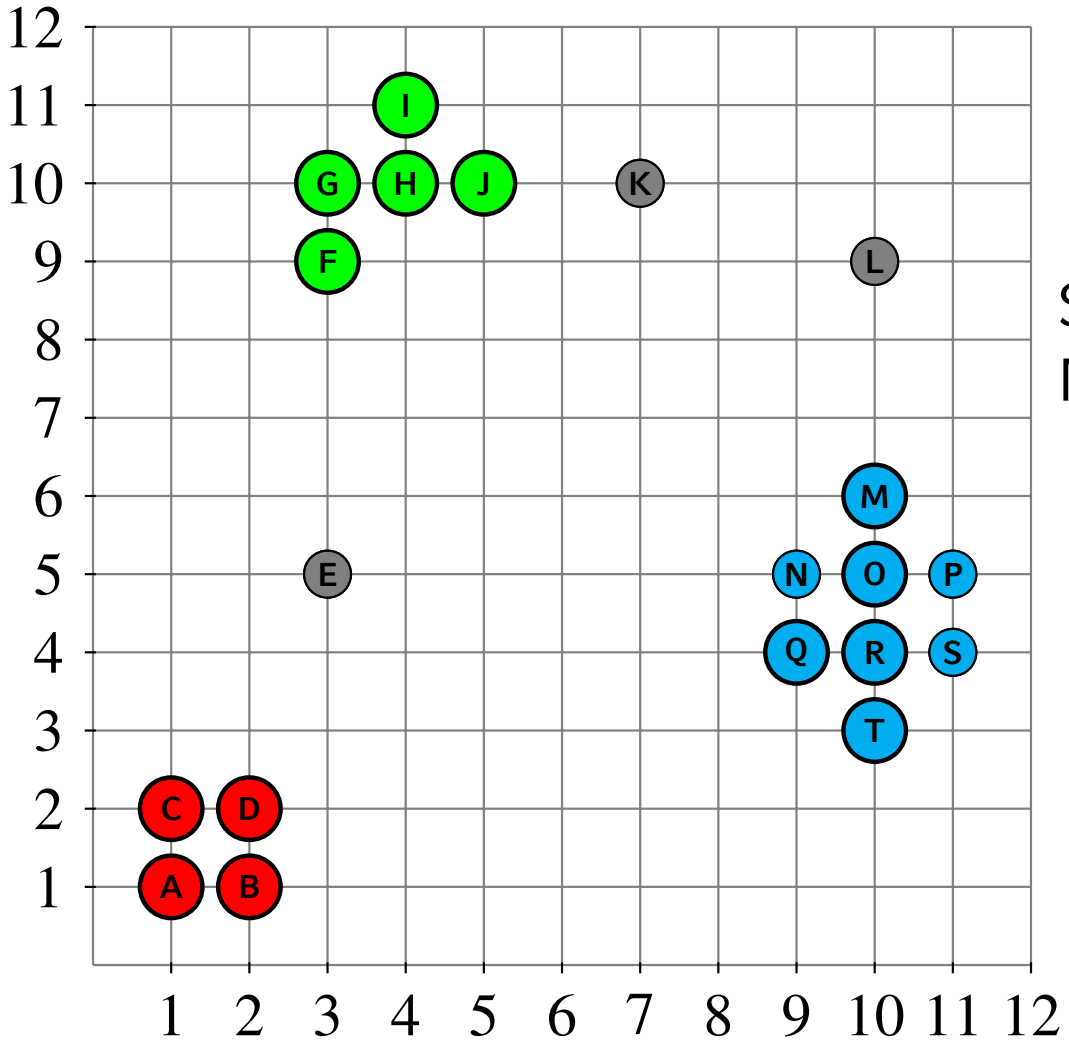
Seed list:
NPS

DBSCAN



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NPS

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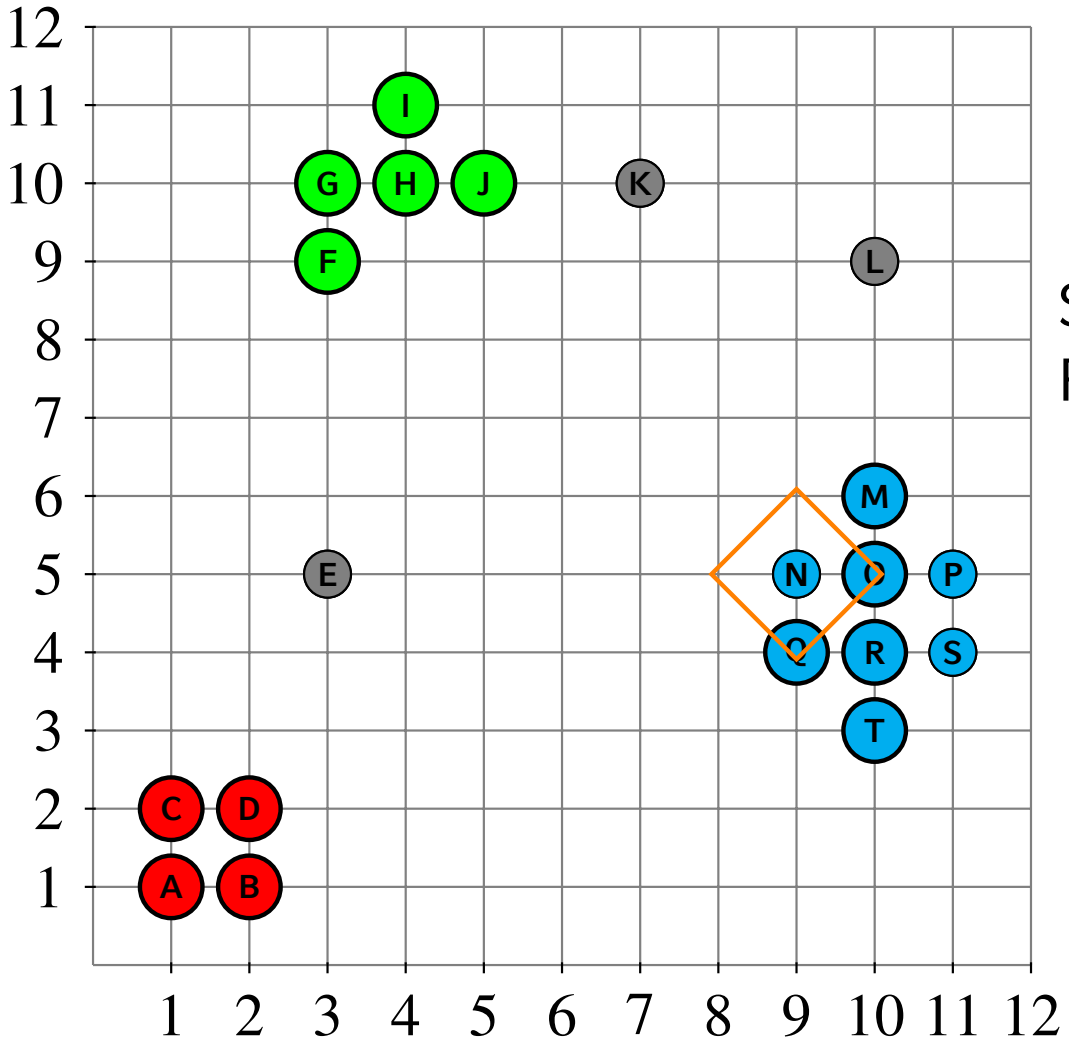

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Seed list:
PS

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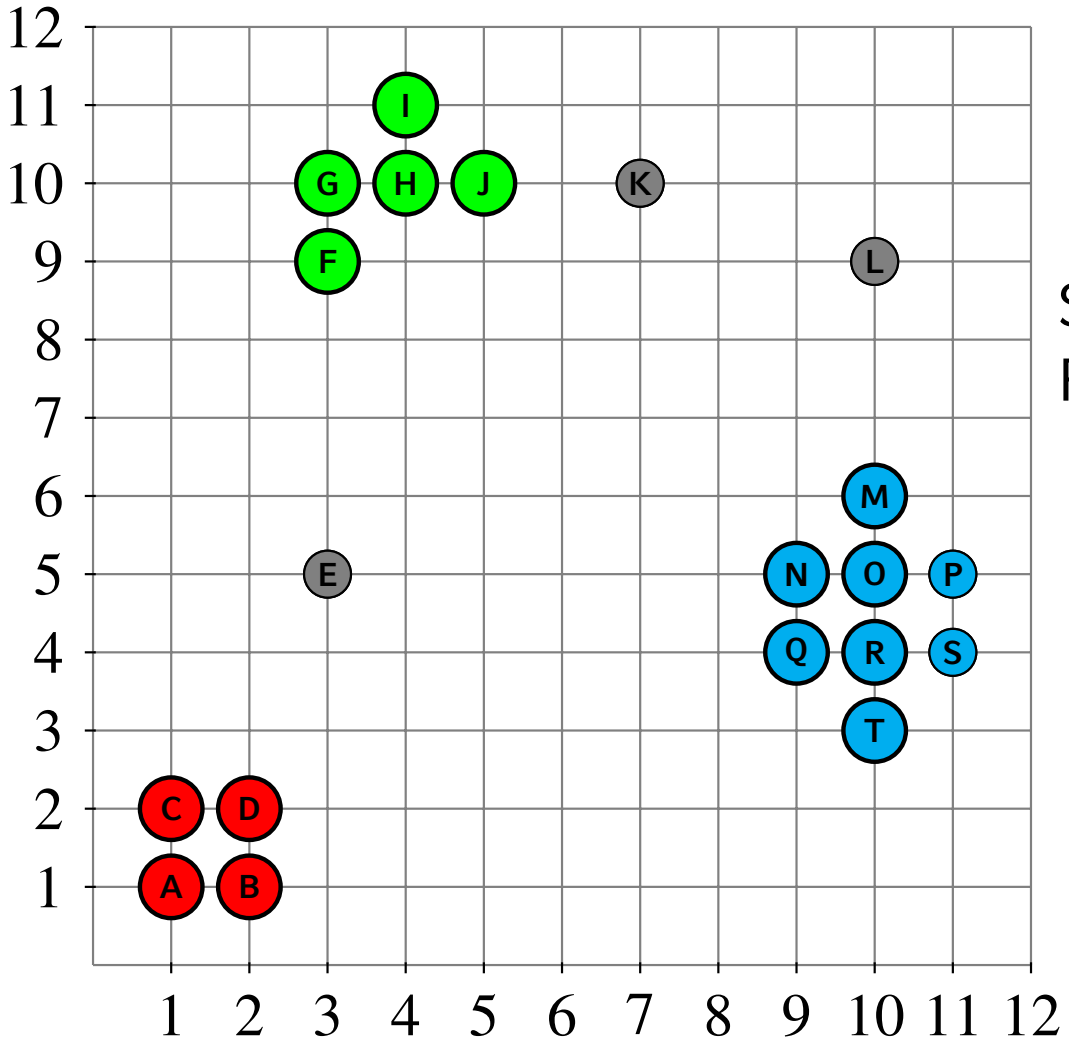

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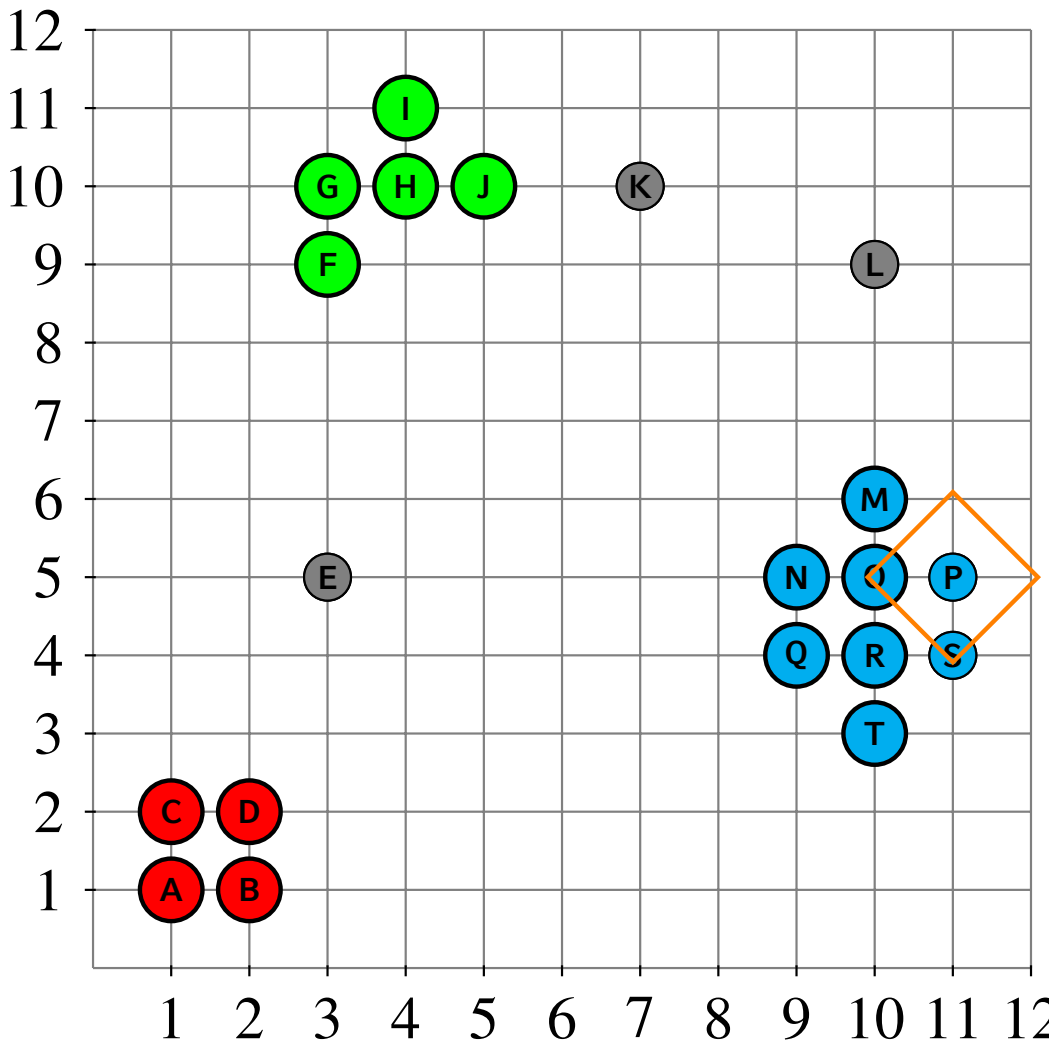
Seed list:
PS

DBSCAN

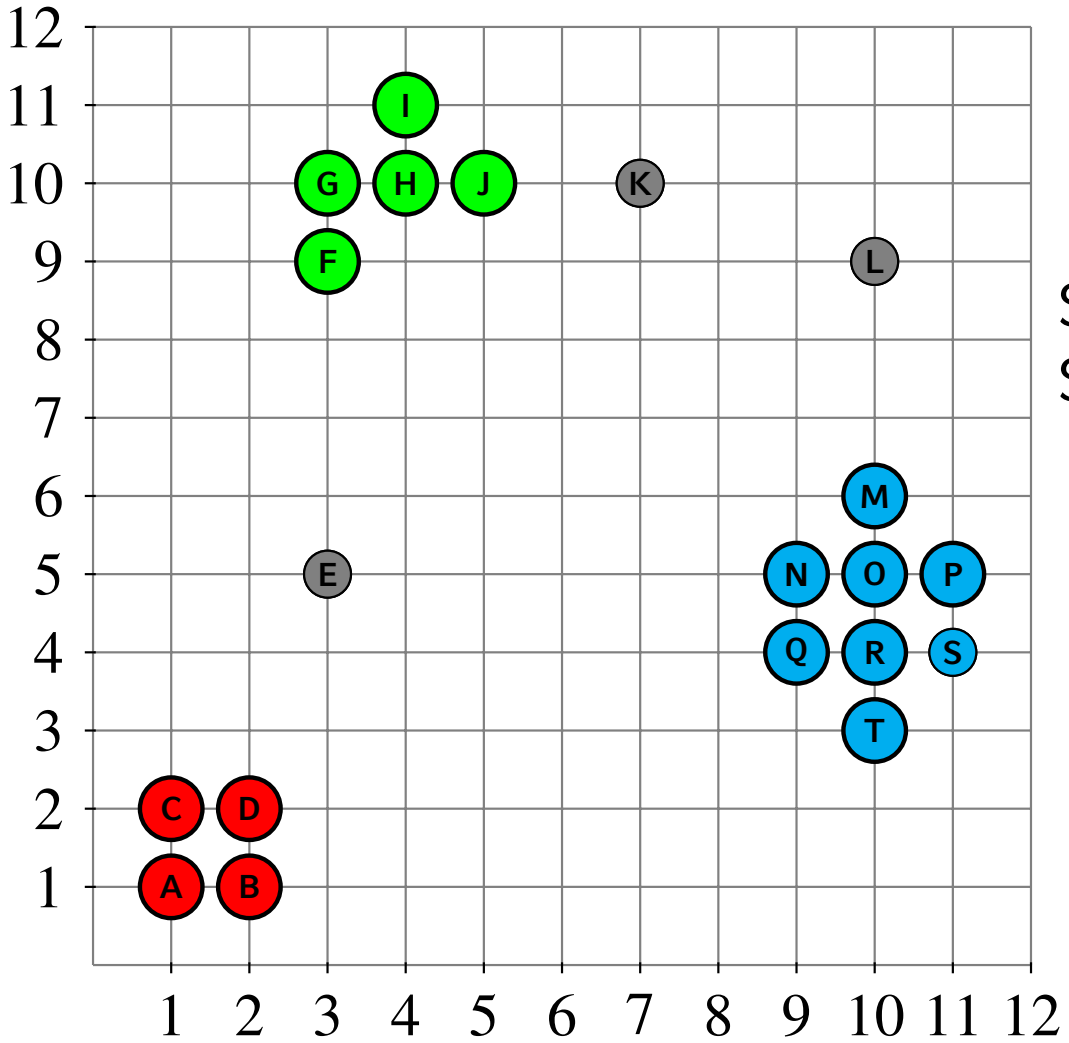


$\varepsilon = 1.1$

$minPts = 2$

Seed list:
S

DBSCAN



$\varepsilon = 1.1$

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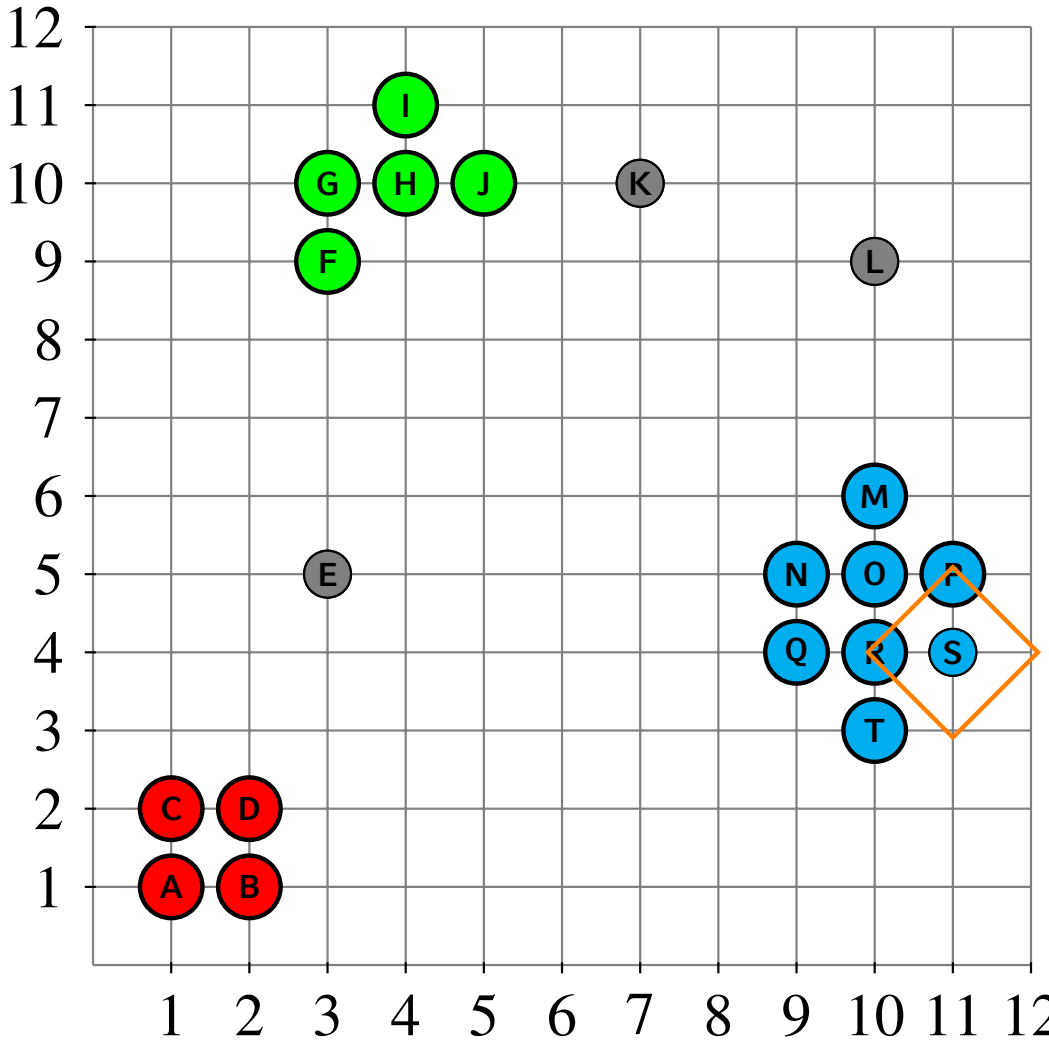
Seed list:
S

DBSCAN



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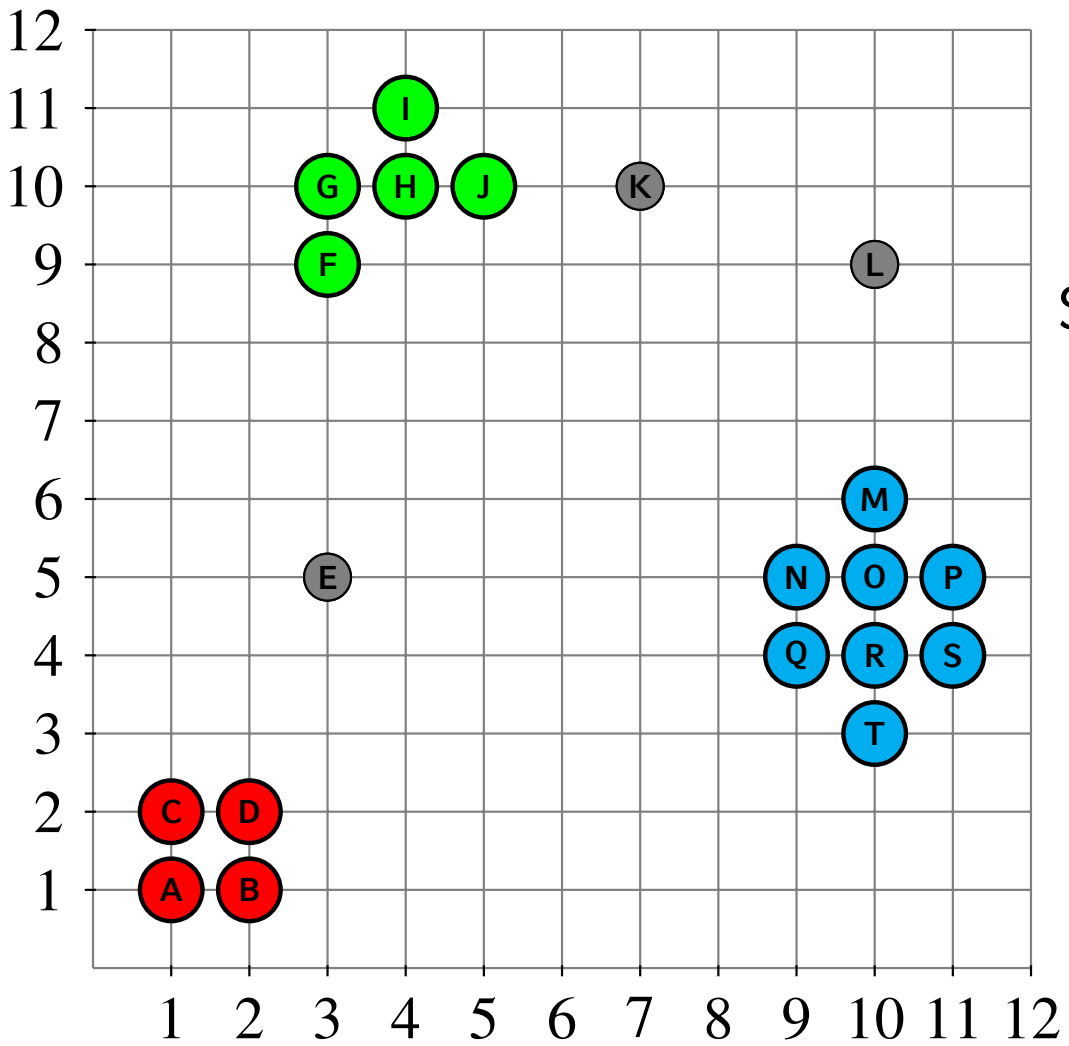
Seed list:

DBSCAN



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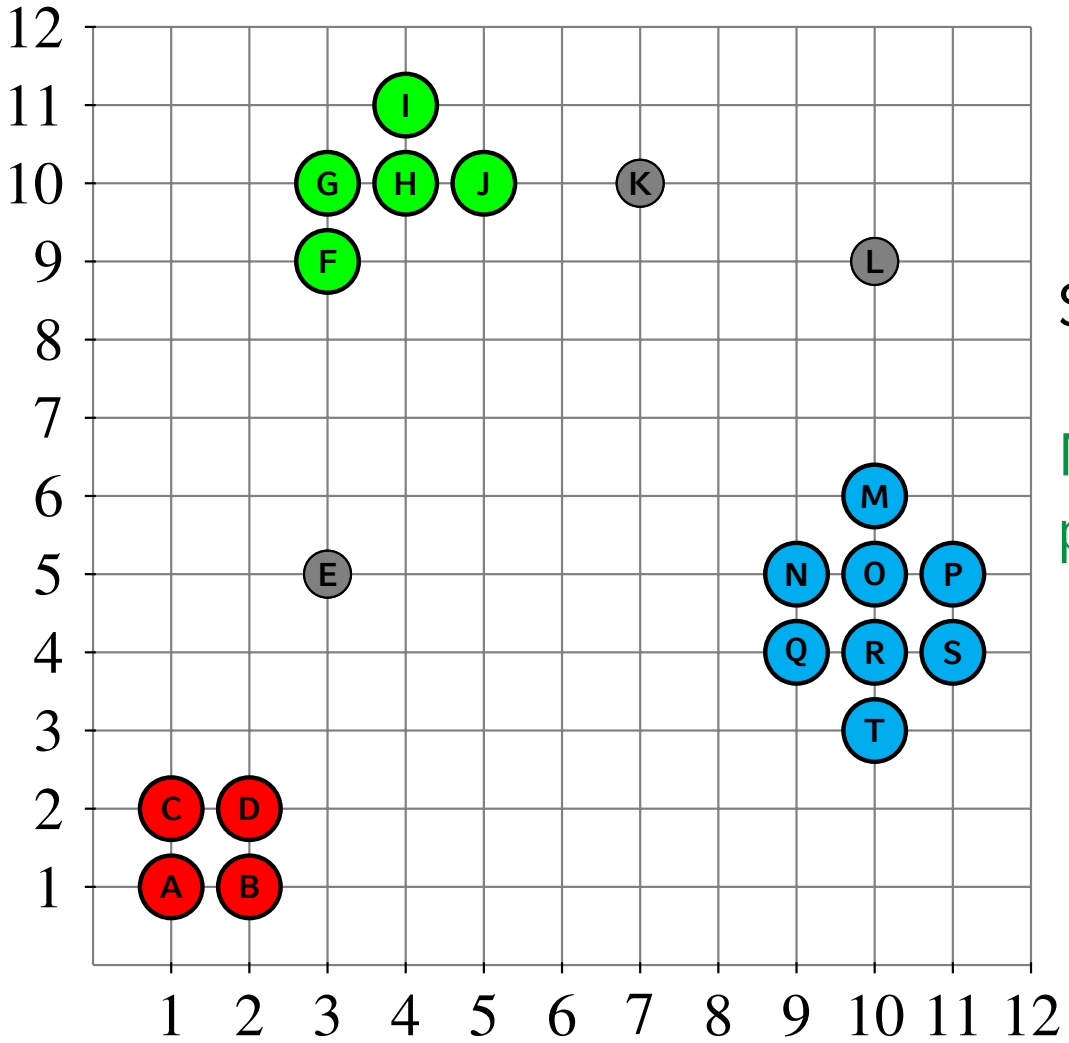
$minPts = 2$

Seed list:

DBSCAN



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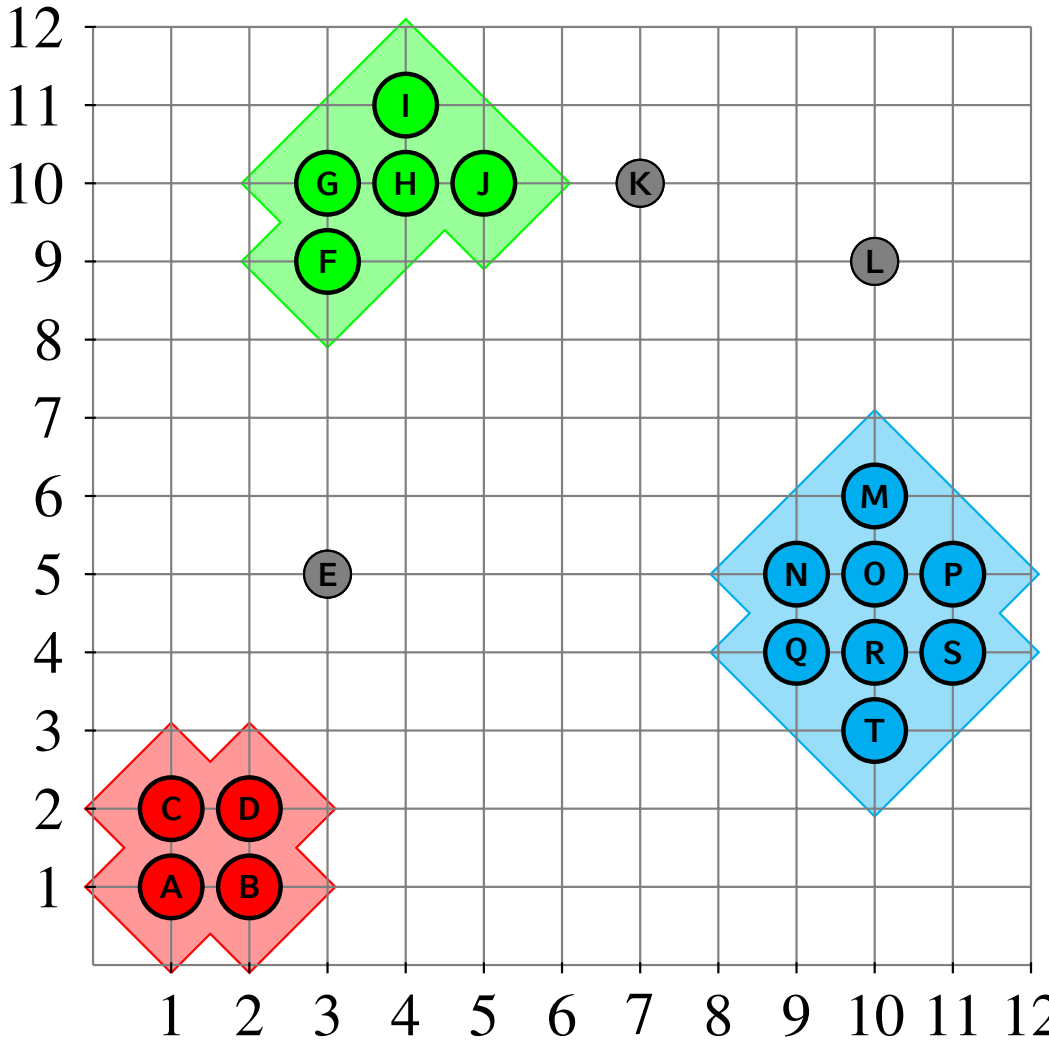
Seed list:

No border points!

DBSCAN



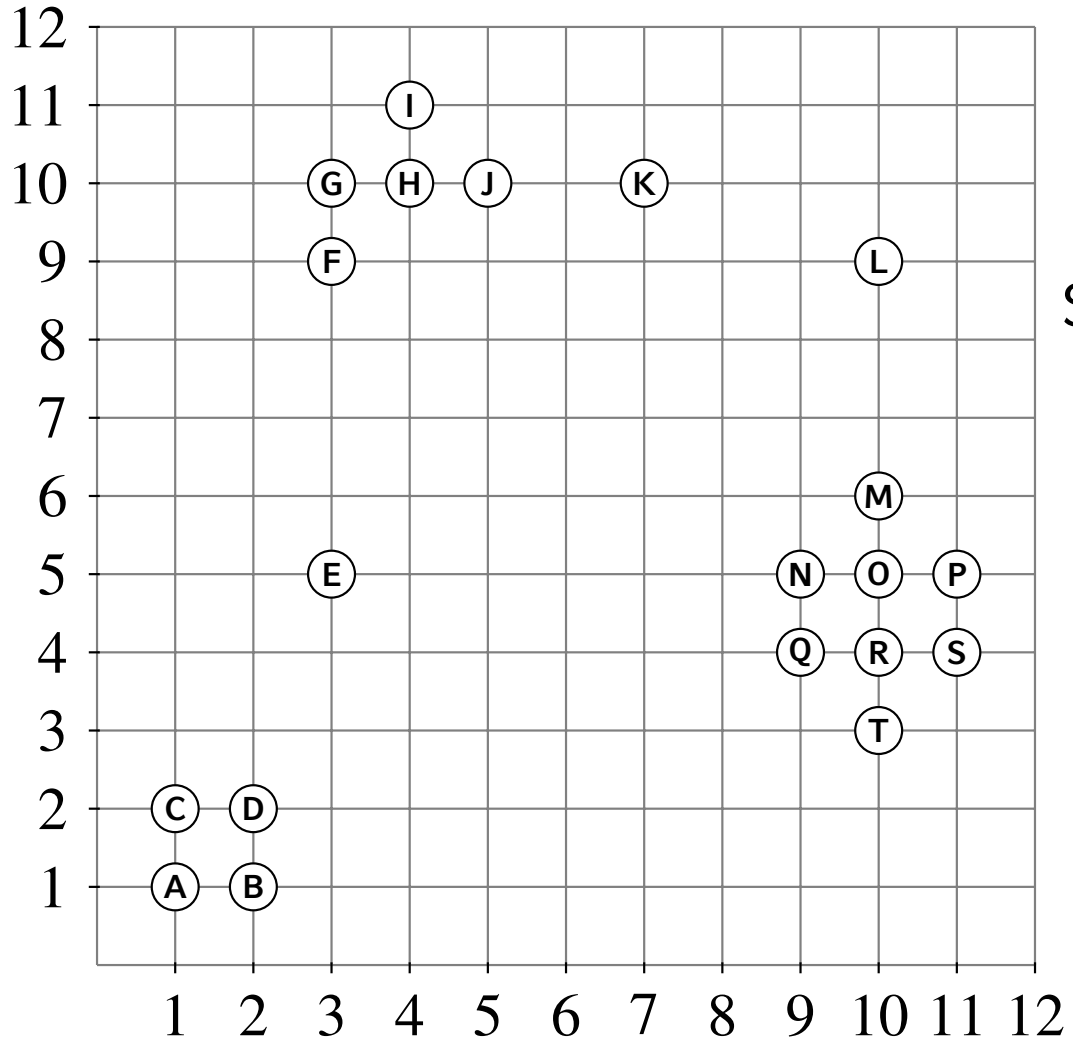
$\varepsilon = 1.1$

$minPts = 2$

Seed list:

No border points!

DBSCAN



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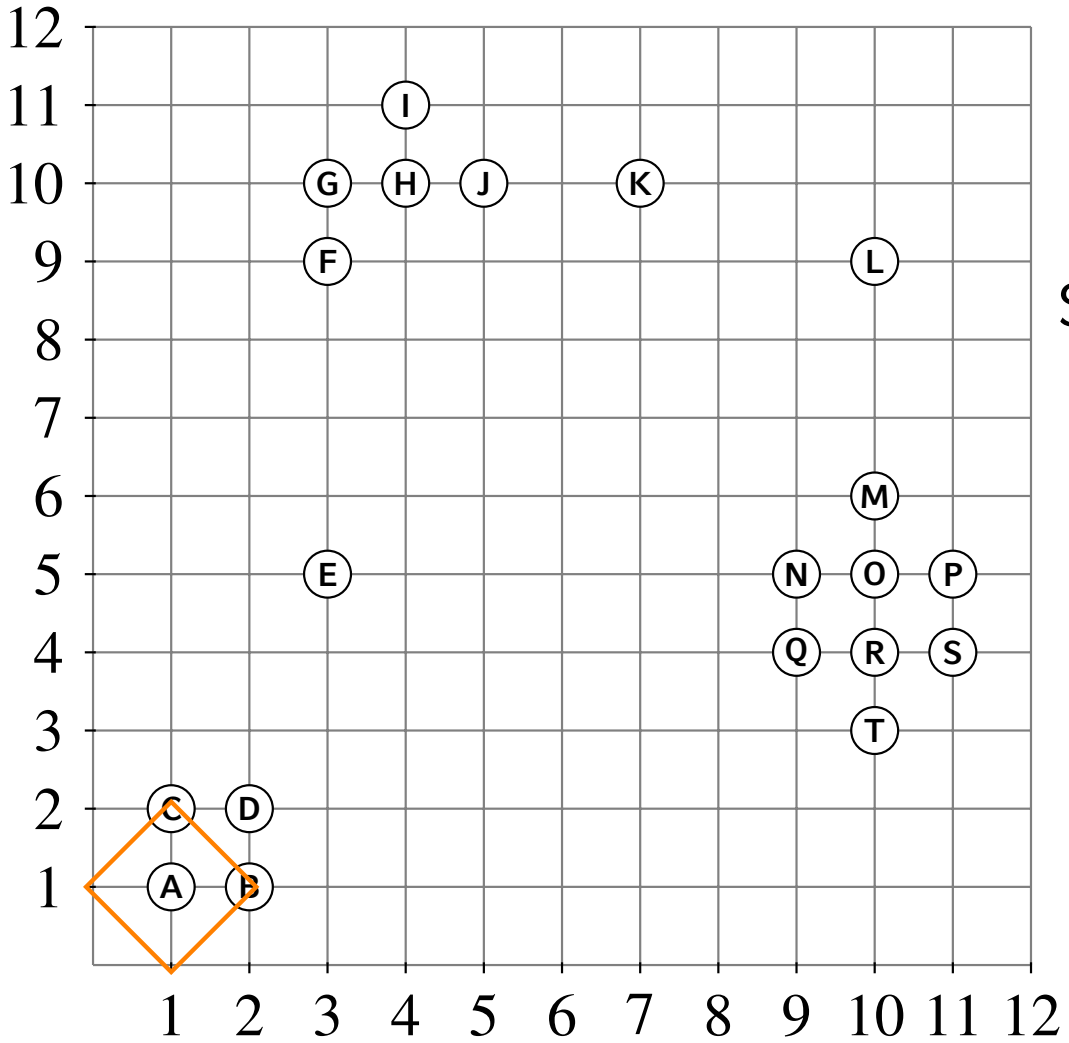
$minPts = 3$

Seed list:

DBSCAN



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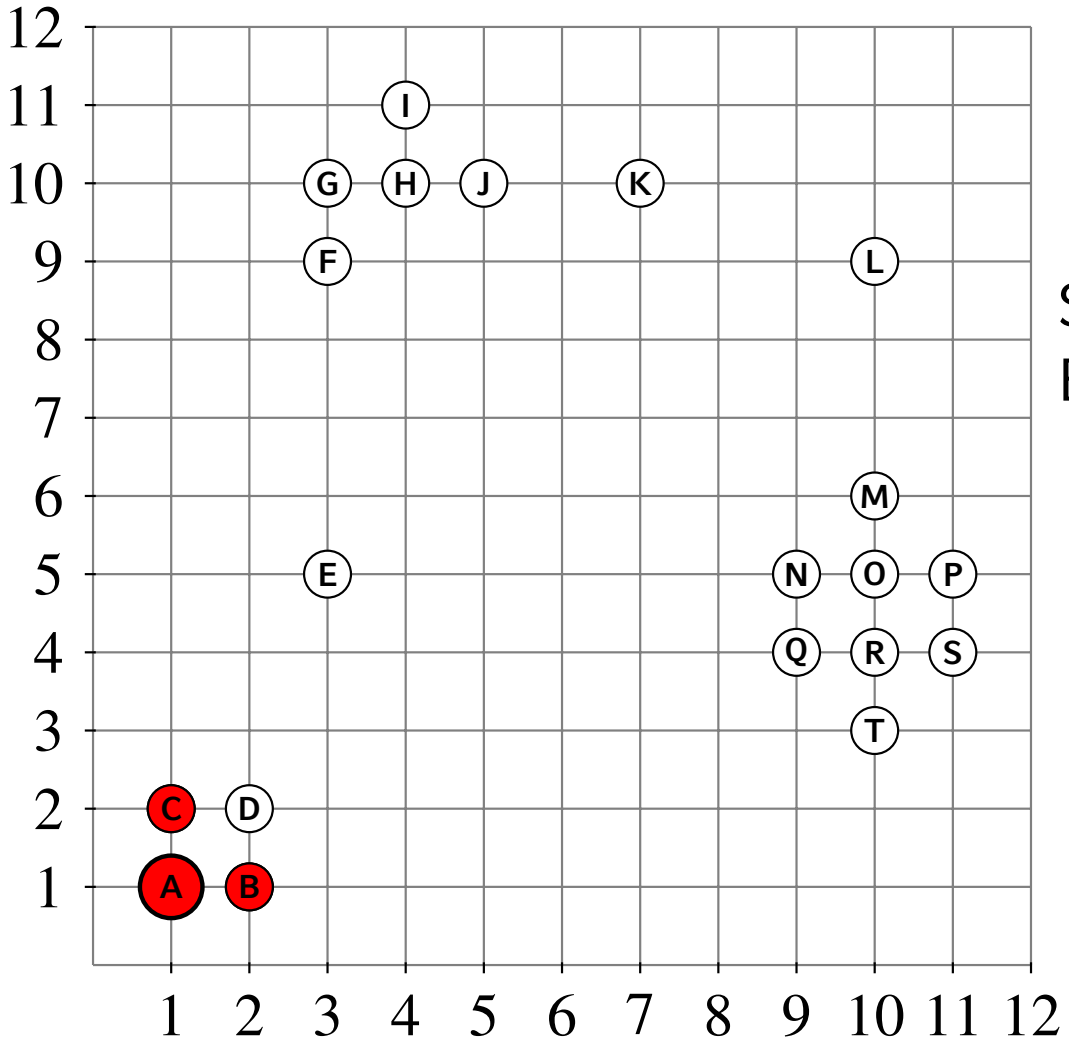
Seed list:

DBSCAN



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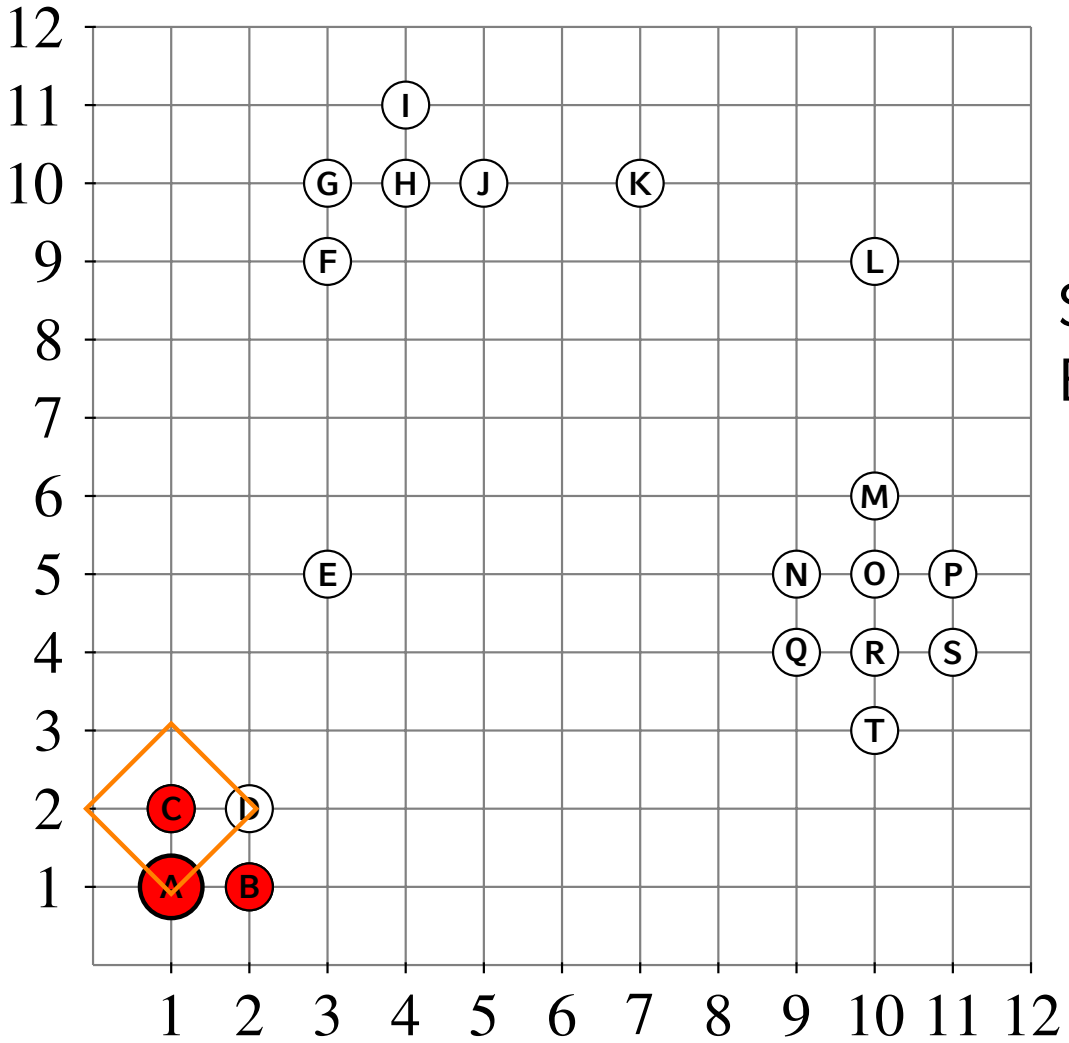
$minPts = 3$

Seed list:
BC

DBSCAN



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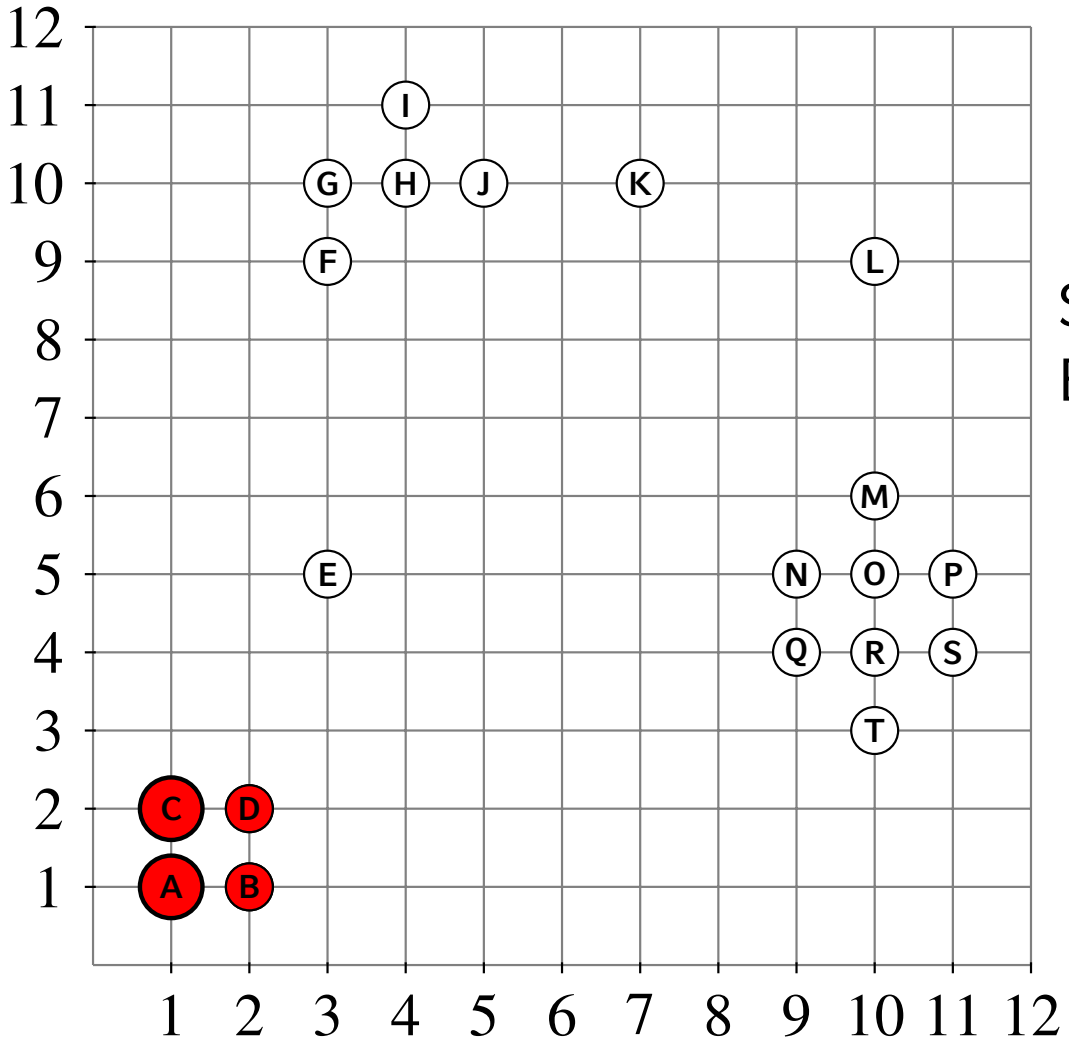
Seed list:
B

DBSCAN



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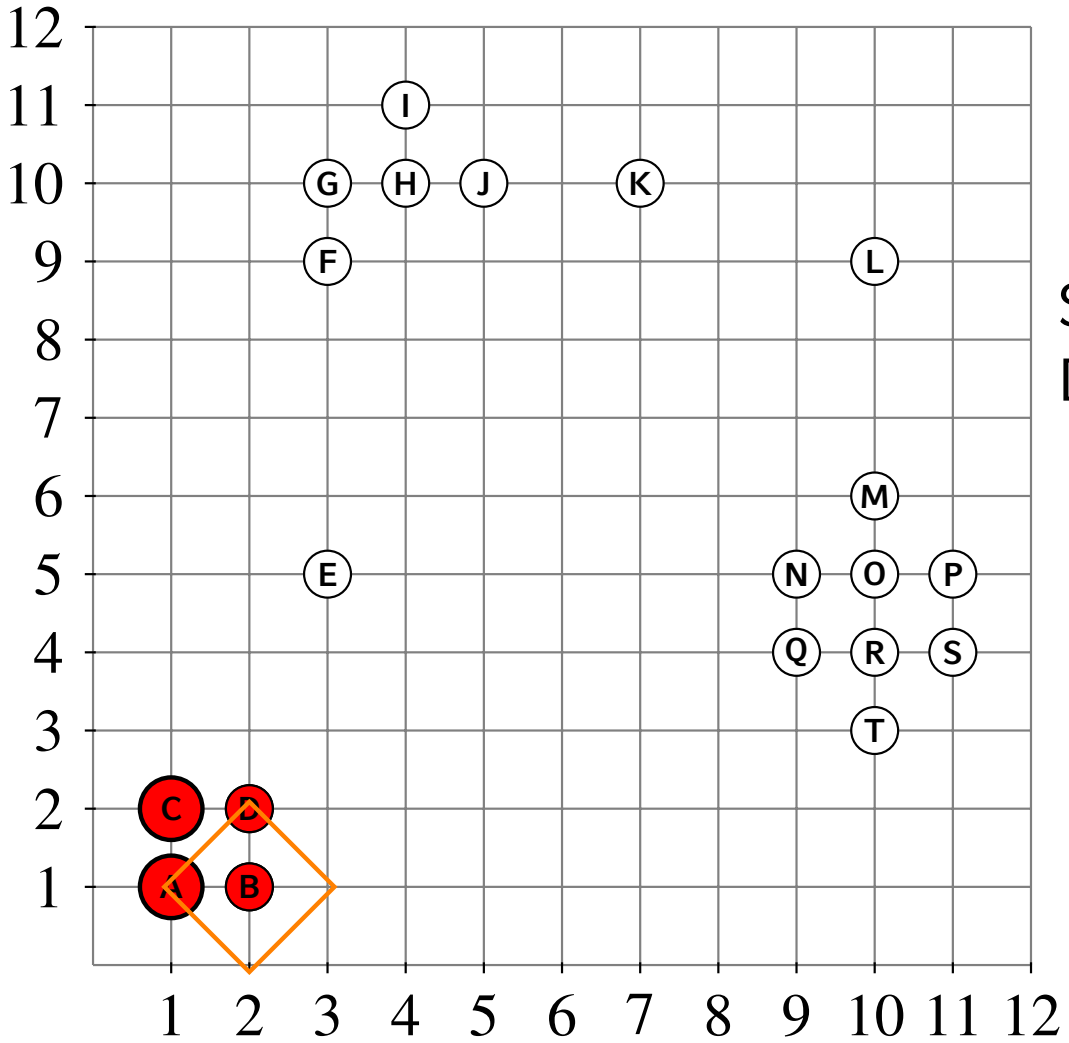
Seed list:
BD

DBSCAN



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Seed list:
D

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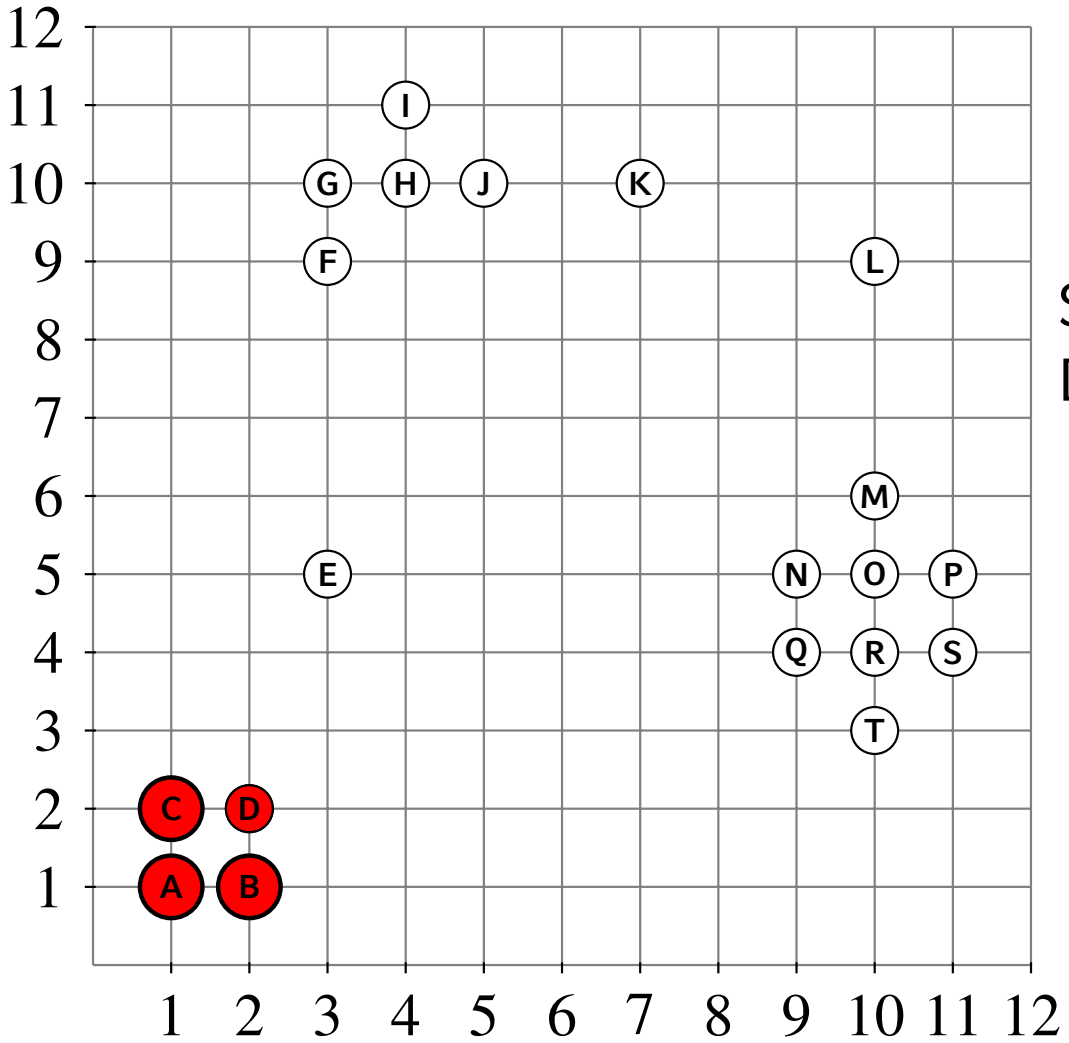

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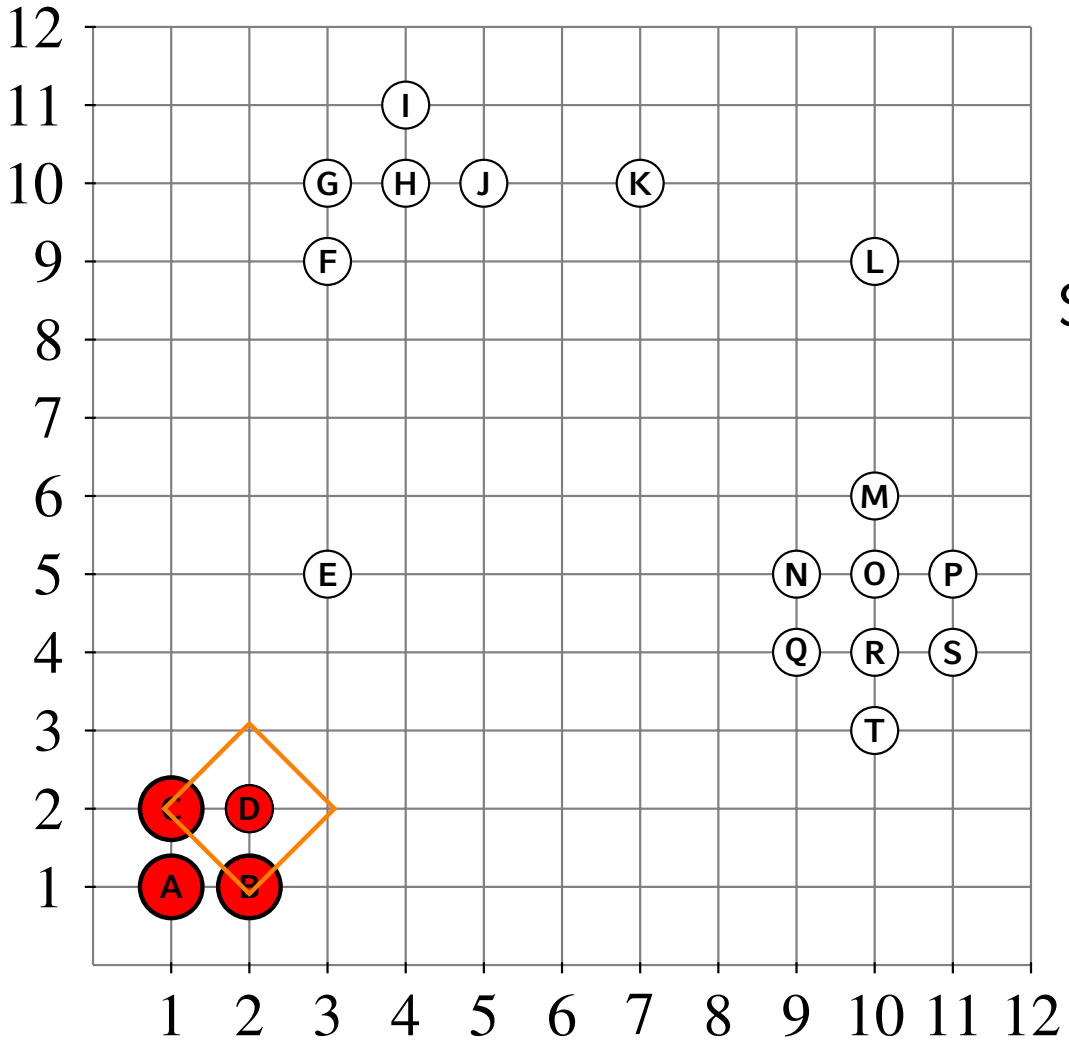
Seed list:
D

DBSCAN



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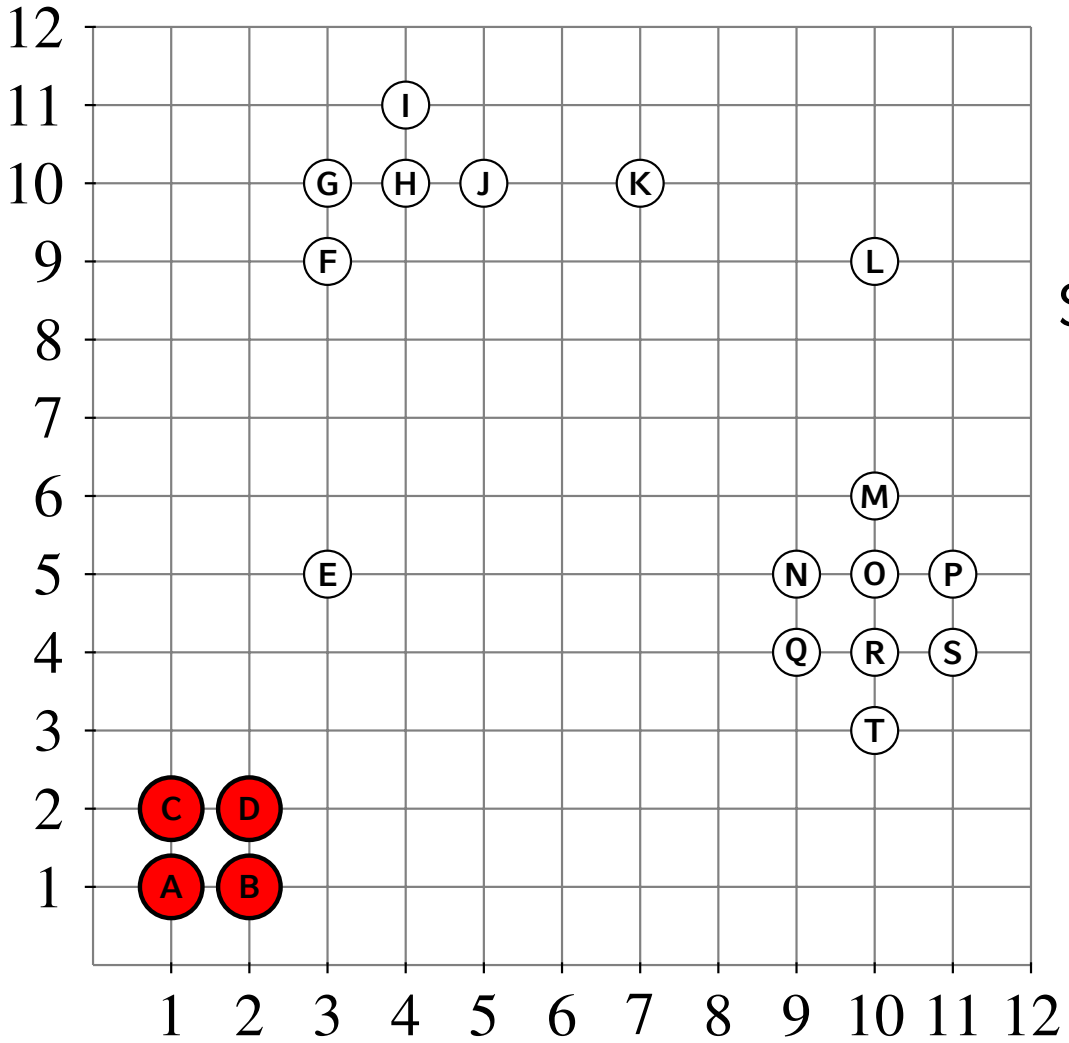
DBSCAN



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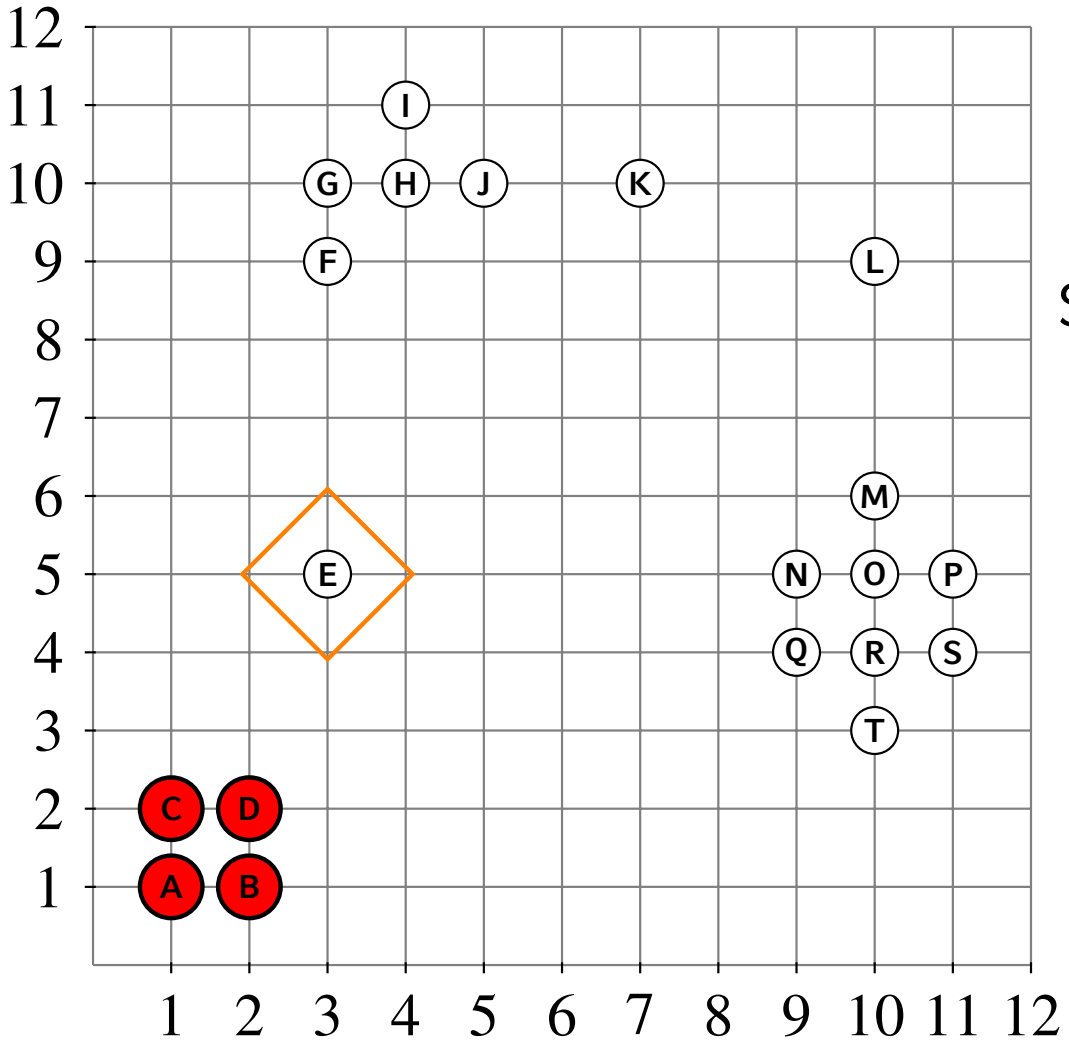
Seed list:

DBSCAN



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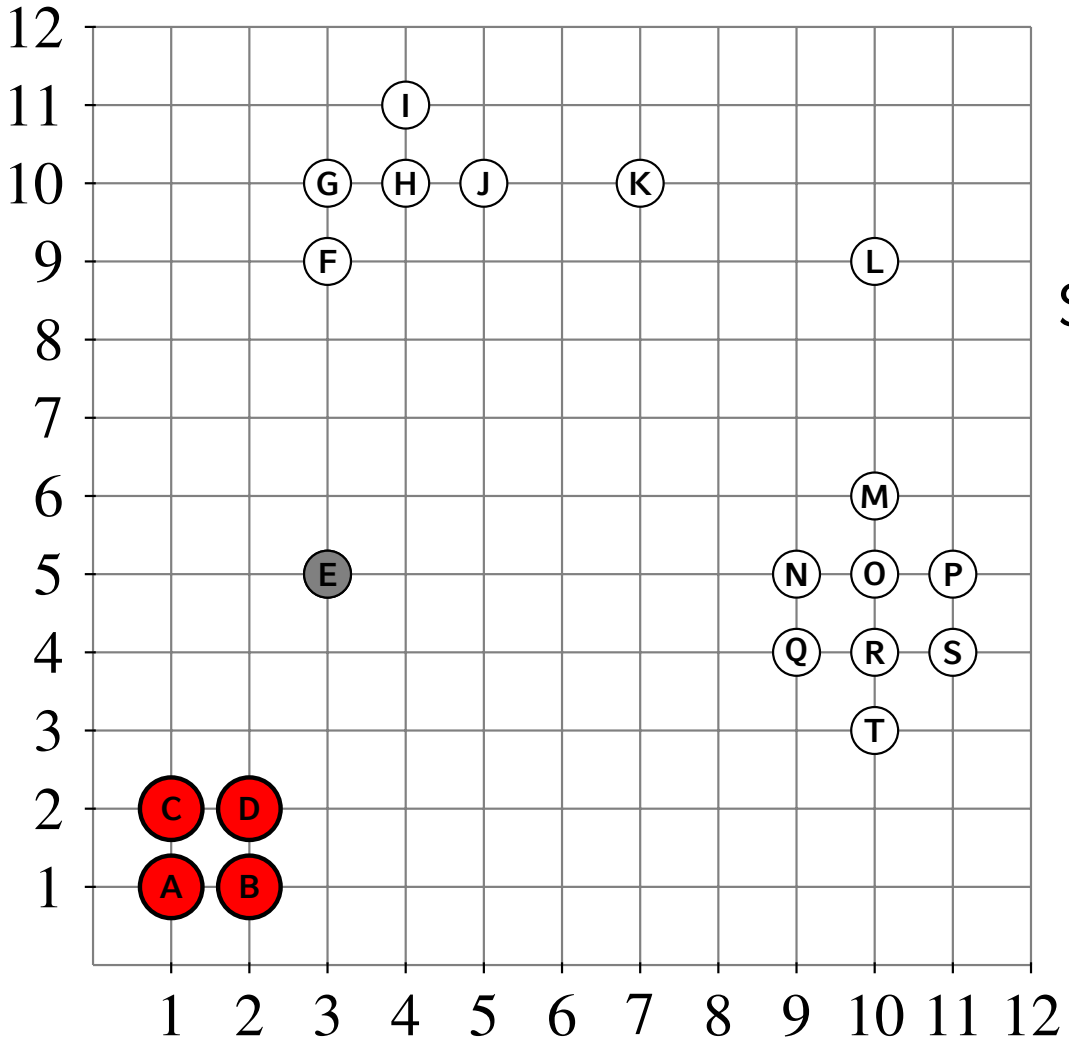
$minPts = 3$

Seed list:

DBSCAN



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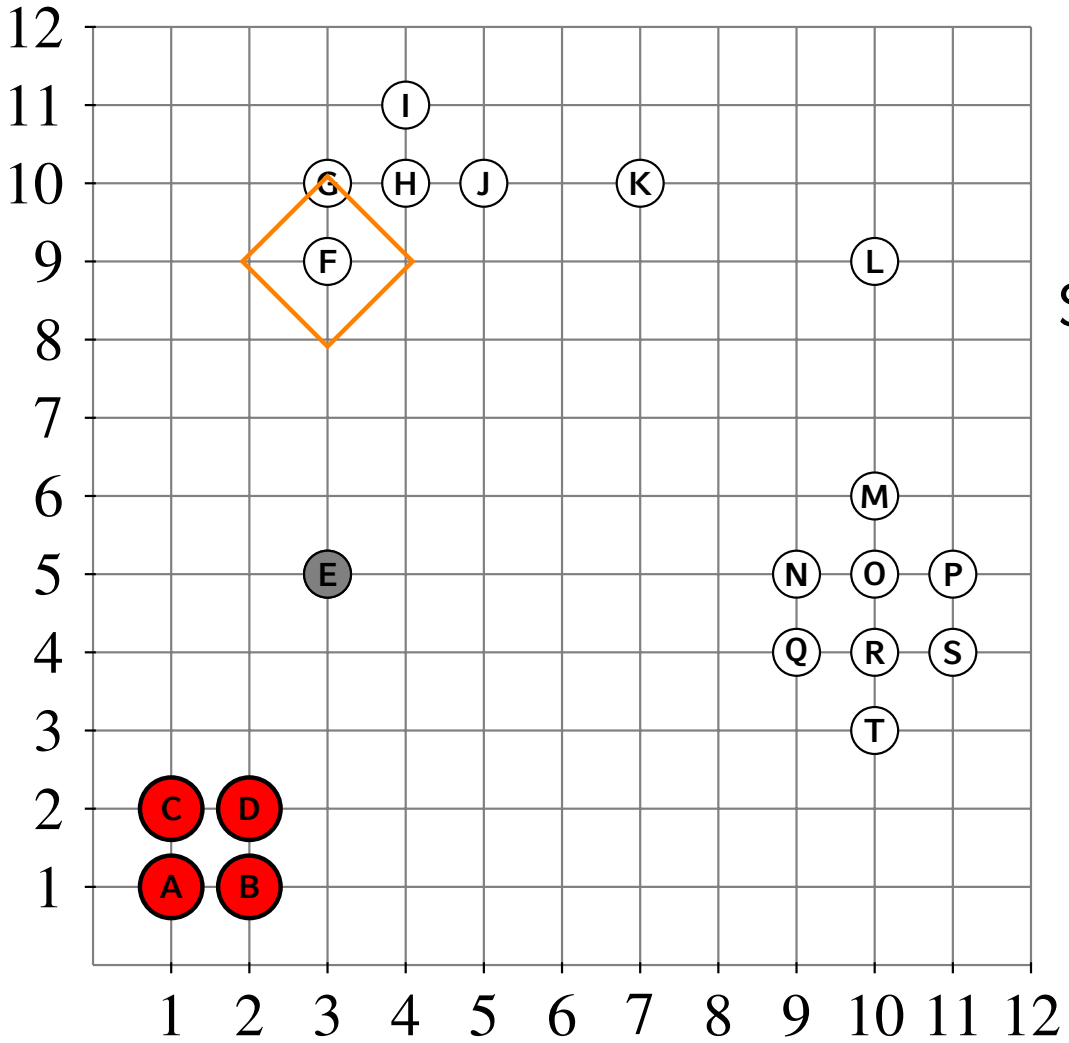
$minPts = 3$

Seed list:

DBSCAN



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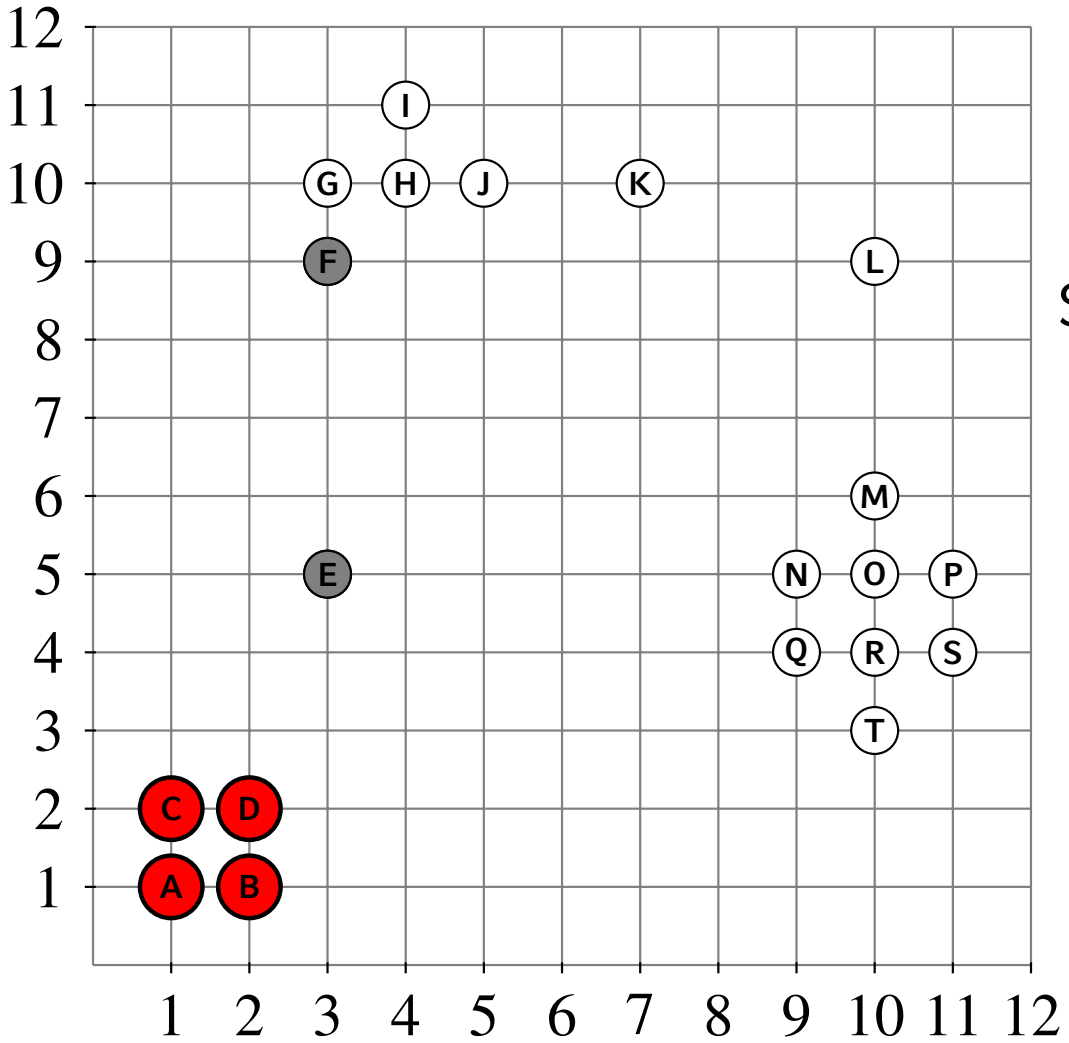
Seed list:

DBSCAN



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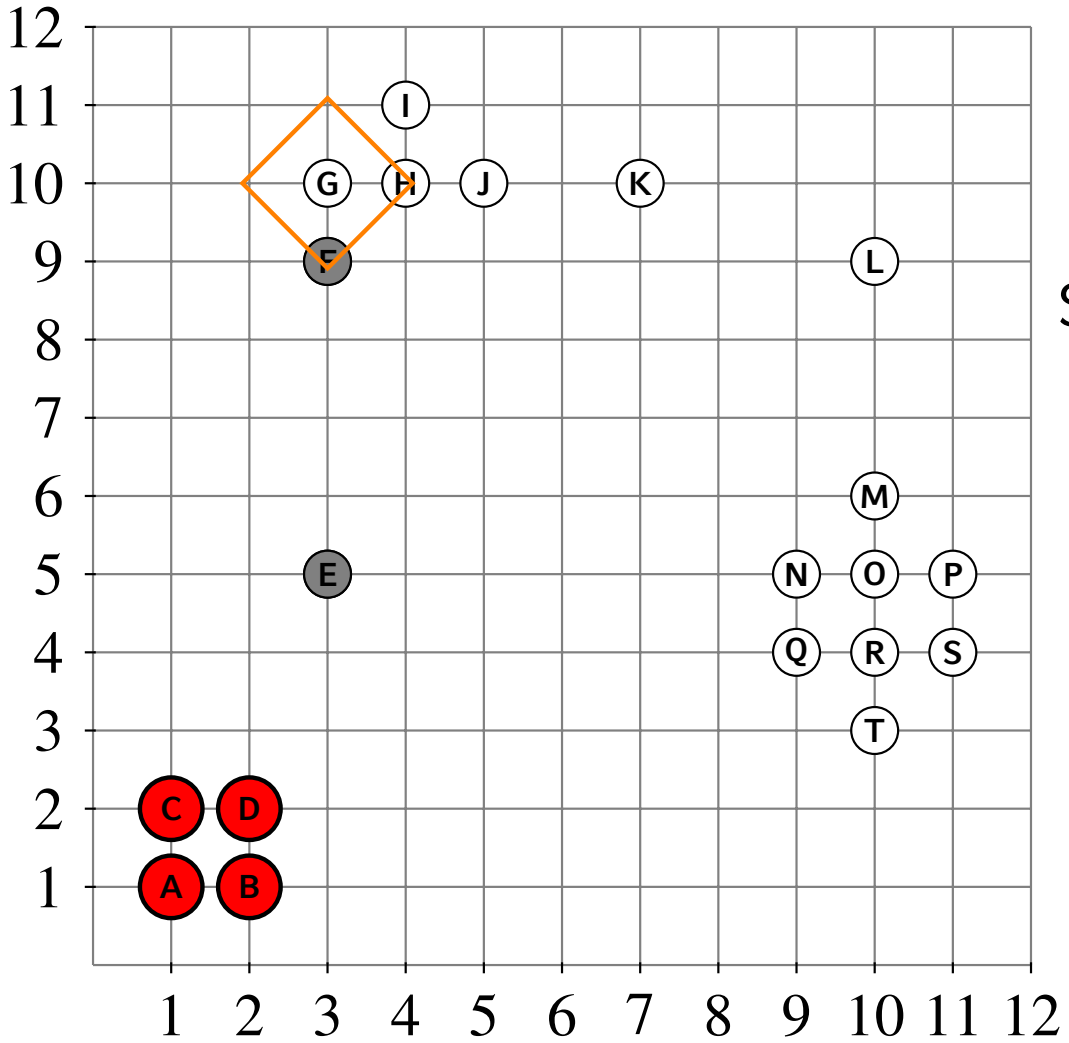
Seed list:

DBSCAN



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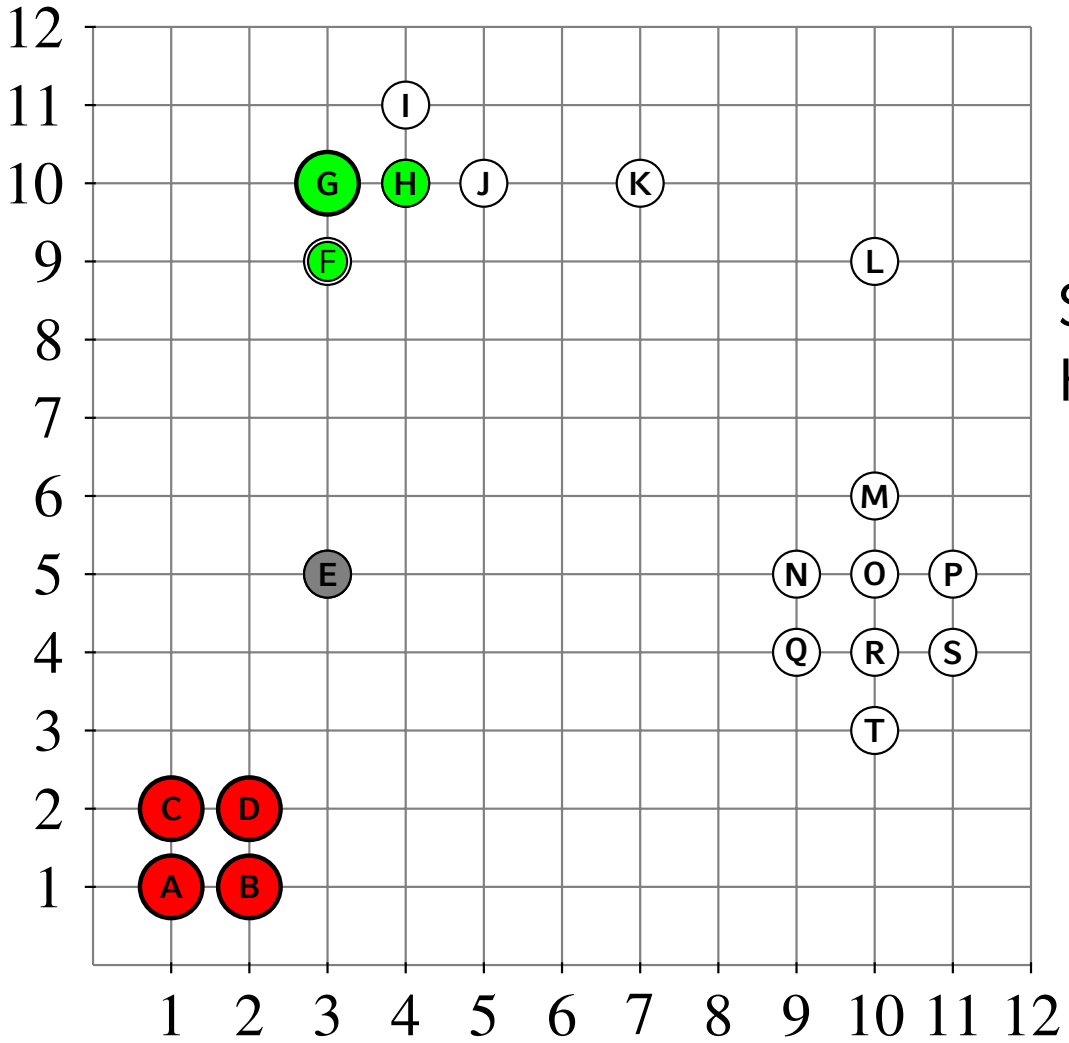
Seed list:

DBSCAN

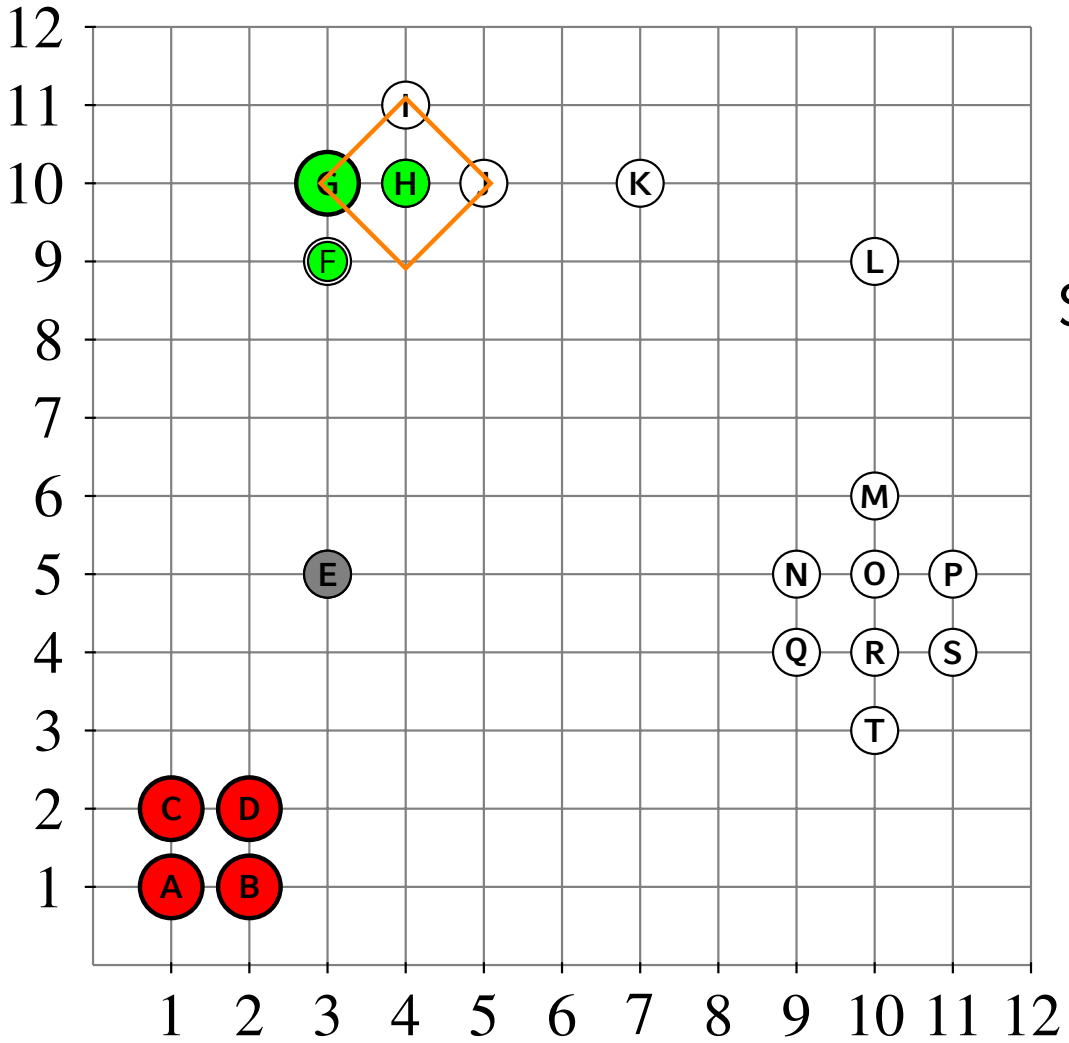


$\varepsilon = 1.1$

$minPts = 3$

Seed list:
H

DBSCAN



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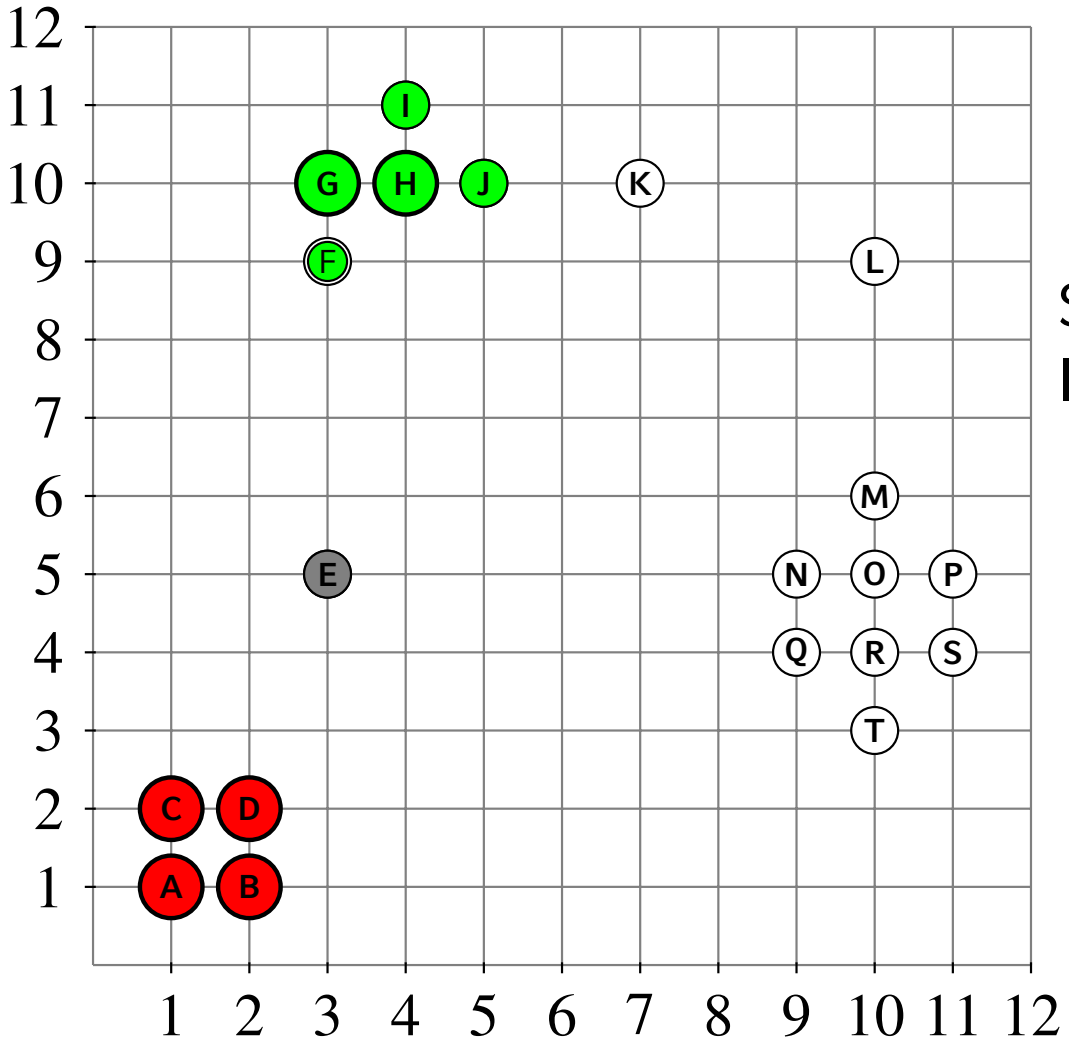
Seed list:

DBSCAN



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Seed list:
IJ

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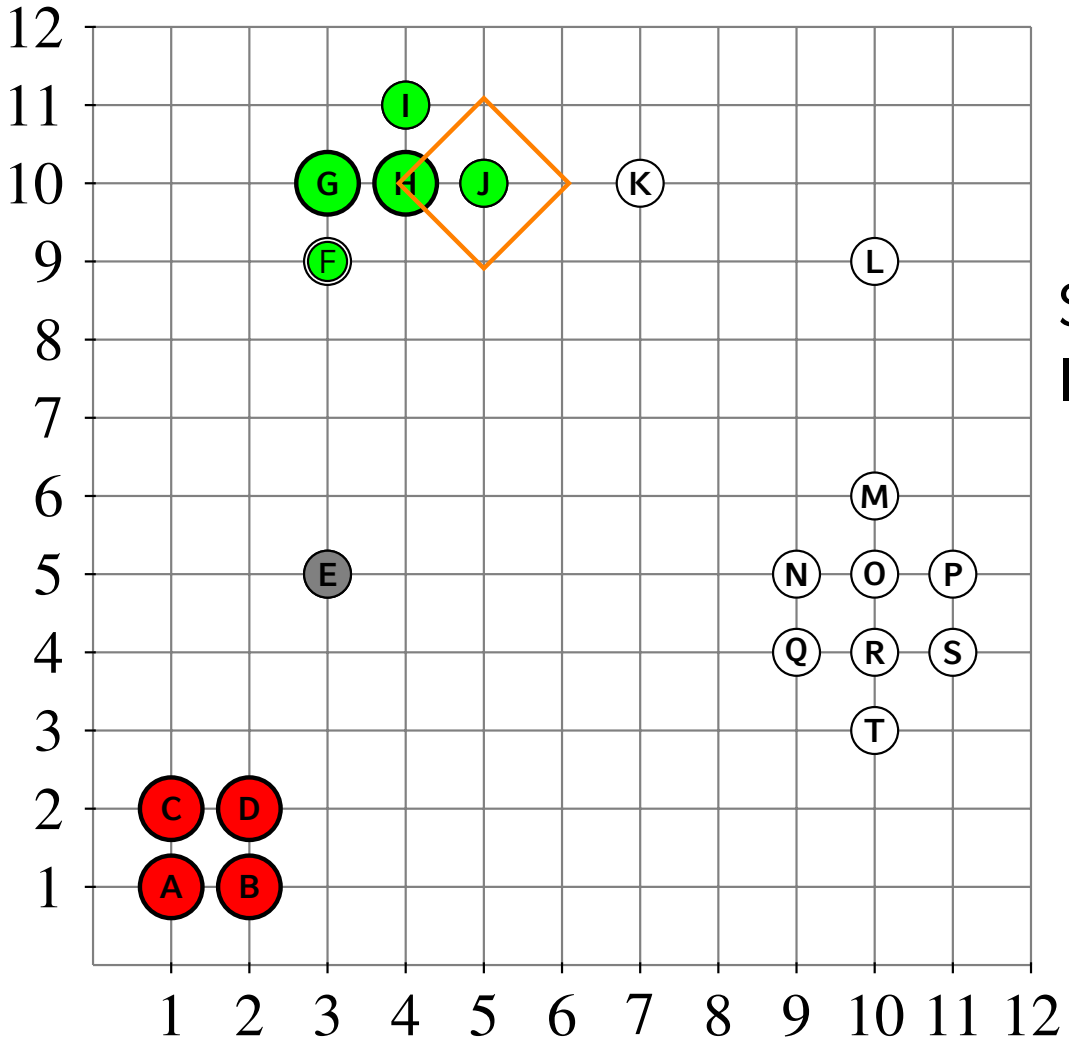

$\varepsilon = 1.1$

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Seed list:

I

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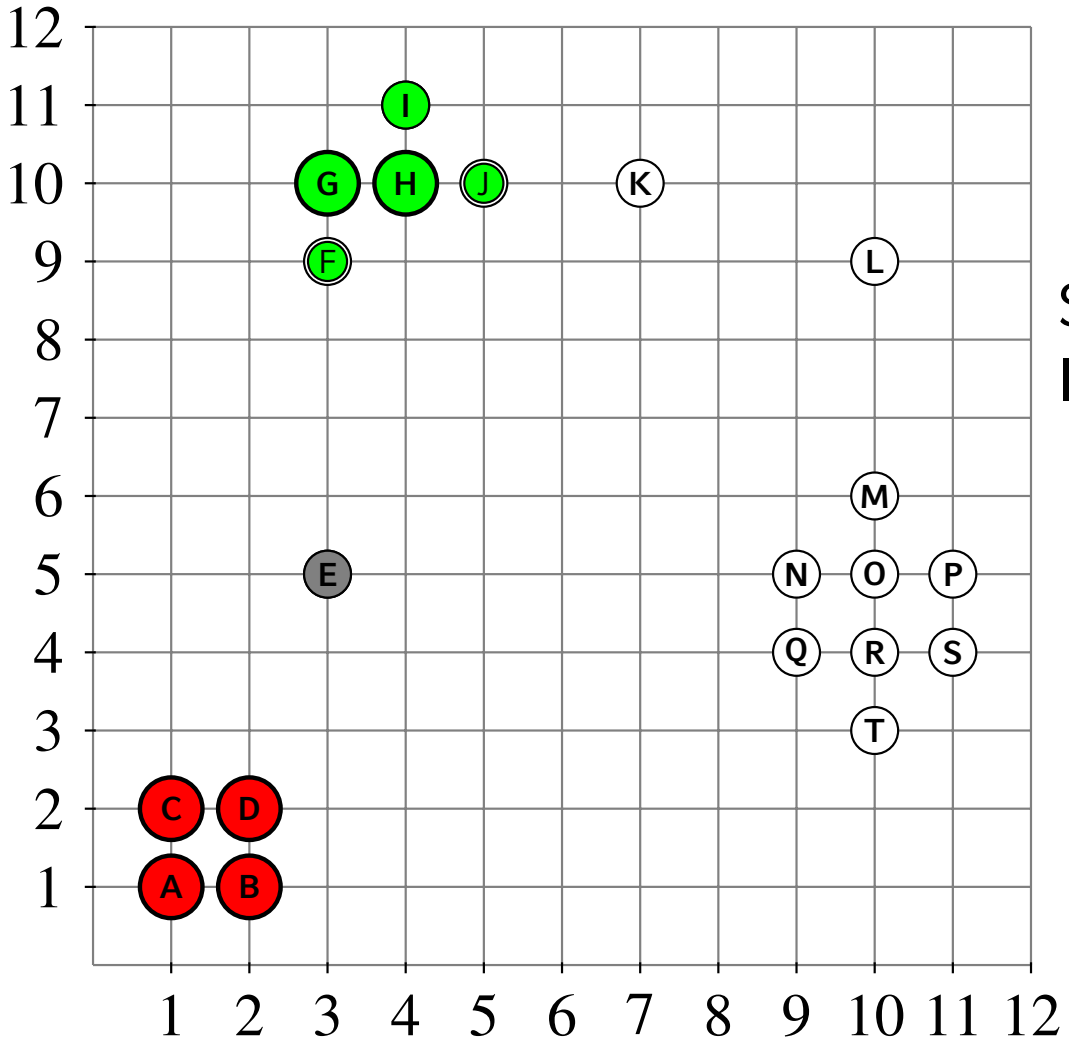

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$minPts = 3$

Seed list:

I

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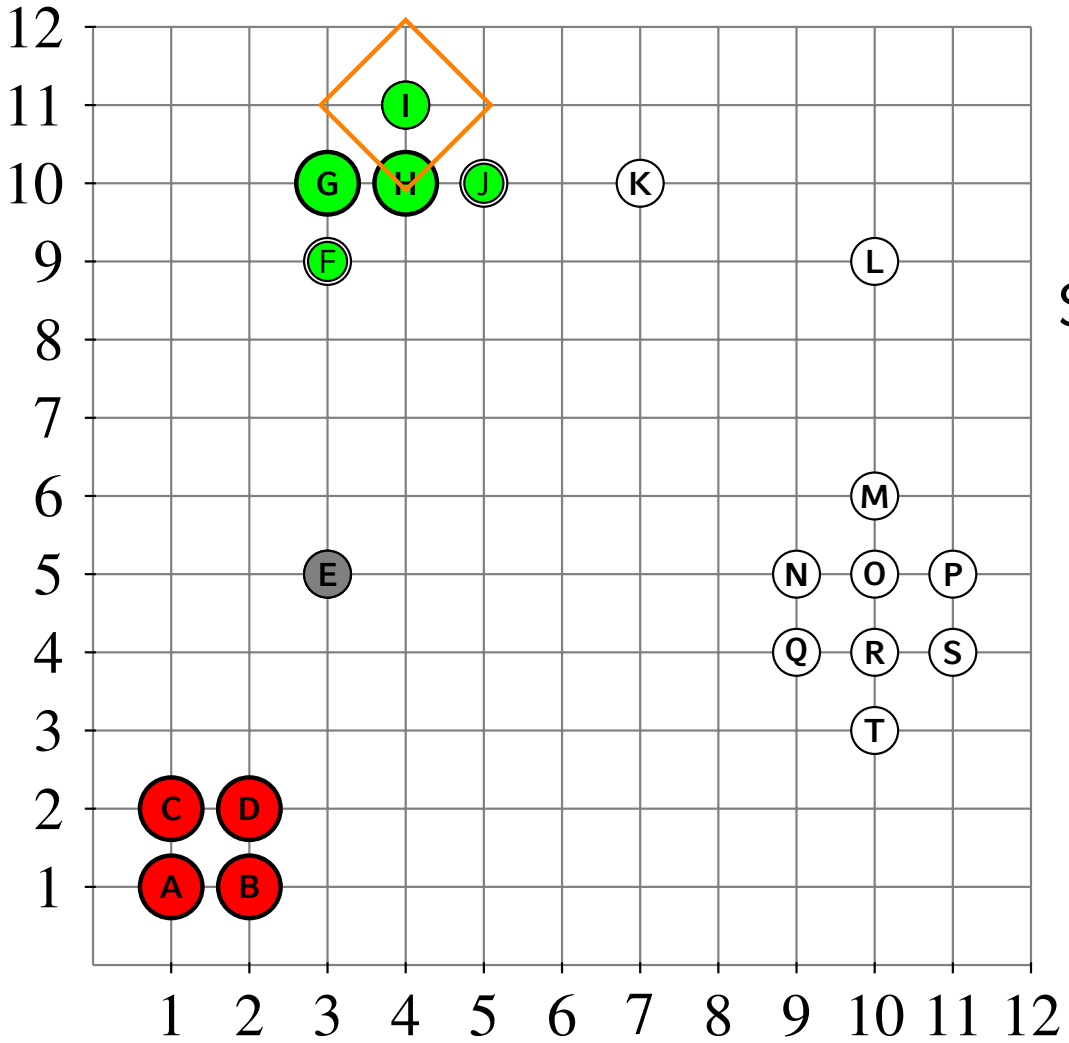

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Seed list:

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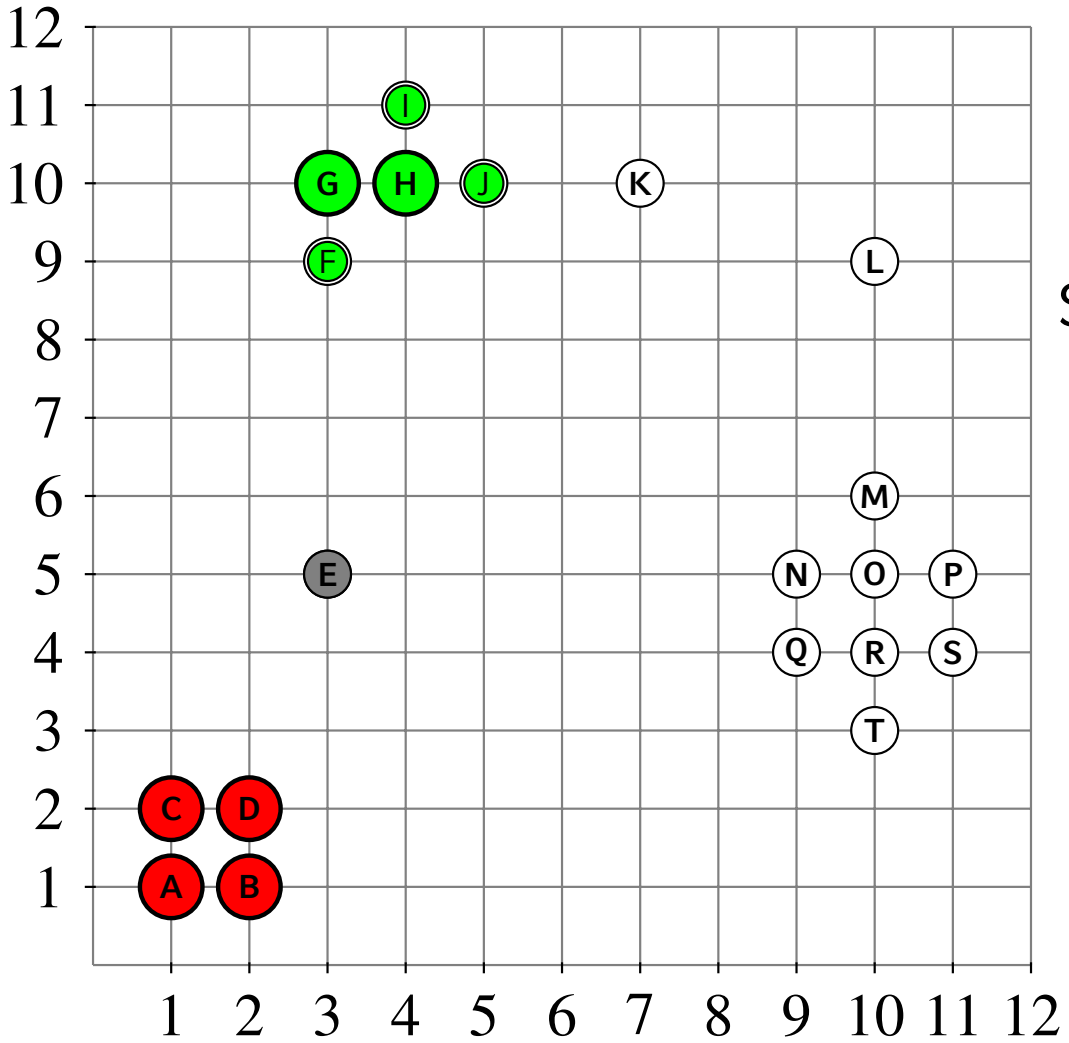

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Seed list:

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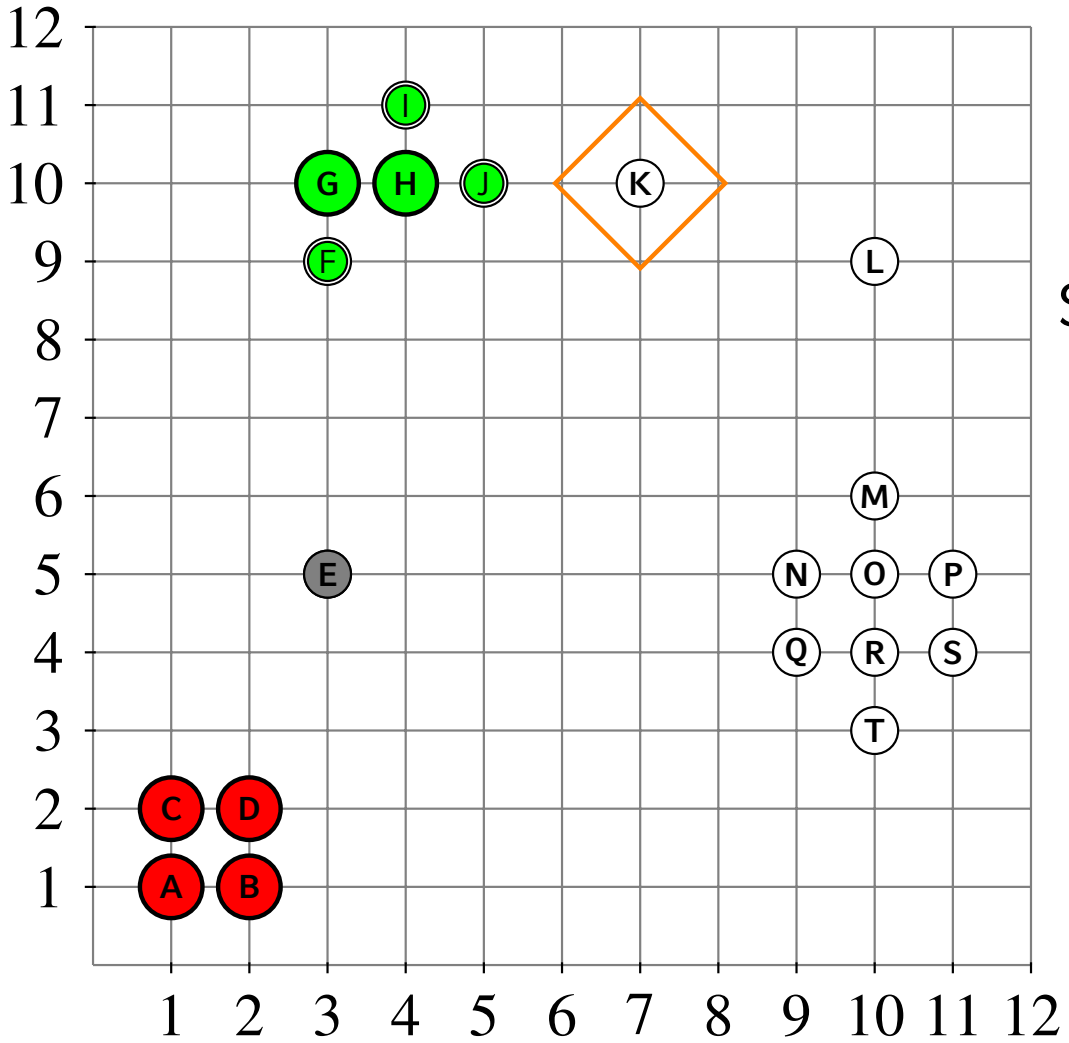

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Seed list:

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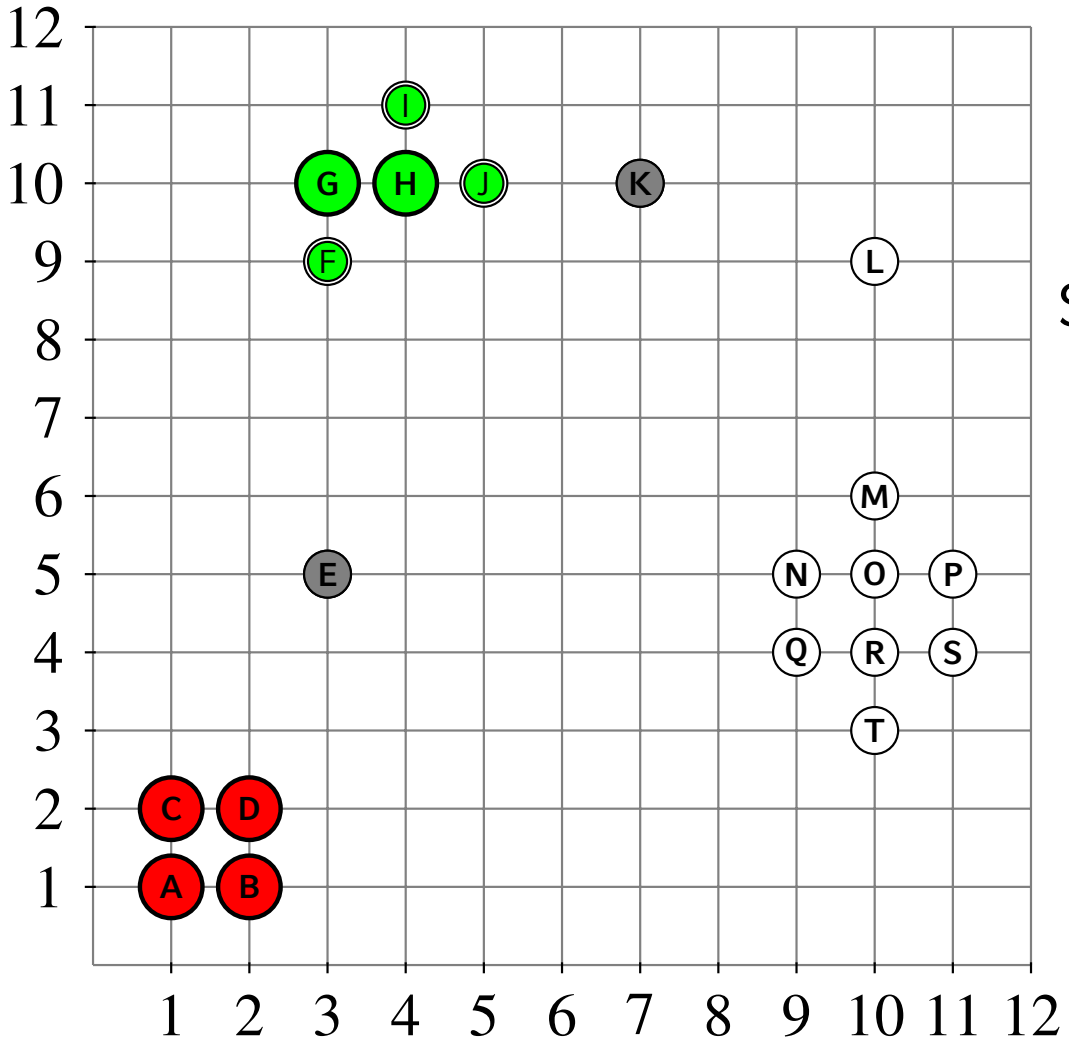

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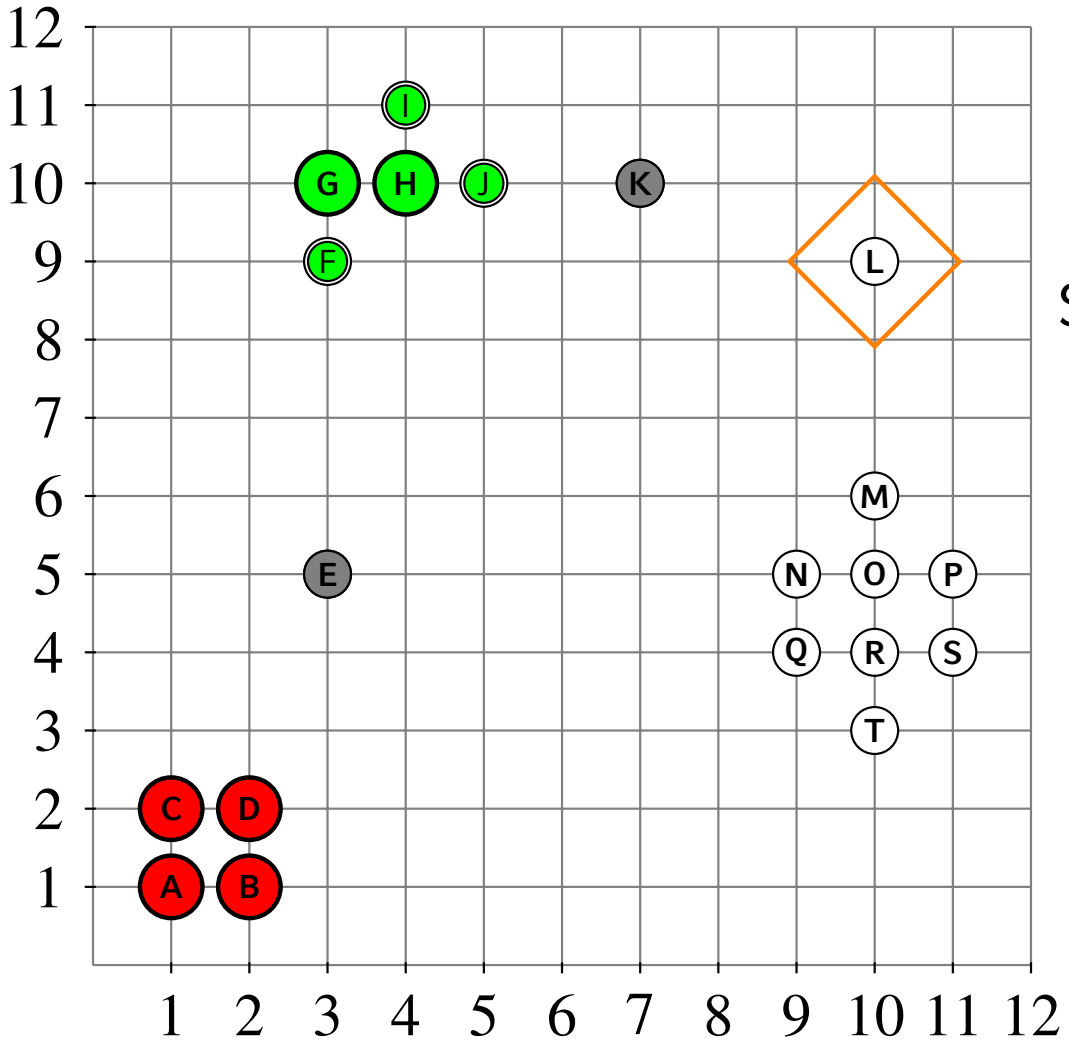
Seed list:

DBSCAN



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Seed list:

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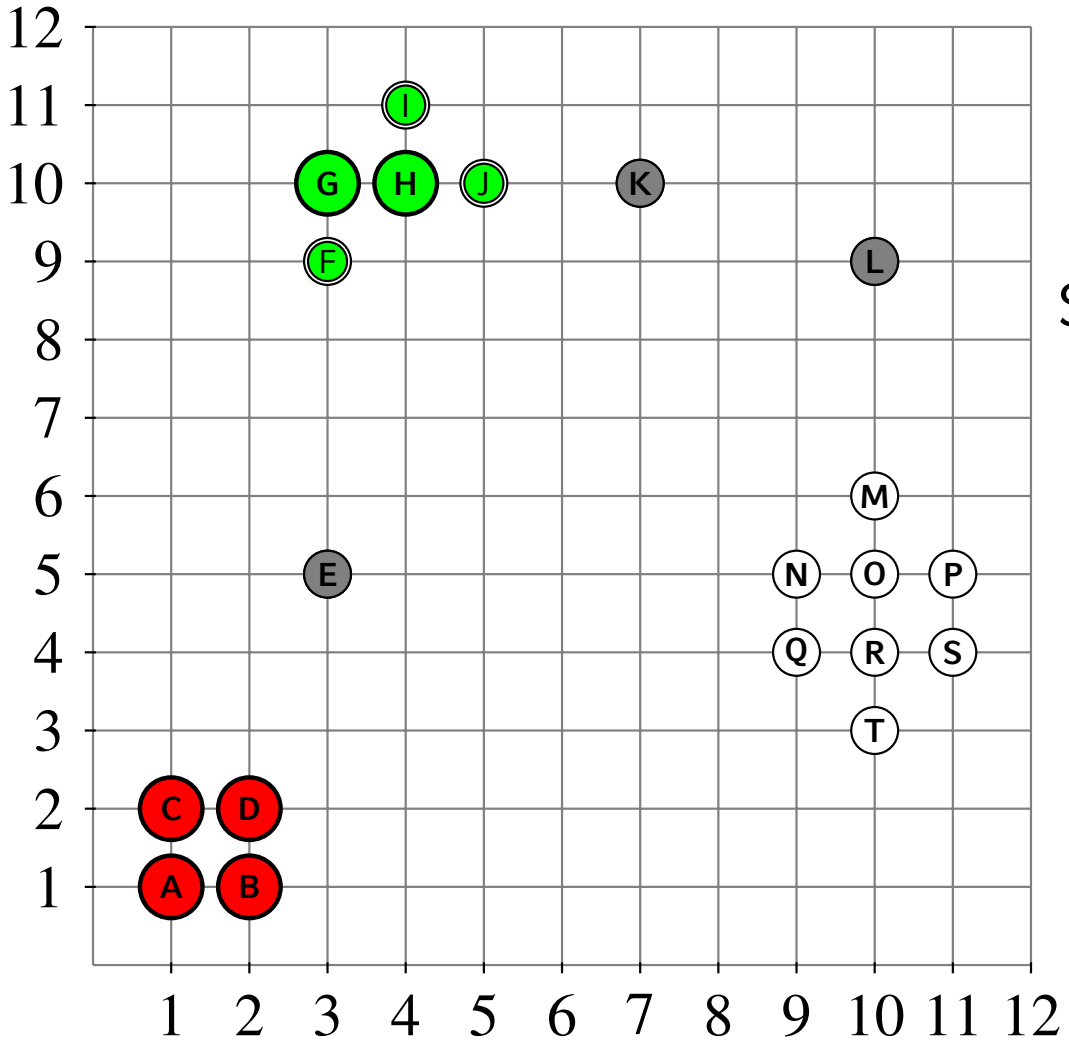

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Seed list:

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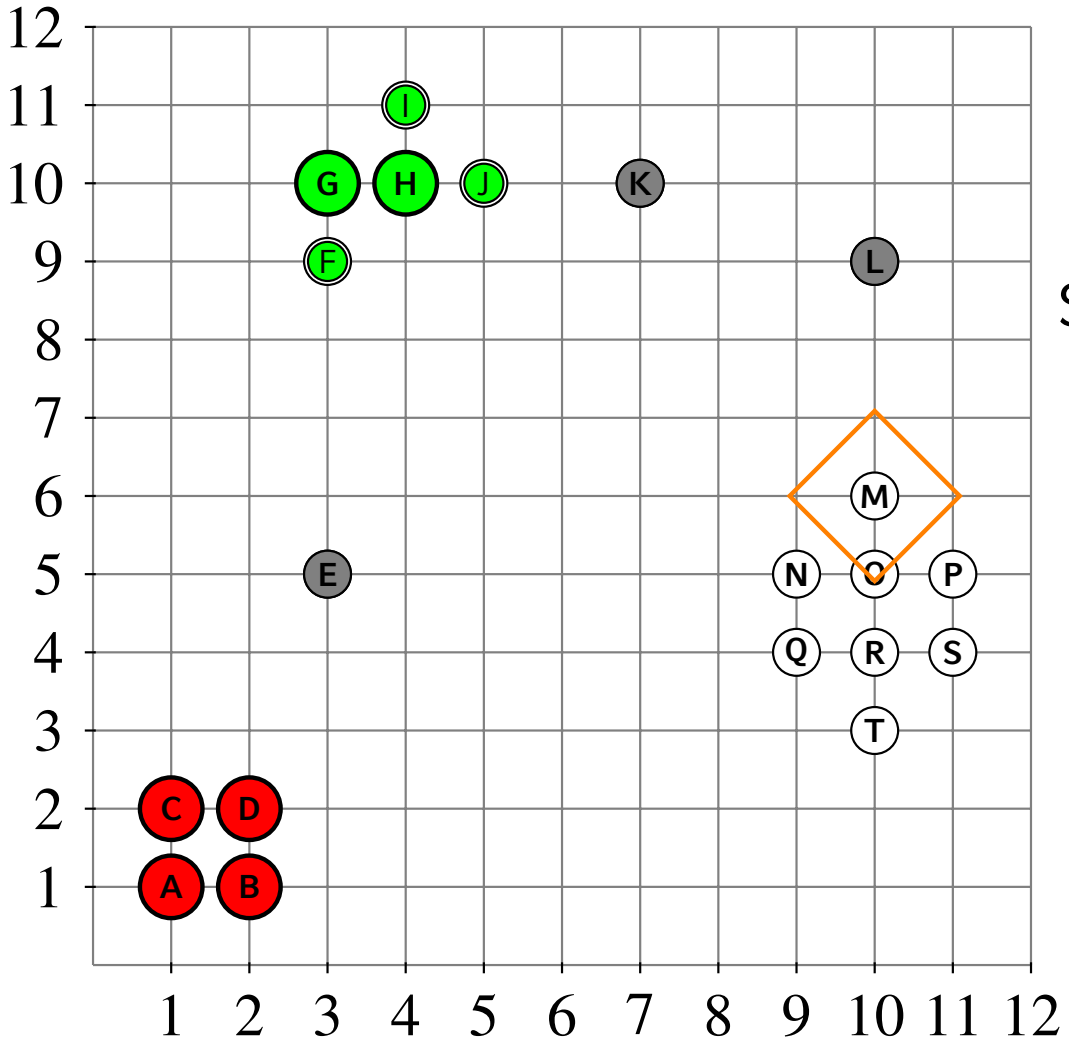

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Seed list:

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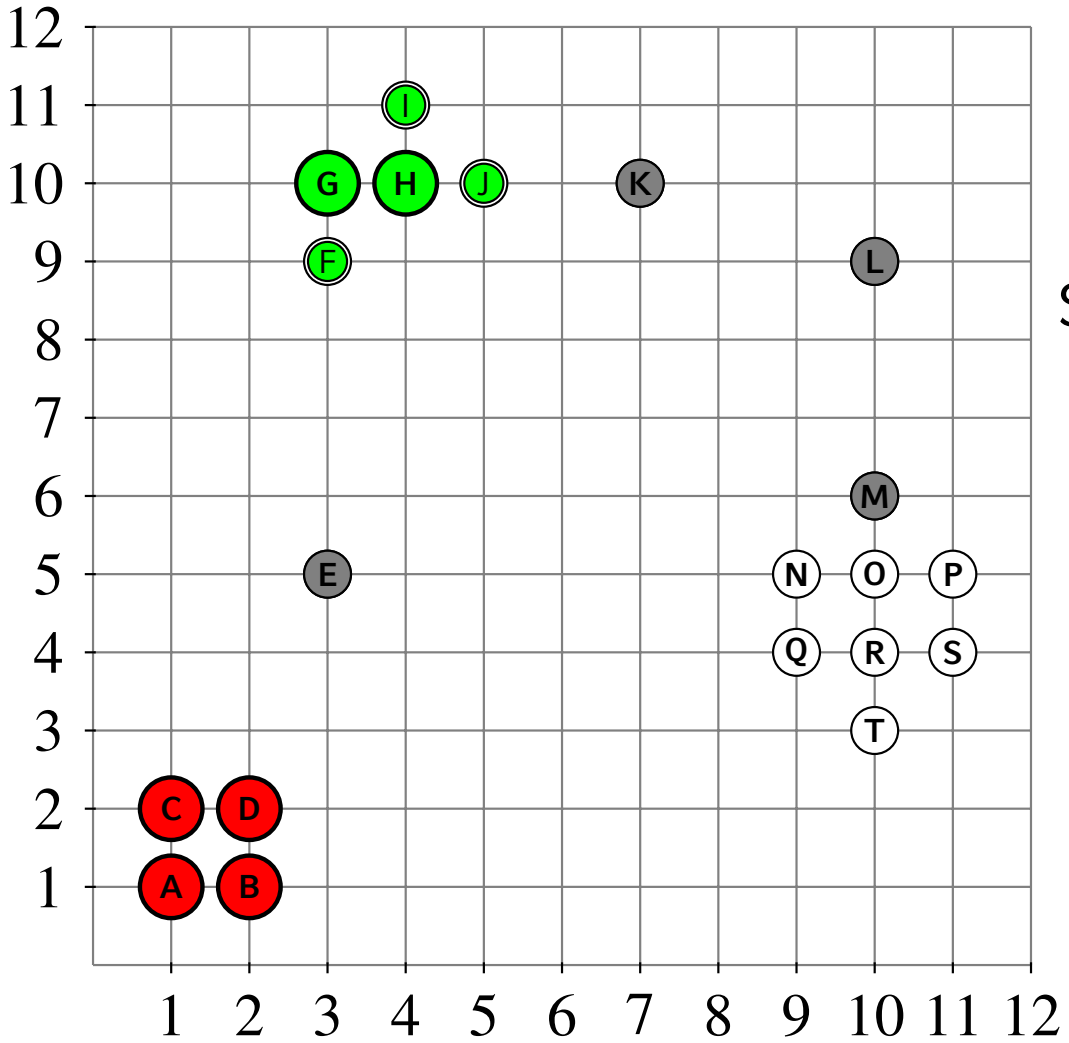

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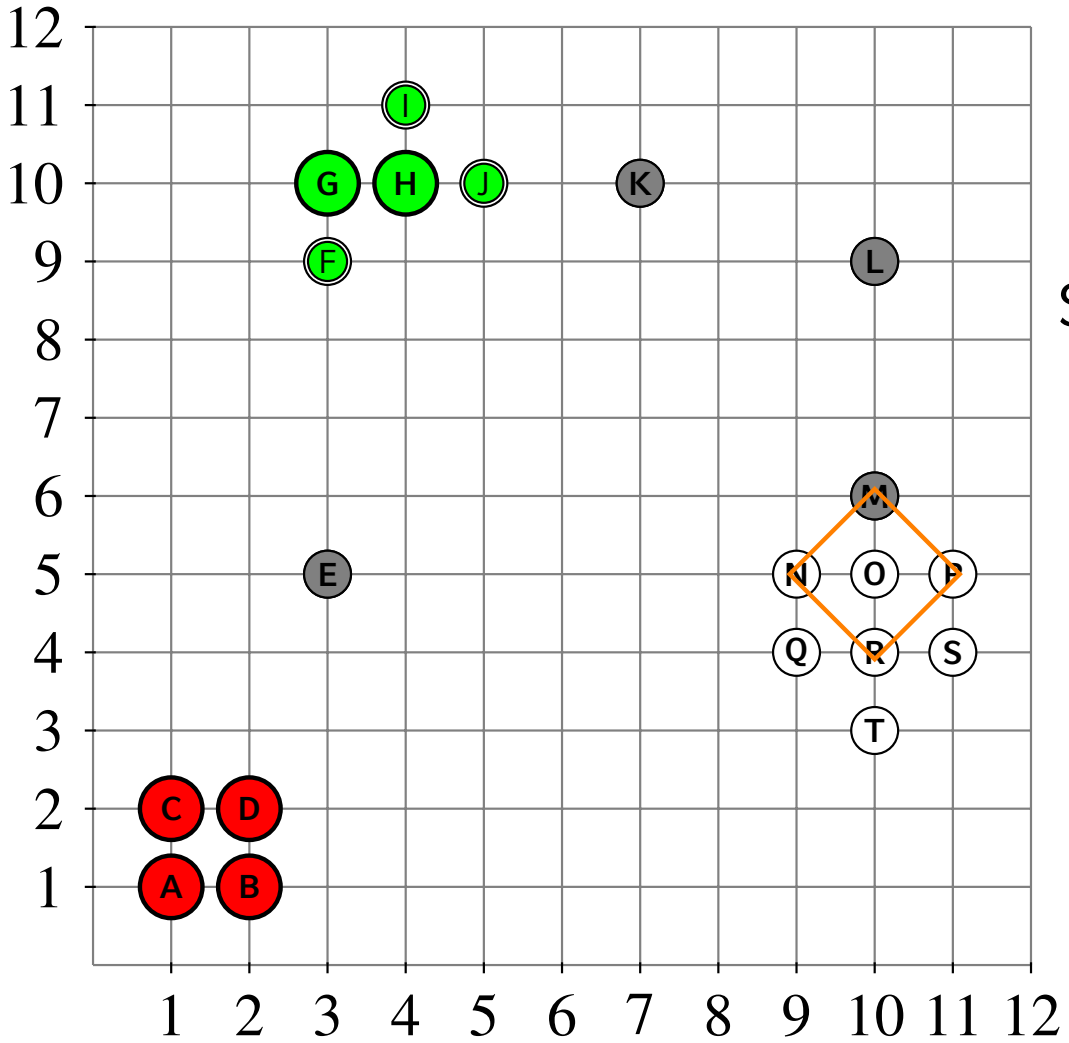
Seed list:

DBSCAN



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Seed list:

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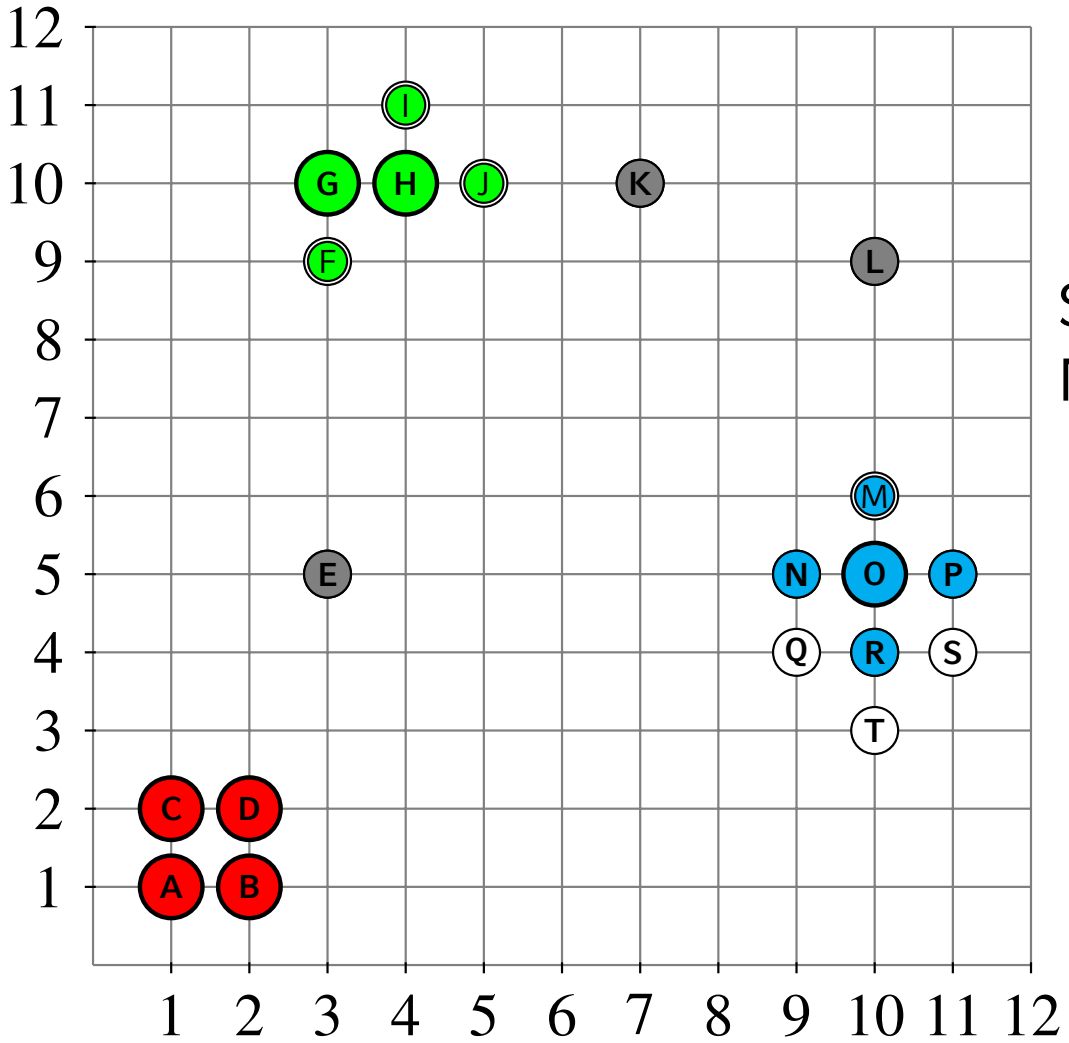

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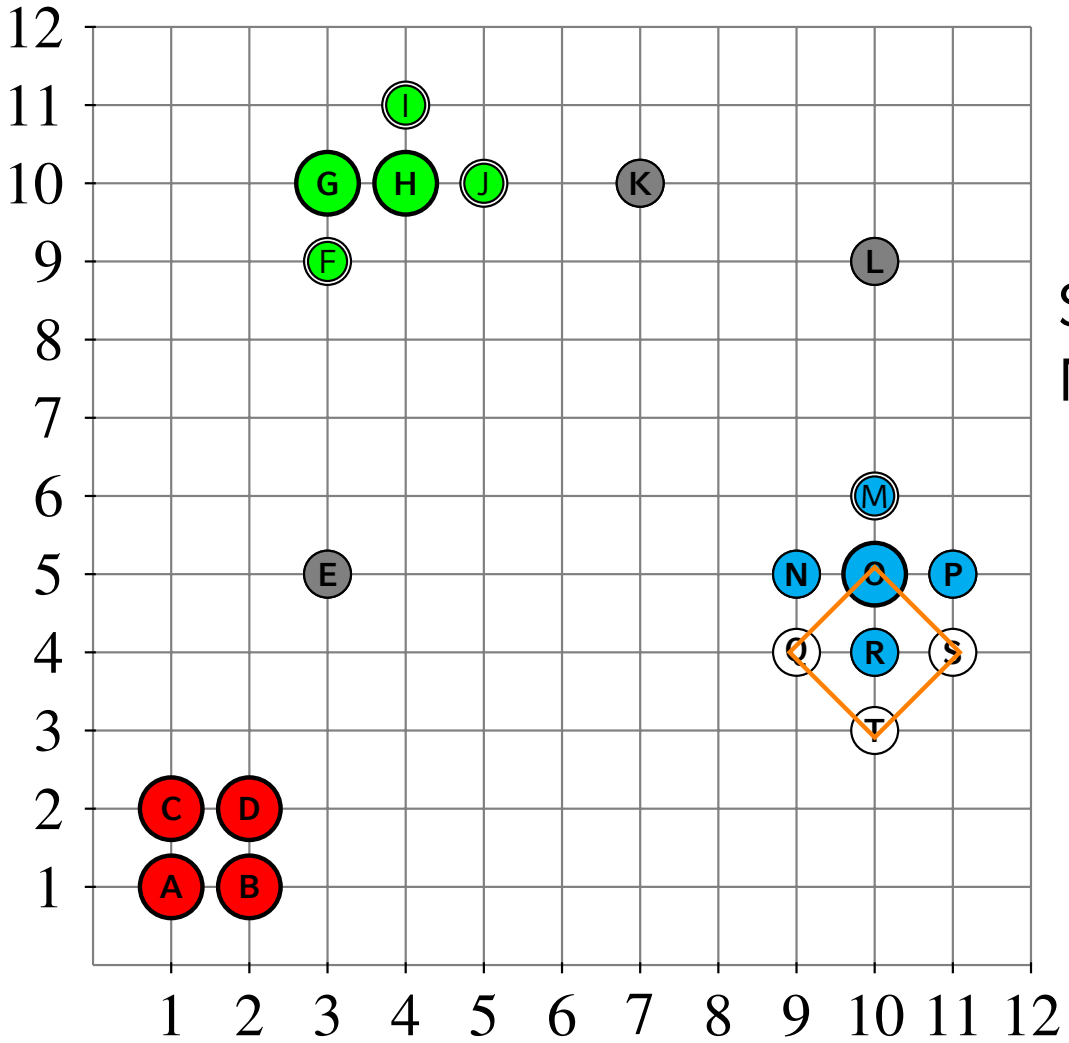
Seed list:
NPR

DBSCAN



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$minPts = 3$

Seed list:
NP

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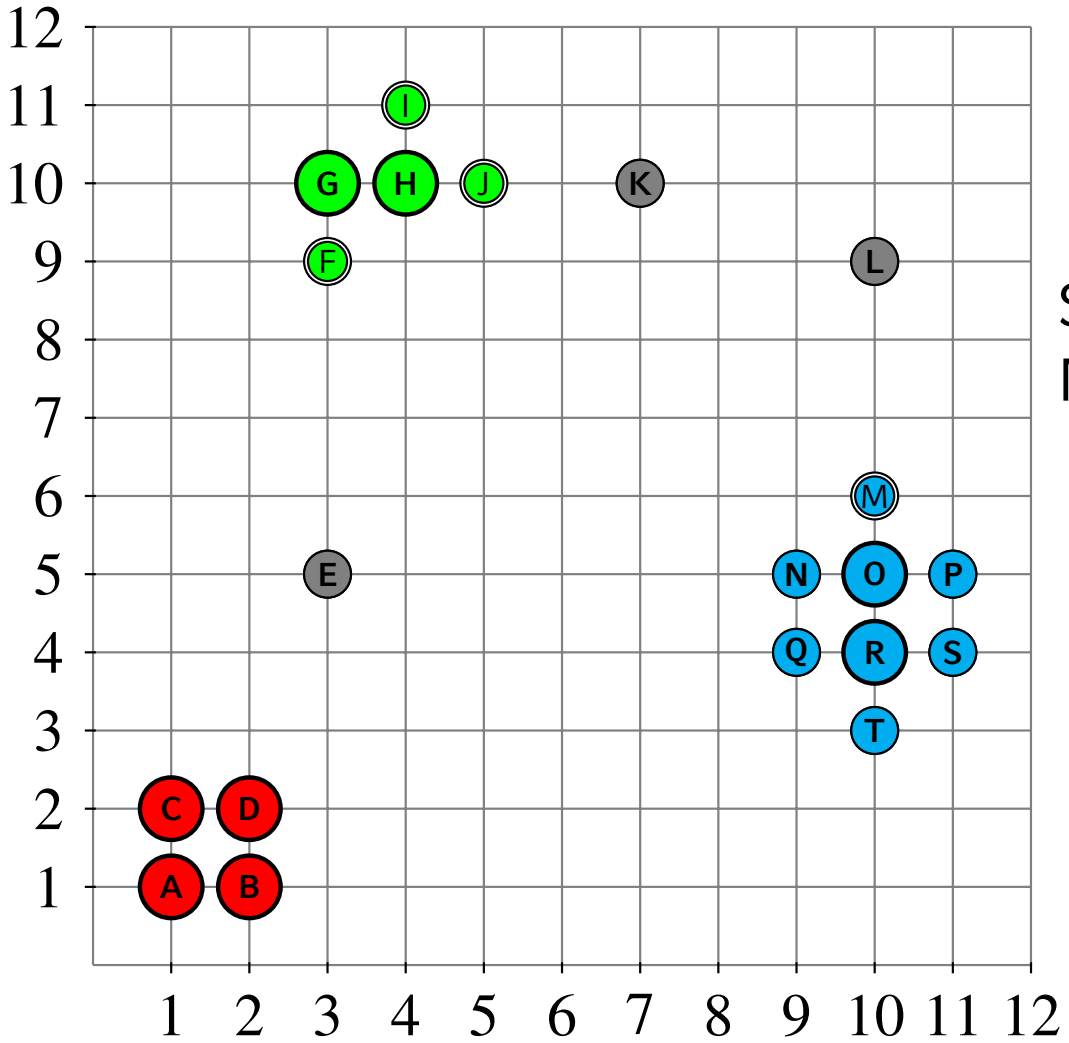

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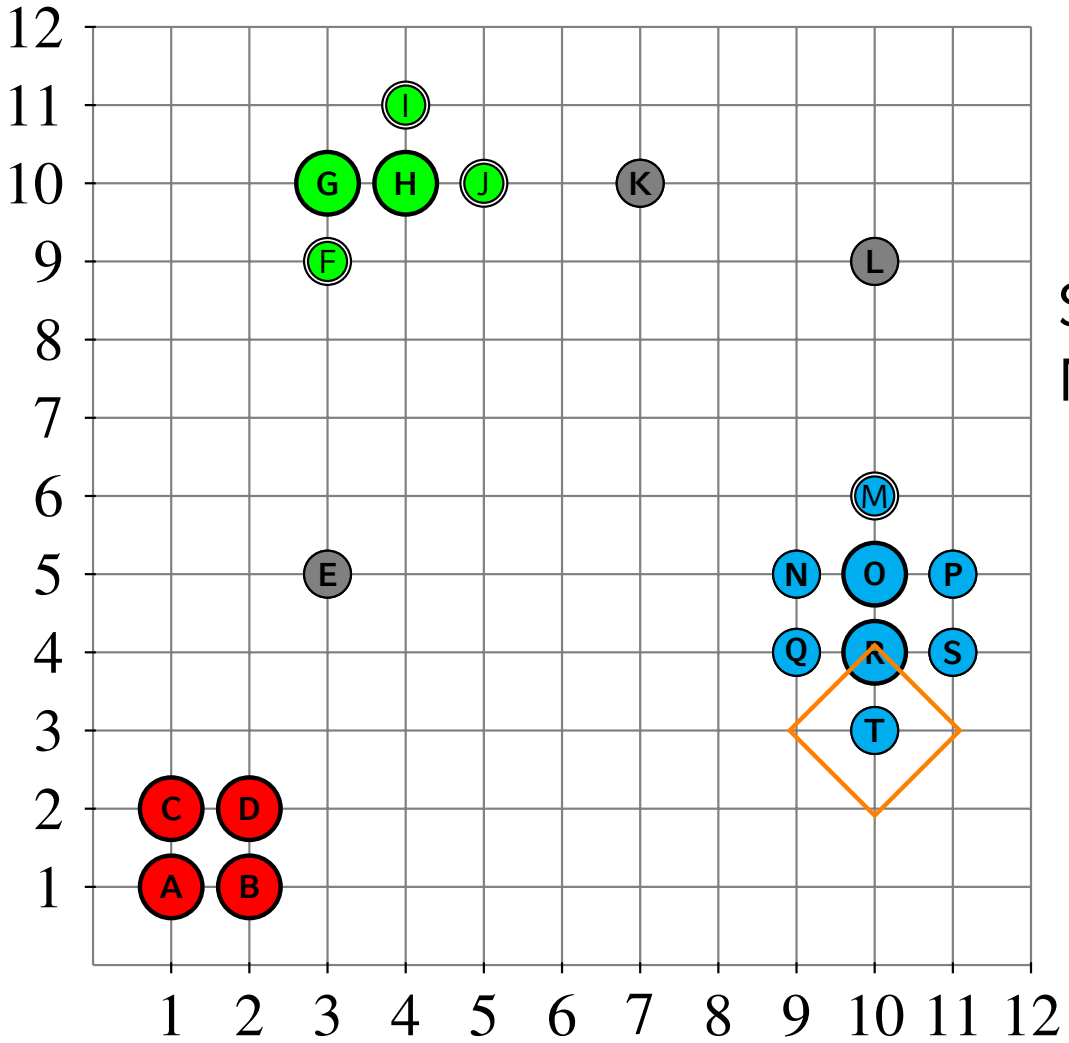
Seed list: NPQST

DBSCAN



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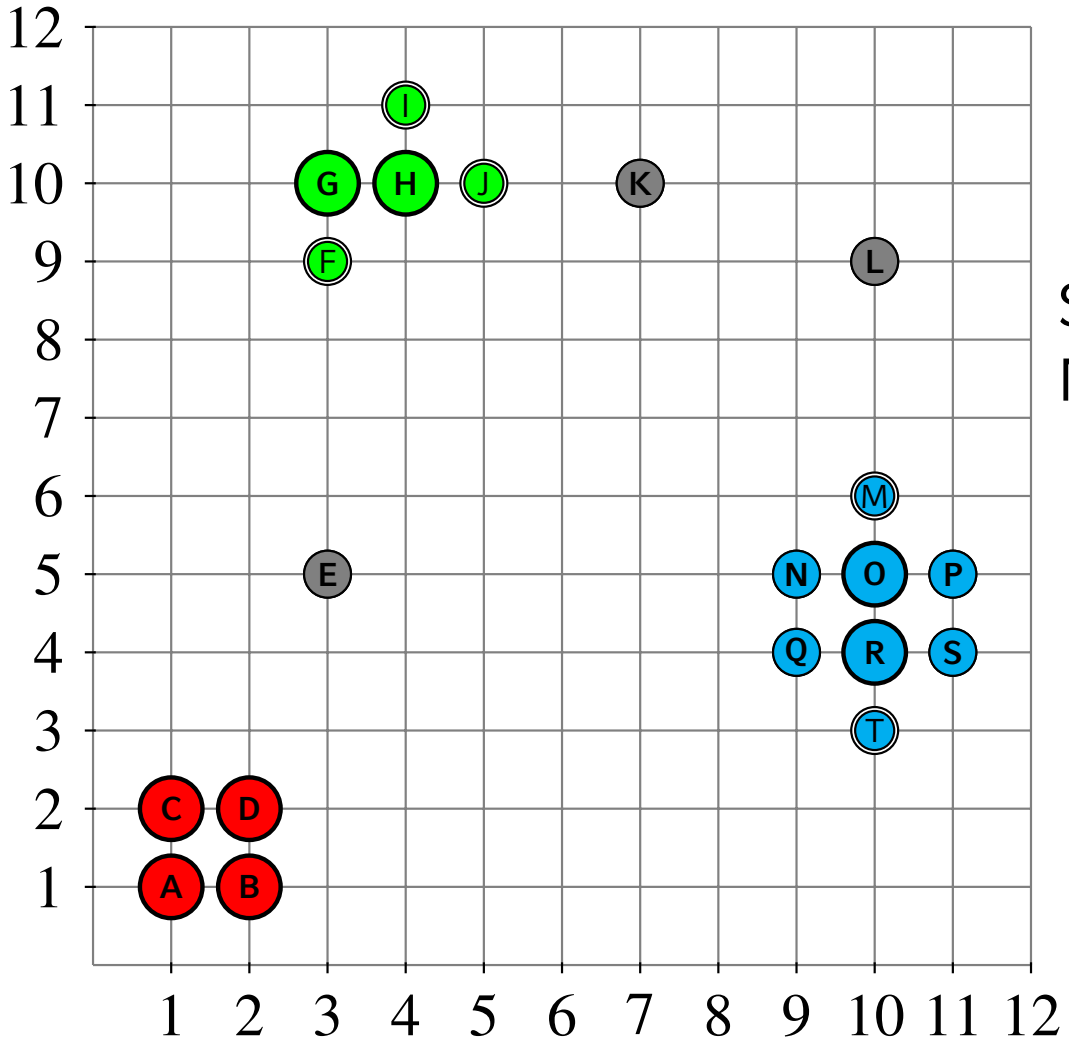
Seed list: NPQS

DBSCAN



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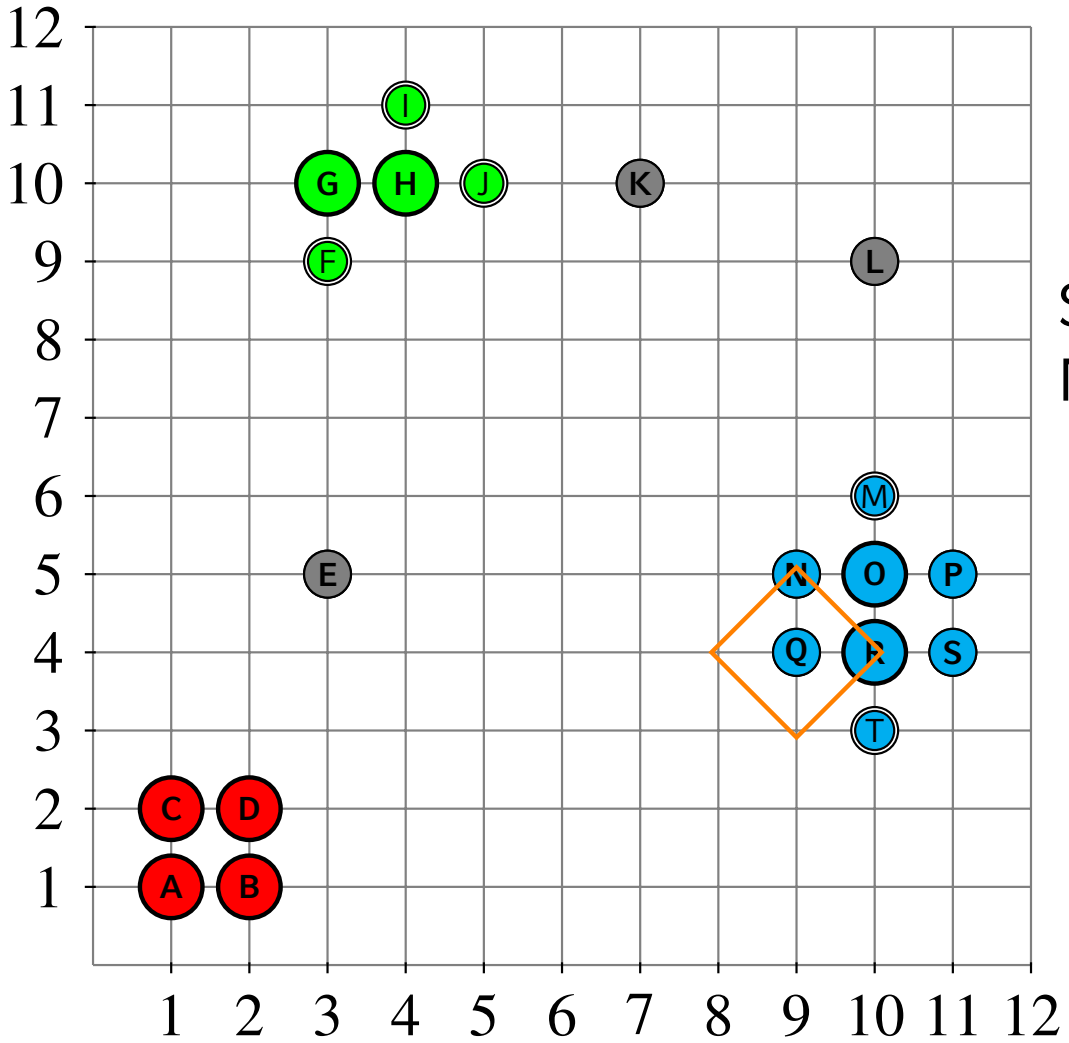
$minPts = 3$

Seed list: NPQS

DBSCAN



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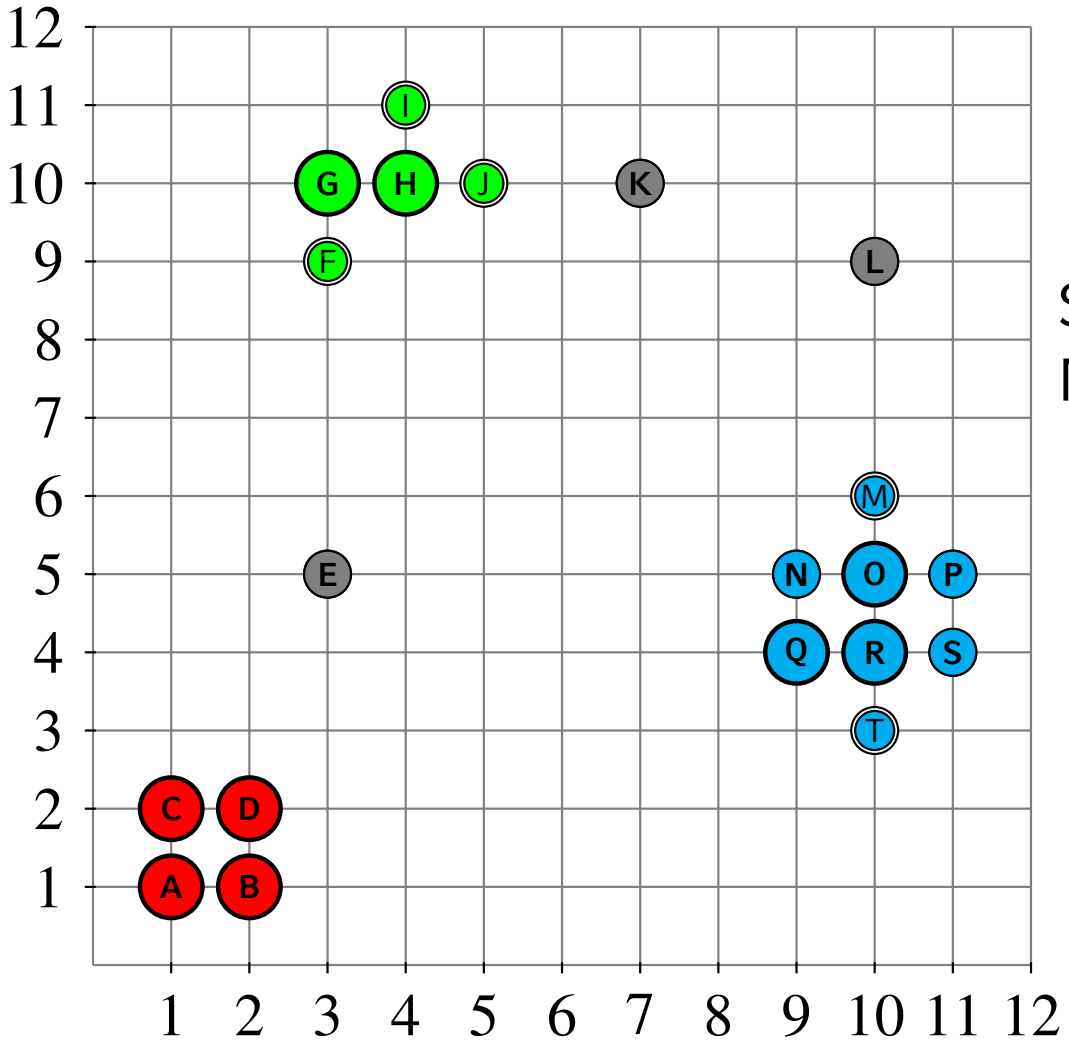
$minPts = 3$

Seed list:
NPS

DBSCAN



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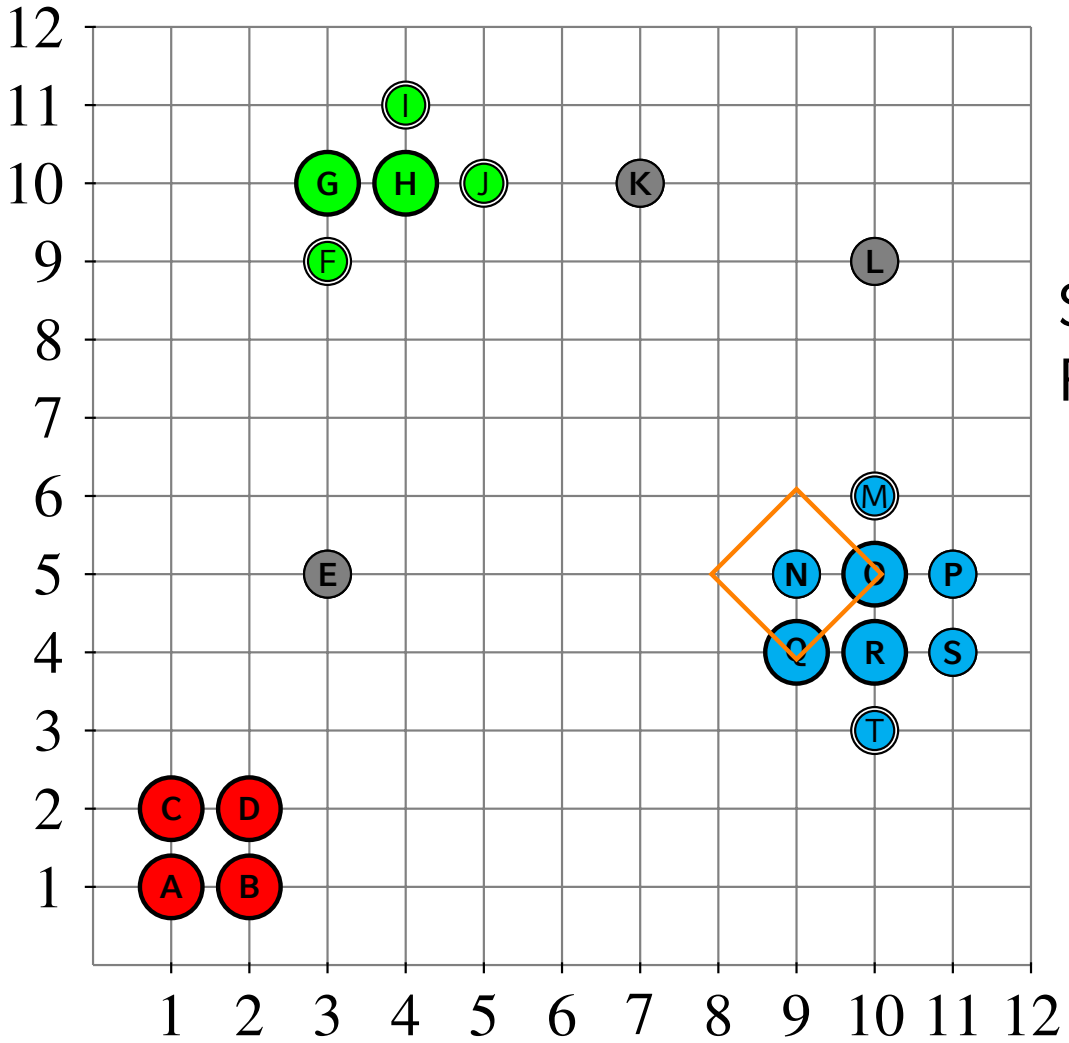
$minPts = 3$

Seed list: NPS

DBSCAN



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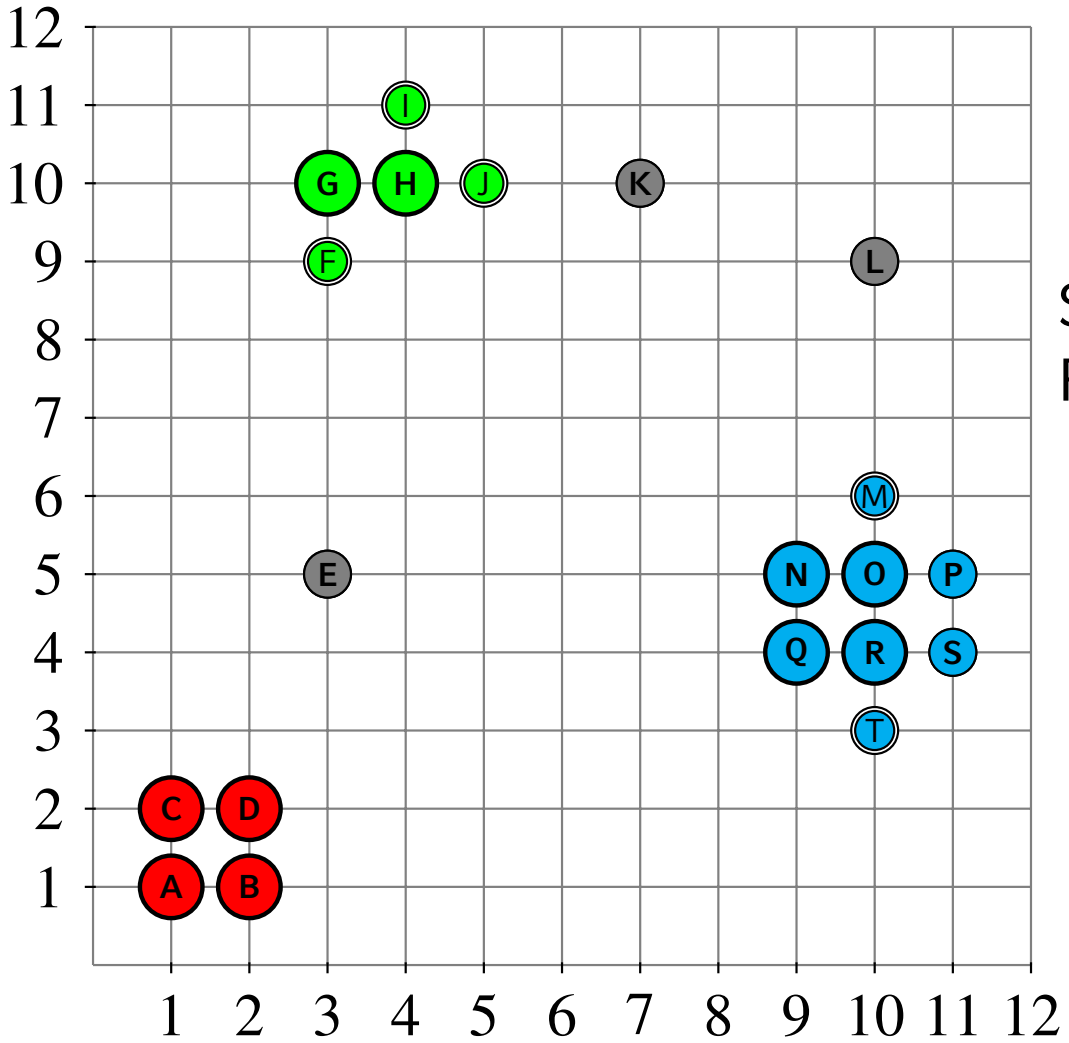
$minPts = 3$

Seed list:
PS

DBSCAN



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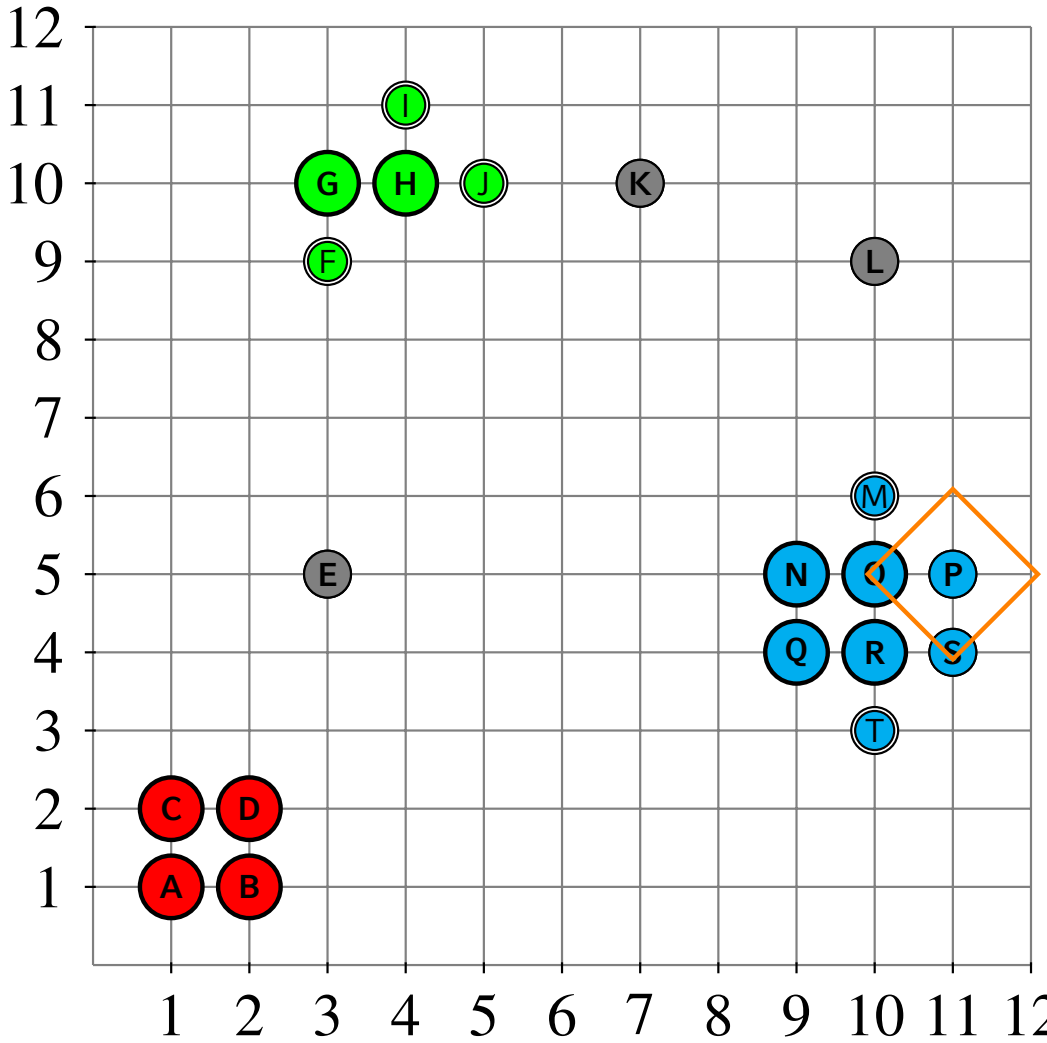
$minPts = 3$

Seed list:
PS

DBSCAN



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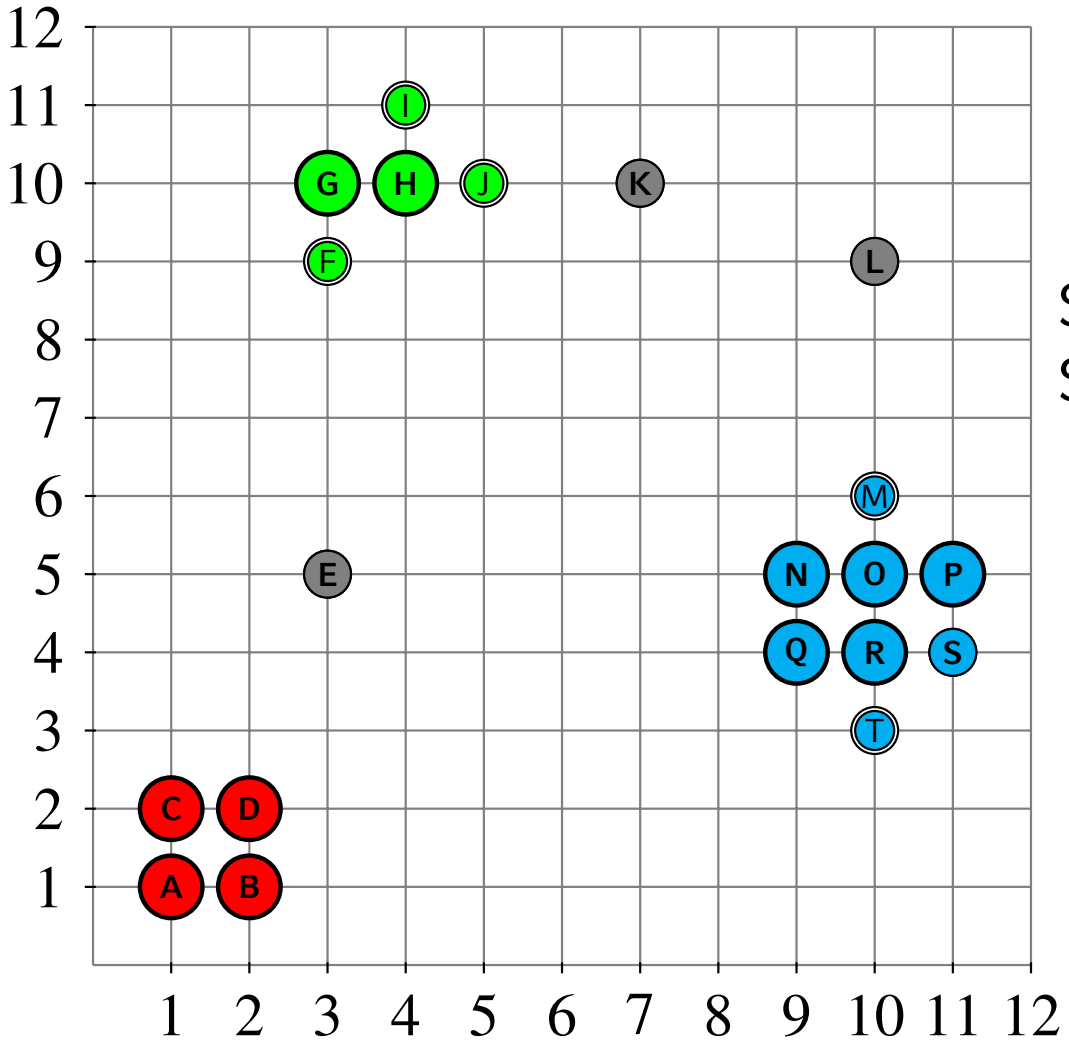
$minPts = 3$

Seed list:
S

DBSCAN



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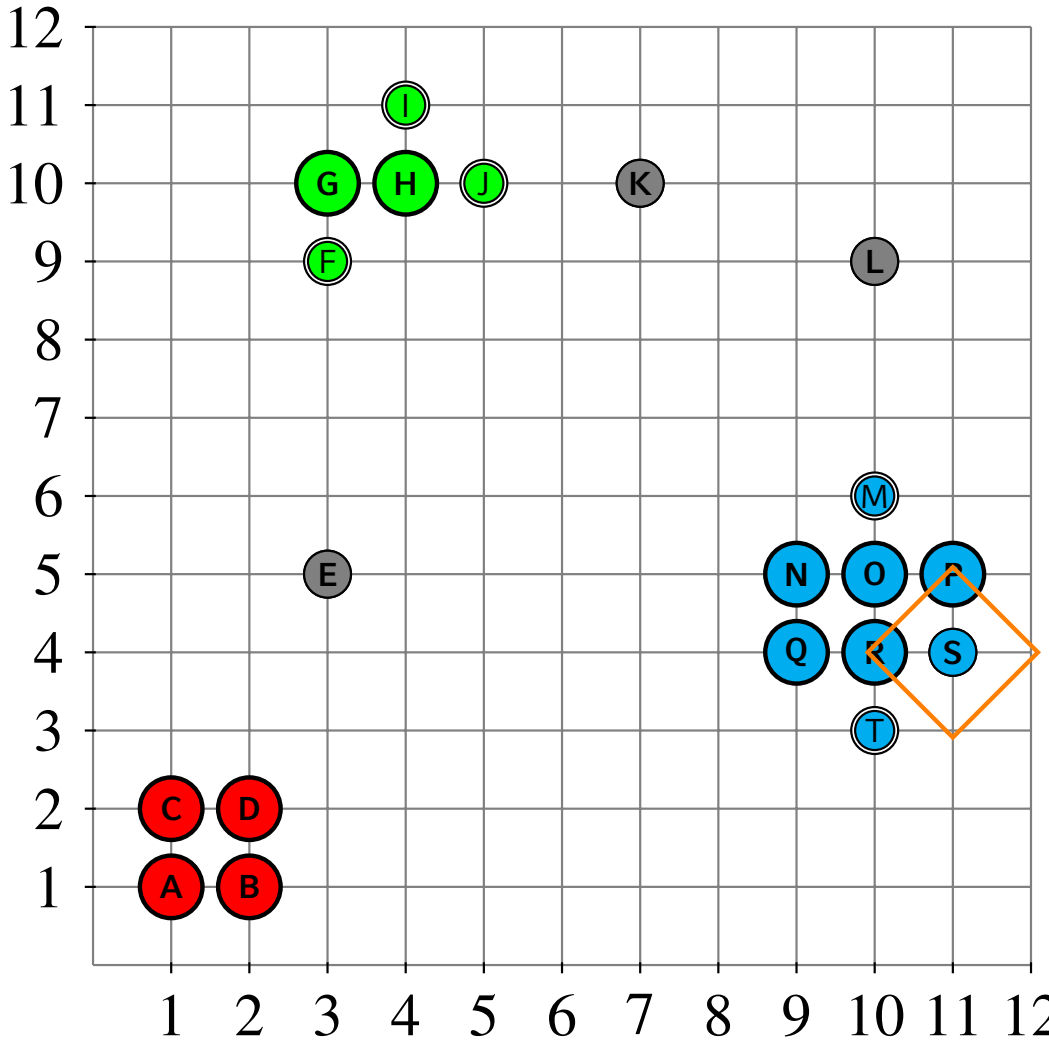
$minPts = 3$

Seed list:
S

DBSCAN



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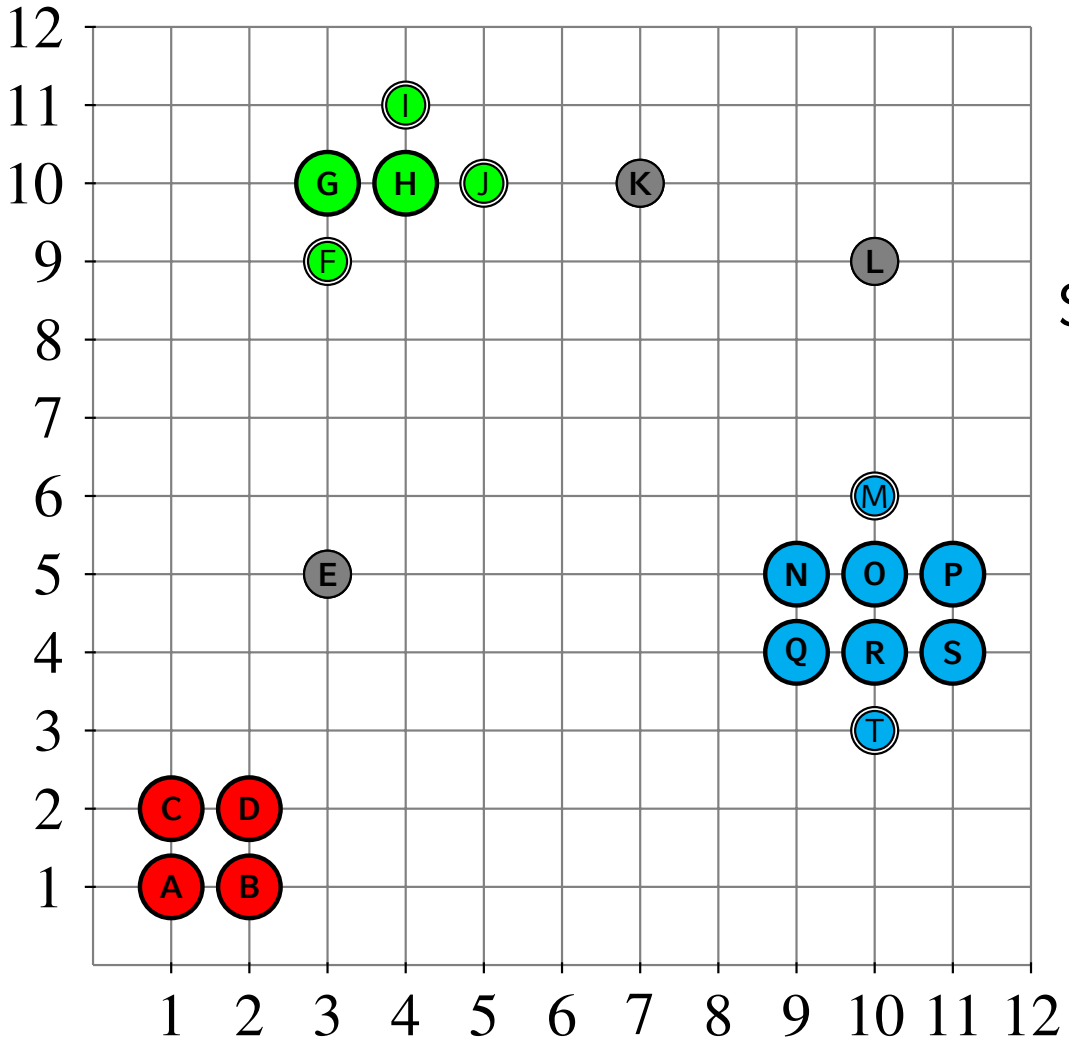
Seed list:

DBSCAN



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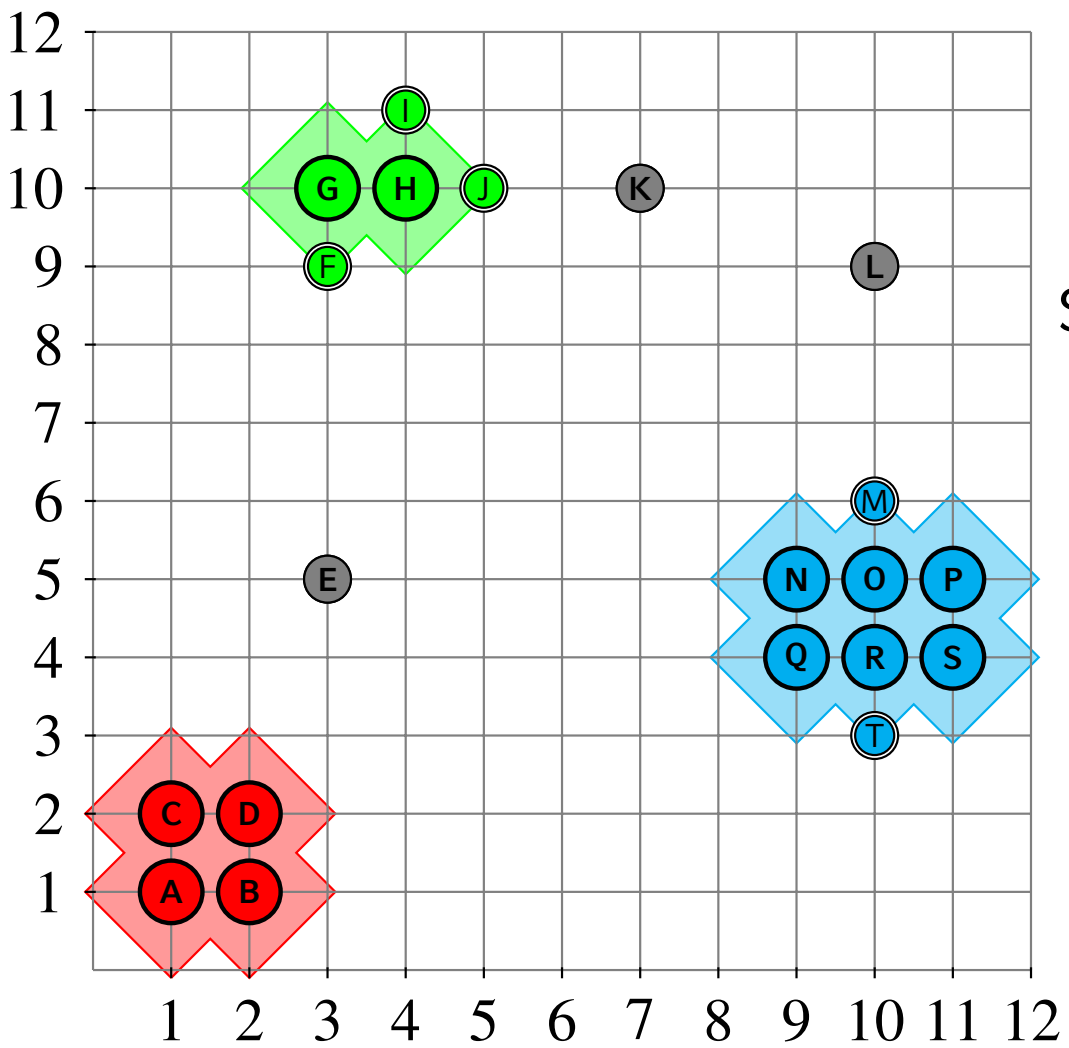
Seed list:

DBSCAN



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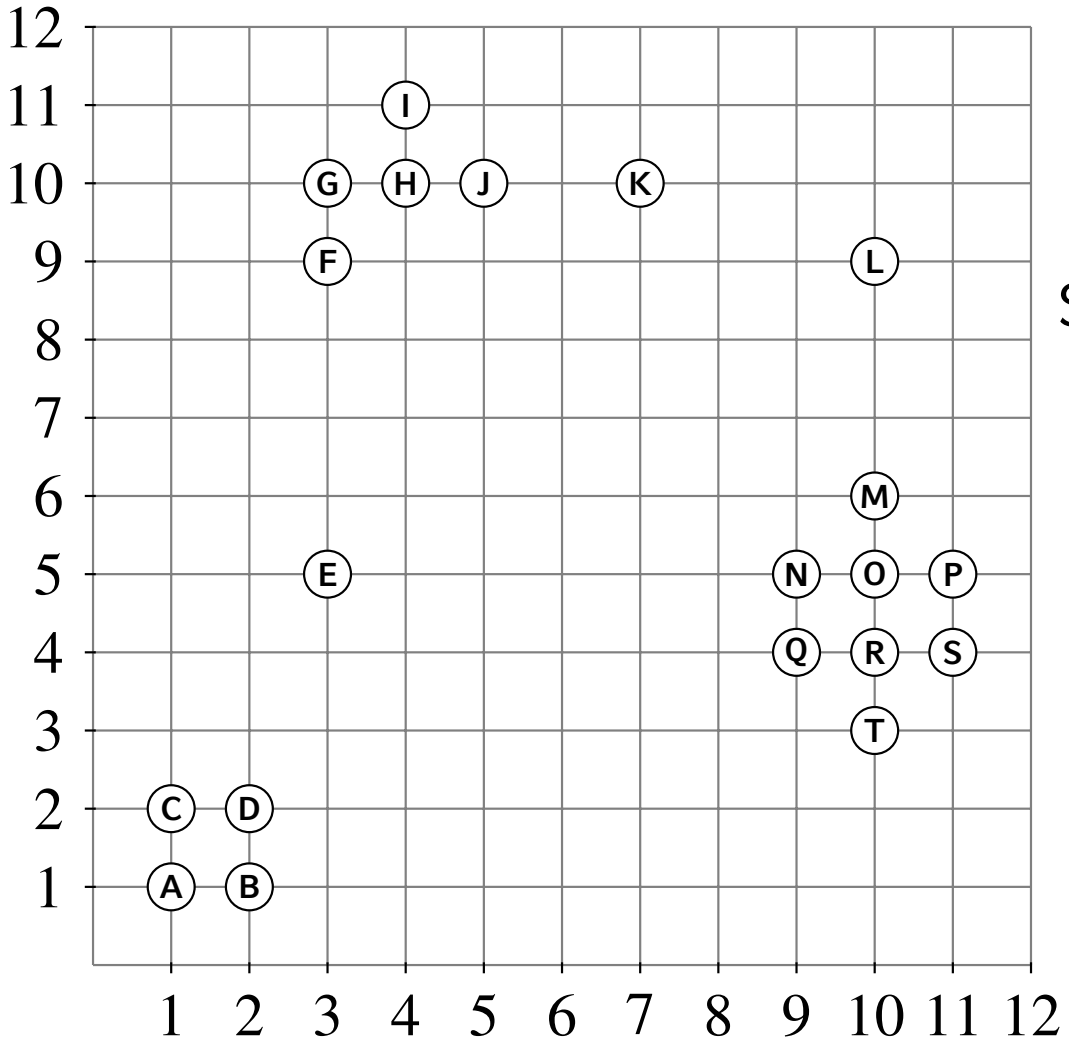
Seed list:

DBSCAN



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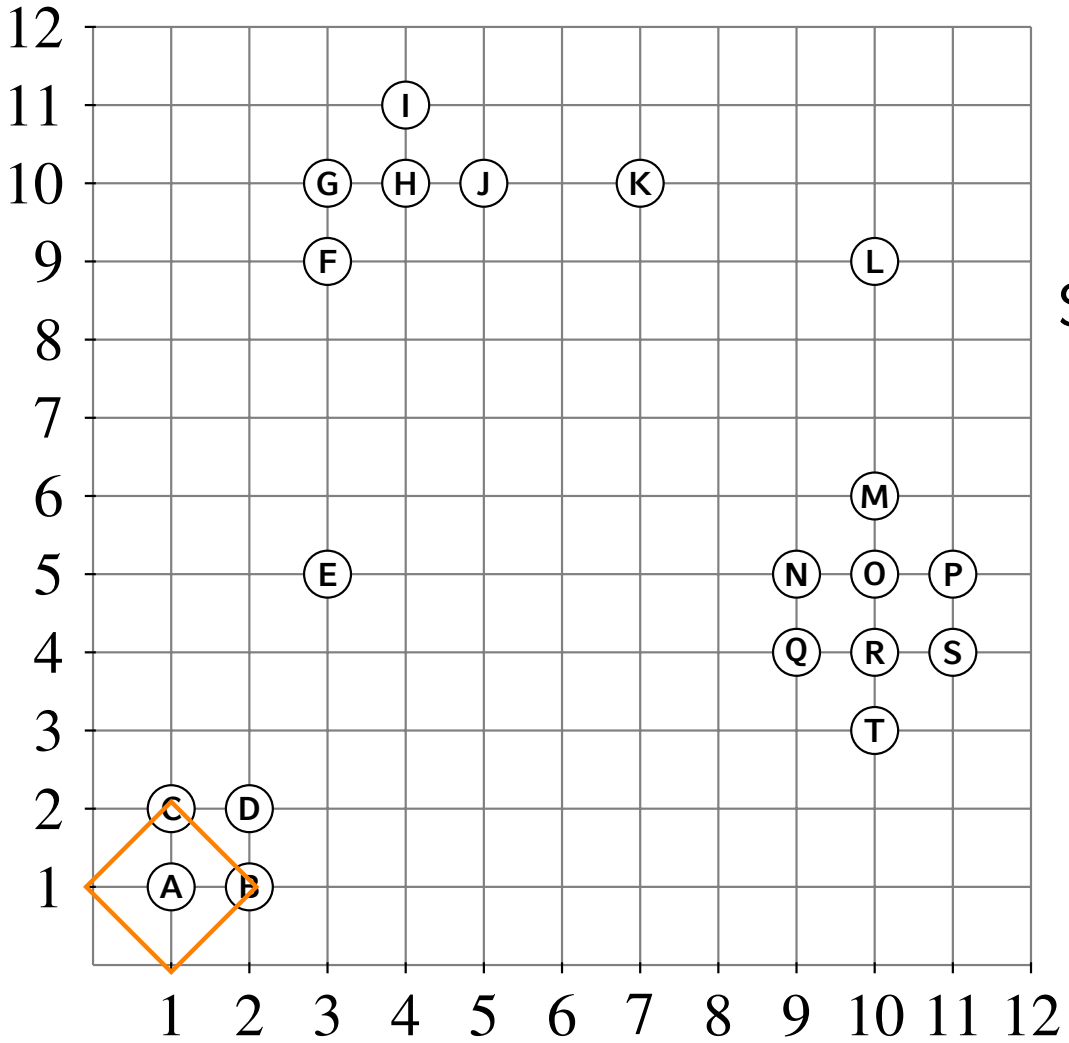
Seed list:

DBSCAN

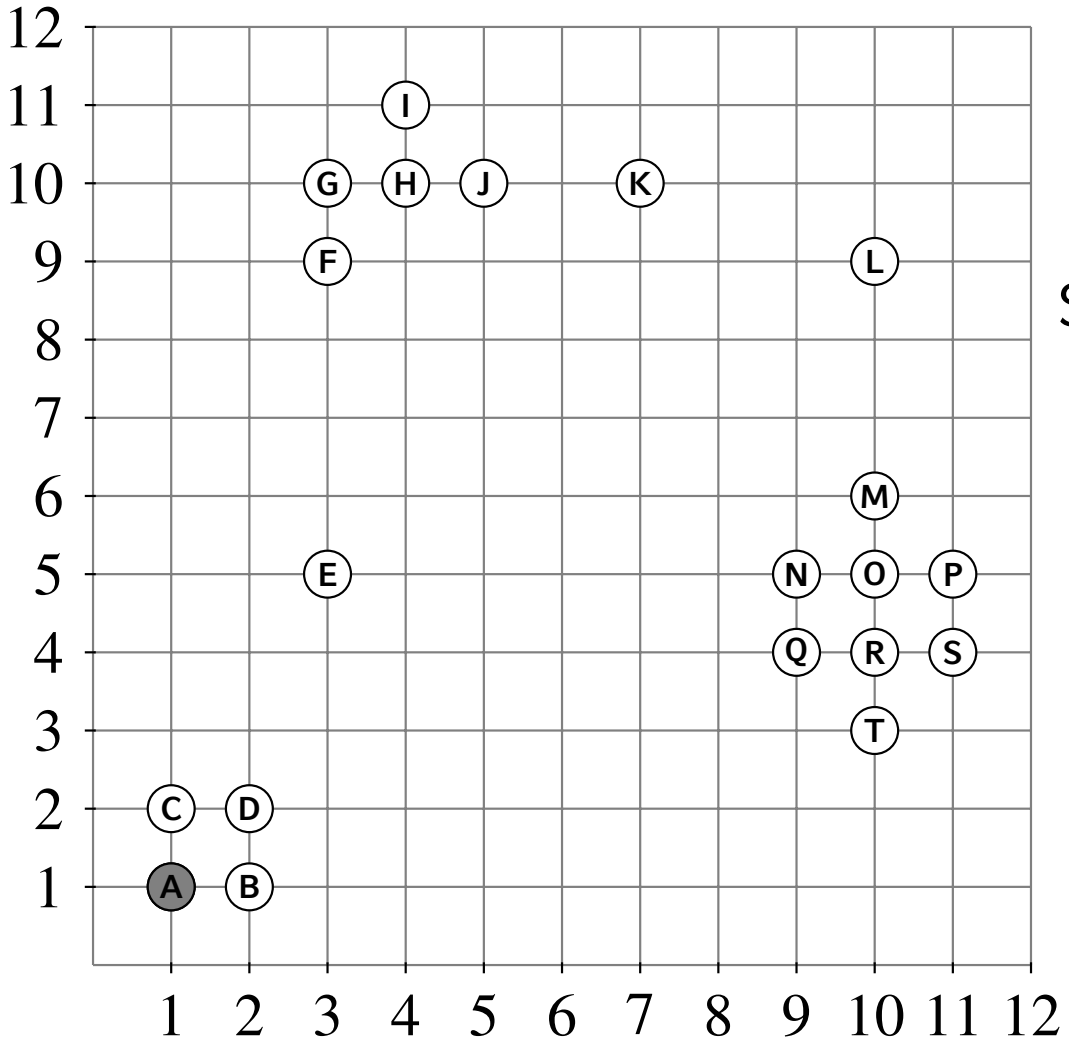


$\varepsilon = 1.1$

$minPts = 4$

Seed list:

DBSCAN



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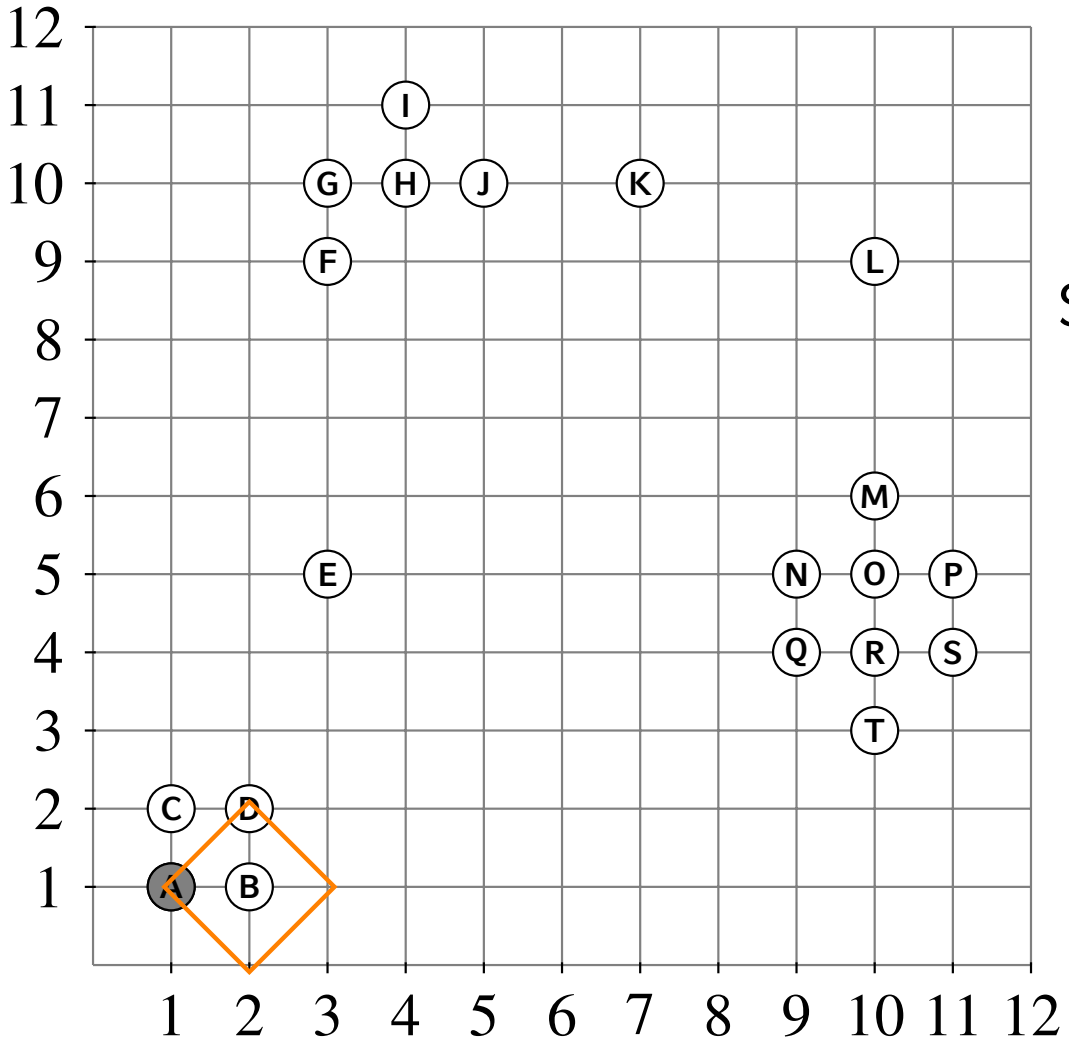

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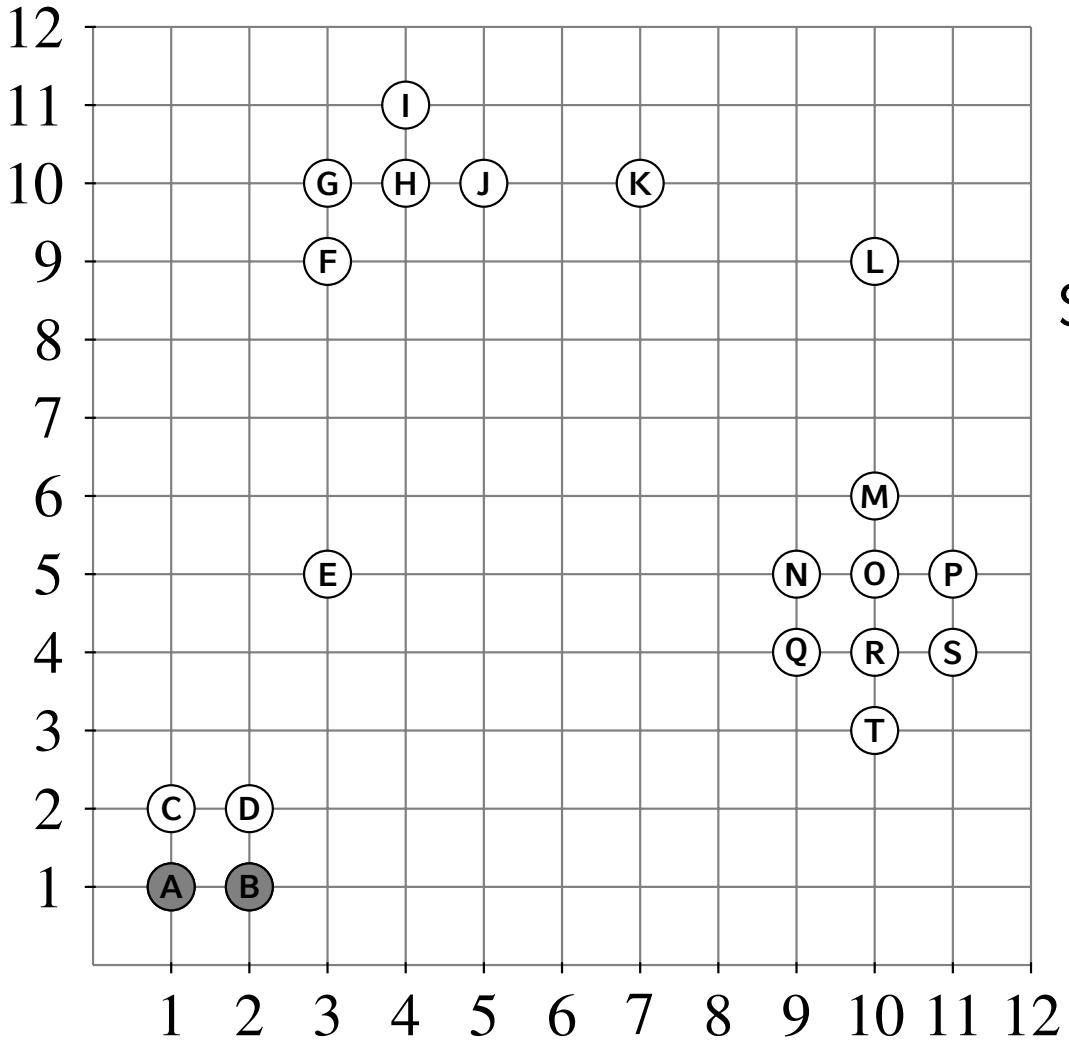

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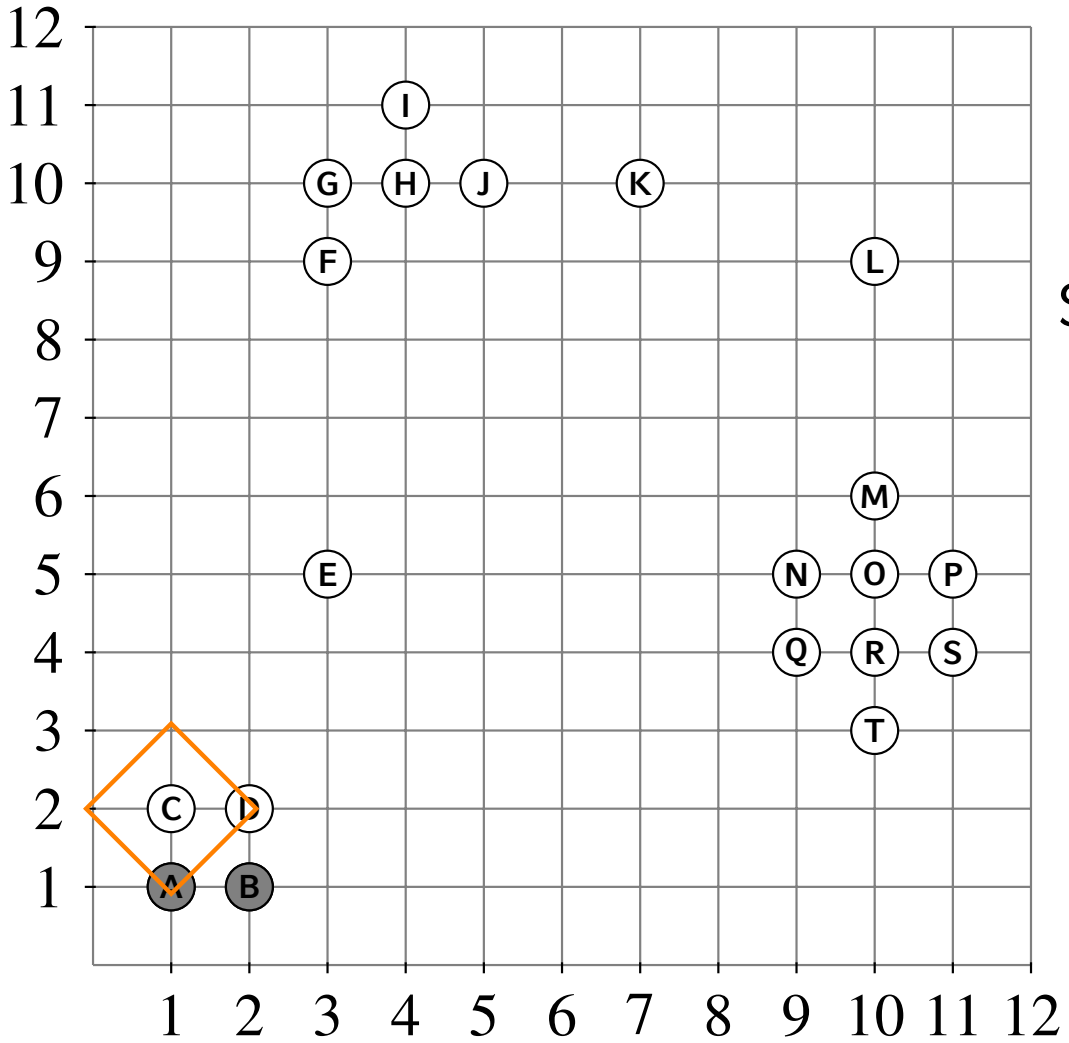

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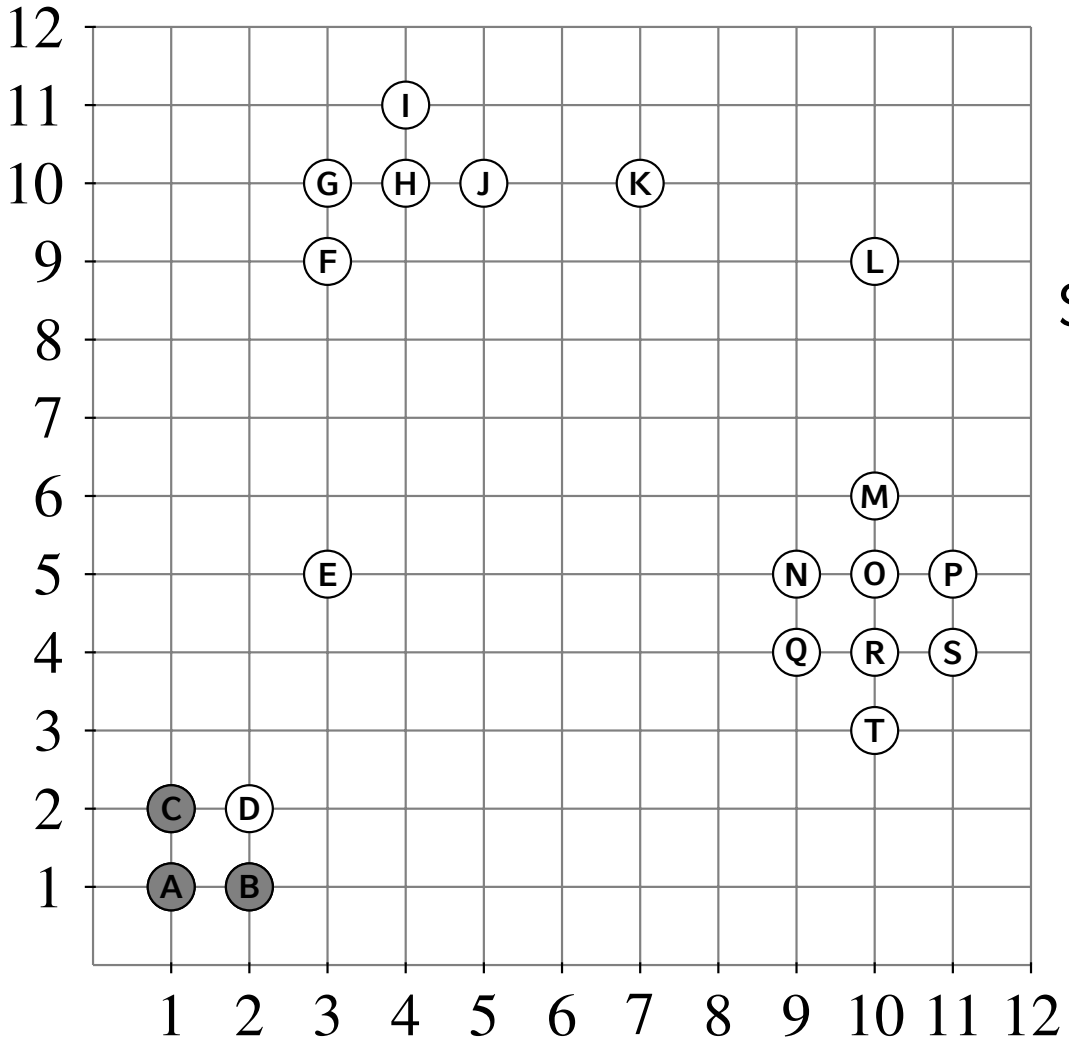

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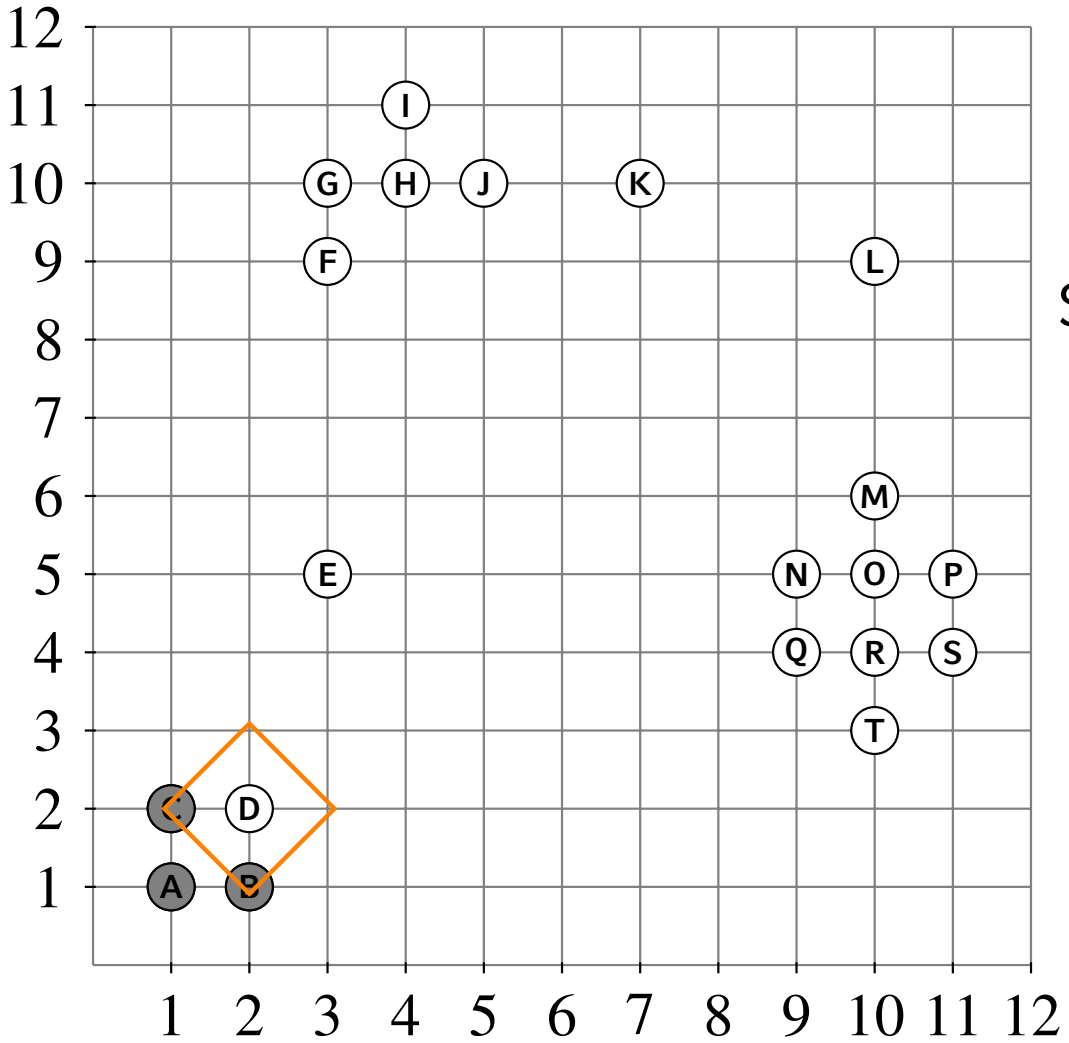

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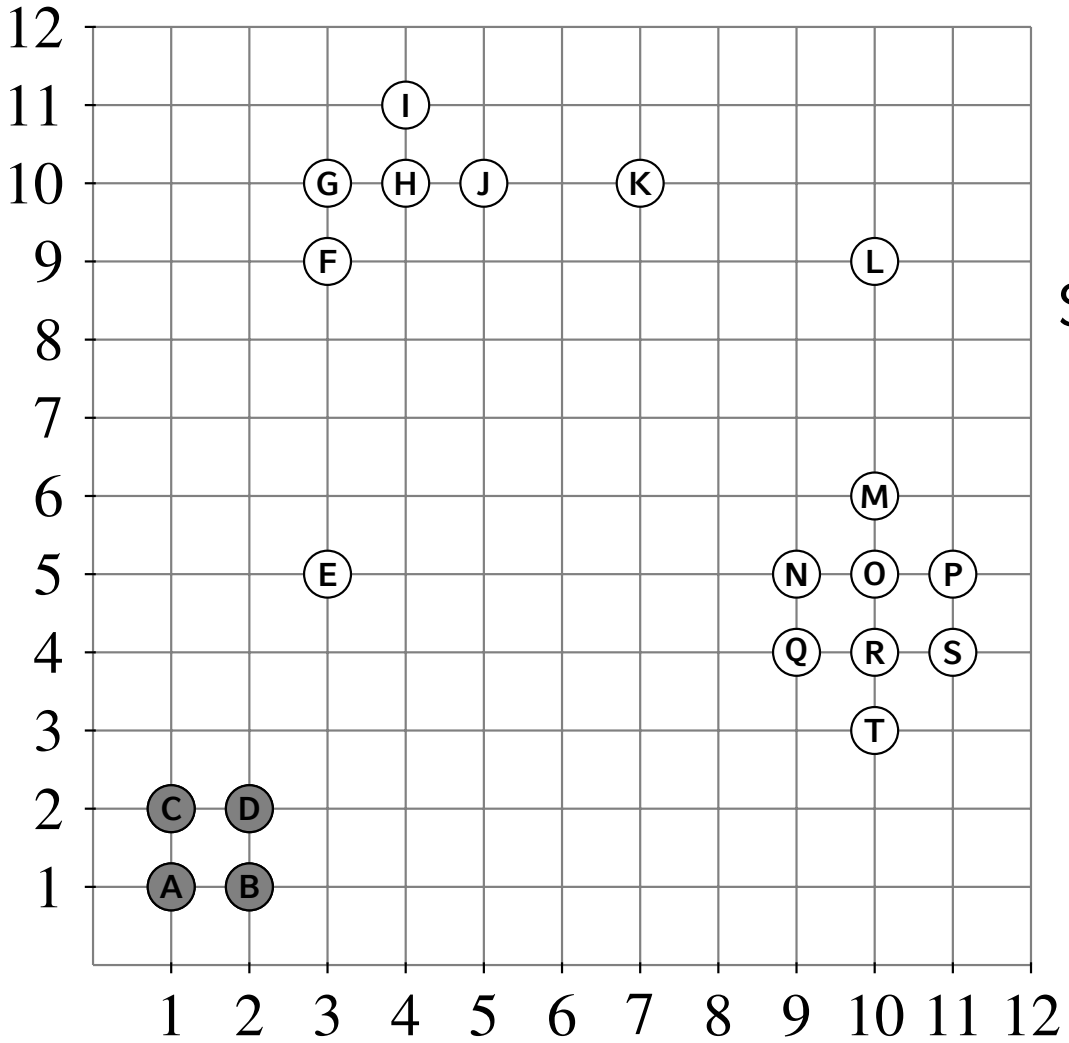

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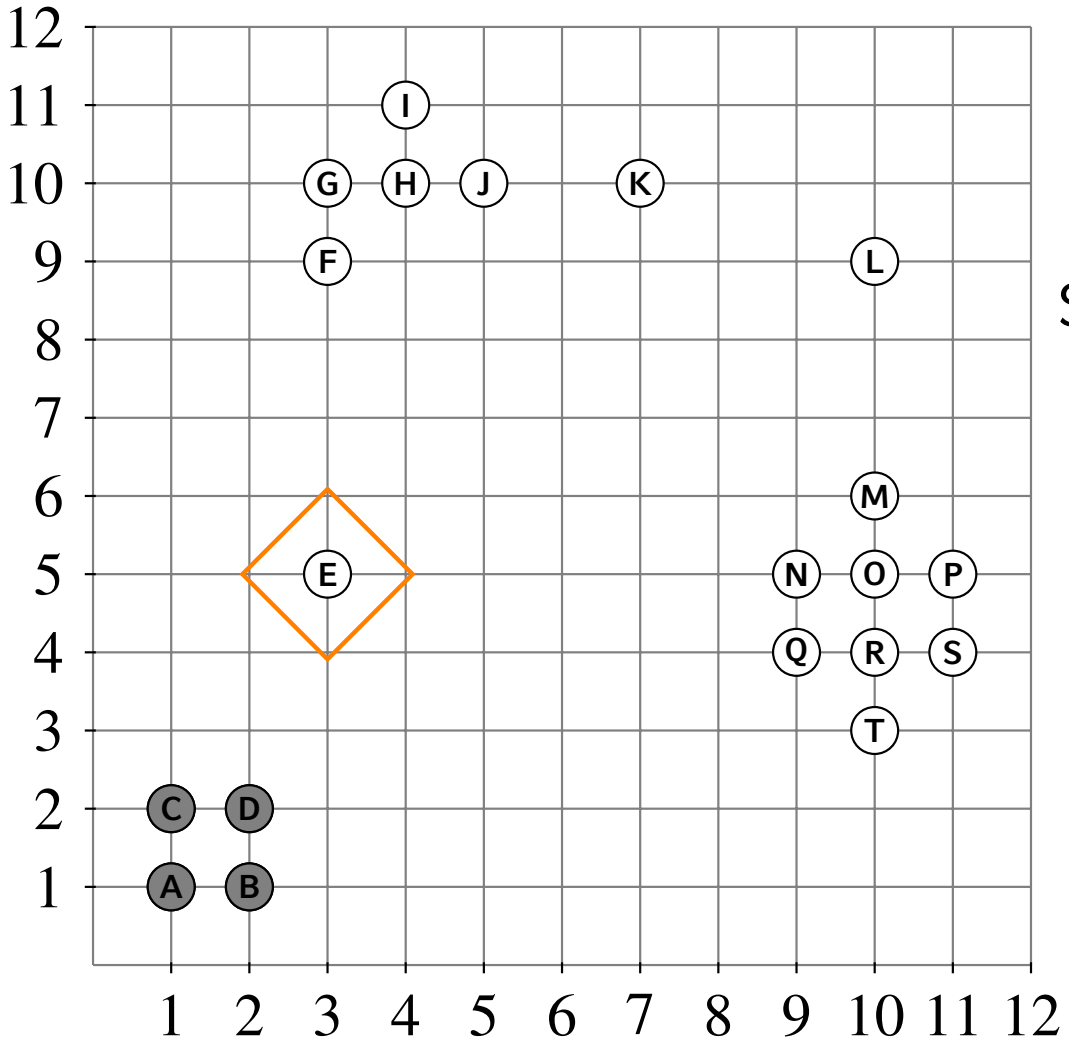

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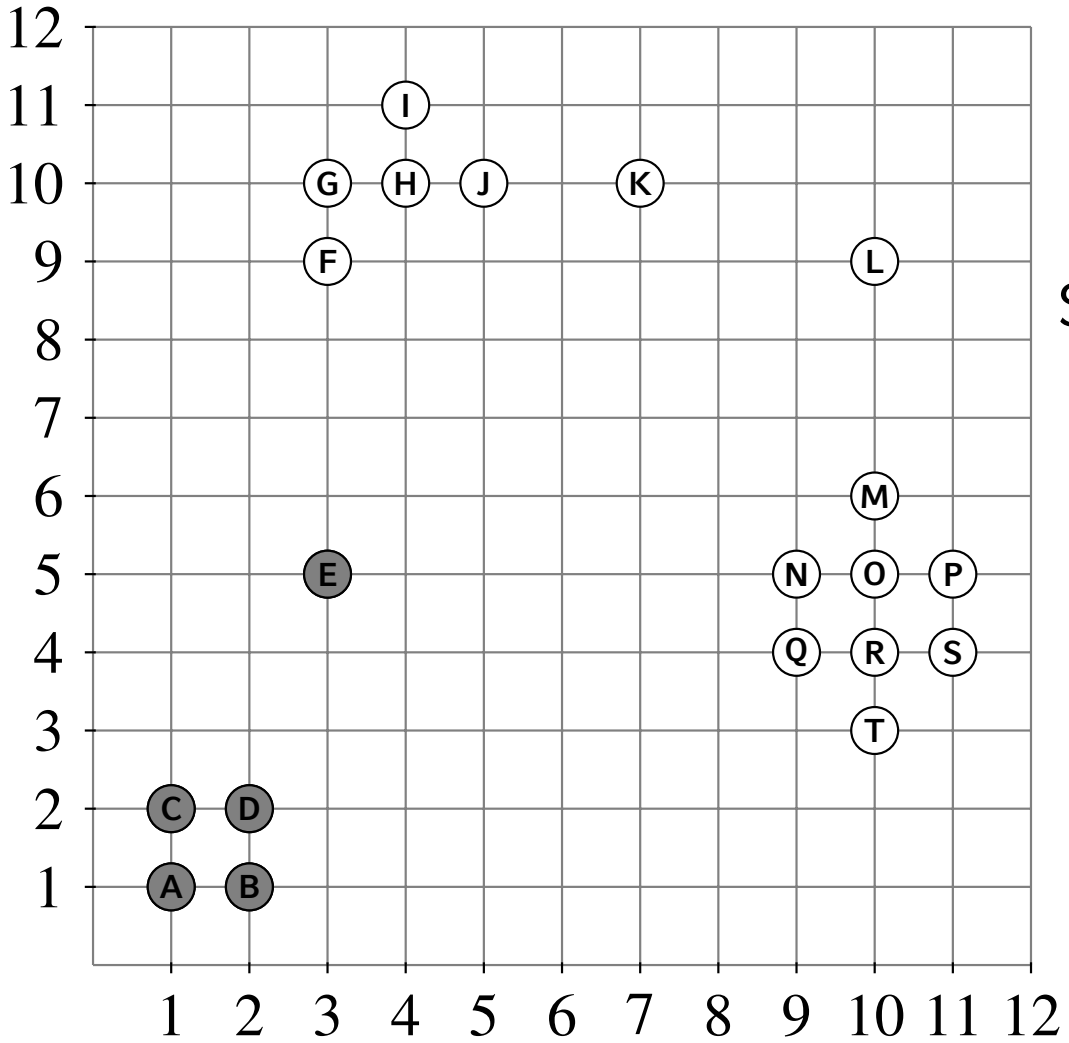

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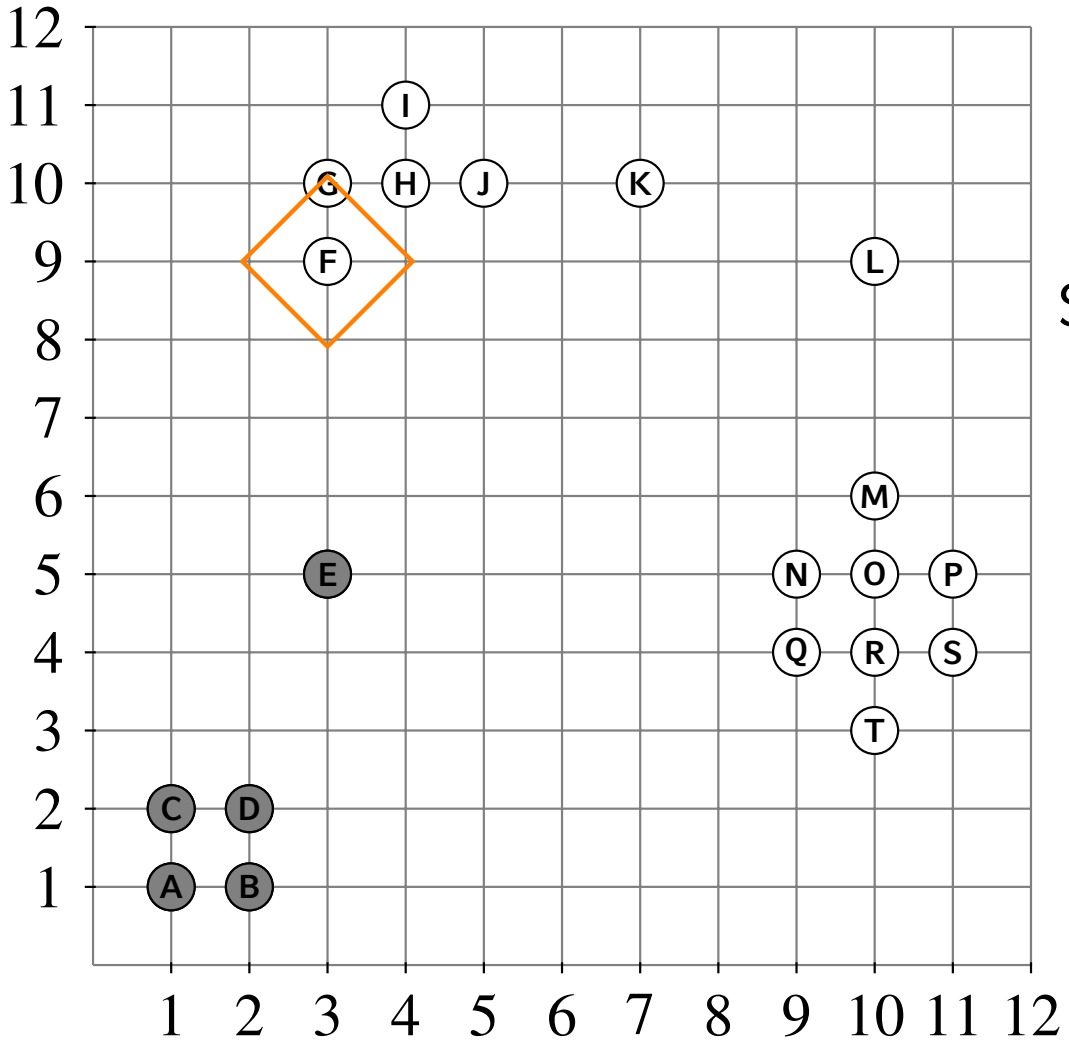

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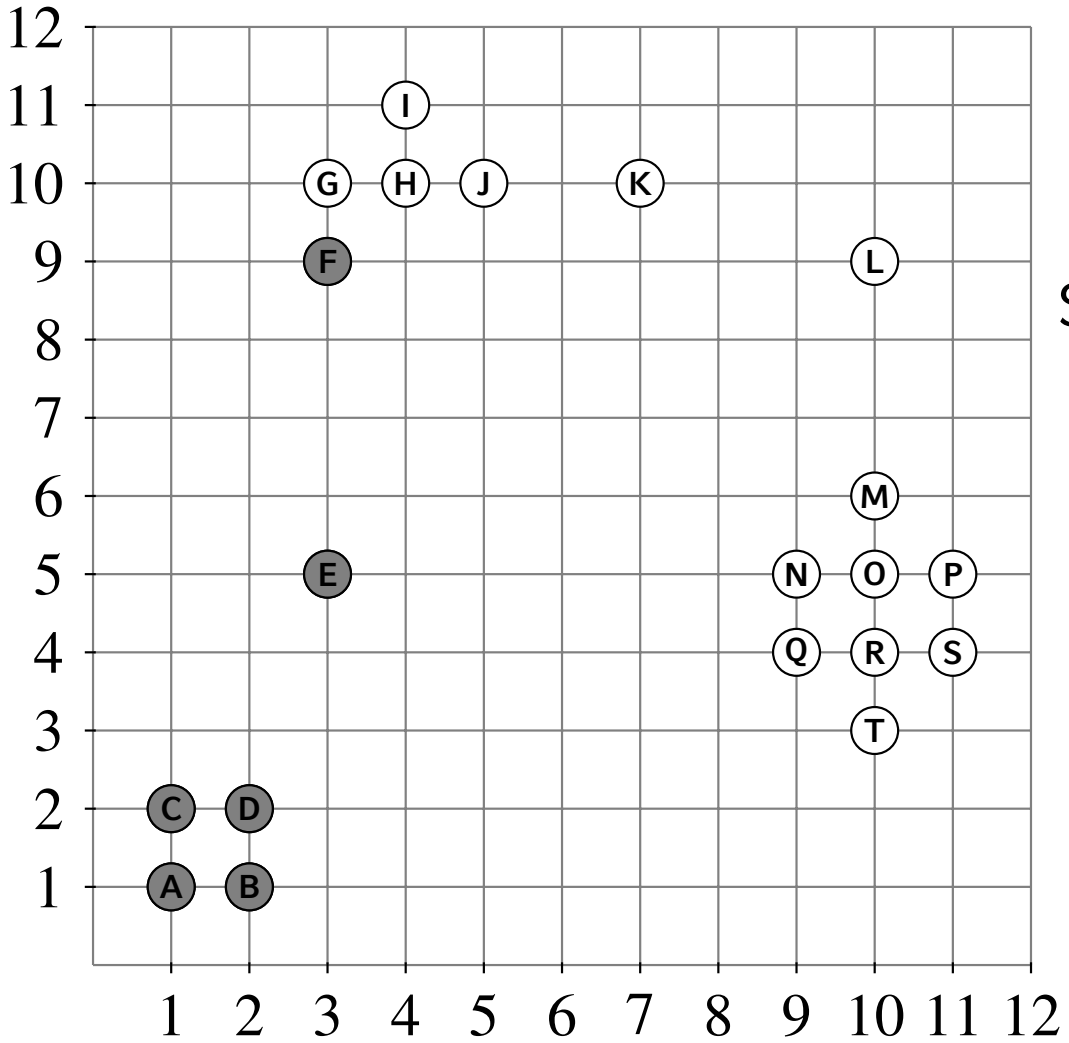

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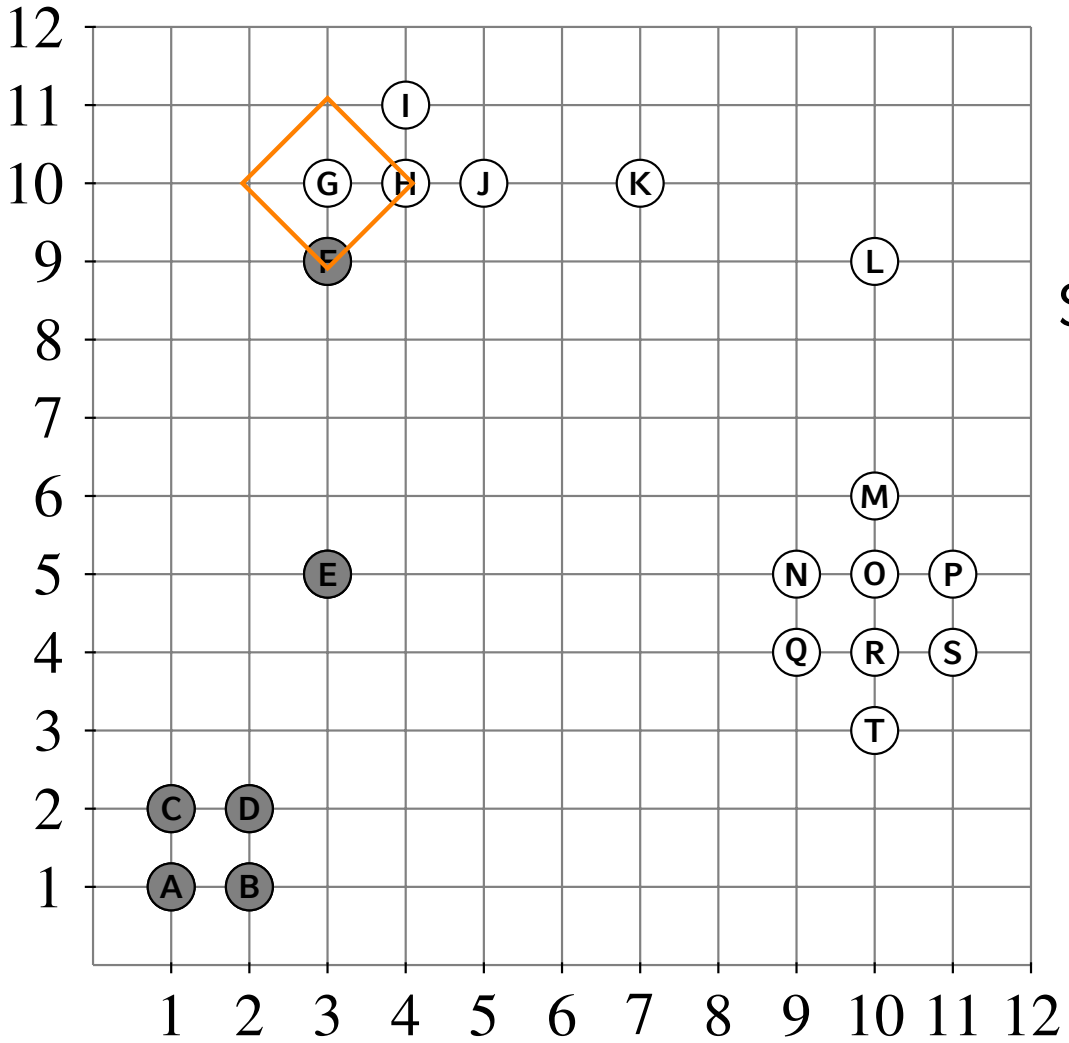

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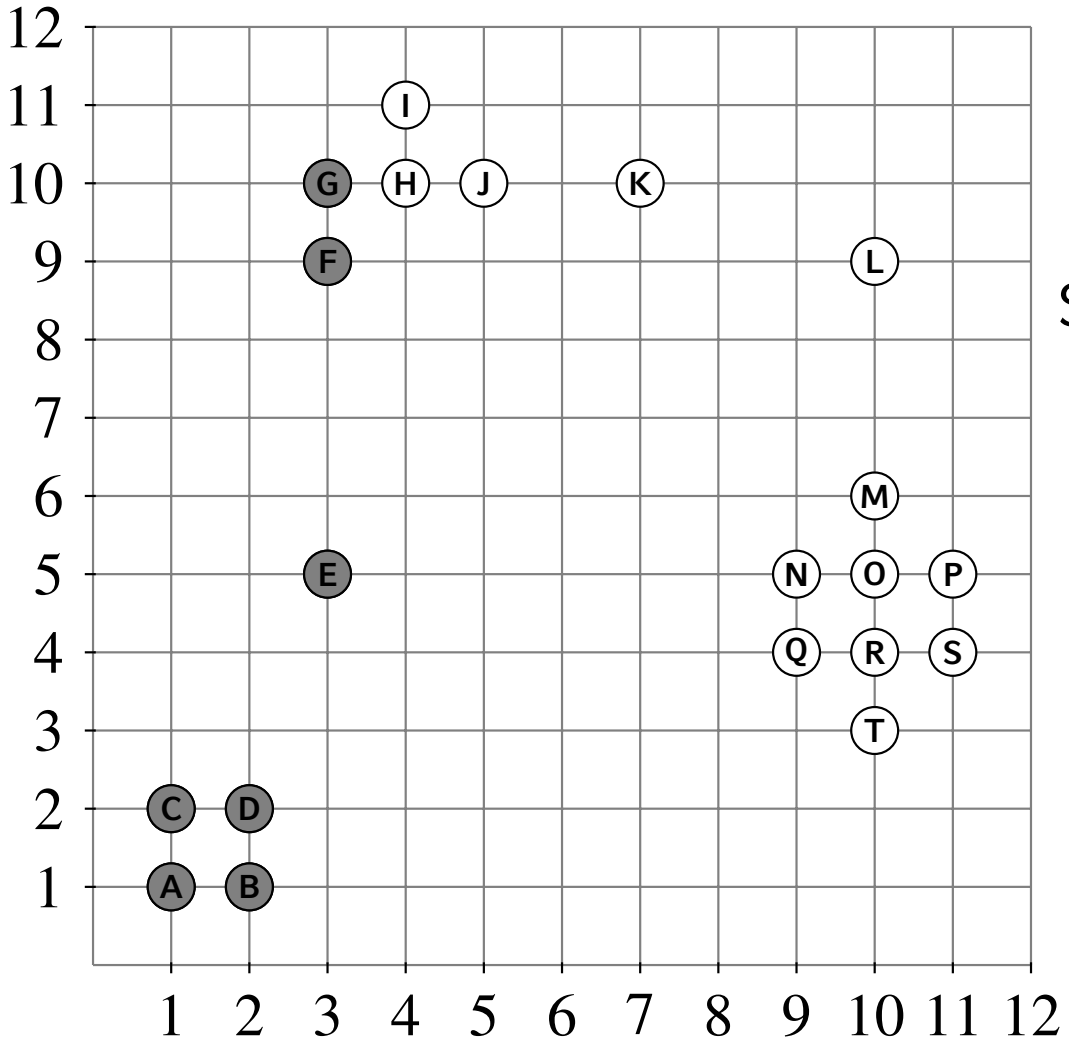

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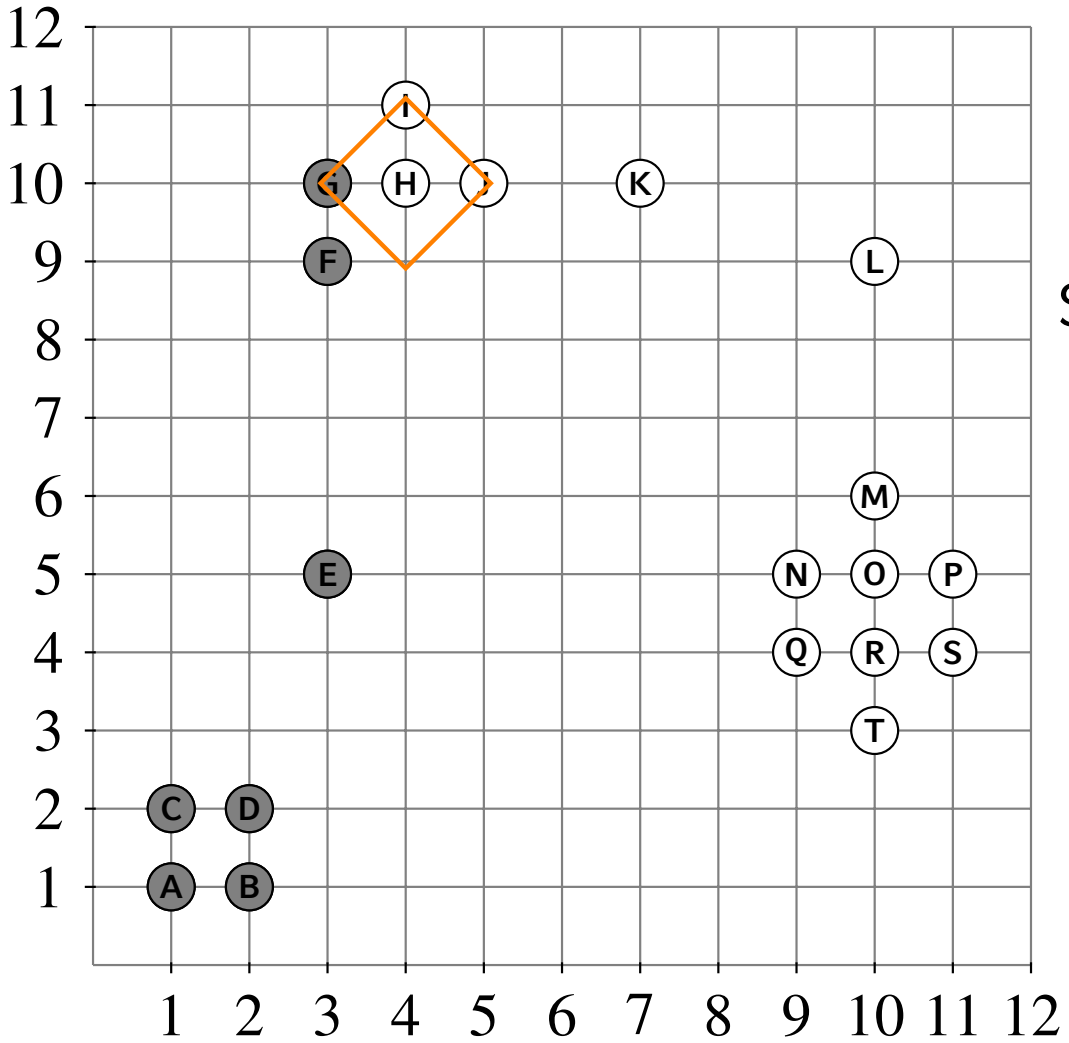

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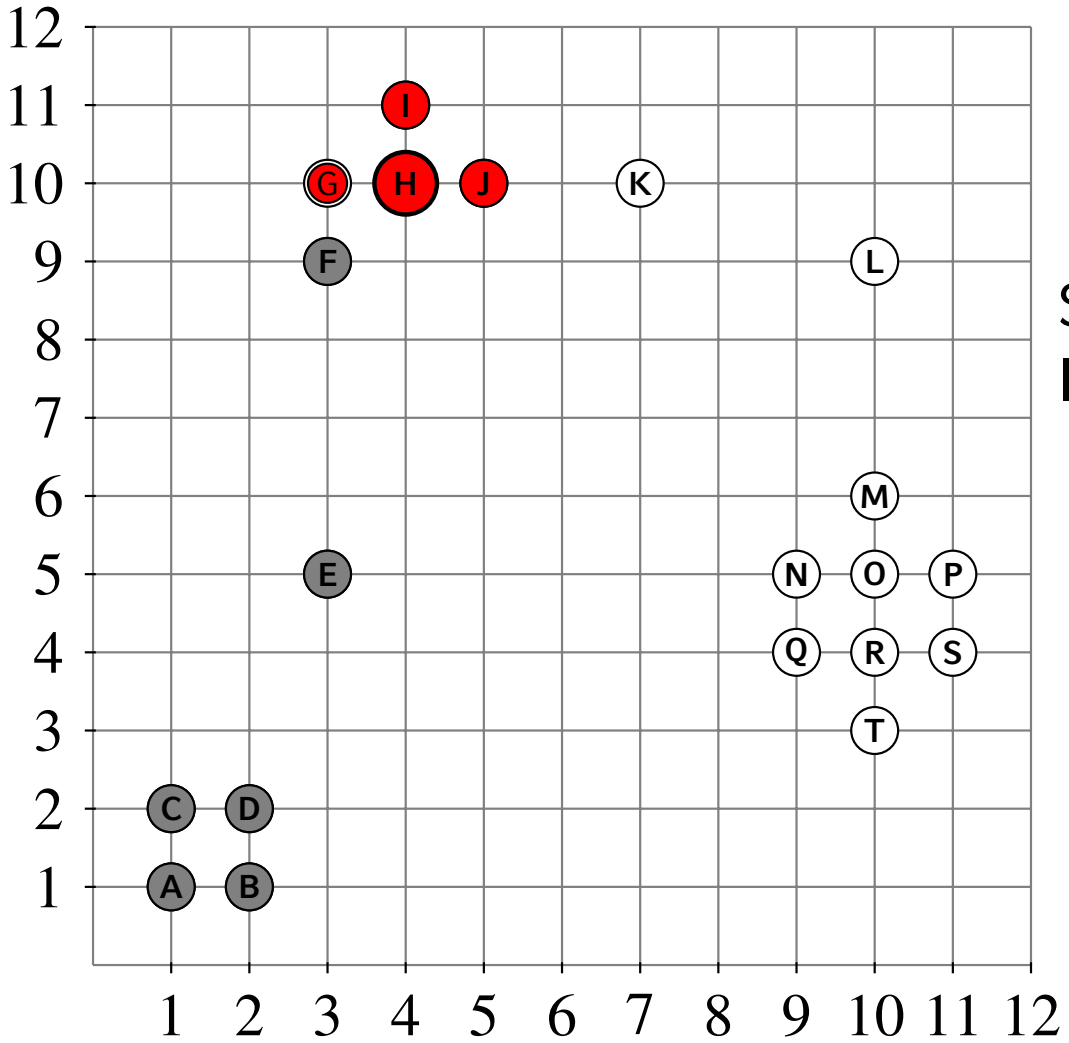

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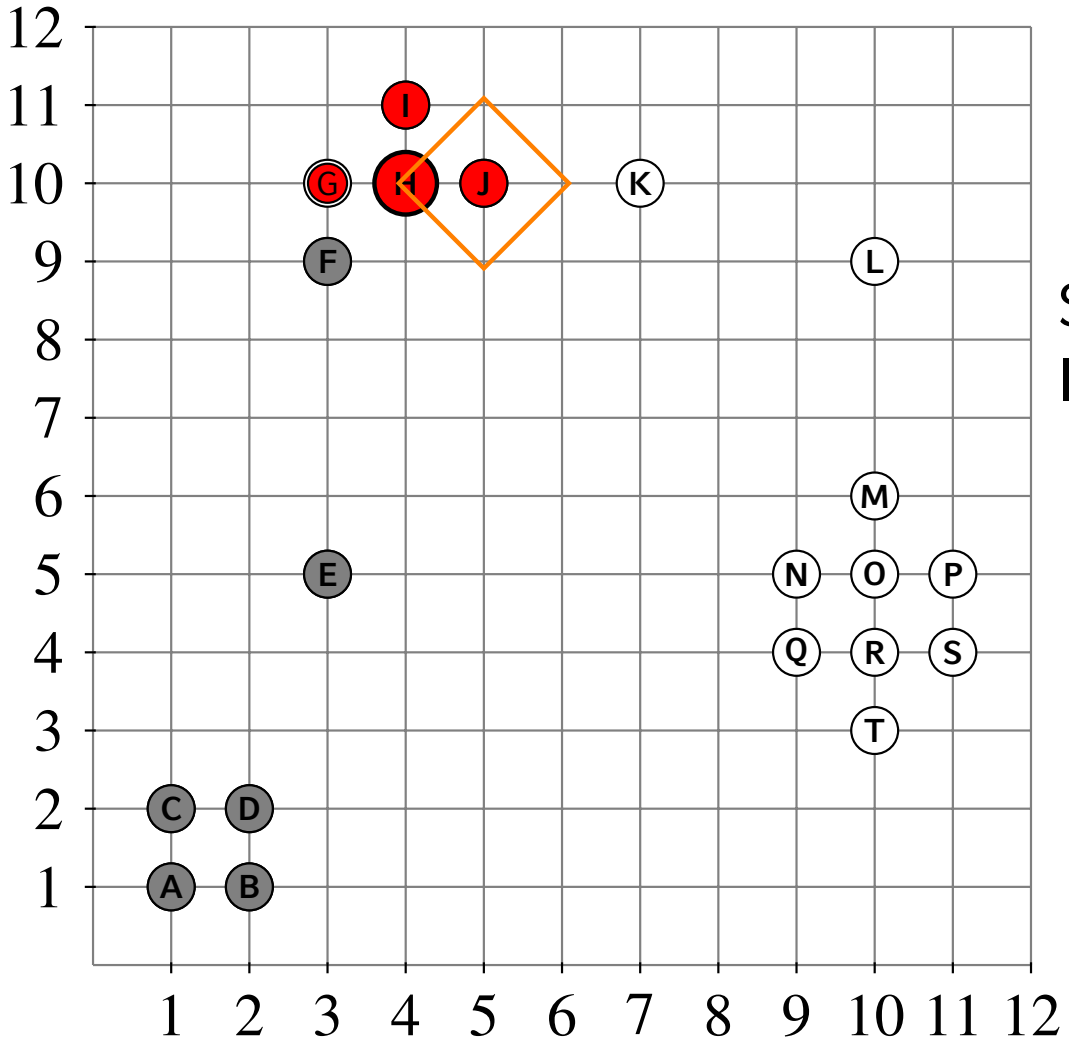

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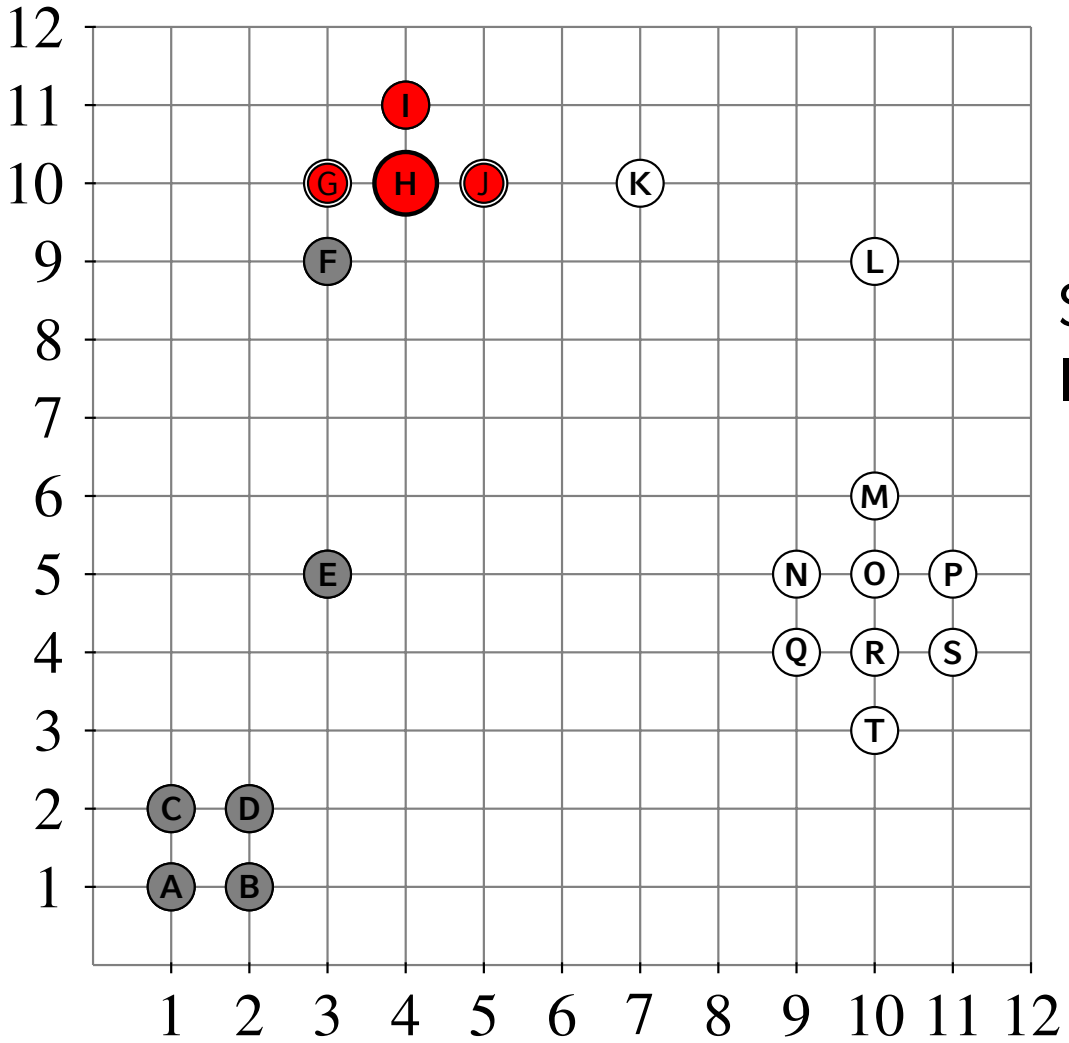

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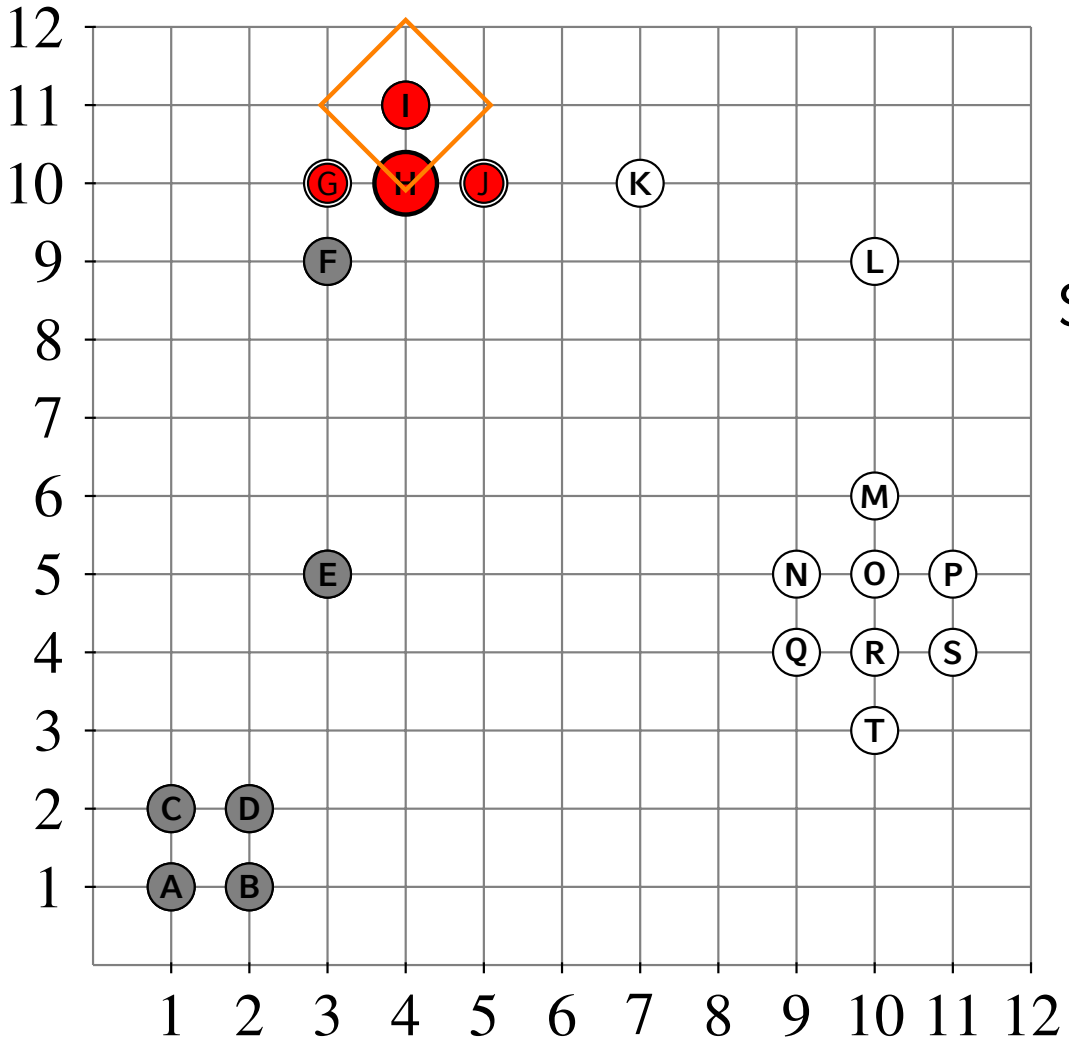

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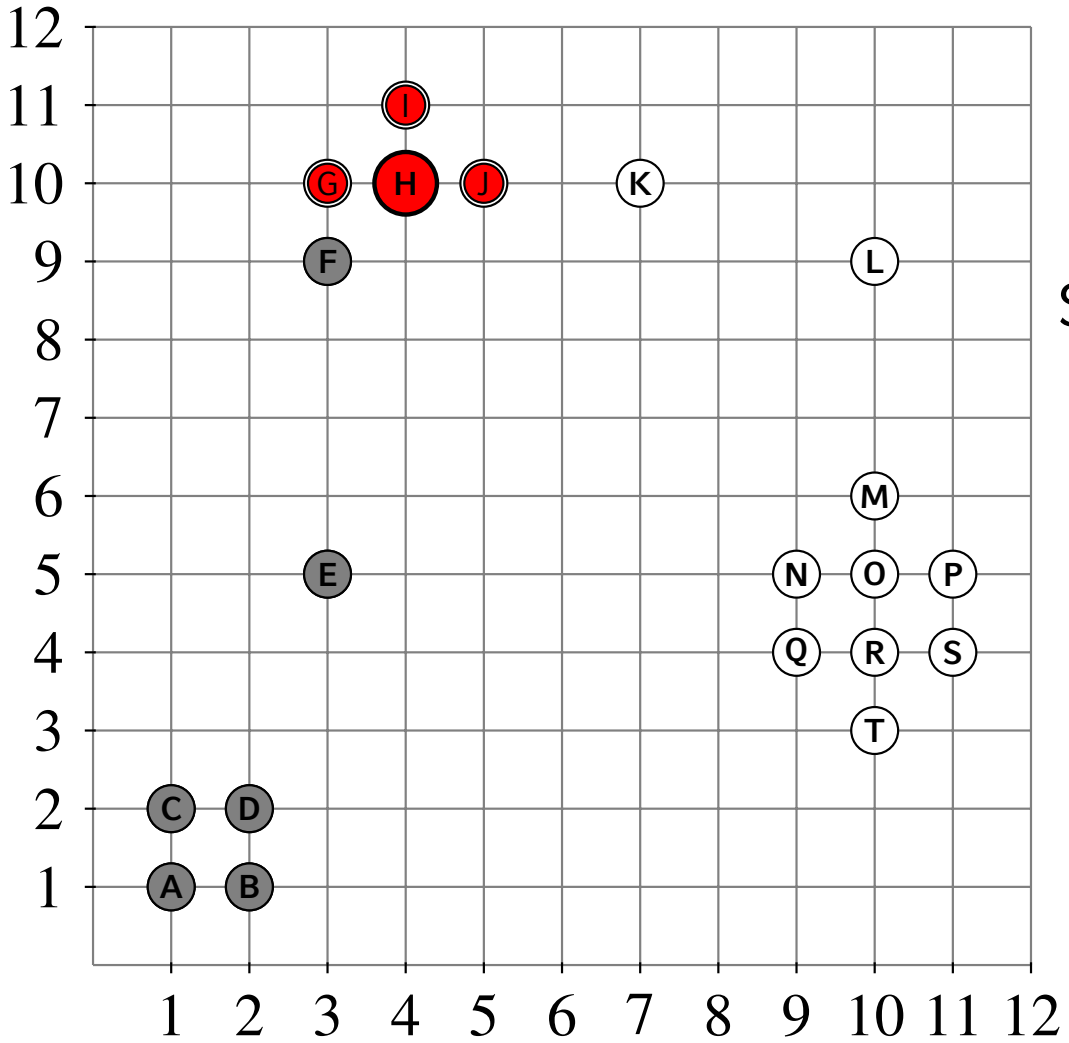

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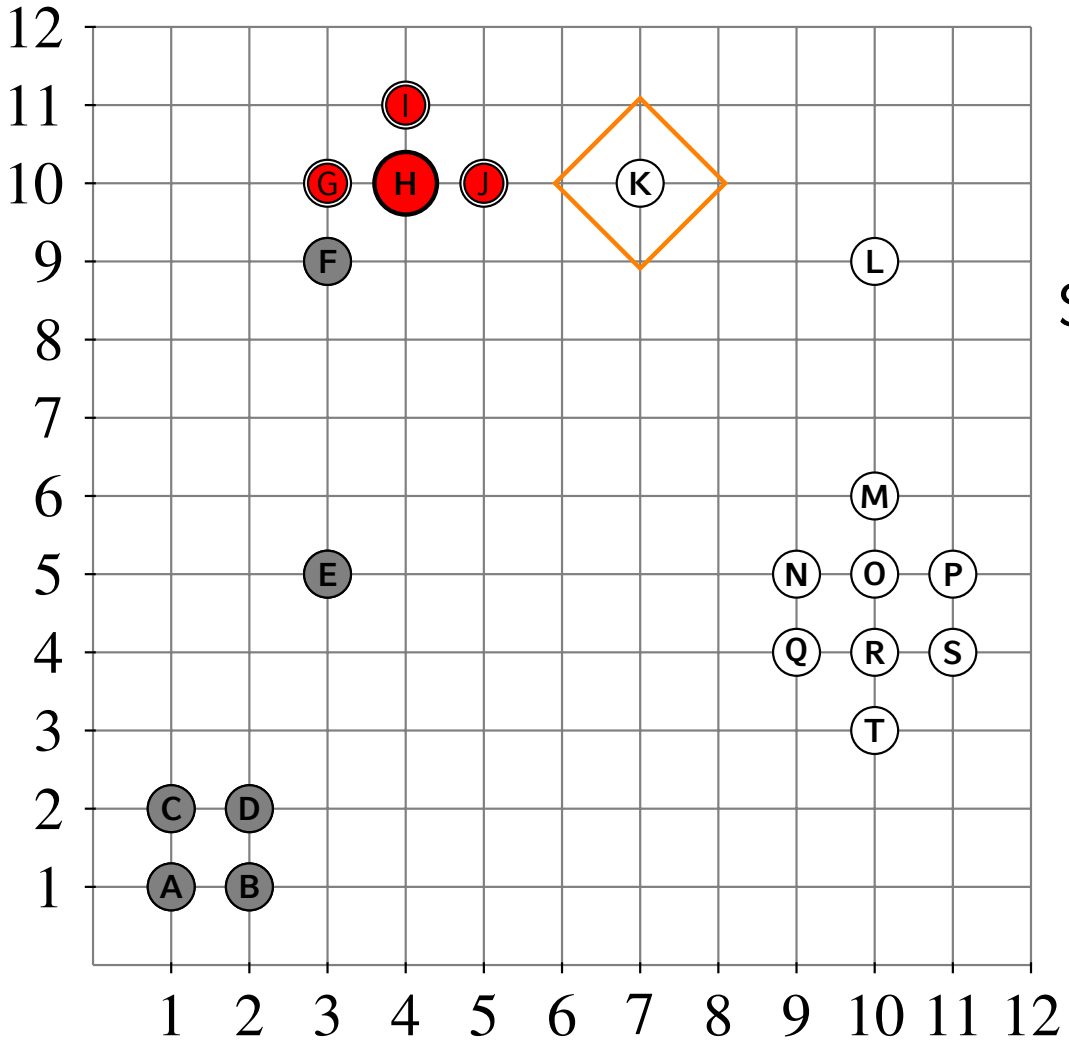

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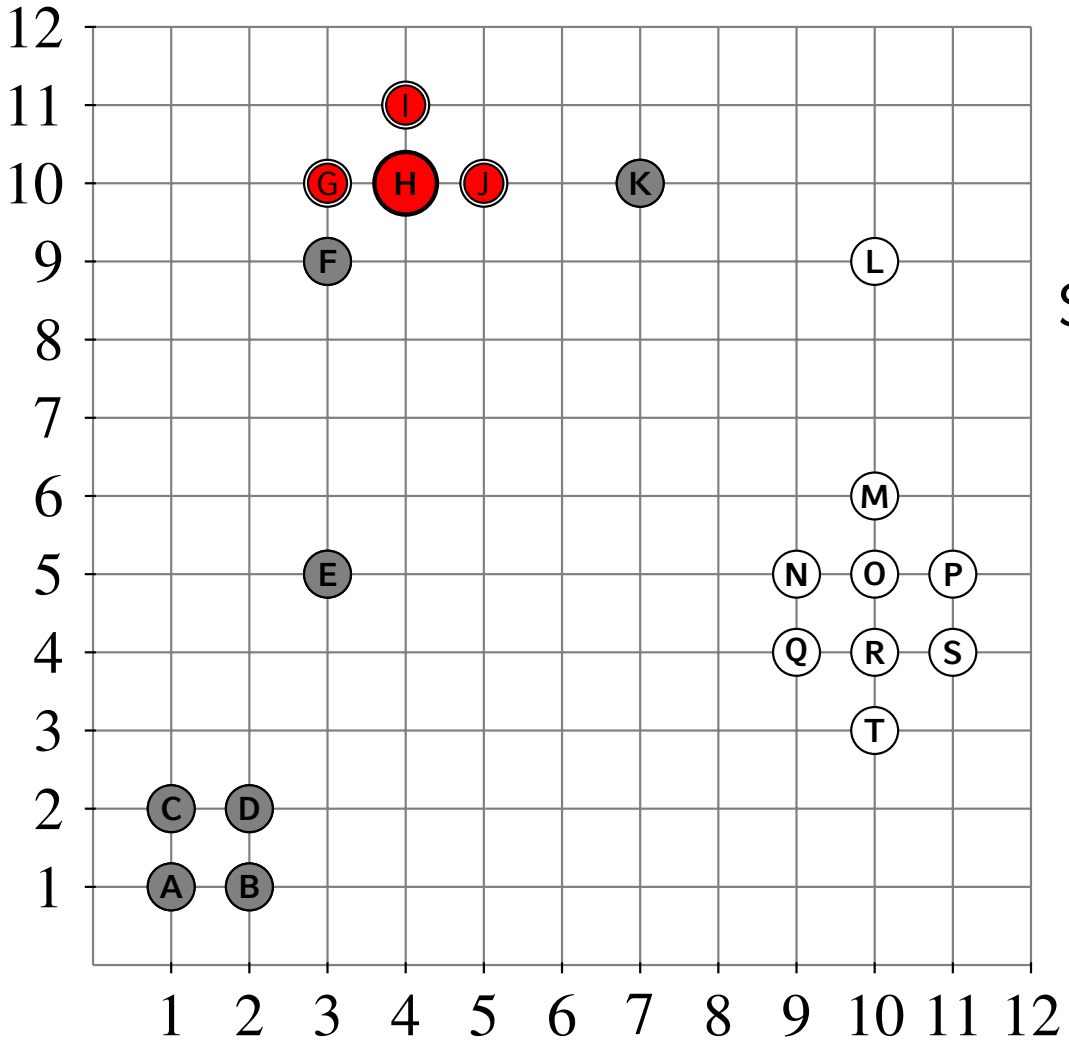

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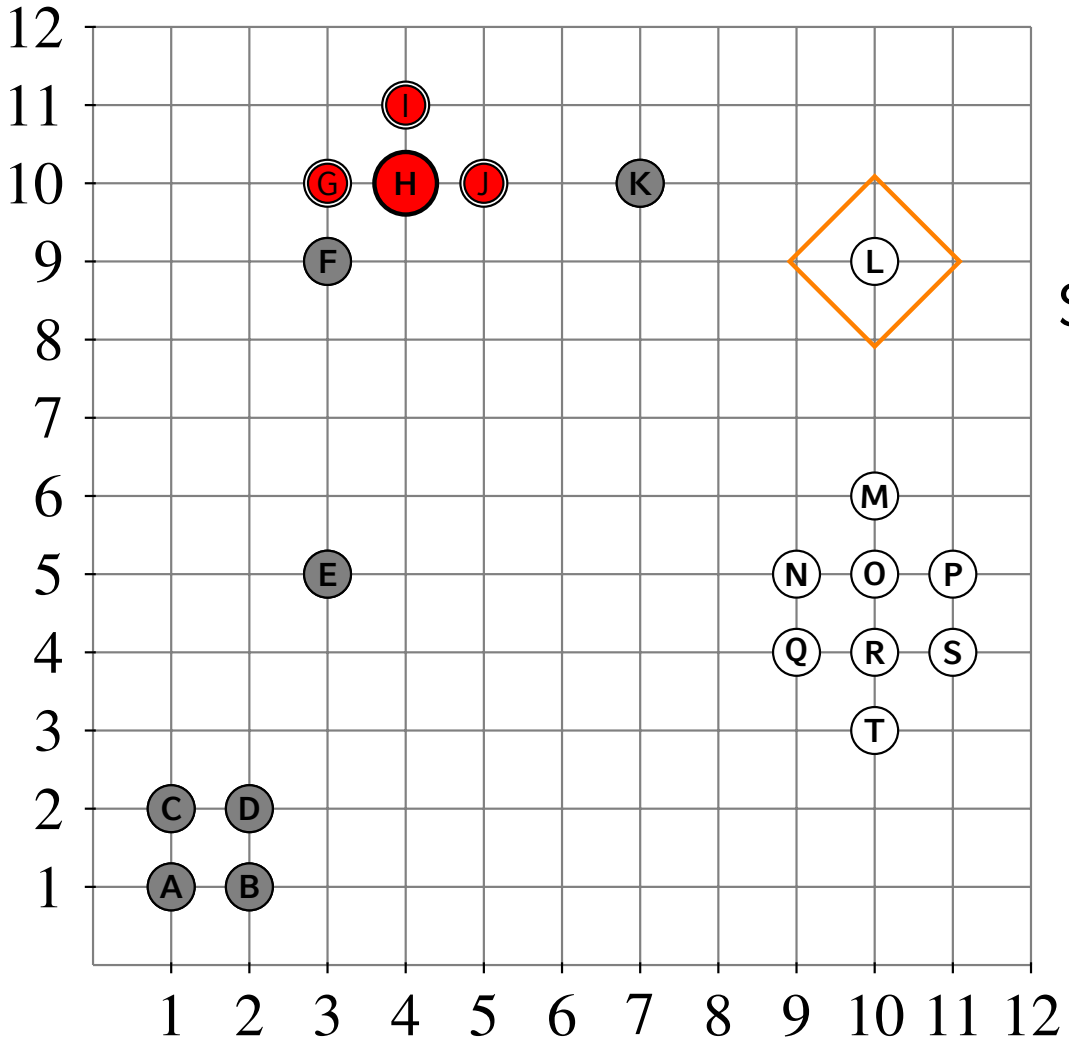

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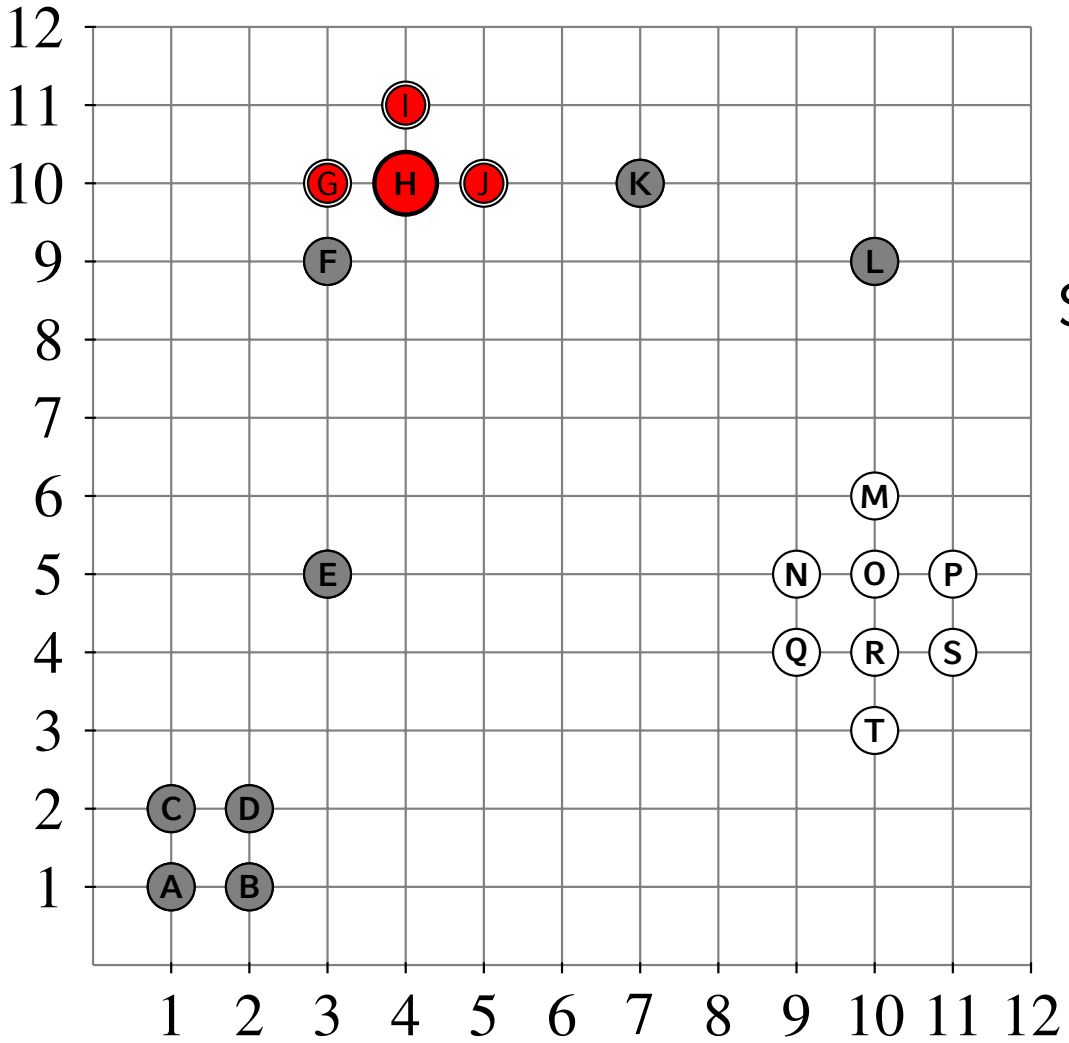

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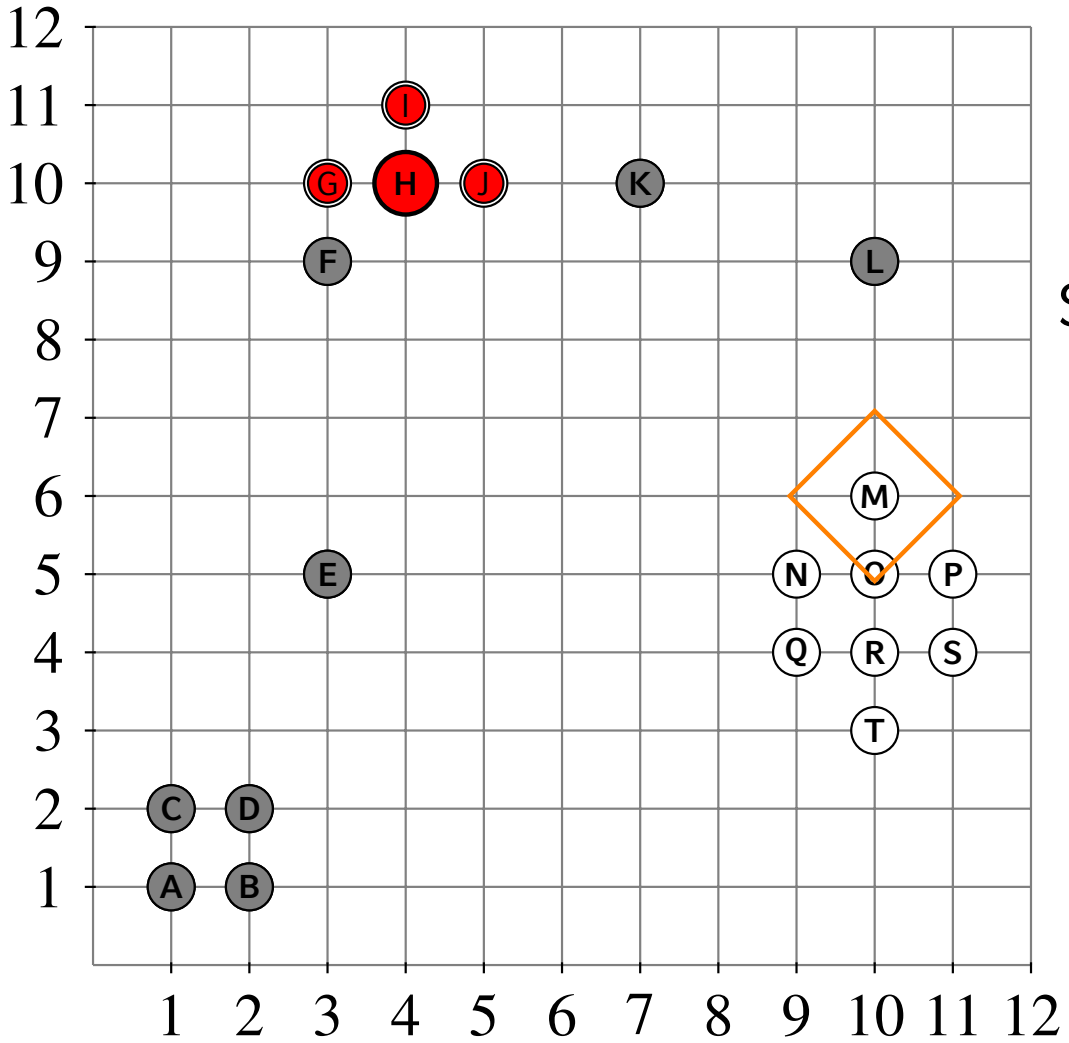

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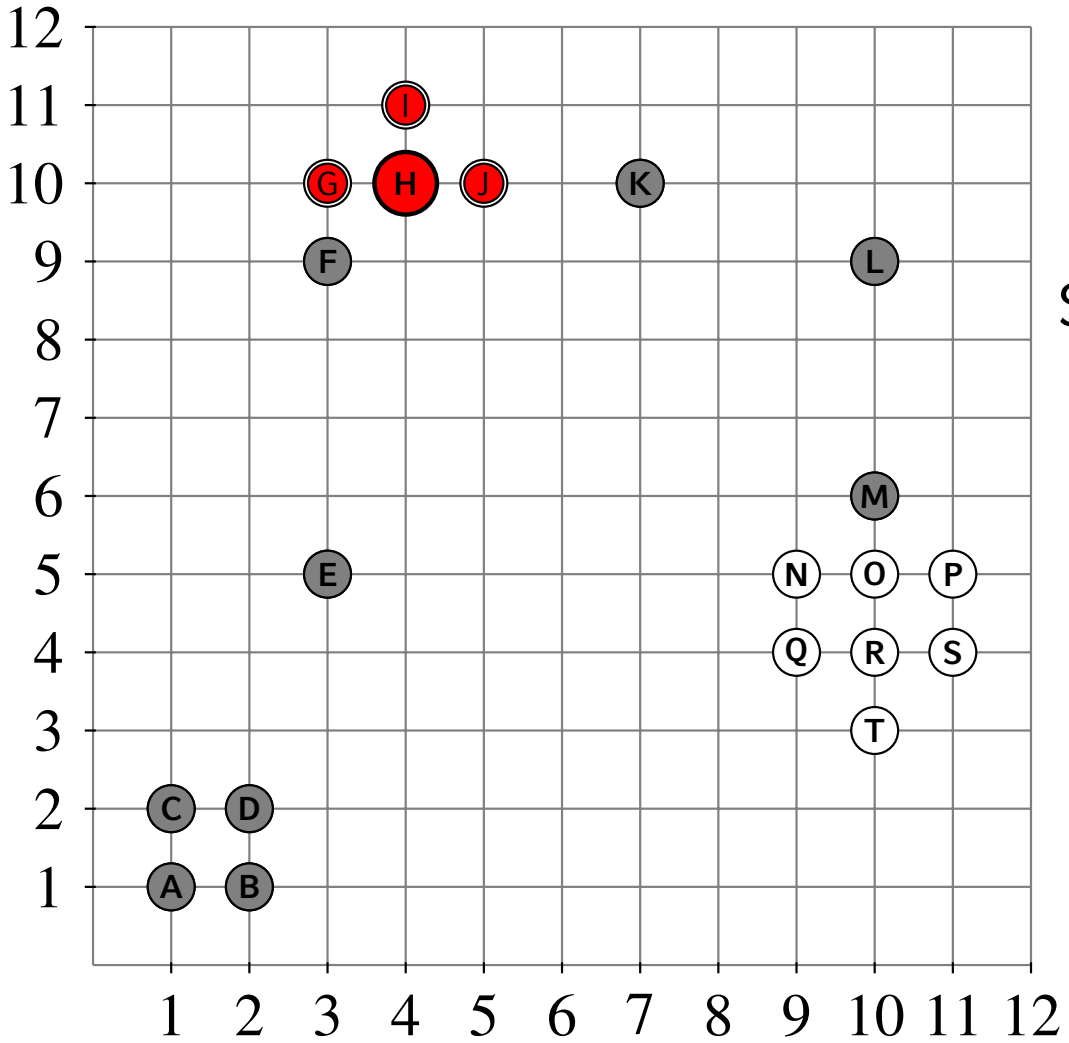

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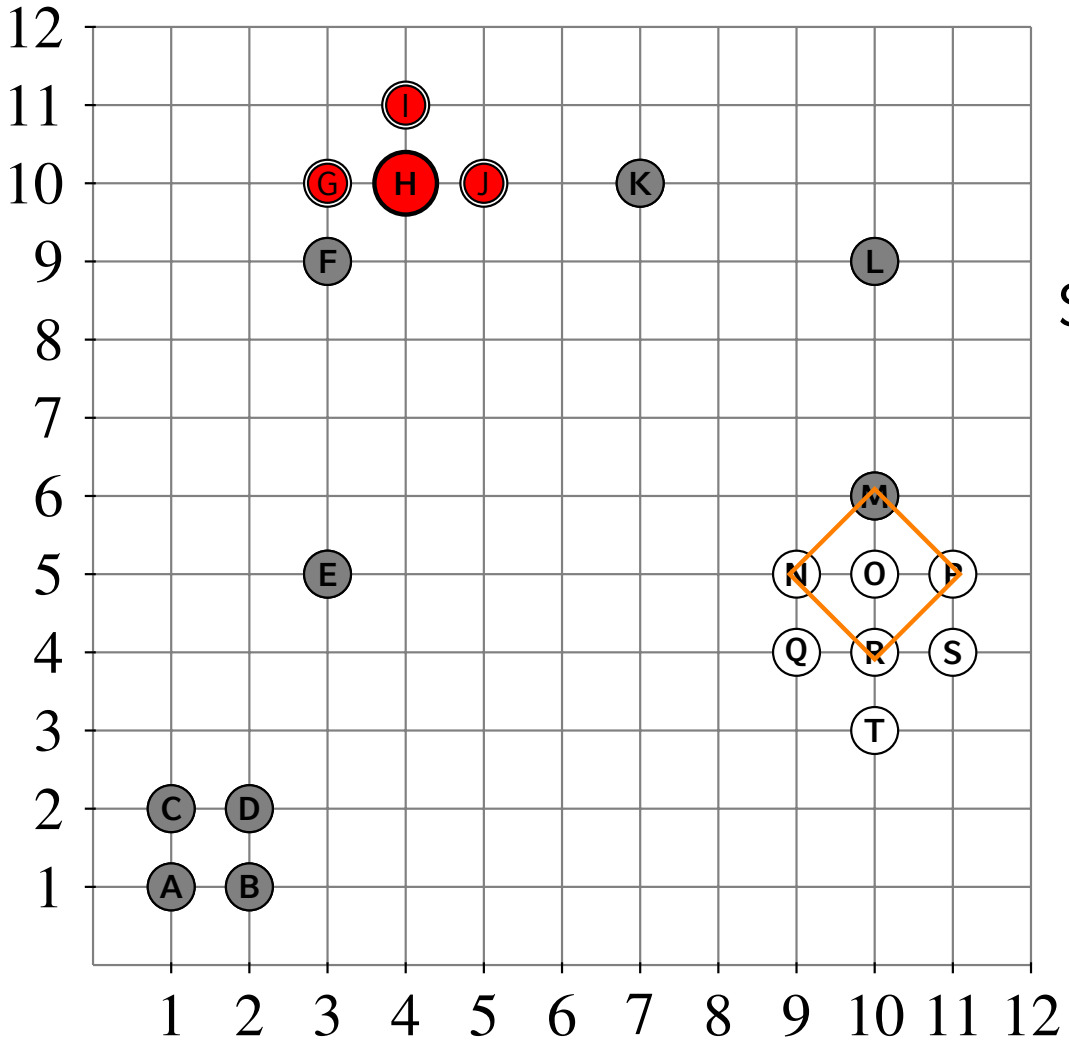

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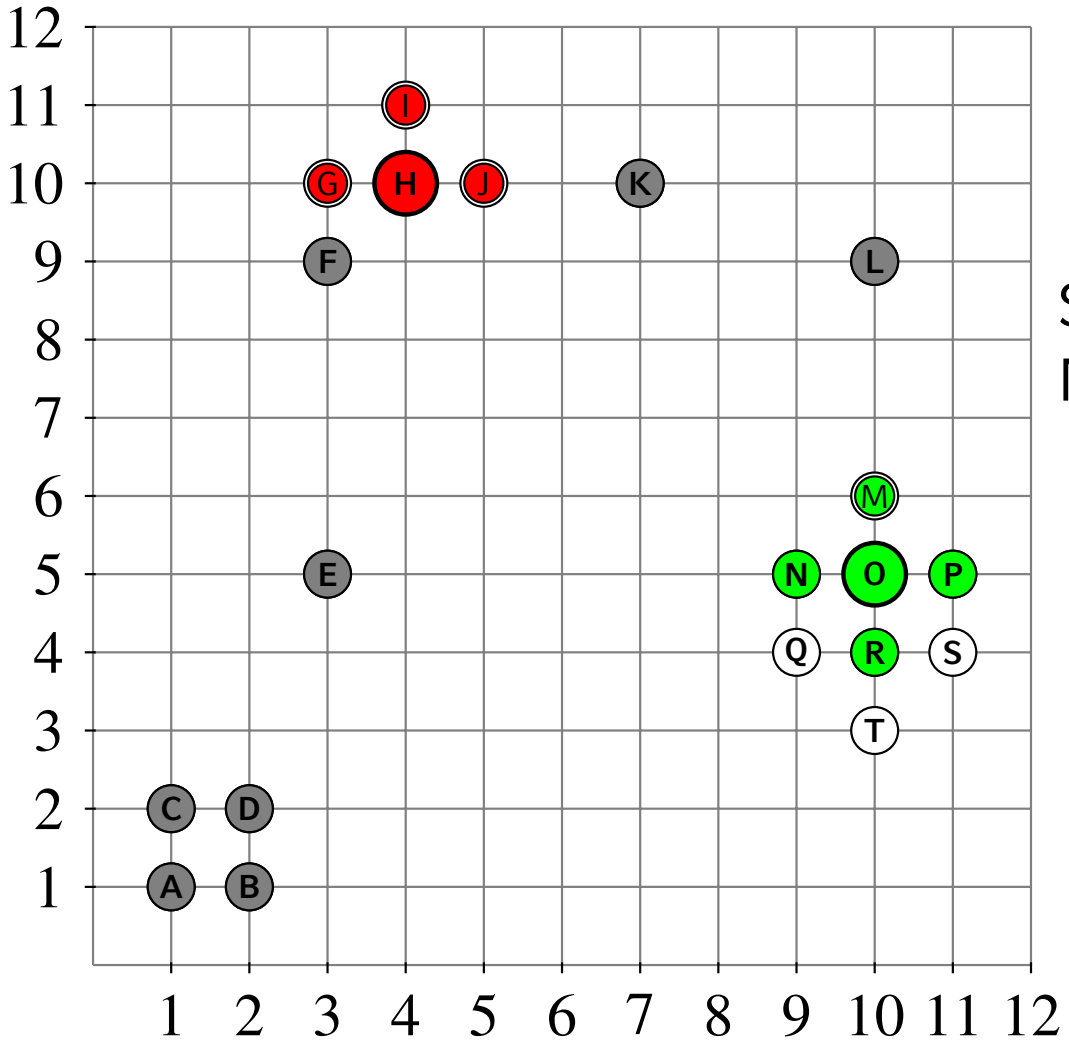

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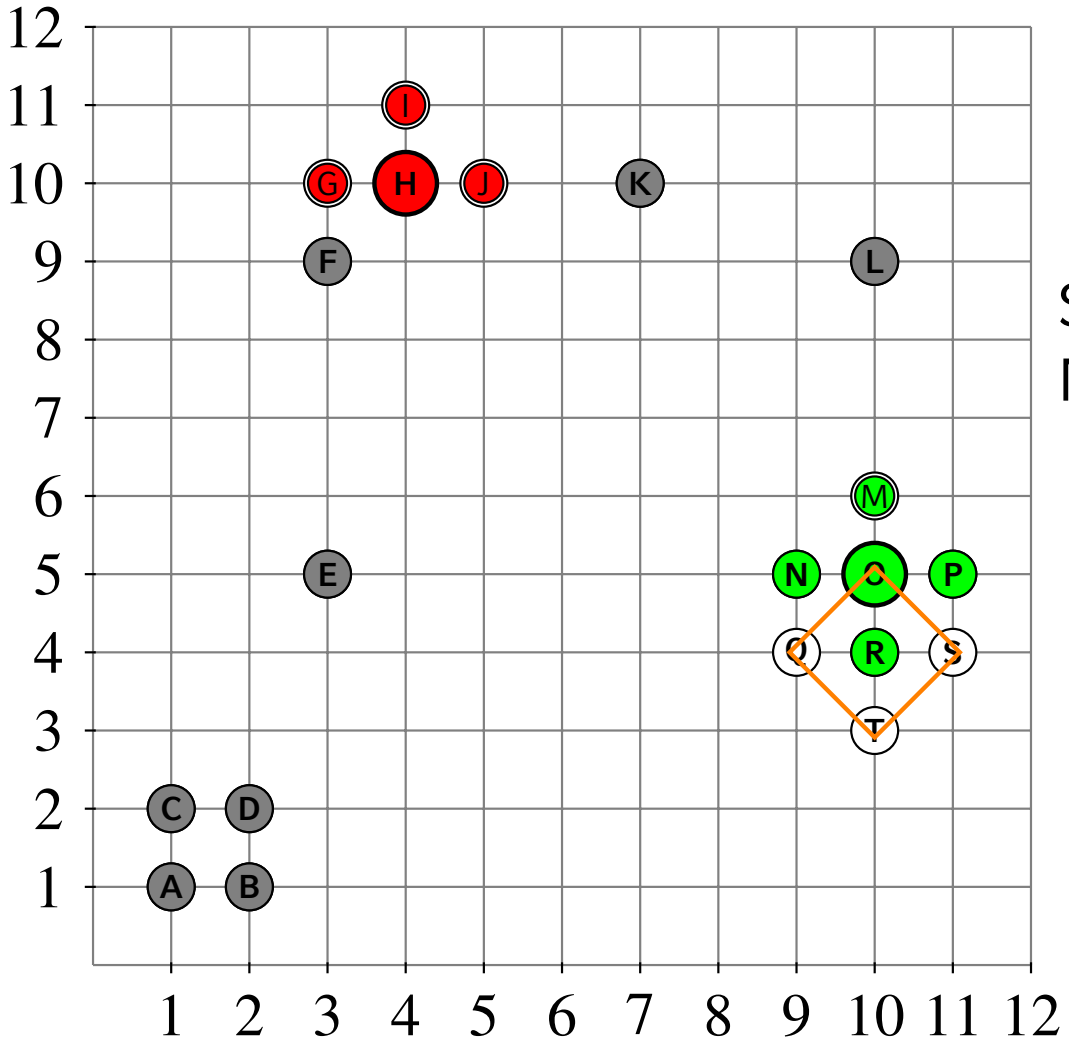

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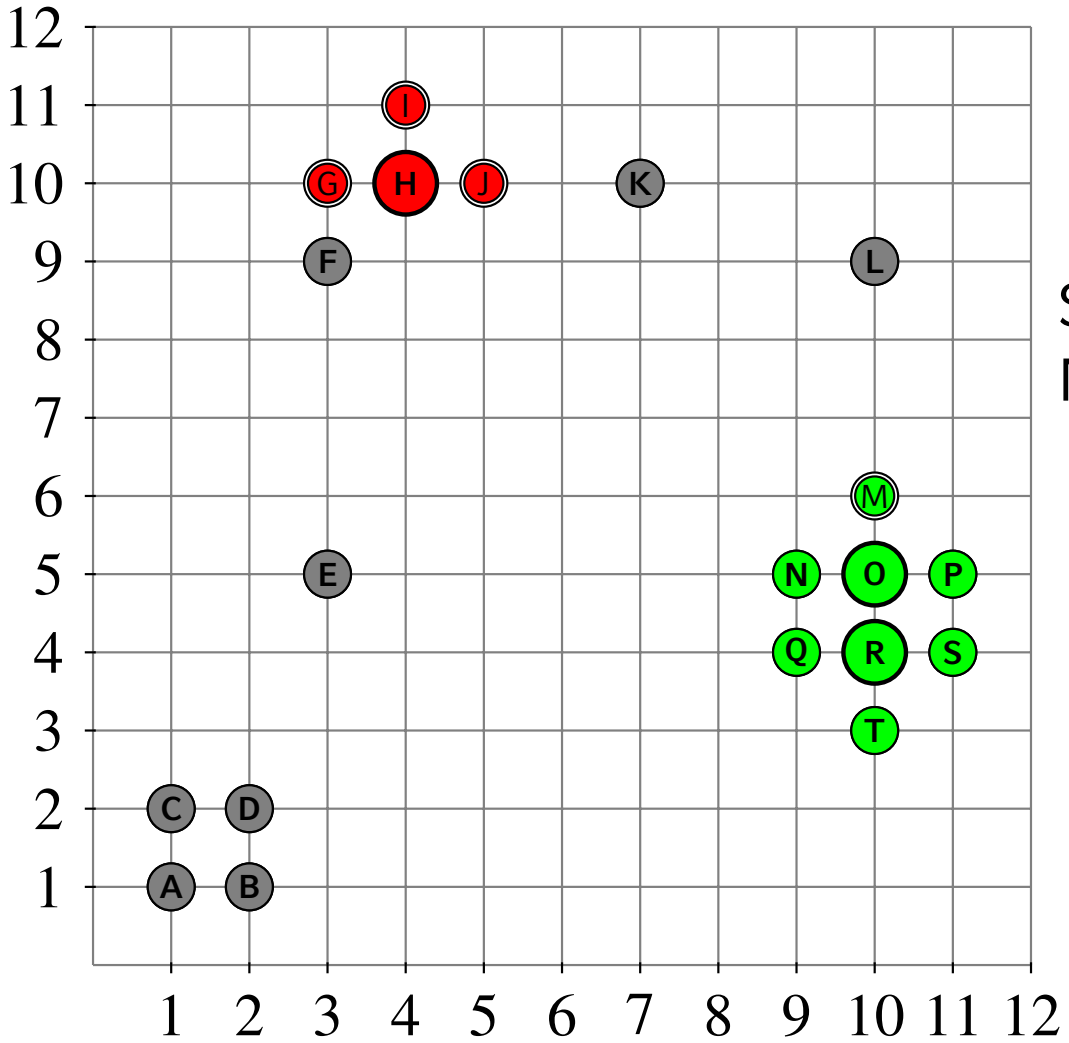

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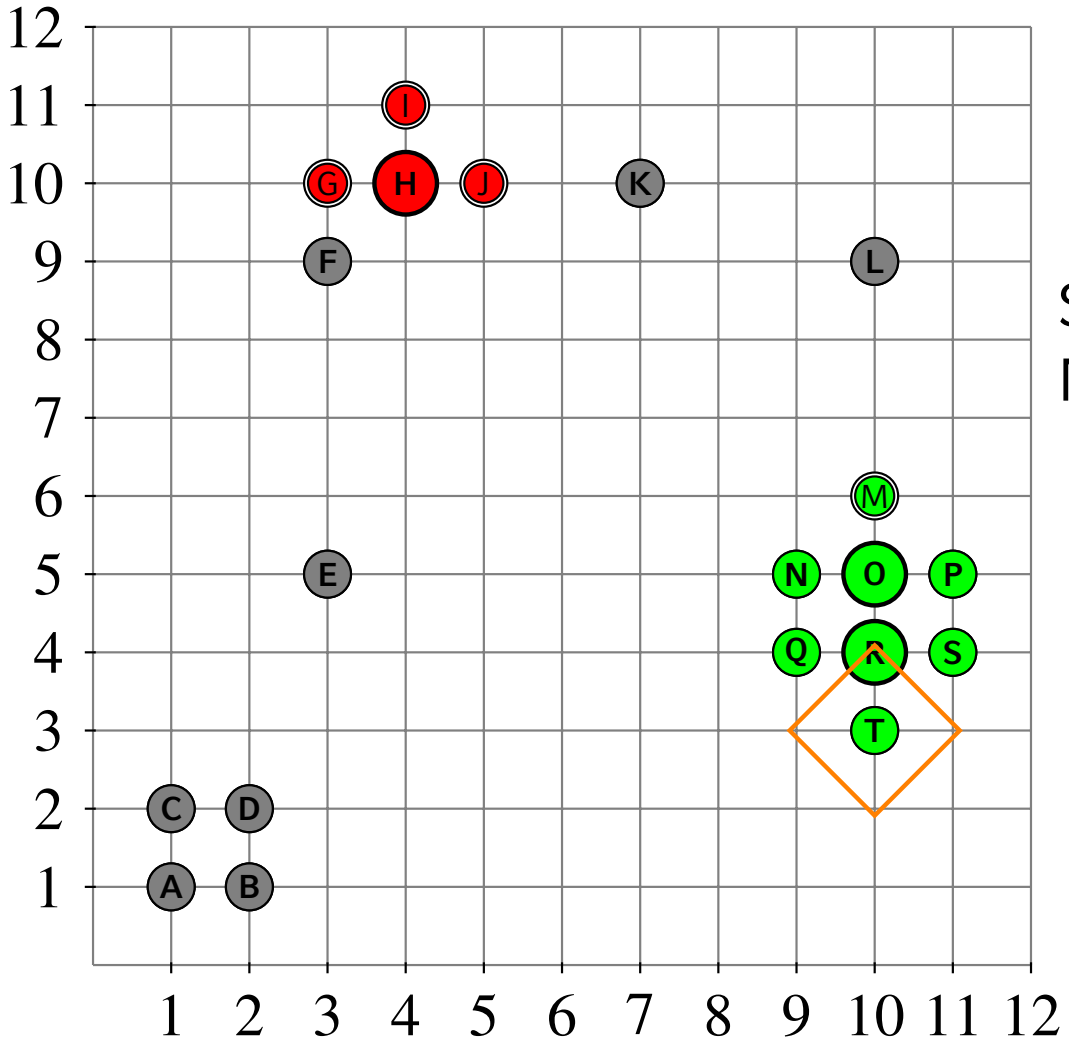

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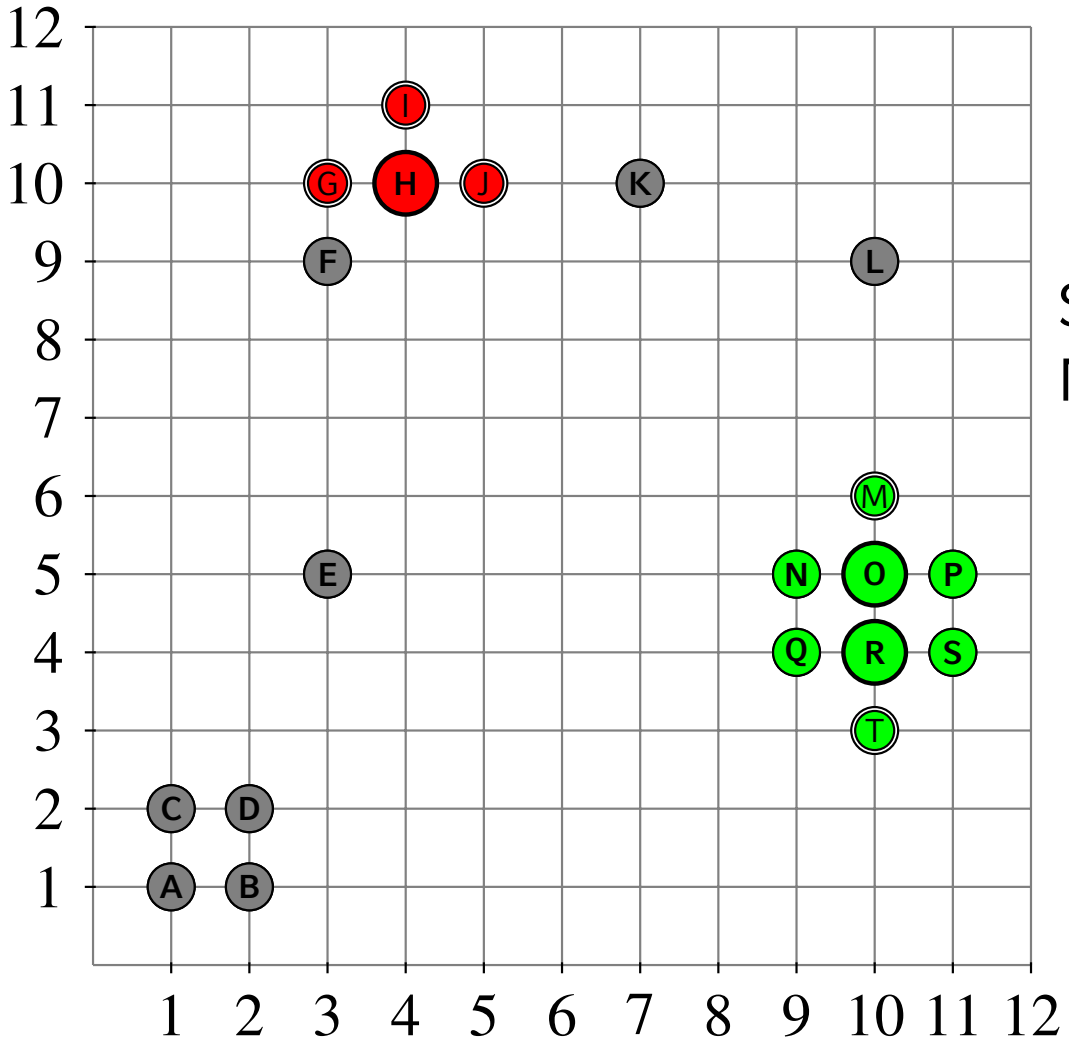

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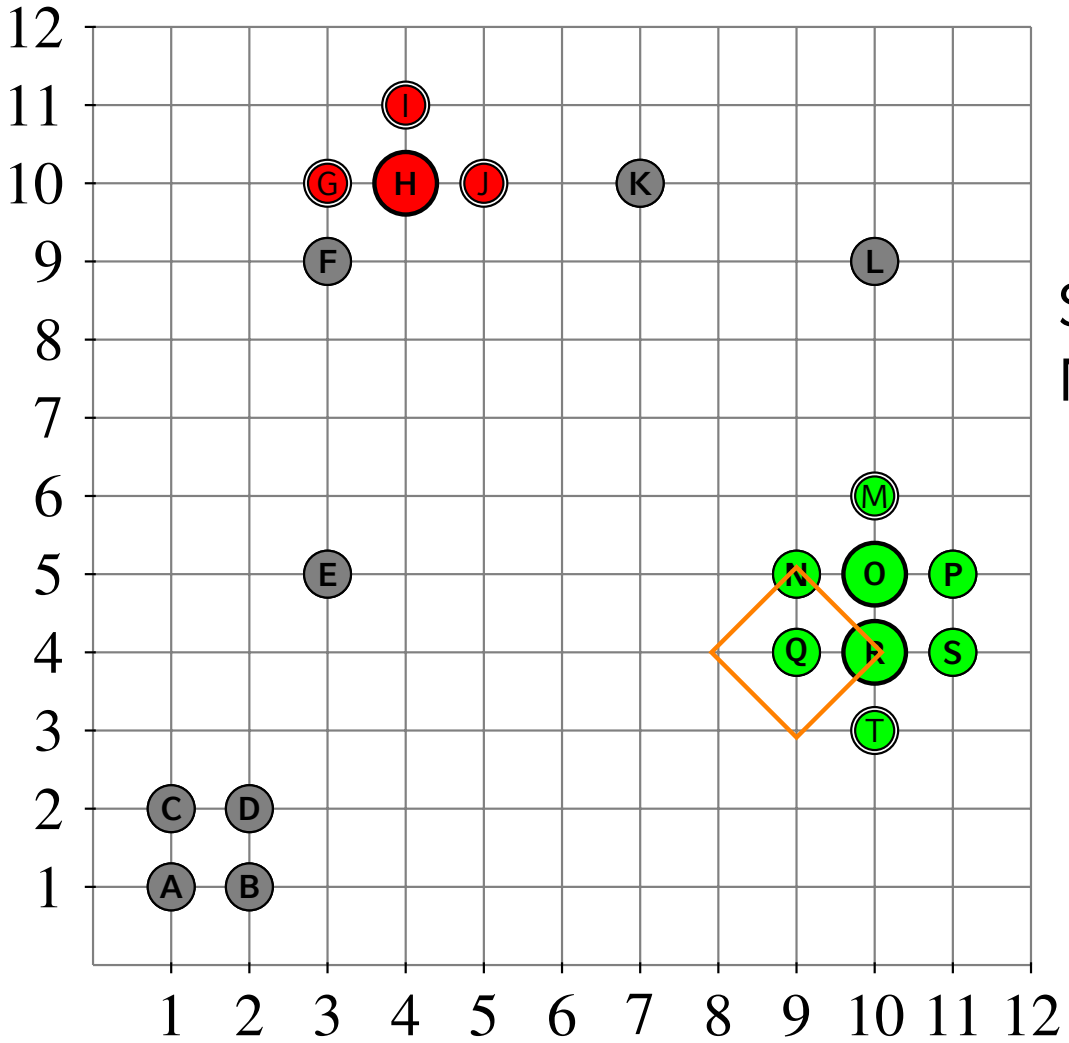

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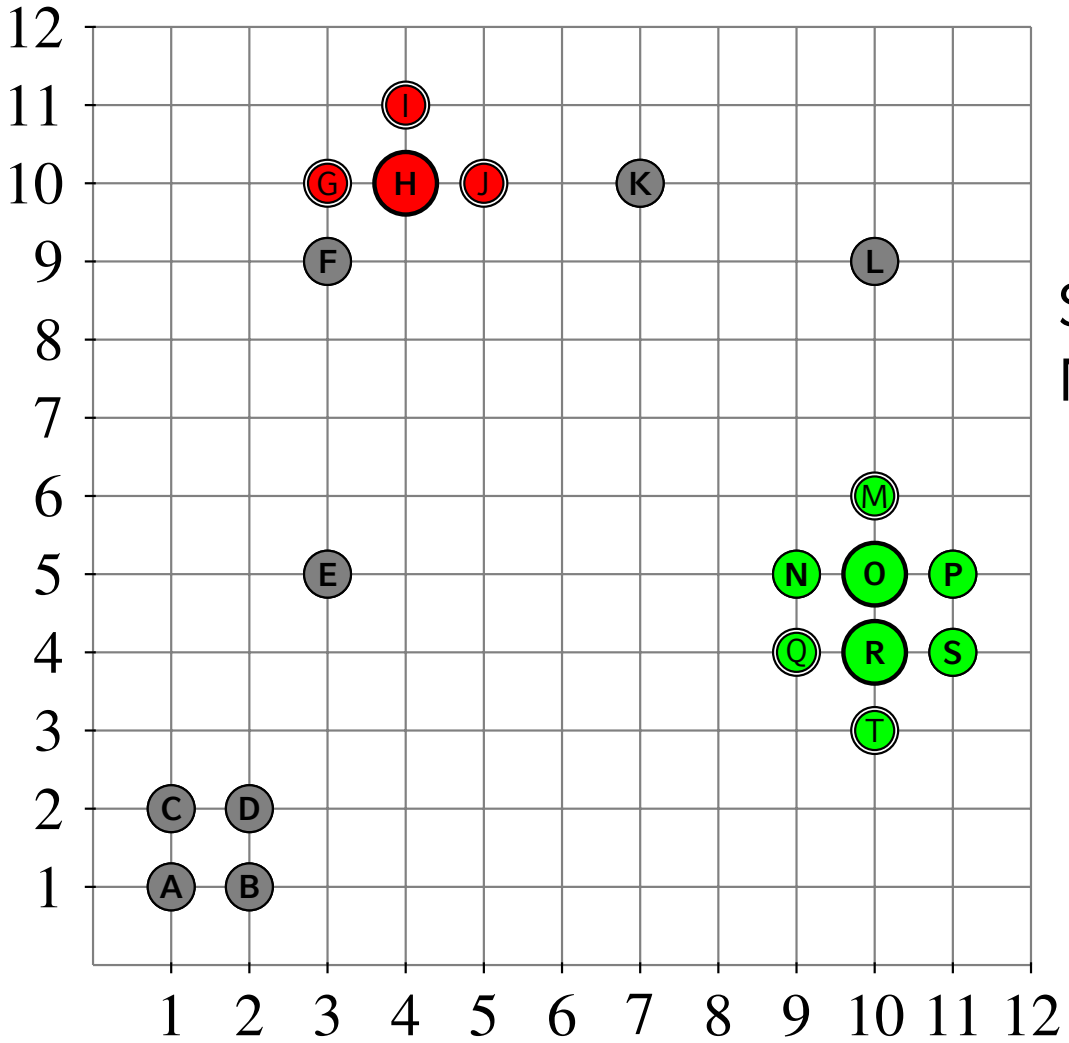

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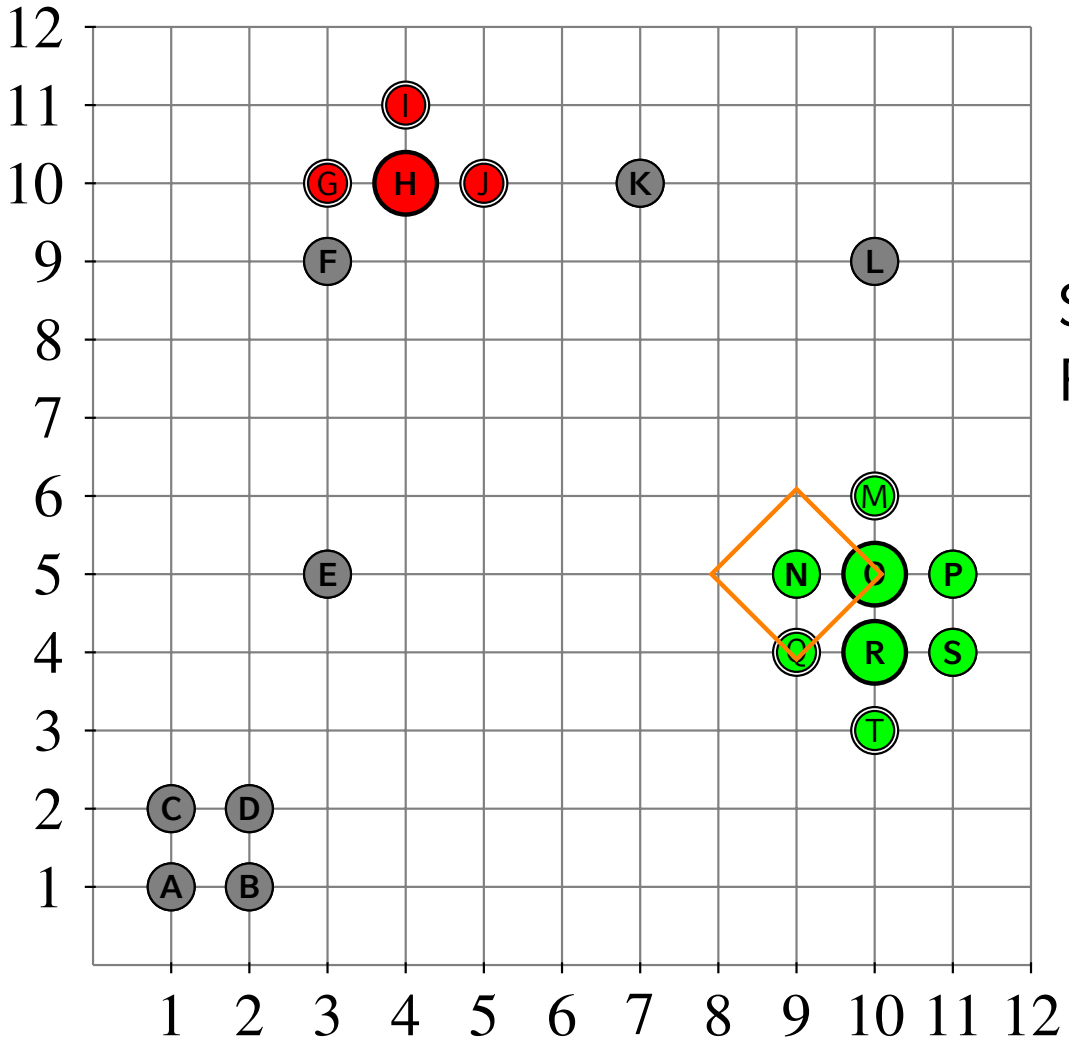

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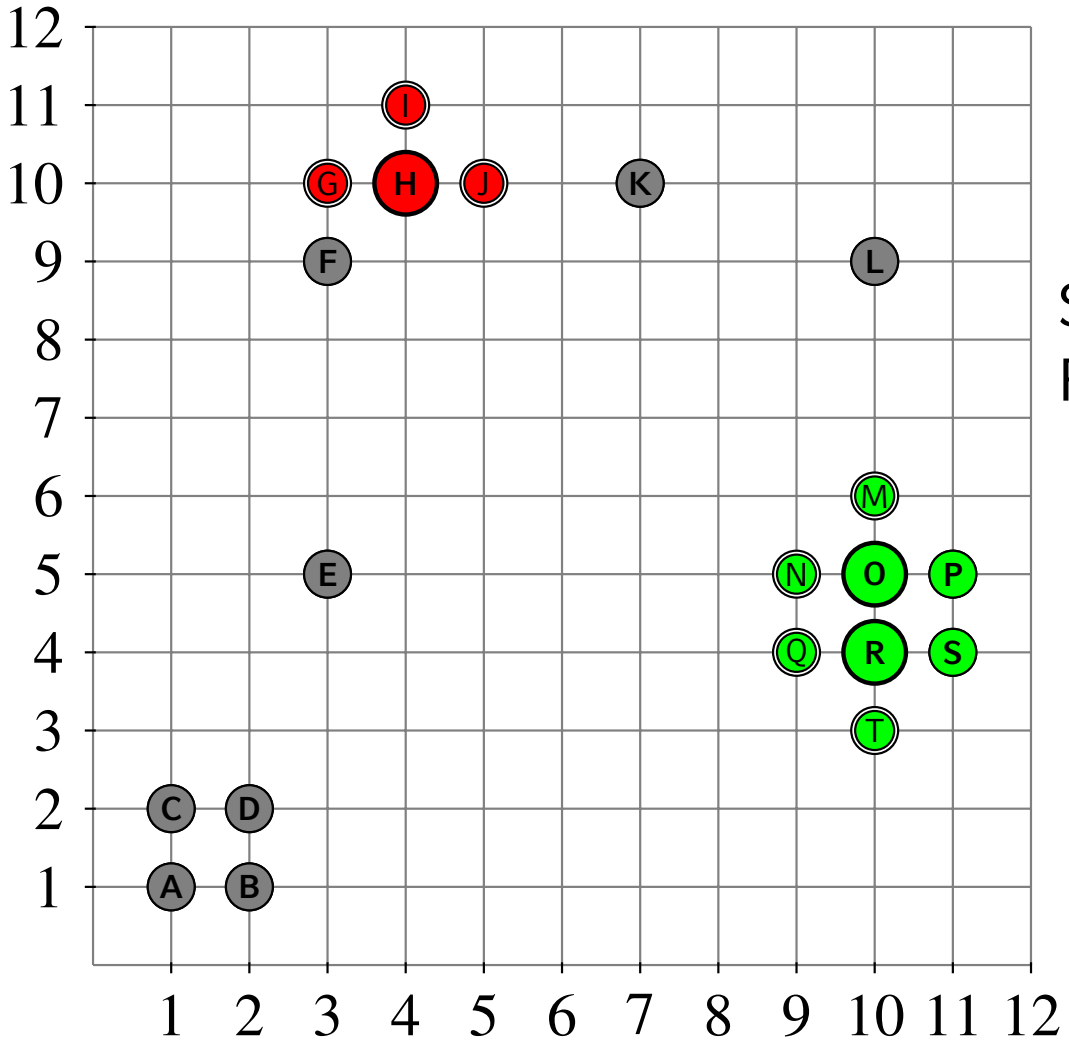

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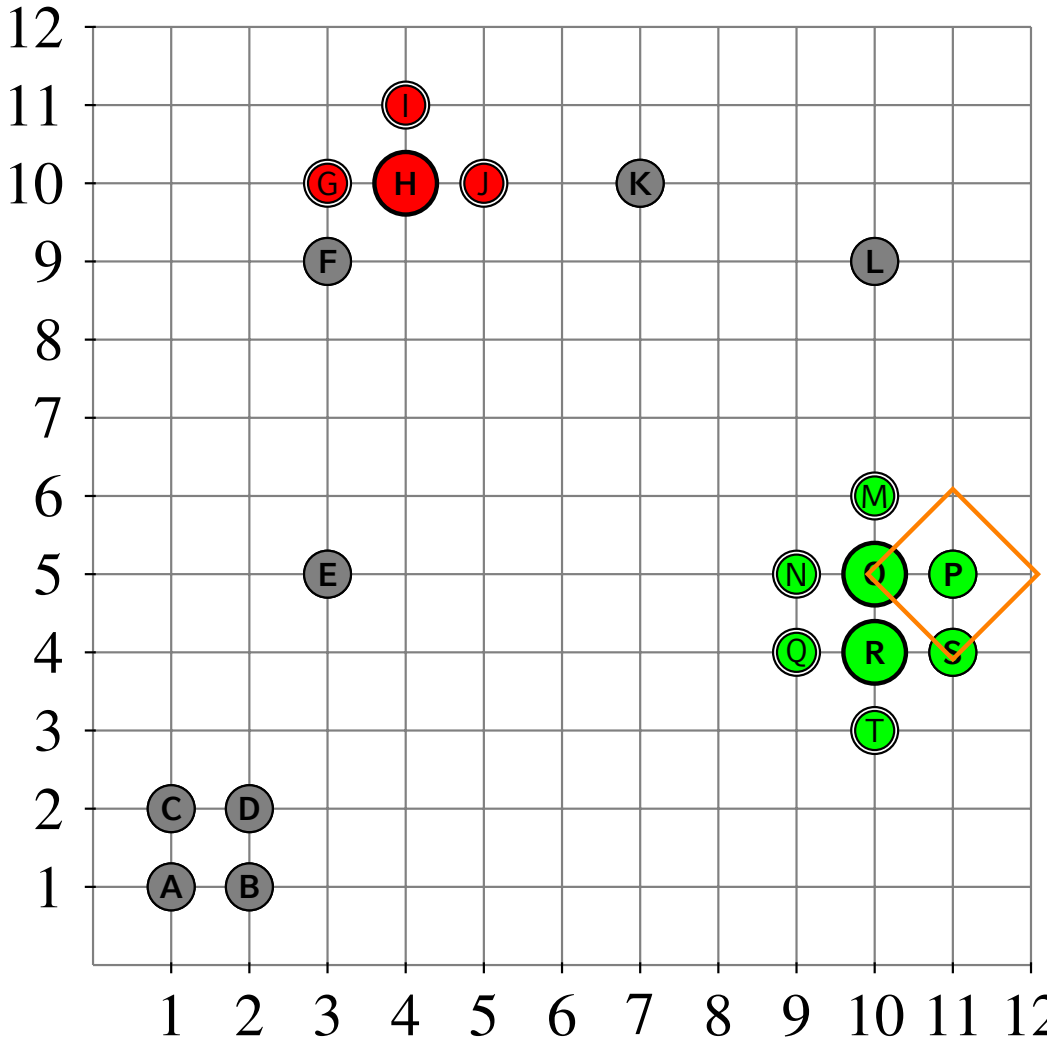

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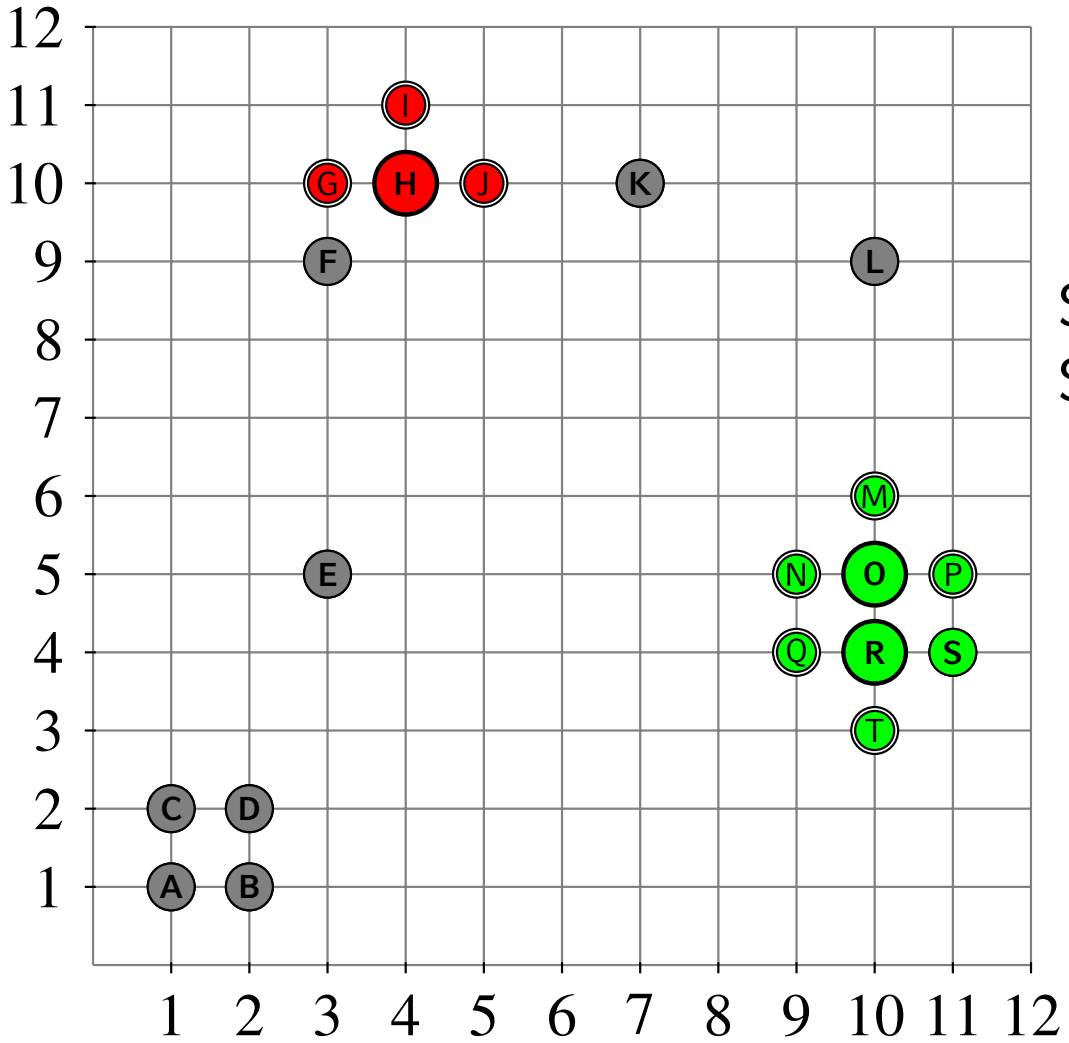

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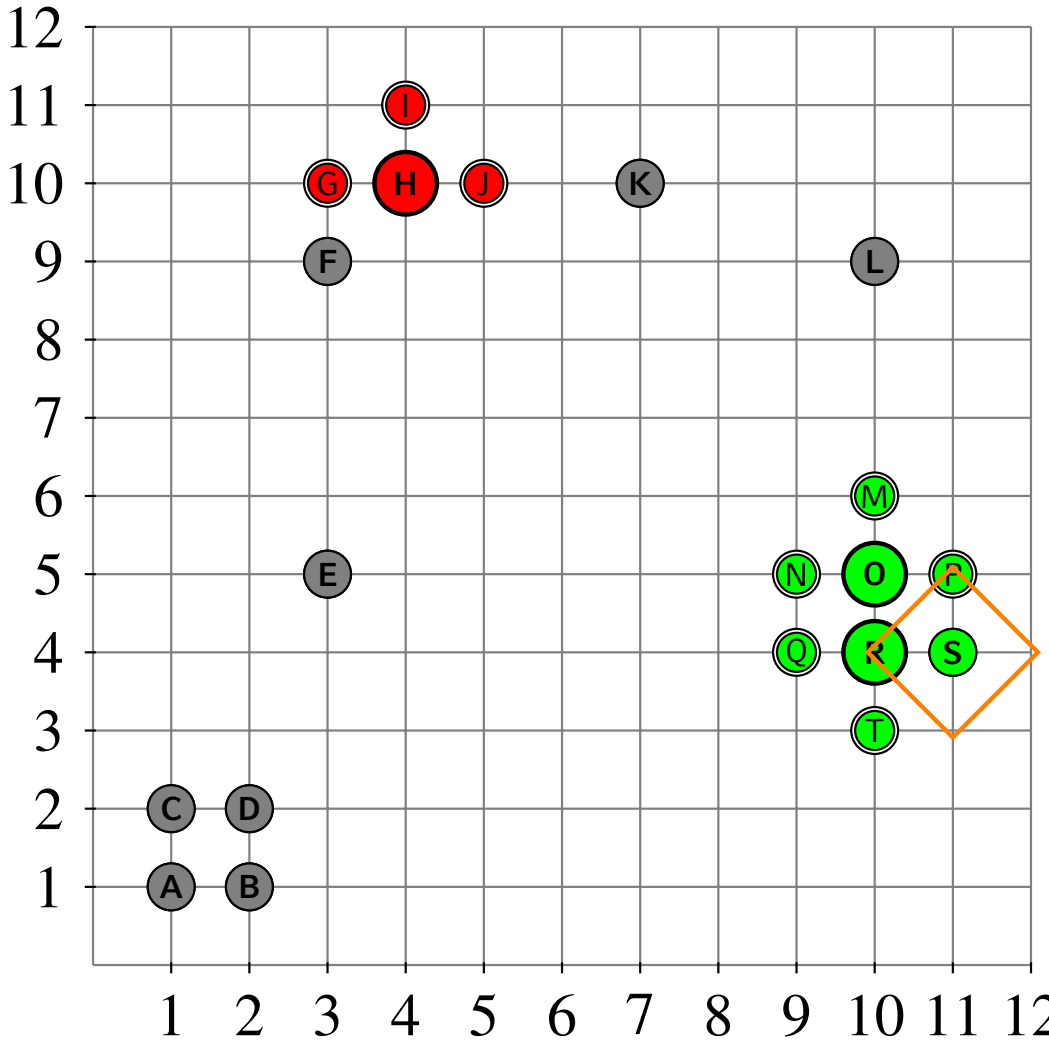

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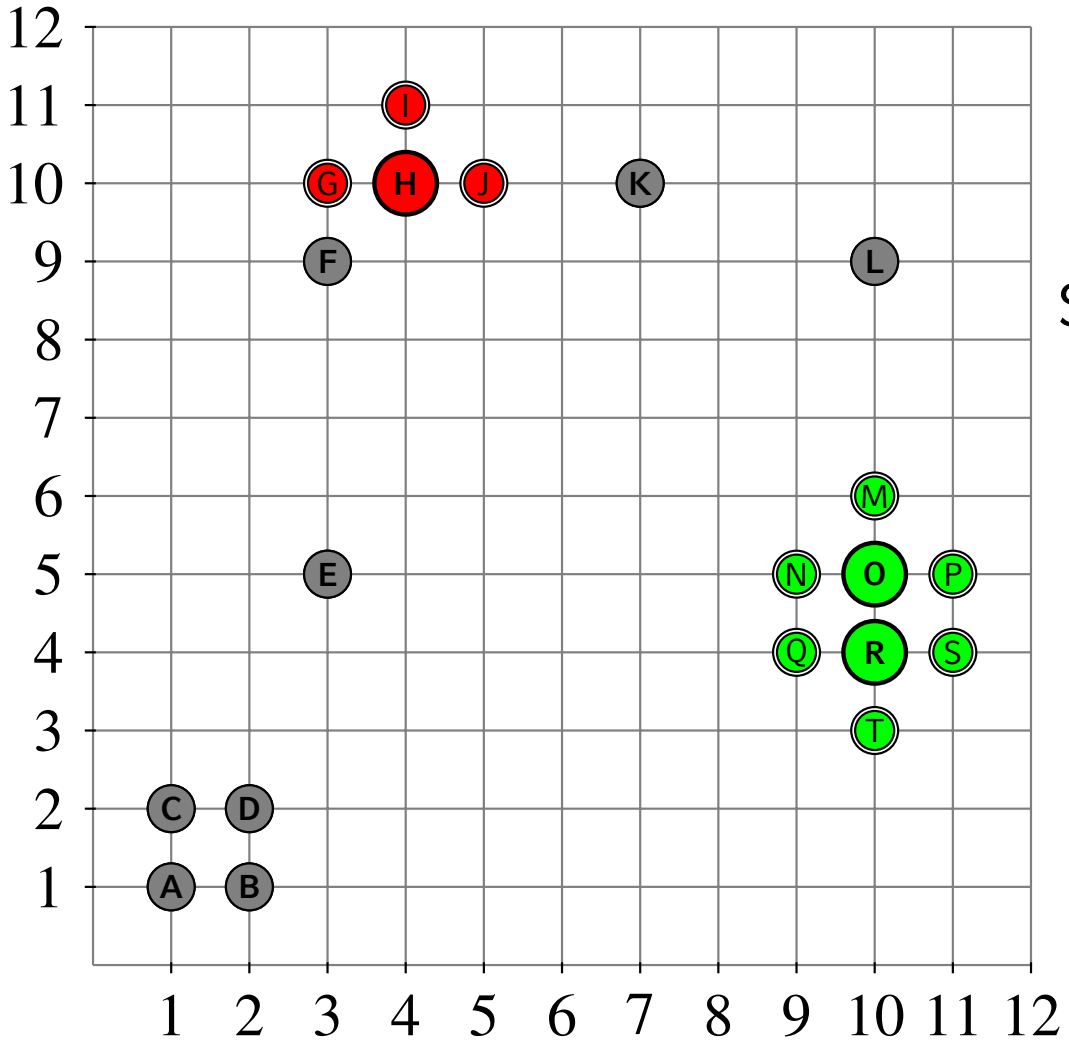

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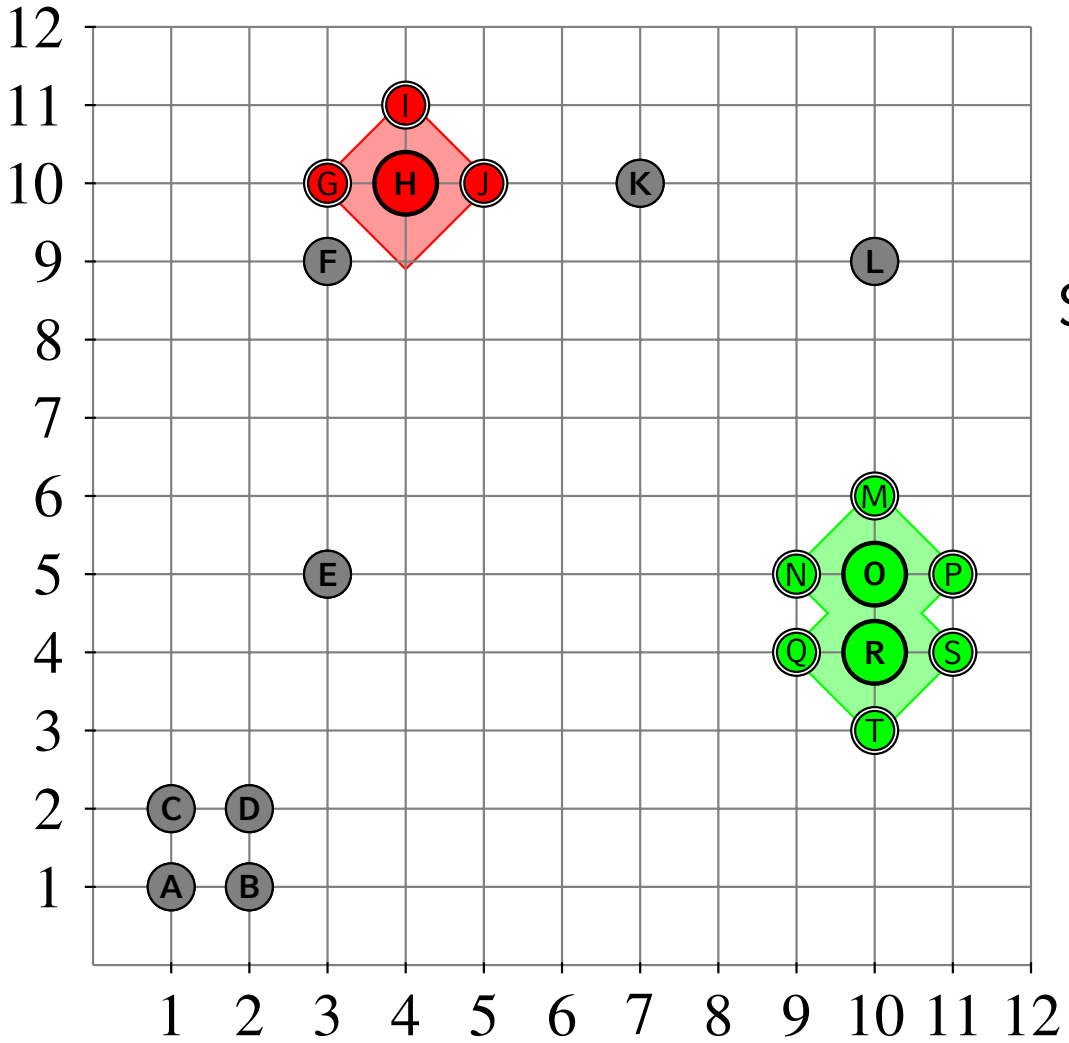

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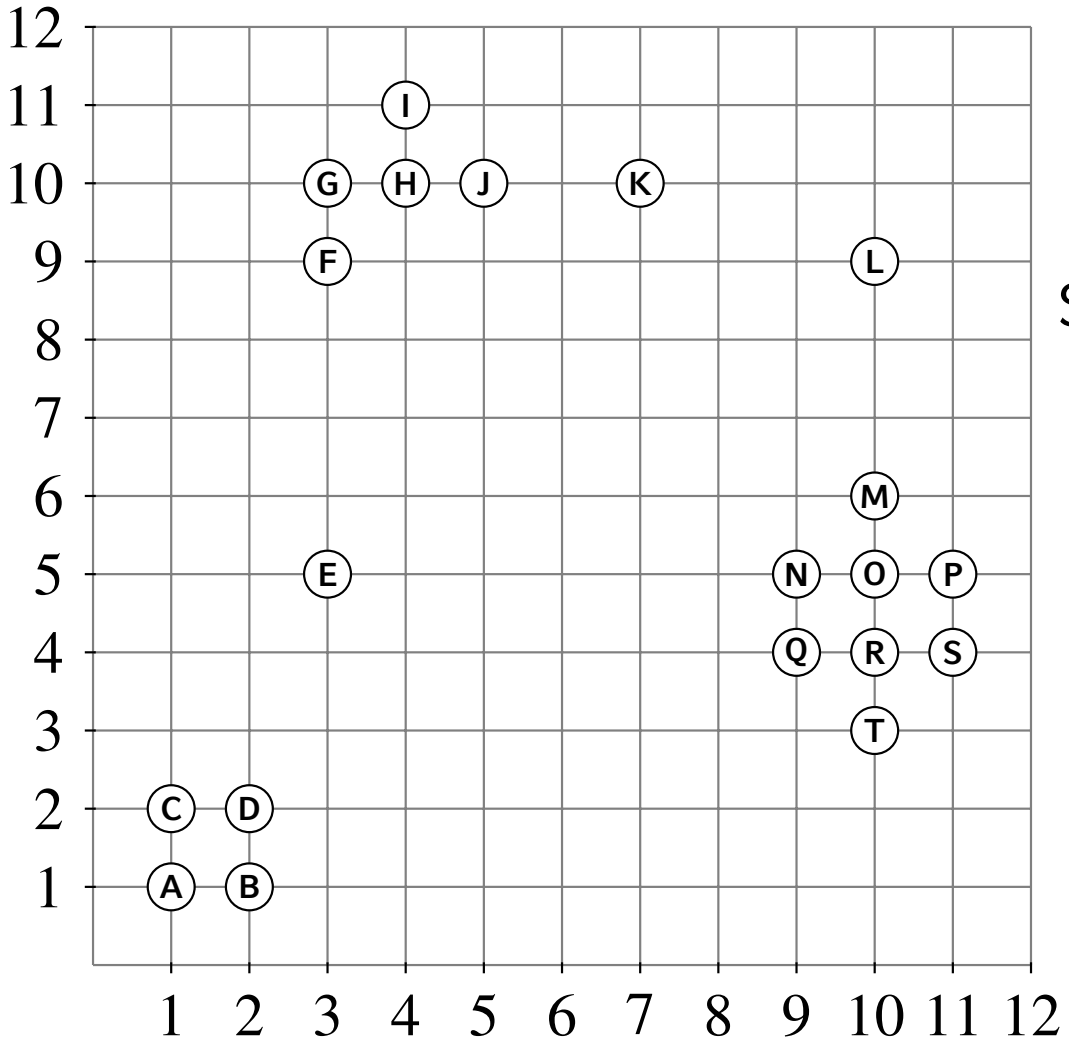

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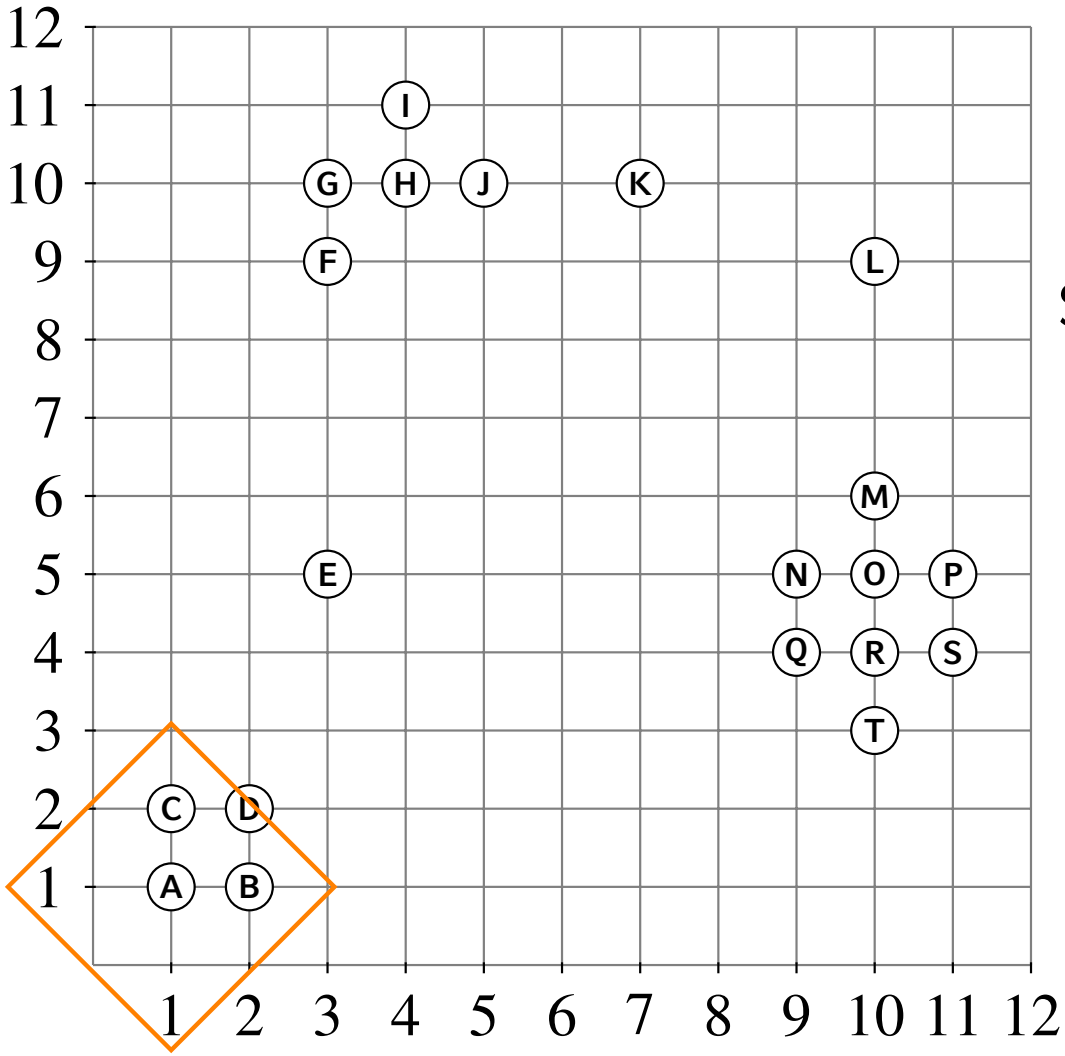

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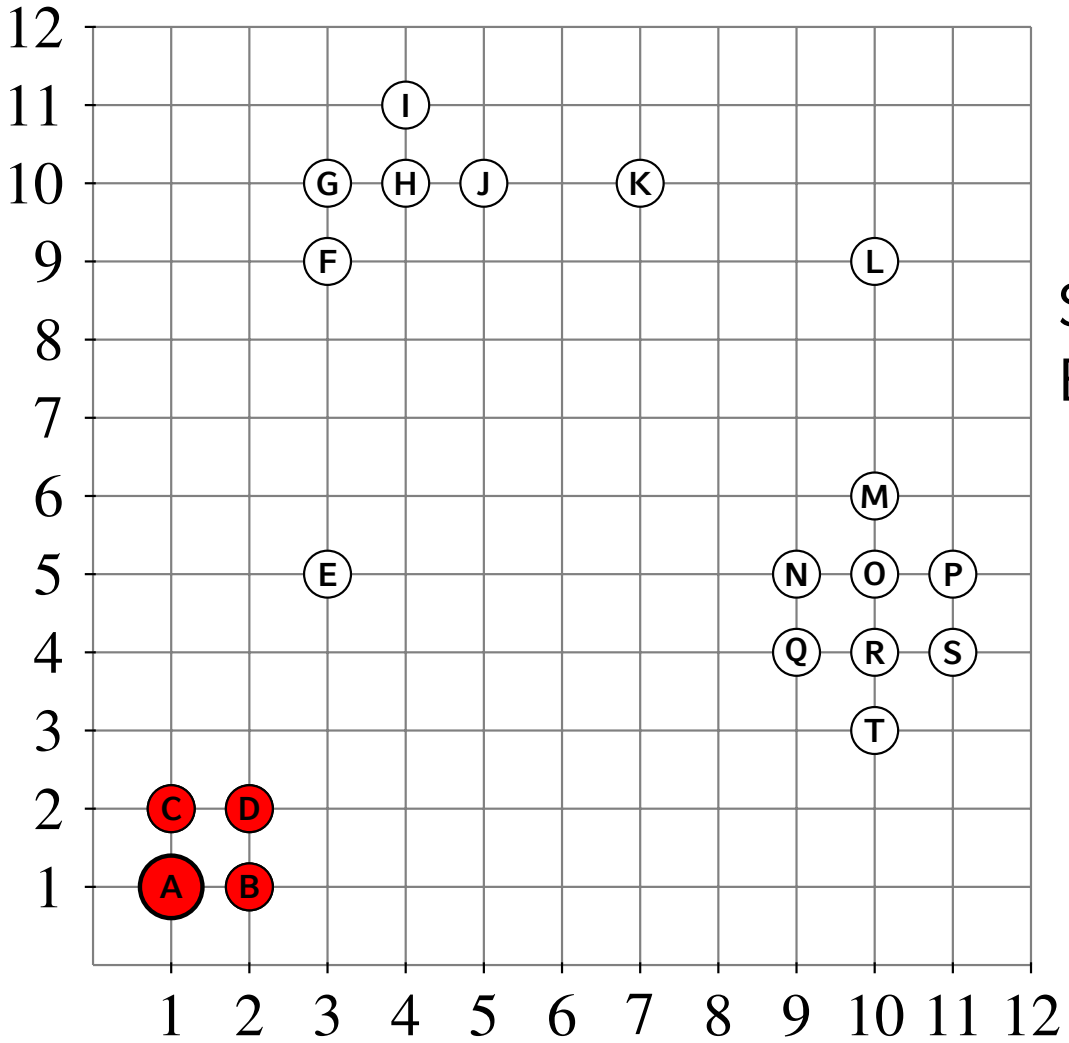

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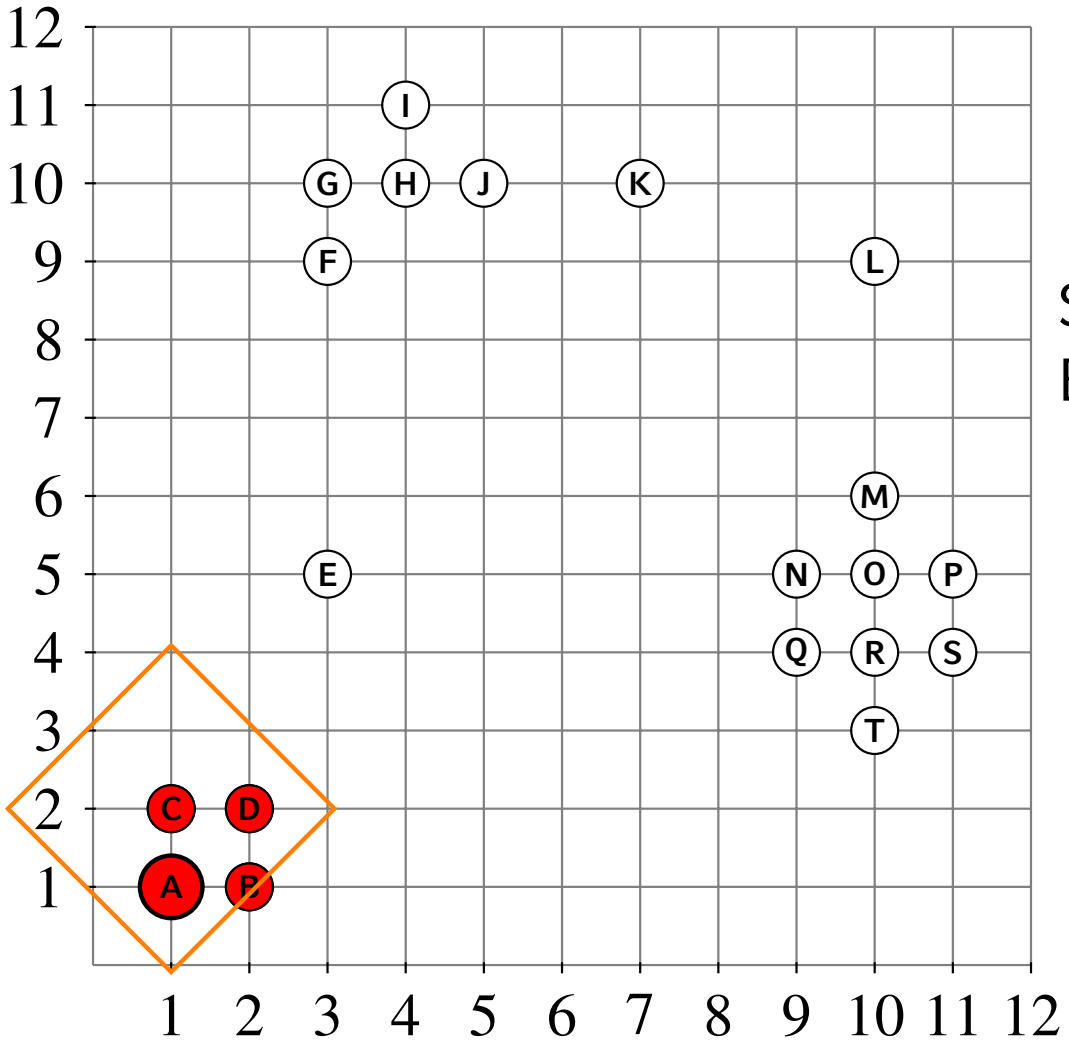

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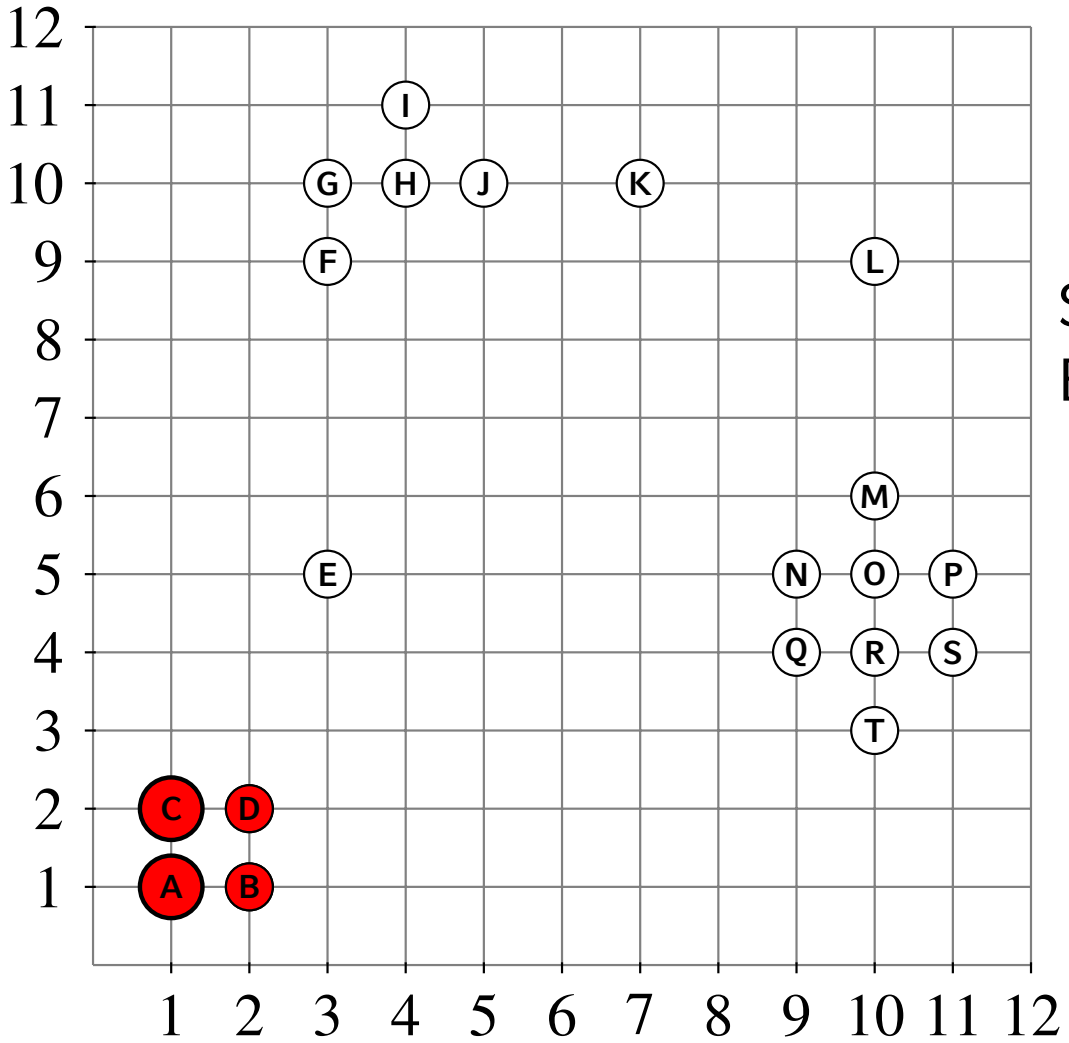

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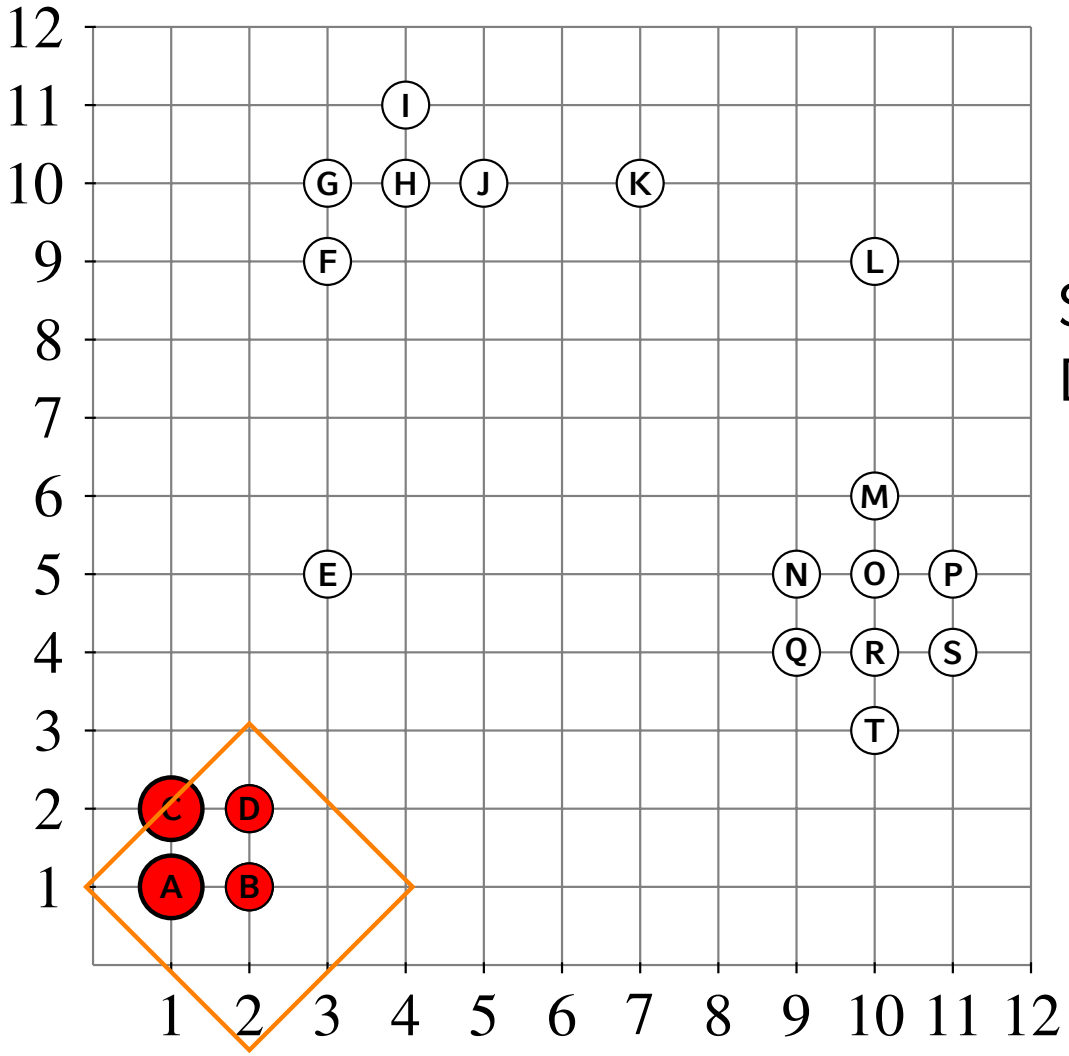

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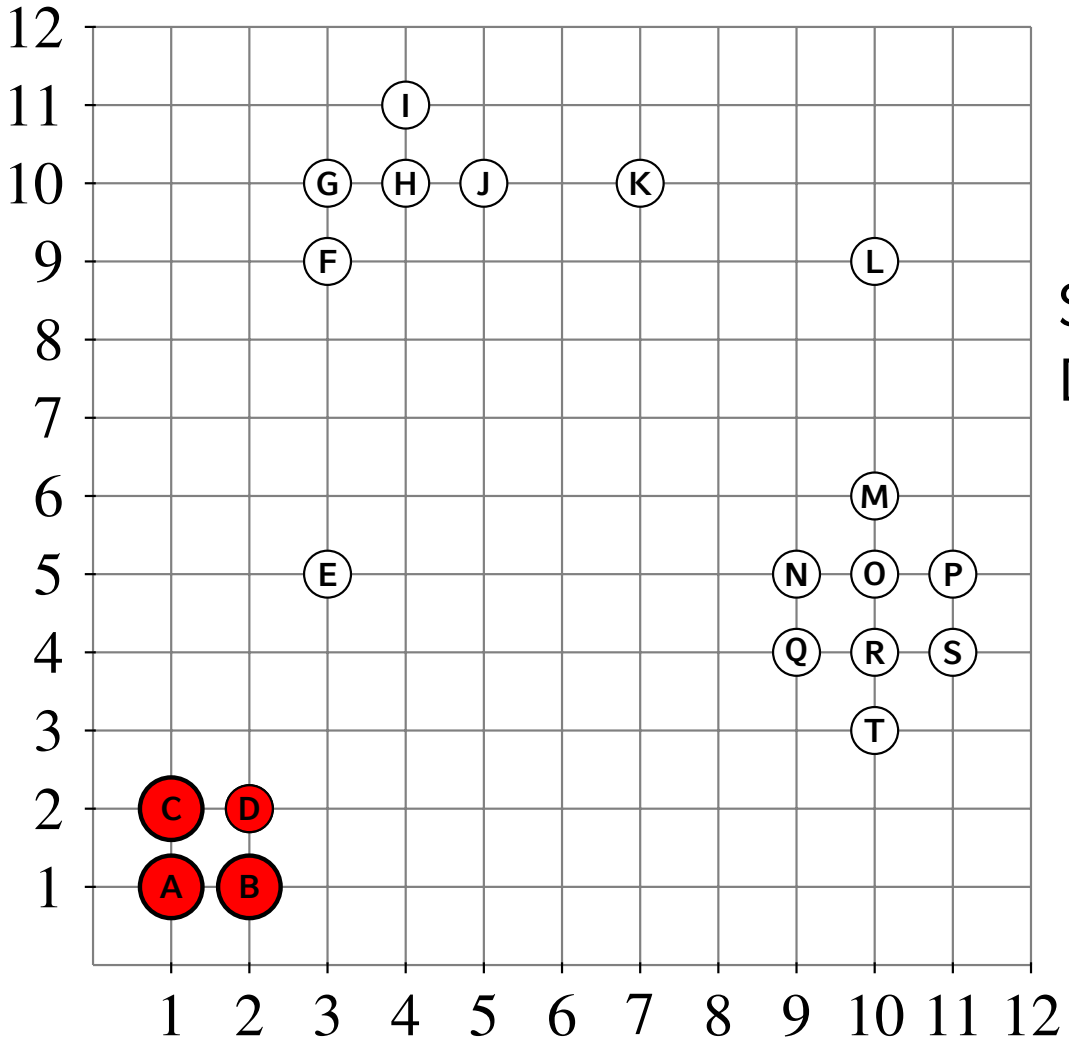

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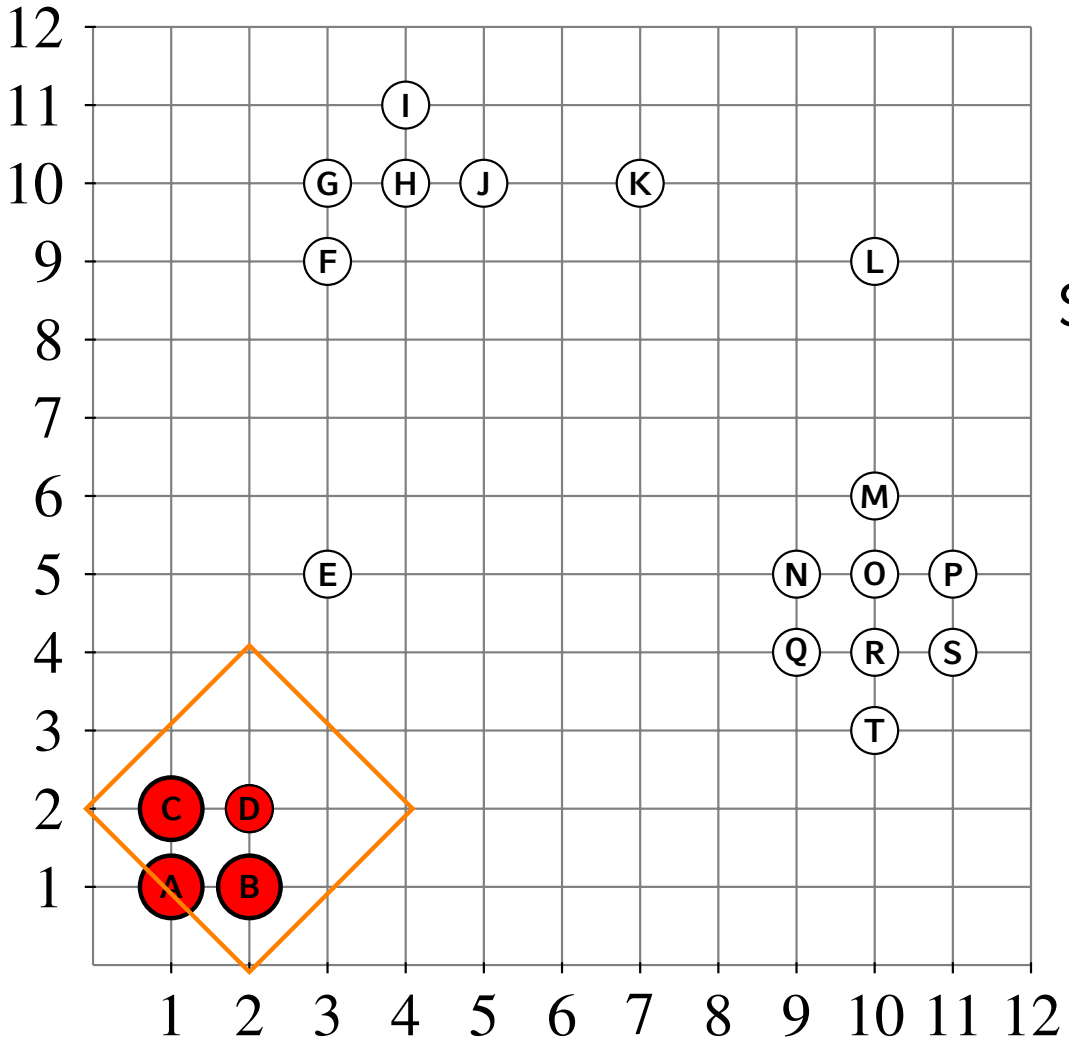
Seed list:
D

DBSCAN



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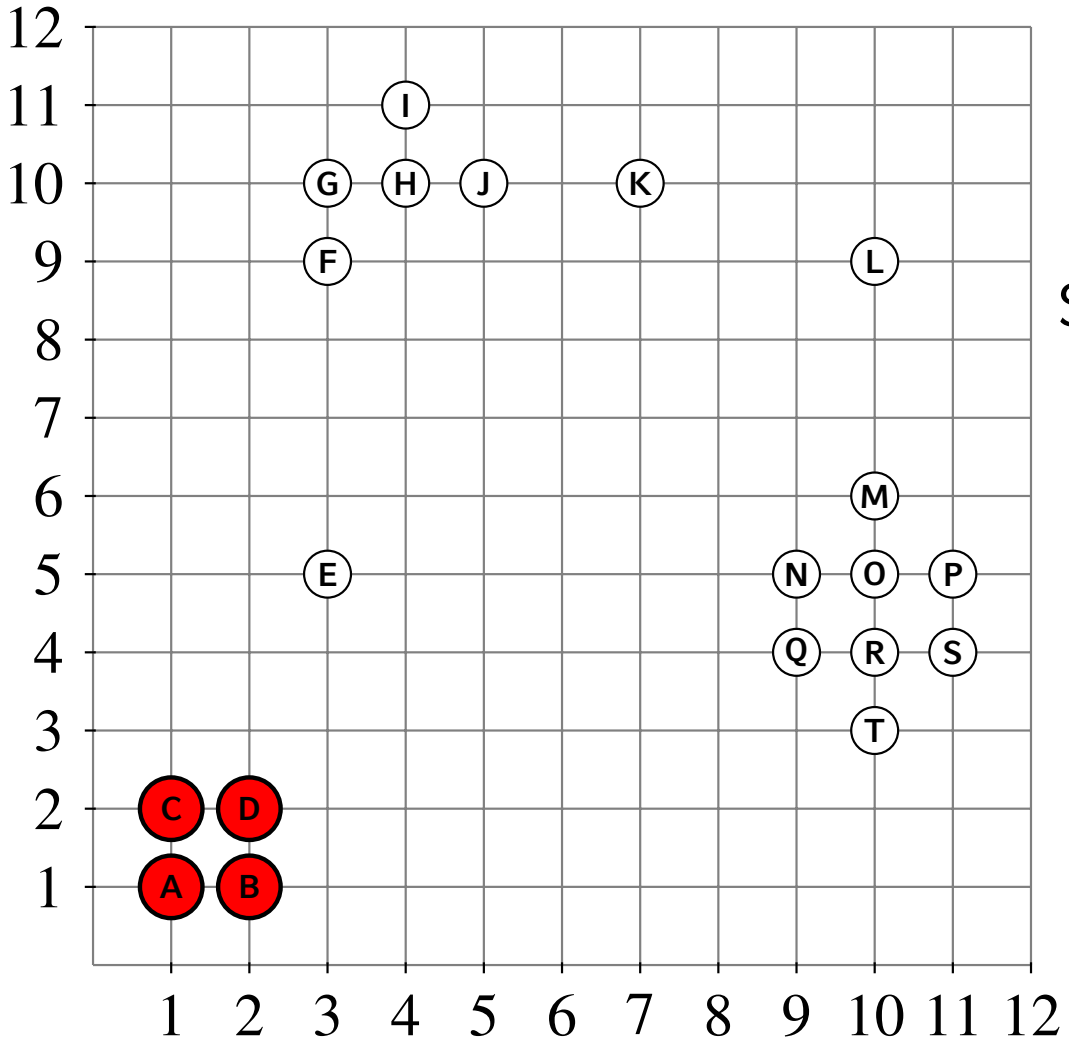
Seed list:

DBSCAN



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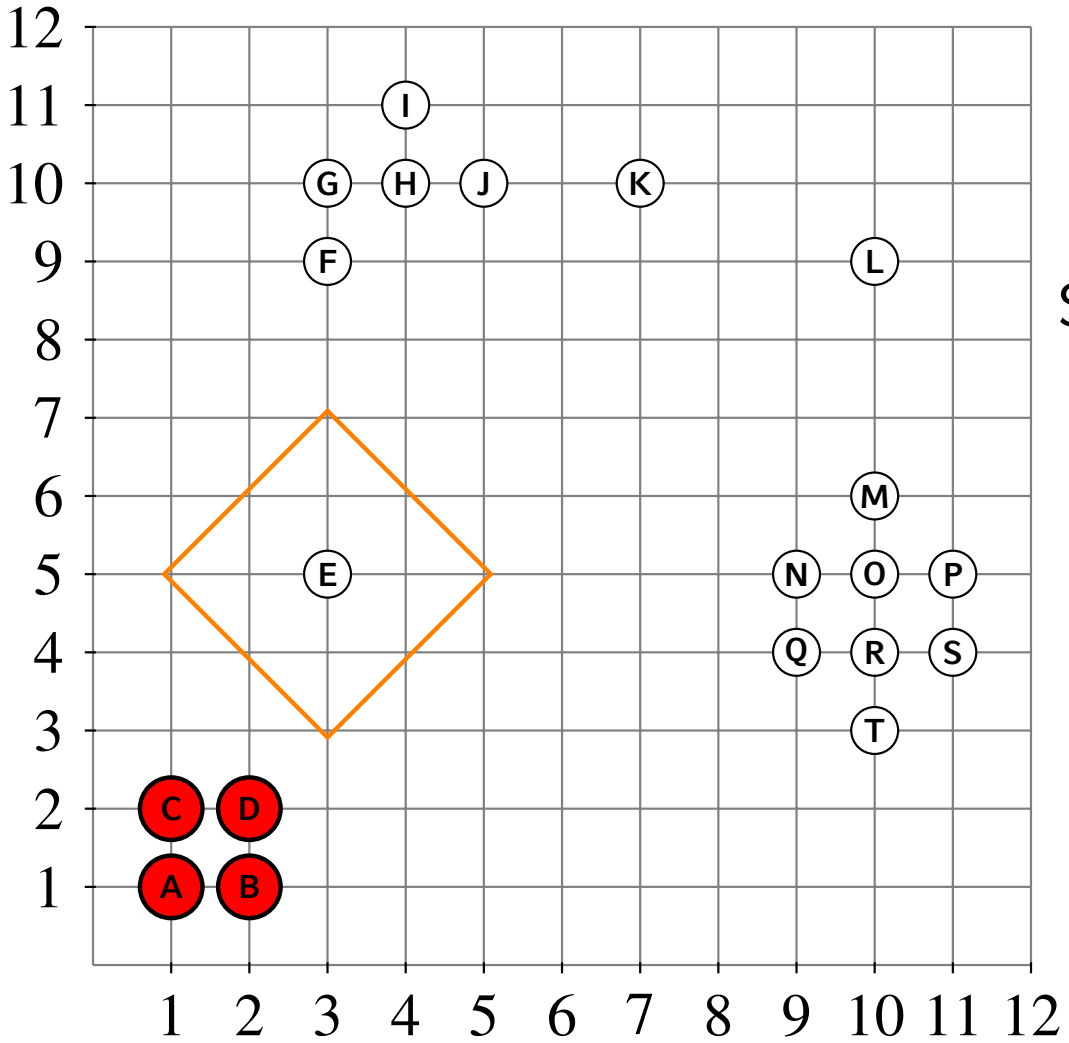
DBSCAN



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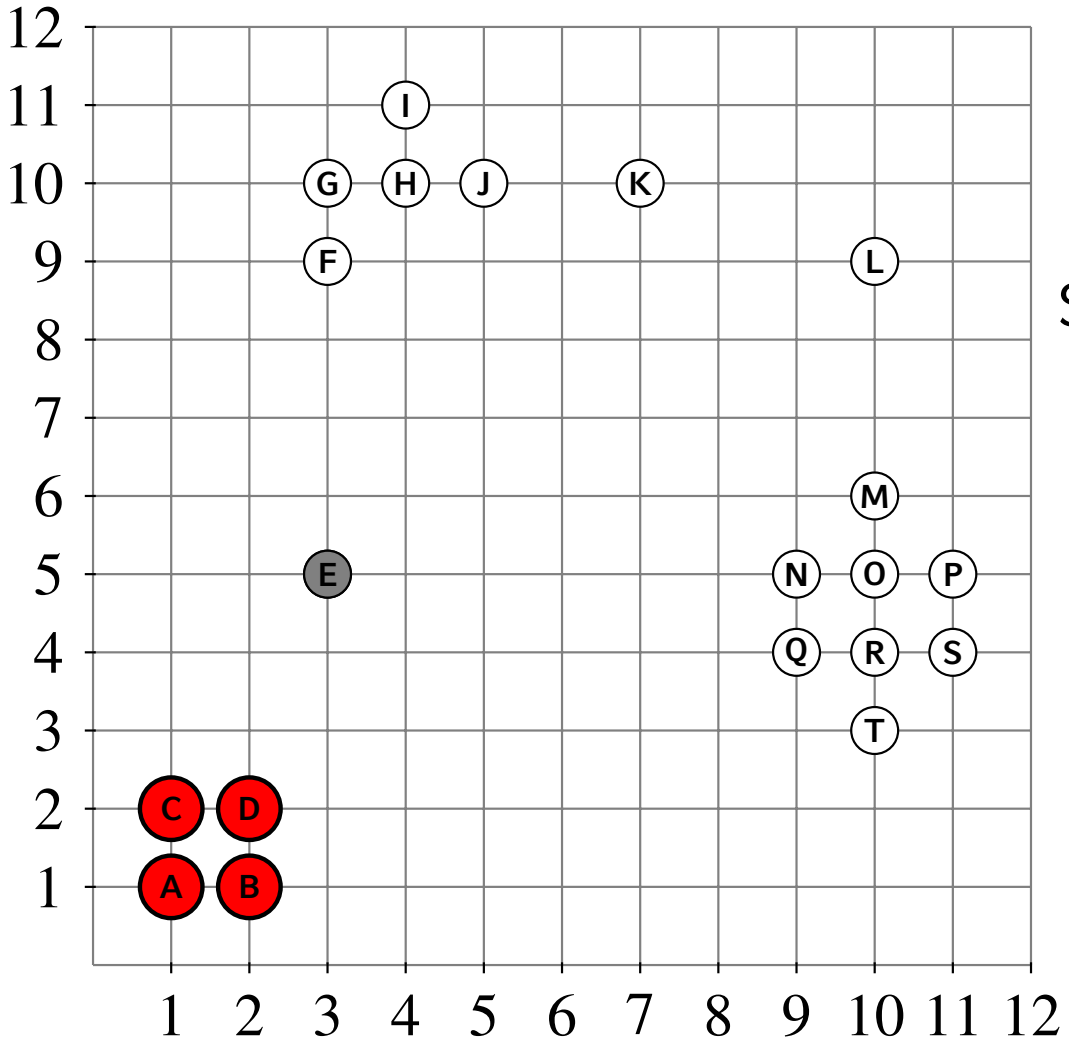
Seed list:

DBSCAN



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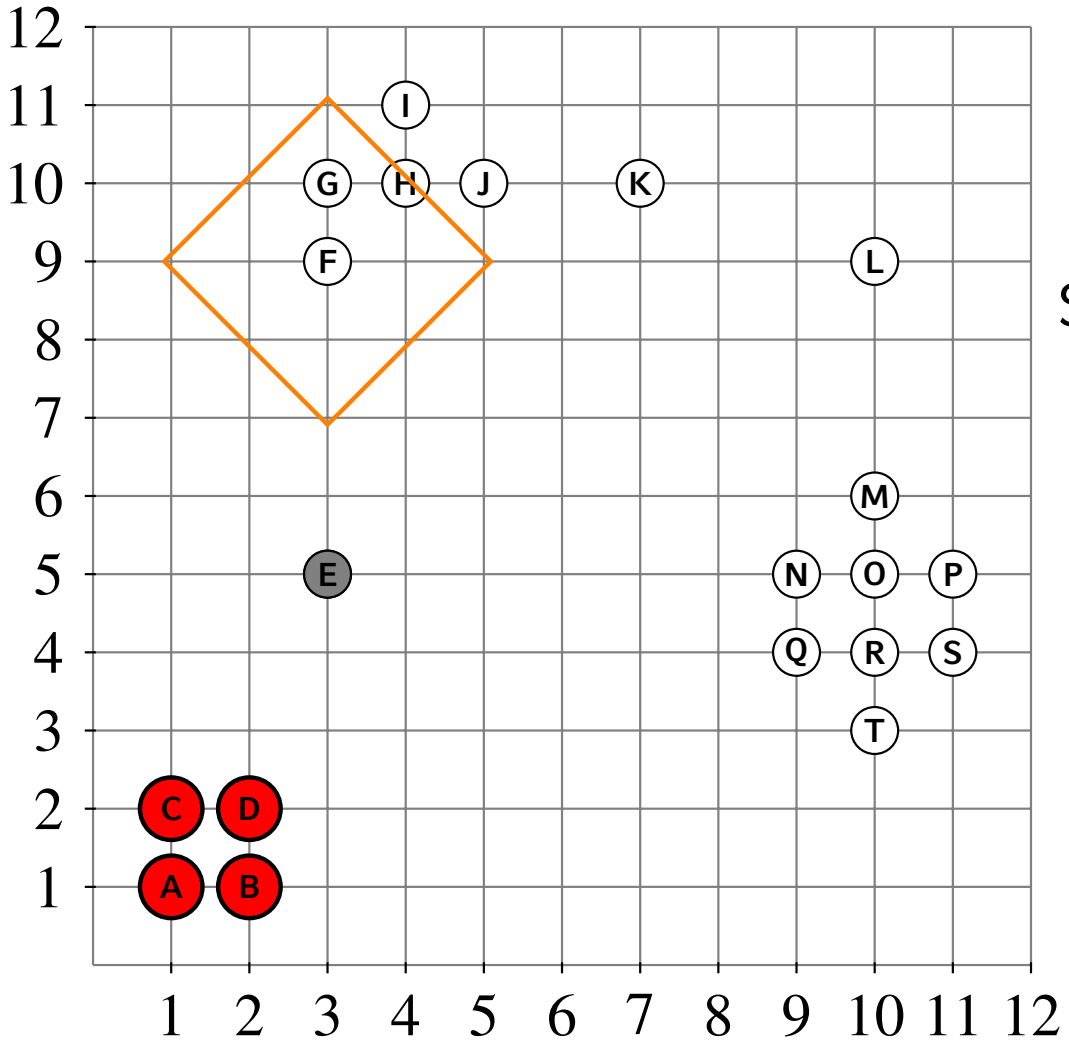
Seed list:

DBSCAN



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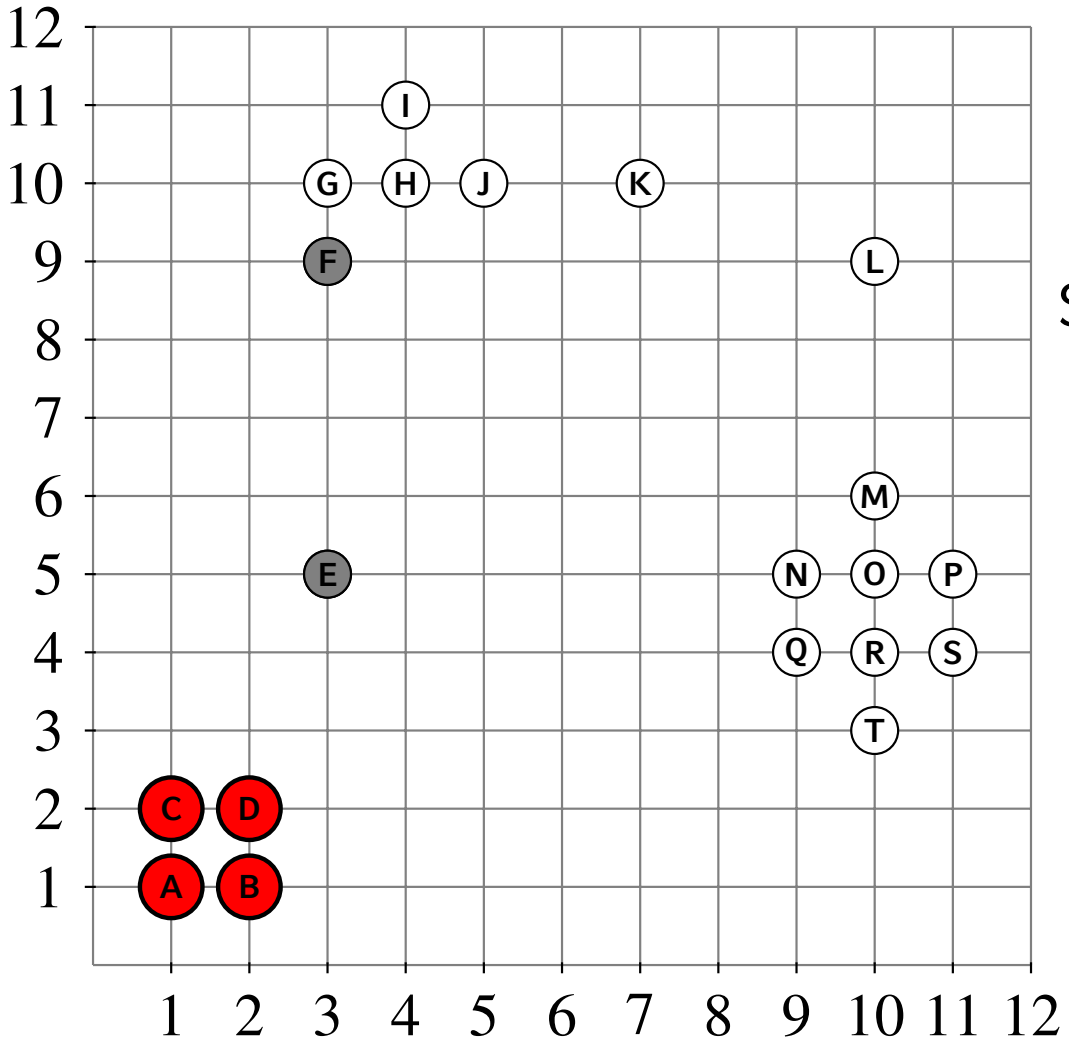
DBSCAN



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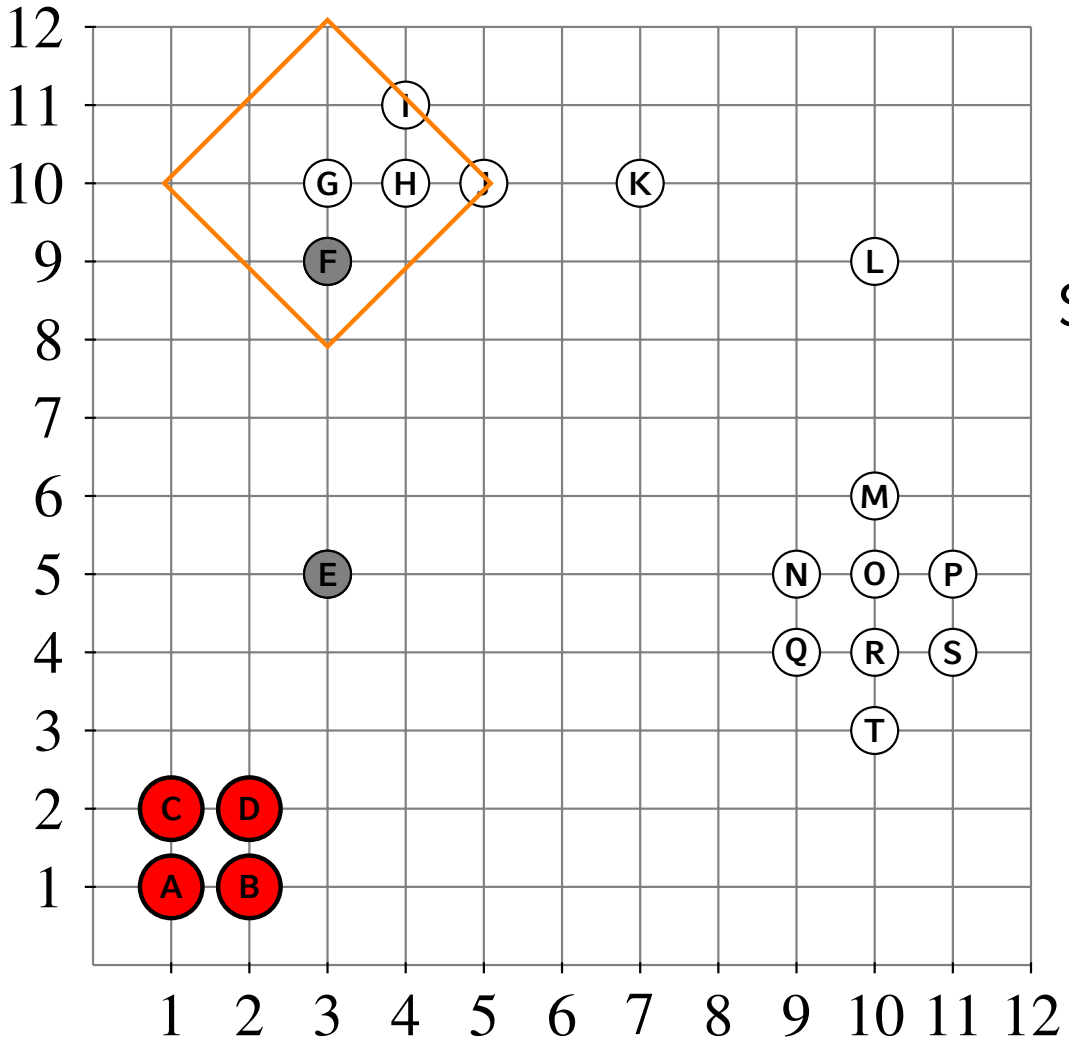

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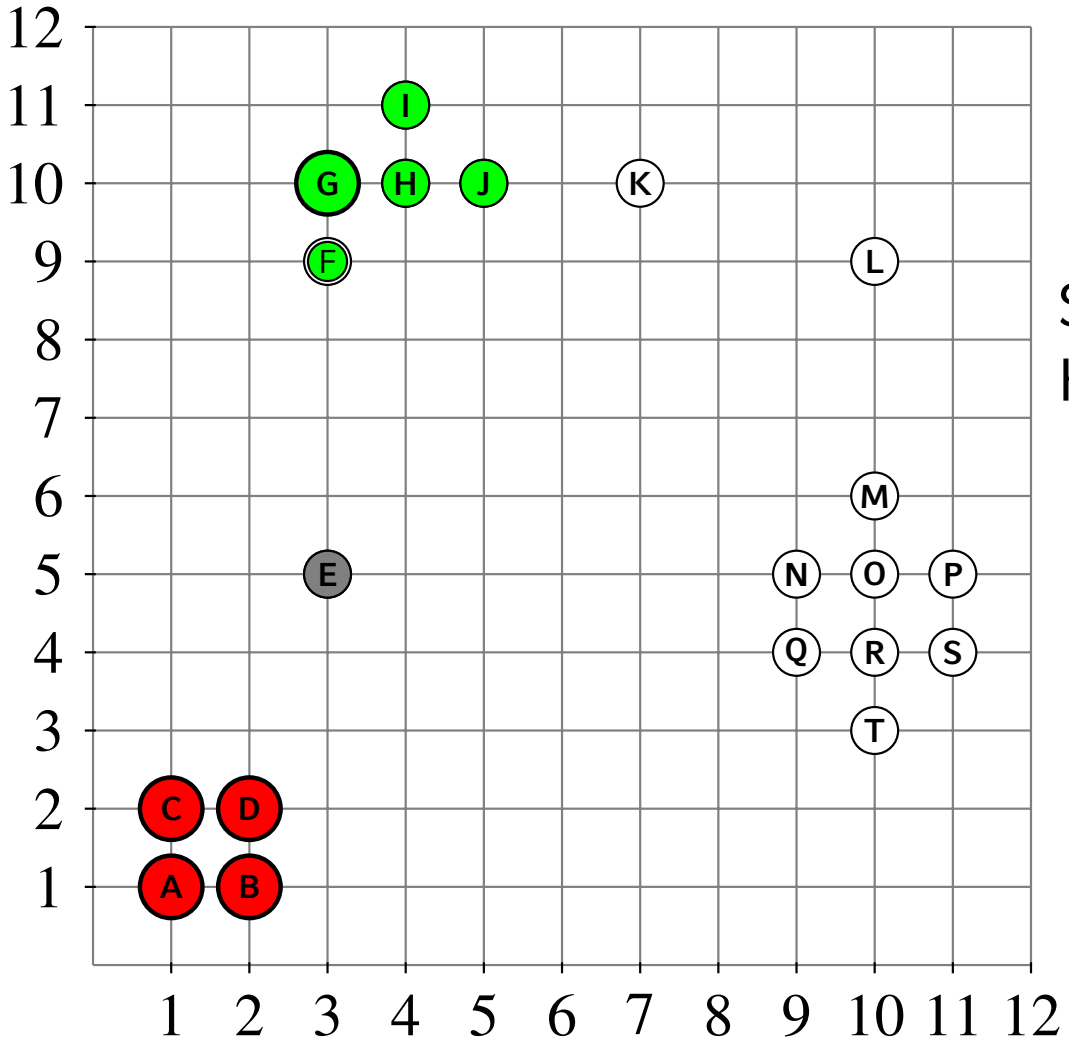
DBSCAN



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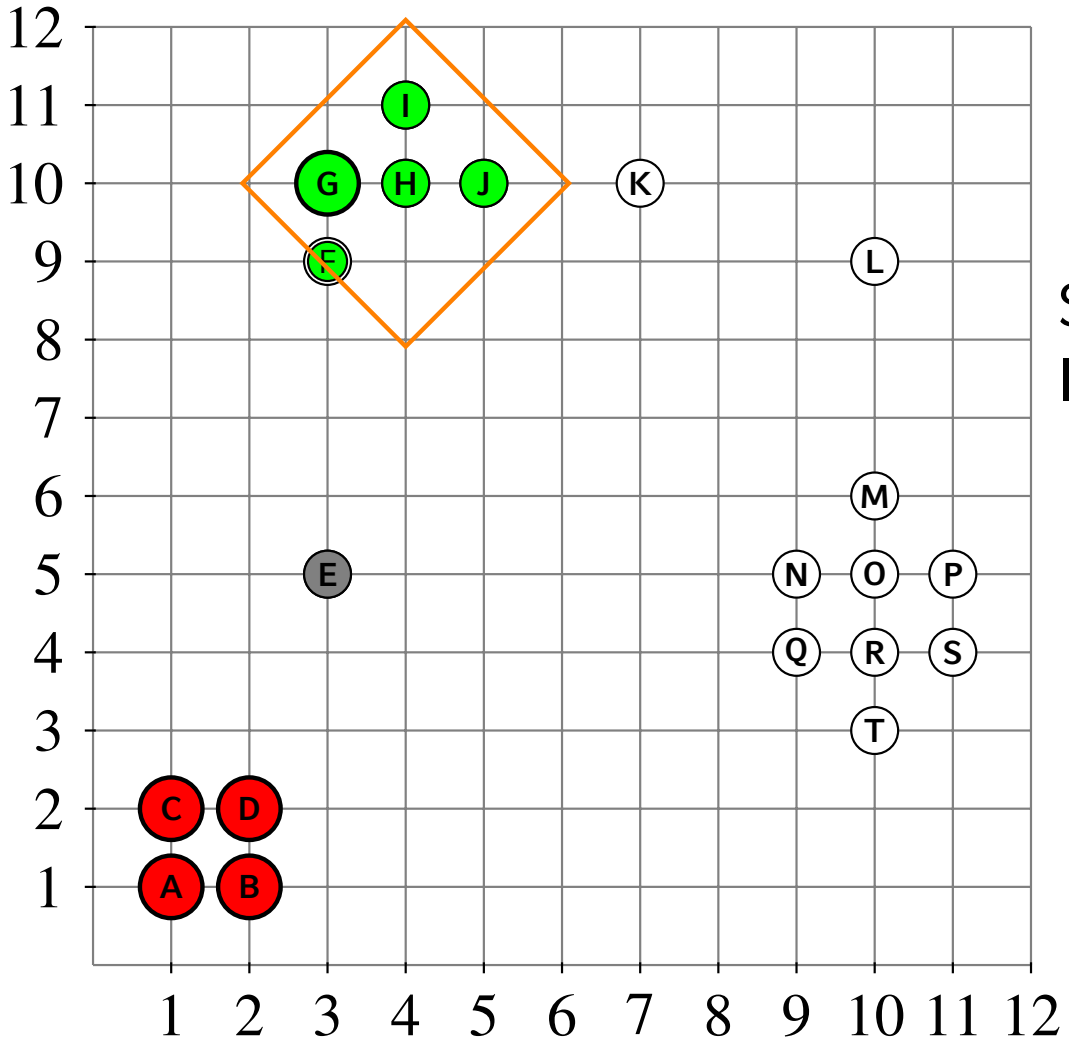
HIJ

DBSCAN



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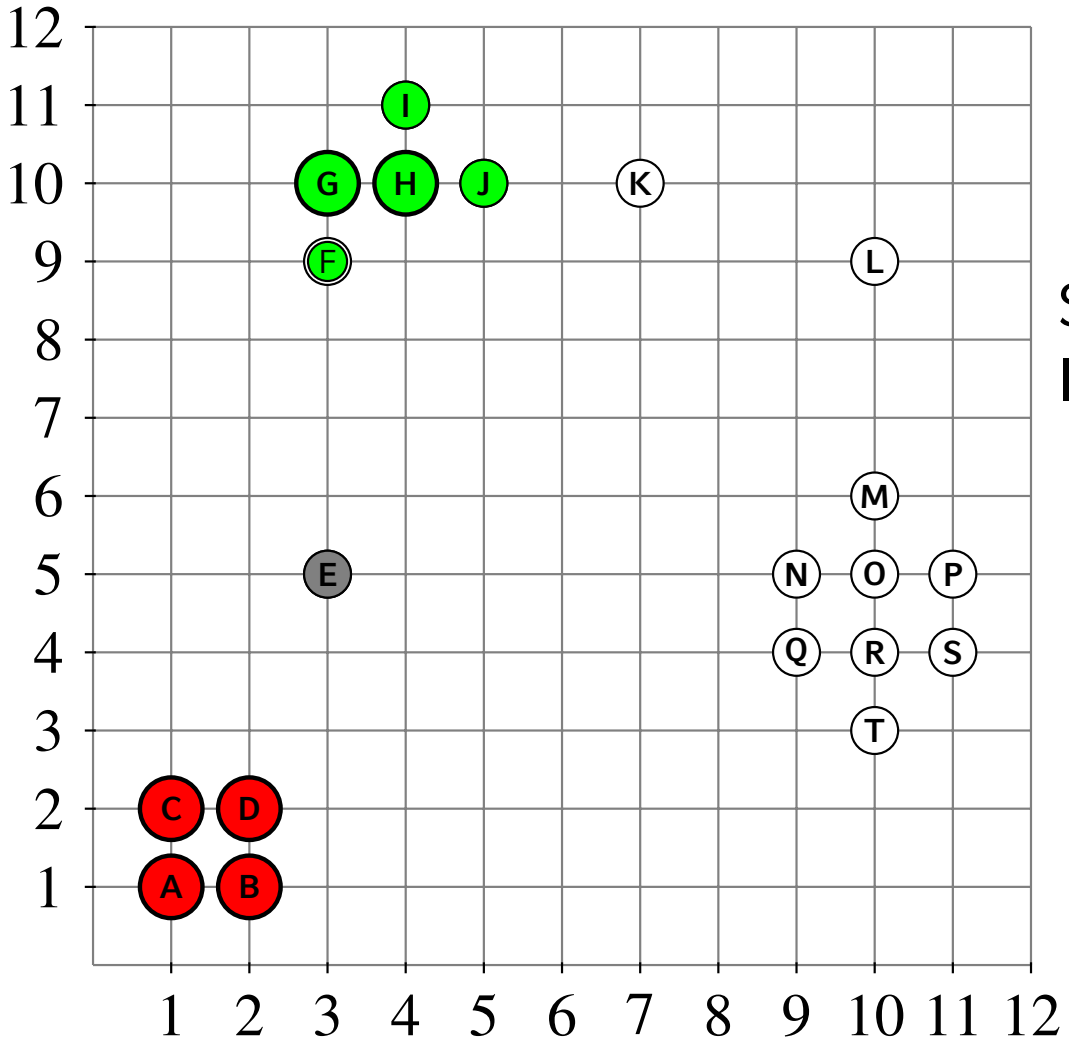
Seed list:
IJ

DBSCAN



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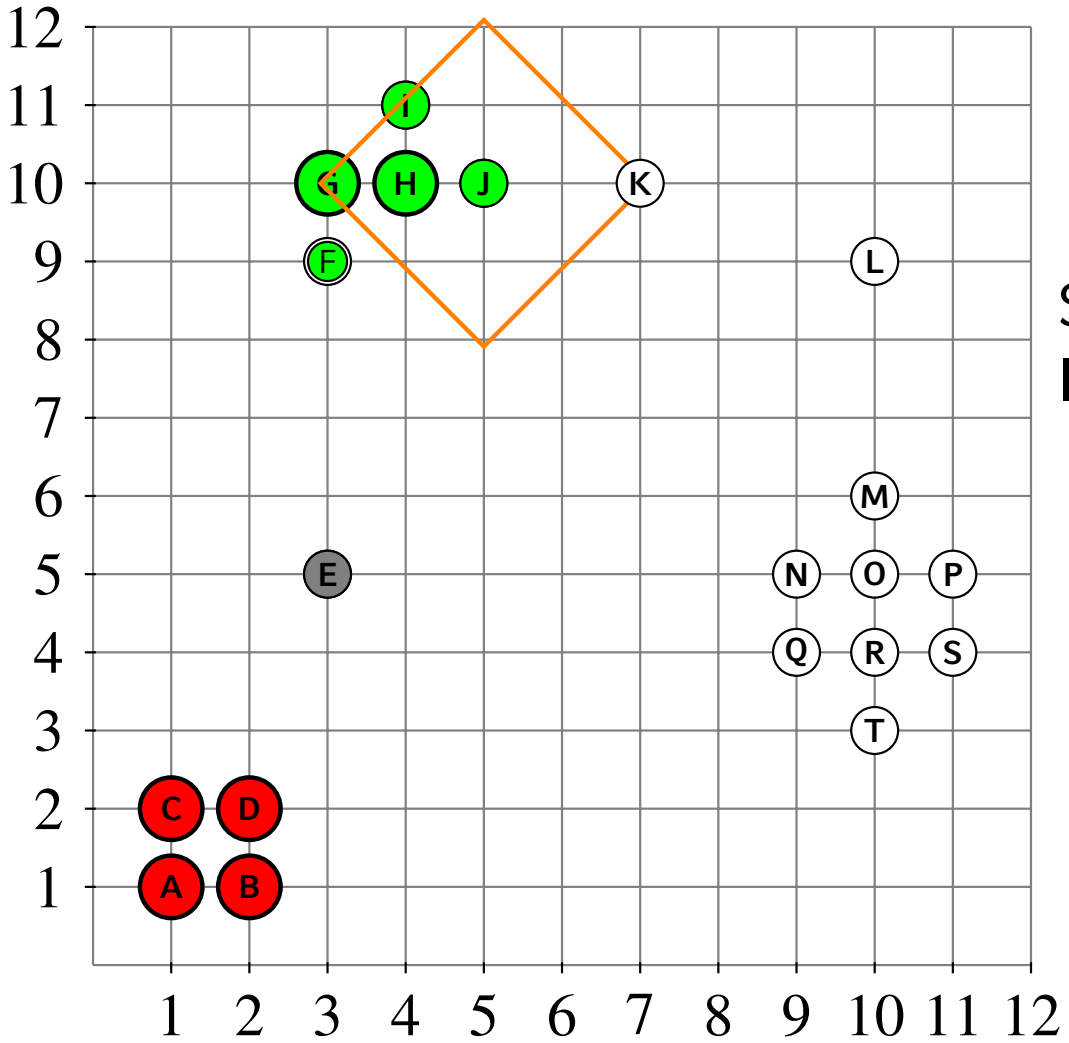
$minPts = 4$

Seed list:
IJ

DBSCAN



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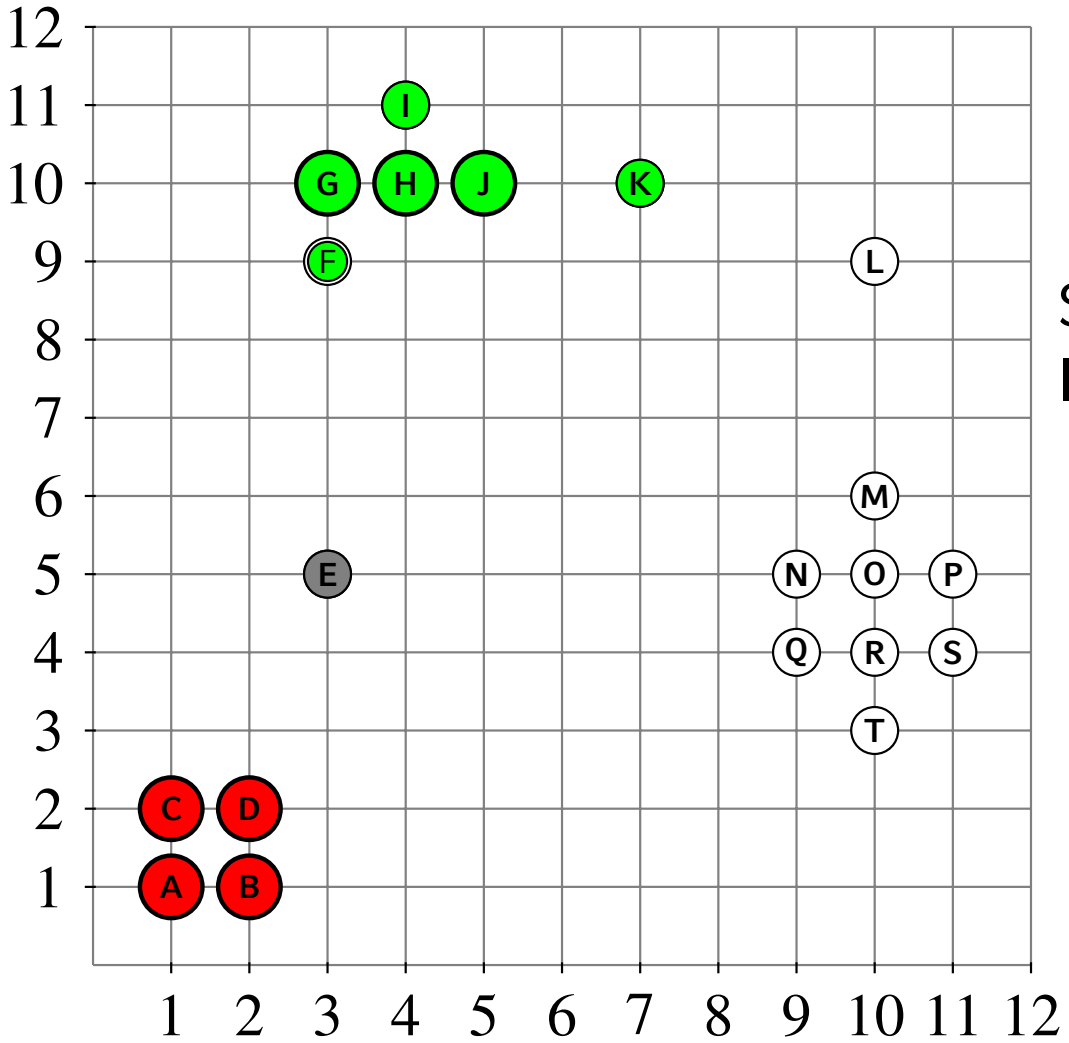
Seed list:
I

DBSCAN



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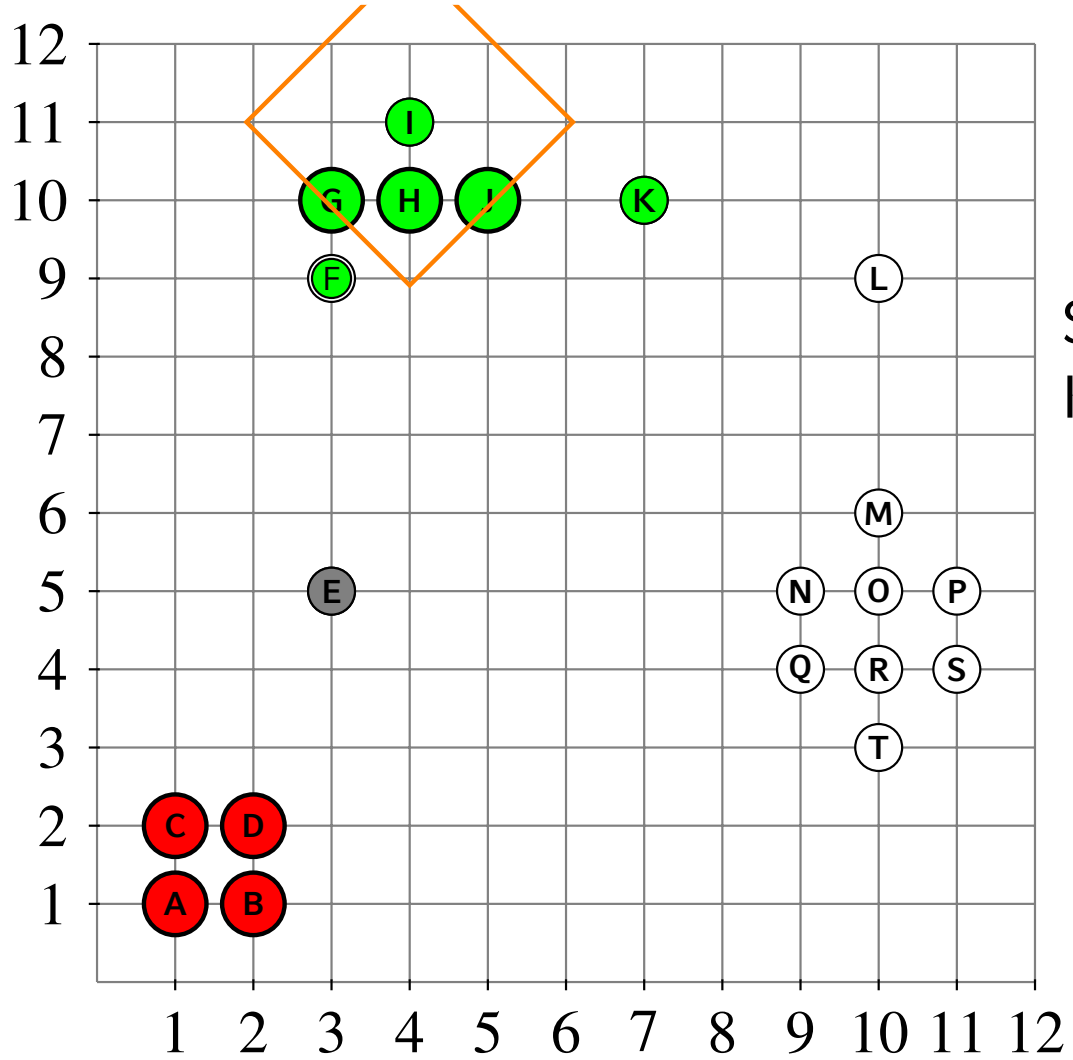
Seed list:
IK

DBSCAN



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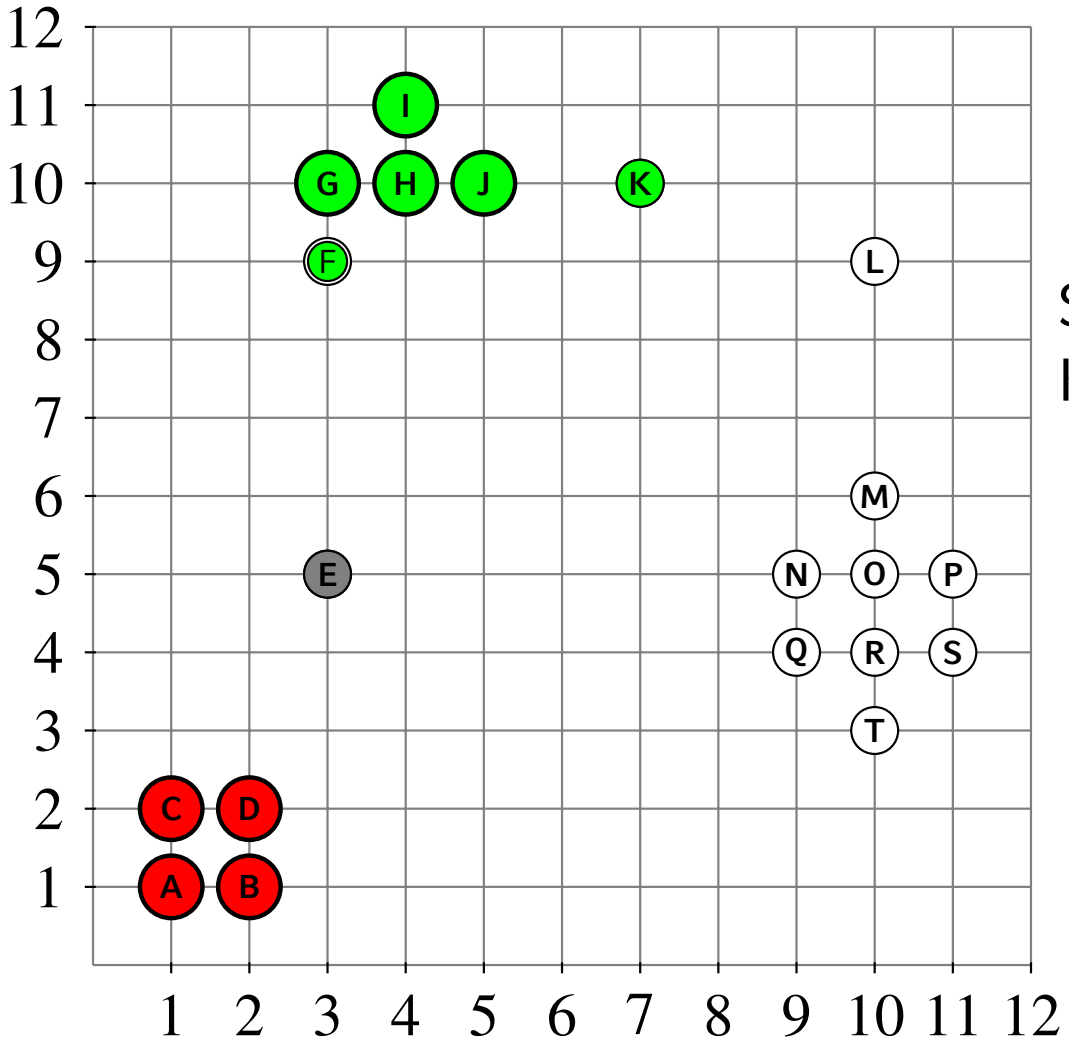
Seed list:
K

DBSCAN



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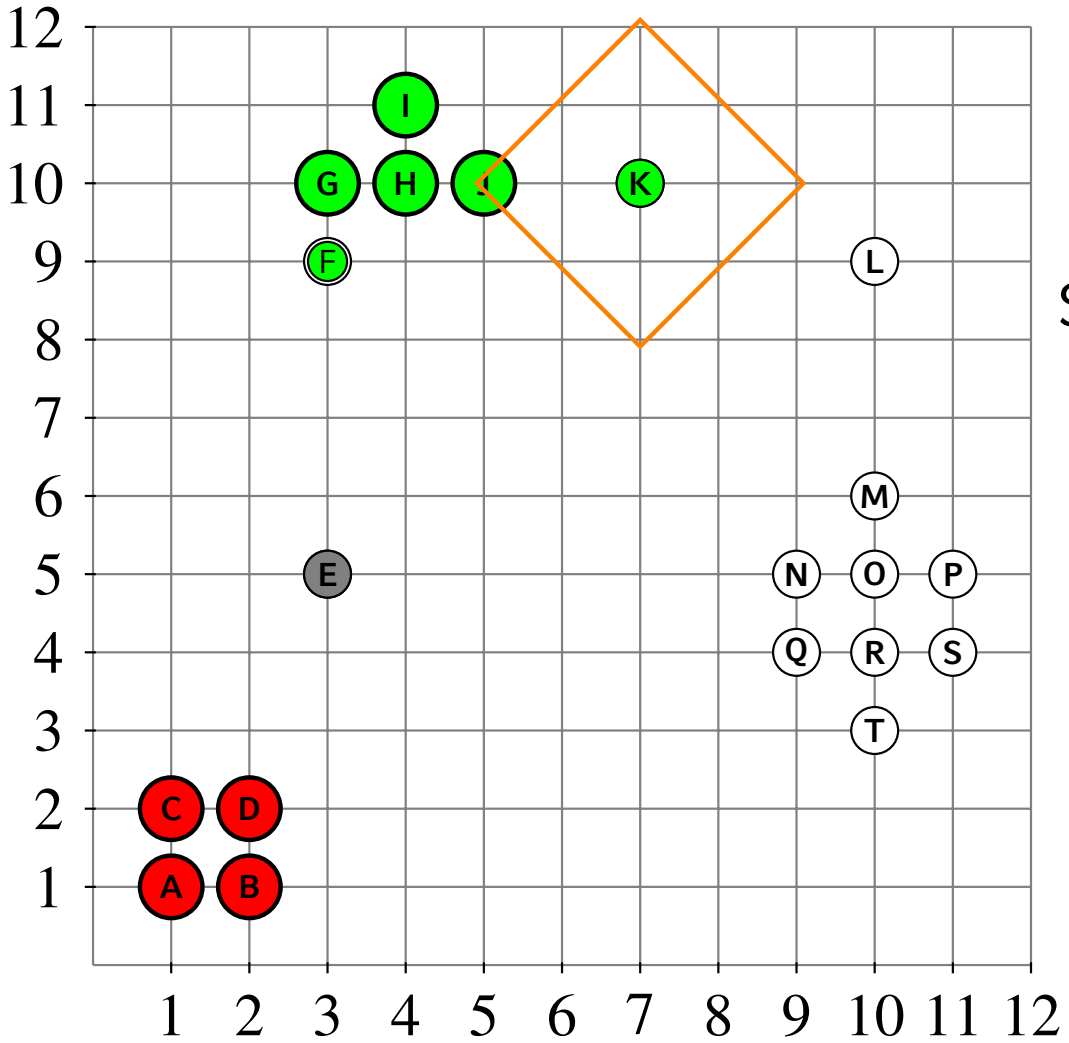
Seed list:
K

DBSCAN



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$minPts = 4$

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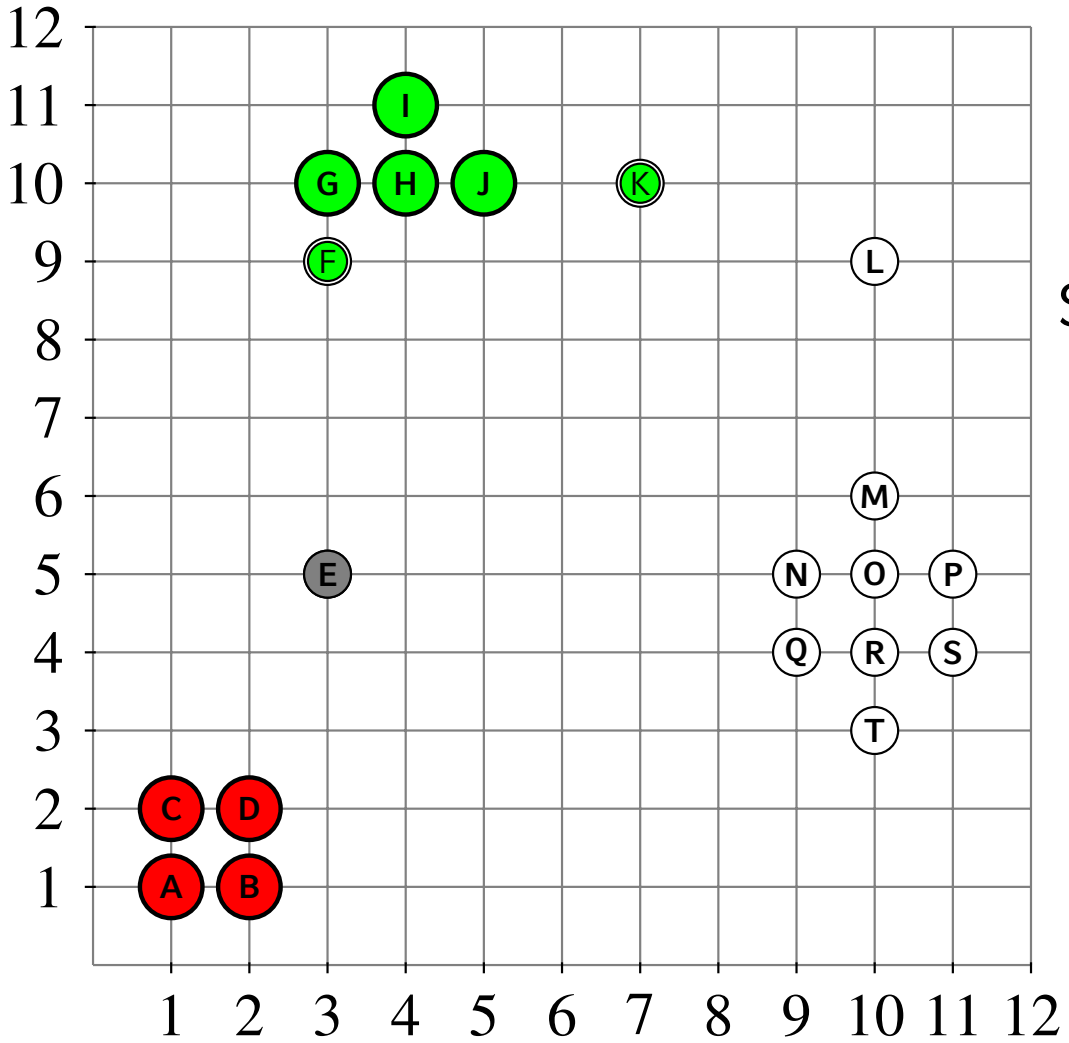
DBSCAN



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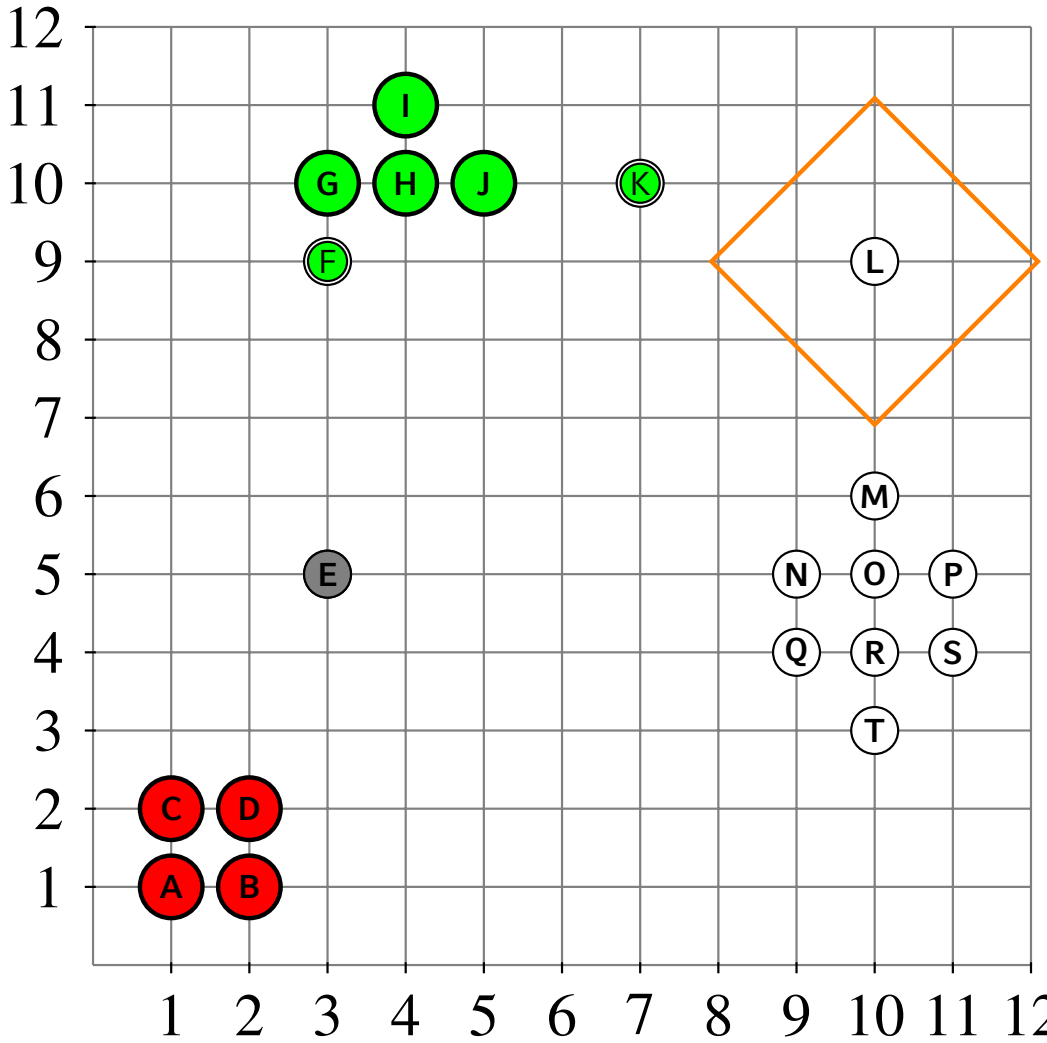
$minPts = 4$

Seed list:

DBSCAN



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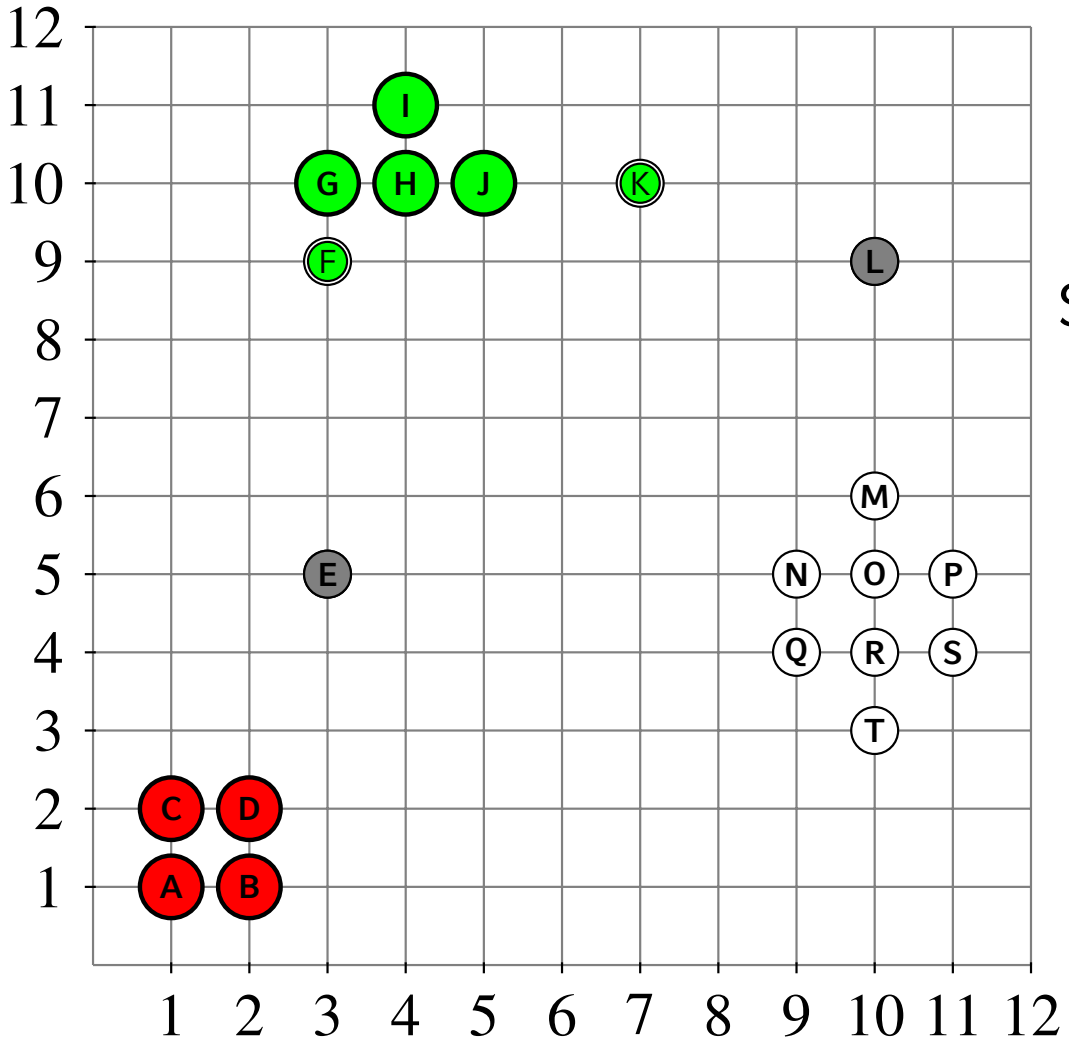
$minPts = 4$

Seed list:

DBSCAN



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$minPts = 4$

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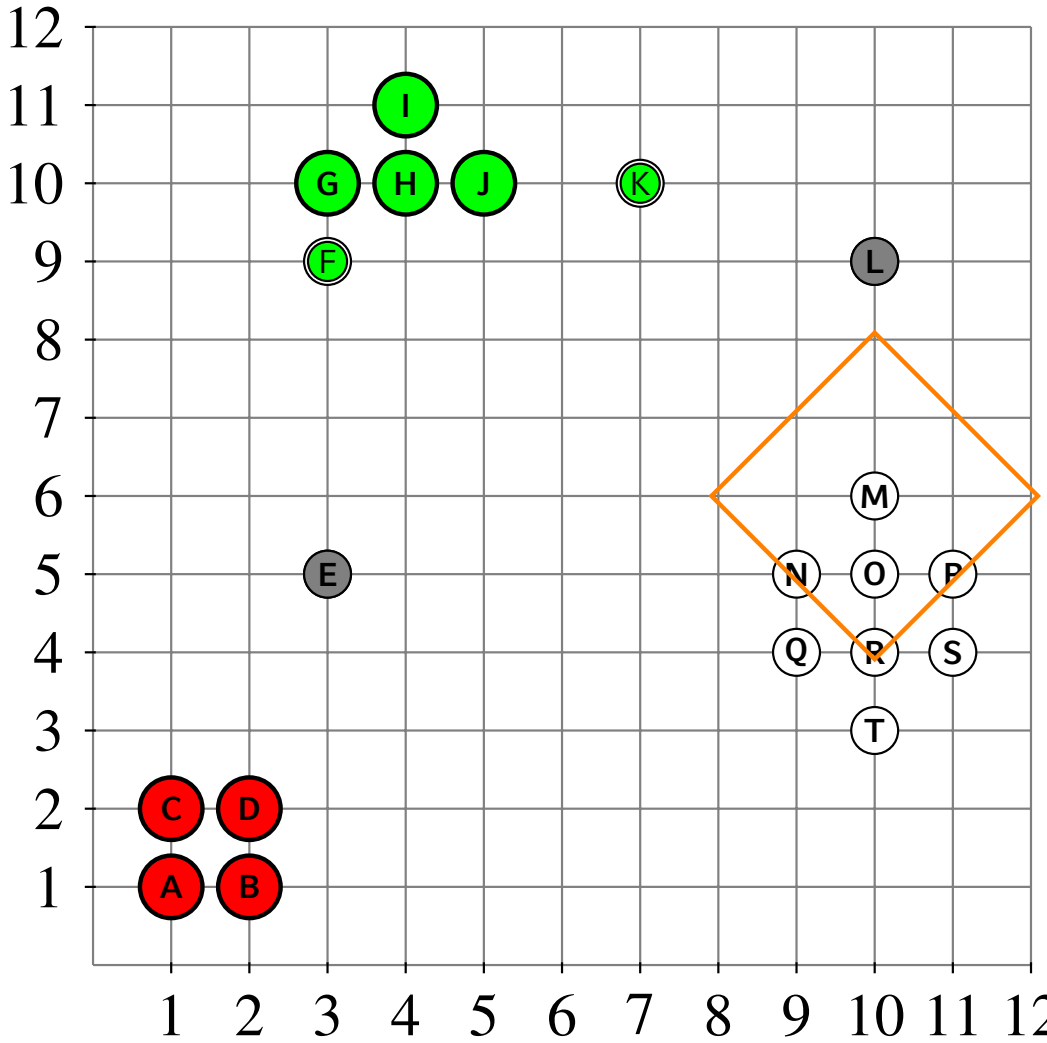
DBSCAN



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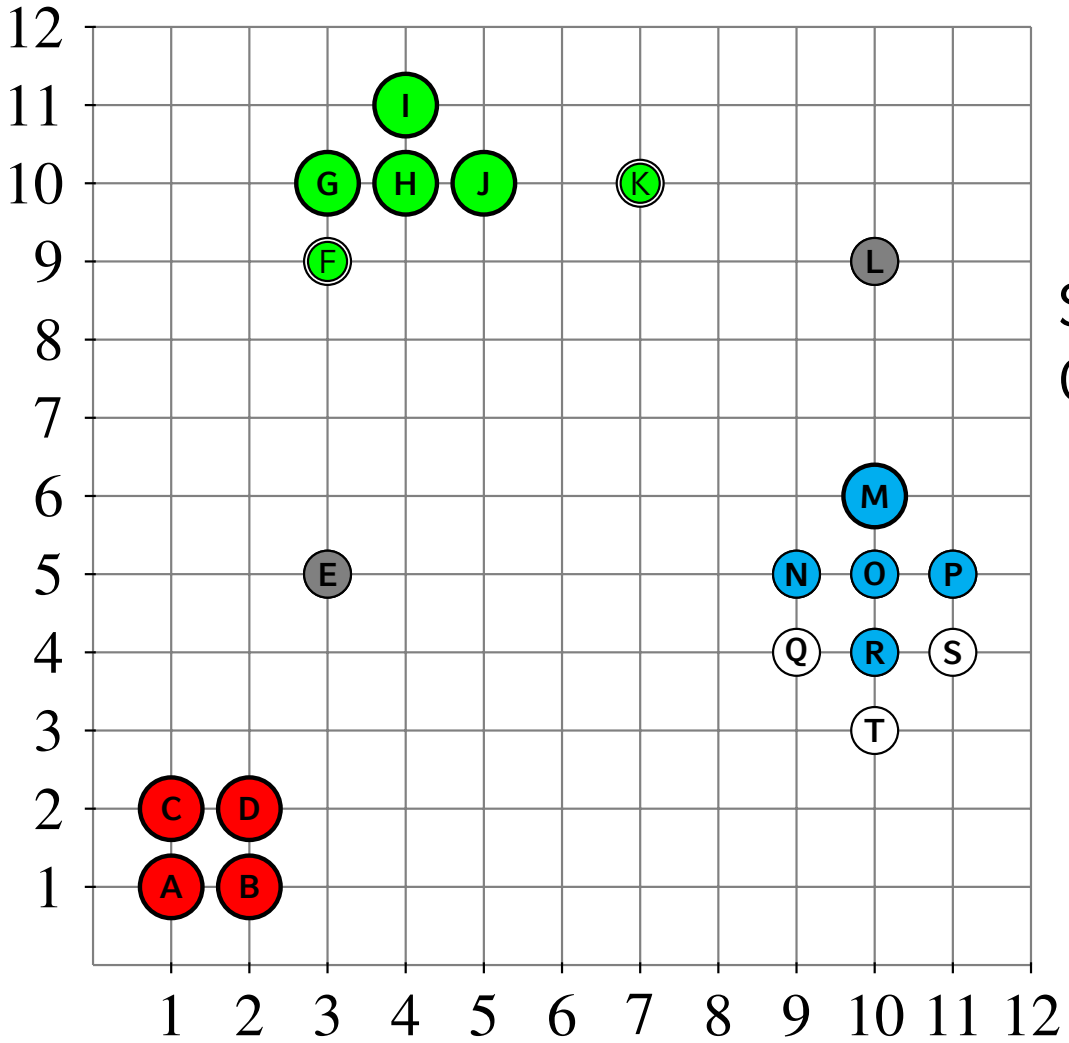
$minPts = 4$

Seed list:

DBSCAN



$\varepsilon = 2.1$

$minPts = 4$

Seed list: ONPR

DBSCAN

Data Mining Tutorial

E. Schubert, E. Ntoutsi

Aufgabe 7-1

Aufgabe 7-3

$\varepsilon = 1.1$ minPts$= 2$

$\varepsilon = 1.1$ minPts$= 3$

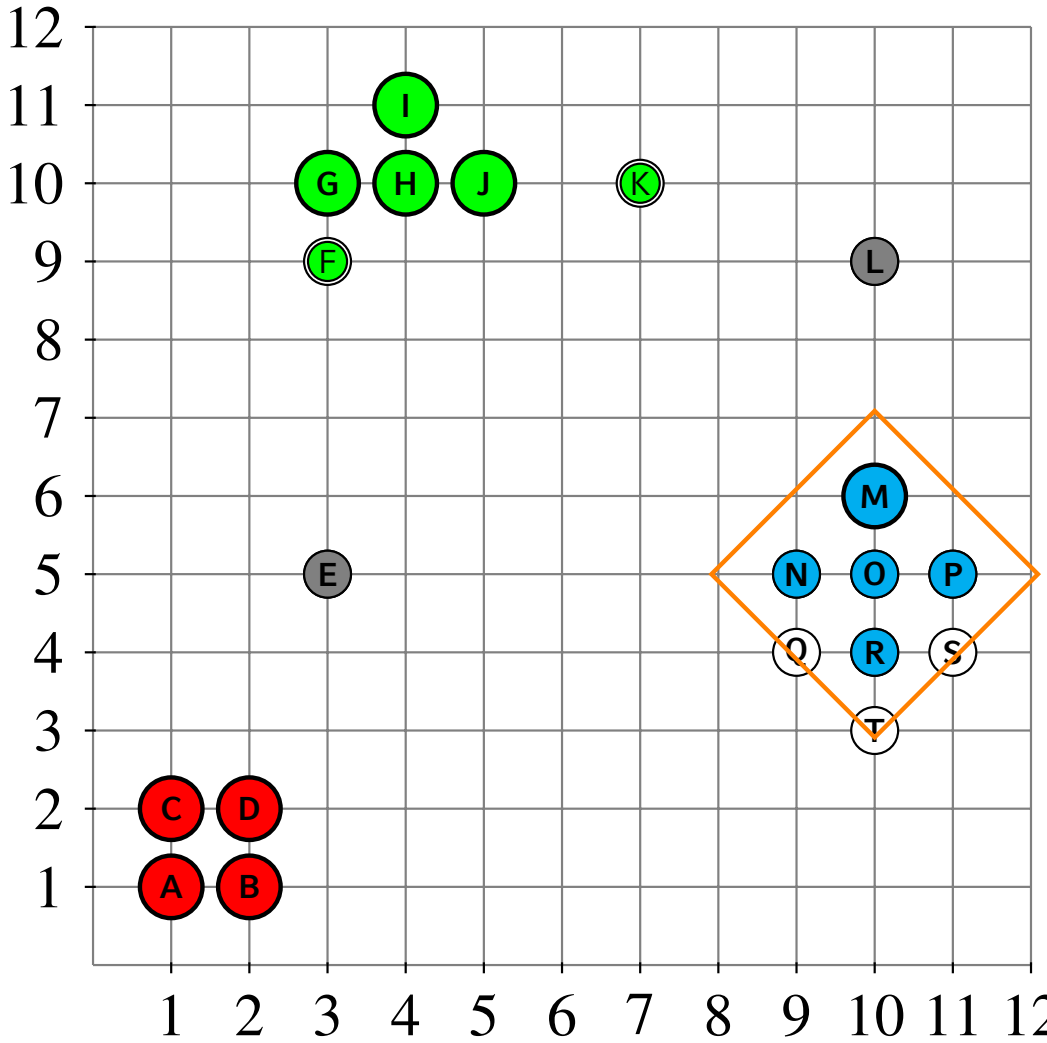
$\varepsilon = 1.1$ minPts$= 4$

$\varepsilon = 2.1$ minPts$= 4$

$\varepsilon = 4.1$ minPts$= 5$

$\varepsilon = 4.1$ minPts$= 4$

DBSCAN and Single-Link



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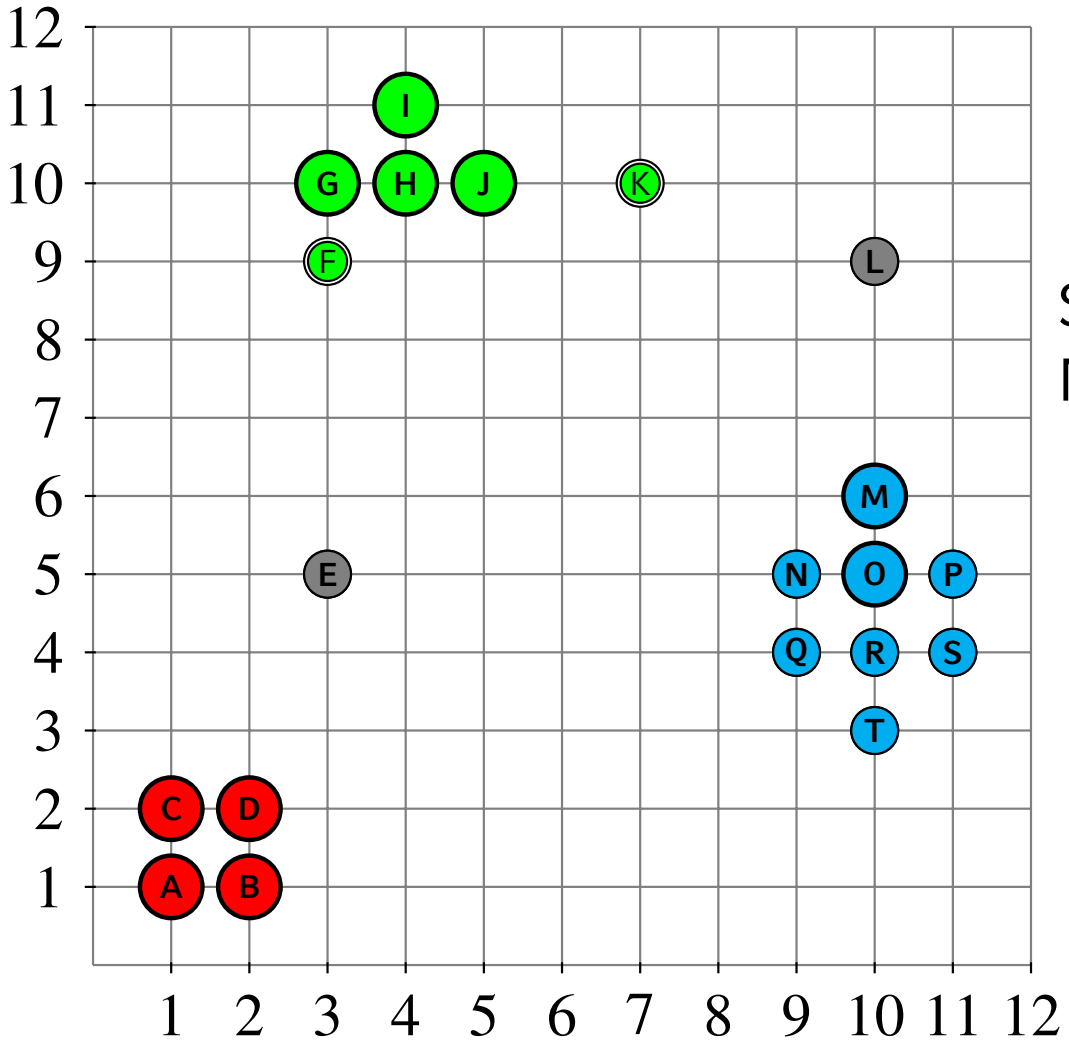
Seed list:
NPR

DBSCAN



$\varepsilon = 2.1$

$minPts = 4$

Seed list:
NPRQST

DBSCAN

Data Mining Tutorial

E. Schubert, E. Ntoutsi

Aufgabe 7-1

Aufgabe 7-3

$\varepsilon = 1.1$ minPts$= 2$

$\varepsilon = 1.1$ minPts$= 3$

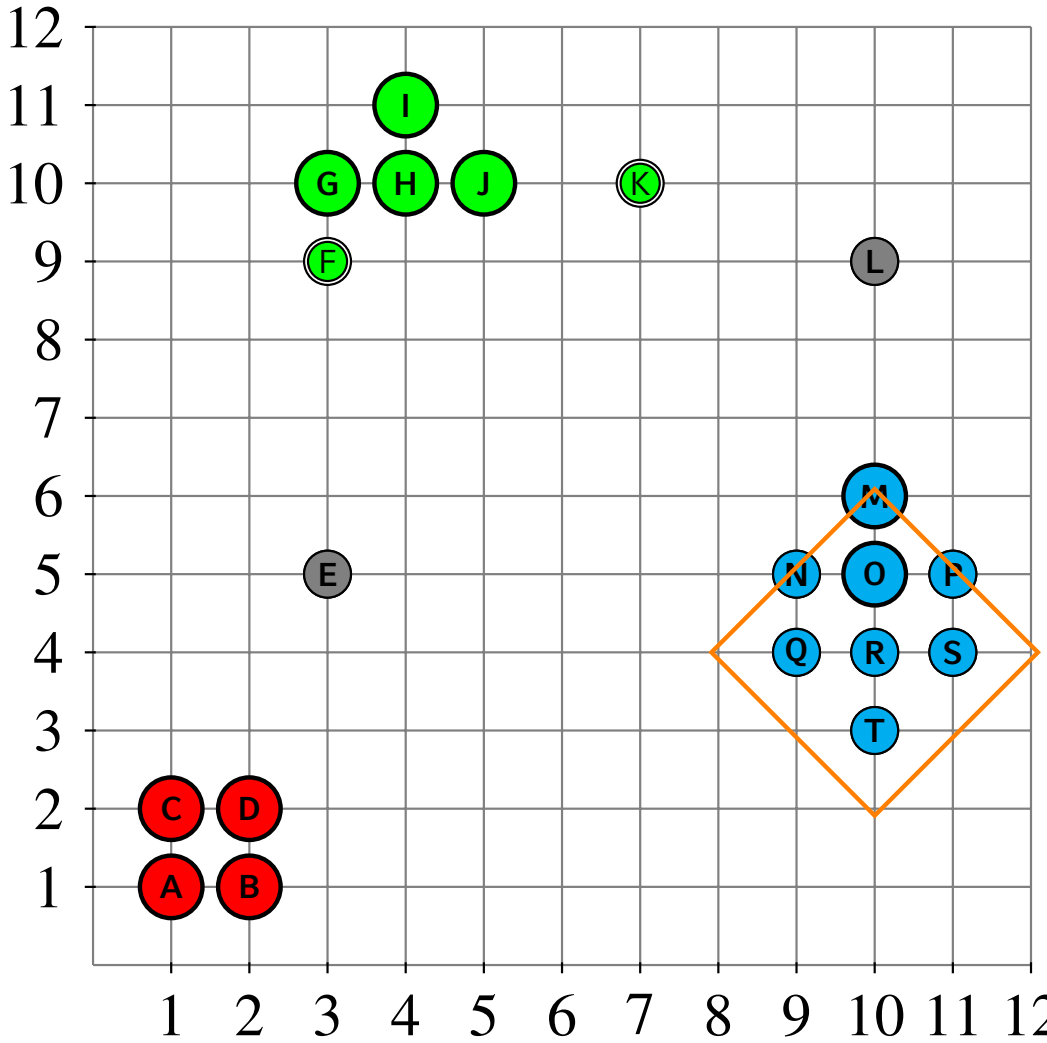
$\varepsilon = 1.1$ minPts$= 4$

$\varepsilon = 2.1$ minPts$= 4$

$\varepsilon = 4.1$ minPts$= 5$

$\varepsilon = 4.1$ minPts$= 4$

DBSCAN and Single-Link



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$minPts = 4$

Seed list: NPQST

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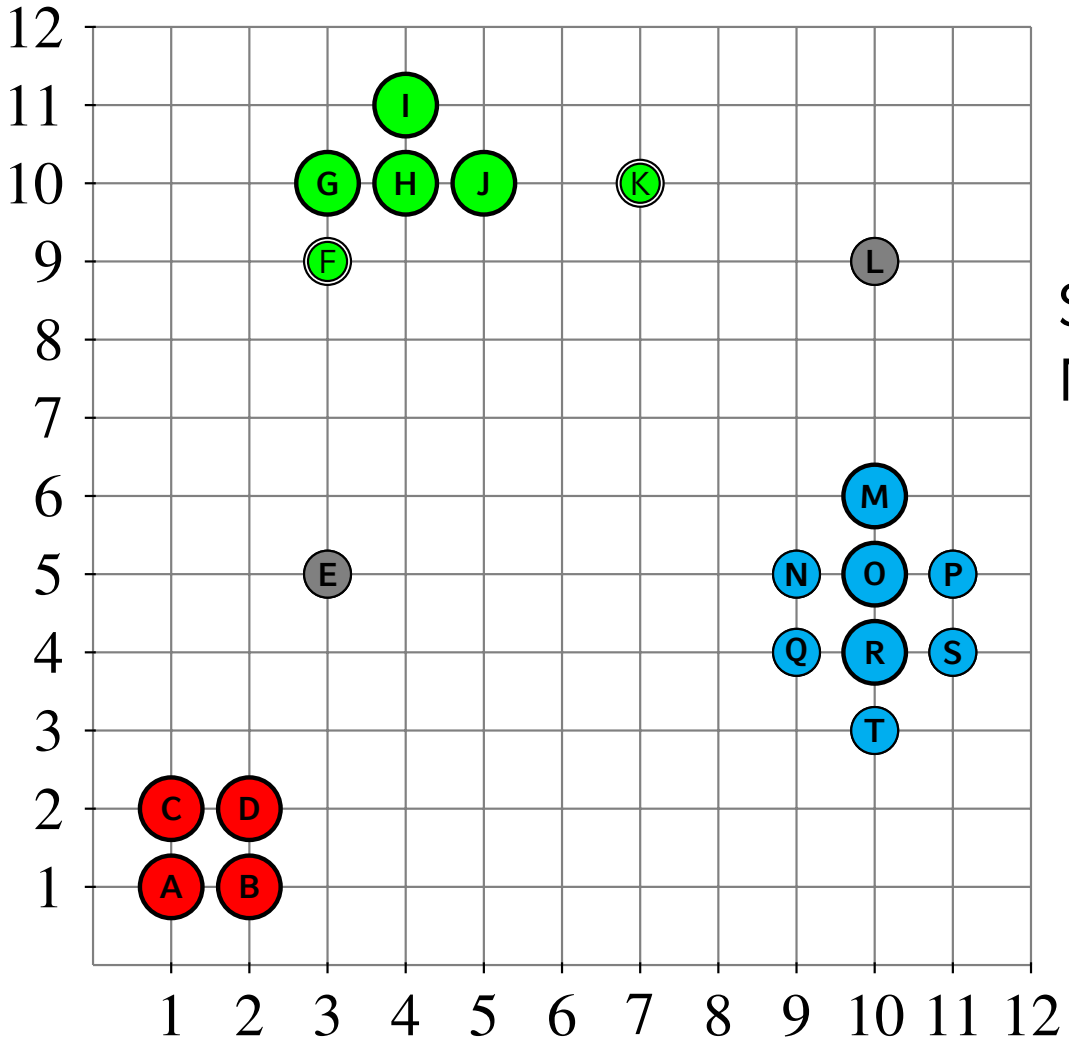

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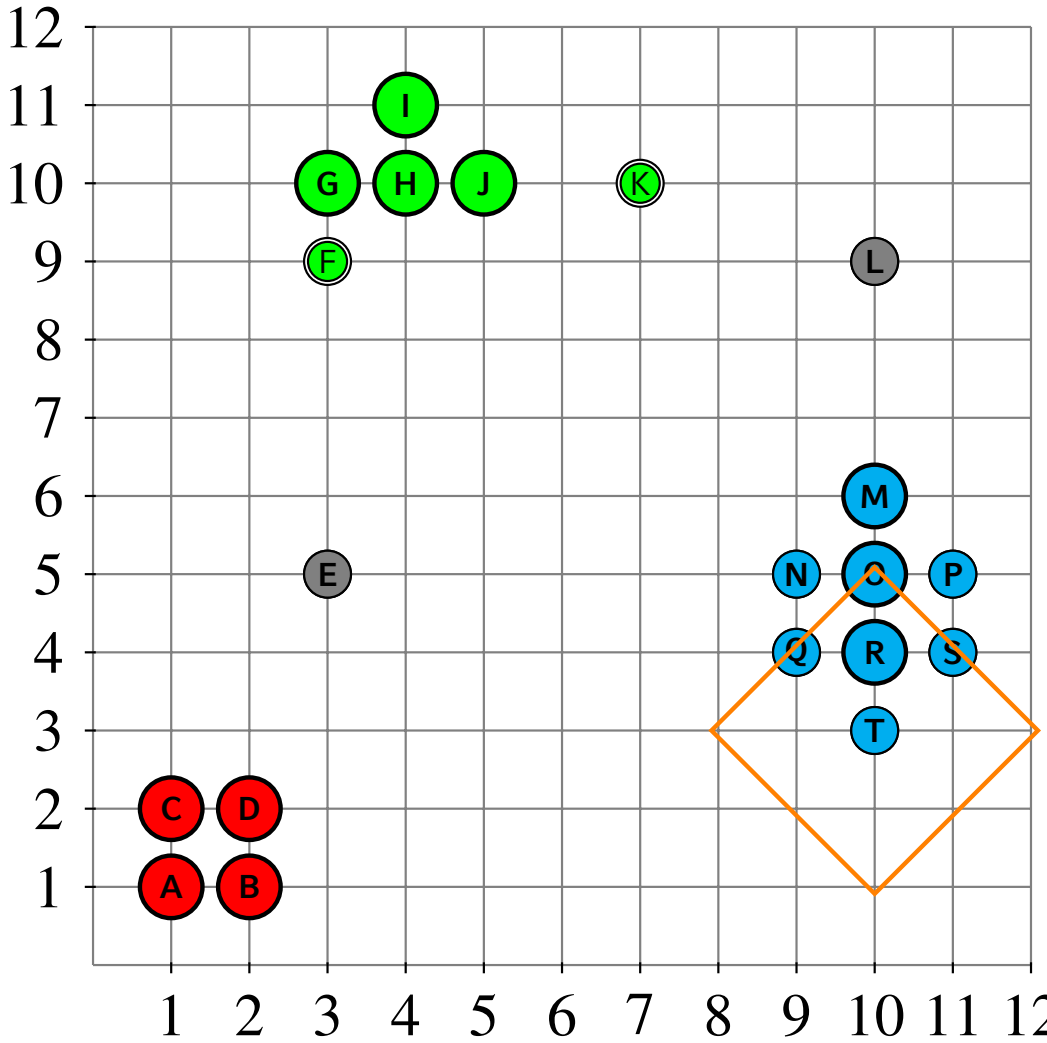
Seed list:
NPQST

DBSCAN



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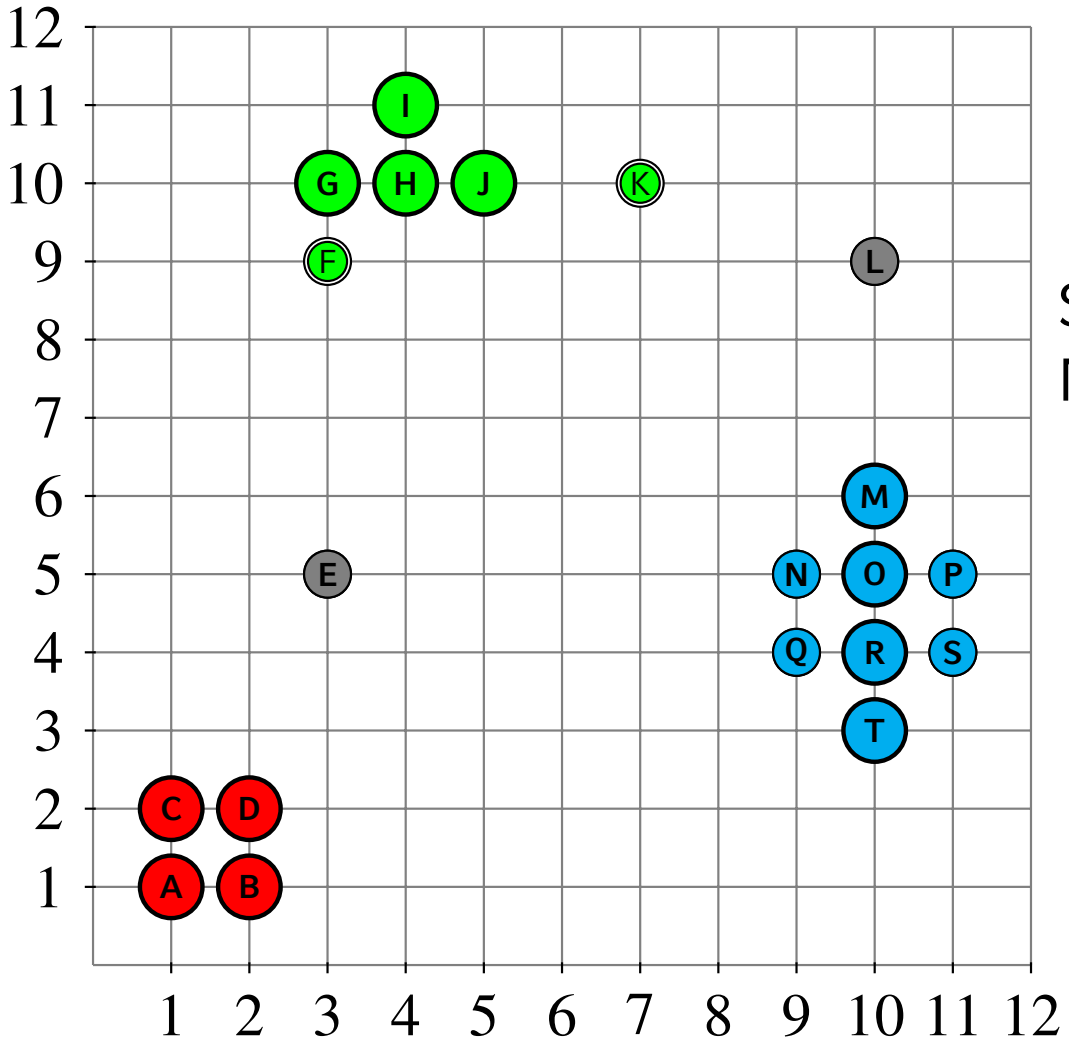
Seed list: NPQS

DBSCAN



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Seed list: NPQS

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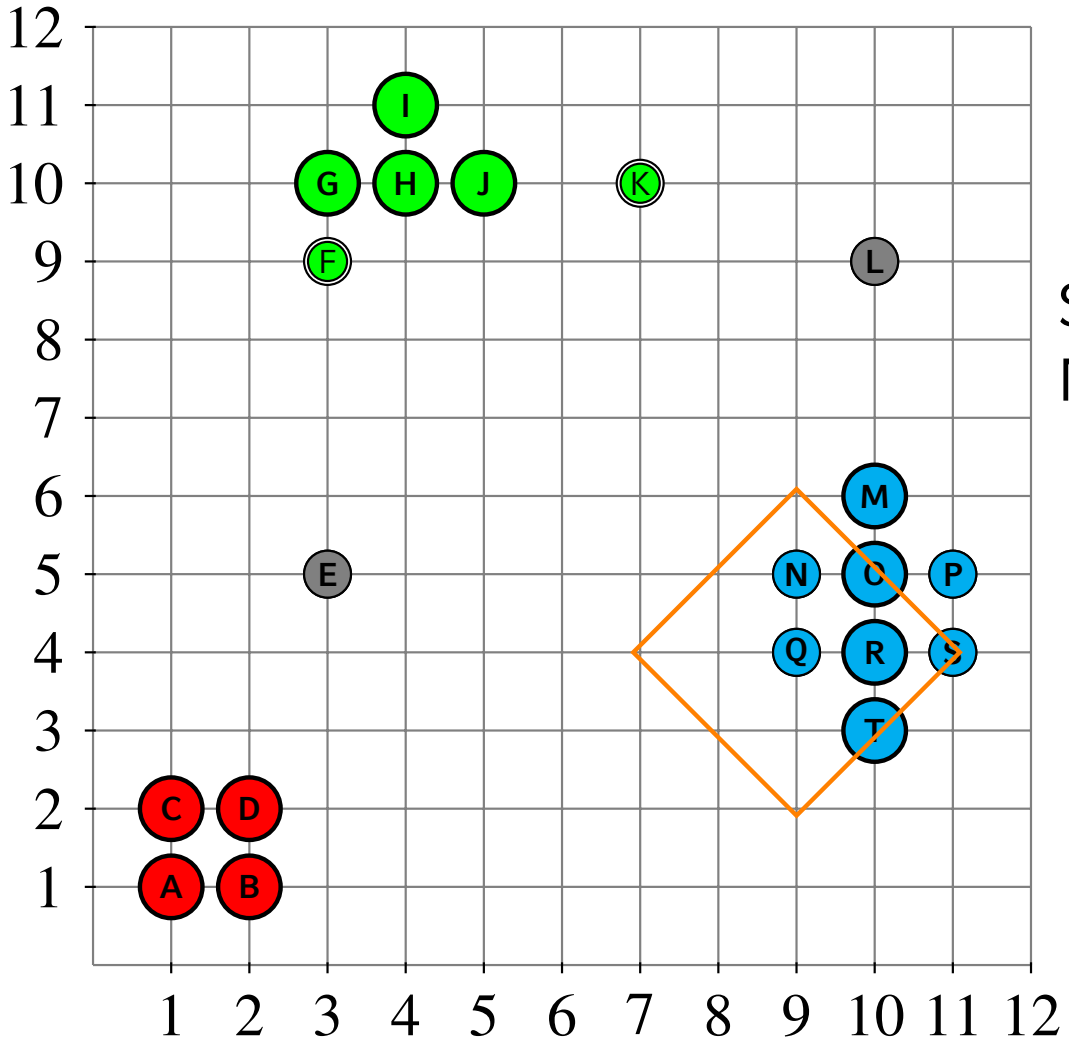

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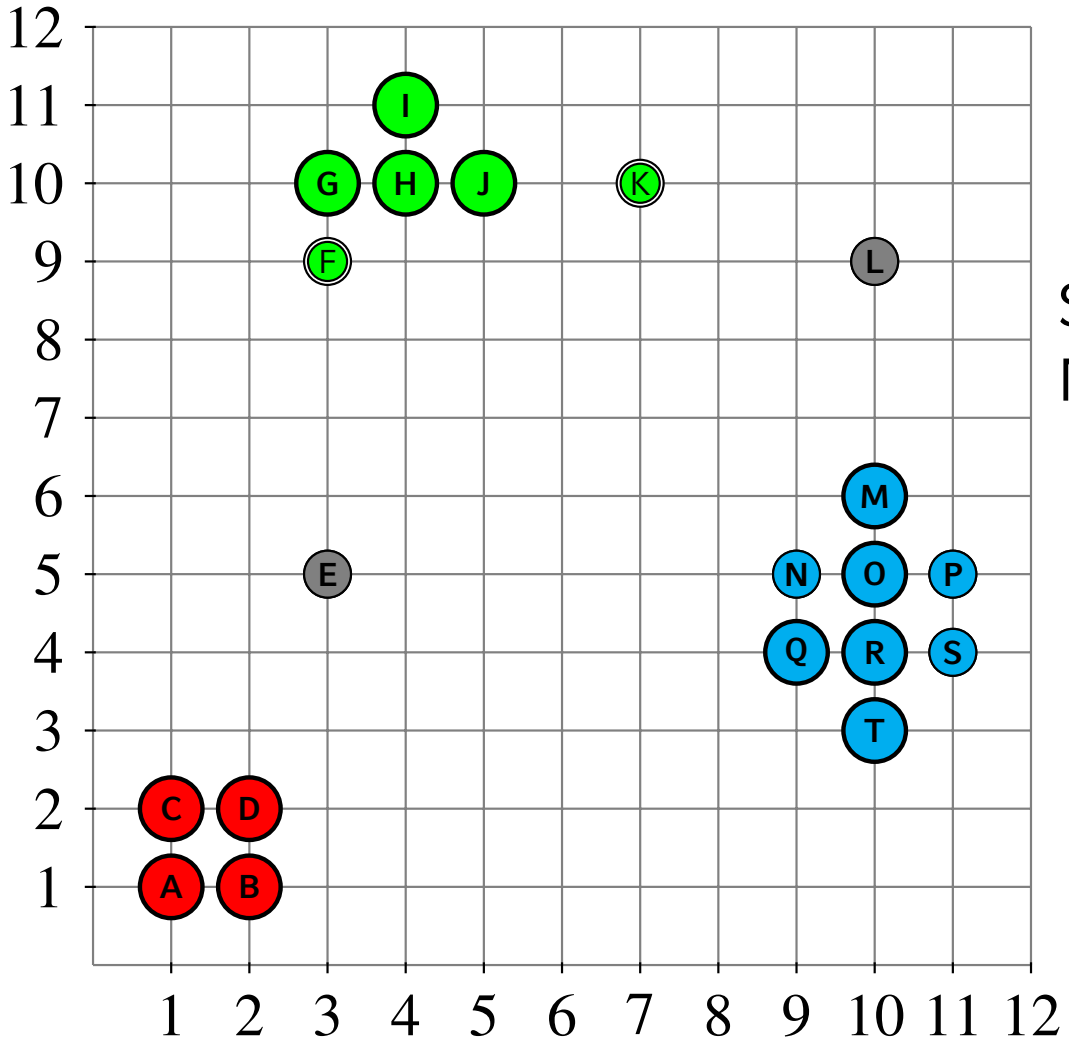
$minPts = 4$

Seed list: NPS

DBSCAN



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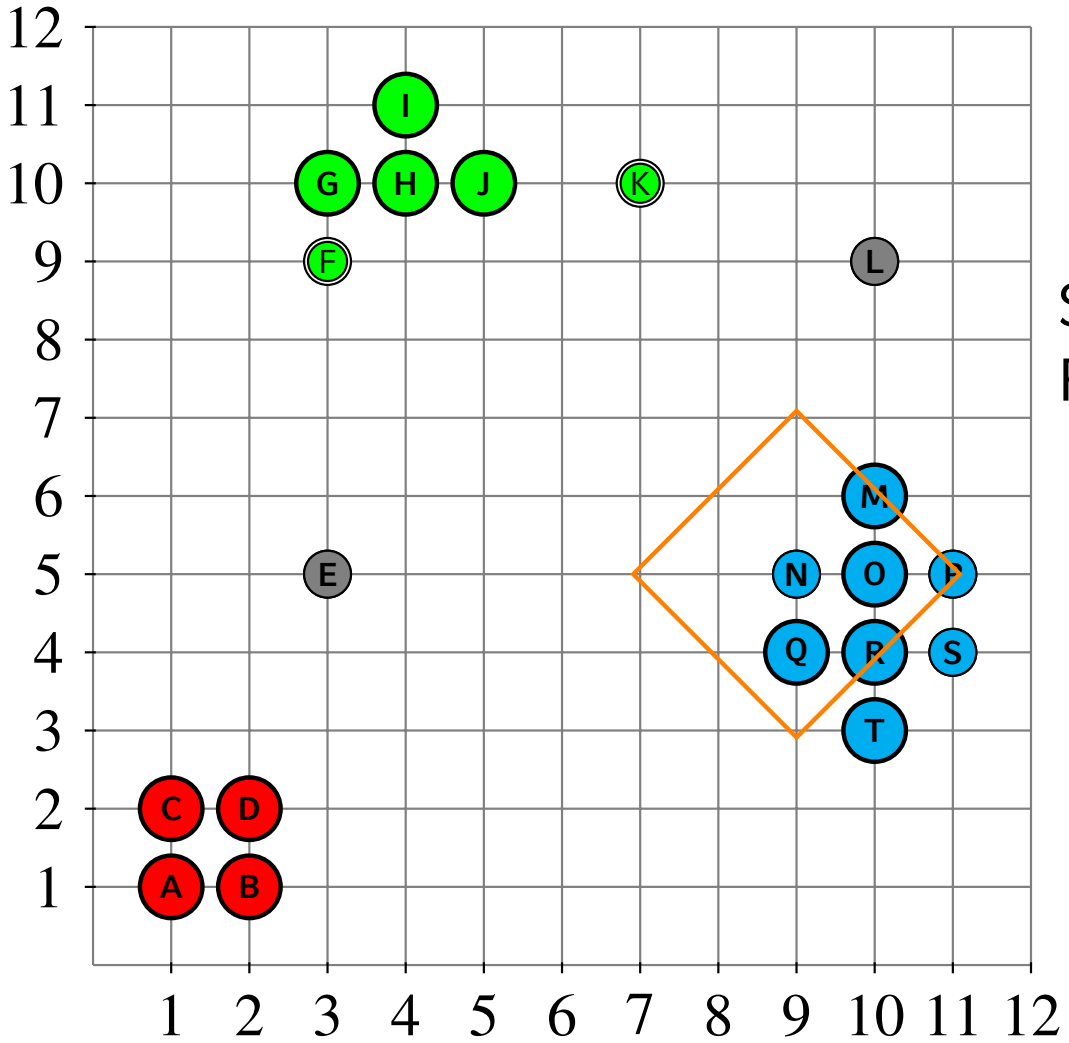
$minPts = 4$

Seed list:
NPS

DBSCAN



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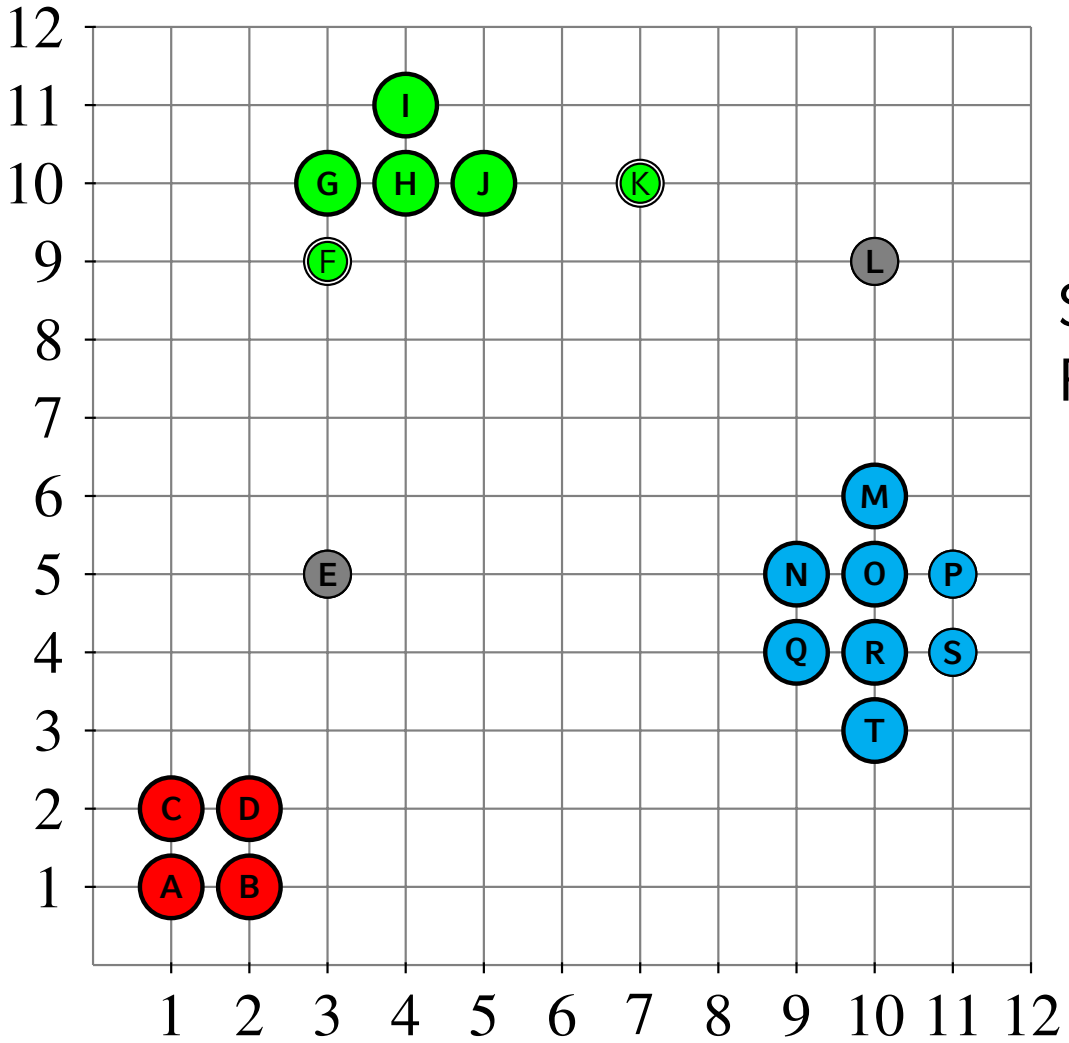
$minPts = 4$

Seed list:
PS

DBSCAN



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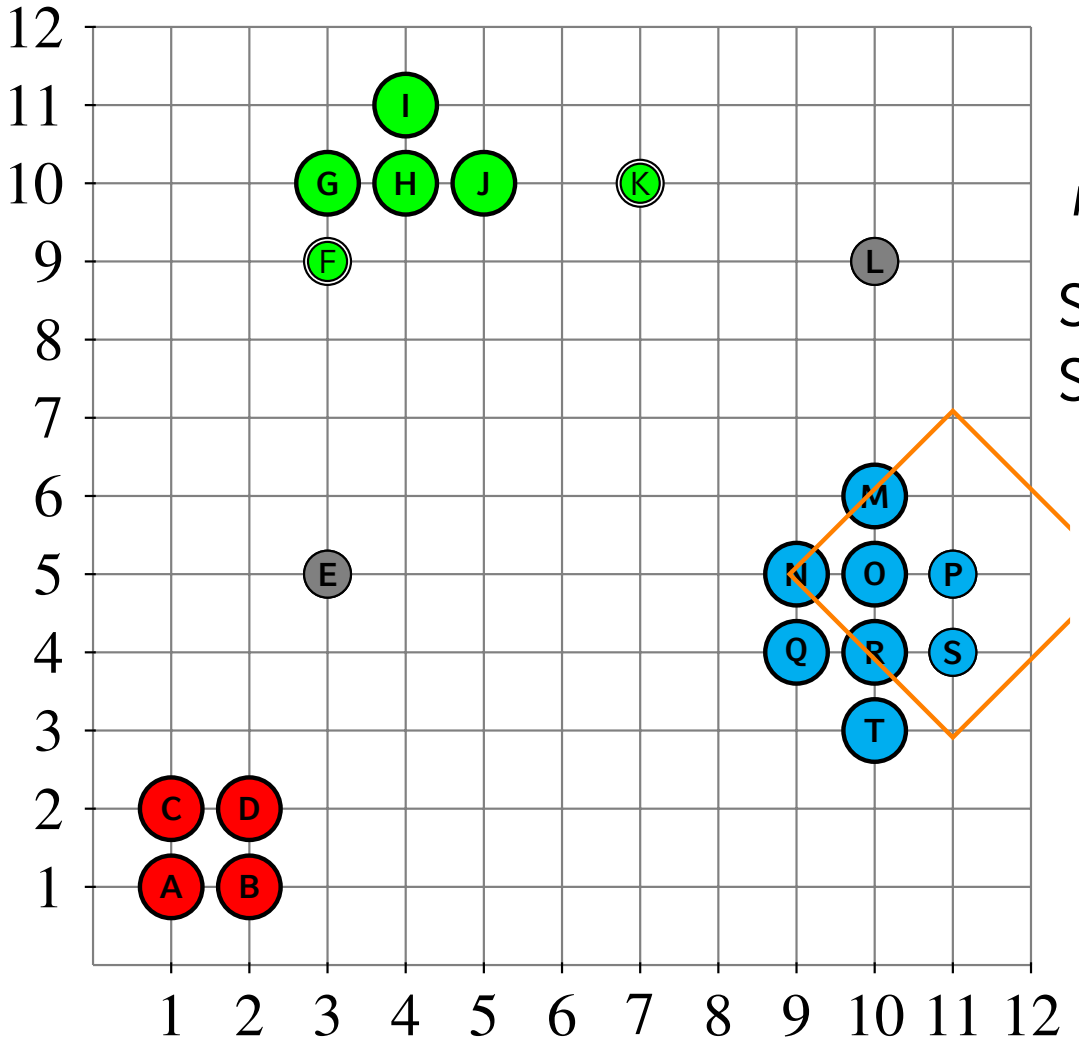
$minPts = 4$

Seed list:
PS

DBSCAN



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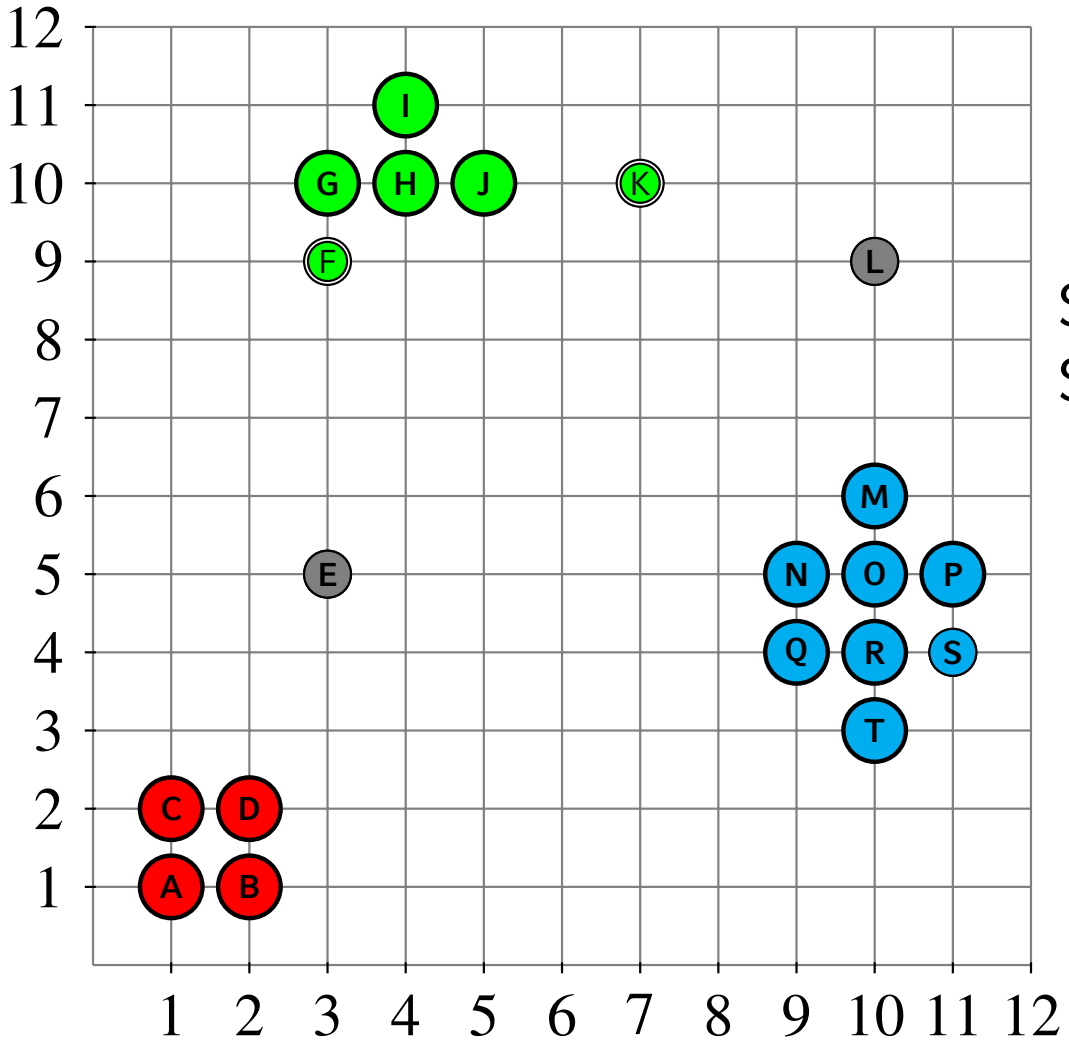
$minPts = 4$

Seed list:
S

DBSCAN



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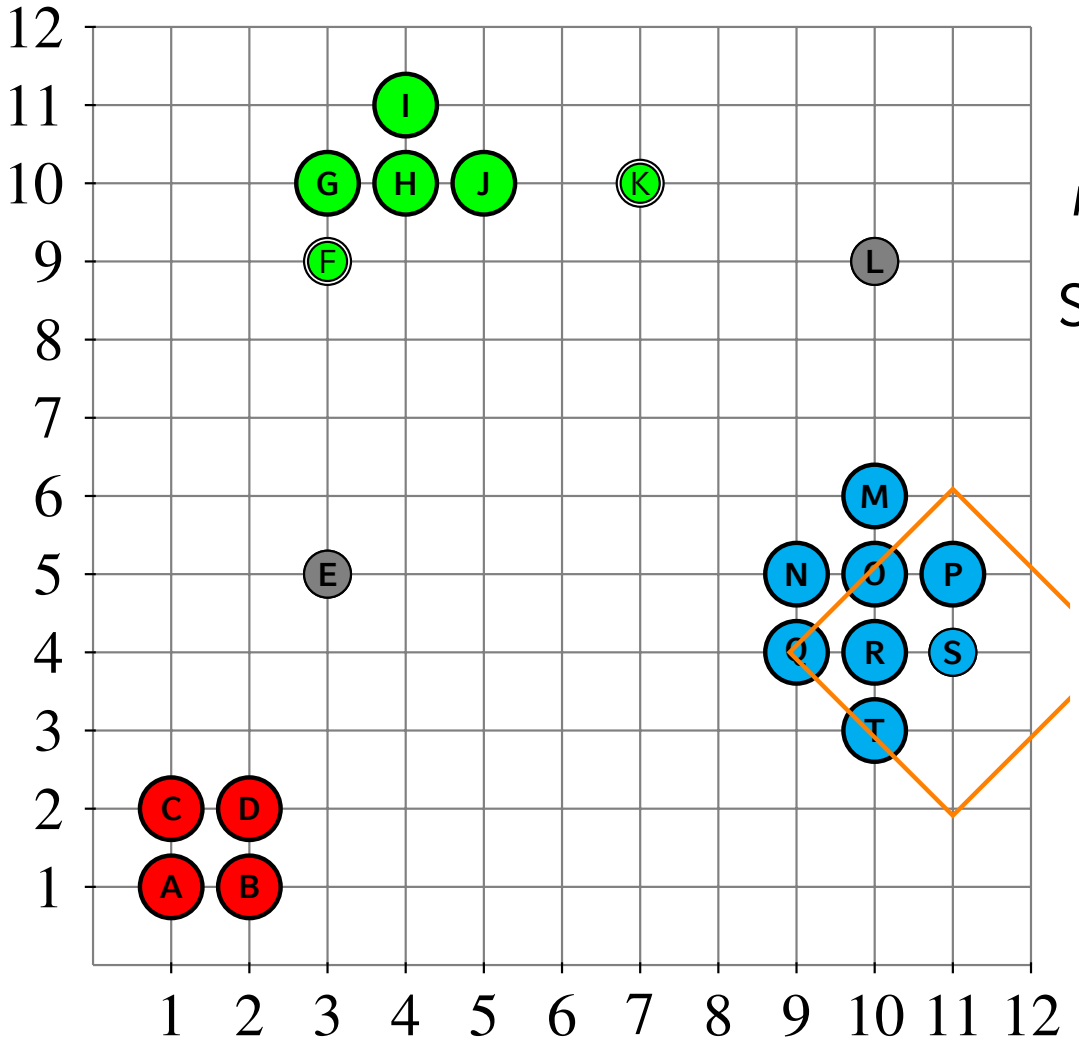
$minPts = 4$

Seed list:
S

DBSCAN



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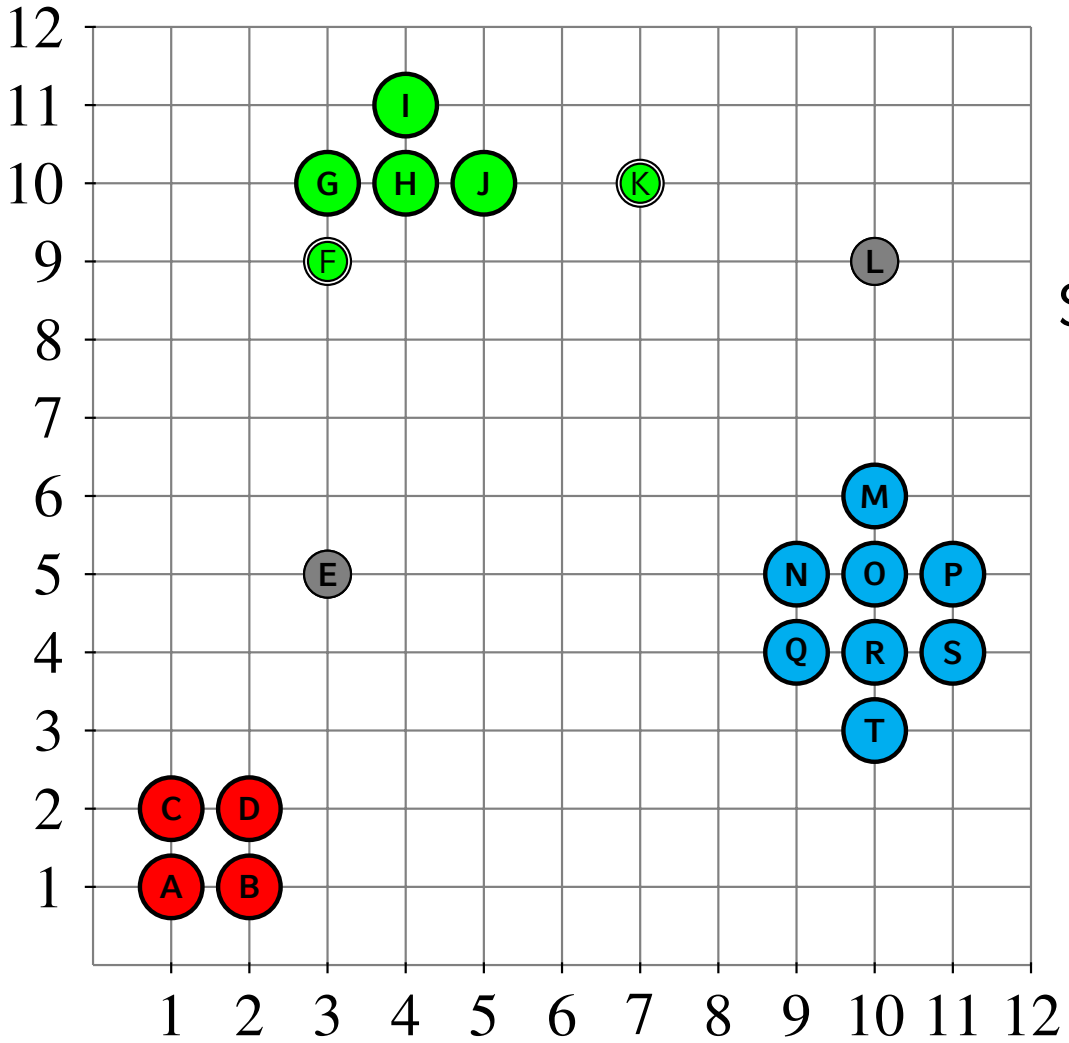
$minPts = 4$

Seed list:

DBSCAN



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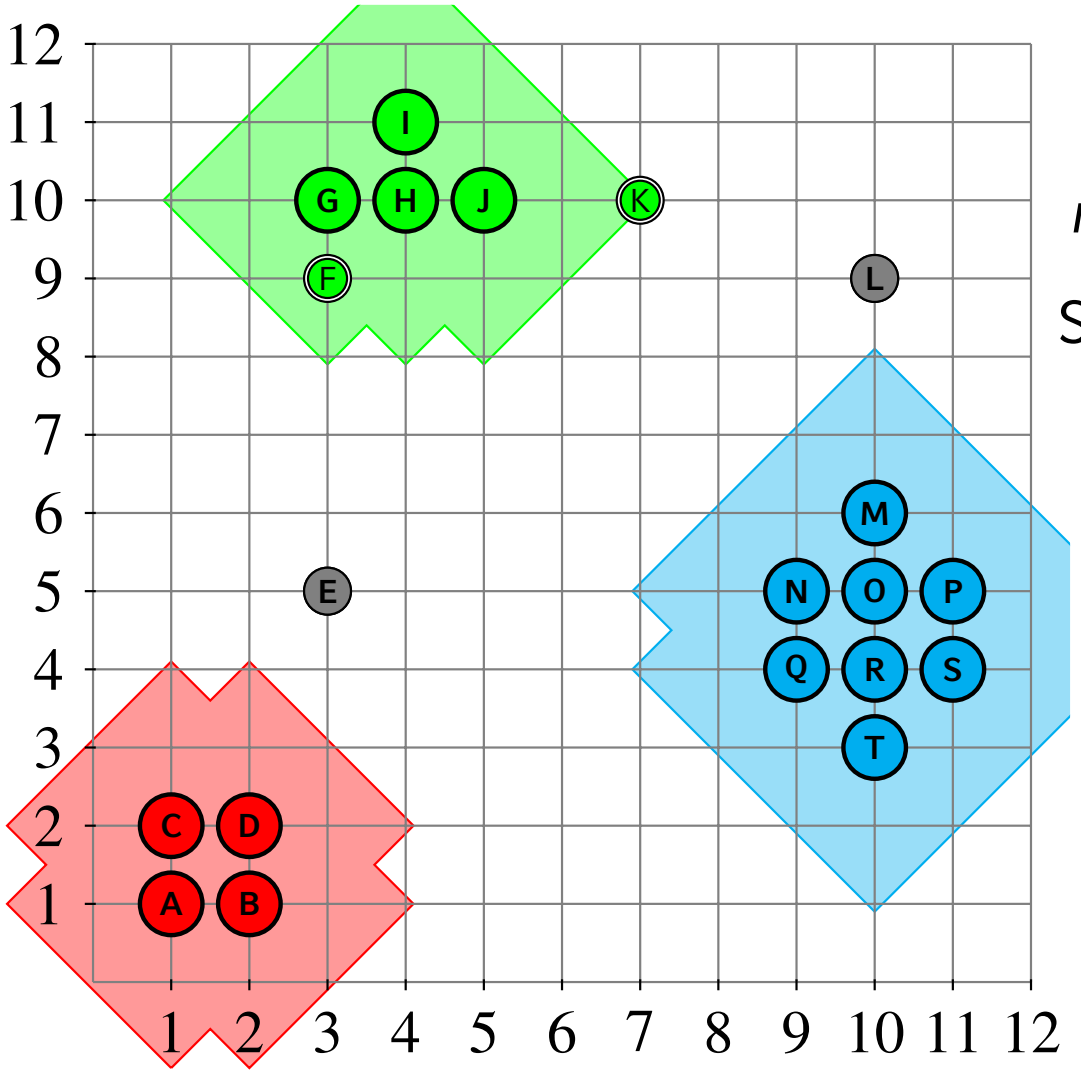
$minPts = 4$

Seed list:

DBSCAN

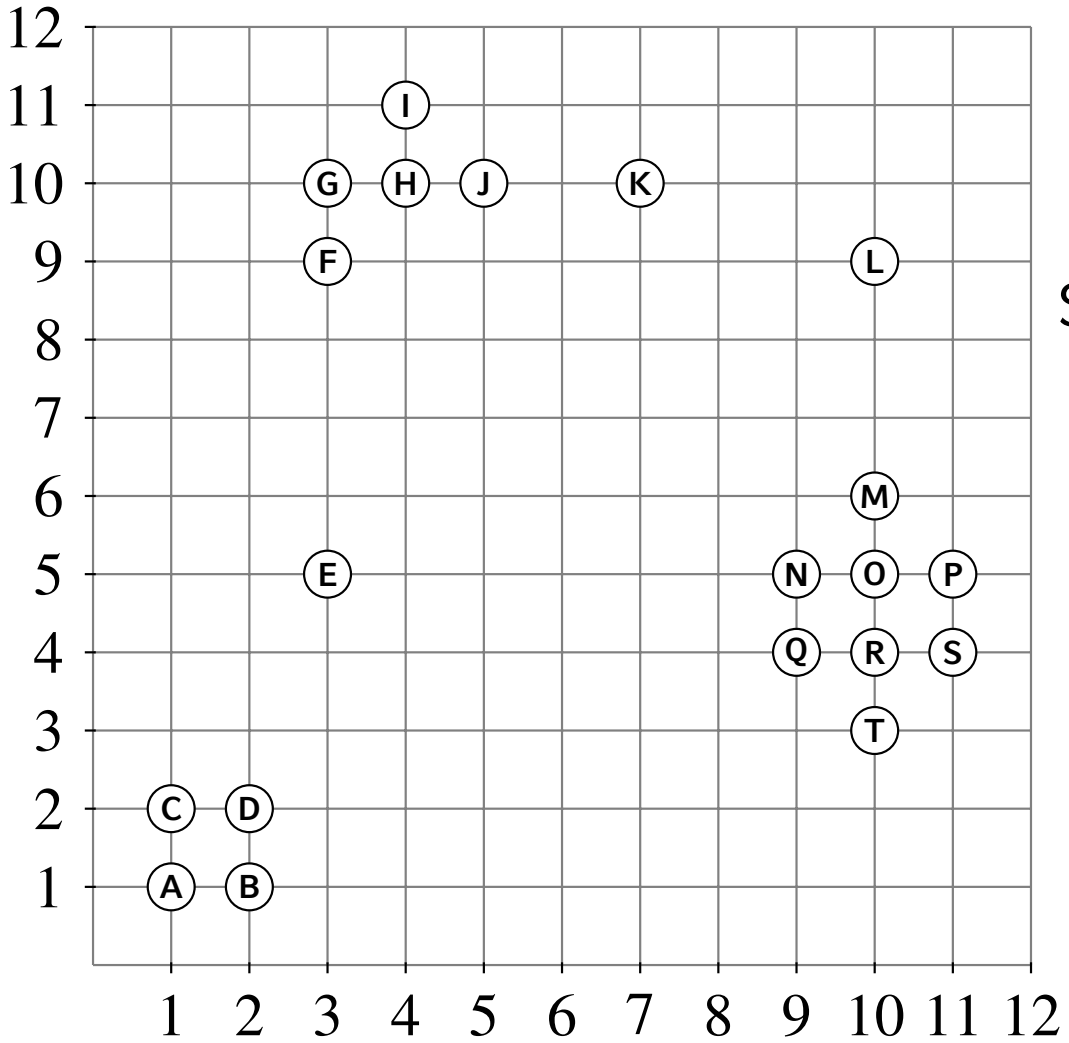


$\varepsilon = 2.1$

$minPts = 4$

Seed list:

DBSCAN



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Seed list:

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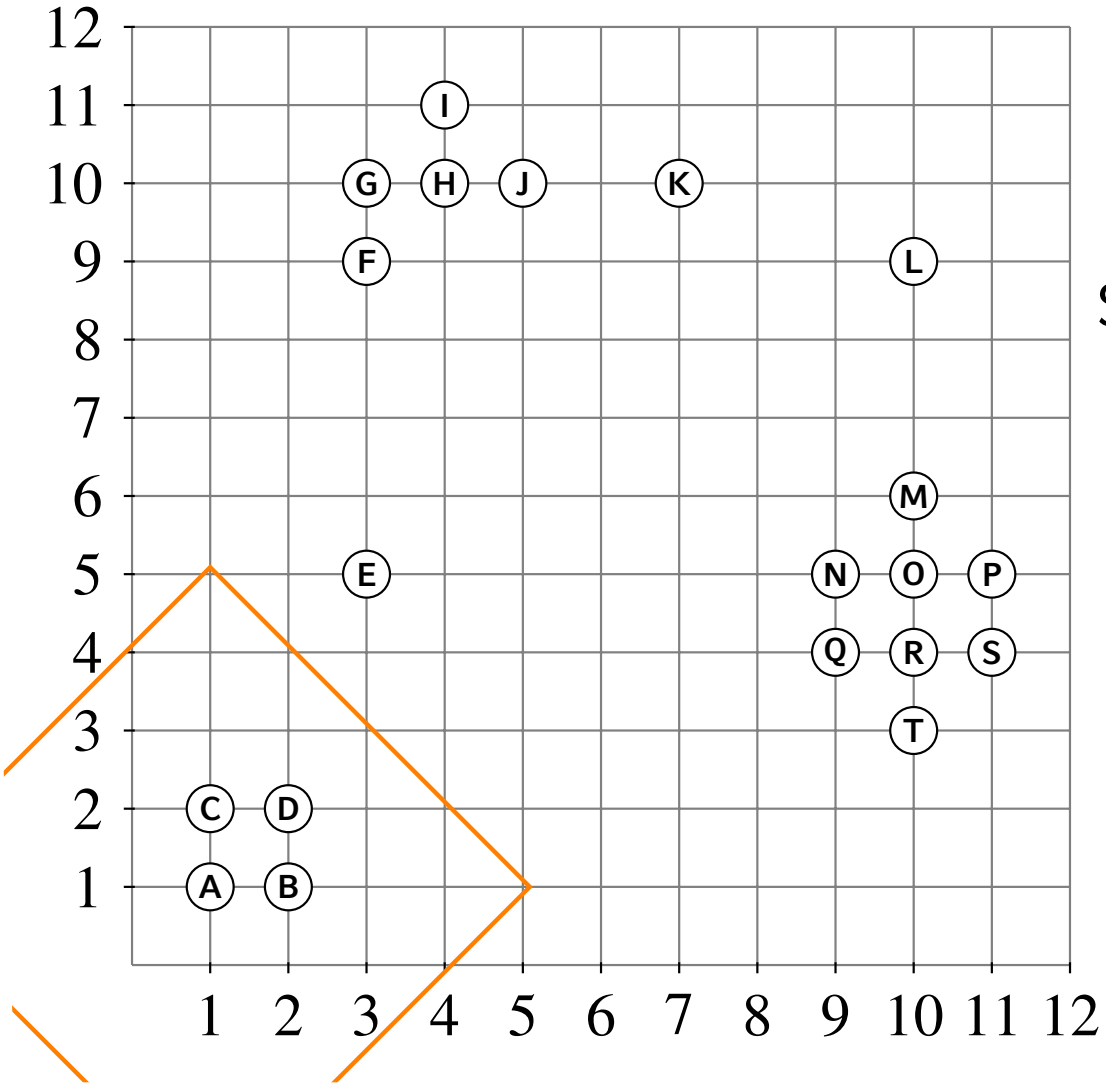

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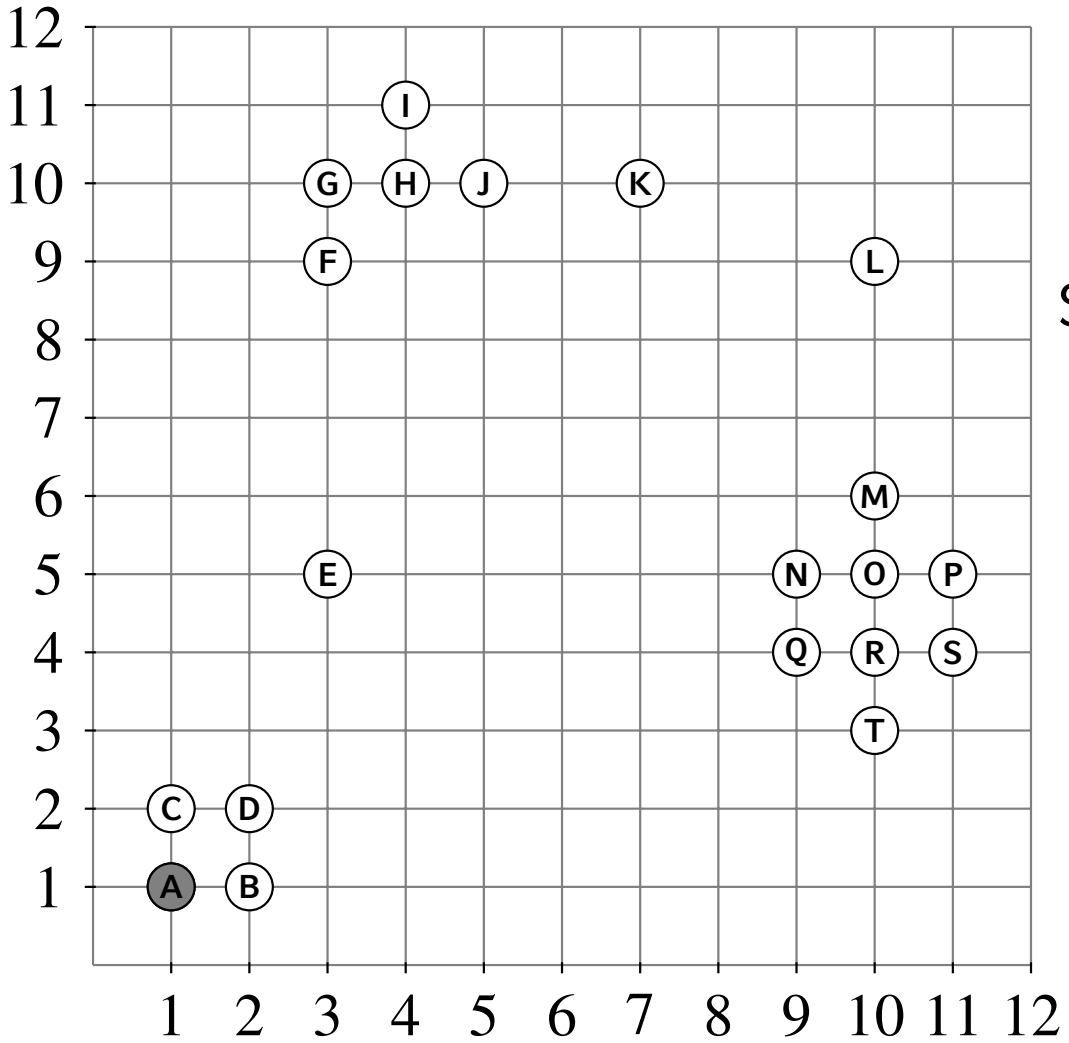
$minPts = 5$

Seed list:

DBSCAN



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Seed list:

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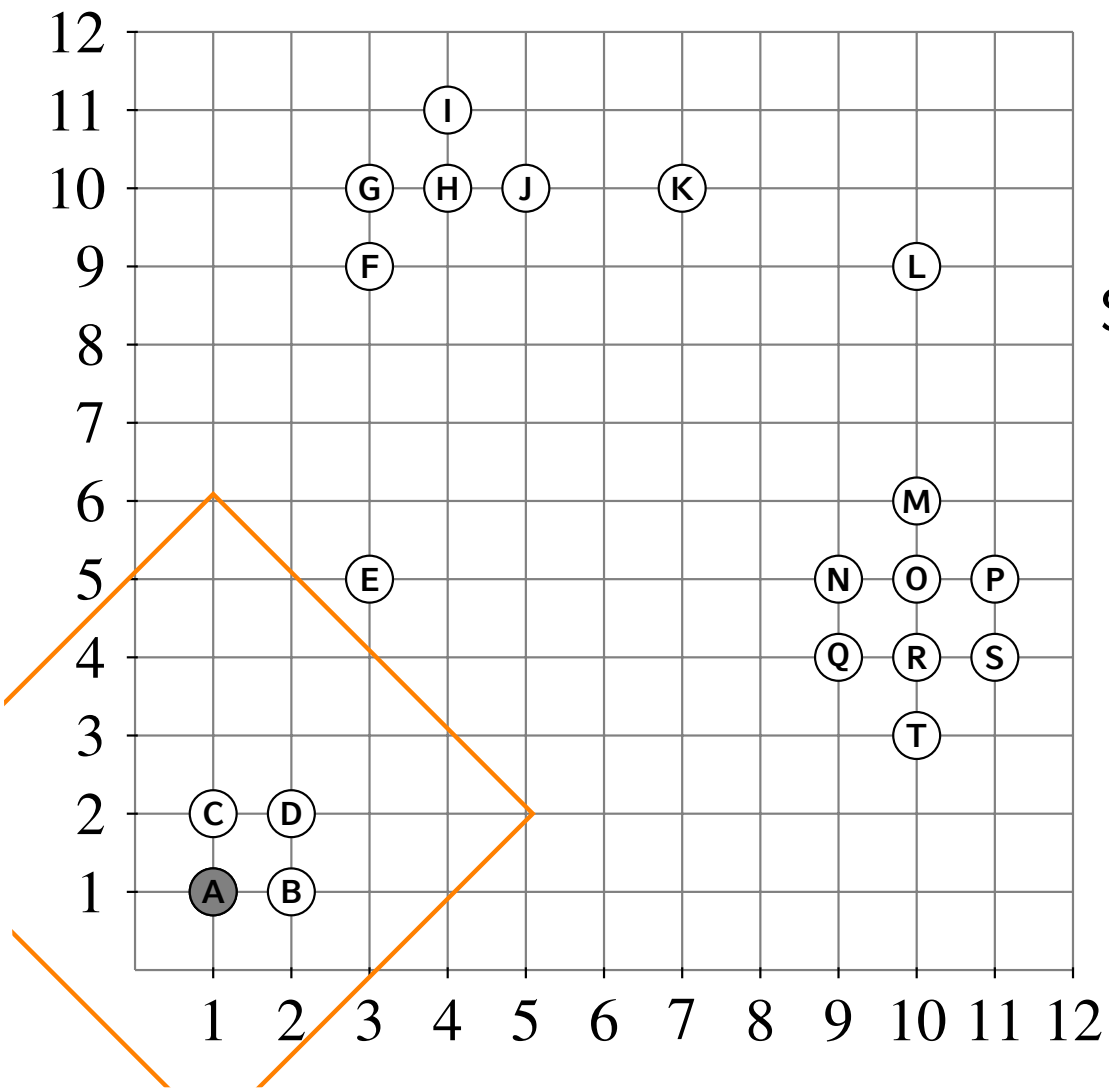

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Seed list:

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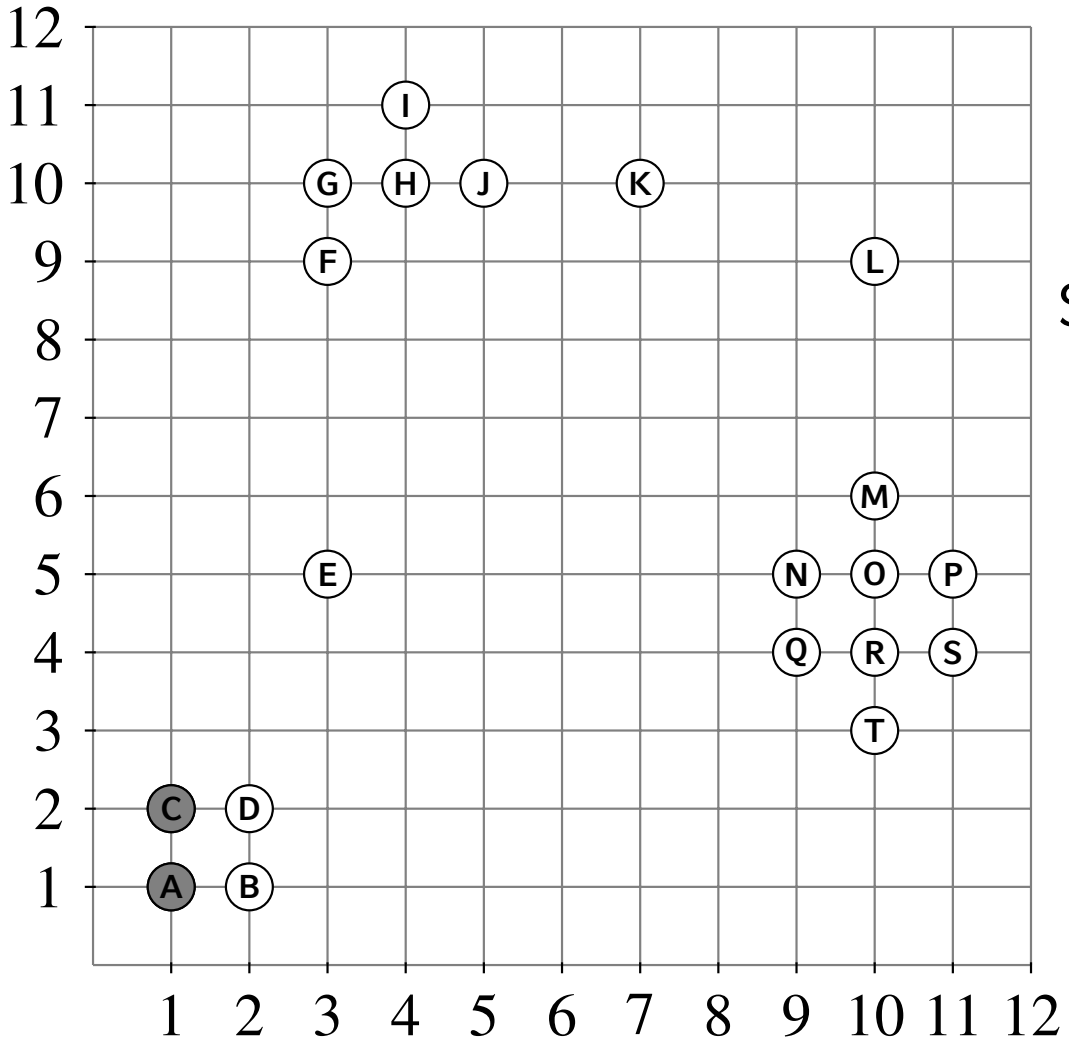

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Seed list:

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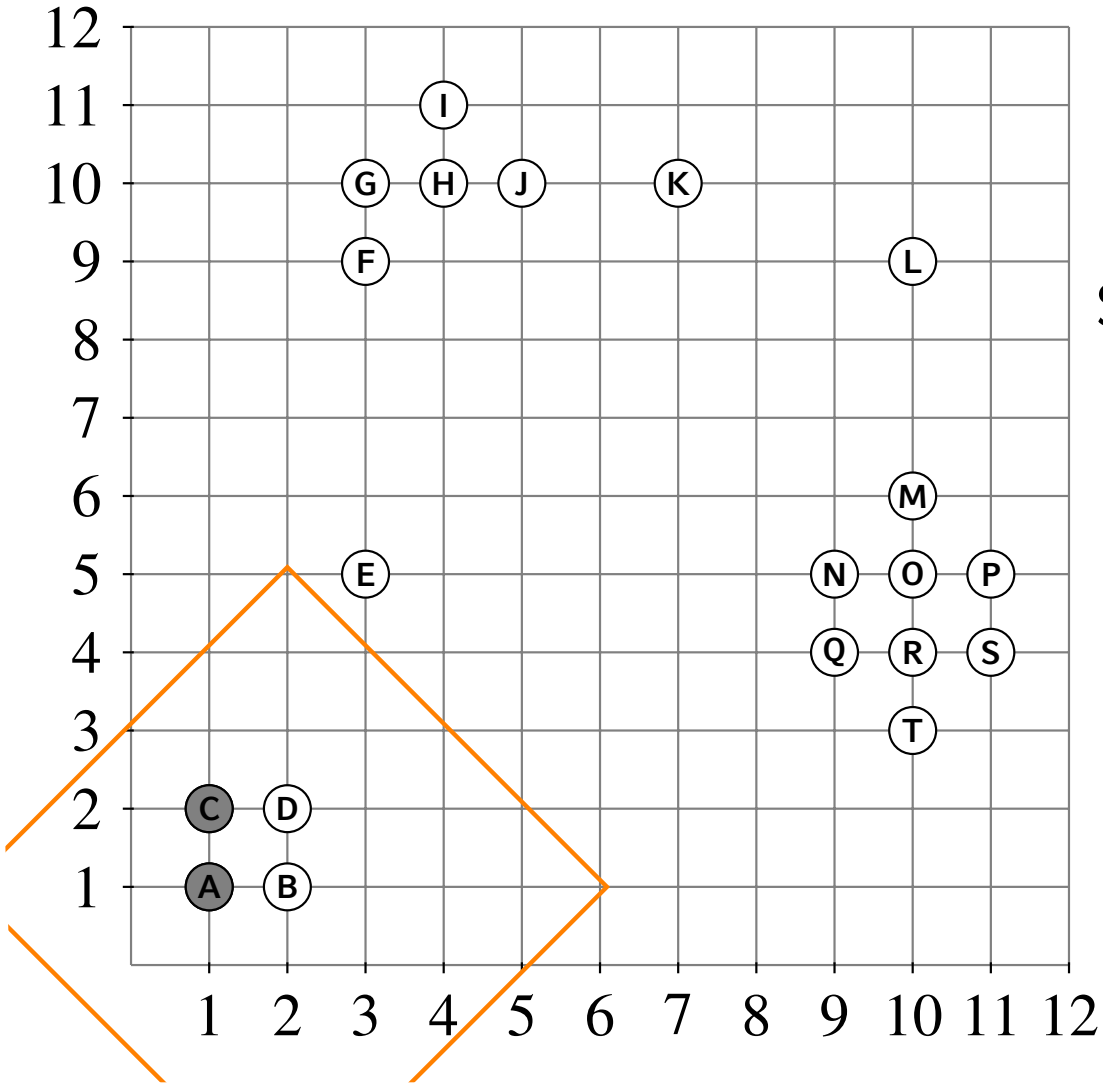

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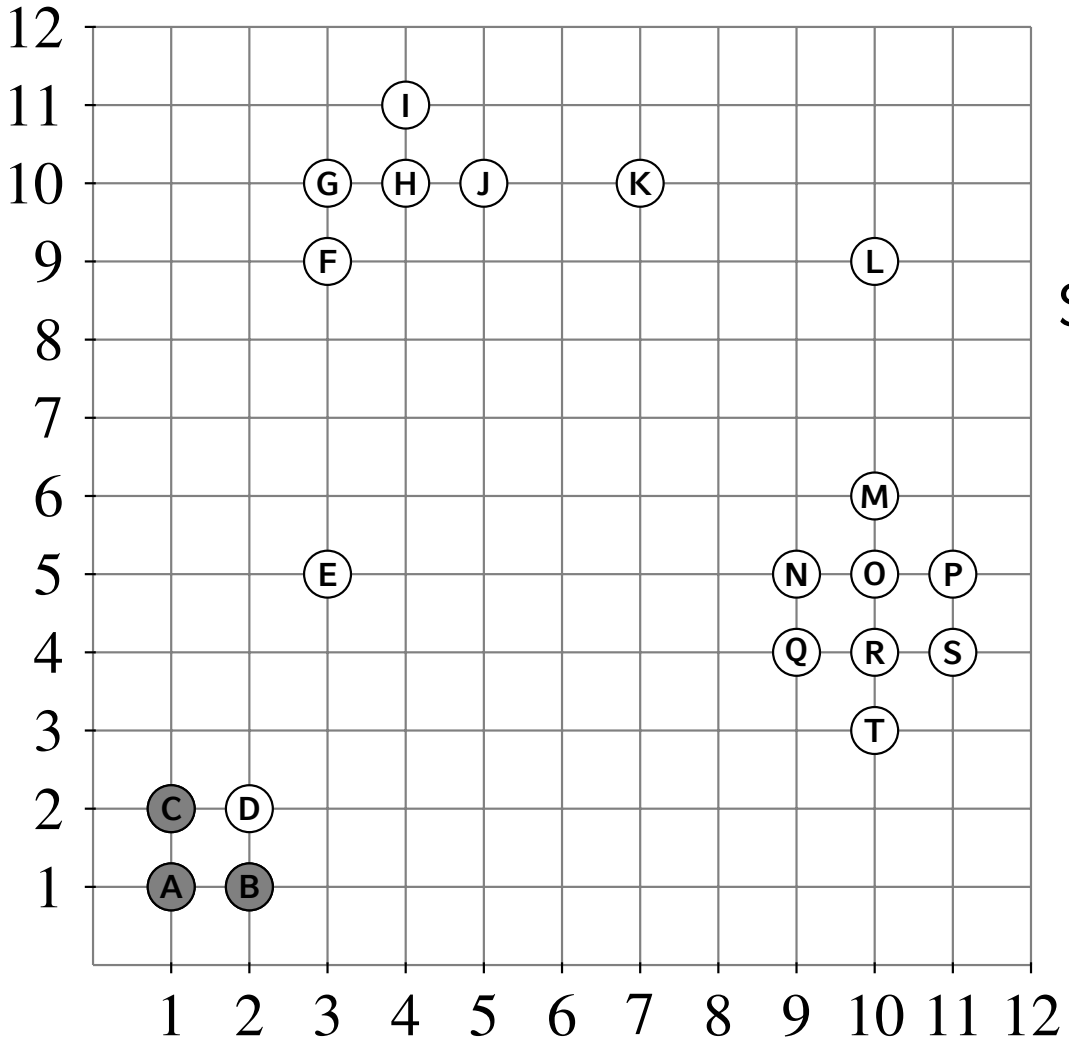
$minPts = 5$

Seed list:

DBSCAN



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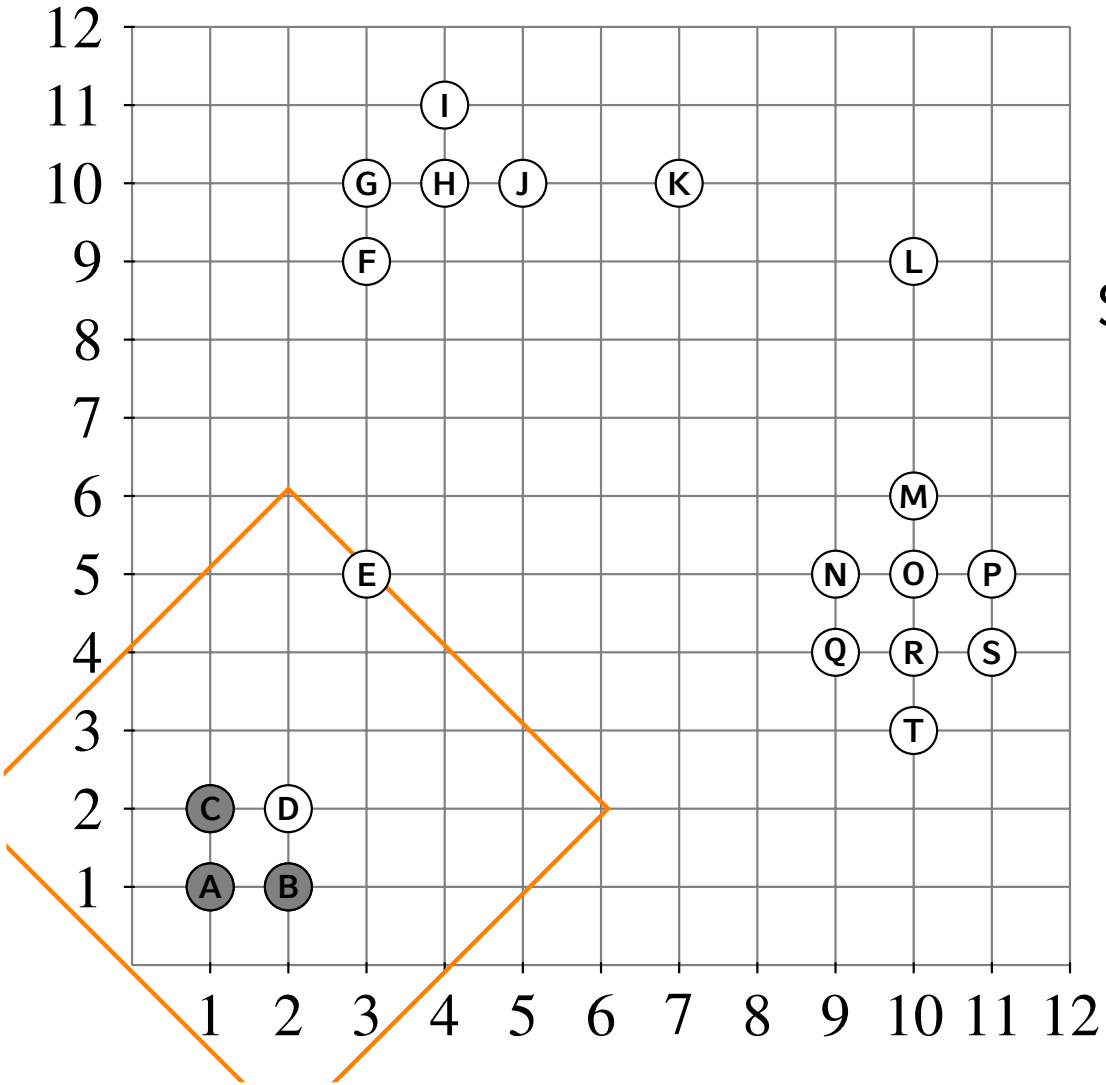
Seed list:

DBSCAN



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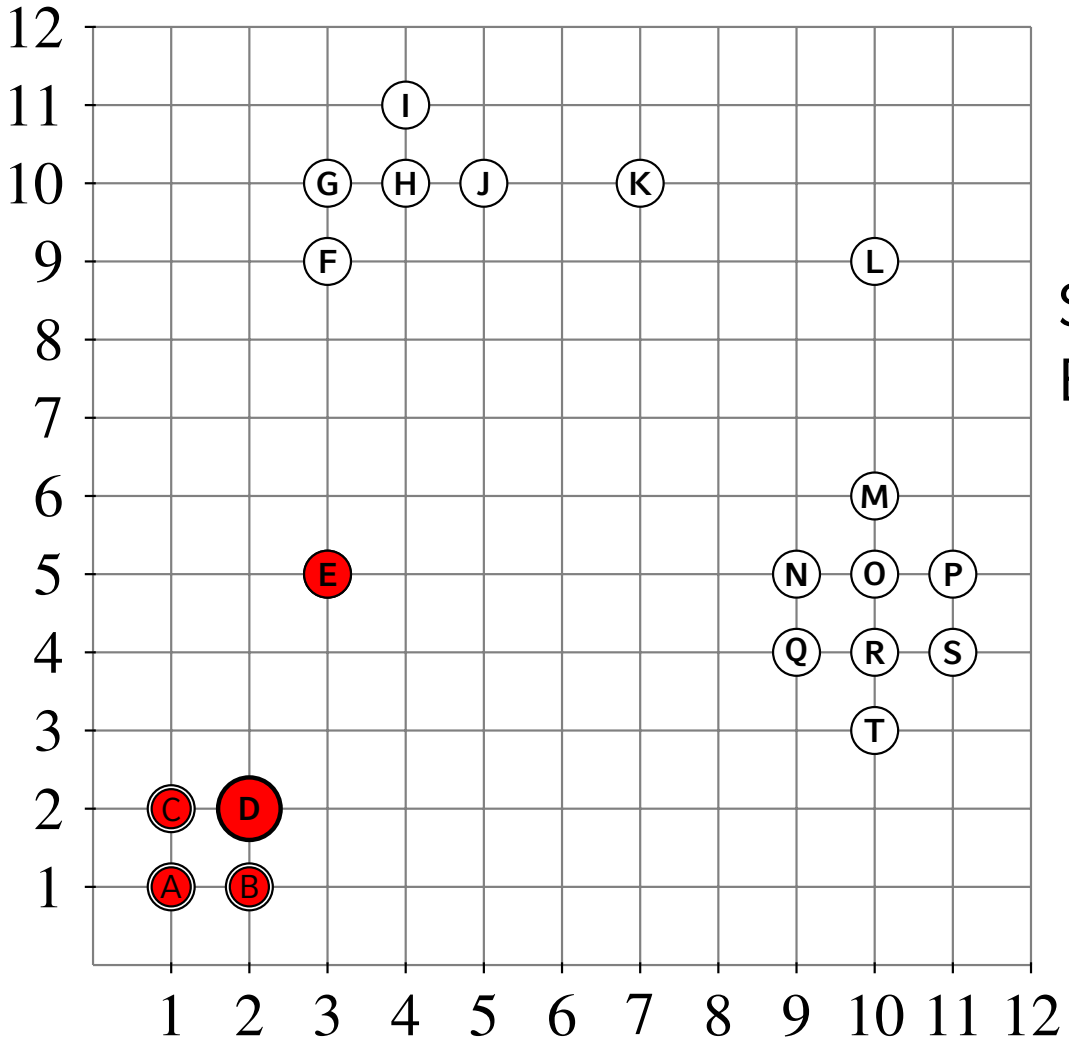
$minPts = 5$

Seed list:

DBSCAN

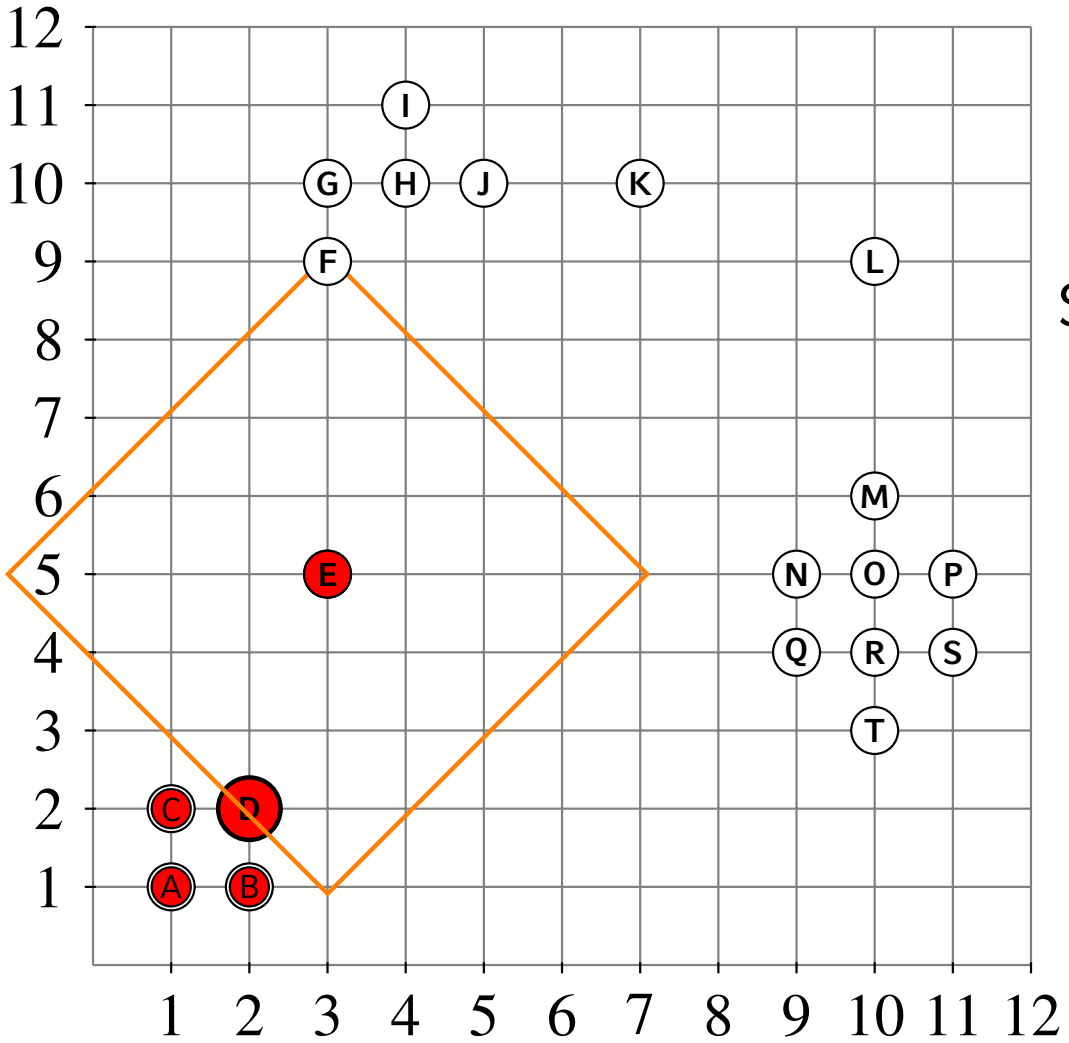


$\varepsilon = 4.1$

$minPts = 5$

Seed list:
E

DBSCAN



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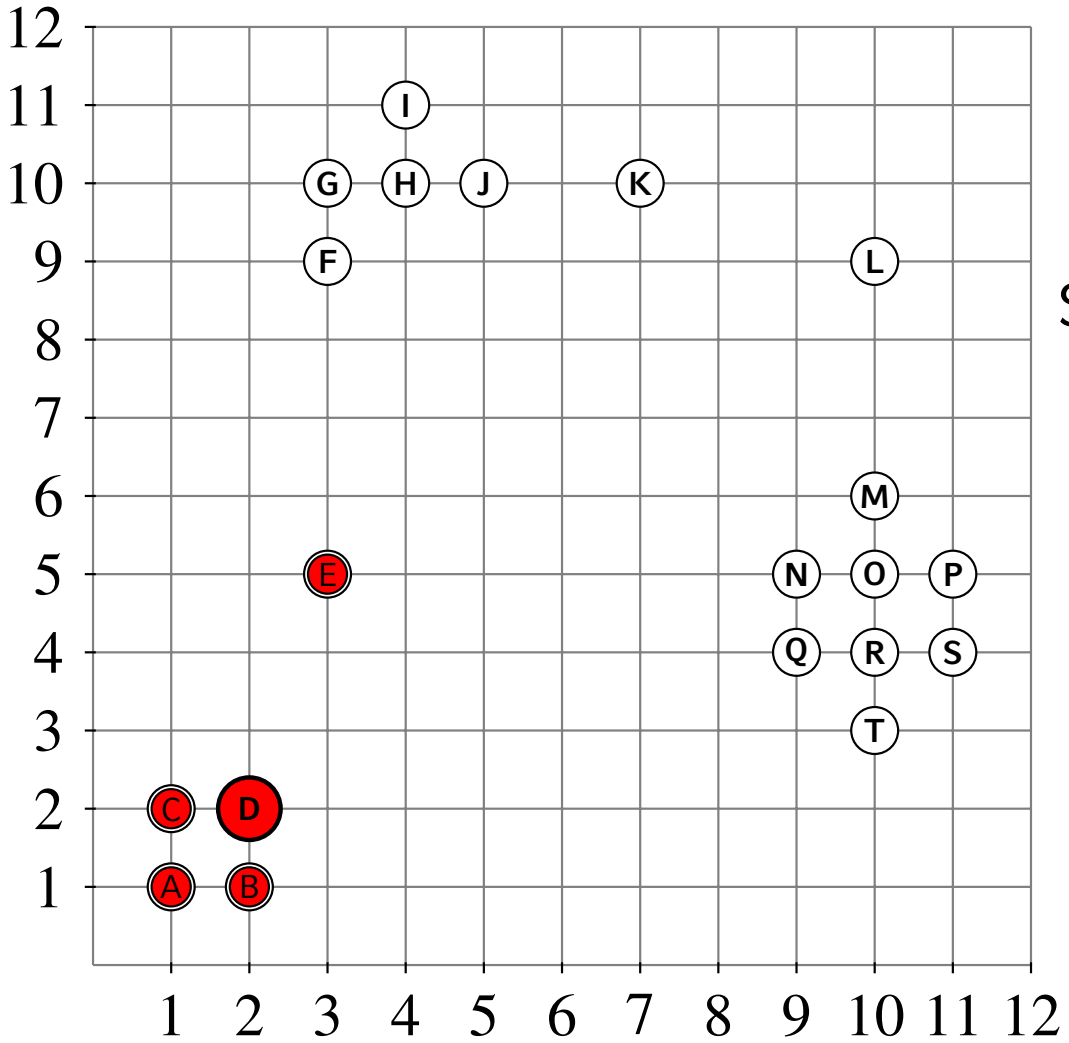
$minPts = 5$

Seed list:

DBSCAN



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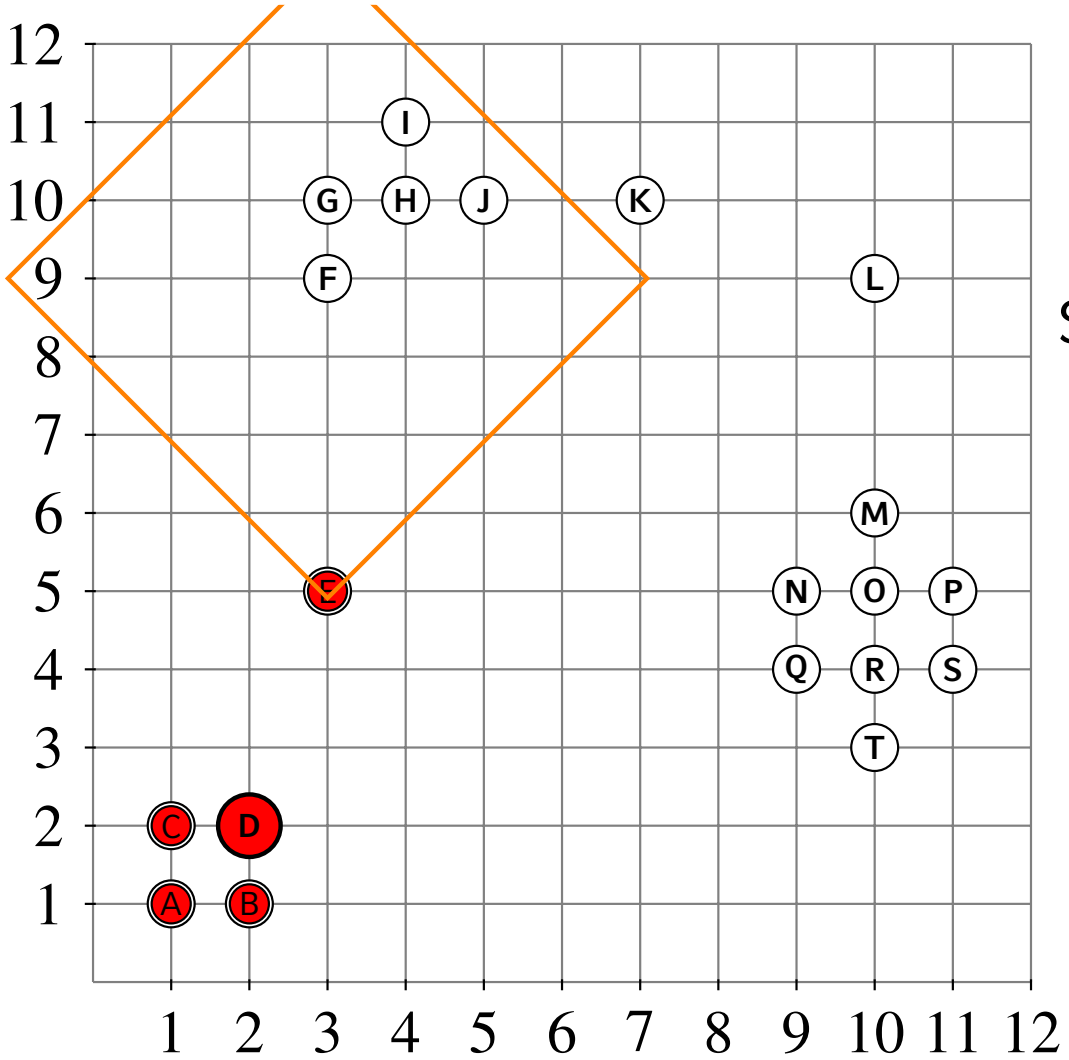

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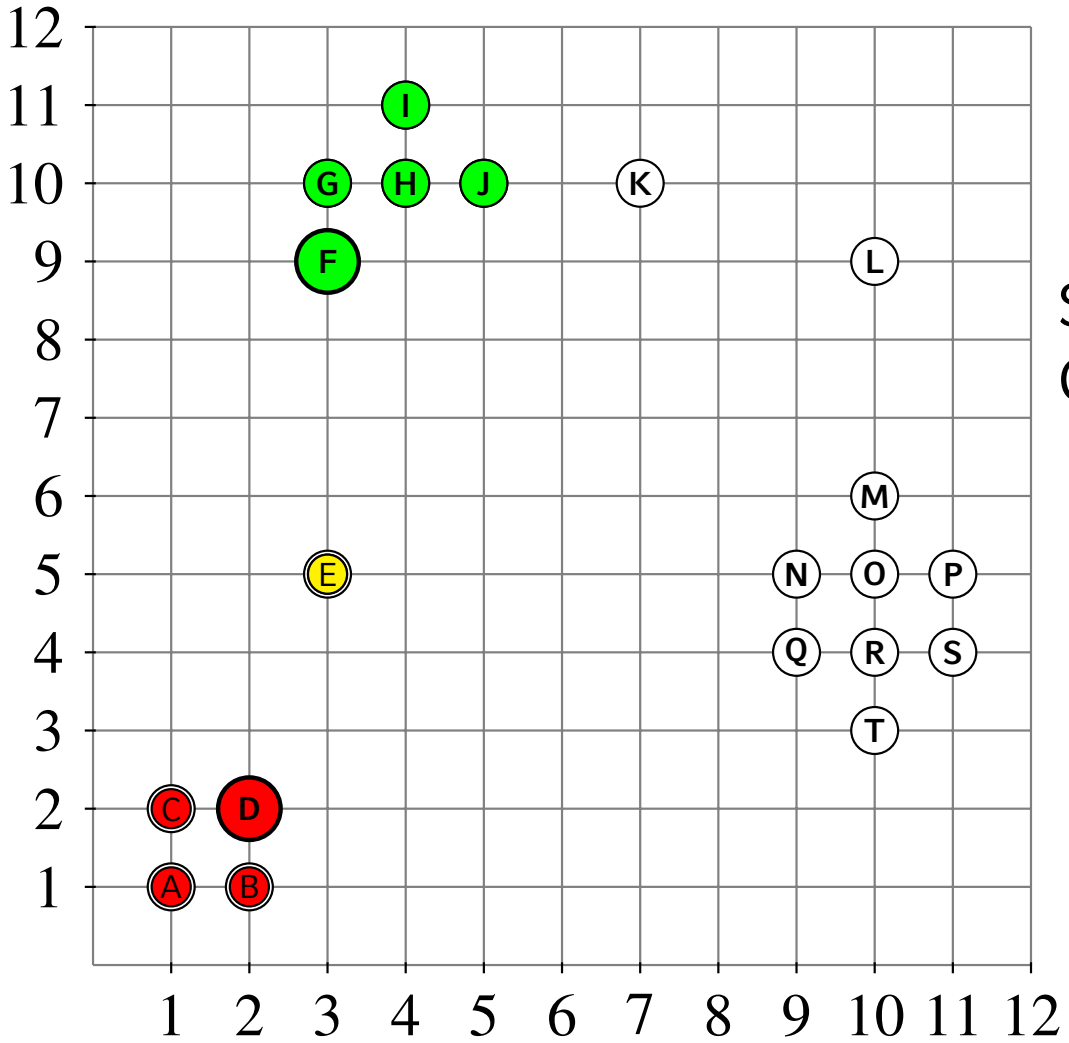

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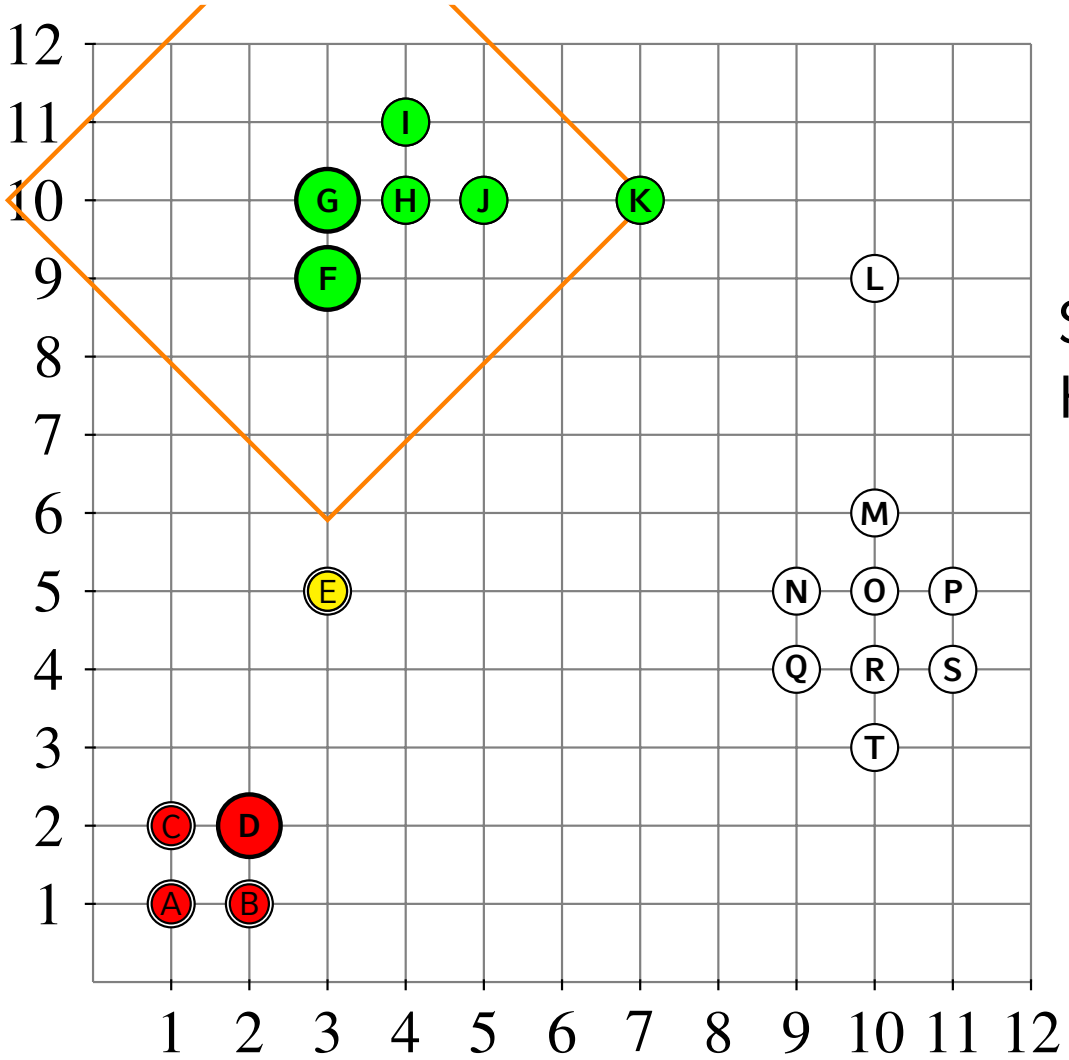

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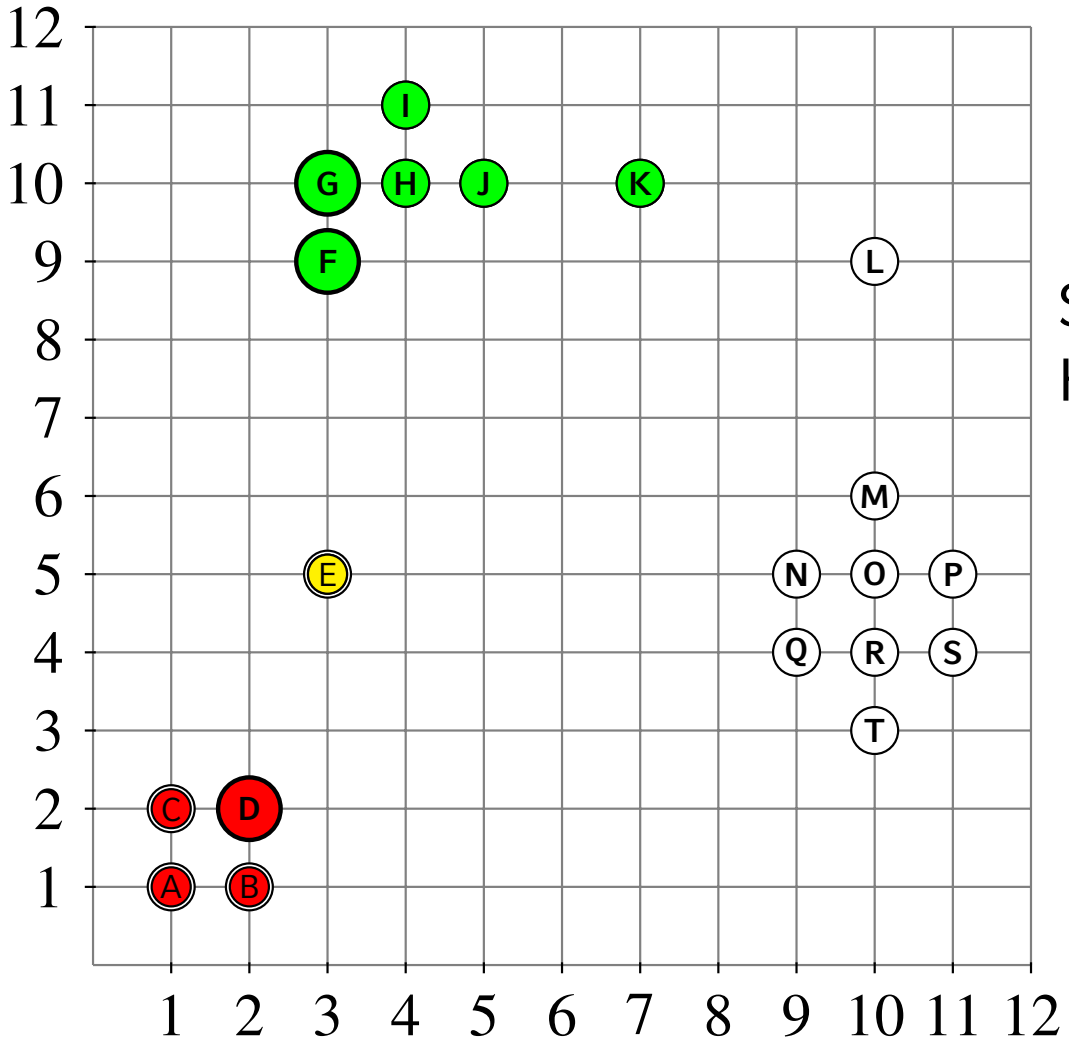

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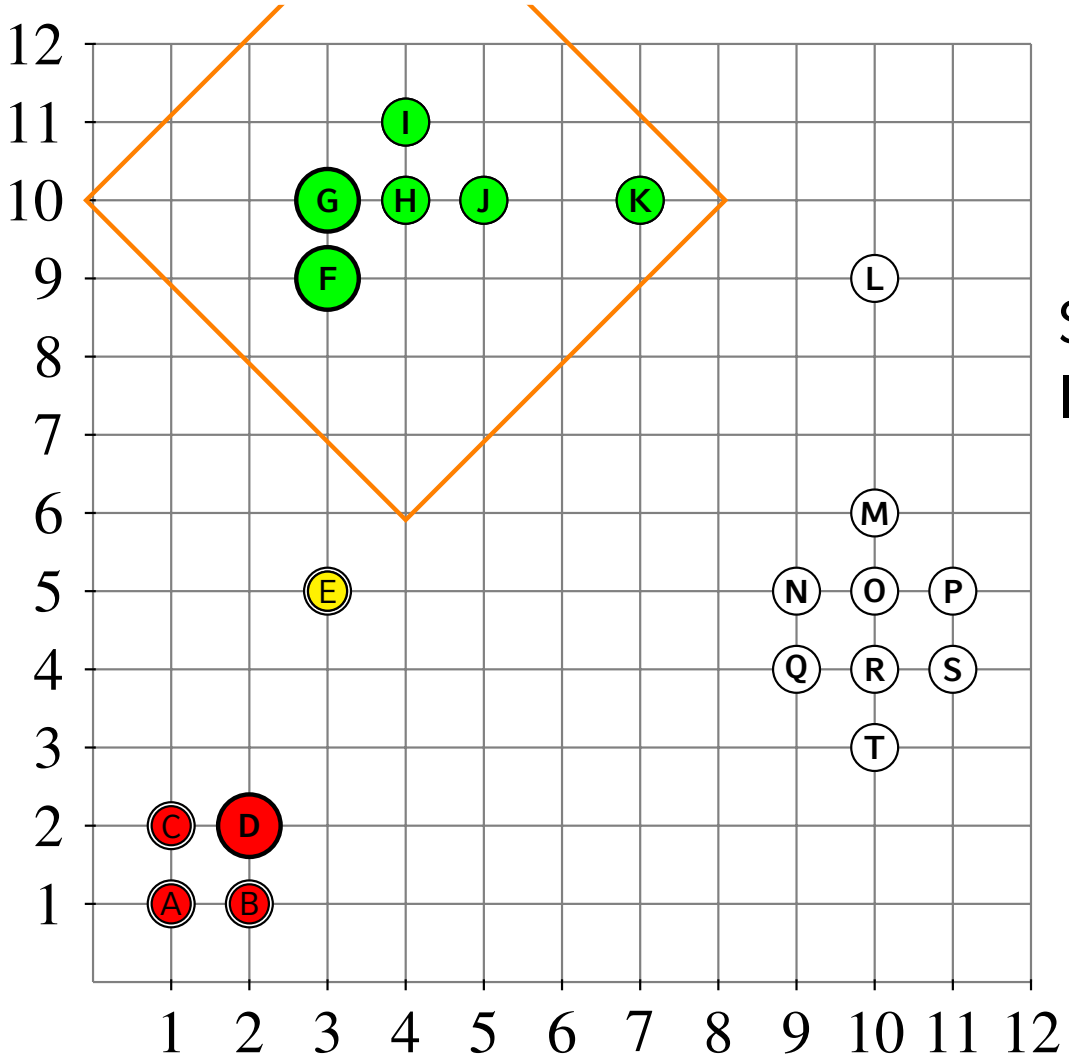

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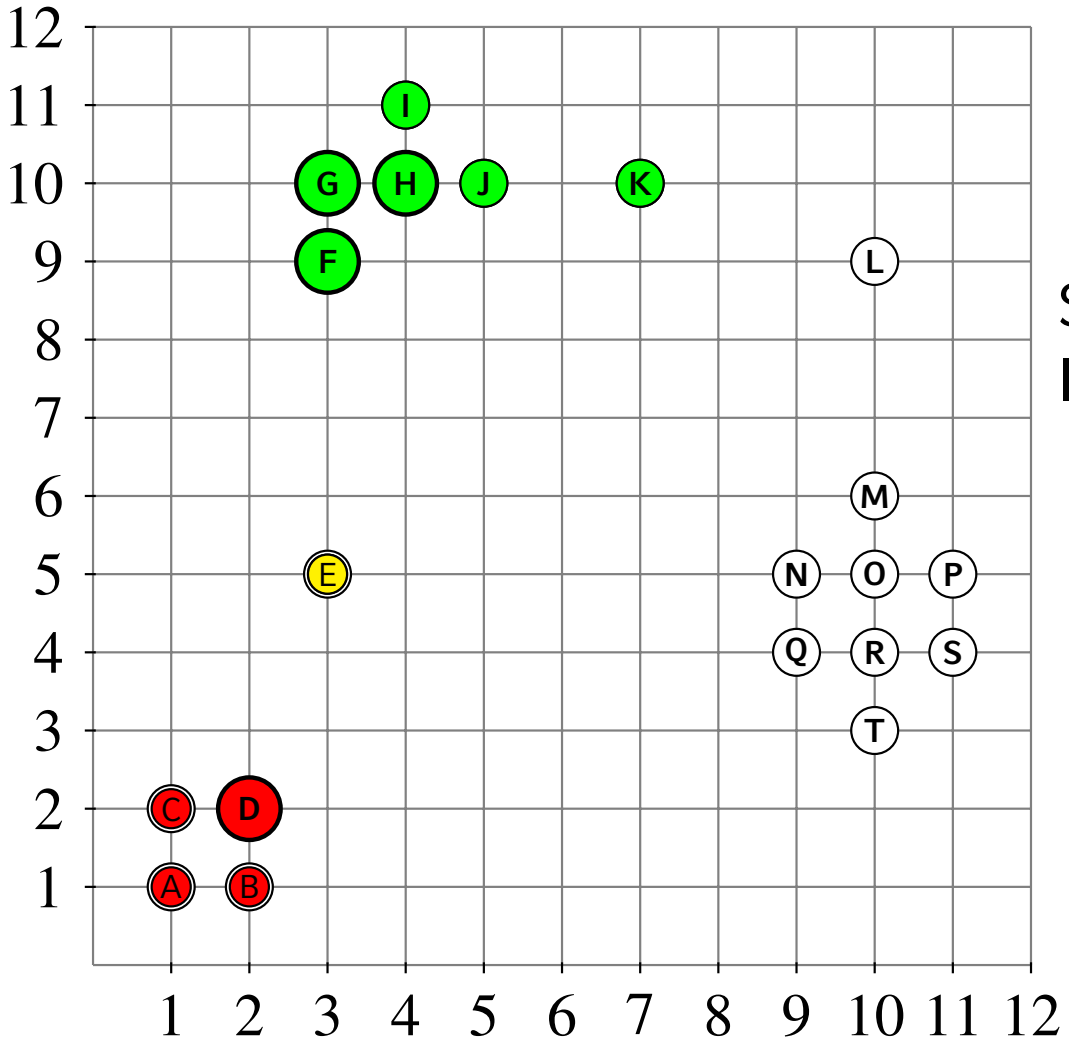

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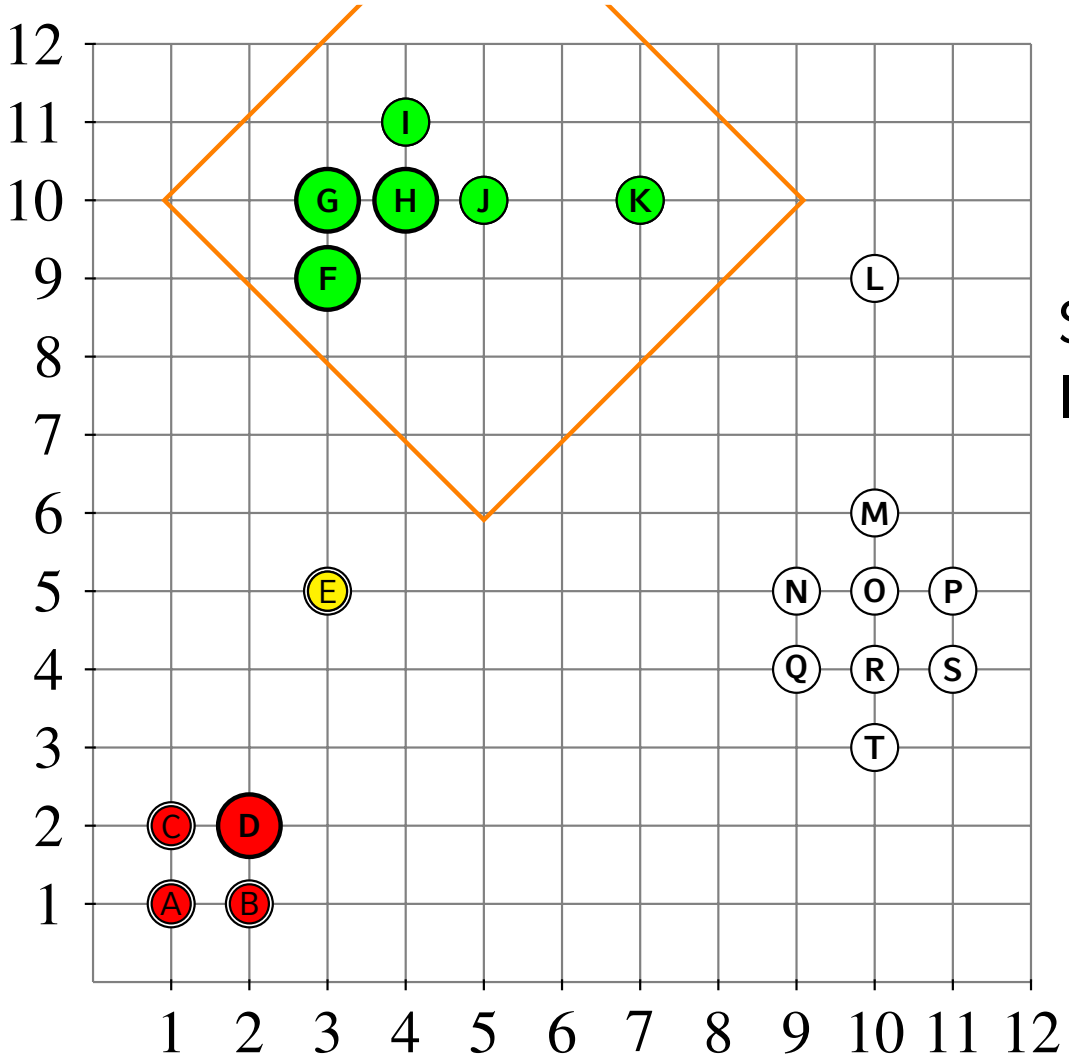

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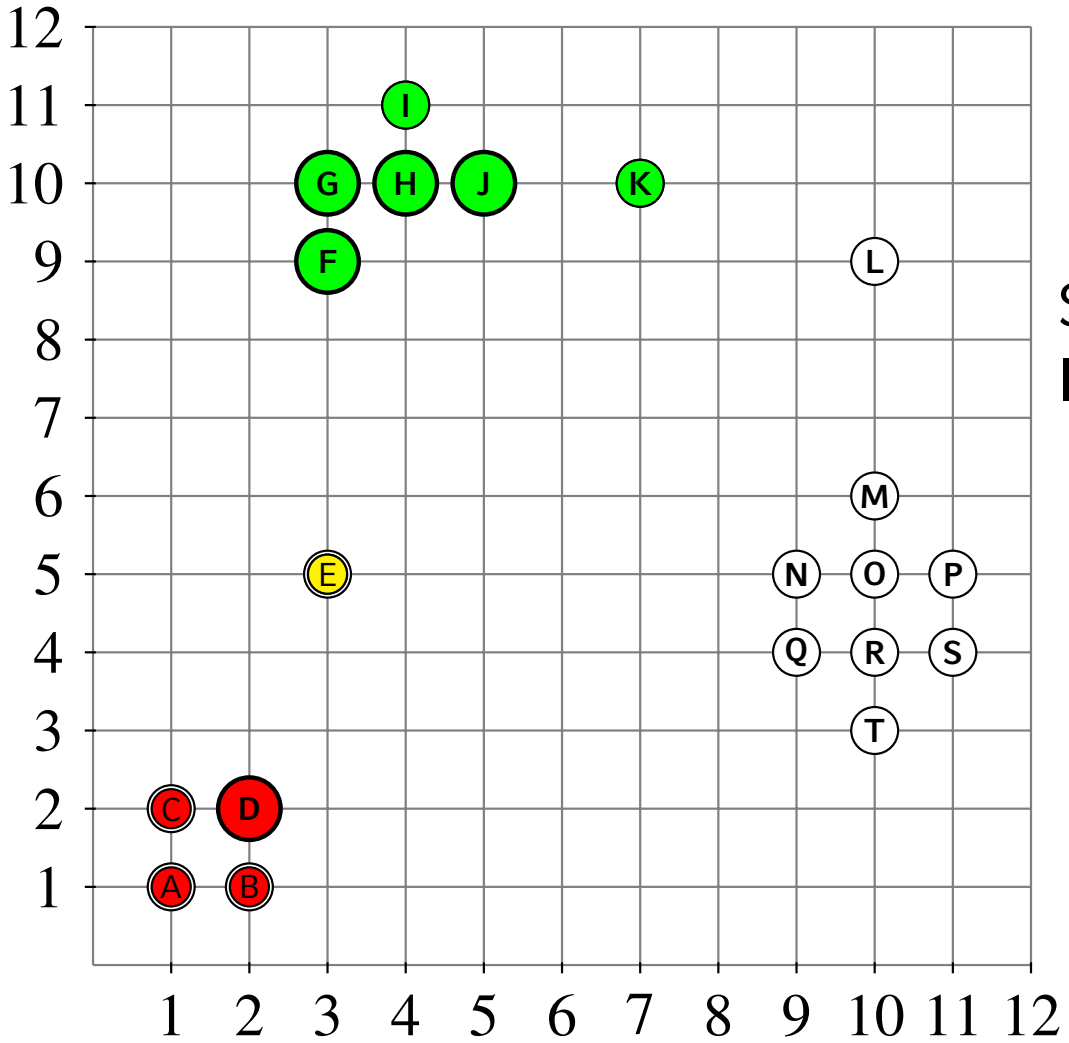

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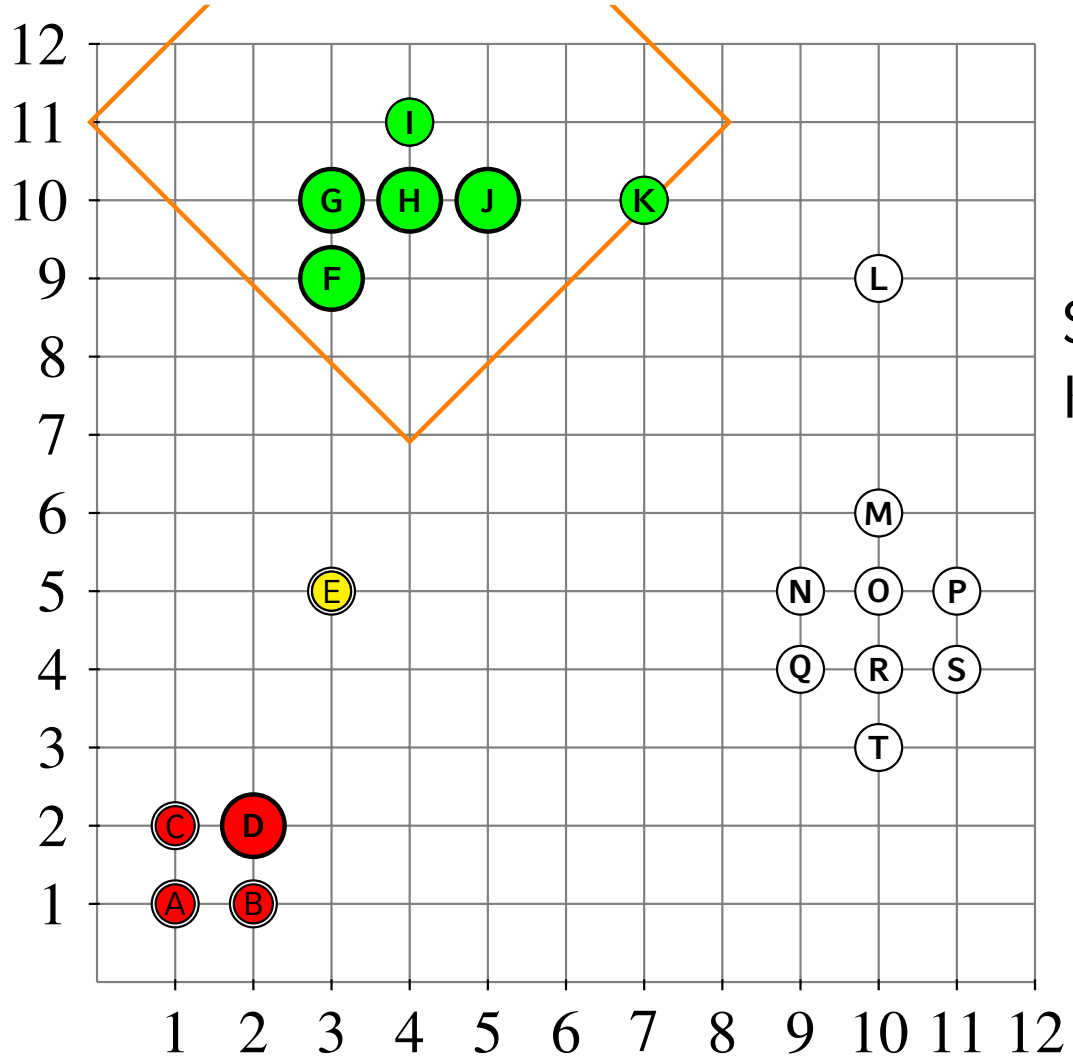

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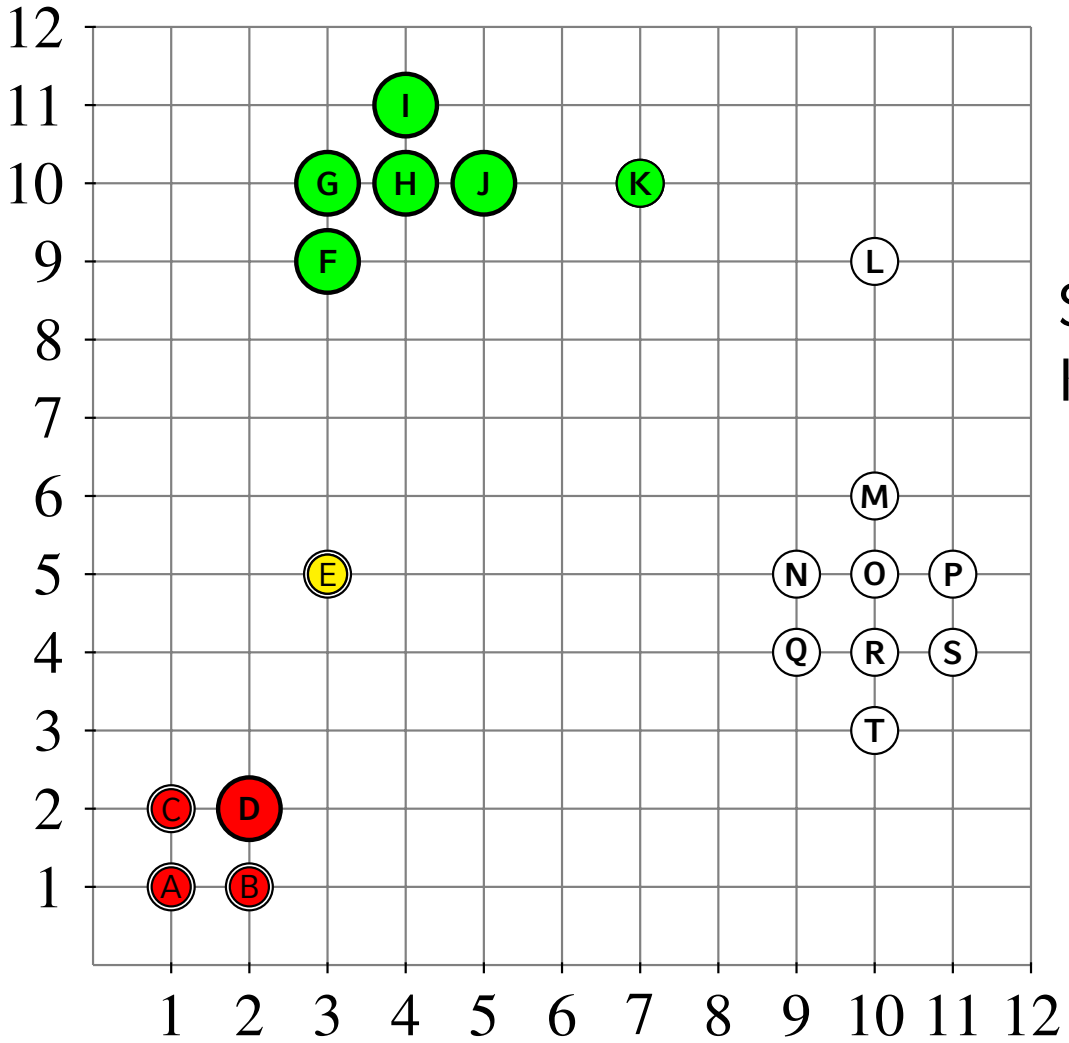

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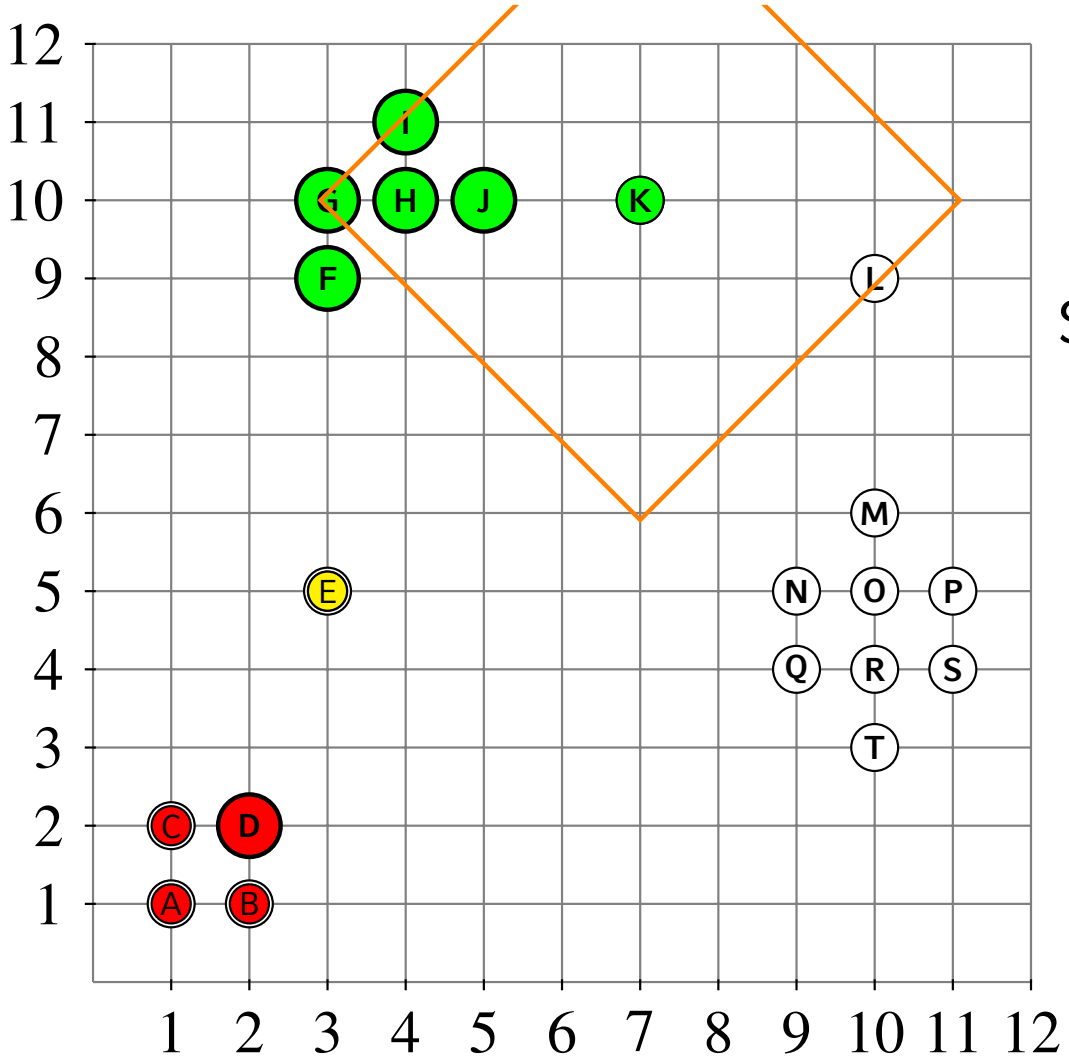

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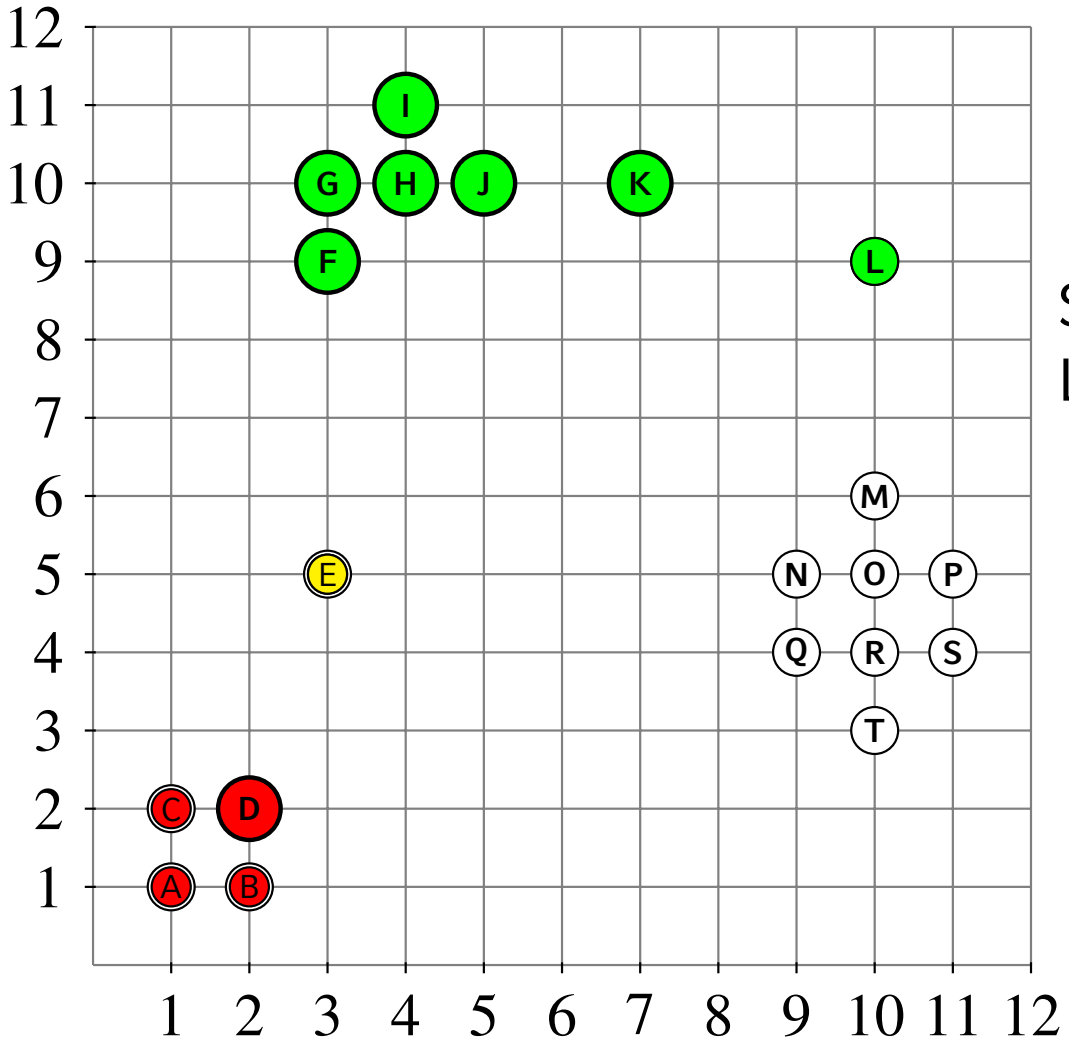

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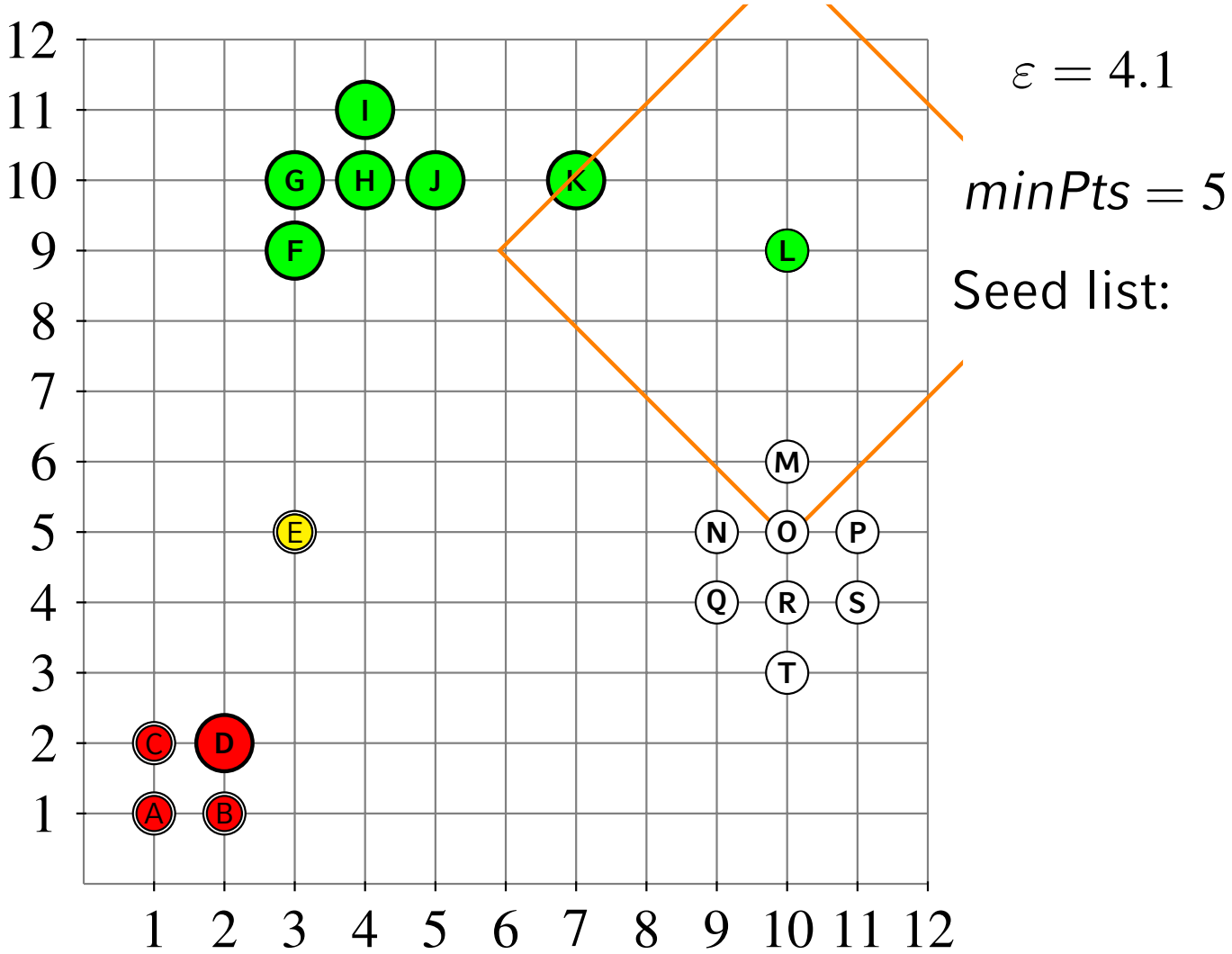
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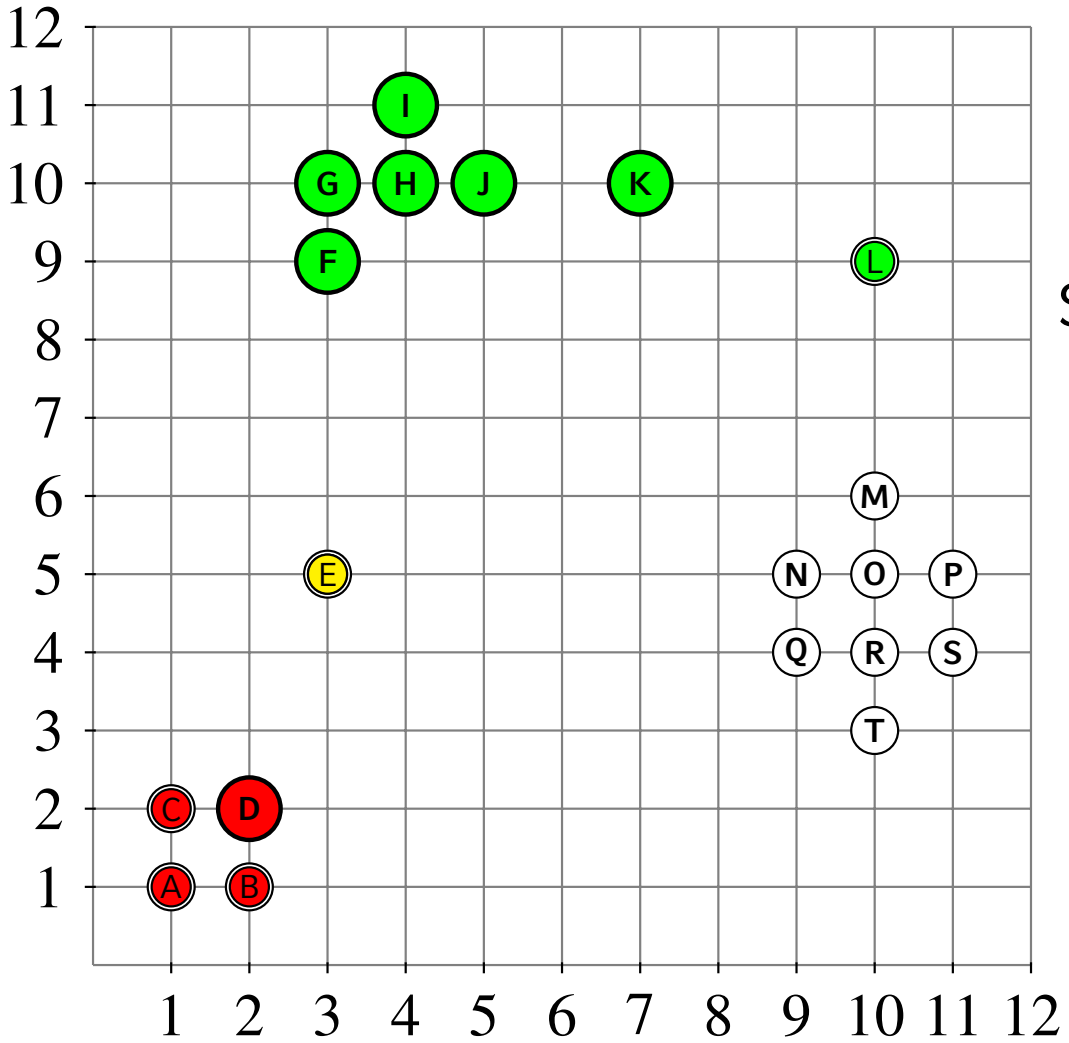

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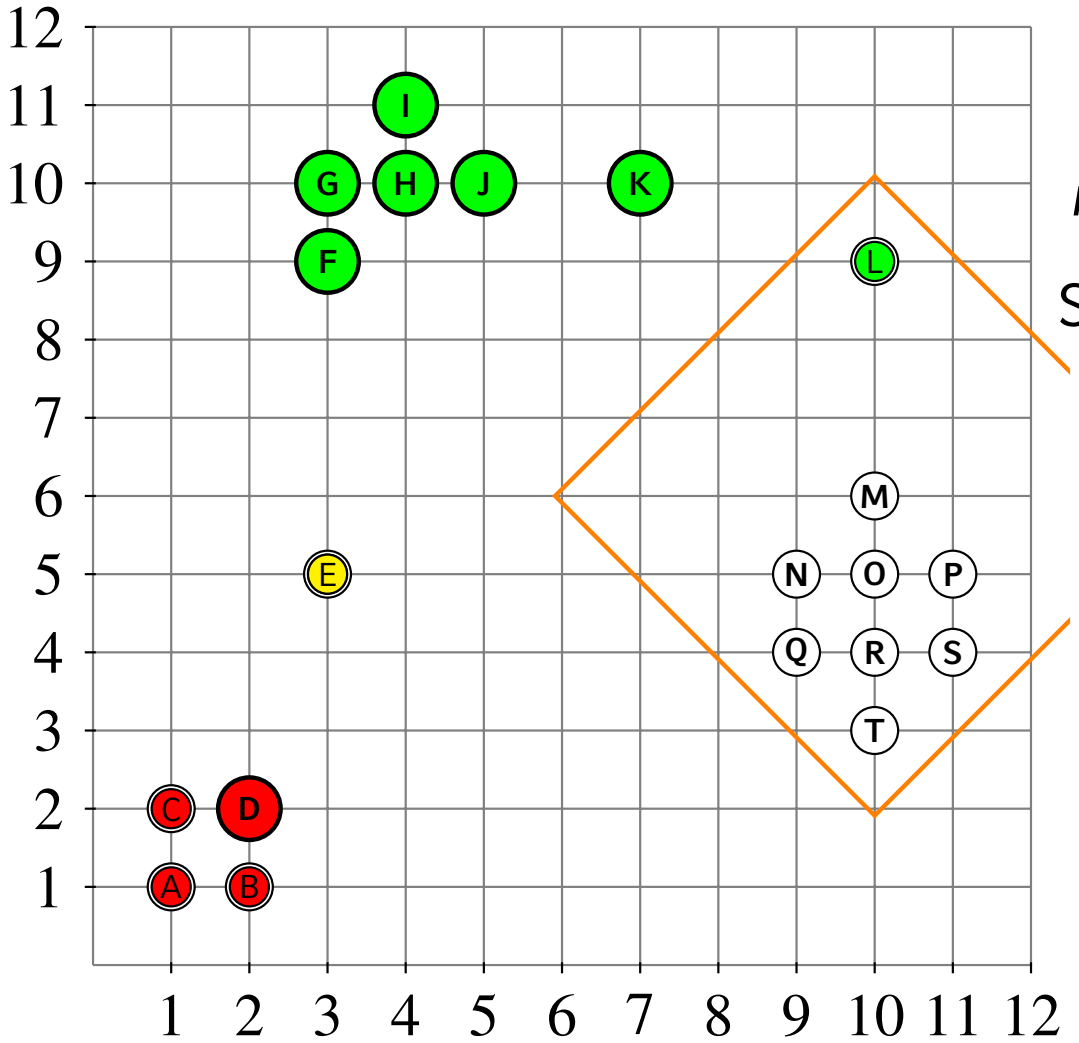

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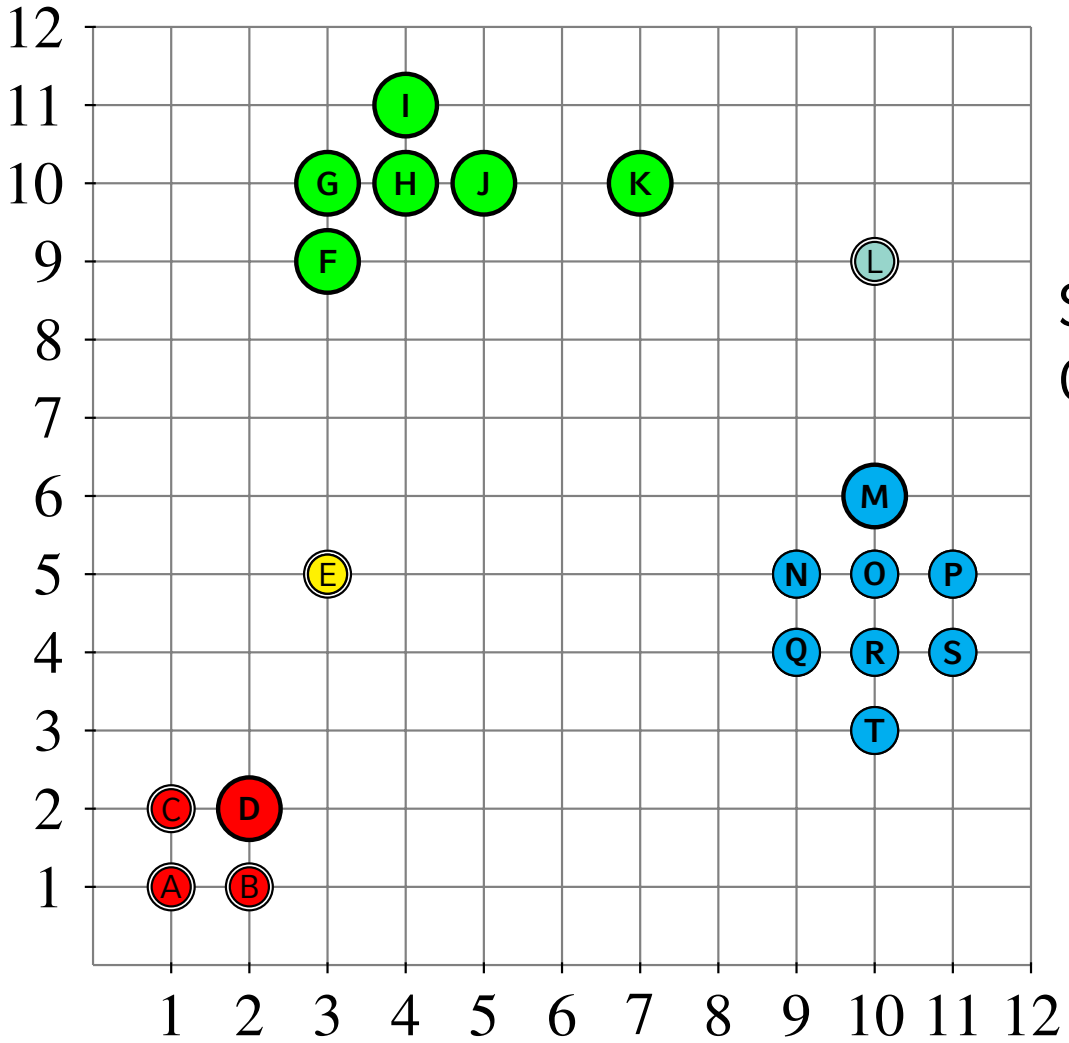

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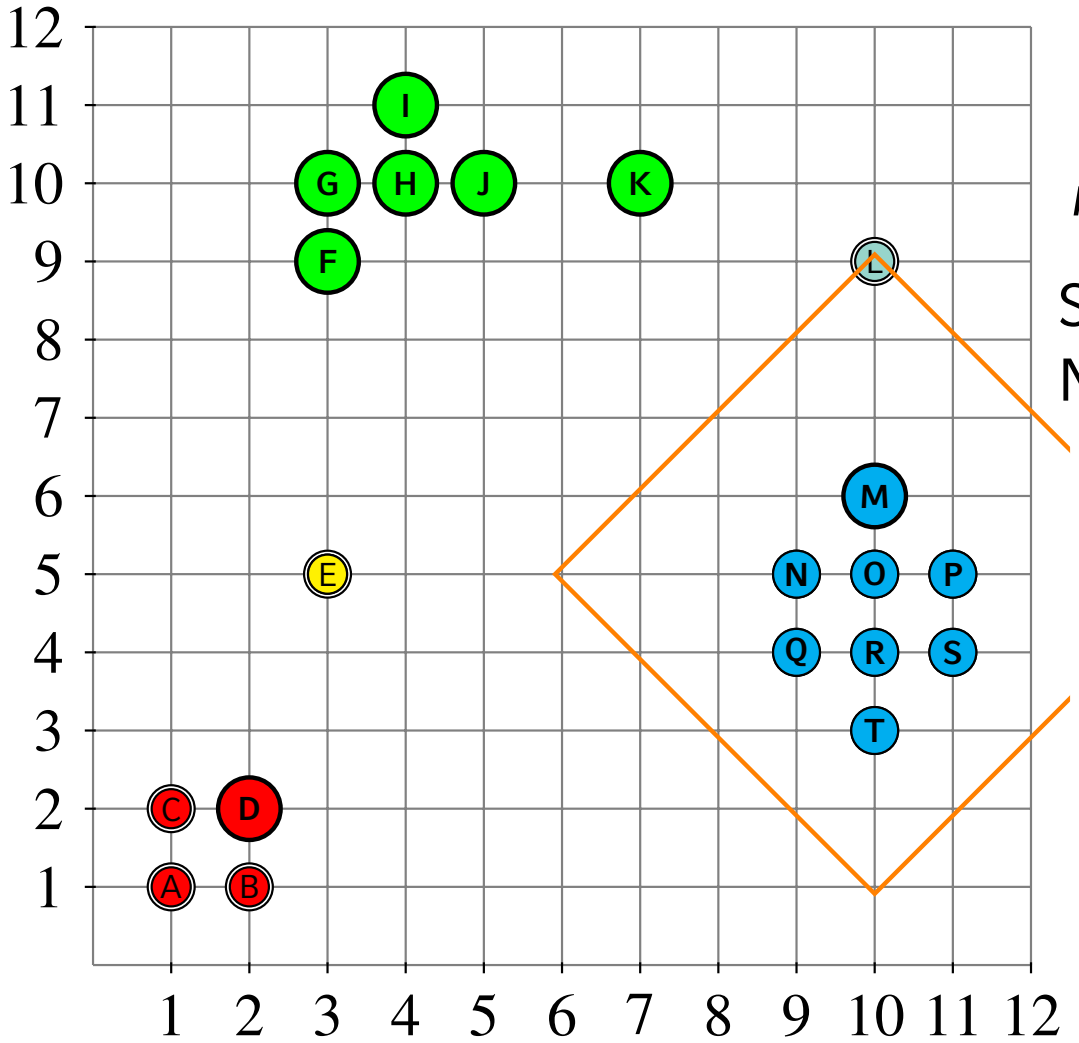

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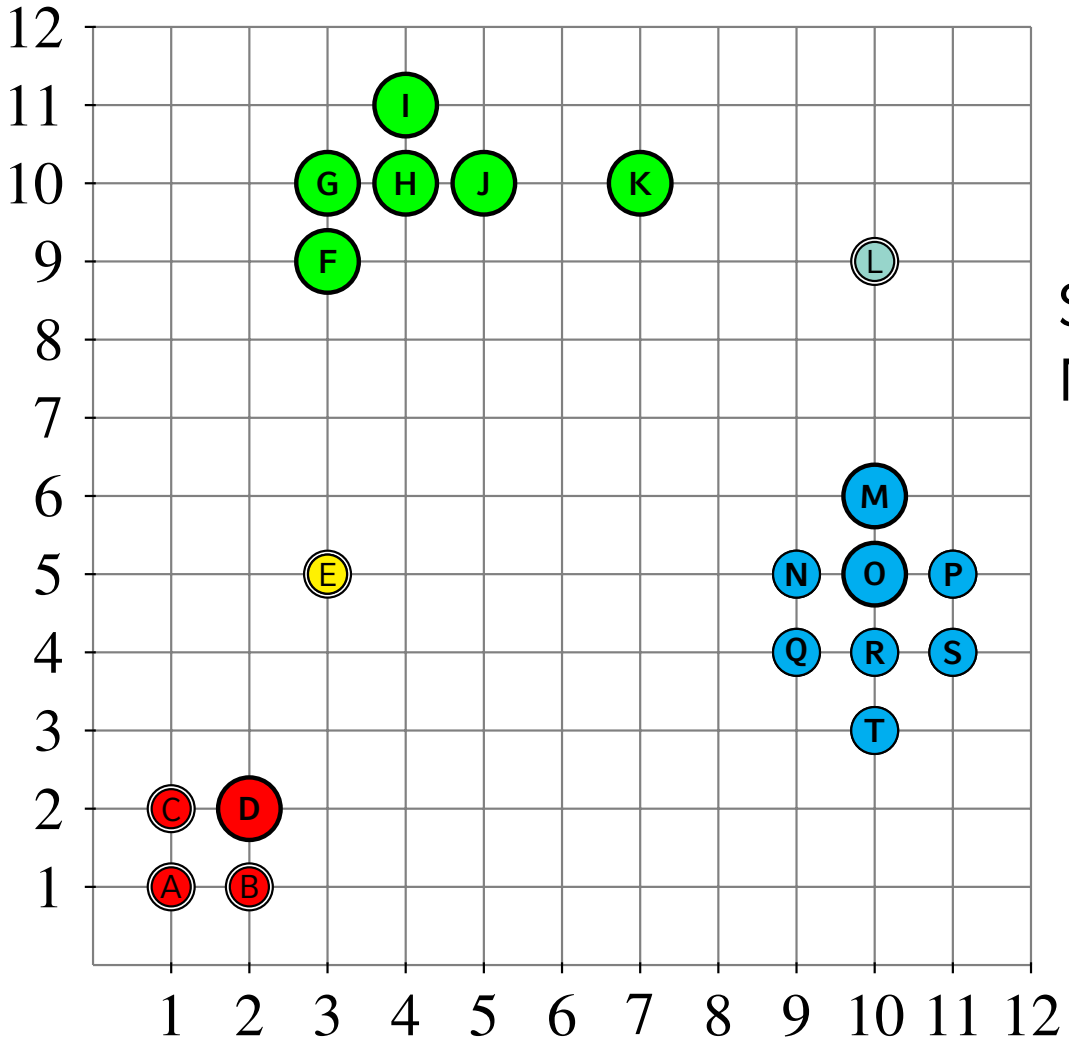

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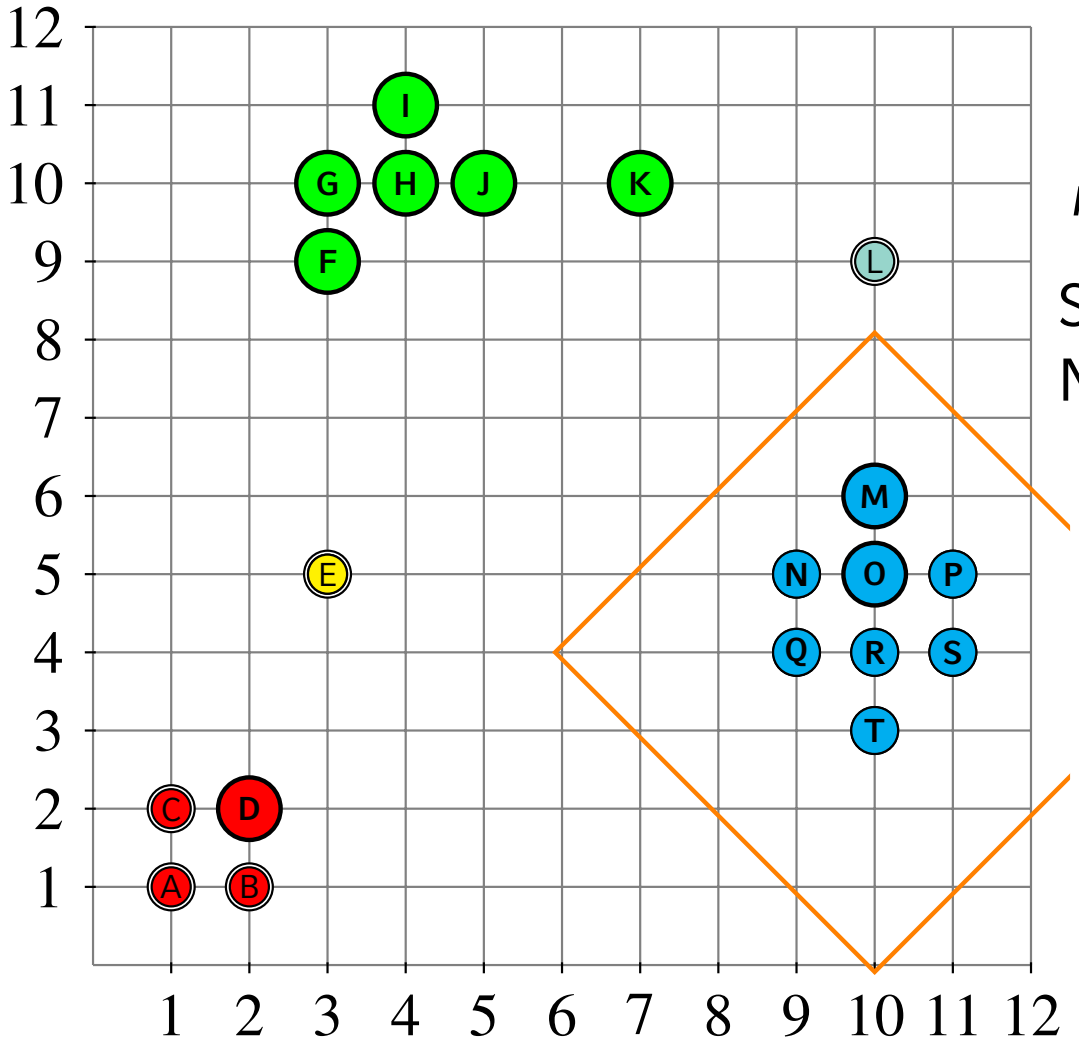

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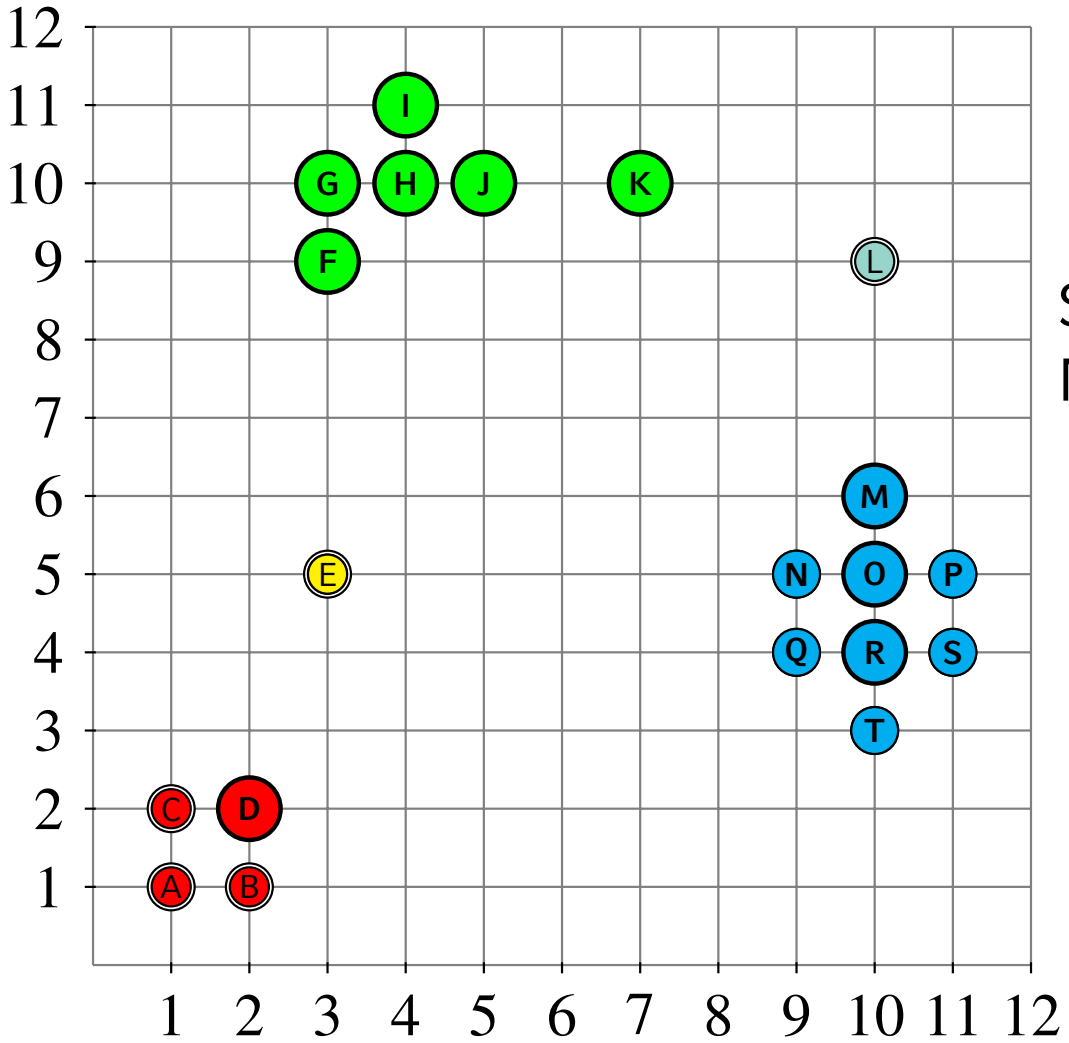

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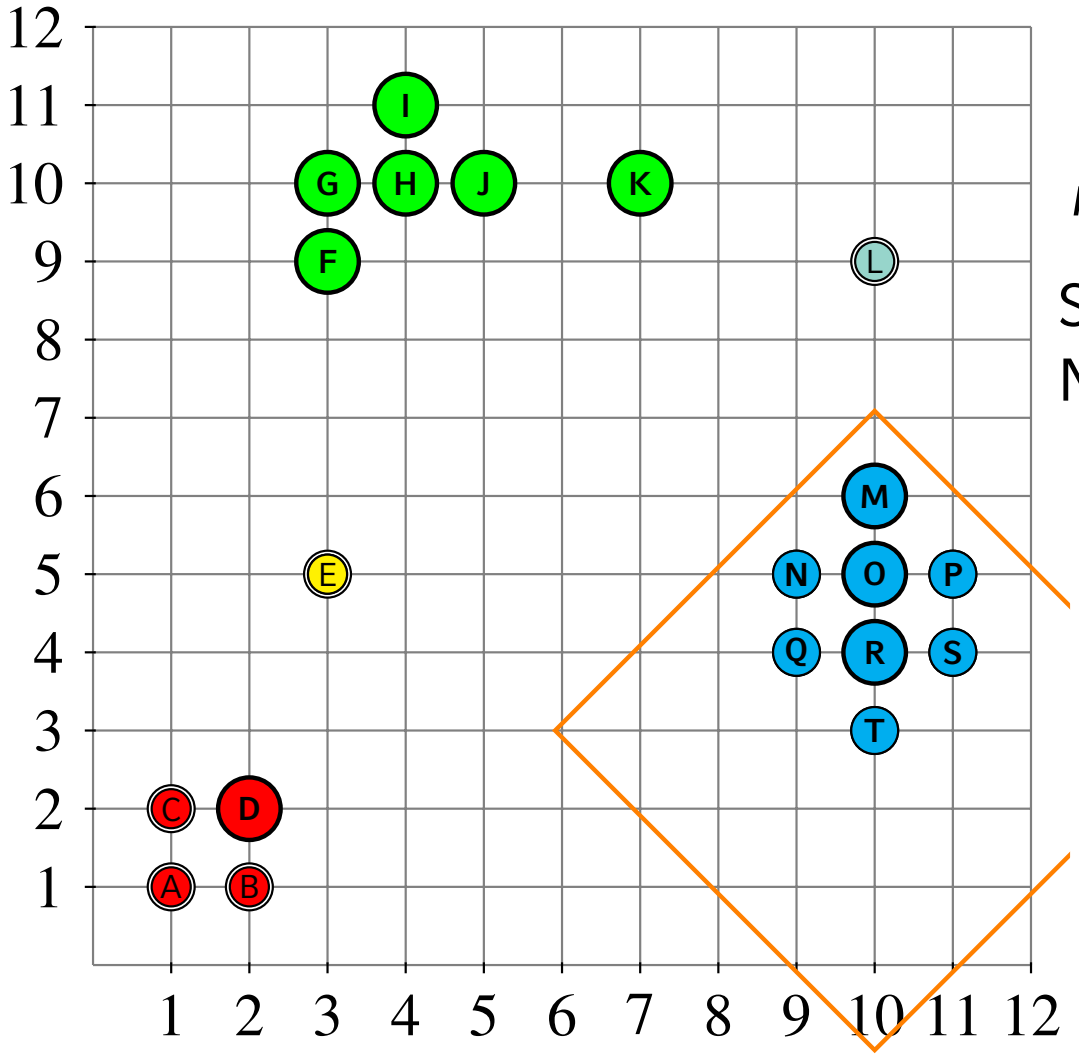

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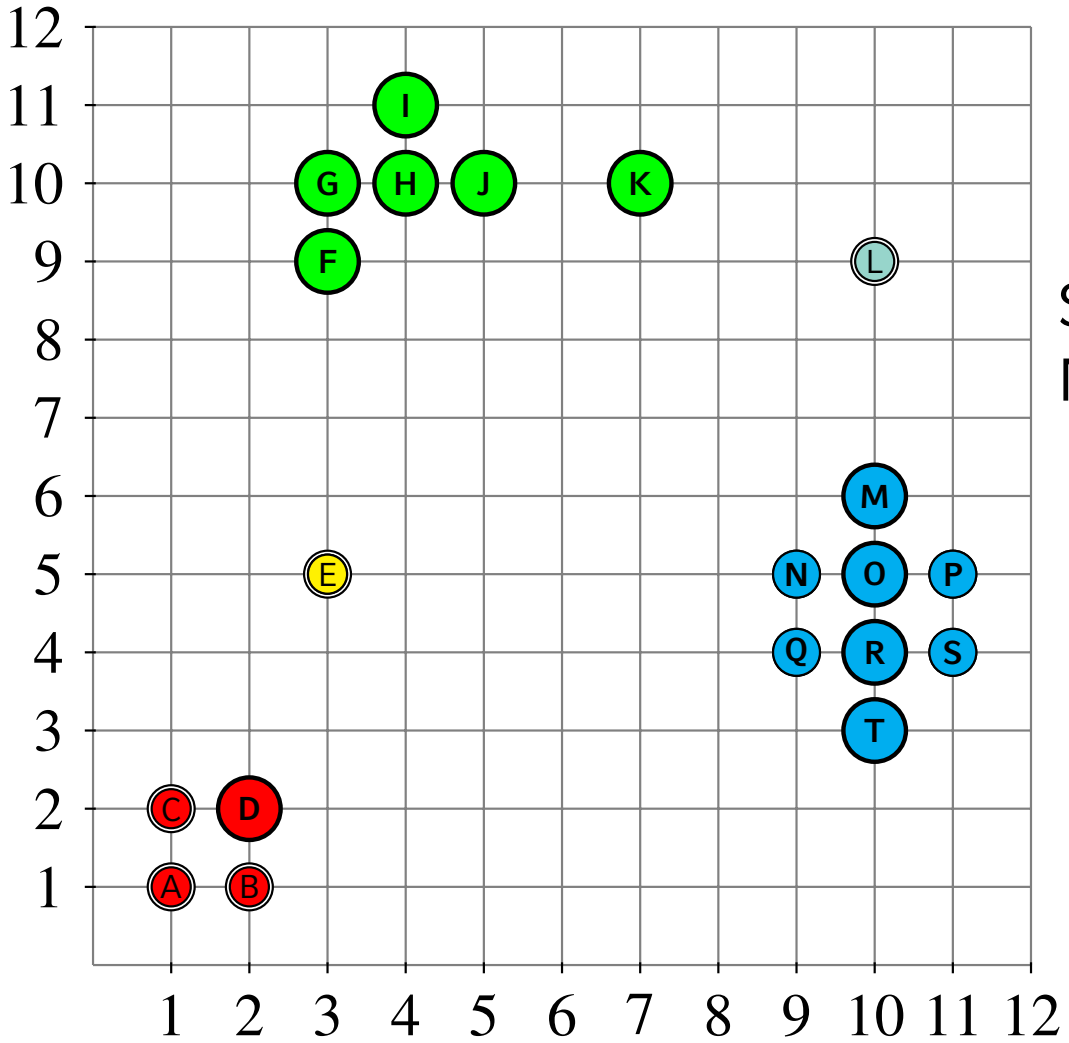

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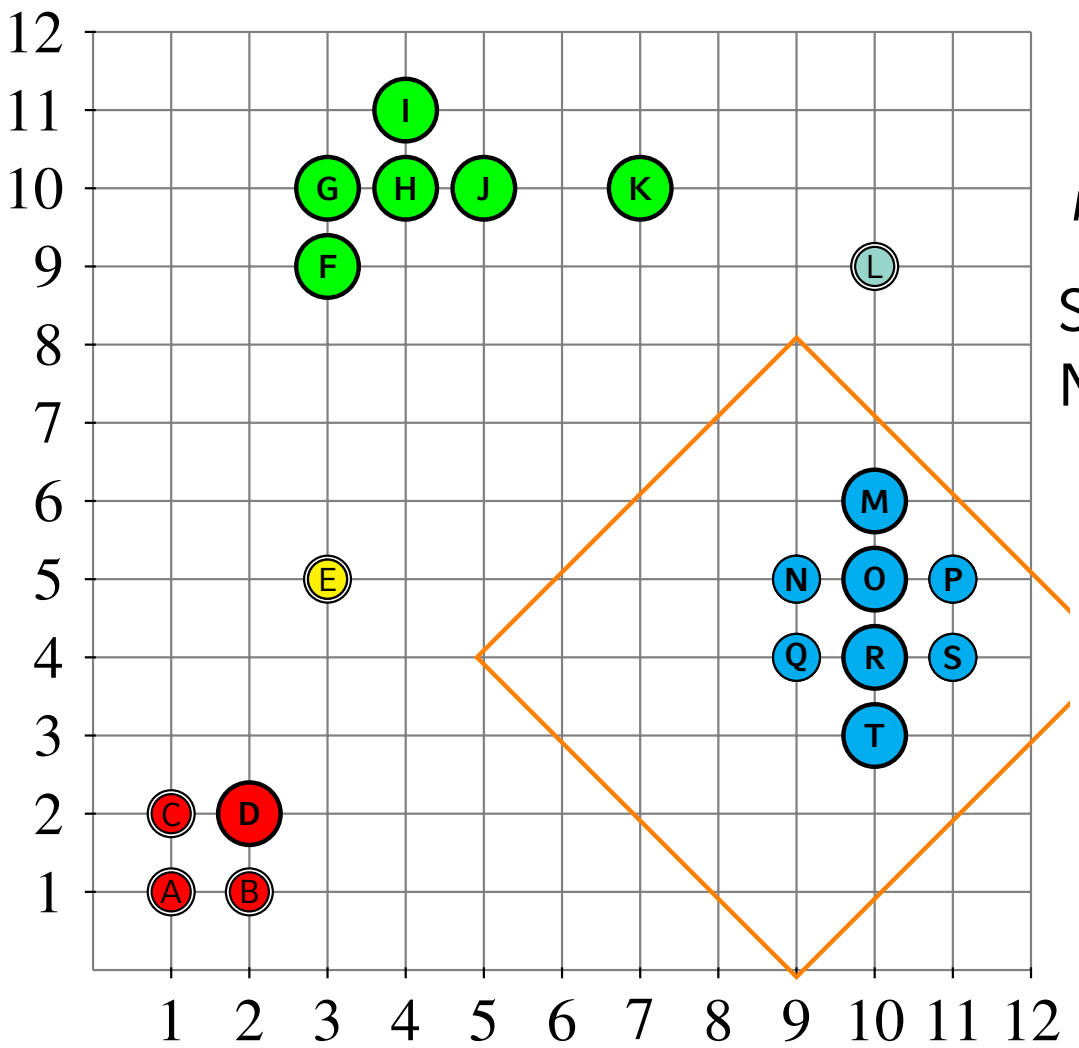

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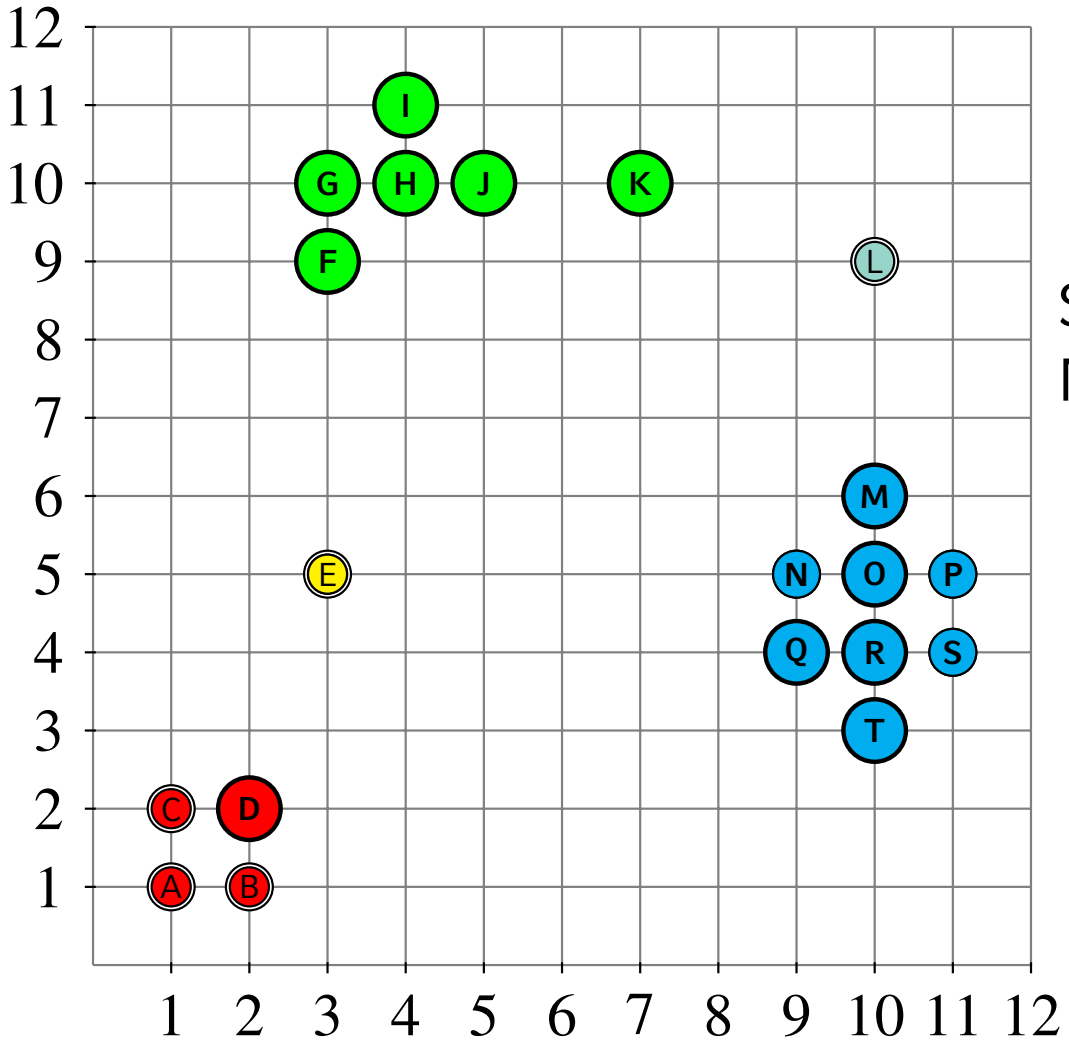

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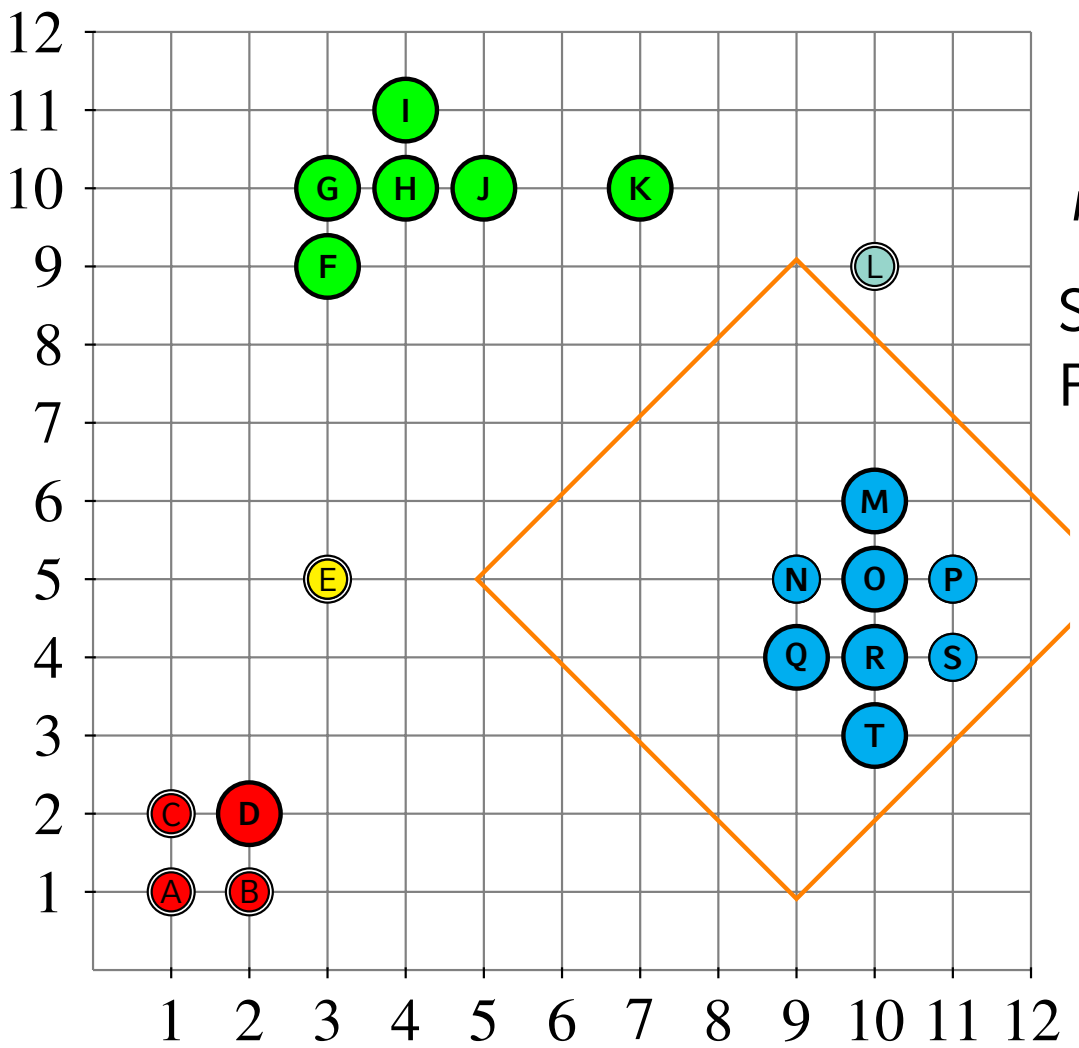

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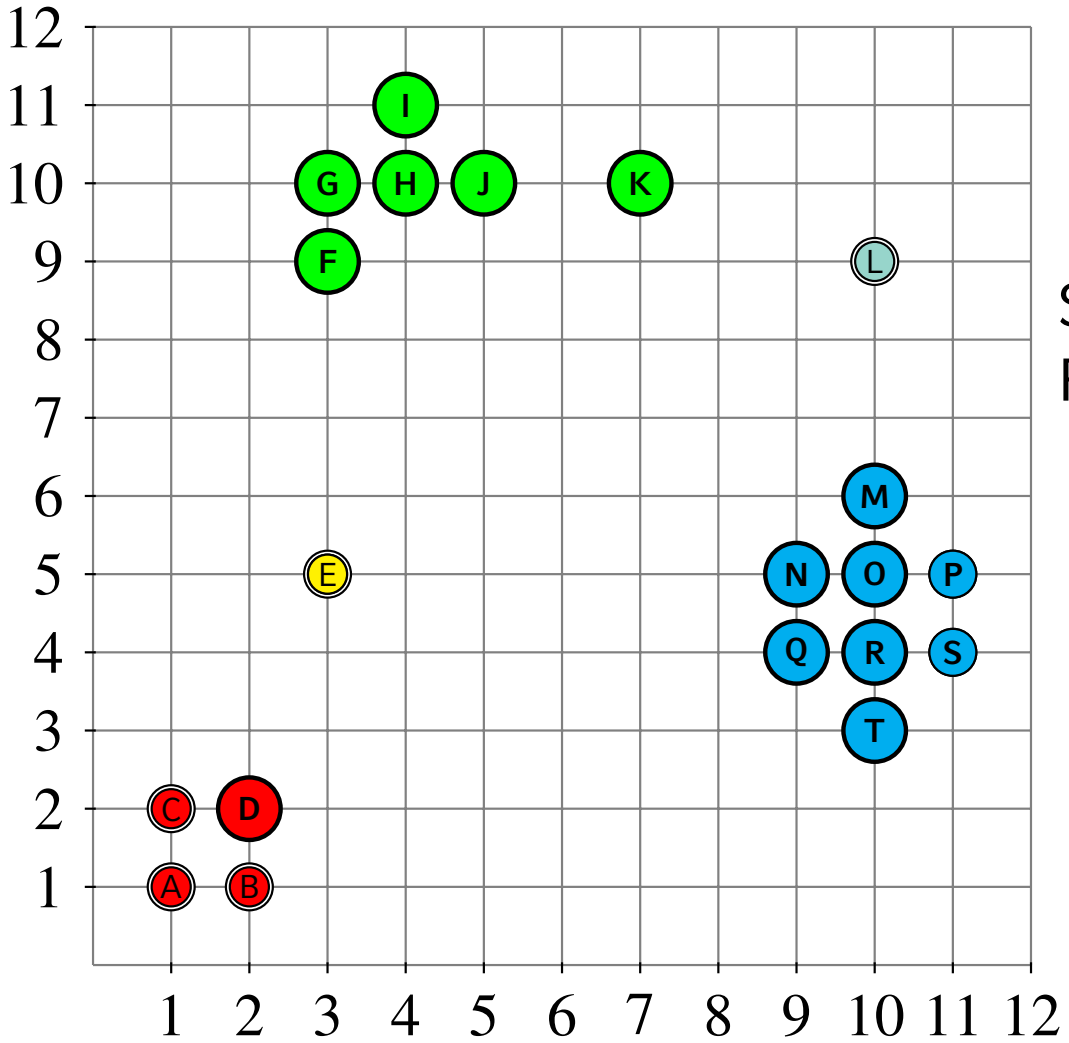

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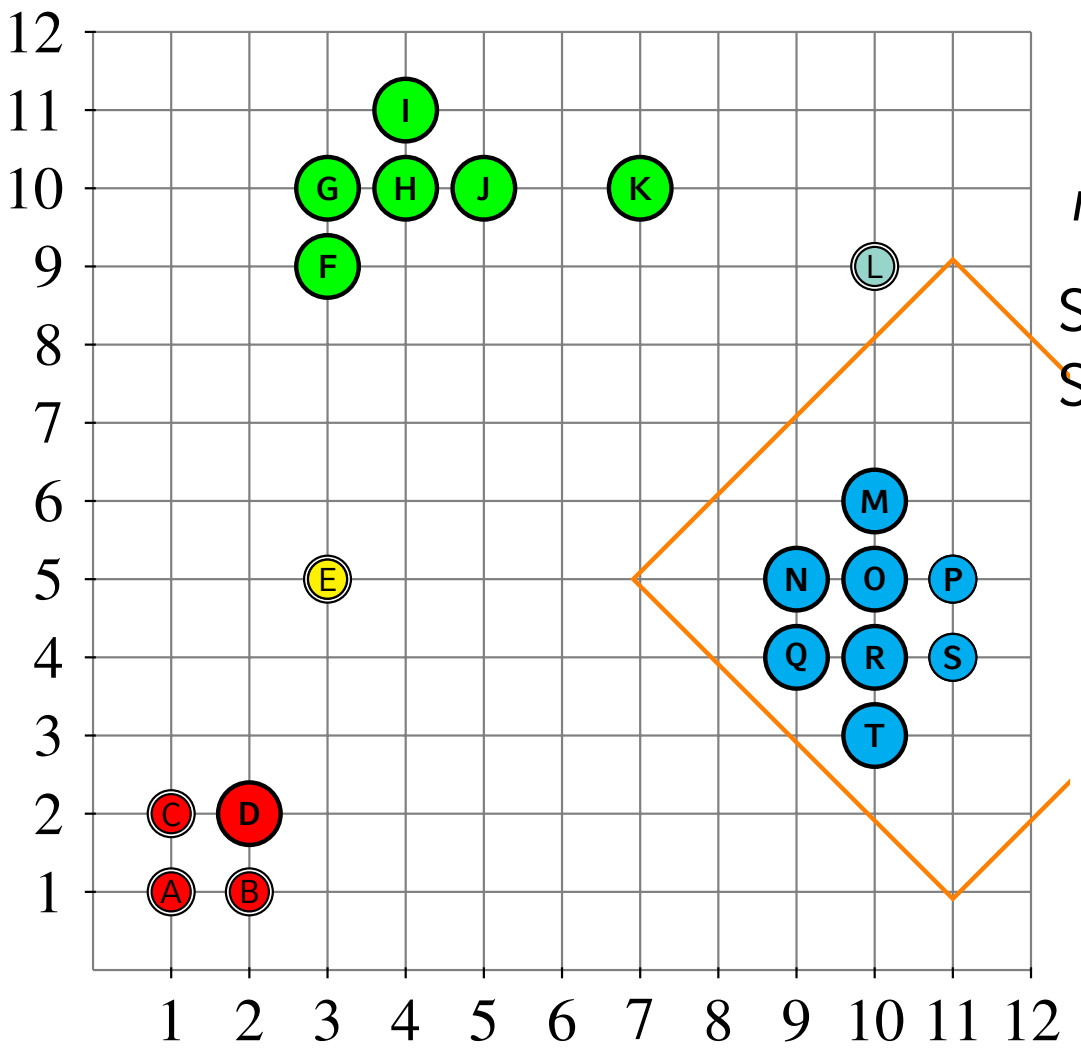

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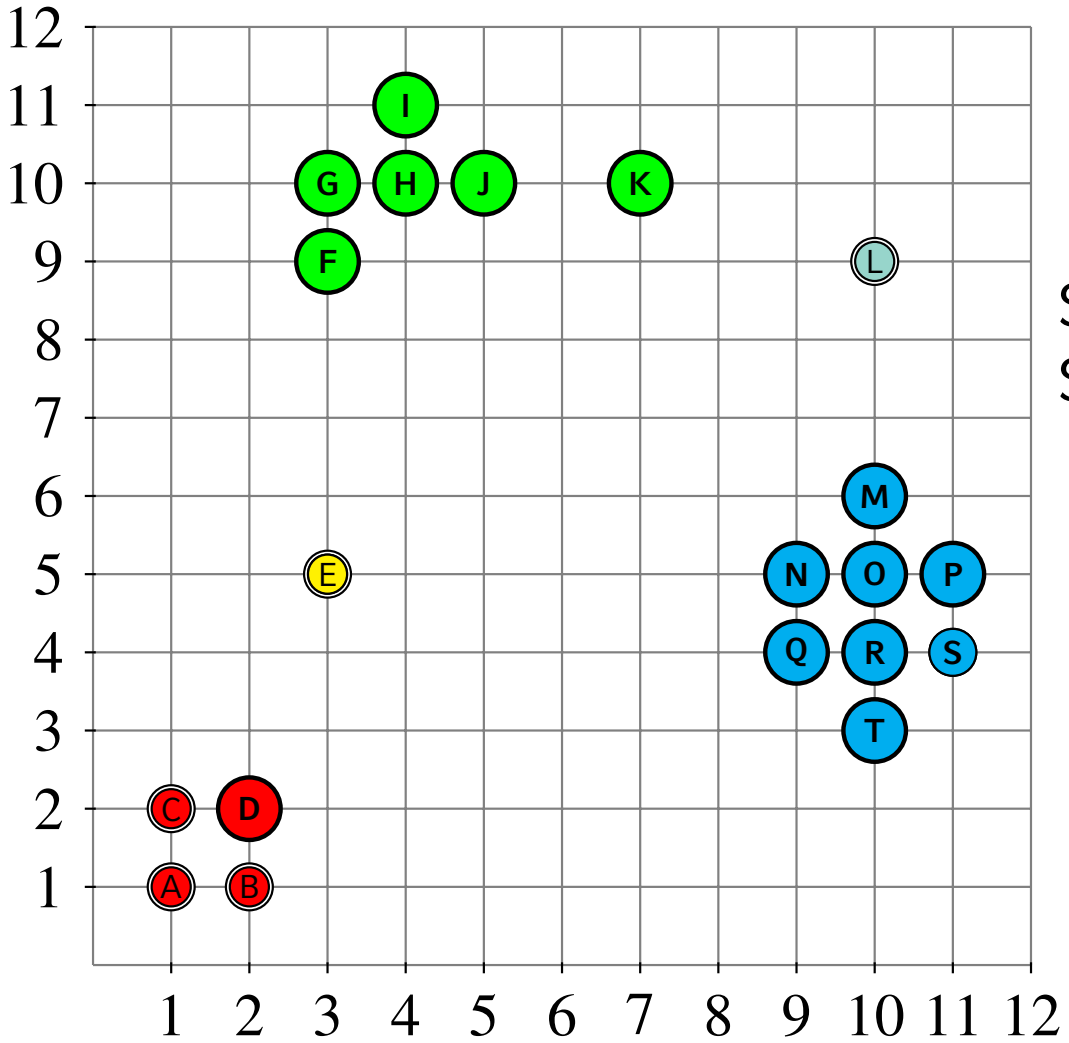

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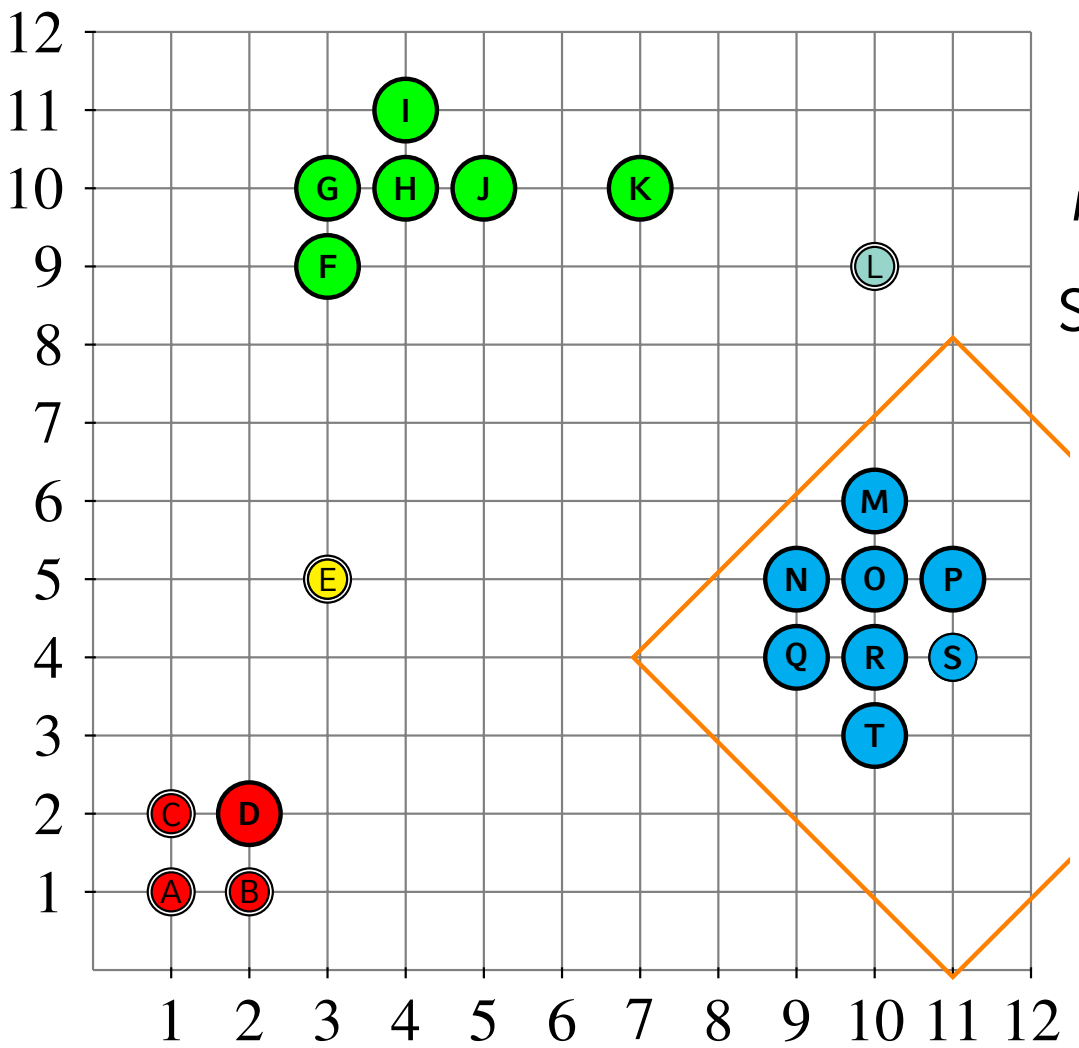

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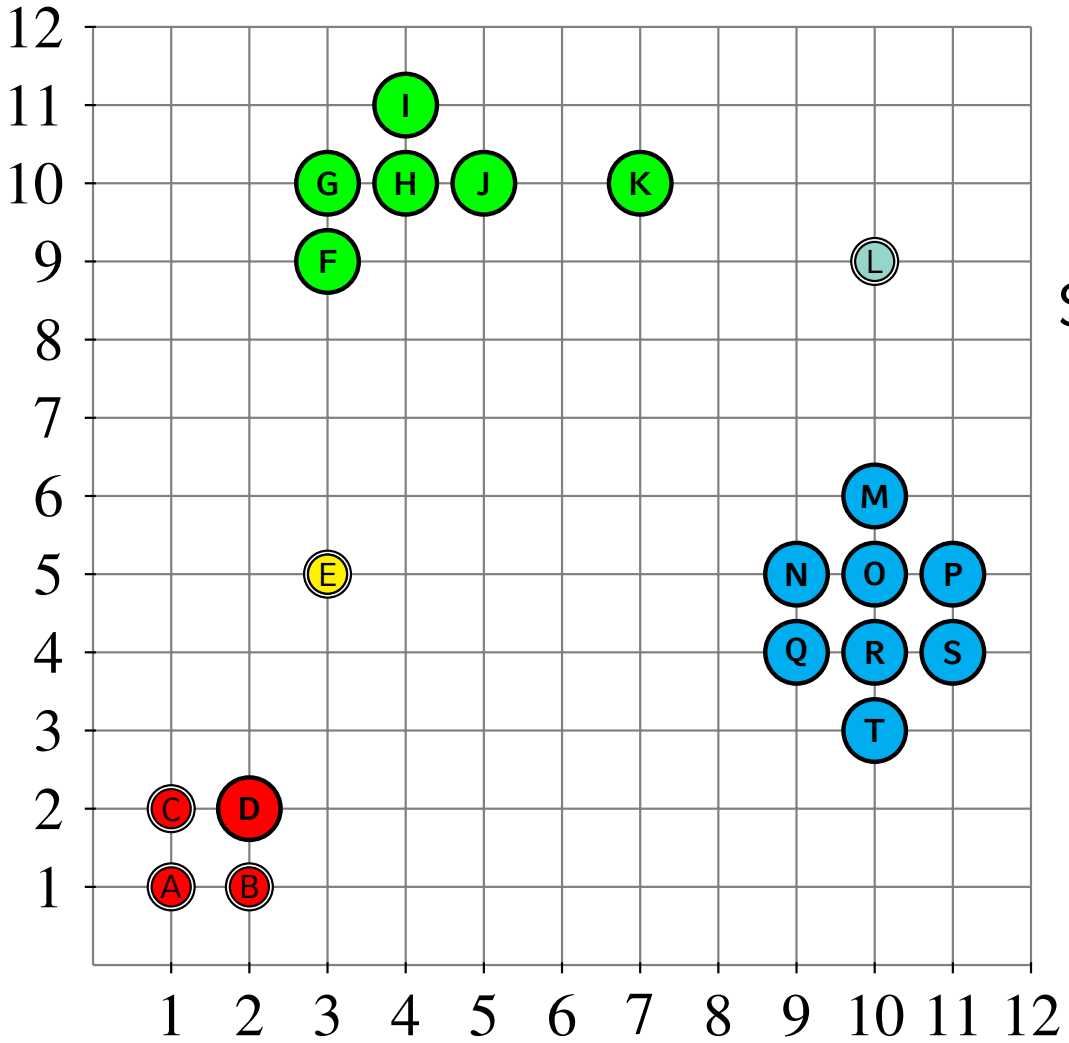

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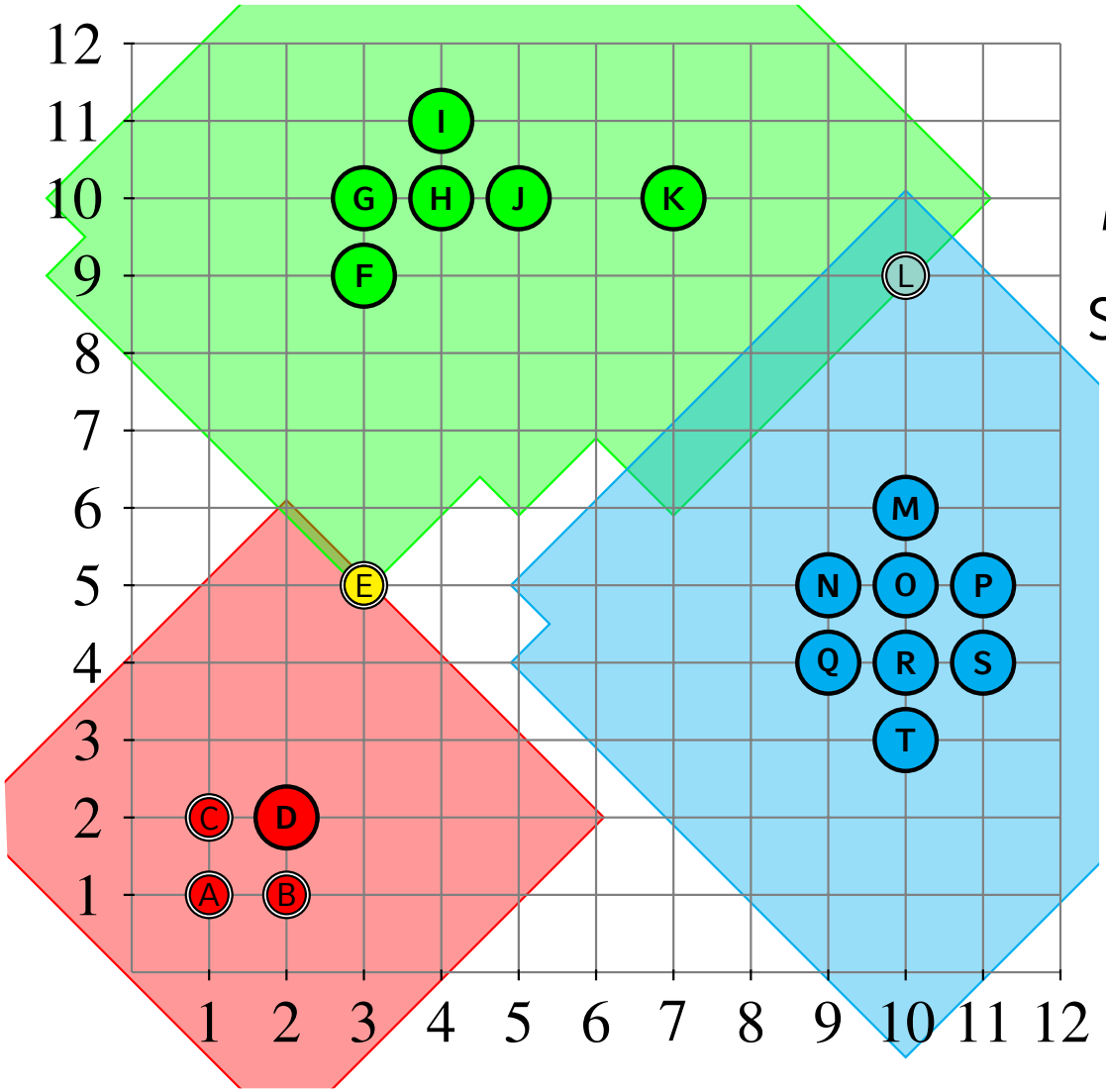

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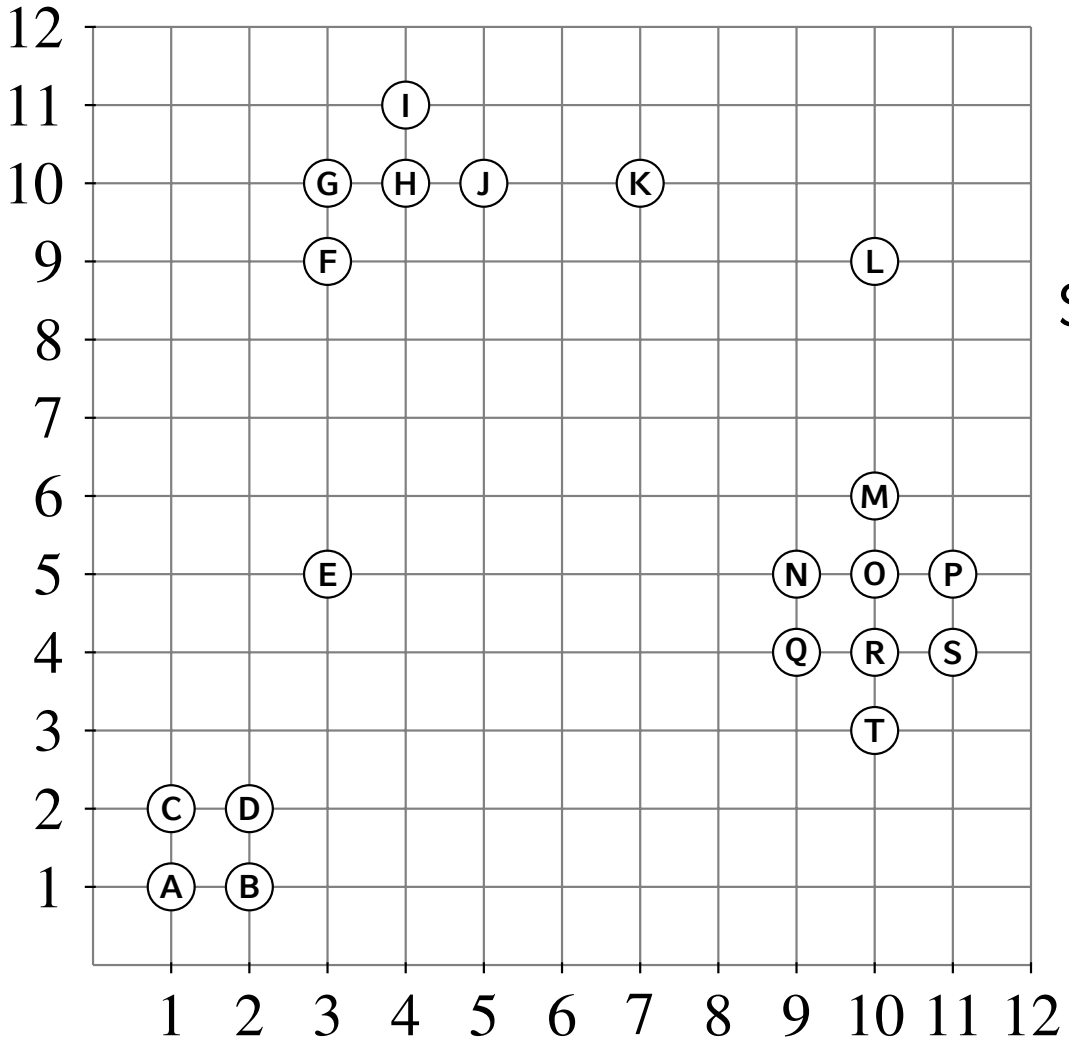

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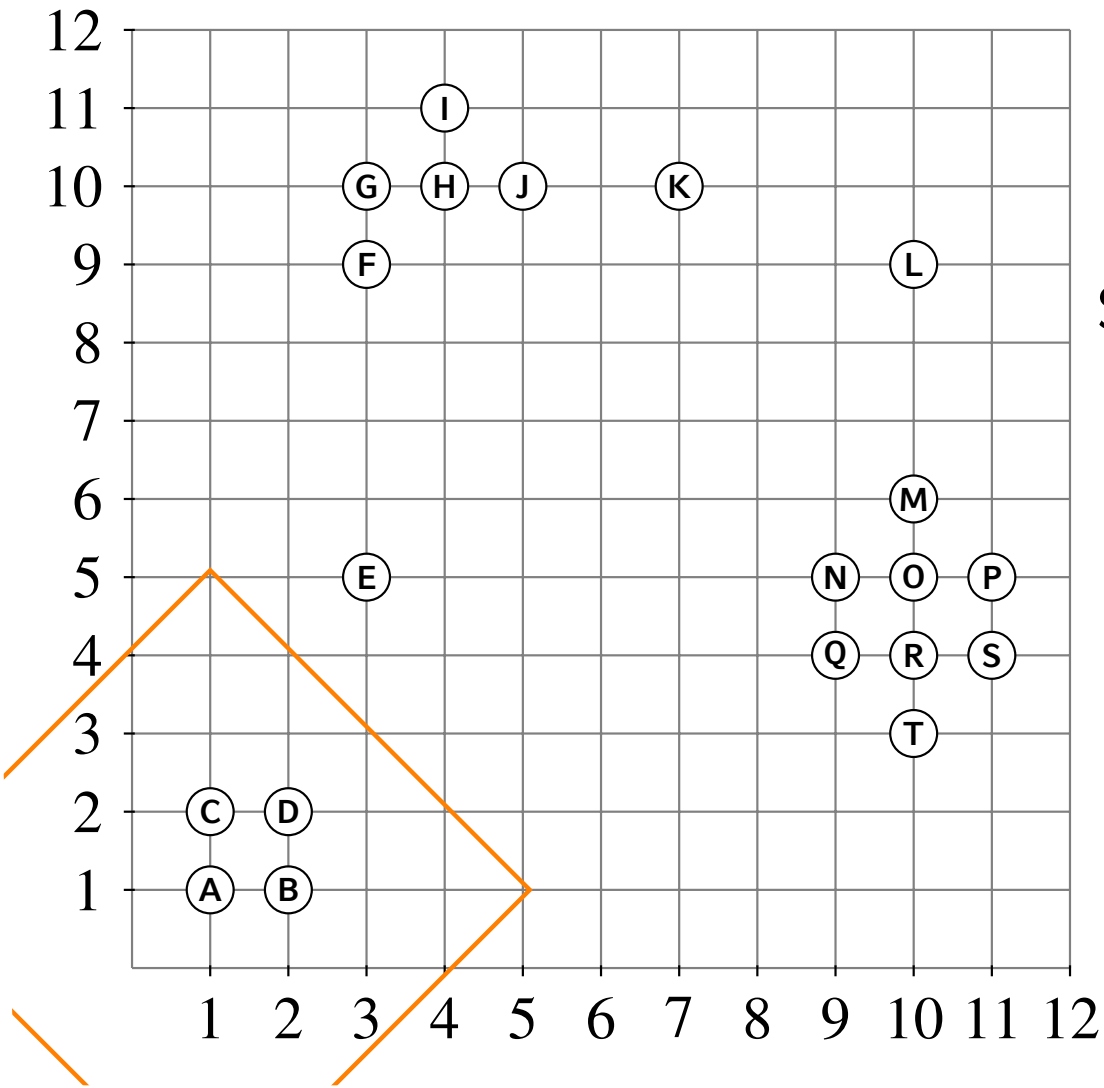

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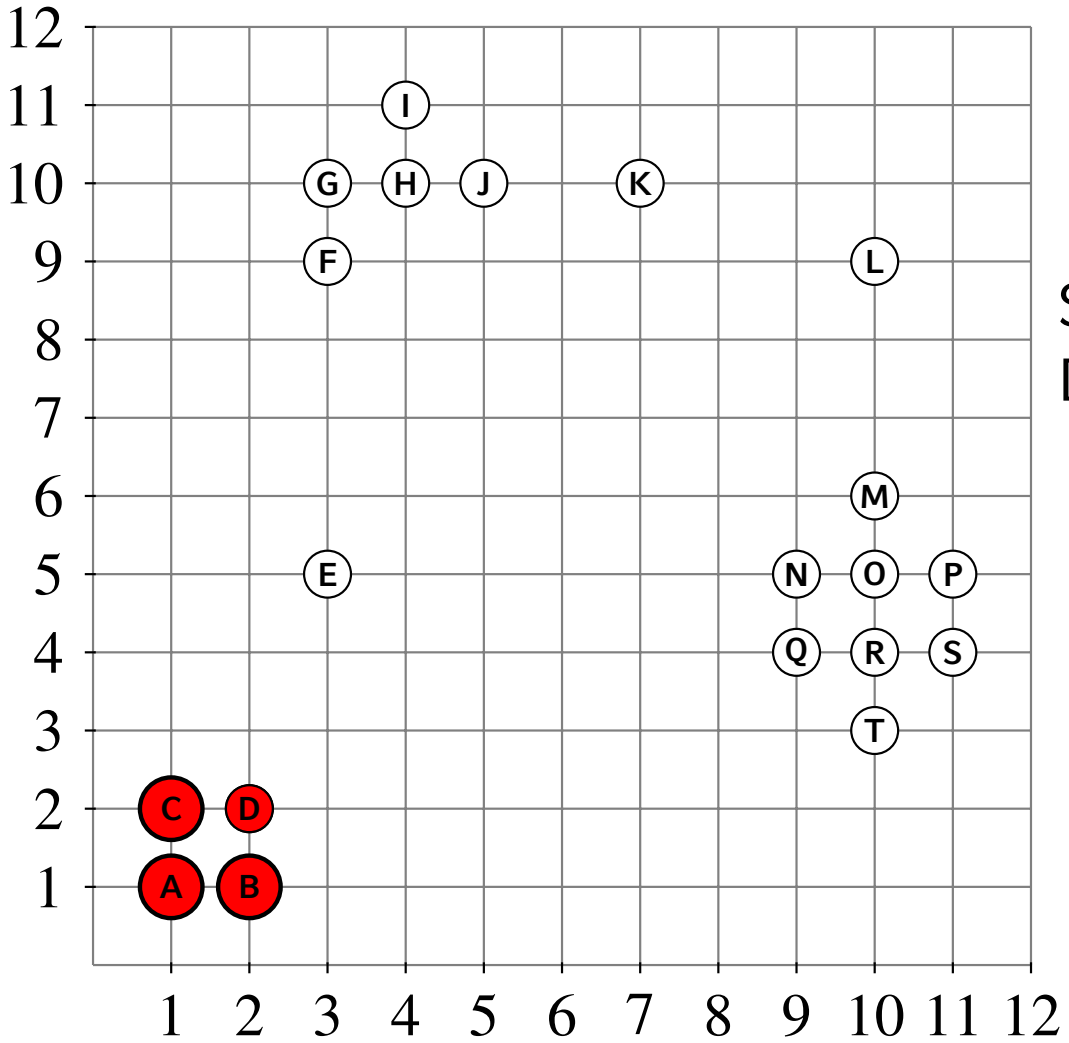

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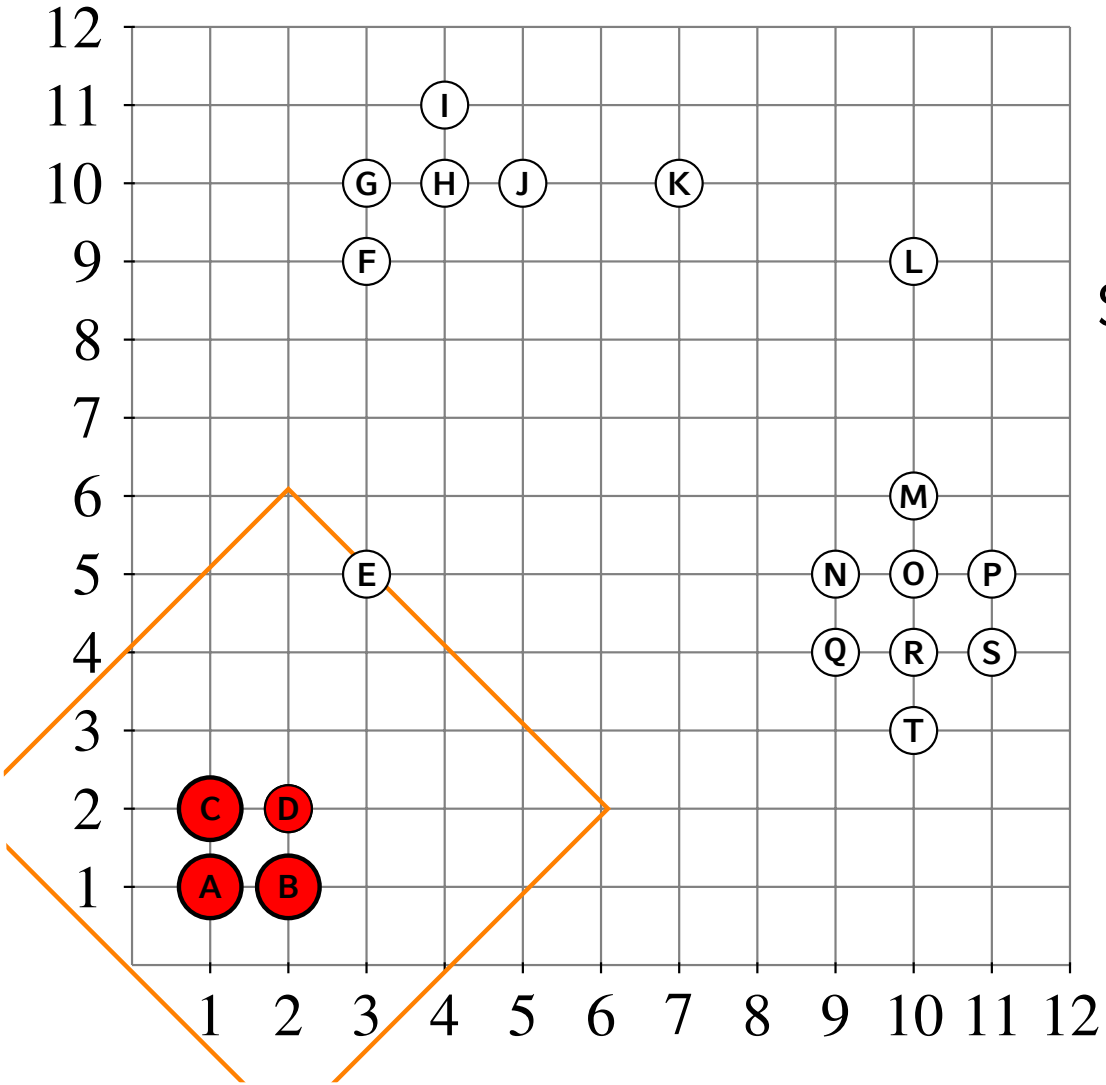

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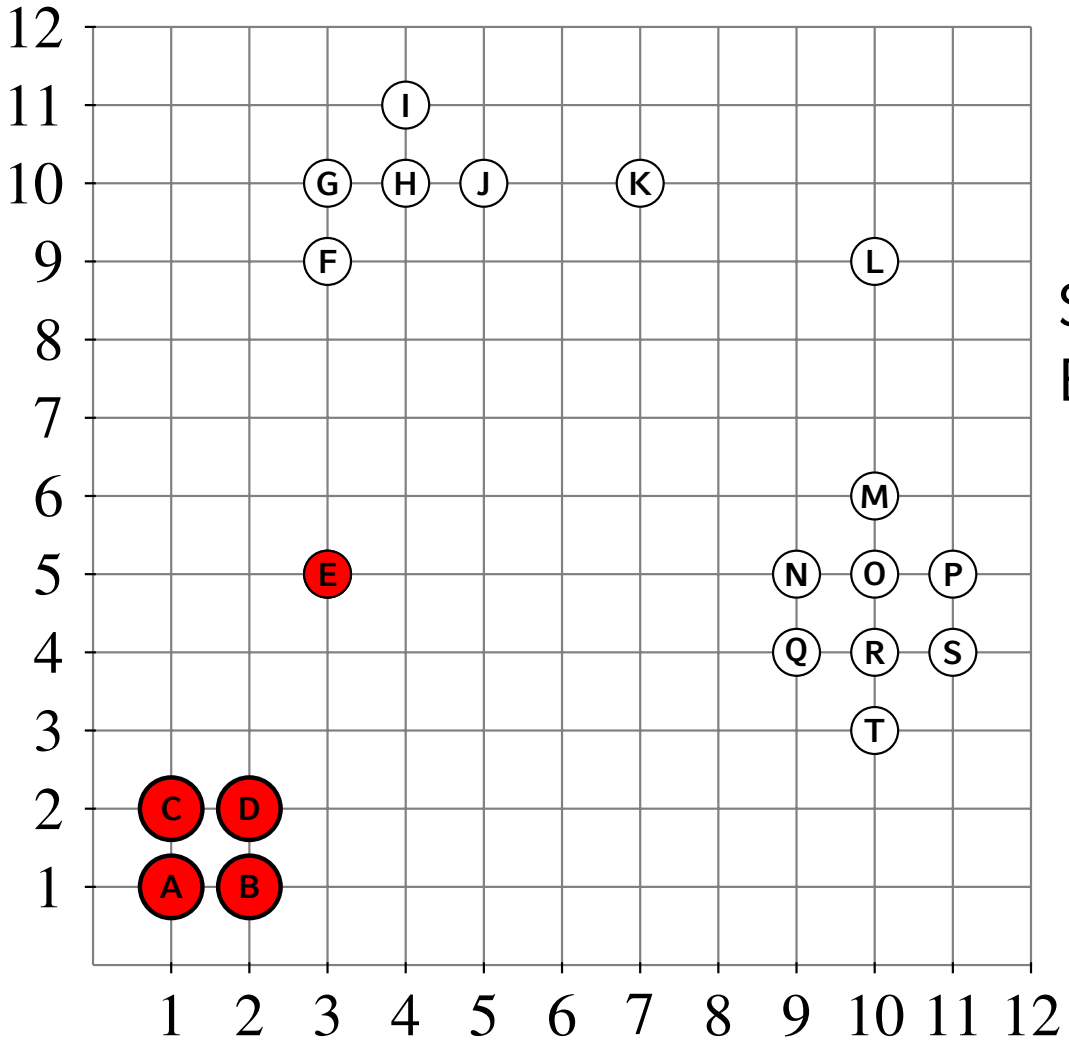

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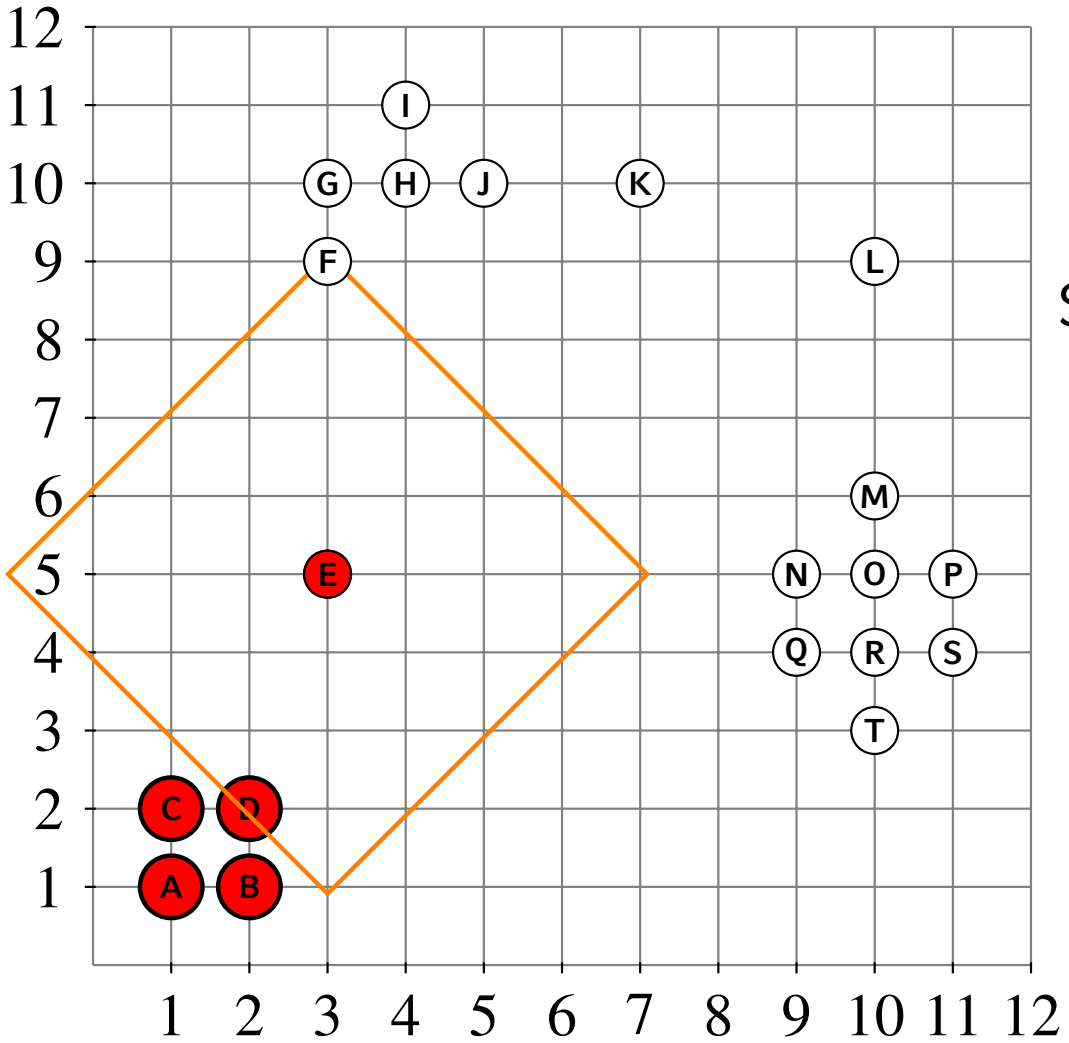

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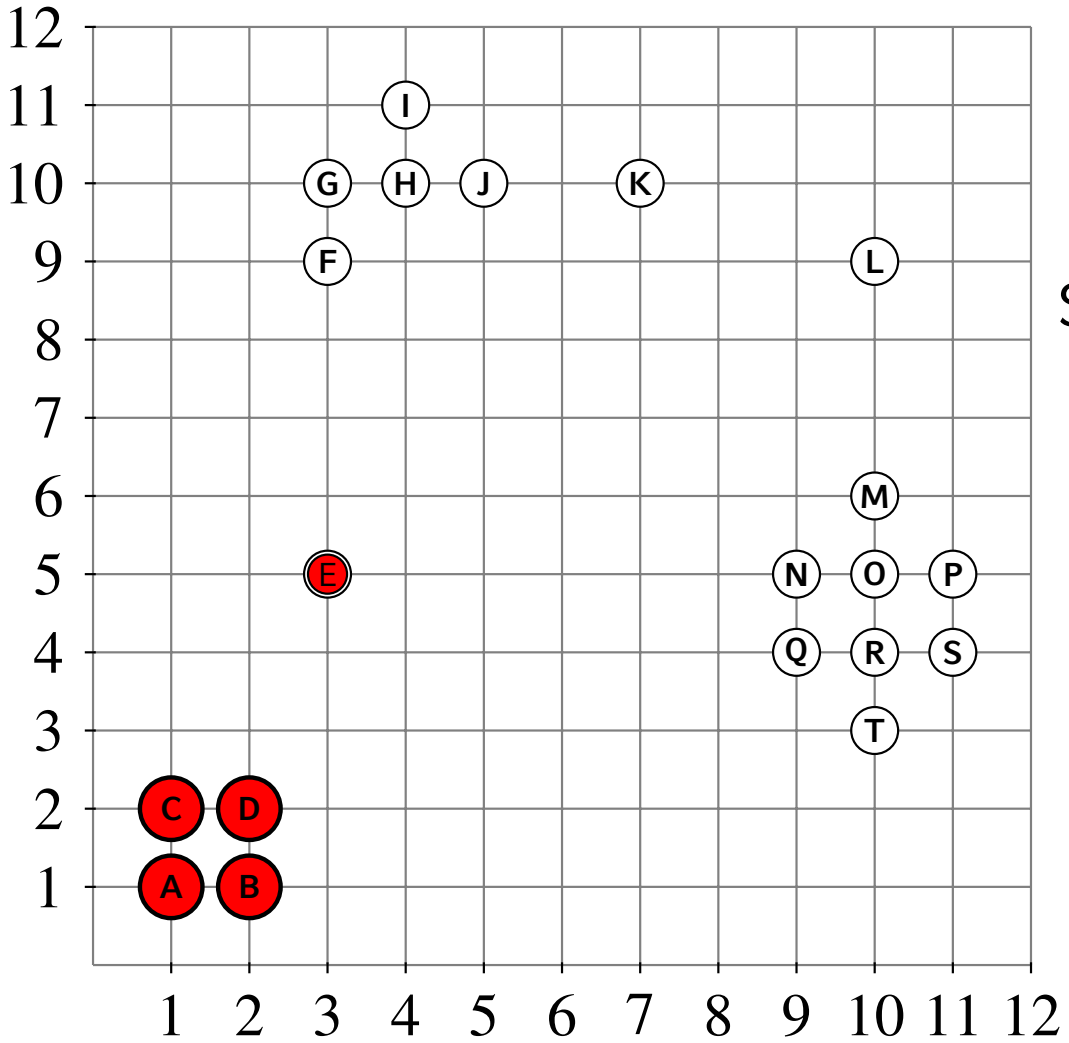

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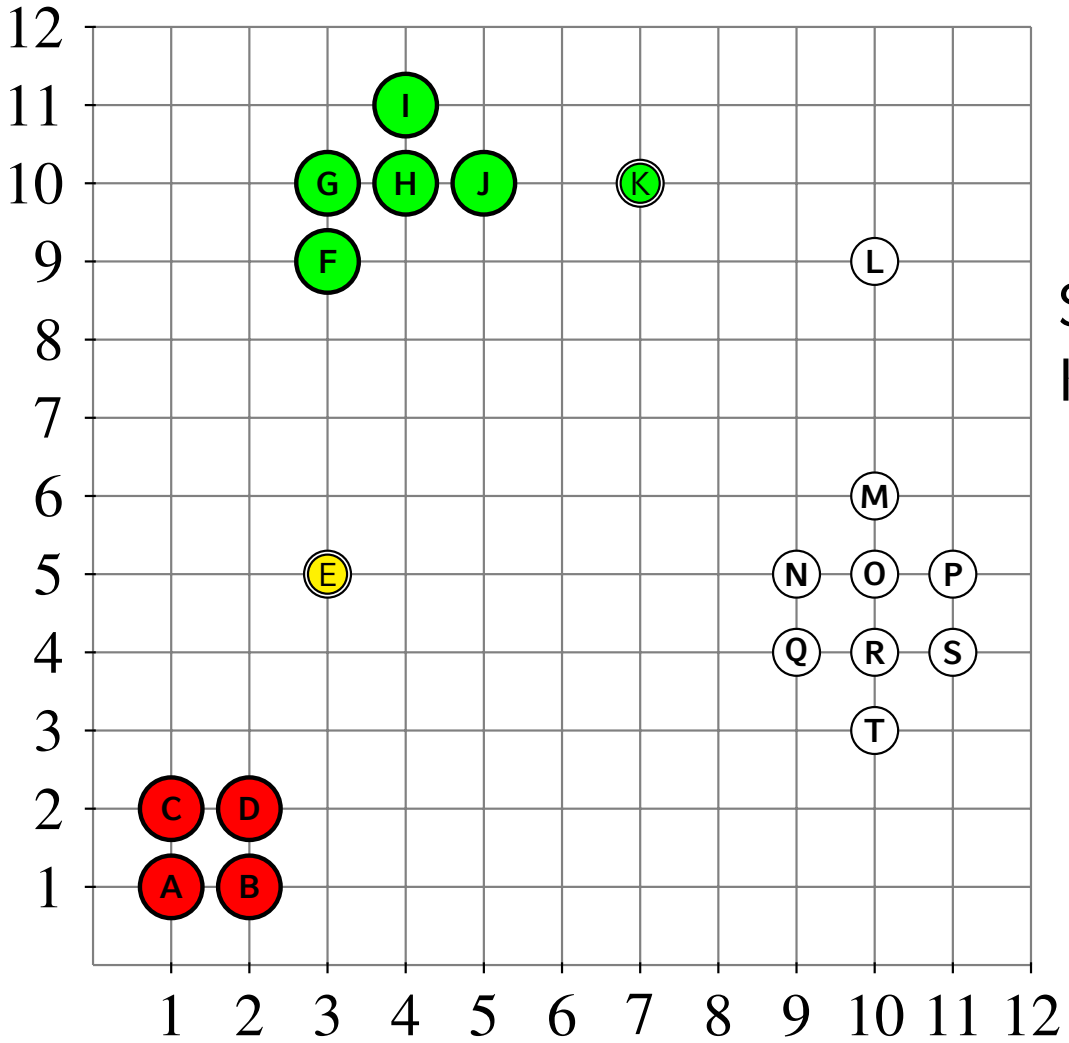

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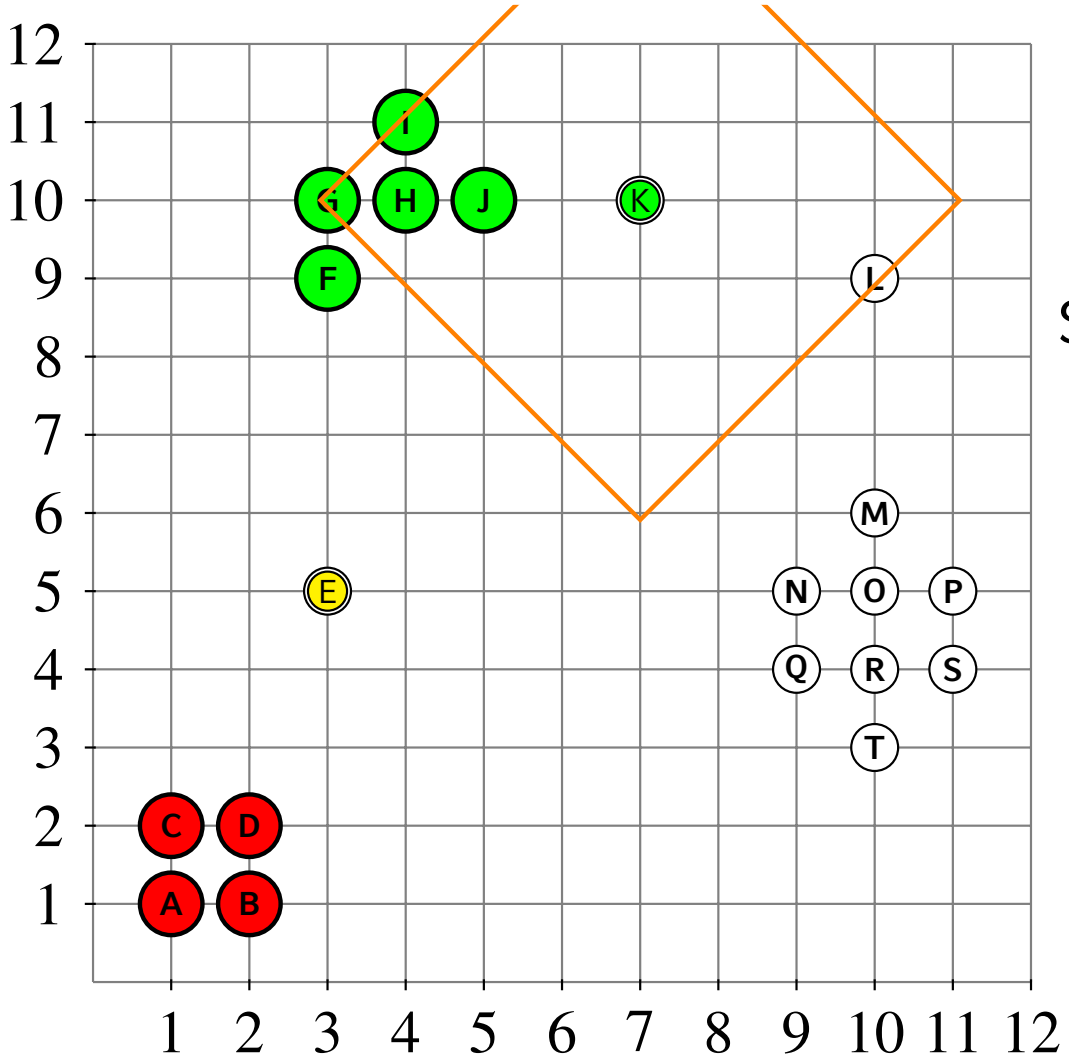

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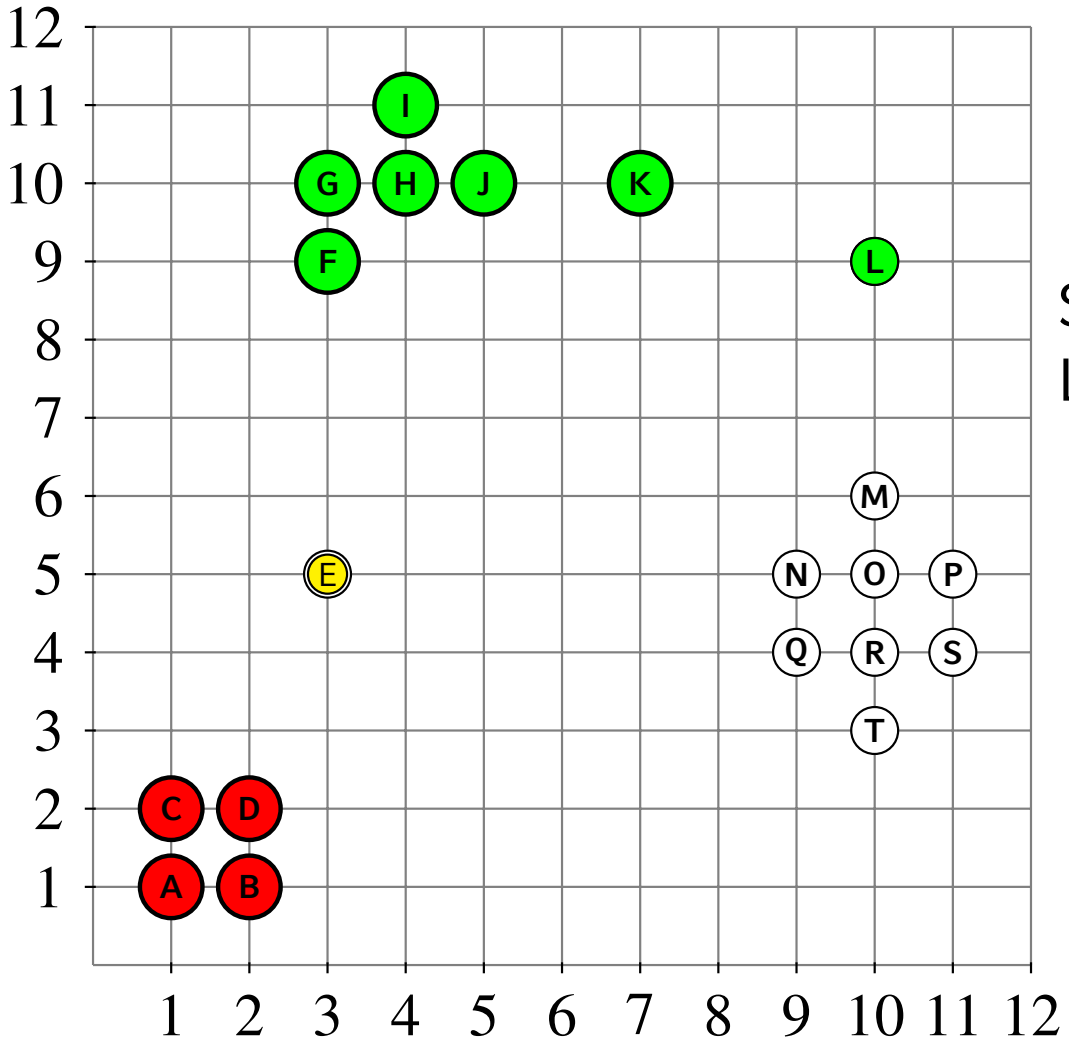

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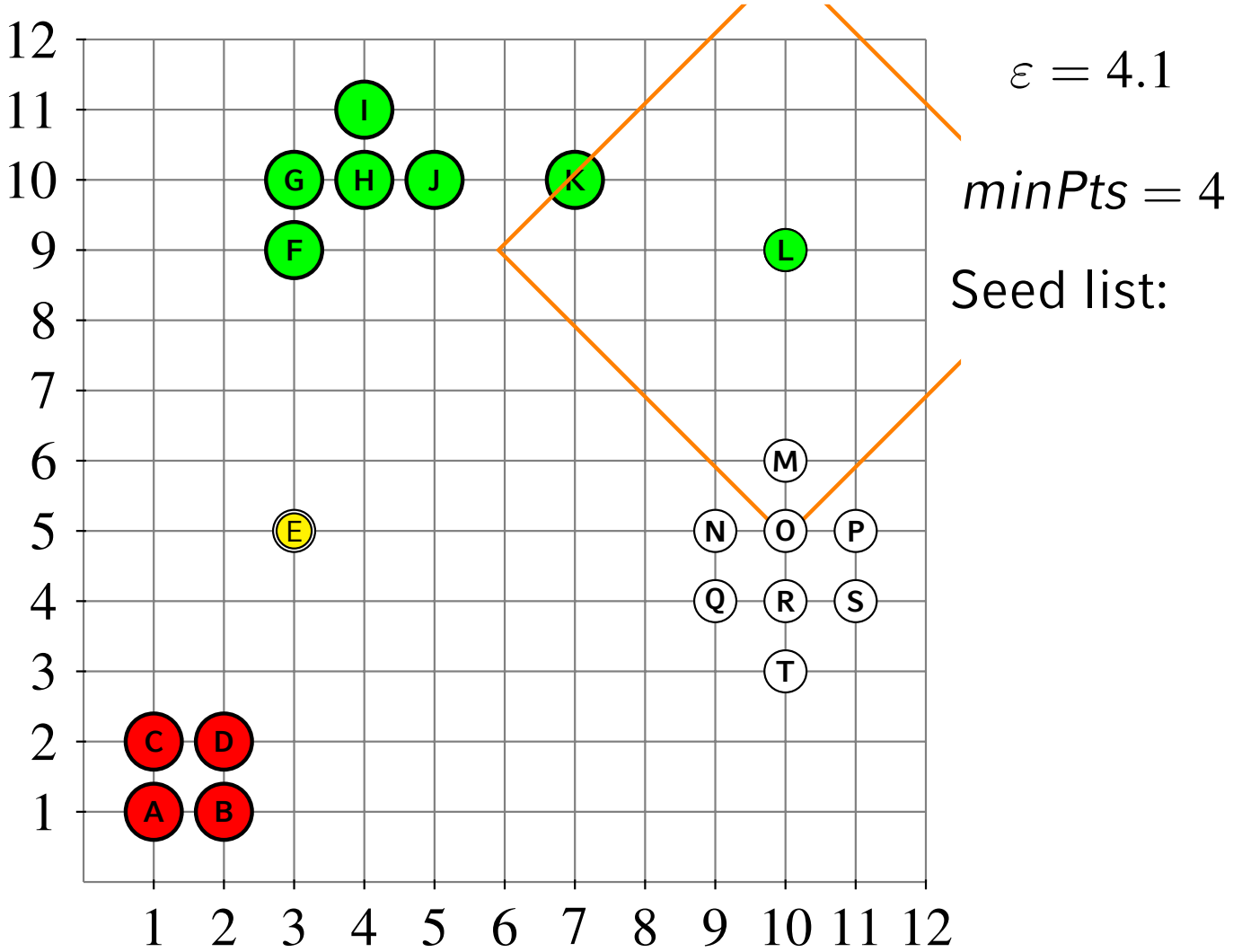
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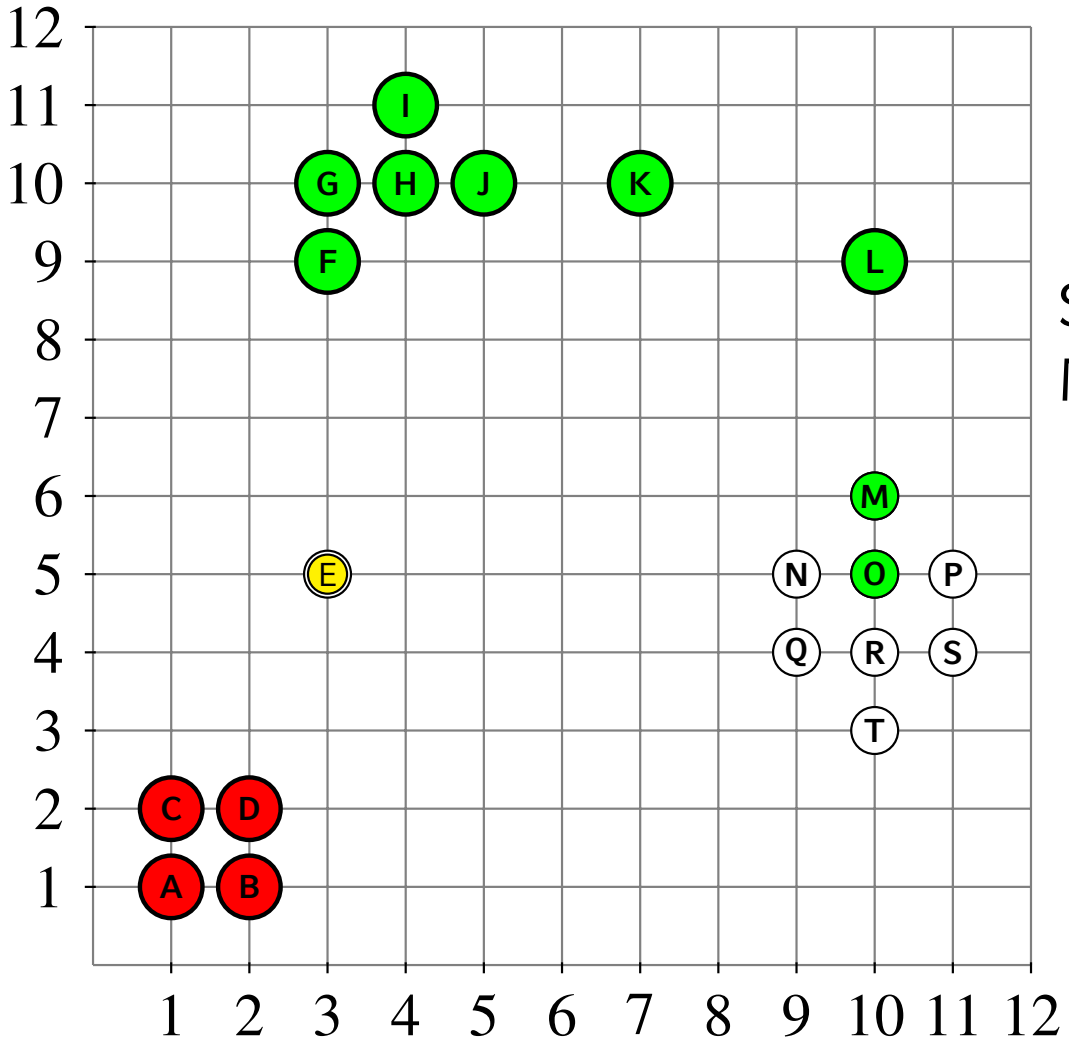

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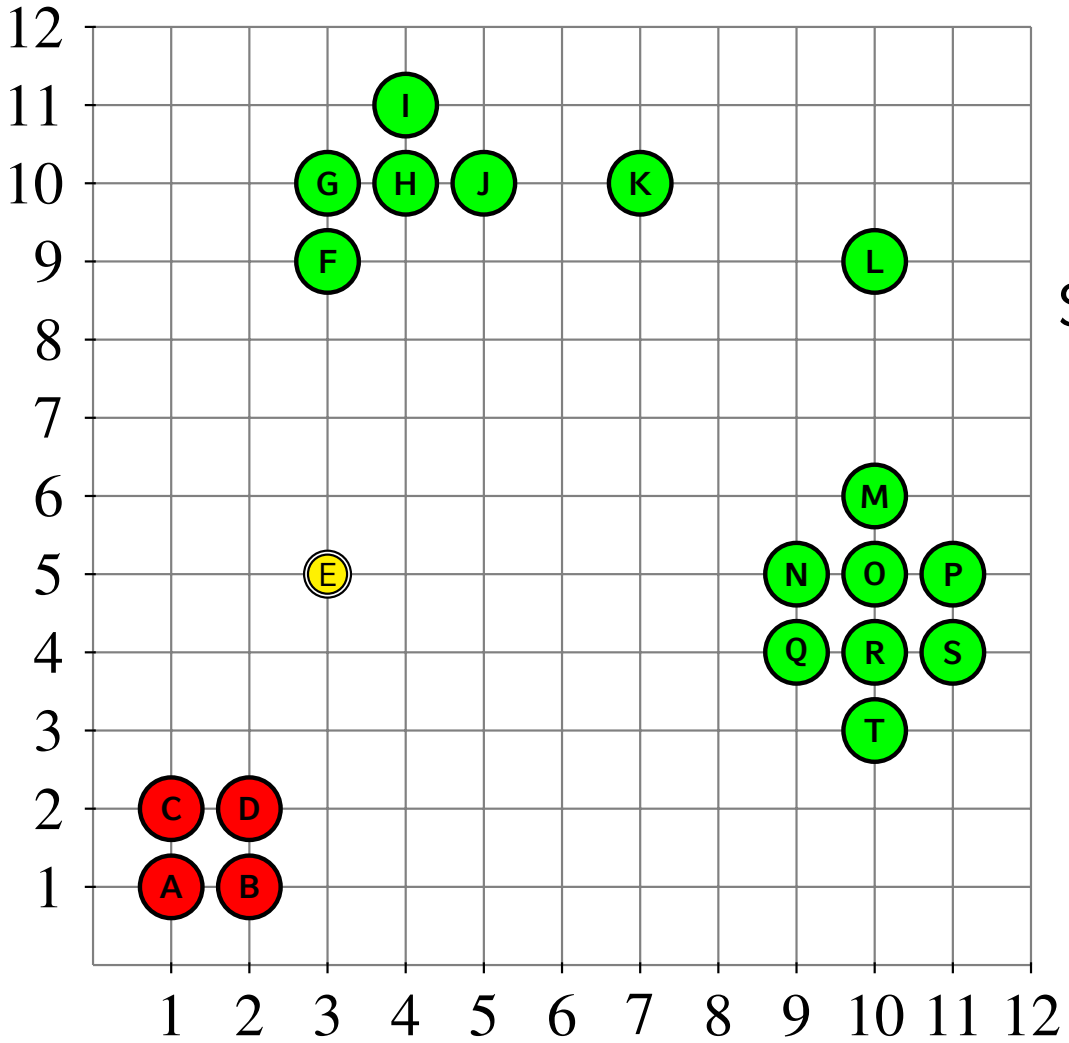

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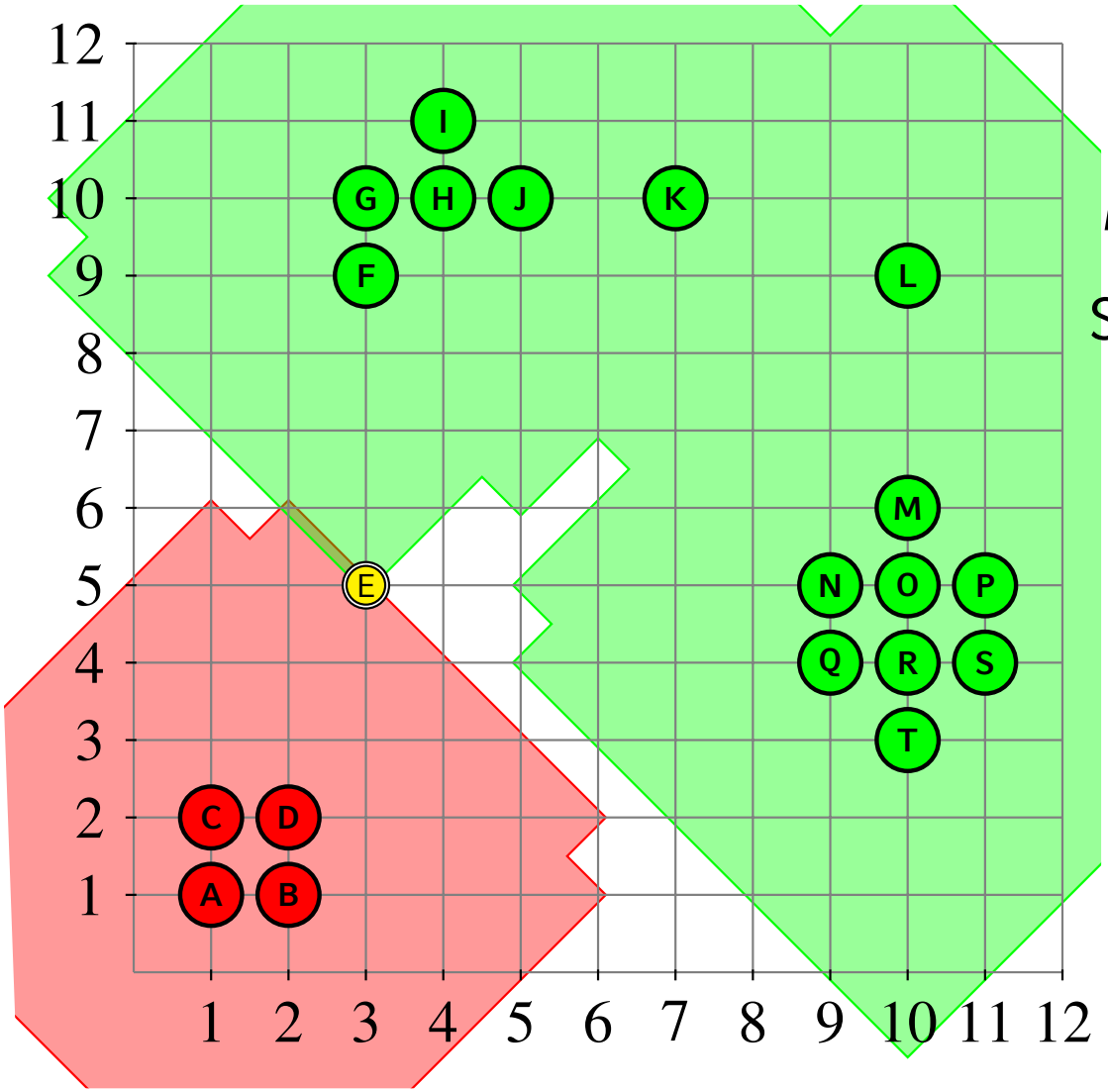
Seed list:

DBSCAN



$\varepsilon = 4.1$

$minPts = 4$

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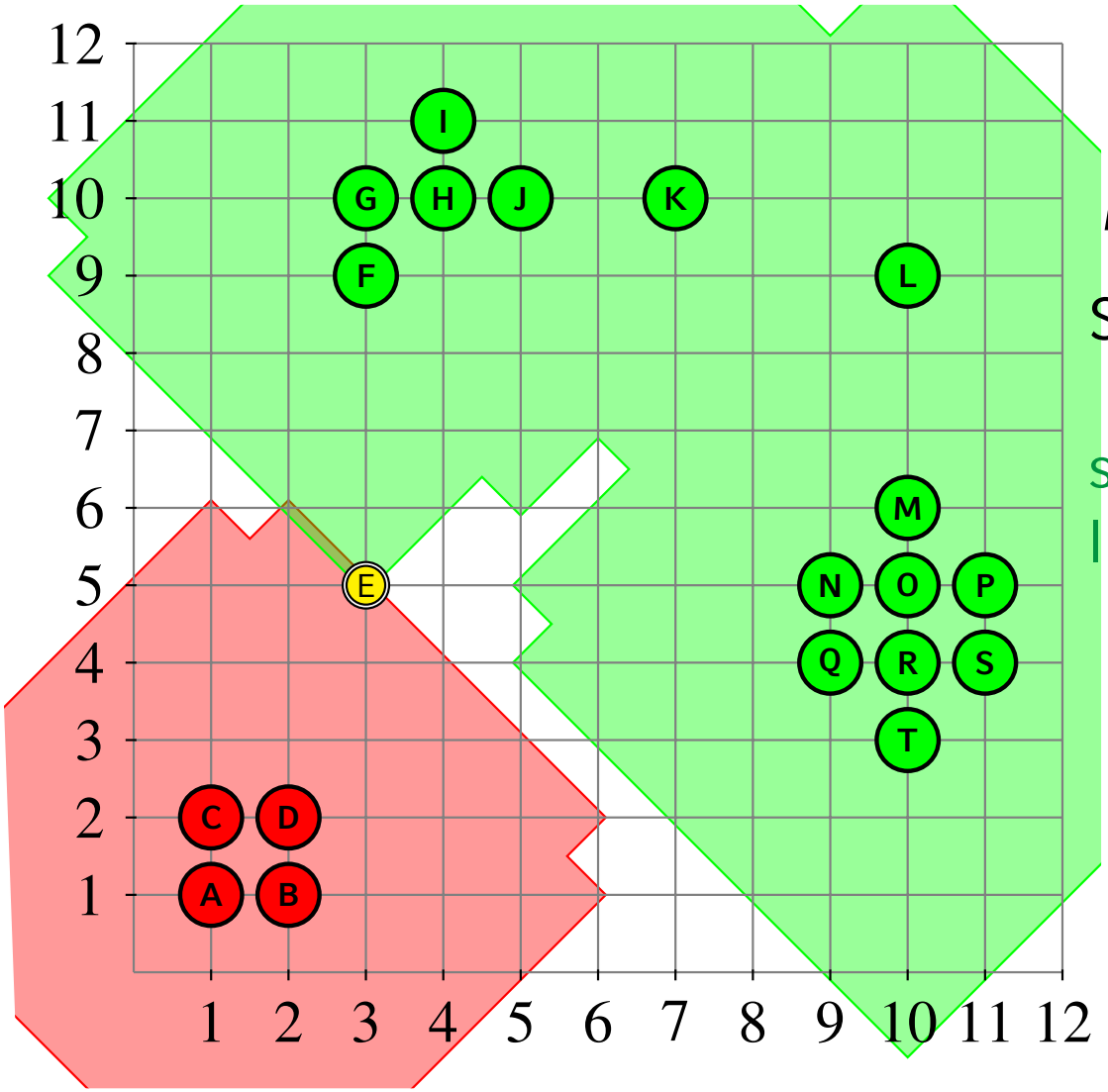

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Seed list:

single-link like effect!

DBSCAN and Single-Linkage Clustering

DBSCAN with $minPts = 2$

$\Leftrightarrow$ single-linkage dendrogram *cut* at distance ε.

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However, results are generally better with larger *minPts*!