

GRAPH DRAWING CONTEST

2017 report



CONTEST COMMITTEE

William Devanny
University of California, Irvine

Philipp Kindermann
FernUniversität in Hagen

Maarten Löffler
Utrecht University

Ignaz Rutter
Karlsruhe Institute of Technology

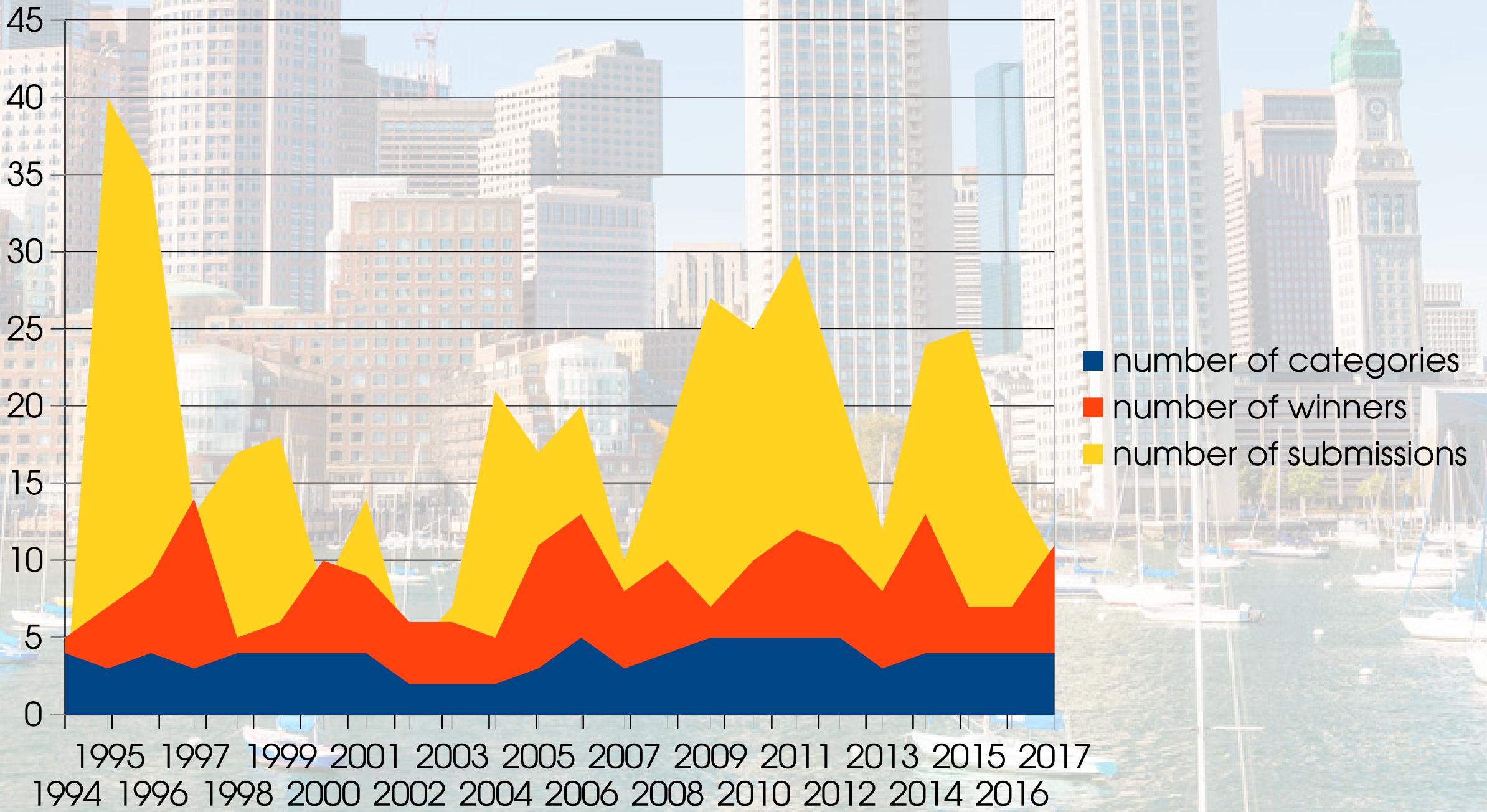
GRAPH DRAWING CONTEST

historic perspective



GRAPH DRAWING CONTEST

historic perspective



GRAPH DRAWING CONTEST

historic perspective



1994 Uwe Wuerker • Stefan Hougardy •
Petra Mutzel & Thomas Odenthal •
Georg Sander

1995 Falk Schreiber & Carsten Friedrich
• Vladimir Batagelj & Andrej Mrvar •
Paulis Kikusts & Peteris Rucevskis •
Georg Sander

1996 Ulrich Fößmeier & Michael
Kaufmann • Vladimir Batagelj & Andrej
Mrvar • Falk Schreiber & Carsten
Friedrich • Thomas Kamps, Jörg Kleinz &
Thomas Reichenberger

1997 B. Bascary, B. Cattan, A.
Cohen-Solal, M. Philip & H. Szigeti •
Vladimir Batagelj & Andrej Mrvar •
Michael Kaufmann & Gunnar Klau •
Thomas Ziegler & Petra Mutzel • Cristian
Ghezzi • Falk Schreiber & Carsten
Friedrich

1998 Vladimir Batagelj & Andrej Mrvar •
Petrus Abri Santoso & Andi Surjanto •
Roland Wiese

1999 Vladimir Batagelj & Andrej Mrvar •
Ulrik Brandes • Karlis Freivalds & Paulis
Kikusts • Rowena Mankelow

2000 Nikola S. Nikolov • Vladimir
Batagelj & Andrej Mrvar • Jan Adamec
• C. Duncan, P. Gajer, M. Goodrich & S.
Kobourov • Robby Schönfeld & Nikola
S. Nikolov

2001 Ulrik Brandes & Marco Gärtler • C.
Gutwenger, K. Klein, J. Kupke & S.
Leipert • Roland Wiese • Carsten
Friedrich • Merijam Percan

2002 Daniel Gmach • Paul Holleis &
Thomas Zimmermann • Nikola S. Nikolov
& Patrick Healey • Christoph Vogt

2003 Daniel Gmach, Paul Holleis &
Thomas Zimmermann • Christian Kuklas,
Dirk Koschützki & Falk Schreiber

2004 Andrei Grecu & Gunnar Klau •
Ulrik Brandes, Daniel Fleischer & Thomas
Puppe

2005 Markus Chimani, Carsten
Gutwenger & Karsten Klein • V.
Batagelj, A. Mrvar, A. Ahmed, X. Fu, S.
Hong & D. Merrick • Marco Gärtler &
Markus Krug

2006 Michael McGuffin • Adel Admed,
Seok-Hee Hong, Quan Nguyen &
Donald Taylor • Adel Admed, Xiaoyan
Fu, Seok-Hee Hong, Quan Nguyen &
Kai Xu • Fabrizio Frati & Markus Geyer •
Andreas Gerasch & team

2007 Wolfgang Brunner & Jens Schmidt
• Robert Theron, Rodrigo Santamaría,
Juan Garcia, Diego Gomez & Vadim
Paz-Madrid • Felix Heinen

2008 Yifan Hu & Emden Gansner •
Melanie Badent & Pietro Palladino •
Melanie Badent, Martin Mader &
Christian Piech • Hoi-Ming Wong,
Markus Chimani & Karsten Klein

2009 Hui Liu • Nicholas Jefferson •
Melanie Badent & Michael Baur •
Hoi-Ming Wong & Karsten Klein • Joe
Fowler

2010 Quan Nguyen • Sergey Pupyrev •
M. Baur, M. Siebenhaller, R. Wiese &
Thomas Wurst • Petra Mutzel &
Hoi-Ming Wong • Maarten Löffler &
Martin Nöllenburg

2011 Hanley Weng • M. Löffler, D.
Eppstein, M. Goodrich & S. Kobourov •
R. Zelina, S. Bota, S. Houtman & R. Ban •
Sergey Pupyrev • Maarten Löffler &
Martin Nöllenburg

2012 Roman Prutkin • Sergey Pupyrev •
Remus Zelina, S. Bota, S. Houtman & R.
Balaban • Tobias Brinkjost • A. Bauer, I.
Rutter, J. Vordermeier & M. Kaufmann

2013 Jos de Jong & Giovanni Pazienza
• Remus Zelina, Sebastian Bota, Siebren
Houtman & Radu Balaban • Thomas
Bläsius & Ignaz Rutter

2014 Martin Nöllenburg • Remus Zelina,
Sebastian Bota, Siebren Houtman &
Radu Balaban • Tamara Mchedlidze,
Martin Nöllenburg, Alexander
Khomenko, Igor Karlinsky & Denis
Knöpfle • Philipp Kindermann, Fabian
Lipp & Wadim Reimche

2015 Tamara Mchedlidze • Jennifer
Hood & Pat Morin • Boris Klemz, Ulf
Rüegg & Fabian Lipp • Josef Cibulka

2016 Fabian Klute • Jonathan Klawitter
& Tamara Mchedlidze • Michael Bekos,
Thanasis Lianeas & Chrysanthi
Raftopoulou • Johan de Ruiter

2017 CONTEST overview



2017 CONTEST overview



CREATIVE TOPICS

GD citation graph

Draw the graph of citation relations
between GD papers.

Human metabolism

Redraw the largest hand-drawn
multigraph that we are aware of!

LIVE CHALLENGE

In one hour, draw a number of graphs
as straight line embeddings in the
plane, maximising the smallest crossing
angle.

manual category

automatic category

2017 CONTEST overview



CREATIVE TOPICS

GD citation graph

Draw the graph of citation relations between GD papers.

2 submissions

Human metabolism

Redraw the largest hand-drawn multigraph that we are aware of!

1 submission

LIVE CHALLENGE

In one hour, draw a number of graphs as straight line embeddings in the plane, maximising the smallest crossing angle.

manual category

5 submissions

automatic category

4 submissions



CREATIVE TOPICS

Citation graph

gd
S17

CREATIVE TOPICS

Citation graph



Graph Drawing Citation Graph

vertices are papers published in GD

directed edges are citations

1053 vertices

2681 edges

additional attributes:

title, author(s), institute(s), year

CREATIVE TOPICS

Citation graph



Graph Drawing Citation Graph

vertices are papers published in GD

directed edges are citations

1053 vertices

2681 edges

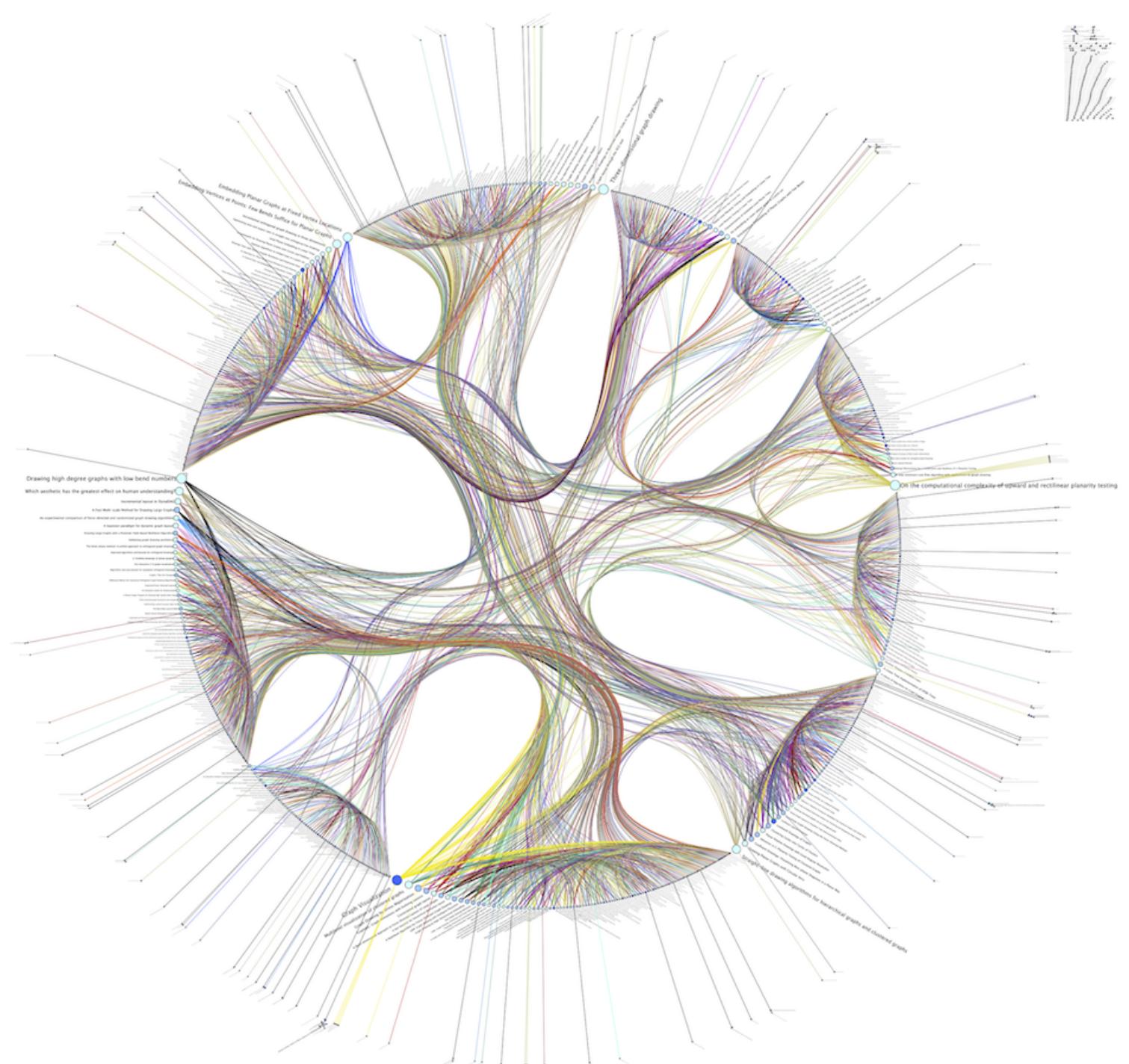
additional attributes:

title, author(s), institute(s), year



CREATIVE TOPICS

Citation graph

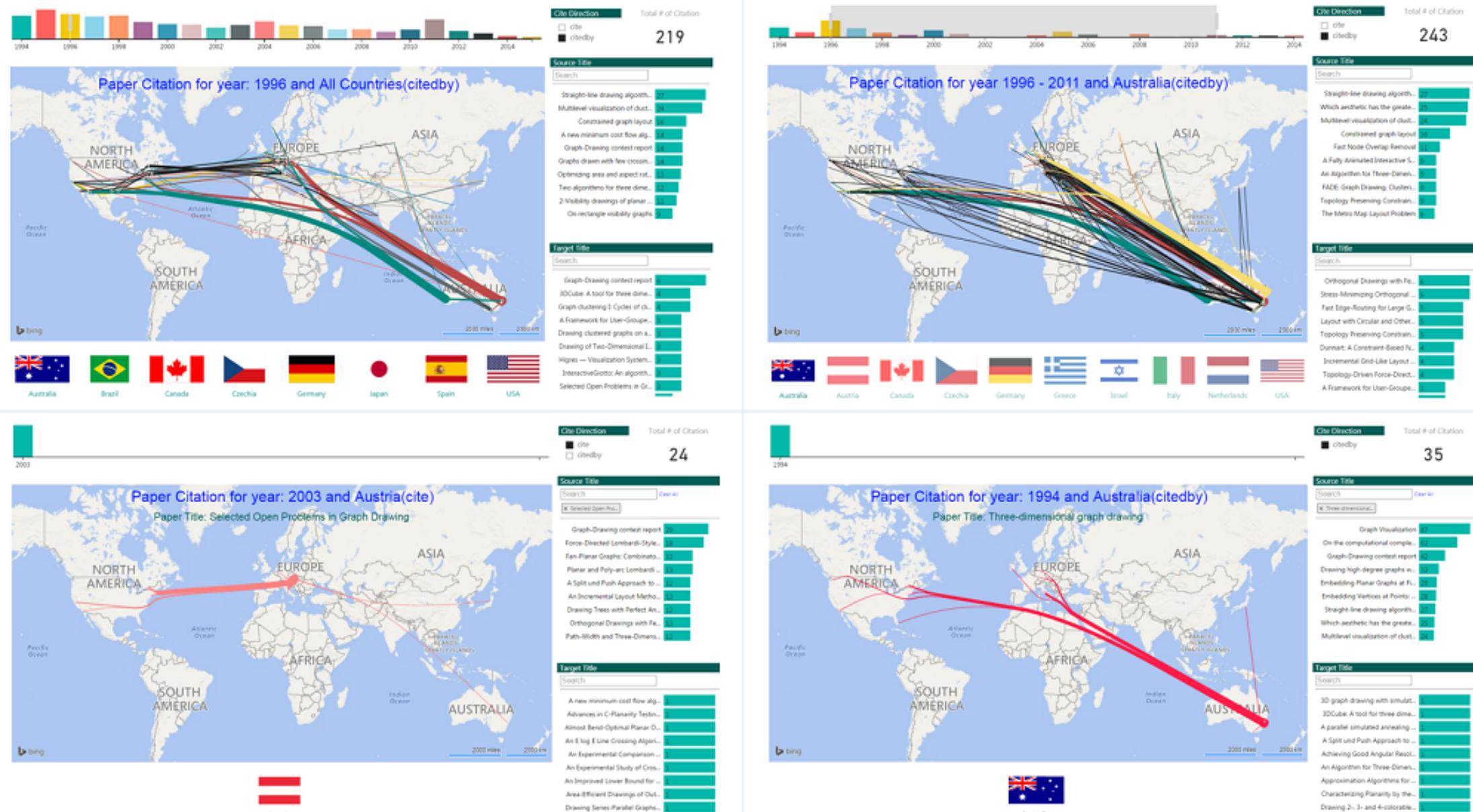


Da Ye

University of Sydney

CREATIVE TOPICS

Citation graph



Steven Wang
University of Sydney



bit.ly/papercitation



CREATIVE TOPICS

Human metabolism

gd
17

CREATIVE TOPICS

Human metabolism



Human Metabolism Hypergraph

vertices are metabolites

hyperedges are reactions

5063 vertices

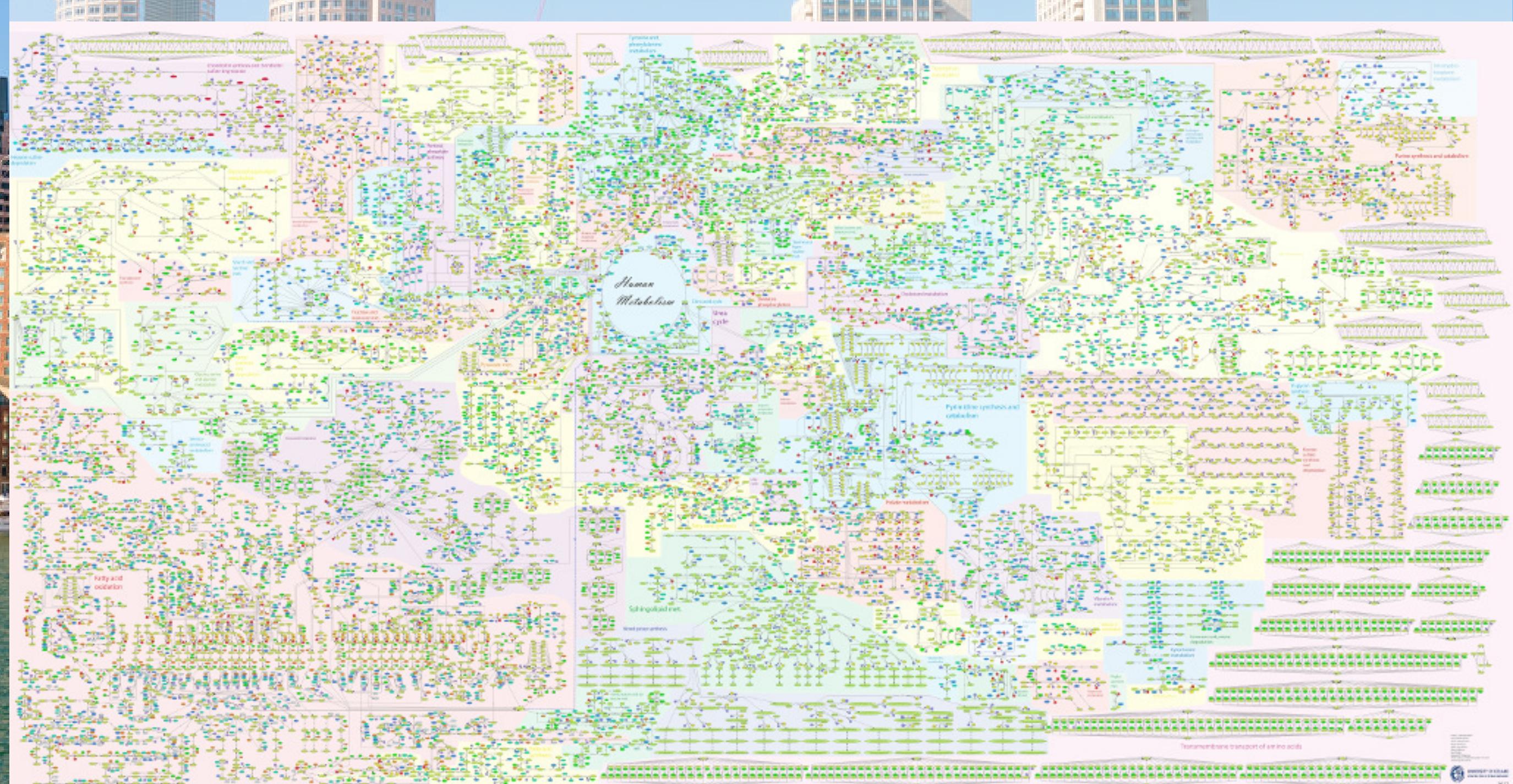
7440 edges

largest manually drawn graph in the
history of biology

CREATIVE TOPICS

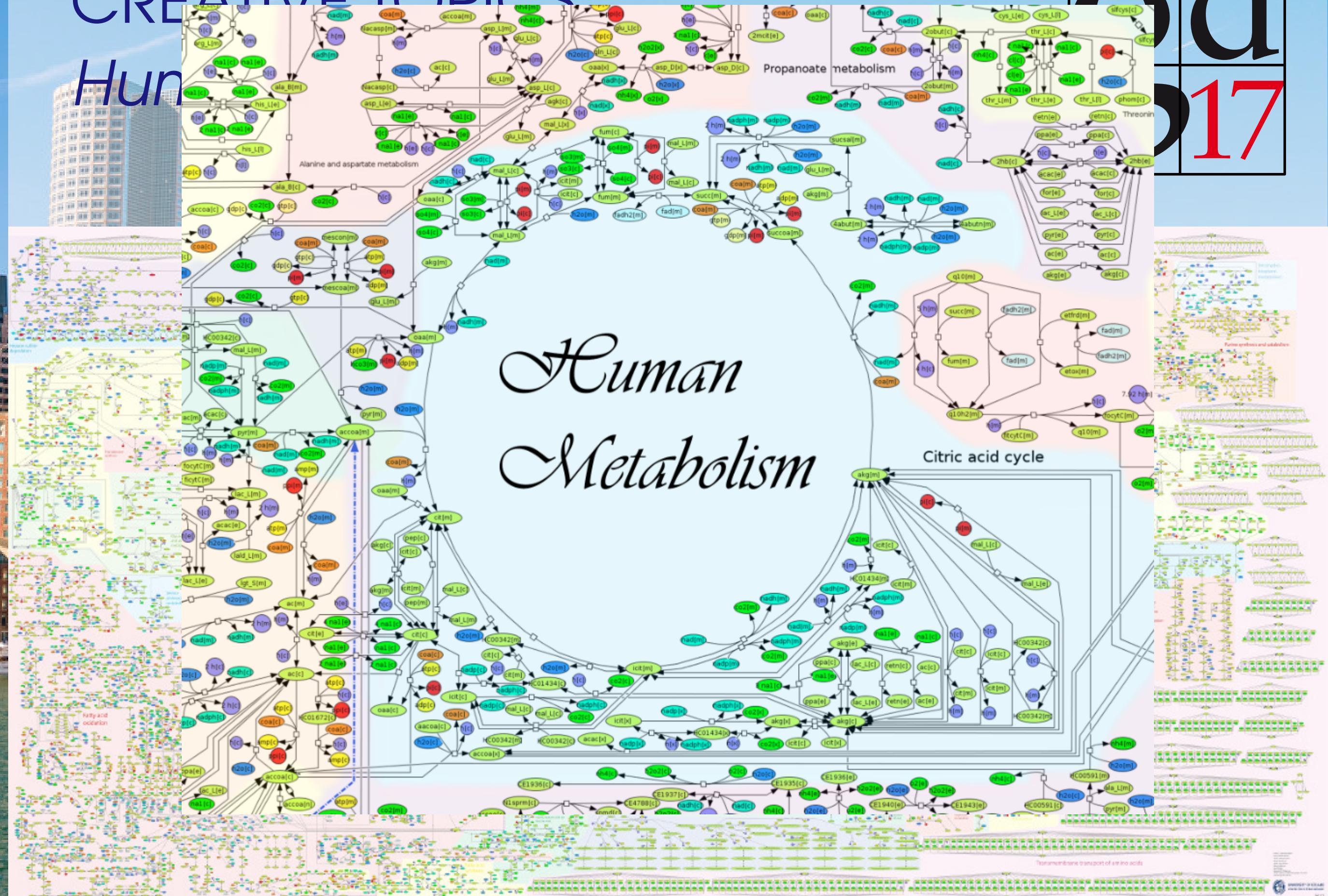
Human metabolism

gd
817



CREATIVE TOPICS

Hun



sd
17





CREATIVE TOPICS

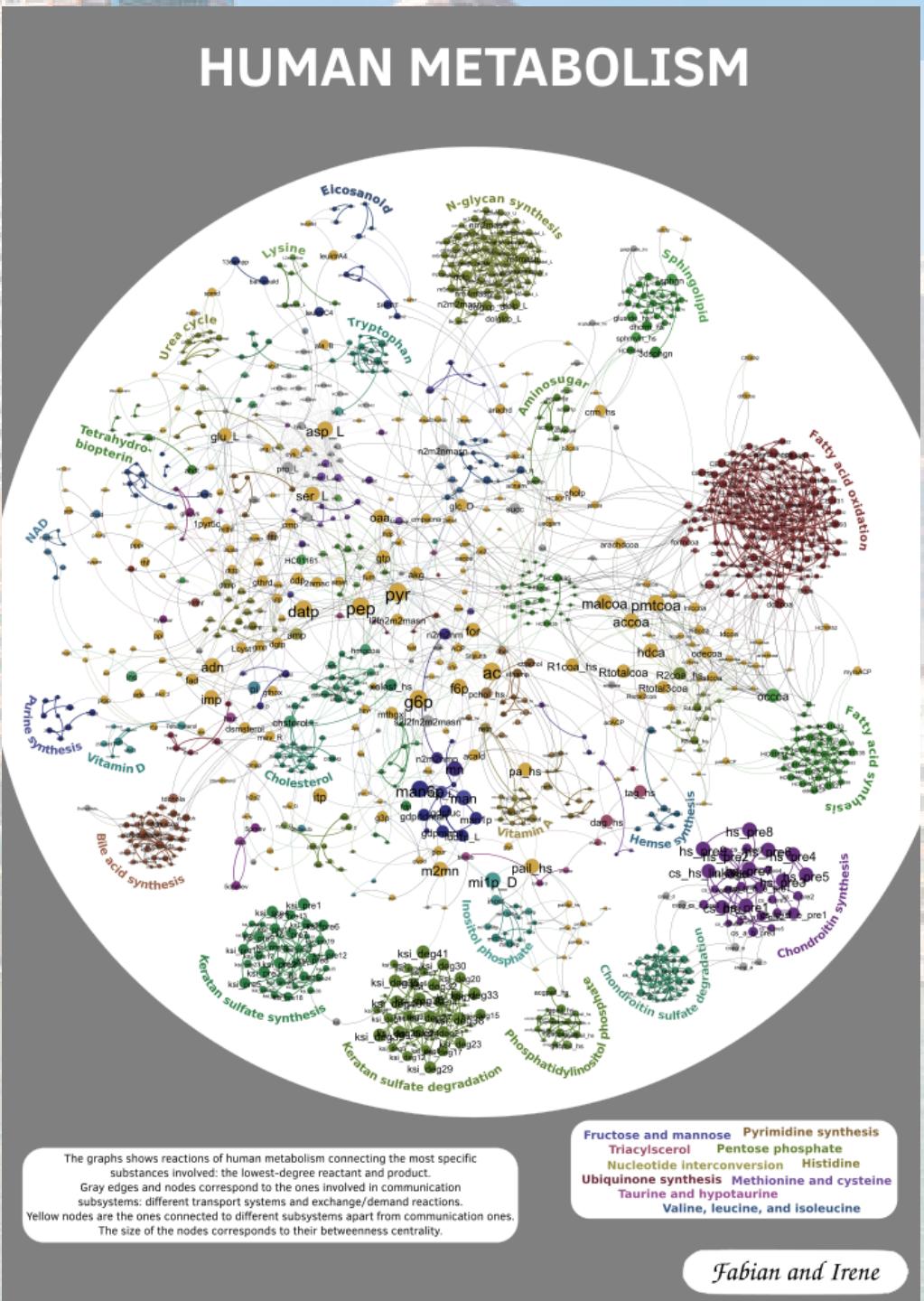
Human metabolism

gd
817

CREATIVE TOPICS

Human metabolism

gd
817



Fabian Klute
TU Wien

Irene Parada
TU Graz

LIVE CHALLENGE



LIVE CHALLENGE



Crossing Angle Maximization

input: arbitrary graph

output: straight-line embedding with
integer vertex coordinates

must be a proper
drawing

objective:
maximize the
smallest angle
between any
crossing edges

LIVE CHALLENGE



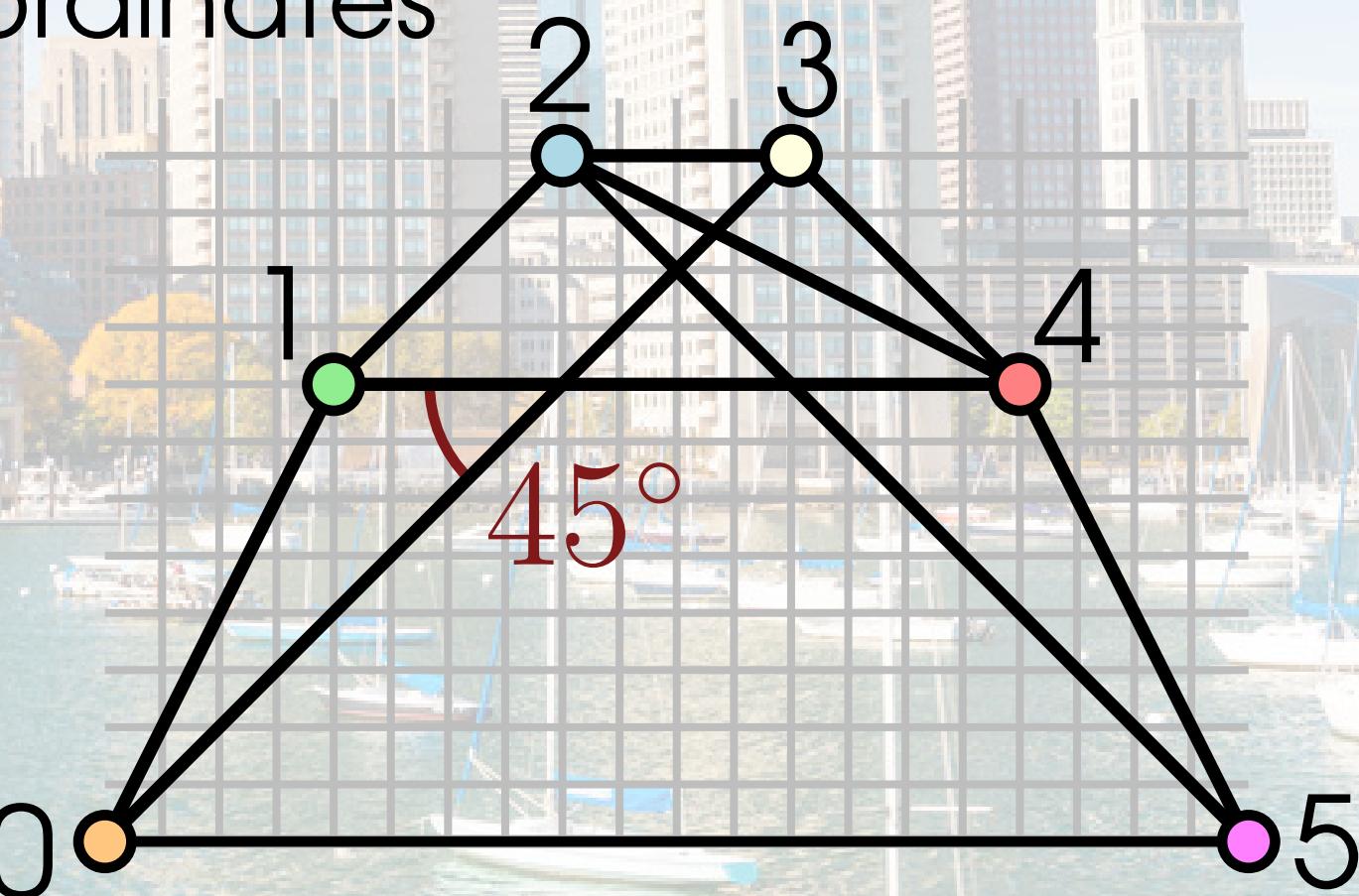
Crossing Angle Maximization

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LIVE CHALLENGE



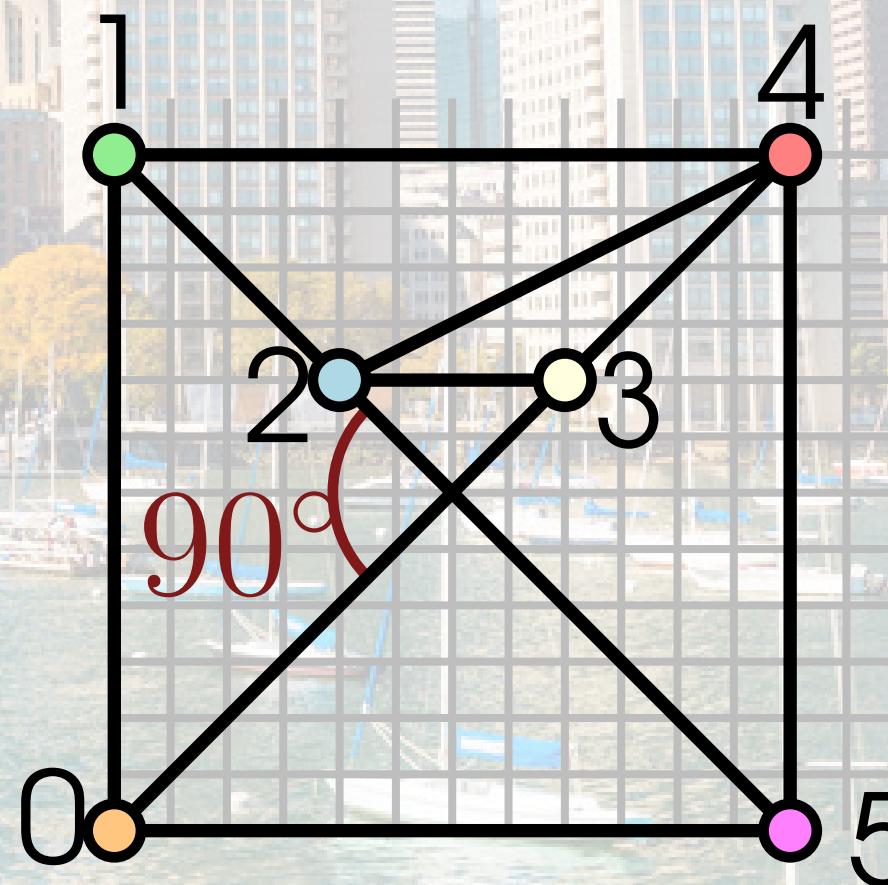
Crossing Angle Maximization

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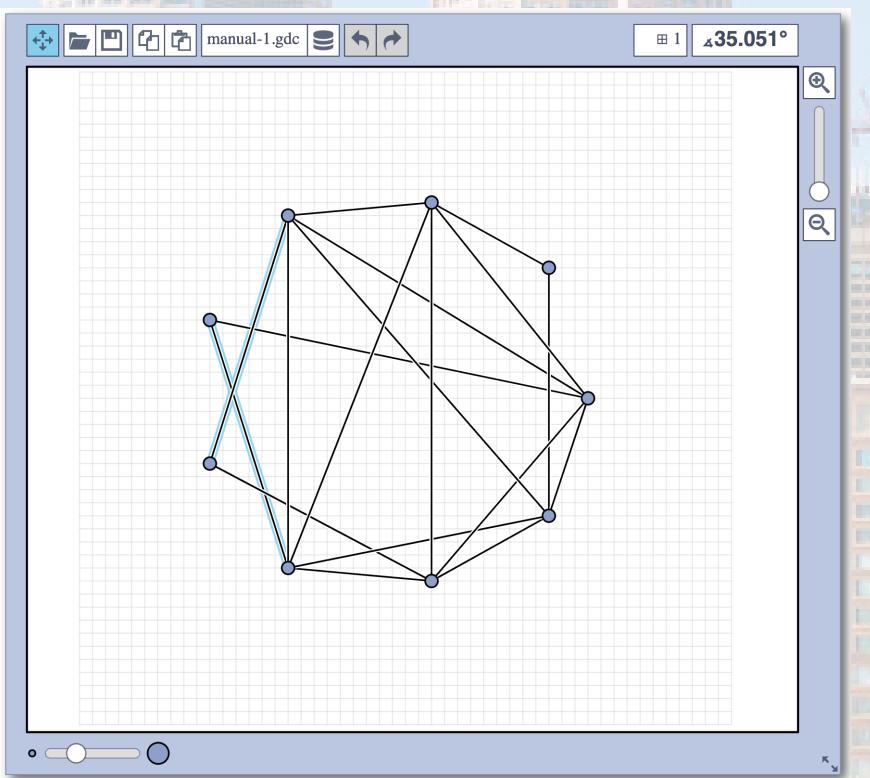
LIVE CHALLENGE

the graphs

gd
817

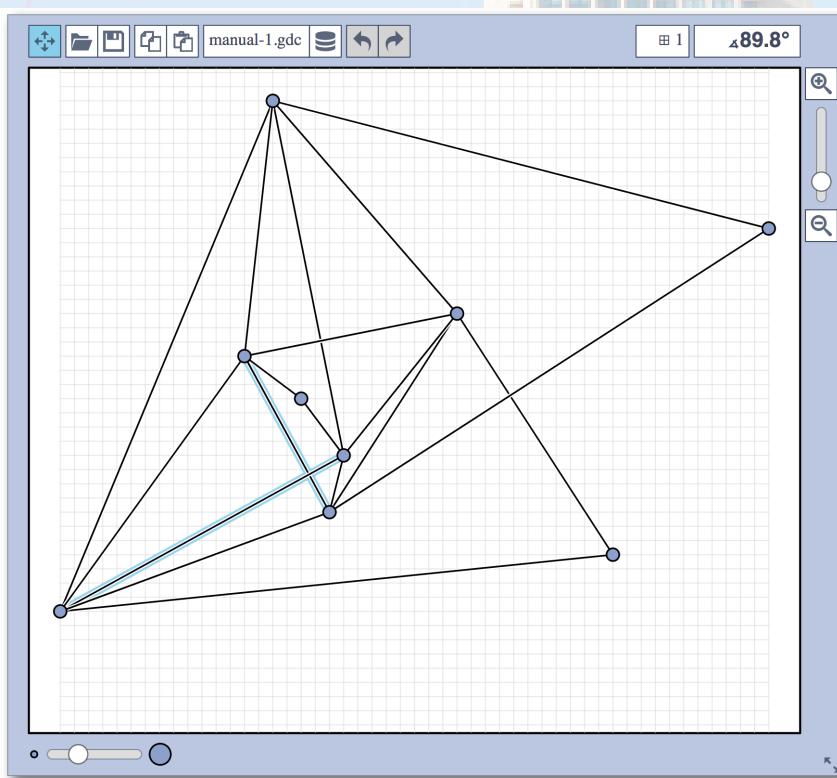
LIVE CHALLENGE

the graphs

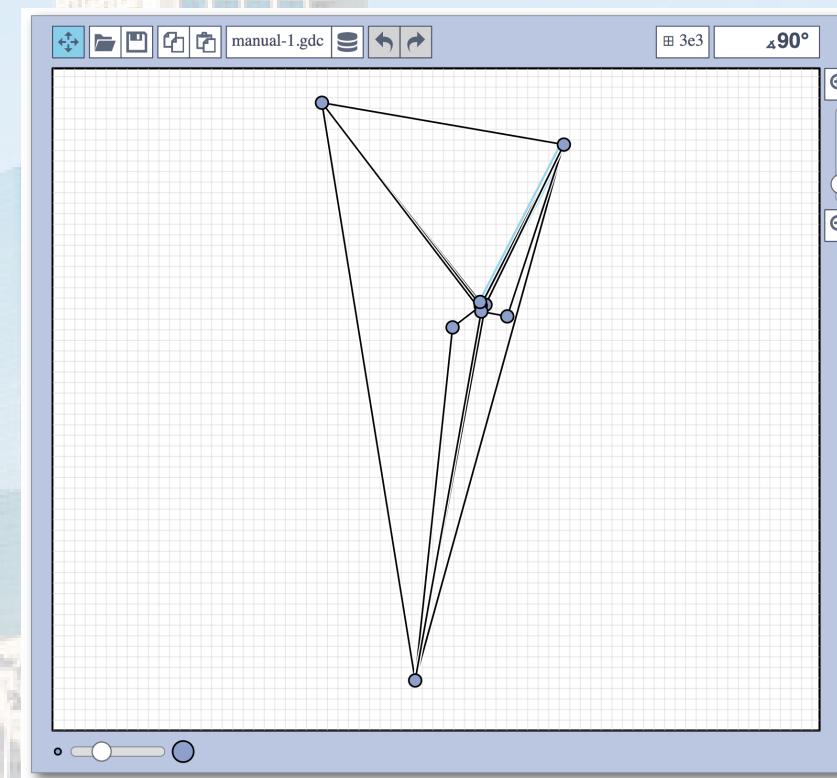


input

graph 1



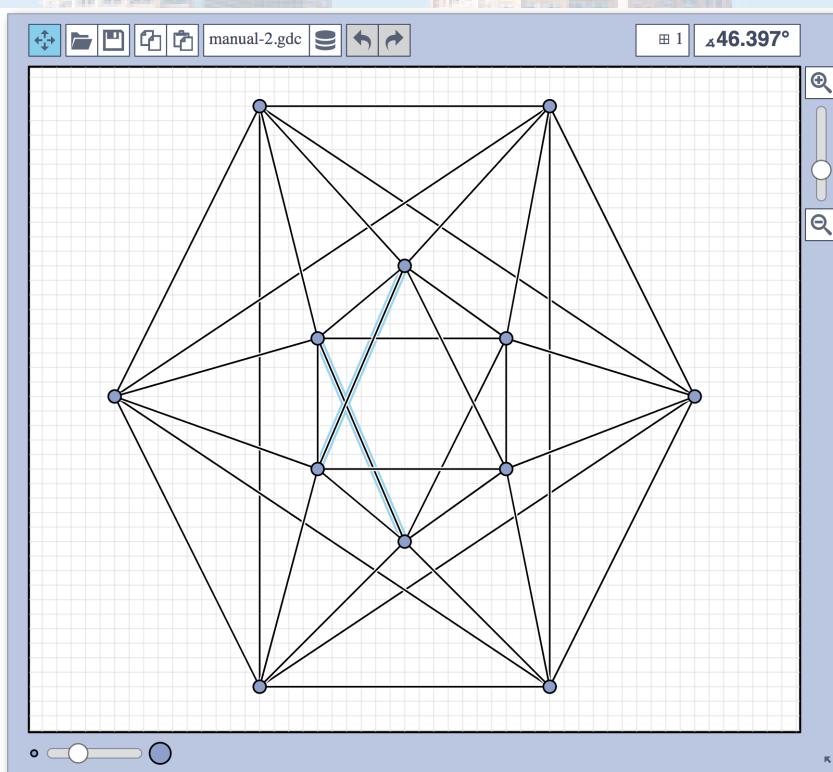
best manual



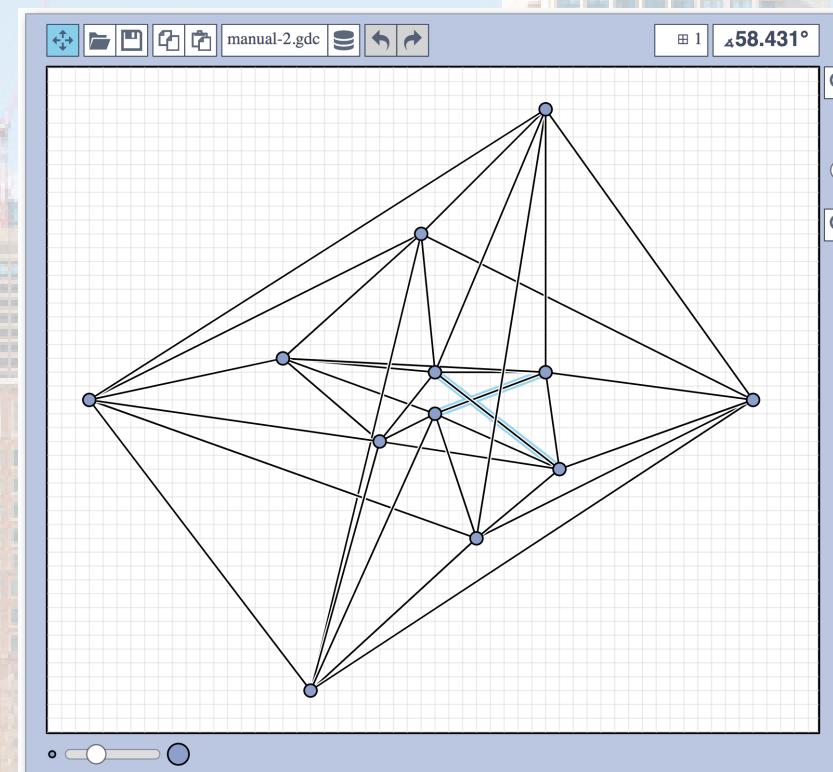
best automatic

LIVE CHALLENGE

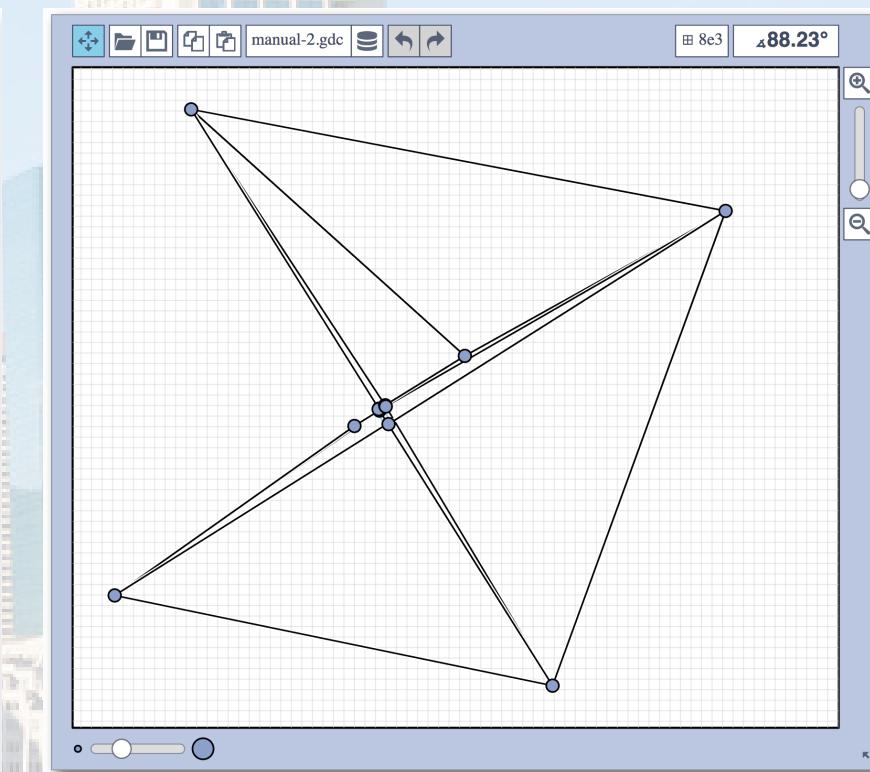
the graphs



input



best manual

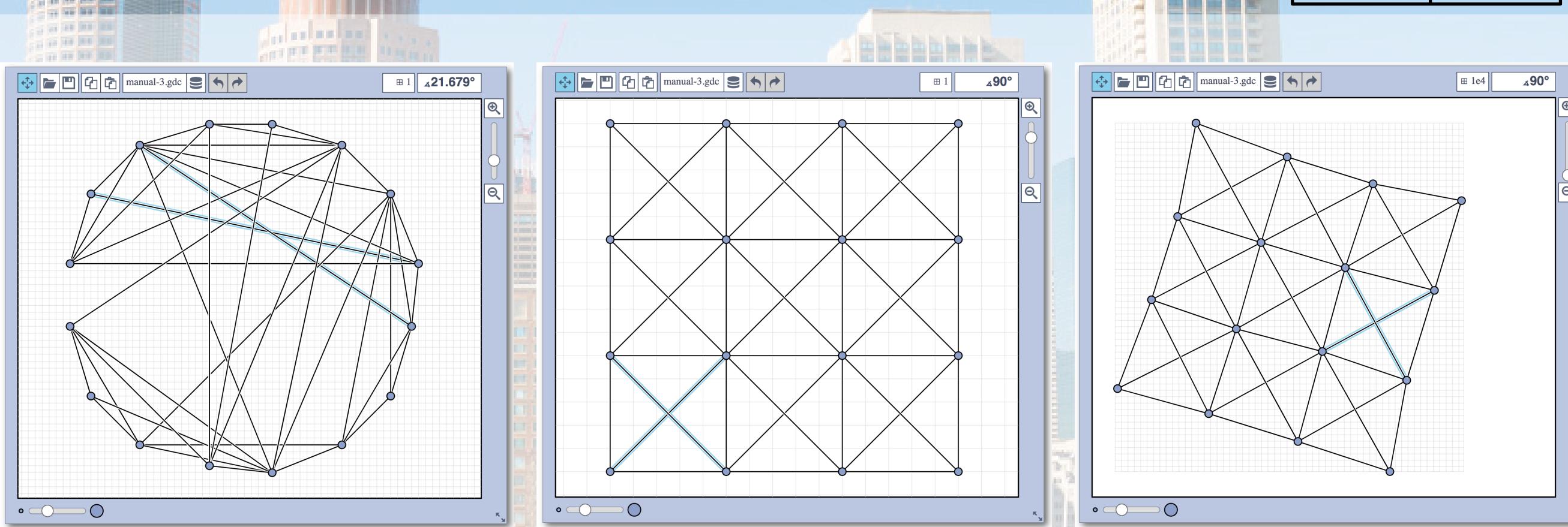


best automatic

graph 2

LIVE CHALLENGE

the graphs



input

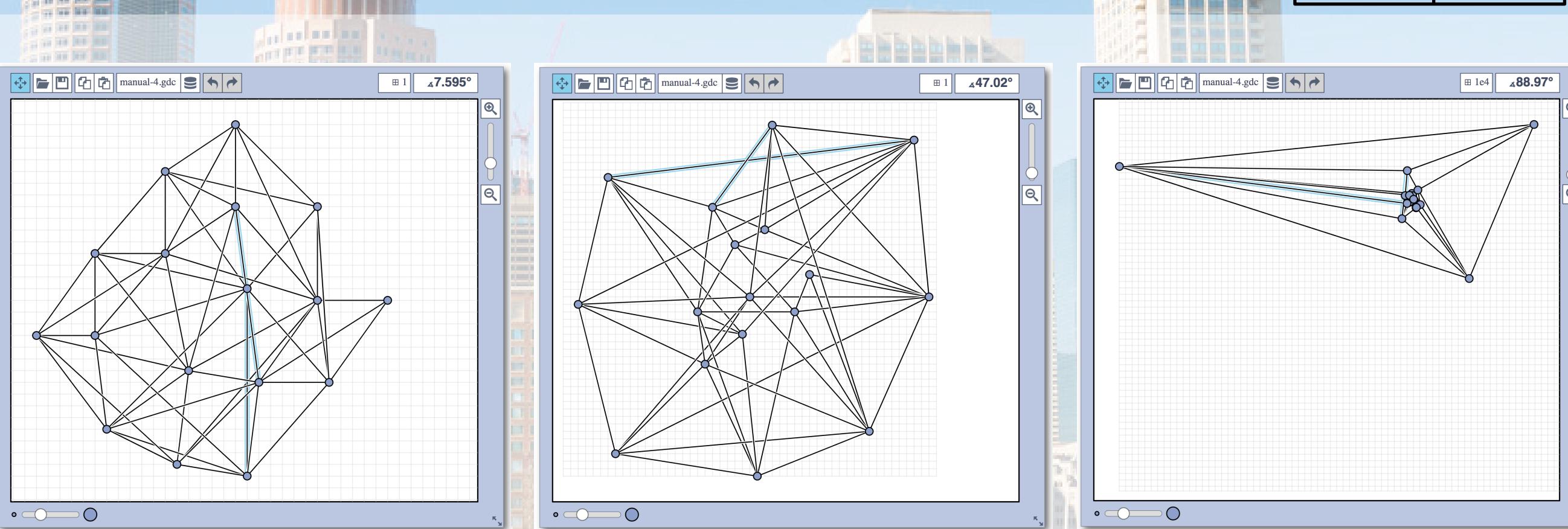
best manual

best automatic

graph 3

LIVE CHALLENGE

the graphs



input

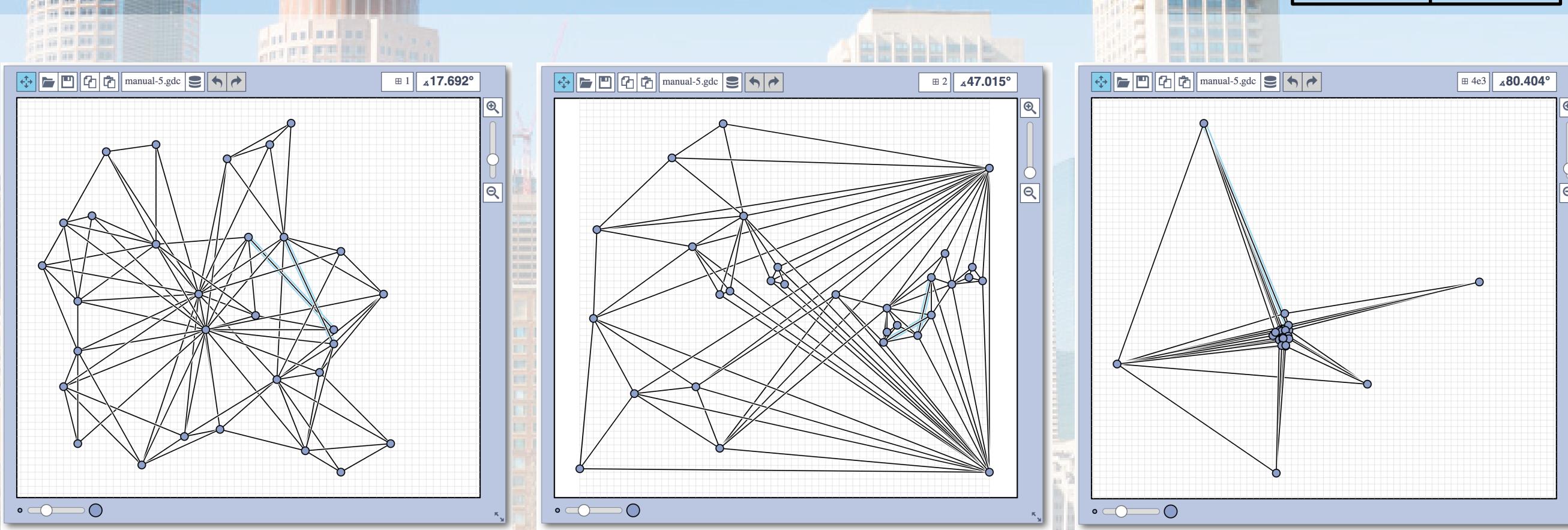
best manual

best automatic

graph 4

LIVE CHALLENGE

the graphs



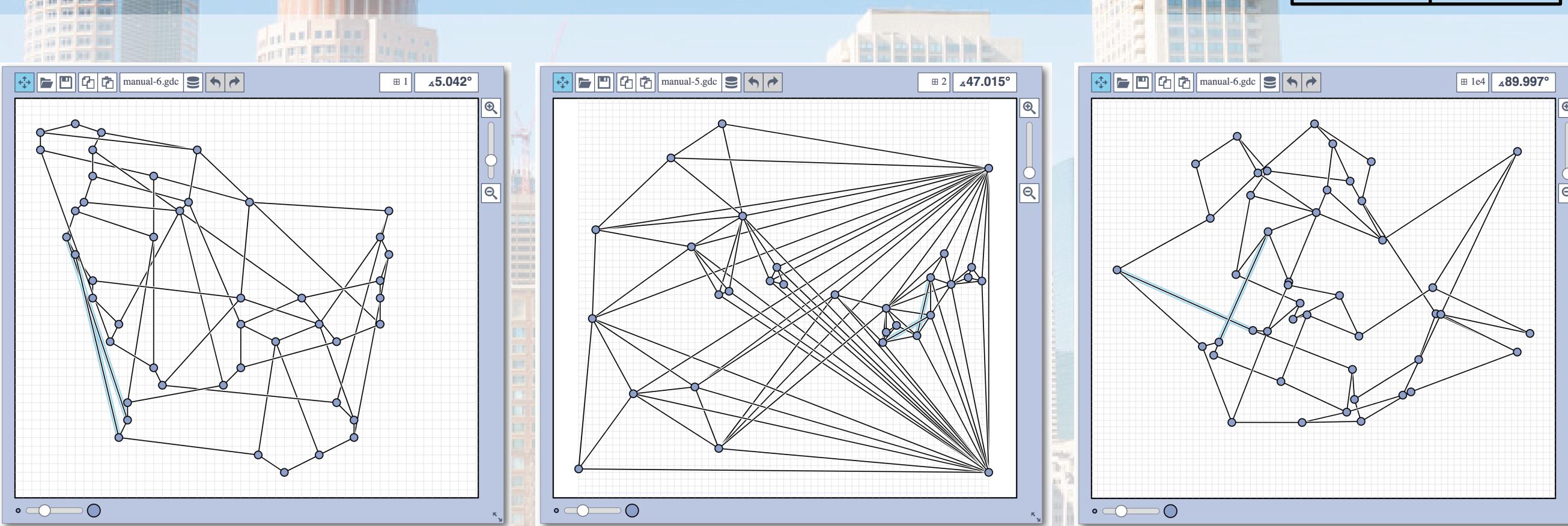
graph 5

best manual

best automatic

LIVE CHALLENGE

the graphs



input

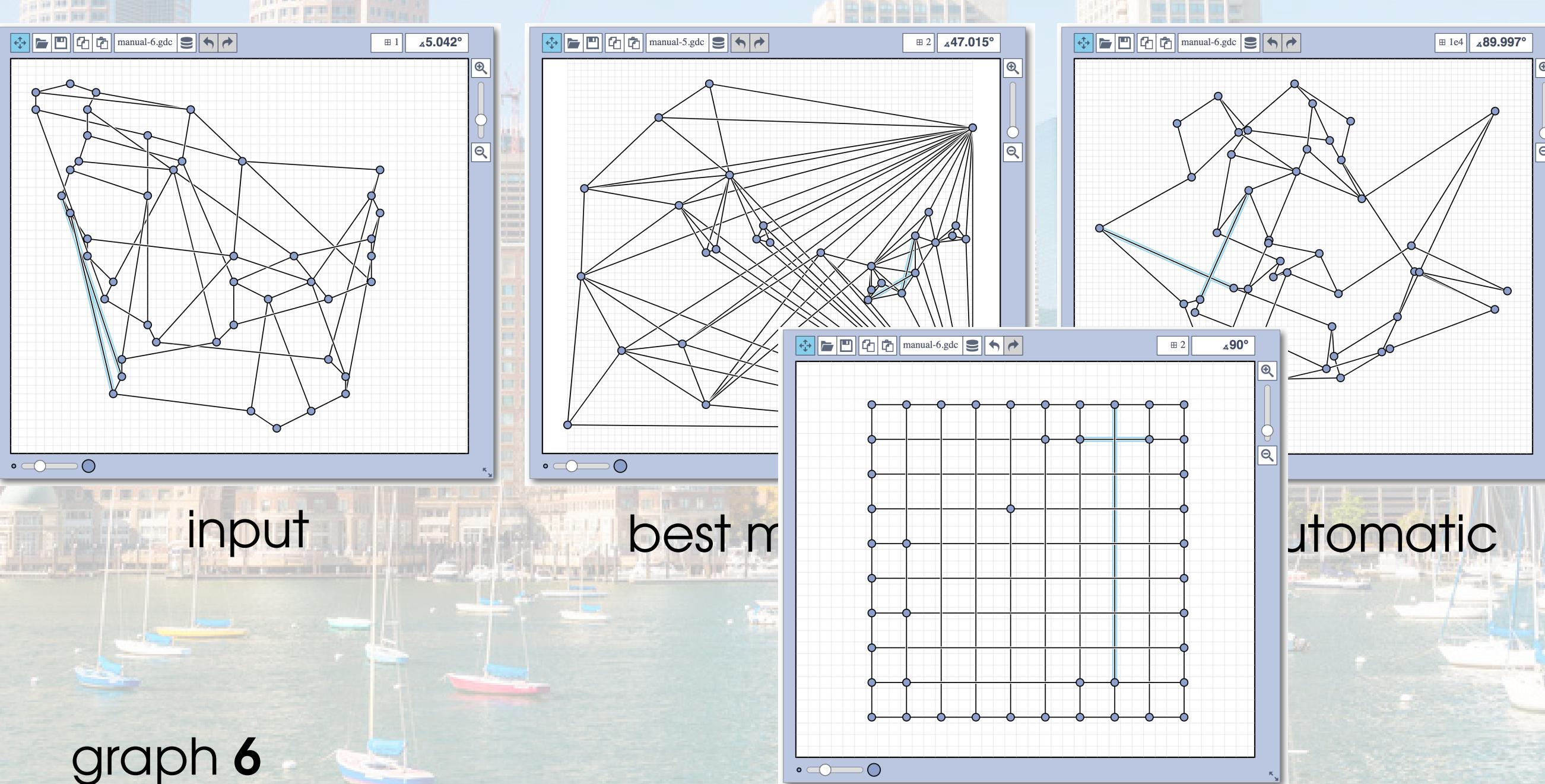
best manual

best automatic

graph 6

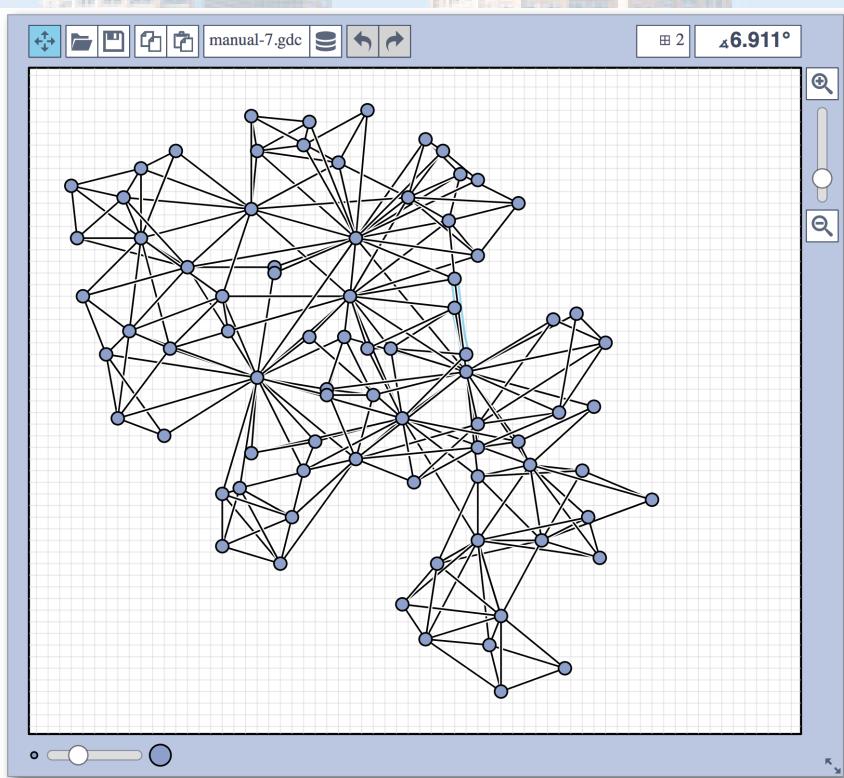
LIVE CHALLENGE

the graphs

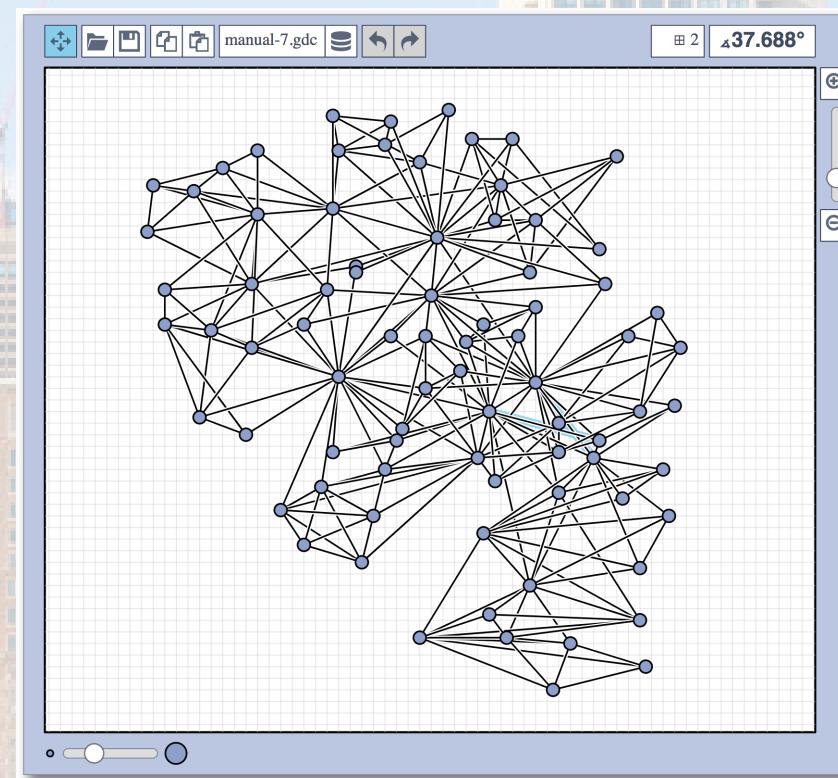


LIVE CHALLENGE

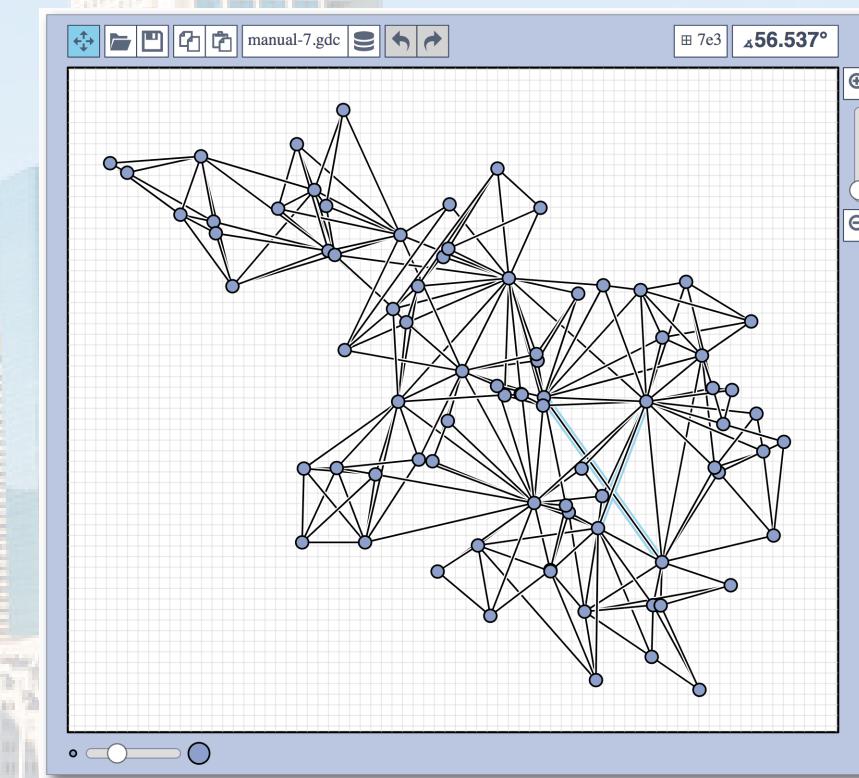
the graphs



input



best manual



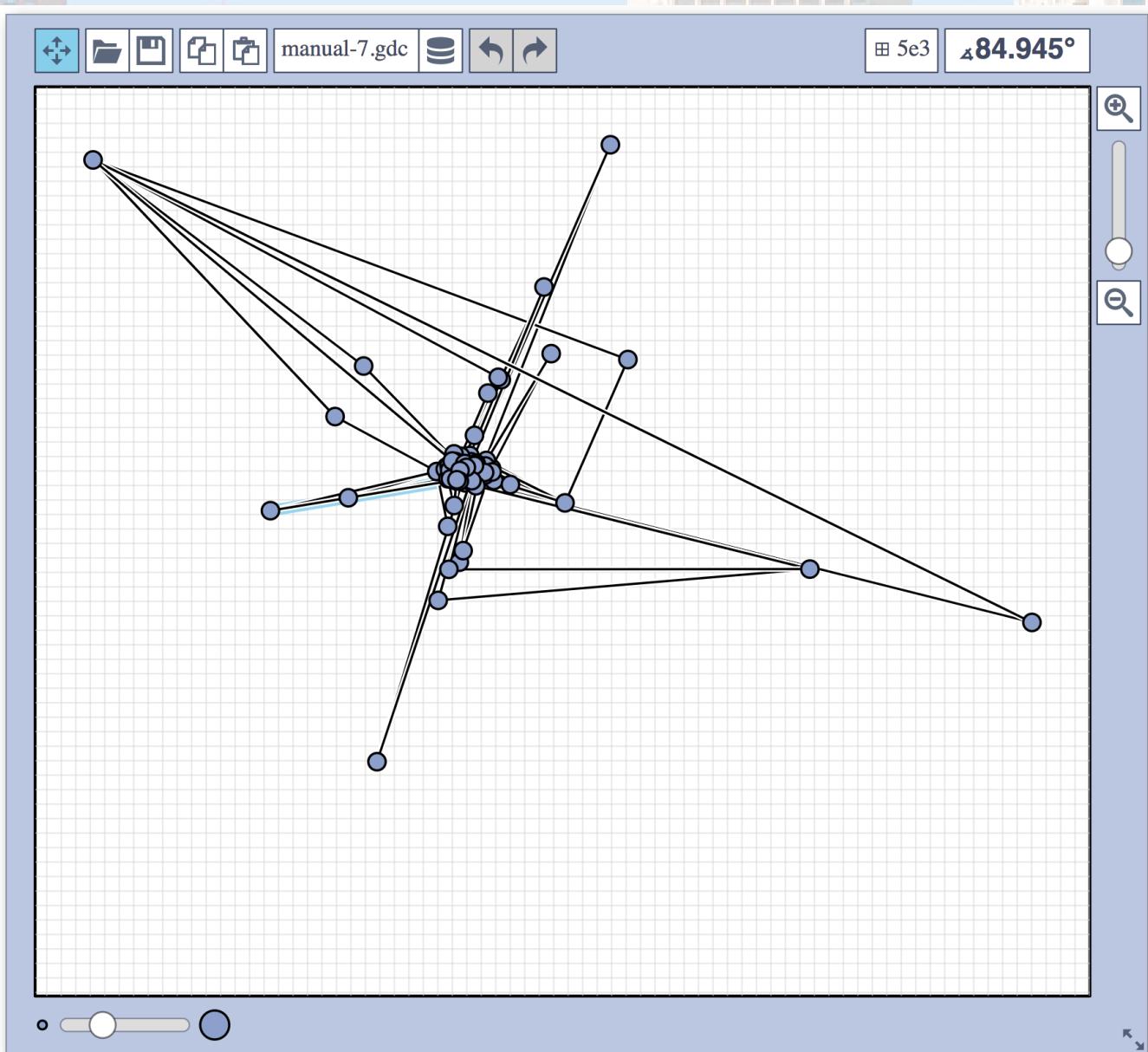
best automatic

graph 7

LIVE CHALLENGE

the graphs

gd
817



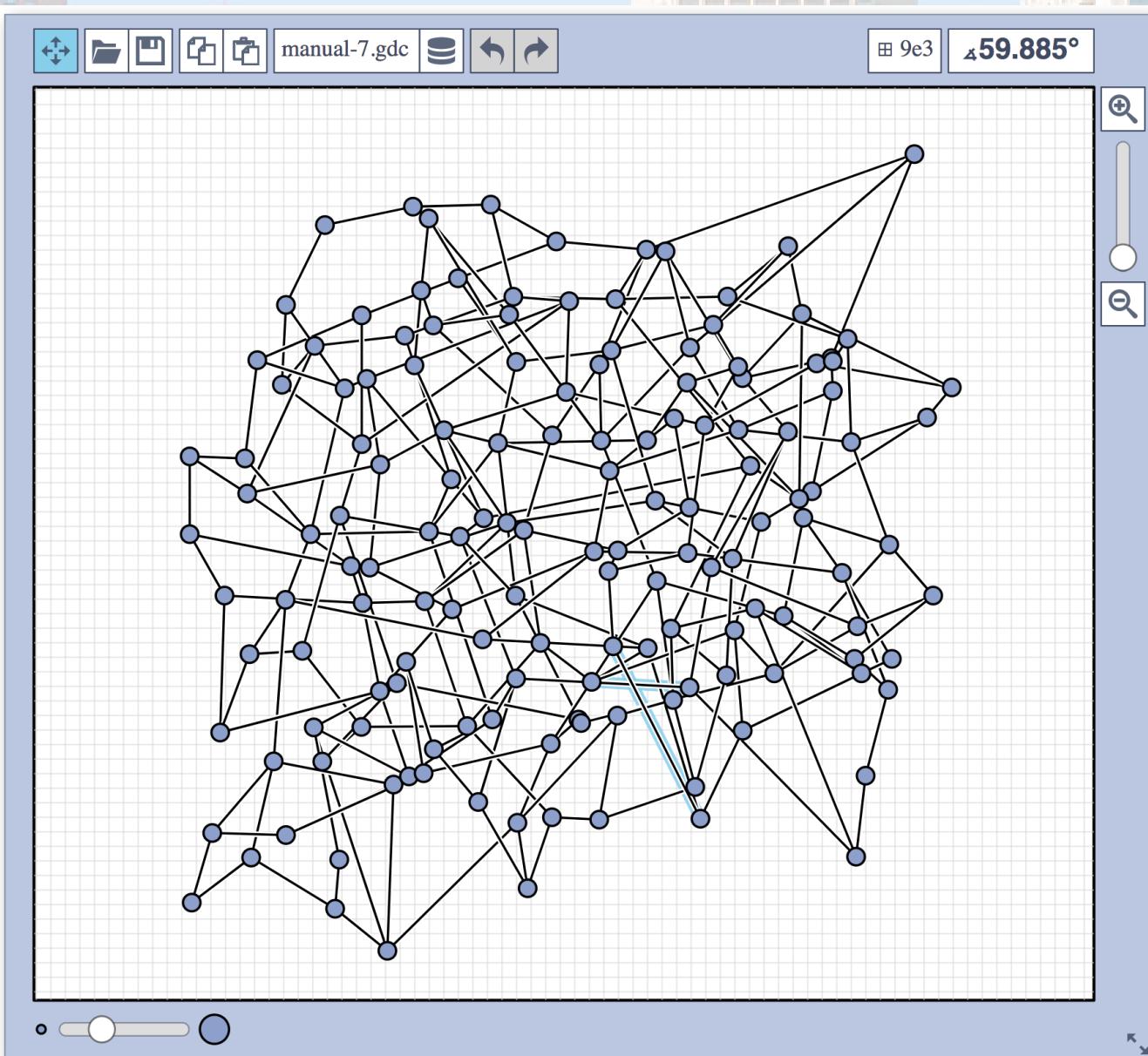
graph 8

best automatic

LIVE CHALLENGE

the graphs

gd
17



graph 9

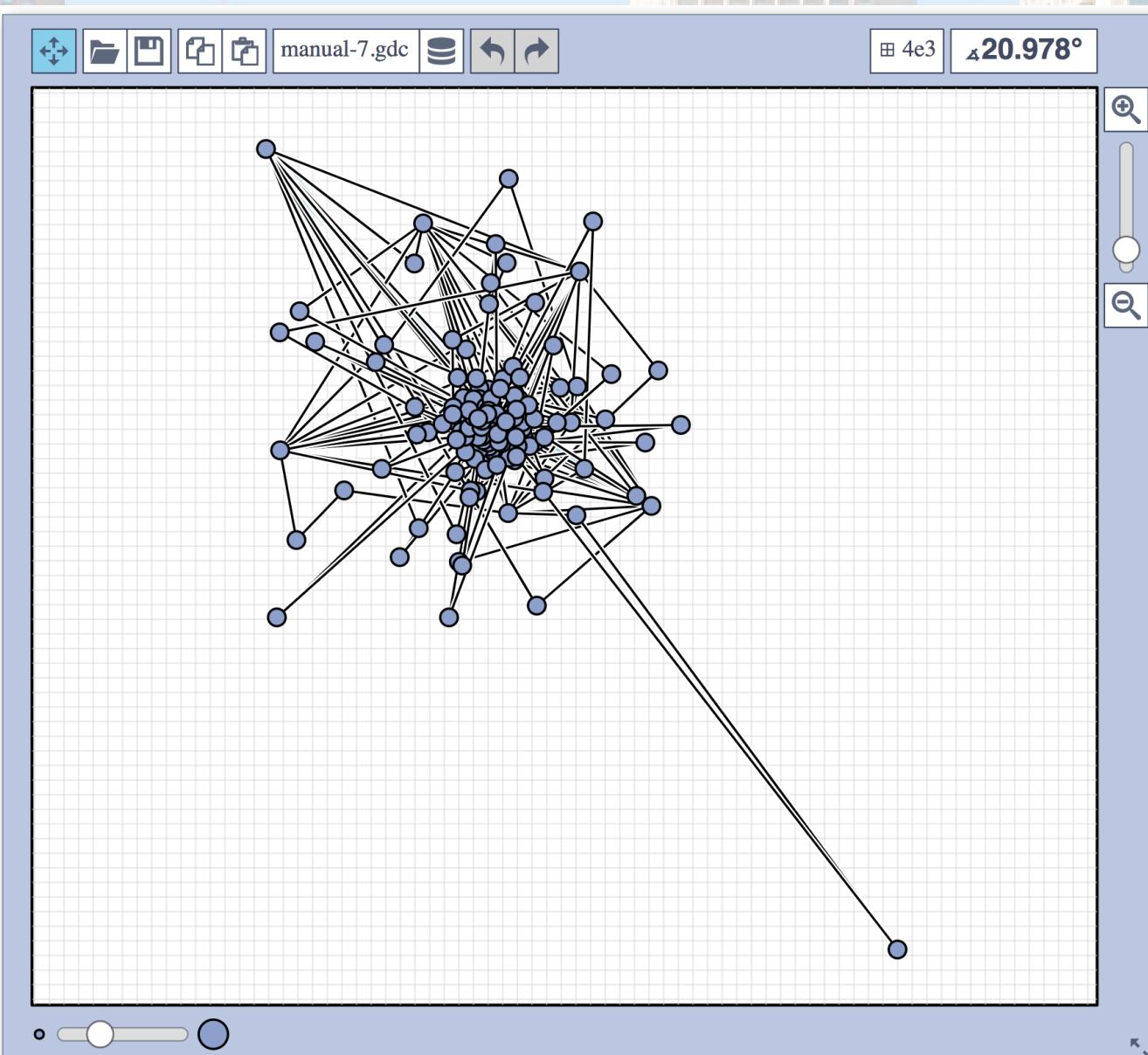
best automatic

LIVE CHALLENGE

the graphs

gd
817

graph 10



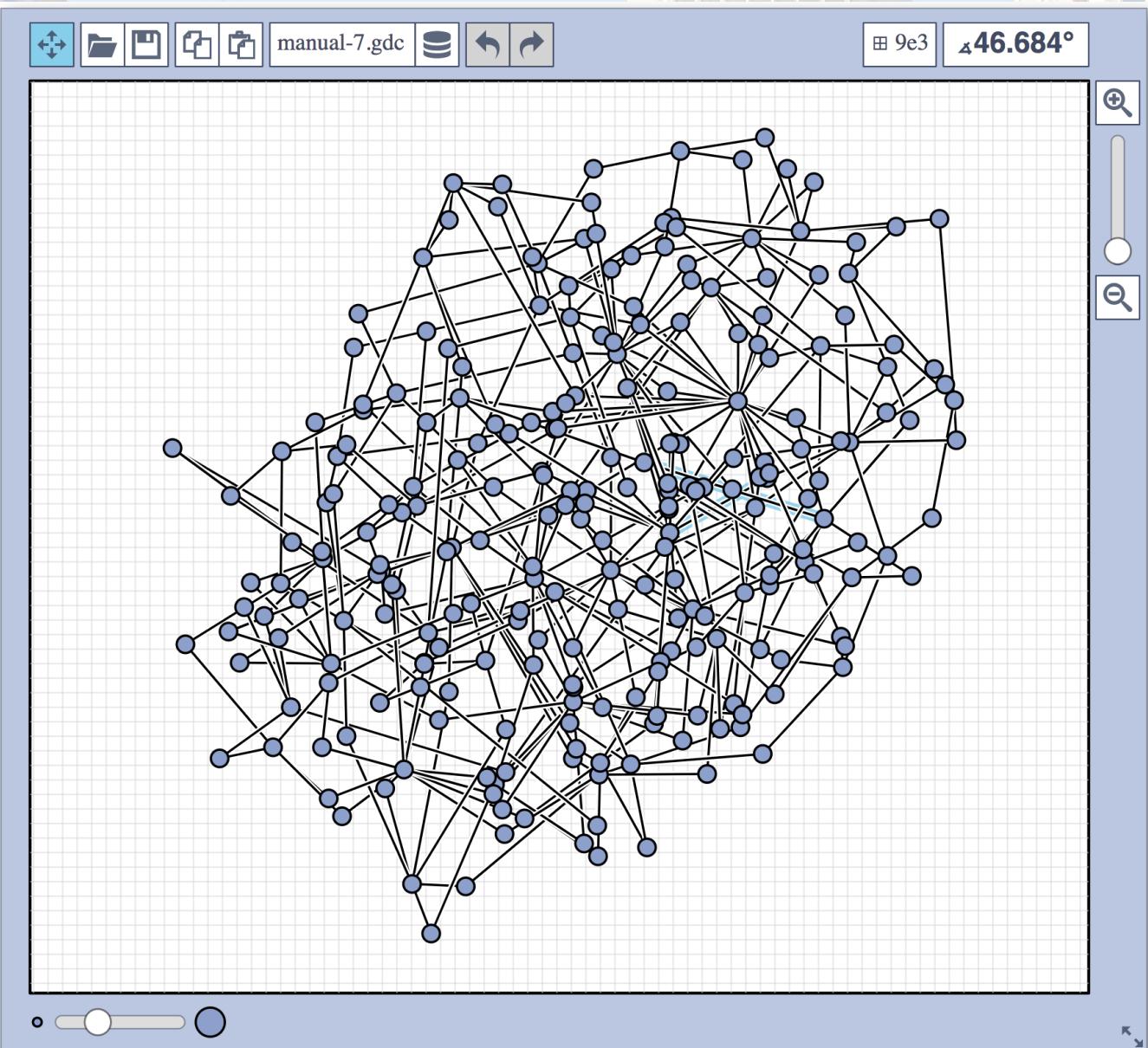
best automatic

LIVE CHALLENGE

the graphs



graph 11



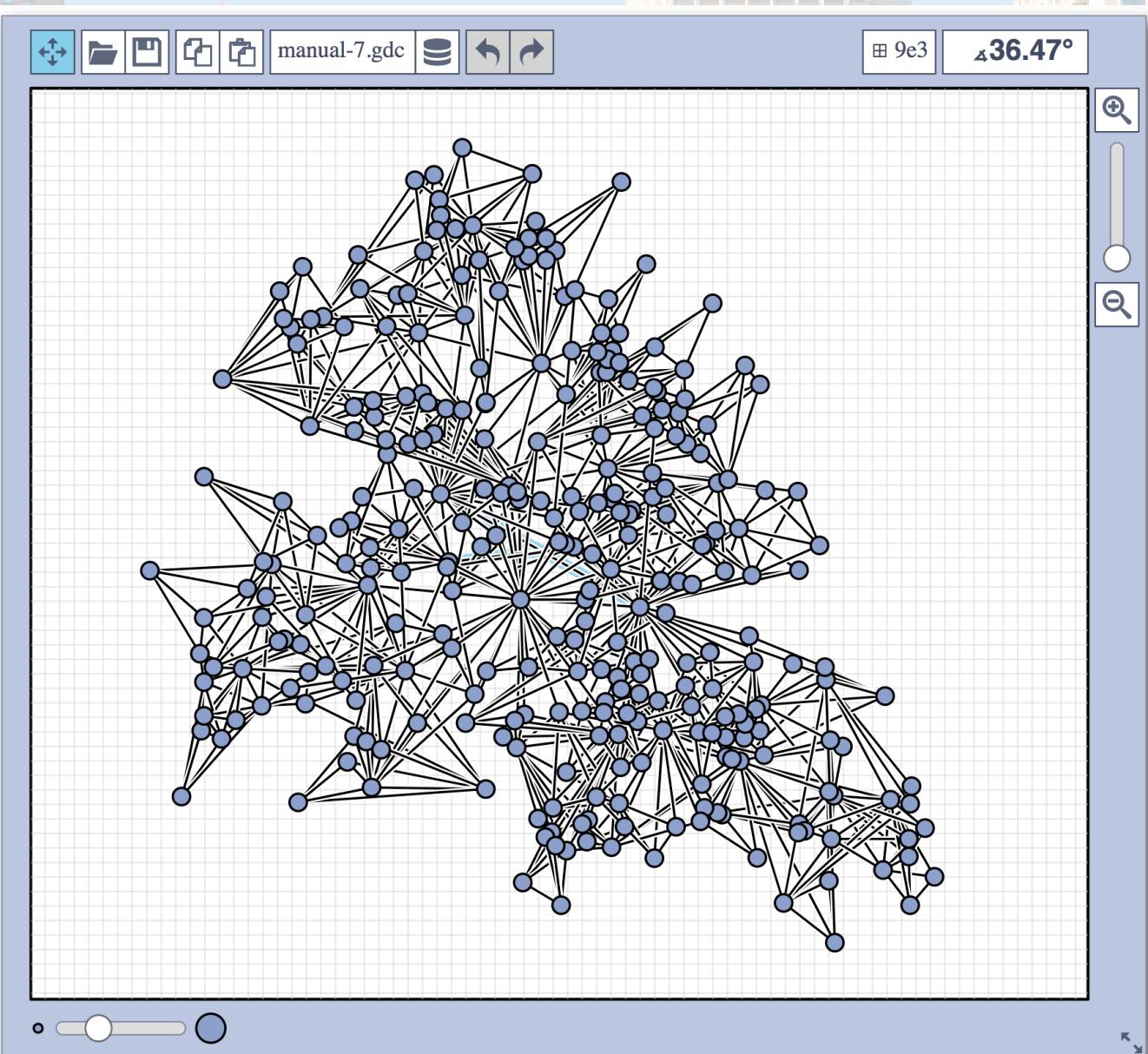
best automatic

LIVE CHALLENGE

the graphs

gd
517

graph 12



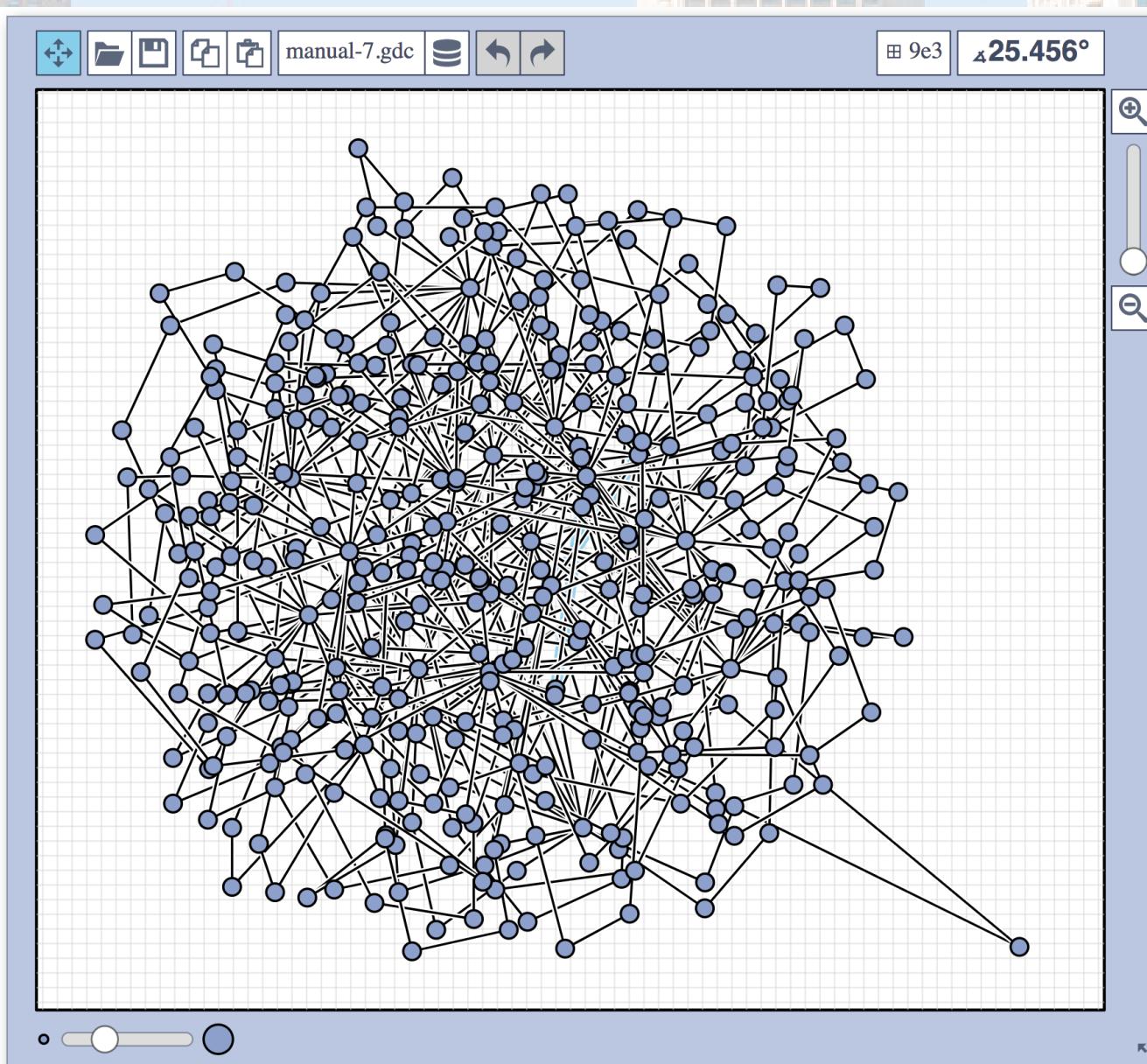
best automatic

LIVE CHALLENGE

the graphs

gd
817

graph 13



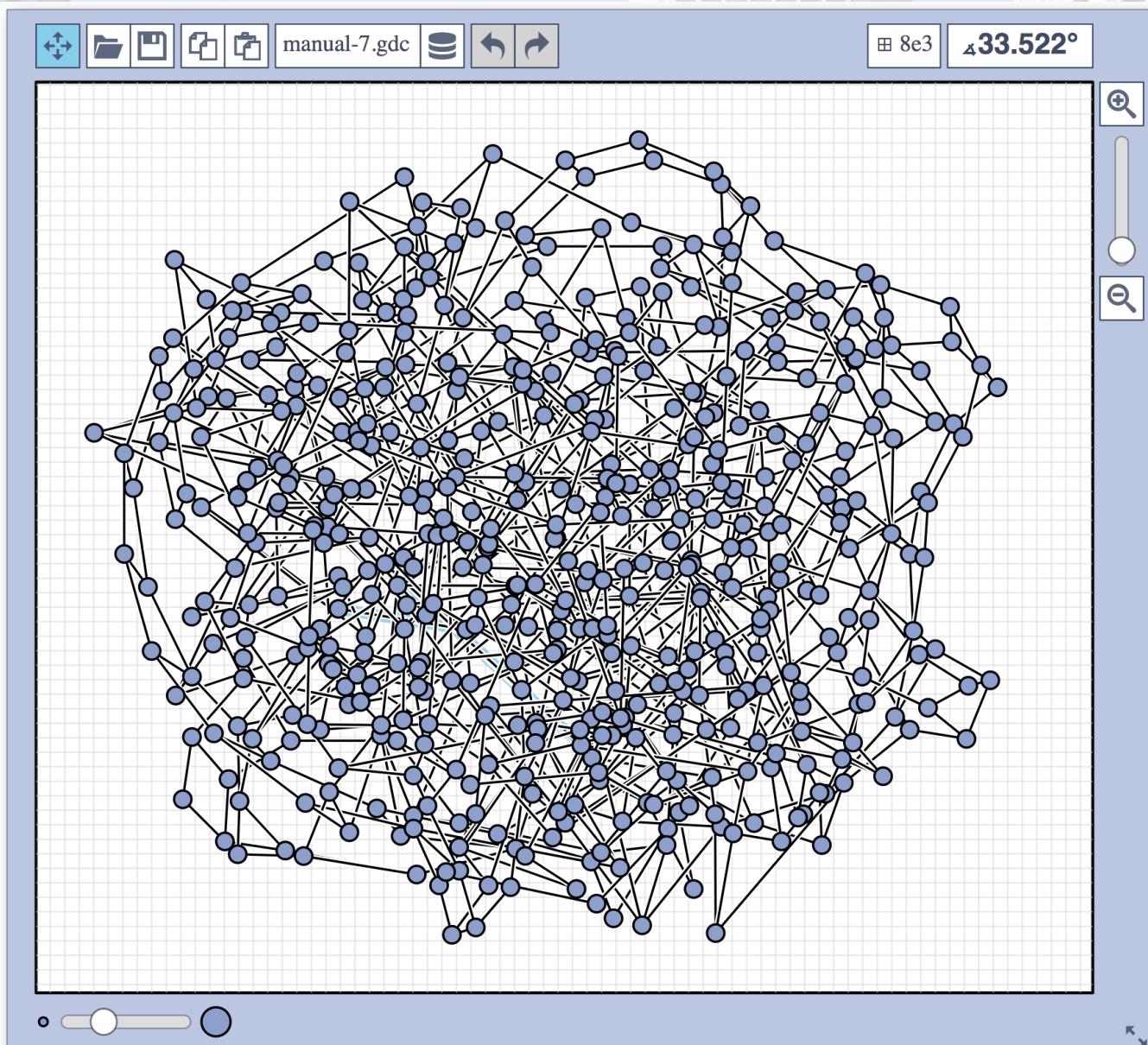
best automatic

LIVE CHALLENGE

the graphs



graph 14



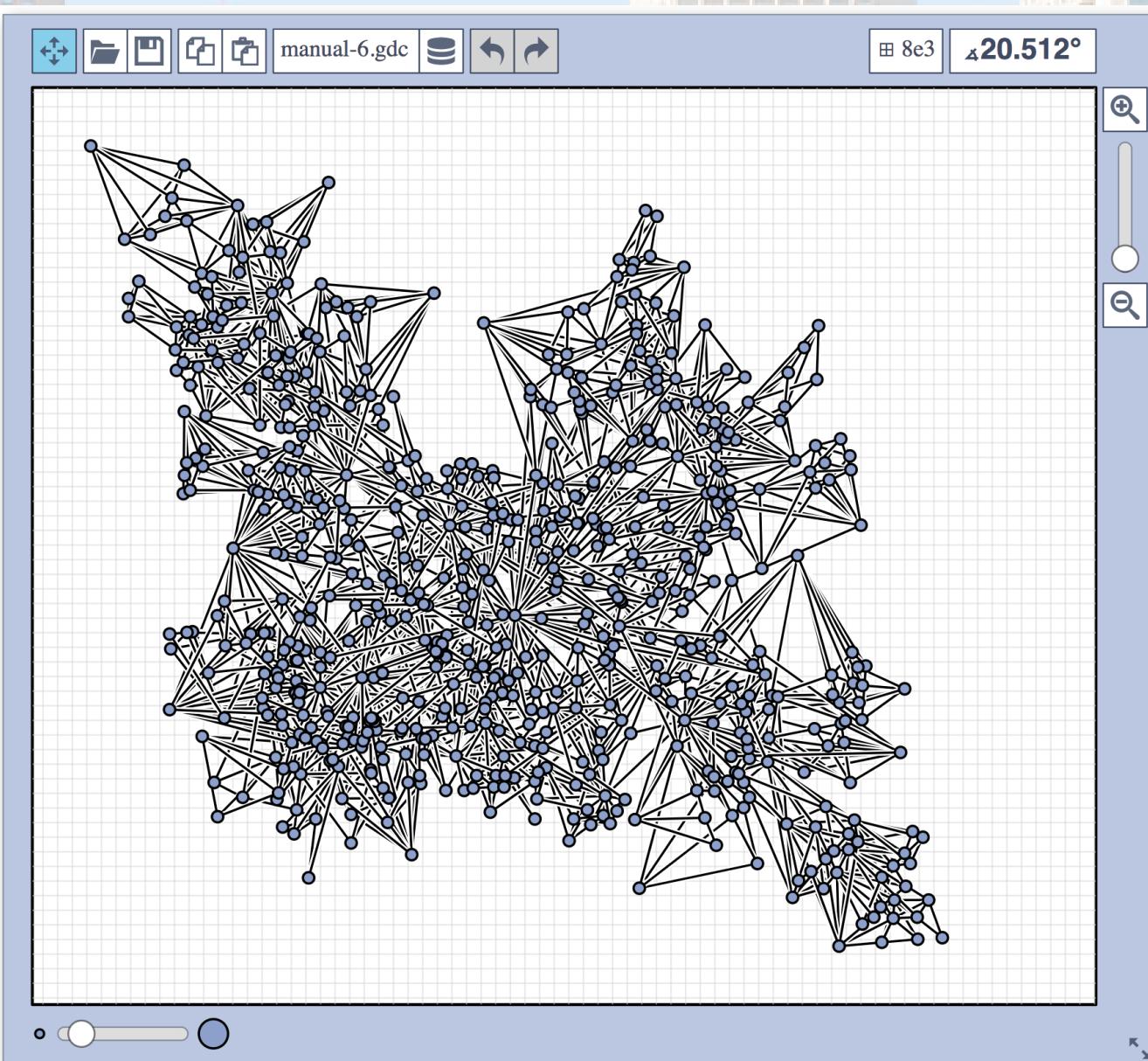
best automatic

LIVE CHALLENGE

the graphs

gd
17

graph 15

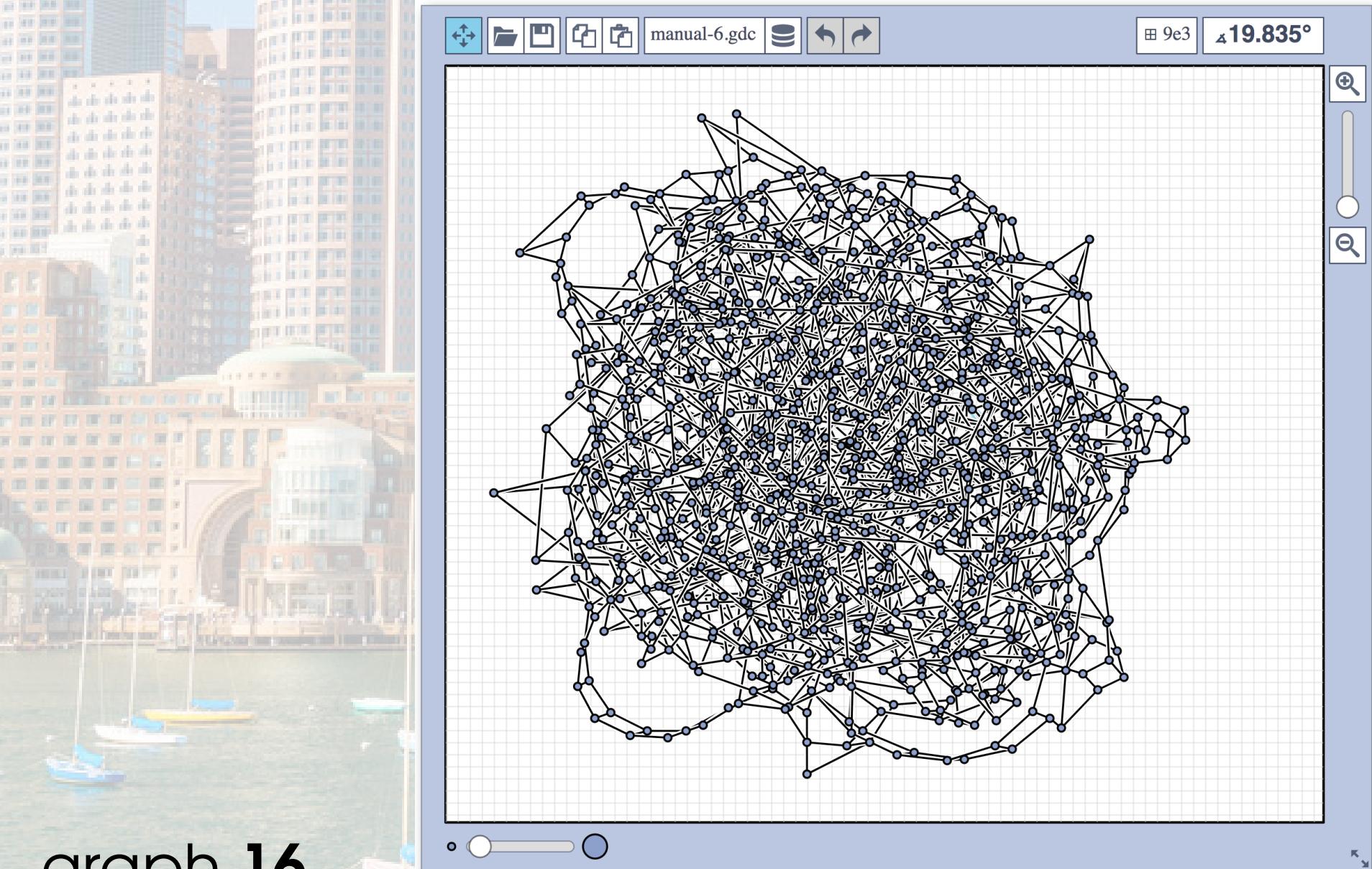


best automatic

LIVE CHALLENGE

the graphs

gd
817



graph 16

best automatic



LIVE CHALLENGE
manual category



RESULTS



LIVE CHALLENGE

manual category

gd
517

LIVE CHALLENGE

manual category



graph

cold

Aaaaaaaah

GraphSolvers



1337



LIVE CHALLENGE

manual category



graph

1

cold

49°

Aaaaaaaah

90°

GraphSolvers

71°

☃

88°

1337

89°

LIVE CHALLENGE

manual category



graph

1

2

cold

49° 58°

Aaaaaaaah

90° 57°

GraphSolvers

71° 57°

⛄

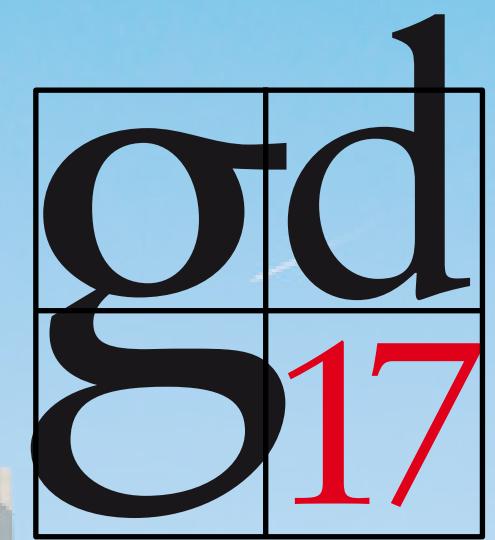
88° 40°

1337

89° 58°

LIVE CHALLENGE

manual category



graph

1 2 3

cold 49° 58° 90°

Aaaaaaaah 90° 57° 46°

GraphSolvers 71° 57° 46°

⛄ 88° 40° 85°

1337 89° 58° 78°

LIVE CHALLENGE

manual category



graph

1 2 3 4

cold

49° 58° 90° 43°

Aaaaaaaah

90° 57° 46° 47°

GraphSolvers

71° 57° 46° 46°

18*

88° 40° 85° 40°

1337

89° 58° 78° 43°

LIVE CHALLENGE

manual category



graph

1 2 3 4 5

cold

49° 58° 90° 43° 41°

Aaaaaaaah

90° 57° 46° 47° 46°

GraphSolvers

71° 57° 46° 46° 29°

18*

88° 40° 85° 40° 35°

1337

89° 58° 78° 43° 47°

LIVE CHALLENGE

manual category



graph

1

2

3

4

5

6

cold

49°

58°

90°

43°

41°

76°

Aaaaaaaah

90°

57°

46°

47°

46°

67°

GraphSolvers

71°

57°

46°

46°

29°

37°

18*

88°

40°

85°

40°

35°

56°

1337

89°

58°

78°

43°

47°

56°

LIVE CHALLENGE

manual category



graph

1 2 3 4 5 6 7

cold

49° 58° 90° 43° 41° 76° 36°

Aaaaaaaah

90° 57° 46° 47° 46° 67° 38°

GraphSolvers

71° 57° 46° 46° 29° 37° 32°

18*

88° 40° 85° 40° 35° 56° 23°

1337

89° 58° 78° 43° 47° 56° 17°

LIVE CHALLENGE

automatic category

gd
517



LIVE CHALLENGE

automatic category



graph

Oh-Hyun Kwon

Arizona Anglers

TuebingenMidnight

CoffeeVM

LIVE CHALLENGE

automatic category



graph

1

Oh-Hyun Kwon

79°

Arizona Anglers

48°

TuebingenMidnight

77°

CoffeeVM

90°

LIVE CHALLENGE

automatic category



graph

1 2

Oh-Hyun Kwon

79° 59°

Arizona Anglers

48° 30°

TuebingenMidnight

77° 42°

CoffeeVM

90° 88°

LIVE CHALLENGE

automatic category



graph

1 2 3

Oh-Hyun Kwon

79° 59° 90°

Arizona Anglers

48° 30° 78°

TuebingenMidnight

77° 42° 89°

CoffeeVM

90° 88° 90°

LIVE CHALLENGE

automatic category



graph	1	2	3	4
Oh-Hyun Kwon	79°	59°	90°	50°
Arizona Anglers	48°	30°	78°	40°
TuebingenMidnight	77°	42°	89°	89°
CoffeeVM	90°	88°	90°	90°

LIVE CHALLENGE

automatic category



graph

1 2 3 4 5

Oh-Hyun Kwon

79° 59° 90° 50° 40°

Arizona Anglers

48° 30° 78° 40° 28°

TuebingenMidnight

77° 42° 89° 89° 30°

CoffeeVM

90° 88° 90° 90° 80°

LIVE CHALLENGE

automatic category



graph

1 2 3 4 5 6

79° 59° 90° 50° 40° 84°

48° 30° 78° 40° 28° 36°

77° 42° 89° 89° 30° 78°

90° 88° 90° 90° 80° 90°

Oh-Hyun Kwon

Arizona Anglers

TuebingenMidnight

CoffeeVM

LIVE CHALLENGE

automatic category



graph

1 2 3 4 5 6 7

Oh-Hyun Kwon 79° 59° 90° 50° 40° 84° 31°

Arizona Anglers 48° 30° 78° 40° 28° 36° 3°

TuebingenMidnight 77° 42° 89° 89° 30° 78° 34°

CoffeeVM 90° 88° 90° 90° 80° 90° 57°

LIVE CHALLENGE

automatic category



graph

1 2 3 4 5 6 7 8

Oh-Hyun Kwon

79° 59° 90° 50° 40° 84° 31° 45°

Arizona Anglers

48° 30° 78° 40° 28° 36° 3° 1°

TuebingenMidnight

77° 42° 89° 89° 30° 78° 34° 61°

CoffeeVM

90° 88° 90° 90° 80° 90° 57° 85°

LIVE CHALLENGE

automatic category



graph

1 2 3 4 5 6 7 8 9

Oh-Hyun Kwon 79° 59° 90° 50° 40° 84° 31° 45° 28°

Arizona Anglers 48° 30° 78° 40° 28° 36° 3° 1° 7°

TuebingenMidnight 77° 42° 89° 89° 30° 78° 34° 61° 9°

CoffeeVM 90° 88° 90° 90° 80° 90° 57° 85° 60°

LIVE CHALLENGE

automatic category



graph

1 2 3 4 5 6 7 8 9 10

Oh-Hyun Kwon 79° 59° 90° 50° 40° 84° 31° 45° 28° 7°

Arizona Anglers 48° 30° 78° 40° 28° 36° 3° 1° 7° 4°

TuebingenMidnight 77° 42° 89° 89° 30° 78° 34° 61° 9° 4°

CoffeeVM 90° 88° 90° 90° 80° 90° 57° 85° 60° 21°

LIVE CHALLENGE

automatic category



graph

1 2 3 4 5 6 7 8 9 10 11

Oh-Hyun Kwon 79° 59° 90° 50° 40° 84° 31° 45° 28° 7° 14°

Arizona Anglers 48° 30° 78° 40° 28° 36° 3° 1° 7° 4° 5°

TuebingenMidnight 77° 42° 89° 89° 30° 78° 34° 61° 9° 4° 6°

CoffeeVM 90° 88° 90° 90° 80° 90° 57° 85° 60° 21° 47°

LIVE CHALLENGE

automatic category



graph

1 2 3 4 5 6 7 8 9 10 11 12

Oh-Hyun Kwon 79° 59° 90° 50° 40° 84° 31° 45° 28° 7° 14° 11°

Arizona Anglers 48° 30° 78° 40° 28° 36° 3° 1° 7° 4° 5° 0°

TuebingenMidnight 77° 42° 89° 89° 30° 78° 34° 61° 9° 4° 6° 5°

CoffeeVM 90° 88° 90° 90° 80° 90° 57° 85° 60° 21° 47° 36°

LIVE CHALLENGE

automatic category



graph

1 2 3 4 5 6 7 8 9 10 11 12 13

Oh-Hyun Kwon

79° 59° 90° 50° 40° 84° 31° 45° 28° 7° 14° 11° 7°

Arizona Anglers

48° 30° 78° 40° 28° 36° 3° 1° 7° 4° 5° 0° 2°

TuebingenMidnight

77° 42° 89° 89° 30° 78° 34° 61° 9° 4° 6° 5° 4°

CoffeeVM

90° 88° 90° 90° 80° 90° 57° 85° 60° 21° 47° 36° 25°

LIVE CHALLENGE

automatic category



graph

1 2 3 4 5 6 7 8 9 10 11 12 13 14

Oh-Hyun Kwon

79° 59° 90° 50° 40° 84° 31° 45° 28° 7° 14° 11° 7° 5°

Arizona Anglers

48° 30° 78° 40° 28° 36° 3° 1° 7° 4° 5° 0° 2° 2°

TuebingenMidnight

77° 42° 89° 89° 30° 78° 34° 61° 9° 4° 6° 5° 4° 5°

CoffeeVM

90° 88° 90° 90° 80° 90° 57° 85° 60° 21° 47° 36° 25° 34°

LIVE CHALLENGE

automatic category



graph

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Oh-Hyun Kwon 79° 59° 90° 50° 40° 84° 31° 45° 28° 7° 14° 11° 7° 5° 6°

Arizona Anglers 48° 30° 78° 40° 28° 36° 3° 1° 7° 4° 5° 0° 2° 2° 0°

TuebingenMidnight 77° 42° 89° 89° 30° 78° 34° 61° 9° 4° 6° 5° 4° 5° 4°

CoffeeVM 90° 88° 90° 90° 80° 90° 57° 85° 60° 21° 47° 36° 25° 34° 21°

LIVE CHALLENGE

automatic category



graph

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

Oh-Hyun Kwon 79° 59° 90° 50° 40° 84° 31° 45° 28° 7° 14° 11° 7° 5° 6° 2°

Arizona Anglers 48° 30° 78° 40° 28° 36° 3° 1° 7° 4° 5° 0° 2° 2° 0° 0°

TuebingenMidnight 77° 42° 89° 89° 30° 78° 34° 61° 9° 4° 6° 5° 4° 5° 4° 3°

CoffeeVM 90° 88° 90° 90° 80° 90° 57° 85° 60° 21° 47° 36° 25° 34° 21° 20°



GRAPH DRAWING CONTEST

2018 announcement



Announcement of Tasks



GRAPH DRAWING CONTEST

2018 creative topic #1



GRAPH DRAWING CONTEST

2018 creative topic #1



Game of Thrones Character Interactions

vertices are characters
edges are relations
edges have an
additional type attribute

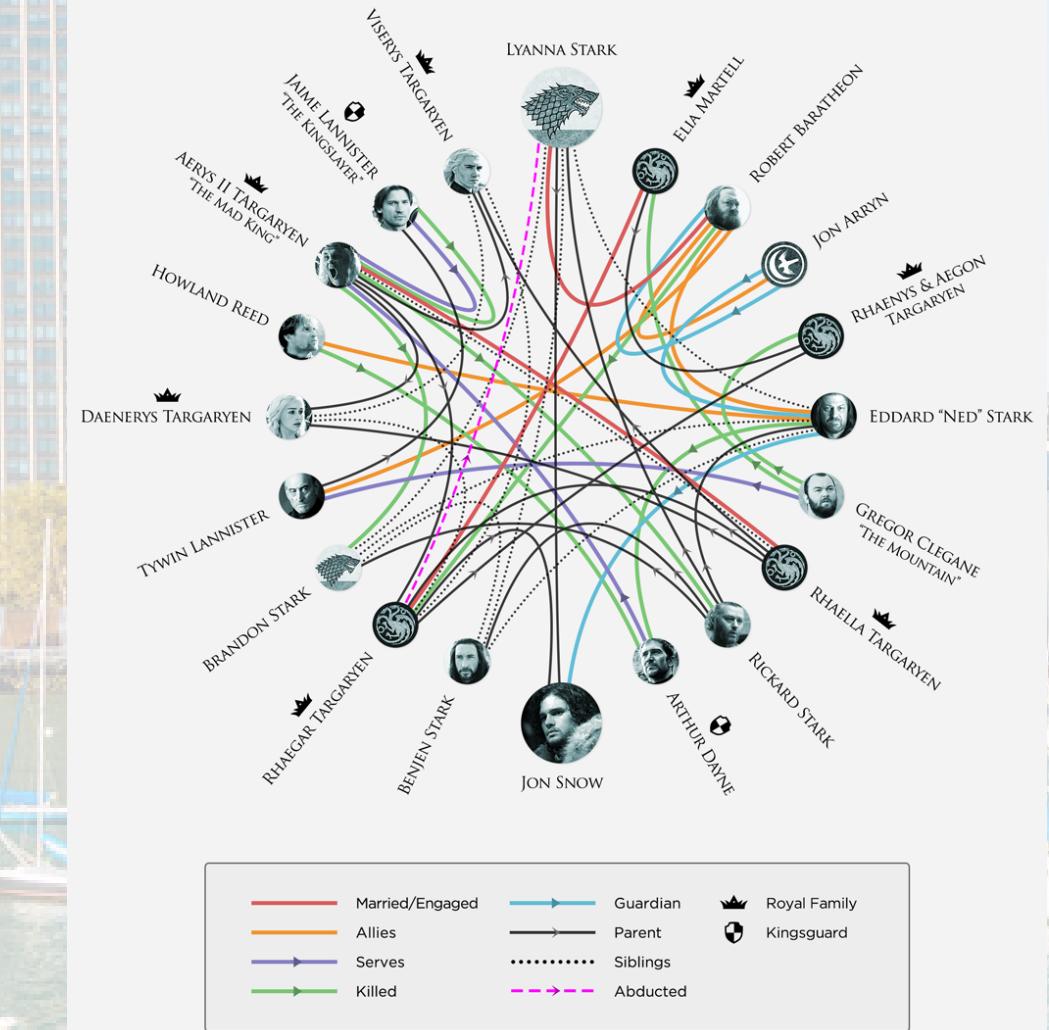
GRAPH DRAWING CONTEST

2018 creative topic #1



Game of Thrones Character Interactions

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GRAPH DRAWING CONTEST

2018 creative topic #2



GRAPH DRAWING CONTEST

2018 creative topic #2



Mathematics Genealogy Project

vertices are mathematicians

edges are supervisor/student relations

vertices have
additional
attributes:
year, topic



GRAPH DRAWING CONTEST

2018 creative topic #2

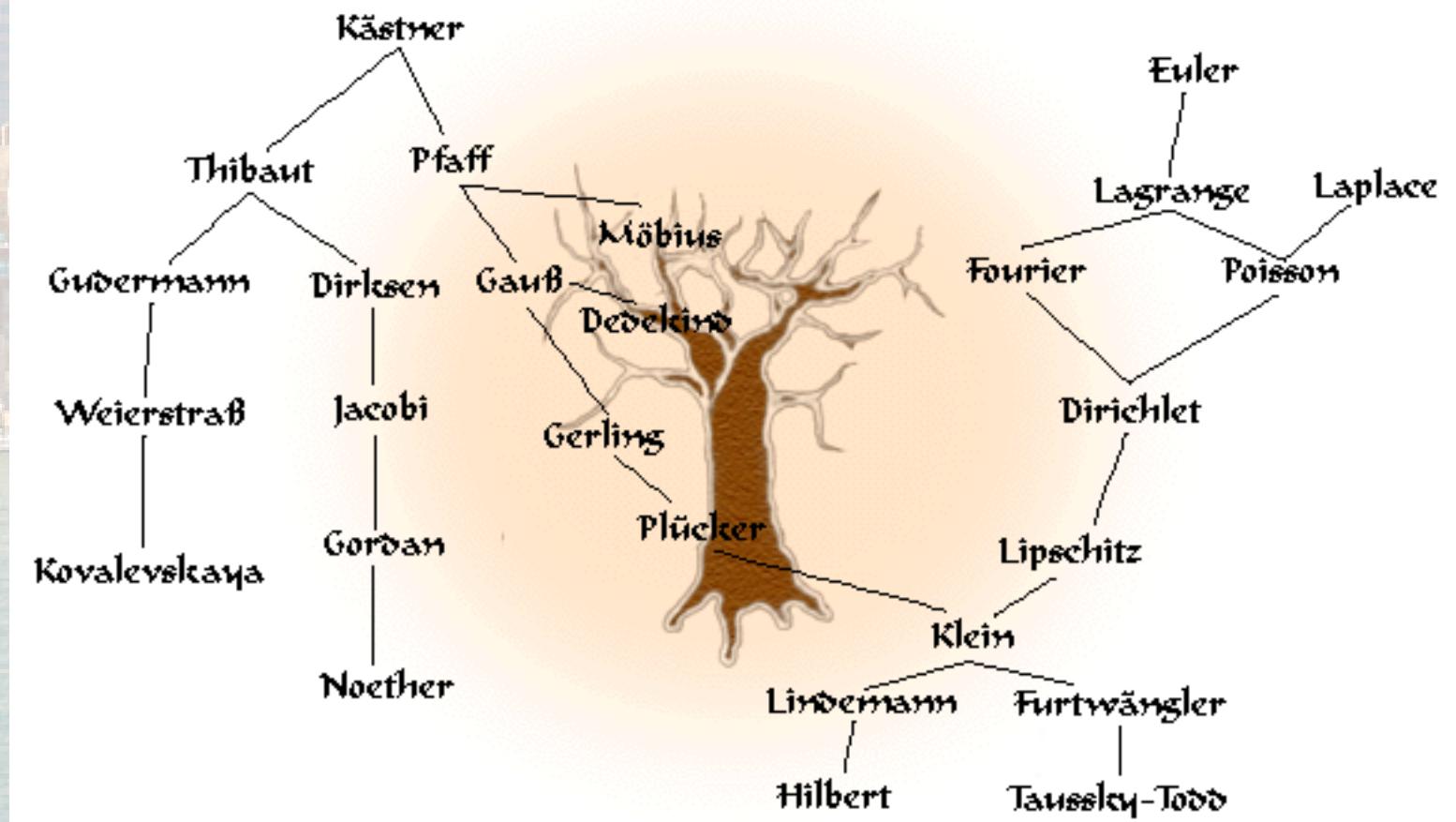


Mathematics Genealogy Project

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GRAPH DRAWING CONTEST

2018 live challenge



Crossing Angle Maximization

input: arbitrary graph

output: straight-line embedding with
integer vertex coordinates

must be a proper
drawing

objective:
maximize the
smallest angle
between any
crossing edges

