



Visualizing set relationships: EVenn's comprehensive approach to Venn diagrams.

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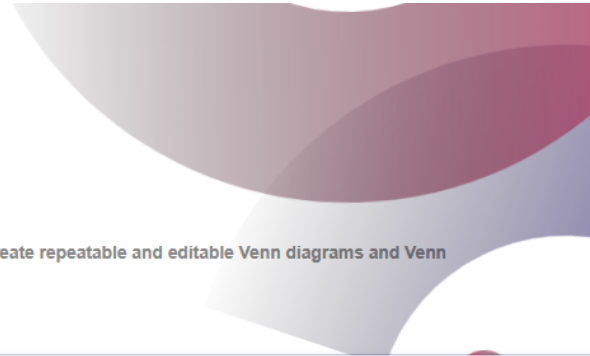


Introduction

E Venn

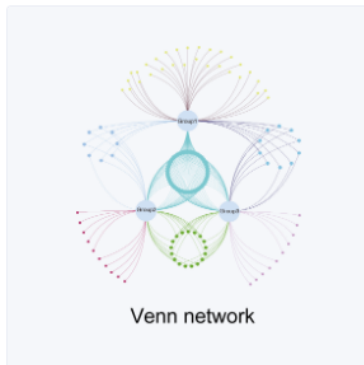
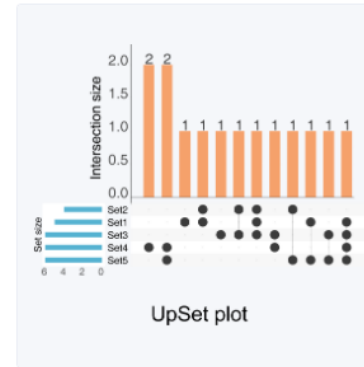
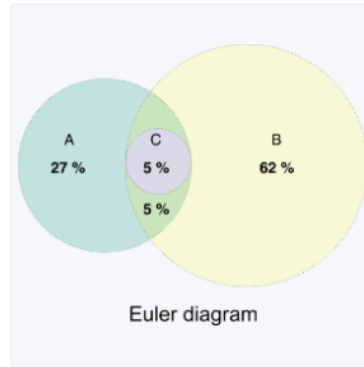
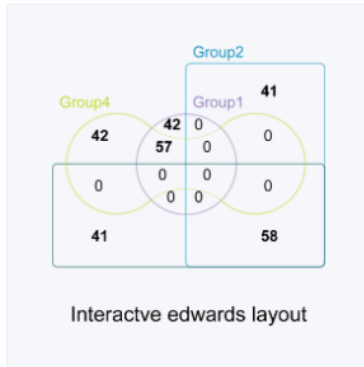
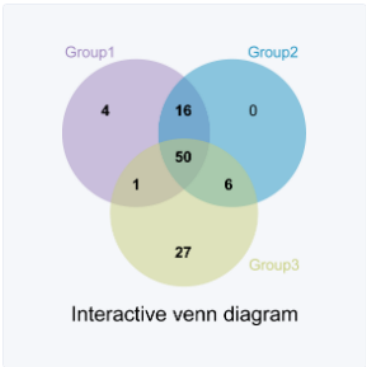
Easy to create repeatable, editable, and statistically measurable Venn diagrams and Venn-alternative plots online.

- Supporting 5-types visualization for set relationships
- Developing one unified matrix as input for all 7 tools
- Listing elements of each intersection for any number of sets
- Computing the statistical significance of set consistency
- Generating publication-quality vector images for downloading
- Customizing a bunch of style parameters for individual requirements
- If you use EVenn in your work, please cite: Tong Chen, Haiyan Zhang, Yu Liu, Yong-Xin Liu, Luqi Huang. **EVenn: Easy to create repeatable and editable Venn diagrams and Venn networks online.** Journal of Genetics and Genomics. 2021 Aug 2. doi: 10.1016/j.jgg.2021.07.007.
- Please post operation problems to chentong_biologyAT163.com for helps.



Home Data Center Interactive Venn diagram Euler diagram UpSet Flower plot Interactive Flower plot Venn network Venn estimate Venn calculator Help

Please check [help](#) page for more demo data.



P-value

Statistical meaning

Here apply two types of estimations. One is for estimating if there is statistical meaning of the given overlap of two sets. Another is for estimating if given two sets have statistically significant similarity.

Random sample test

Jaccard similarity test (bootstrap)

P-value: 0.001

Estimate set similarity

Compute intersection elements for any number of sets

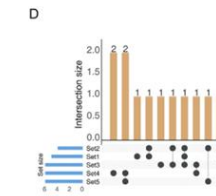
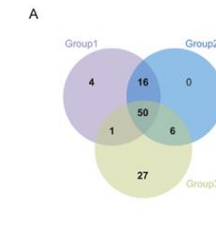
Intersection	Count	Elements
Set1&Set2&Set3	1	g1
Set1&Set3&Set4&Set5	1	g2
Set1	3	b4;g2;h3
Set4&Set5	2	h1;d1
Set2&Set3	2	b1;z1
Set3	2	c2;i1
Set4	2	d3;d2

Venn calculator

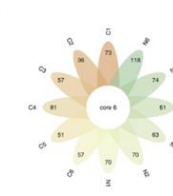
A

Elements	Set
ele1	Set1
ele2	Set1
ele3	Set2
ele3	Set1
ele4	Set2
ele1	Set3
ele5	Set3
ele2	Set4

Example 1



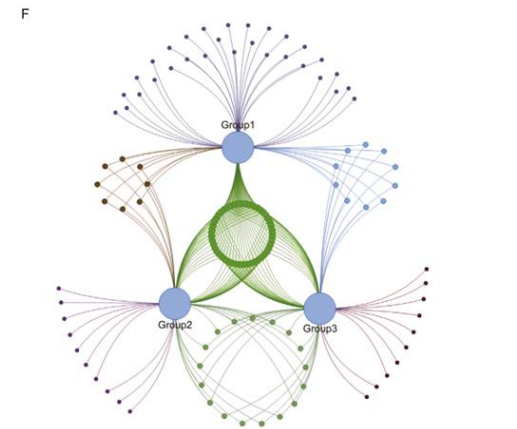
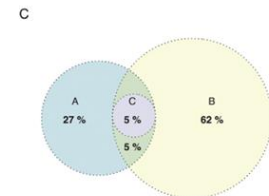
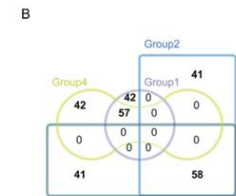
E



B

Genes	Groups
Sox2	Control
Pou5f1	Control
Nanog	Knockout
P53	Control
Sox2	Knockout
Myc	Knockin
Kras	Knockout
Lin28	Knockdown

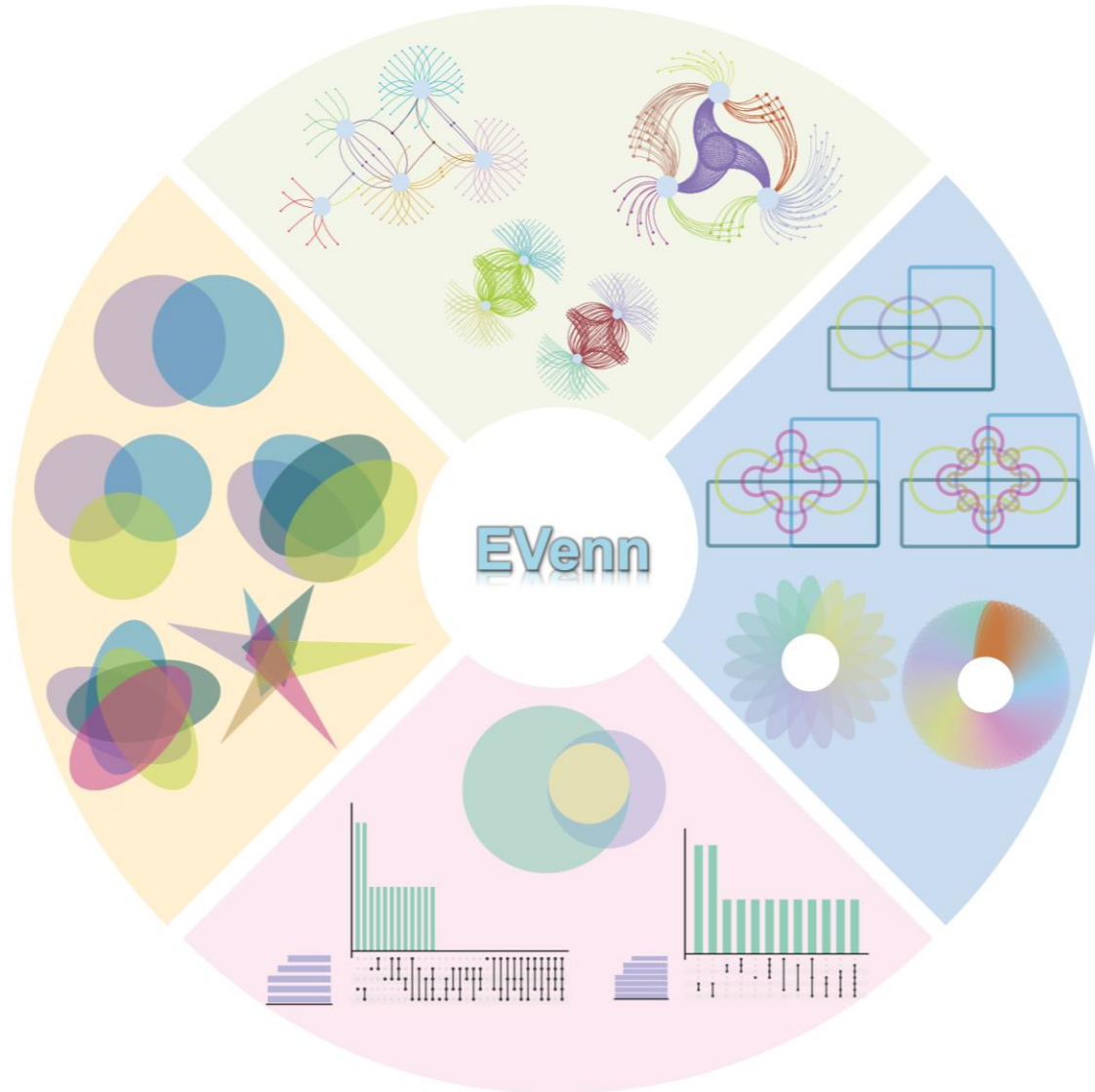
Sets with genes





Highlights

- ① Comprehensive Venn Functionality
- ② Efficient Data Exploration
- ③ User-Friendly Interface



A

Elements	Set
ele1	Set1
ele2	Set1
ele3	Set2
ele3	Set1
ele4	Set2
ele1	Set3
ele5	Set3
ele2	Set4

Example 1

B

Genes	Groups
Sox2	Control
Pou5f1	Control
Nanog	Knockout
P53	Control
Sox2	Knockout
Myc	Knockin
Kras	Knockout
Lin28	Knockdown

Sets with genes

C

OTUs	Positions
ASV_1	Root
ASV_2	Root
ASV_3	Leaf
ASV_4	Root
ASV_1	Leaf
ASV_5	Stem
ASV_6	Stem
ASV_7	Soil

Sets with OTUs

D

Genes	Pathways
JUN	P53 pathway
MEST	EMT pathway
JUN	EMT pathway
KLF9	TNFA pathway
ACTA2	EMT pathway
MAFF	Hypoxia
UGP2	Hypoxia
APBB2	UV response

Sets with ontologies

E

Group1 Group2

OTU1	OTU1
OTU2	OTU12
OTU3	OTU13
.	.
.	.
.	.

Input items for each set

F

Set A Set B

	Intersection	Count
A		15
B		35
C		0
A&B		3
A&C		0
B&C		0
A&B&C		3

A specific:
 B specific:
 A ∩ B:

Input numbers for each intersection

G

Ele	A	B	C	D	E
Ele1	1	1	0	0	1
Ele2	1	0	1	1	0
Ele3	0	1	0	0	0
Ele4	1	1	0	0	1
Ele5	0	0	1	0	0
Ele6	0	0	0	1	1
Ele7	1	1	1	1	1

Binary matrix



Representative Results of EVenn

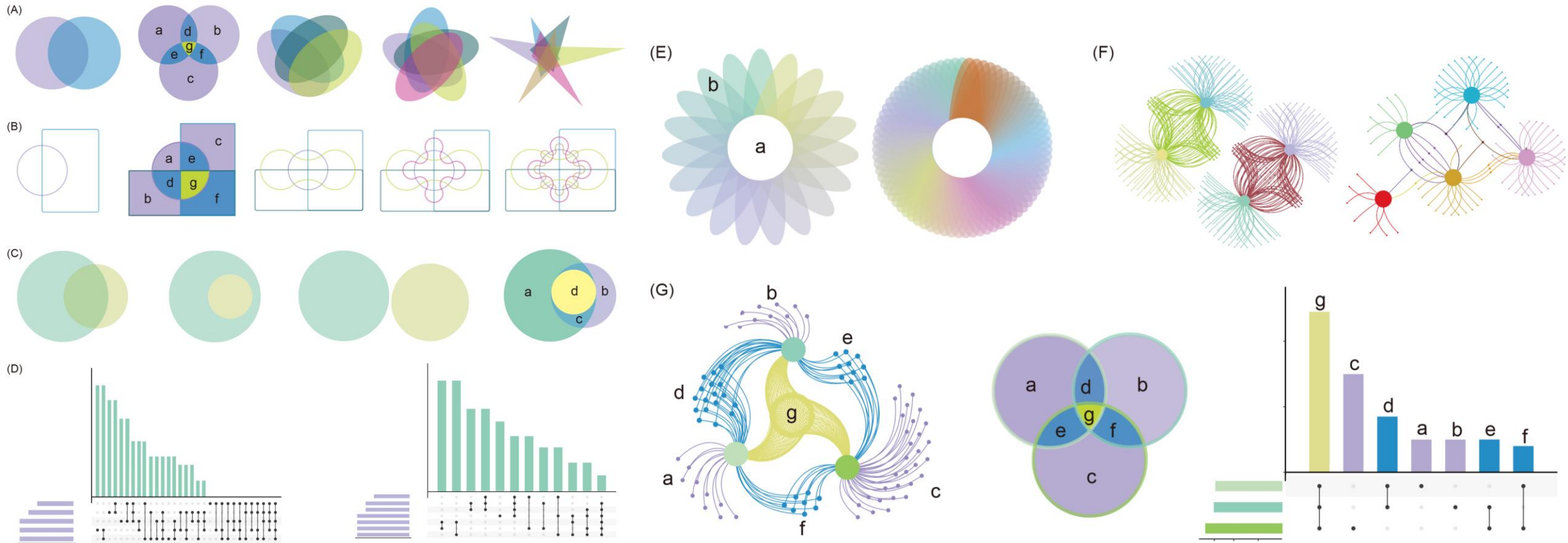


Figure 1. Representative Result Diagrams in EVenn. (A) Interactive standard Venn diagrams for 2 to 6 sets. (B) Interactive Edwards diagrams for 2 to 6 sets. (C) Euler diagrams for 2 to 3 sets. (D) UpSet plot displaying empty intersections of 5 sets and non-empty intersections of 7 sets. (E) Flower plot for 19 sets and 70 sets. (F) Venn network diagrams for 4 to 5 sets. (G) Interrelation among Venn diagram, UpSet plot, and Venn network diagrams.



Streamlined Data Input in EVenN's Data Center

The screenshot displays the 'Data Center' section of the EVenN interface. The navigation bar includes 'Home', 'Data Center', and various analysis tools. The main area is a large dashed box with a cloud upload icon and instructions: 'Drag the file here or click to upload. Only support xls | xlsx | csv | txt file with a size no more than 1 Mb could be uploaded. Rember to click 'Submit' to finish data uploading or data revising!'. A red circle '1' points to a 'Upload data' button. Below this is a form with a red circle '2' for 'Input the name for your data', a red circle '3' for 'Preview and edit (if necessary) the uploaded data' (with an 'Or' option to 'Paste your data matrix directly in this text area'), and a red circle '4' for a 'Click Submit' button. A red circle '5' points to the 'Use your uploaded data' option.

Figure 2. Effortless file upload procedure.

This screenshot shows the 'Data Center' interface with the data pasting procedure. The navigation bar is the same. The main area has a dashed box with a cloud upload icon and instructions: 'Drag the file here or click to upload. Only support xls | xlsx | csv | txt file with a size no more than 1 Mb could be uploaded. Rember to click 'Submit' to finish data uploading or data revising!'. A red circle '1' points to the 'Input the name for your data' field. Below is a form with a red circle '2' for 'Paste your data matrix directly in this text area' (with an 'Or' option to 'Preview and edit (if necessary) the uploaded data') and a red circle '3' for a 'Click Submit' button. A red circle '4' points to the 'Use your uploaded data' option. Below the form is a list of files: 'DE_gene_file.txt', 'DE_gene_file1.txt', 'DE_gene_file2.txt', 'DE_gene_file3.txt', and 'DE_gene_file4.txt'. A red circle '5' points to a 'Remove data' button with an 'x' icon next to each file name.

Figure 3. Efficient data pasting procedure.



Displaying the Steps for Generating Case diagram

Home Data Center Interactive Venn diagram Euler diagram UpSet Flower plot Interactive Flower plot Venn network Venn estimate Venn calculator Help

Click to export image and lists

- Download PNG image
- Download SVG image
- Download CSV lists

Venn global configuration (Click to fold/unfold) Click to show more parameters

- Input matrix in two-column mode.
- The first column containing elements by rows and the second column represents the set it belongs to.
- The column separator should be one TAB.
- One could choose which set to show in the Venn diagram.
- Hold down and drag to modify displaying orders of sets.

Use your uploaded data

Metabolite Tissue Paste your data here

mws0217	FS1
pme2292	FS1
pme1987	FS1
Lmgn000188	FS1
MWS1787	FS1
MWS2040	FS1
MWSmce461	FS1
mws4052	FS1
pme1841	FS1
MWSmce585	FS1
nme3033	FS1

FS1 Select sets FS2 FS3

FS4 FS5 Please select the column

Drag to change set orders

Set colors

Click on a venn diagram figure to display the linked elements:

Common elements in FS1 FS2 FS3 FS4 FS5:

Access specific intersection data

Size of each list

Number of elements: specific (1) or shared by 2, 3, ... lists

Home Data Center Interactive Venn diagram Euler diagram UpSet Flower plot Interactive Flower plot Venn network Venn estimate Venn calculator Help

Matrix (two-column mode matrix) Use your uploaded data

Target_gene	Biological_process	description
IMPTAPA2N18434_1	monocarboxylic_acid_biosynthetic_process	
IMPTAPA2N9430_1	monocarboxylic_acid_biosynthetic_process	
IMPTAPA2N50854_1	monocarboxylic_acid_biosynthetic_process	
IMPTAPA2N52279_1	monocarboxylic_acid_biosynthetic_process	
IMPTAPA2N34454_1	monocarboxylic_acid_biosynthetic_process	
IMPTAPA2N12074_1	monocarboxylic_acid_biosynthetic_process	
IMPTAPA2N17543_1	monocarboxylic_acid_biosynthetic_process	
IMPTAPA2N18486_1	monocarboxylic_acid_biosynthetic_process	
IMPTAPA2N23106_1	monocarboxylic_acid_biosynthetic_process	
IMPTAPA2N37477_1	monocarboxylic_acid_biosynthetic_process	

Paste data

Parameters

Set colors for each set: Select color parameter

Showing mode: Select mode parameter

- Show all elements
- Show only common elements and specific elements like flower

Submit Click Submit

nodes

font:

color: background: strokeWidth: strokeColor:

edges

dashes: smooth: enabled: type: forceDirection: roundness:

layout

physics

physics enabled:

barnesHut:

gravitationalConstant: centralGravity: springLength: springConstant: damping: avoidOverlap: maxVelocity: minVelocity: solver: timestep:

Tools menu

- Click left toolbar
- Download SVG
- Legend
- Edit node
- Edit edge
- Preferred layout

Click Preferred layout

Figure 4. Displaying the Steps for Generating Case diagram.



CASE DEMONSTRATION

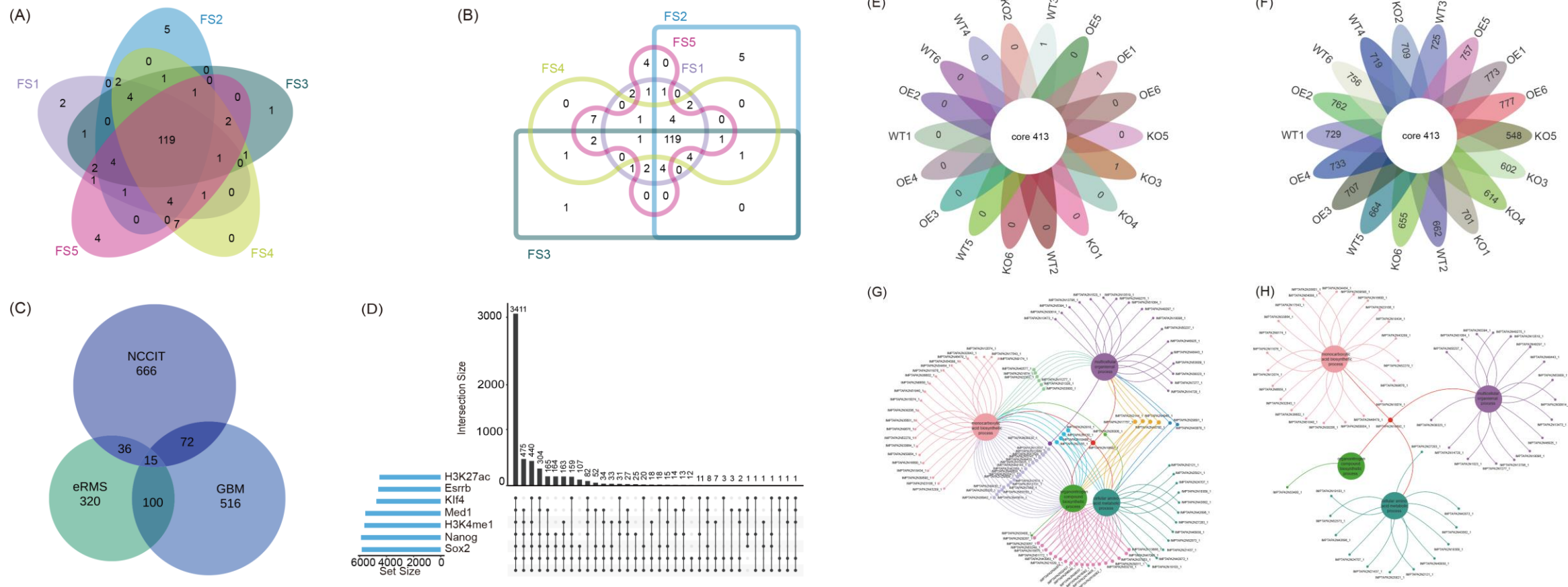


Figure 5. Case Demonstrations in EVenN. (A) Interactive Venn diagrams for differential metabolites. (B) Interactive

Edwards diagrams for differential metabolites. (C) Euler diagrams for differentially expressed genes. (D) UpSet plot for ChIP-seq.

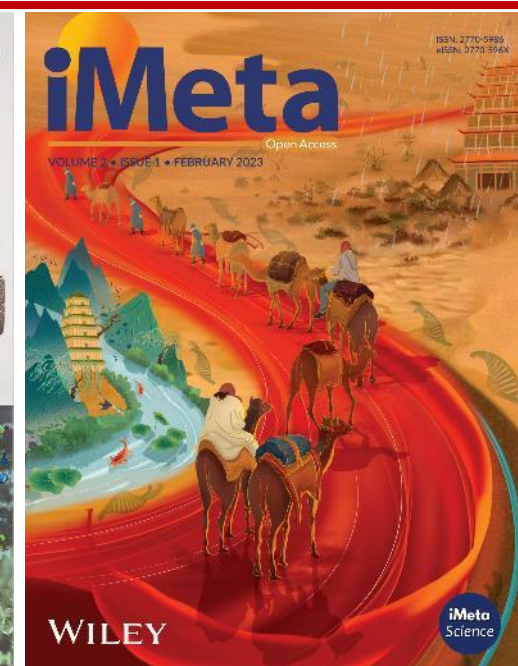
(E-F) Interactive flower plot displaying OTUs. (G-H) Venn network diagrams for visualizing GO enrichment analysis results.



Summary

- ❑ In this paper, we introduced EVenn, a user-friendly platform with diverse Venn diagram tools for multi-omics data analyses.
- ❑ Currently, EVenn's data center streamlines exploration by supporting a standardized data format, allowing researchers to effortlessly upload and analyze data, and accelerates the transition from data preparation to insightful analysis.
- ❑ We demonstrate EVenn's practical utility through representative results and detailed case demonstrations. EVenn as a valuable resource for researchers seeking a cohesive and accessible tool for multi-omics data interpretation.
- ❑ Website: <http://ehbio.com/test/venn/>

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