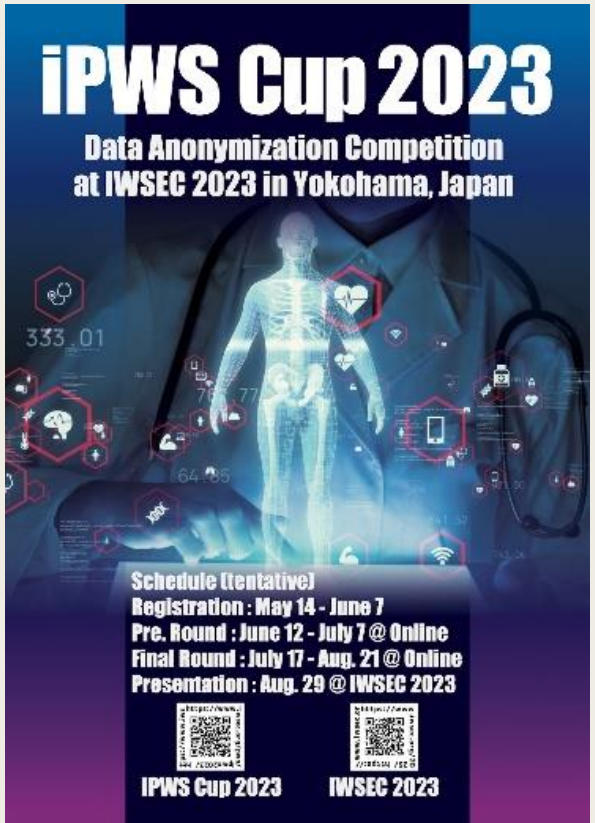
iPWS Cup 2024

July 14, 2024

iPWS Cup 2024 Steering Committee

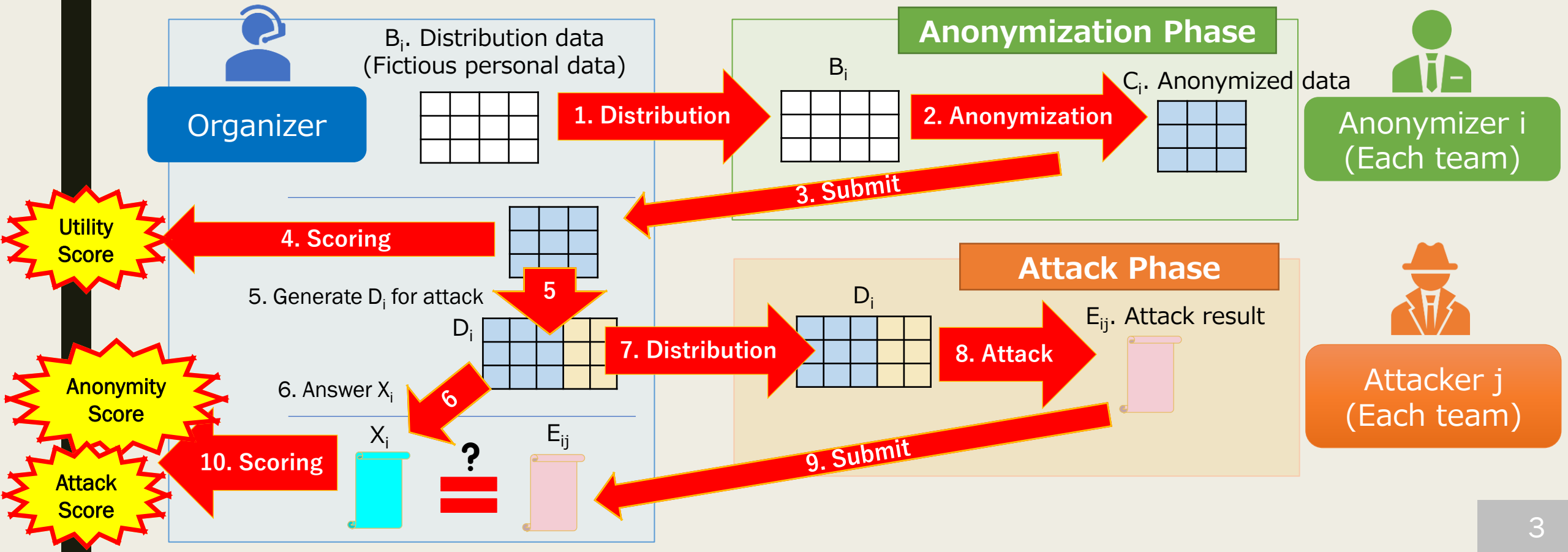
About iPWS Cup

- PWS (Privacy Workshop) : held annually in Japan since 2015.
  - https://www.iwsec.org/pws/2024/
- PWS Cup : A competition for anonymization and its attack techniques, held as one of the PWS events.
- iPWS Cup : International version of the PWS Cup, starting in 2023.



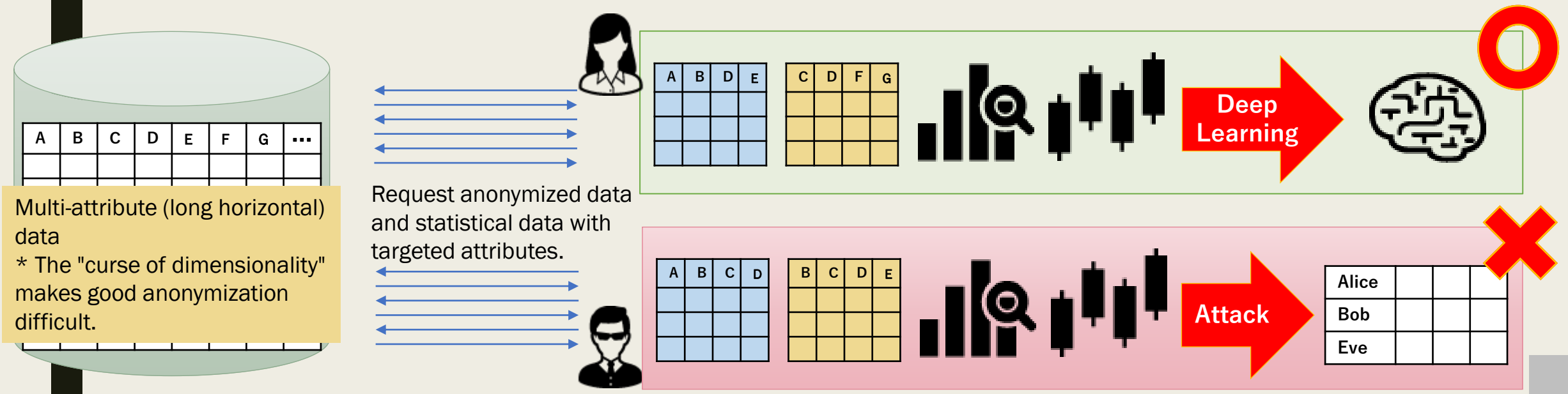
Basic Flow of the iPWS Cup

- All participating teams take part in both the anonymization and attack phases.
- Anonymization phase : Submit anonymized (fictitious) personal data provided by the organizer.
- Attack phase : Submit the attack result on the anonymized data of other teams.
- The organizer announces the results of each team's utility, anonymity and attack scores.



Theme of iPWS Cup 2024

- "Database (DB) reconstruction attacks" have become a serious problem in recent years.
- Using the movie review data "MovieLens" https://grouplens.org/datasets/movielens/ to create highly useful anonymized data while preventing the DB reconstruction attacks and personal identification attacks.



Data to Use

- MovieLens 1M Dataset (Released 2/2003) https://grouplens.org/datasets/movielens/
  - movies.dat
    - Movie ID, Title, Genres
    - 3,952 films, 18 genres (Action, Adventure, Animation, ...) [multiple choice]
  - ratings.dat
    - User ID, Movie ID, Rating (1 – 5), Timestamp
    - 6,040 Users, 1,000,209 records
    - All users have rated at least 20 films (max. 2,314 films).
  - users.dat
    - User ID and Basic attributes (Gender (M/F), Age, Occupation, ZIP-code)
    - Age : 1(Under 18), 18(18-24), 25(25-34), 35(35-44), 45(45-49), 50(50-55), 56(56+)
    - Occupation : 0(other or not specified), 1(academic/educator), ⋯, 20(writer)
    - ZIP-code : 5 digits

Data to Use (Cont.)

- The MovieLens 1M Dataset is modified as follows.
  - Extract only films with "Fantasy" in genre.
    - 46 films, 4,850 views
  - Consists of the following 51 attributes
    - User ID (Plans to convert to fictitious names.)
    - Basic attributes : Gender (M/F), Age (7 types), Occupation (21 types), ZIP-code (Up to the 3rd digit)
    - Rating (1-5) for each of the 46 films *No viewing is considered to be 0.
  - Create a single csv file with one record per person (51 columns).
  - 1,920 records with a Rating of 5 or more films were extracted.
  - The above processed data is published as "Original data A".
    - Filename of A : "A.csv" (to be published)
- Generate "distribution data B_i" for each team from the original data A by means of data synthesis.
  - The contents of other teams' distribution data should not be known.
  - Number of records increases from 1,920 to 10,000.
    - Filename of a sample Bi : "sampleBi.csv" (to be published)
  - Note that B_i differs significantly from A.
  - For fairness, B_i allows each team to choose.

Genres	Films	Views
Action	402	6,012
Adventure	234	5,894
Animation	71	4,808
Children's	179	5,283
Comedy	938	6,031
Crime	171	5,662
Documentary	90	2,243
Drama	1,168	6,037
Fantasy	46	4,850
Film-Noir	33	4,150
Horror	251	5,300
Musical	84	4,754
Mystery	83	5,133
Romance	367	5,961
Sci-Fi	220	5,911
Thriller	375	5,989
War	139	5,769
Western	56	4,100

Image of A

Movie ID (46 film IDs)

51 columns

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1	User ID	Gender	Age	Occupatic	ZIP-code	2	56	247	260	653	673	810	885	1009	1073	1097	1126	1525	1654	1702	1750	1881	1920	1967	2(
2	0	M	1	0	296	0	3	4	5	1	5	4	5	3	2	5	0	5	4	2	5	4	4	2	
3	1	M	18	19	390	3	3	5	5	1	0	4	0	5	0	1	2	0	0	0	5	1	3	3	
4	2	M	25	15	27	3	0	4	5	0	0	1	2	1	3	2	4	1	0	1	1	0	2	4	
5	3	F	1	2	316	4	3	1	5	5	0	0	5	3	1	4	1	3	3	0	5	4	4	0	
6	4	M	45	9	725	4	1	0	1	5	4	0	0	1	4	1	1	0	0	4	2	2	2	0	
7	5	F	18	8	968	4	2	3	1	3	1	2	1	1	3	4	2	3	3	2	5	5	0	0	
8	6	M	50	9	45	2	4	4	3	2	0	2	0	3	5	0	2	2	5	0	1	5	1	5	
9	7	M	50	14	517	2	3	3	4	0	2	0	4	4	1	1	0	4	1	5	2	2	3	4	
10	8	M	18	14	525	2	1	5	3	4	1	0	4	2	1	4	2	4	0	2	1	5	0	4	
11	9	M	18	14	530	0	0	1	2	4	3	0	5	0	1	5	5	0	5	5	1	2	0	2	
12	10	M	25	10	695	2	1	4	2	0	3	4	3	0	2	0	0	5	1	0	3	3	4	1	
13	11	M	56	3	378	4	1	0	1	5	3	0	1	4	2	1	0	1	2	1	1	3	2	2	
14	12	M	18	12	20	1	0	5	2	3	0	2	3	1	5	0	1	4	2	5	5	0	4	2	
15	13	M	25	1	886	0	1	2	0	1	4	0	1	4	4	2	2	5	1	5	4	2	3	2	
16	14	F	18	14	829	1	1	4	5	3	0	4	4	5	5	2	0	2	3	5	1	0	4	2	
17	15	M	18	15	910	4	1	4	4	5	0	3	3	2	0	2	0	0	3	3	0	4	1	3	
18	16	M	50	1	596	2	2	5	2	0	0	4	4	1	5	4	5	0	5	0	2	0	0	5	
19	17	M	35	16	947	1	0	3	2	3	0	0	5	1	2	5	3	0	4	2	3	1	4	2	
20	18	F	25	10	888	4	1	0	5	0	1	1	2	4	1	3	1	1	3	5	4	0	3	1	
21	19	M	18	20	546	0	2	4	2	3	2	0	4	5	2	3	1	5	2	4	1	3	2	3	
22	20	F	1	10	715	5	1	1	3	5	1	0	3	3	1	0	3	2	5	3	2	0	1	4	

1,920 rows (excluding header lines)

List of Films in the Genre "Fantasy"

ID	Title	Genres	Views
2	Jumanji (1995)	Adventure|Children's|Fantasy	701
56	Kids of the Round Table (1995)	Adventure|Children's|Fantasy	9
247	Heavenly Creatures (1994)	Drama|Fantasy|Romance|Thriller	477
260	Star Wars, Episode IV - A New Hope (1977)	Action|Adventure|Fantasy|Sci-Fi	2991
653	Dragonheart (1996)	Action|Adventure|Fantasy	612
673	Space Jam (1996)	Adventure|Animation|Children's|Comedy|Fantasy	563
810	Kazaam (1996)	Children's|Comedy|Fantasy	120
885	Bogus (1996)	Children's|Drama|Fantasy	43
1009	Escape to Witch Mountain (1975)	Adventure|Children's|Fantasy	291
1073	Willy Wonka and the Chocolate Factory (1971)	Adventure|Children's|Comedy|Fantasy	1313
1097	E.T. the Extra-Terrestrial (1982)	Children's|Drama|Fantasy|Sci-Fi	2269
1126	Drop Dead Fred (1991)	Comedy|Fantasy	317
1525	Warriors of Virtue (1997)	Action|Adventure|Children's|Fantasy	44
1654	FairyTale, A True Story (1997)	Children's|Drama|Fantasy	87
1702	Flubber (1997)	Children's|Comedy|Fantasy	302
1750	Star Kid (1997)	Adventure|Children's|Fantasy|Sci-Fi	63
1881	Quest for Camelot (1998)	Adventure|Animation|Children's|Fantasy	68
1920	Small Soldiers (1998)	Animation|Children's|Fantasy|War	364
1967	Labyrinth (1986)	Adventure|Children's|Fantasy	554
2017	Babes in Toyland (1961)	Children's|Fantasy|Musical	162
2021	Dune (1984)	Fantasy|Sci-Fi	789
2043	Darby O'Gill and the Little People (1959)	Adventure|Children's|Fantasy	158
2086	One Magic Christmas (1985)	Drama|Fantasy	29
2087	Peter Pan (1953)	Animation|Children's|Fantasy|Musical	594
2093	Return to Oz (1985)	Adventure|Children's|Fantasy|Sci-Fi	276
2100	Splash (1984)	Comedy|Fantasy|Romance	1163
2105	Tron (1982)	Action|Adventure|Fantasy|Sci-Fi	970
2138	Watership Down (1978)	Animation|Children's|Drama|Fantasy	305
2143	Legend (1985)	Adventure|Fantasy|Romance	355
2174	Beetlejuice (1988)	Comedy|Fantasy	1495
2193	Willow (1988)	Action|Adventure|Fantasy	802
2253	Toys (1992)	Action|Comedy|Fantasy	440
2399	Santa Claus, The Movie (1985)	Adventure|Children's|Fantasy	223
2628	Star Wars, Episode I - The Phantom Menace (1999)	Action|Adventure|Fantasy|Sci-Fi	2250
2797	Big (1988)	Comedy|Fantasy	1491
2872	Excalibur (1981)	Action|Drama|Fantasy|Romance	742
2968	Time Bandits (1981)	Adventure|Fantasy|Sci-Fi	1010
3393	Date with an Angel (1987)	Comedy|Fantasy	51
3438	Teenage Mutant Ninja Turtles (1990)	Action|Children's|Fantasy	534
3439	Teenage Mutant Ninja Turtles II, The Secret of the Ooze (1991)	Action|Children's|Fantasy	251
3440	Teenage Mutant Ninja Turtles III (1993)	Action|Children's|Fantasy	188
3466	Heart and Souls (1993)	Comedy|Fantasy	219
3479	Ladyhawke (1985)	Adventure|Fantasy|Romance	542
3489	Hook (1991)	Adventure|Fantasy	722
3877	Supergirl (1984)	Action|Adventure|Fantasy	182
3889	Highlander, Endgame (2000)	Action|Adventure|Fantasy	135

How to Create and Distribute B_i (Synthetic Data)

- 100 synthetic data (data ID 00-99) are created from the original data A using PrivBayes.
  - PrivBayes https://github.com/DataResponsibly/DataSynthesizer/blob/master/DataSynthesizer/lib/PrivBayes.py
- Disclose the hash value (SHA256) of each synthetic data with the data ID.
- Each team chooses three data IDs of their choice.
  - In the case of duplicates, the order of submission will be the earliest first and the remaining teams will change to the free data ID immediately afterwards (99 followed by 00).
- If three data IDs are determined for all teams without duplication, the organizer distributes the three synthetic data corresponding to the data IDs to each team as distribution data 1, 2 and 3.
- Each team checks the integrity of the distribution data 1, 2, 3 from the hash values if necessary.
- Each team freely selects one data from the distributed data 1, 2 and 3 that is easy to anonymize, designates it as B_i and submits the data ID of B_i together with the anonymized data in the anonymization phase (The data ID will be disclosed after the anonymization phase has started.).

[Anonymization Phase] Processing of Anonymizer i

1. Extract subset data $B_i^{(1)}$-$B_i^{(10)}$ of the following 10 patterns from the distribution data B_i.
   - Basic Attributes (BAs) : Gender, Age, Occupation, ZIP-code
   - $B_i^{(1)}$-$B_i^{(10)}$ will be distributed as csv files by the organizer.

   1. BAs and "Action" (260, 653, 1525, 2105, 2193, 2253, 2628, 2872, 3438, 3439, 3440, 3877, 3889)
   2. BAs and "Adventure" (2, 56, 260, 653, 673, 1009, 1073, 1525, 1750, 1881, 1967, 2043, 2093, 2105, 2143, 2193, 2399, 2628, 2968, 3479, 3489, 3877, 3889)
   3. BAs and "Animation" (673, 1881, 1920, 2087, 2138)
   4. BAs and "Children's" (2, 56, 673, 810, 885, 1009, 1073, 1097, 1525, 1654, 1702, 1750, 1881, 1920, 1967, 2017, 2043, 2087, 2093, 2138, 2399, 3438, 3439, 3440)
   5. BAs and "Comedy" (673, 810, 1073, 1126, 1702, 2100, 2174, 2253, 2797, 3393, 3466)
   6. BAs and "Drama" (247, 885, 1097, 1654, 2086, 2138, 2872)
   7. BAs and "Romance" (247, 2100, 2143, 2872, 3479)
   8. BAs and "Sci-Fi" (260, 1097, 1750, 2021, 2093, 2105, 2628, 2968)
   9. BAs and "Musical" and "Thriller" and "War" (247, 1920, 2017, 2087)
   10. BAs and View Top 10 films (260, 1097, 2628, 2174, 2797, 1073, 2100, 2968, 2105, 2193)

2. For each of the above $B_i^{(1)}$-$B_i^{(10)}$, the processing is freely carried out and submitted as anonymized data $C_i^{(1)}$-$C_i^{(10)}$.
   - Each value may be freely changed within the value range, but not to values outside the value range (e.g. changing age to 10-year increments).

[Anonymization Phase] Utility and Sample Anonymity

- Anonymizer i creates anonymized data $C_i^{(1)}$-$C_i^{(10)}$ for $B_i^{(1)}$-$B_i^{(10)}$ such that the following "utility" and "sample anonymity" scores are as high as possible.
  - As the anonymity score cannot be calculated until the end of the attack phase, the sample anonymity will be introduced instead.
- **Utility Score** : MAE (Mean Absolute Error) of all cross-tabulations obtained from $B_i^{(1)}$-$B_i^{(10)}$, $C_i^{(1)}$-$C_i^{(10)}$, subtracting the worst value from 1 and multiplying by 100 (0 to 100 points).
- **Sample Anonymity Score** : The attack success rate of the sample attack code described on page 18, subtracted from 1 and multiplied by 100 (0 to 100 points).
  - Sample anonymity scores will be disclosed during the anonymization phase.

Crosstabulation table for Gender & Film 260 in $B_i^{(1)}$, where $a_{*,*}$ is the frequency.

	0	1	2	3	4	5
F	$a_{F,0}$	$a_{F,1}$	$a_{F,2}$	$a_{F,3}$	$a_{F,4}$	$a_{F,5}$
M	$a_{M,0}$	$a_{M,1}$	$a_{M,2}$	$a_{M,3}$	$a_{M,4}$	$a_{M,5}$

Crosstabulation table for Gender & Film 260 in $C_i^{(1)}$, where $b_{*,*}$ is the frequency.

	0	1	2	3	4	5
F	$b_{F,0}$	$b_{F,1}$	$b_{F,2}$	$b_{F,3}$	$b_{F,4}$	$b_{F,5}$
M	$b_{M,0}$	$b_{M,1}$	$b_{M,2}$	$b_{M,3}$	$b_{M,4}$	$b_{M,5}$

$$MAE_{(1),Gender,260} = \sum_{i=0}^{5} (|a_{F,i} - b_{F,i}| + |a_{M,i} - b_{M,i}|)$$

* The value of MAE will be normalized from 0 to 1 in this competition.

[Attack Phase] Processing of the Organizer

- Randomly select 50 records from each team's distribution data B_i.
- Separate User ID & BAs (Gender, Age, Occupation, ZIP-code) and the ratings for 46 films and randomly shuffle all records in the ratings data.
- For each record of the ratings data, one place is selected at random and painted black.
- A set of anonymized data $C_i^{(1)}$-$C_i^{(10)}$ for each team and the User ID & BAs and processed (random shuffling + black filled) ratings data are used as the attack data D_i and sent to attacker j.

Randomly selected 50 records from B_i.

User ID & BAs | Ratings data

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	User ID	Gender	Age	Occupatic	ZIP-code	2	56	247	260	653	673	810	885
2	0	M	1	0	296	0	3	4	5	1	5	4	5
3	1	M	18	19	390	3	3	5	5	1	0	4	0
4	2	M	25	15	27	3	0	4	5	0	0	1	2
5	3	F	1	2	316	4	3	1	5	5	0	0	5
6	4	M	45	9	725	4	1	0	1	5	4	0	0
7	5	F	18	8	968	4	2	3	1	3	1	2	1
8	6	M	50	9	45	2	4	4	3	2	0	2	0
9	7	M	50	14	517	2	3	3	4	0	2	0	4
10	8	M	18	14	525	2	1	5	3	4	1	0	4
11	9	M	18	14	530	0	0	1	2	4	3	0	5
12	10	M	25	10	695	2	1	4	2	0	3	4	3

User ID & BAs

	A	B	C	D	E
1	User ID	Gender	Age	Occupatic	ZIP-code
2	0	M	1	0	296
3	1	M	18	19	390
4	2	M	25	15	27
5	3	F	1	2	316
6	4	M	45	9	725
7	5	F	18	8	968
8	6	M	50	9	45
9	7	M	50	14	517
10	8	M	18	14	525
11	9	M	18	14	530
12	10	M	25	10	695

?

Rating data processed by random shuffling and black paining.

Processed ratings data

2	56	247	260	653	673	810	885
2	4	■	3	2	0	2	0
4	3	1	5	5	■	0	5
3	3	5	■	1	0	4	0
2	1	5	3	4	1	0	■
0	3	4	5	■	5	4	5
0	0	■	2	4	3	0	5
4	■	3	1	3	1	2	1
■	3	3	4	0	2	0	4
3	0	4	5	0	0	■	2
4	1	0	1	■	4	0	0

[Attack Phase] Processing of Attacker j

- Identification Attack : Guess the number of randomly shuffled records (0-50 points).
- DB Reconstruction Attack : Restore the values of 50 blacked-out areas (0-50 points).
- As attack result data E_{ij} for Anonymizer i, submit a file with 50 rows and 2 columns.
  - Can be submitted up to three times (i.e. can be attacked three times) * Any of the three attack results are chosen at the end for final submission.
  - In column 1, line k, estimate and fill in how many lines of D_i's ratings data (the first is a header line with line 0) correspond to how many lines of D_i's BAs (i.e. which user's ratings data is in line k).
  - In row k of column 2, estimate and enter the value of the blacked-out part of the k-th row of the ratings data for D_i (the first row is 0 and is the header row).

Randomly selected 50 records from B_i.

User ID & BAs

Ratings data

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	User ID	Gender	Age	Occupatic	ZIP-code	2	56	247	260	653	673	810	885
2	0	M	1	0	296	0	3	4	5	1	5	4	5
3	1	M	18	19	390	3	3	5	5	1	0	4	0
4	2	M	25	15	27	3	0	4	5	0	0	1	2
5	3	F	1	2	316	4	3	1	5	5	0	0	5
6	4	M	45	9	725	4	1	0	1	5	4	0	0
7	5	F	18	8	968	4	2	3	1	3	1	2	1
8	6	M	50	9	45	2	4	4	3	2	0	2	0
9	7	M	50	14	517	2	3	3	4	0	2	0	4
10	8	M	18	14	525	2	1	5	3	4	1	0	4
11	9	M	18	14	530	0	0	1	2	4	3	0	5
12	10	M	25	10	695	2	1	4	2	0	3	4	3

User ID & BAs

	A	B	C	D	E
1	User ID	Gender	Age	Occupatic	ZIP-code
2	0	M	1	0	296
3	1	M	18	19	390
4	2	M	25	15	27
5	3	F	1	2	316
6	4	M	45	9	725
7	5	F	18	8	968
8	6	M	50	9	45
9	7	M	50	14	517
10	8	M	18	14	525
11	9	M	18	14	530
12	10	M	25	10	695

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Rating data processed by random shuffling and black paining.

Processed ratings data

2	56	247	260	653	673	810	885
2	4	■	3	2	0	2	0
4	3	1	5	5	■	0	5
3	3	5	■	1	0	4	0
2	1	5	3	4	1	0	■
0	3	4	5	■	5	4	5
0	0	■	2	4	3	0	5
4	■	3	1	3	1	2	1
■	3	3	4	0	2	0	4
3	0	4	5	0	0	■	2
4	1	0	1	■	4	0	0

[Attack Phase] Score

- **Anonymity Score** : 100 – {Highest score of another team's attack (identification + DB reconstruction)} (0-100 points)
- **Overall Score** : Anonymity score + Utility score (0-200 points)
- **Attack Score** : Value of added points for attacks against the top five teams in the overall score (0-500 points)
  - Your team's attack score is the highest score by another team attacking your team.

(The following are reminders.)

- Identification Attack : Guess the number of randomly shuffled records (0-50 points).
- DB Reconstruction Attack : Restore the values of 50 blacked-out areas (0-50 points).
- The scores determined in the anonymization phase :
  - Utility Score : MAE (Mean Absolute Error) of all cross-tabulations obtained from $B_i^{(1)}$-$B_i^{(10)}$, $C_i^{(1)}$-$C_i^{(10)}$, subtracting the worst value from 1 and multiplying by 100 (0 to 100 points).
  - Sample Anonymity Score : The attack success rate of the sample attack code described on page 18, subtracted from 1 and multiplied by 100 (0 to 100 points).
    - Sample anonymity scores will be disclosed during the anonymization phase.

Awards

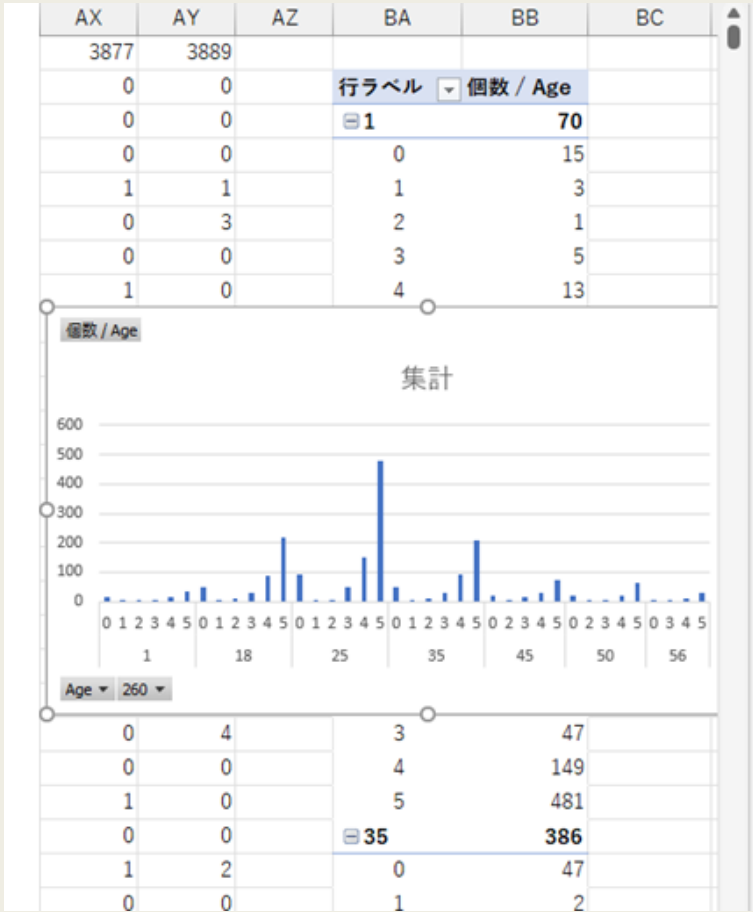
- 1st to 3rd place awards
  - Anonymity score + Utility score
  - The number of places awarded may vary slightly depending on the number of participating teams.
- Best attack award
  - Awarded to the team with the highest attack score.
- Best presentation award
  - Awarded to the team with the best presentation at the iPWS Cup 2024 session on 20th September.
- Best data scientist award
  - Awarded to the team that actually proposes the most useful analysis method using your anonymized data.
  - Overall assessment of the originality and practicality of the analysis method and the utility of the analysis using anonymized data.
  - It is OK if you prepare before the presentation on the day of the event; it is optional whether you present or not.
- Gifts
  - Certificate : all the above-mentioned award-winning teams.
  - Secondary prize (something related to Kyoto) : 1st to 3rd place, best attack, best presentation, and best scientist teams.
  - Prize money (Visa Gift Card totaling 100,000 yen) *1st to 3rd place and best attack teams.

Sample Data Image

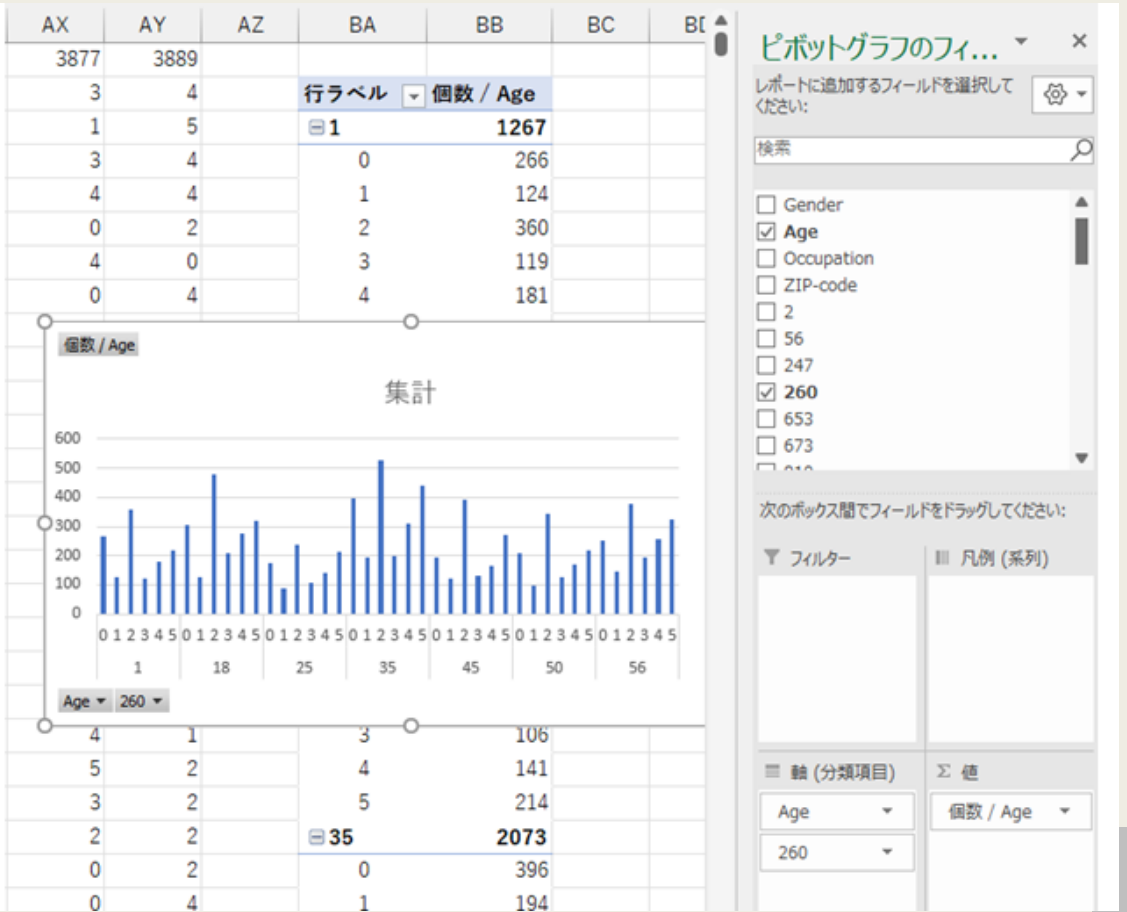
	A	B	C	D	E	F	G	H	I	J
1	Name	Gender	Age	Occupatic	ZIP-code	2	56	247	260	653
2	Waylan Kirton	M	25	8	794	0	3	4	3	5
3	Jamal Seamon	M	50	8	322	0	4	0	3	2
4	Garvy Abyss	M	35	8	975	3	1	3	2	3
5	Arline Morales	F	1	9	140	4	0	5	4	5
6	Babbie Lorroway	F	1	3	942	1	2	1	2	0
7	Corissa Parham	F	56	11	180	0	3	1	0	4

- sampleBi.csv
  - Synthetic data with 10,001 rows (including the header row) and 51 columns generated from A.

Histogram of the crosstabulation table of "Age" and "Film 260" (Star Wars Episode IV) in A.



Histogram of the crosstabulation table of "Age" and "Film 260" (Star Wars Episode IV) in sampleB$_i$.



Sample Codes (Python)

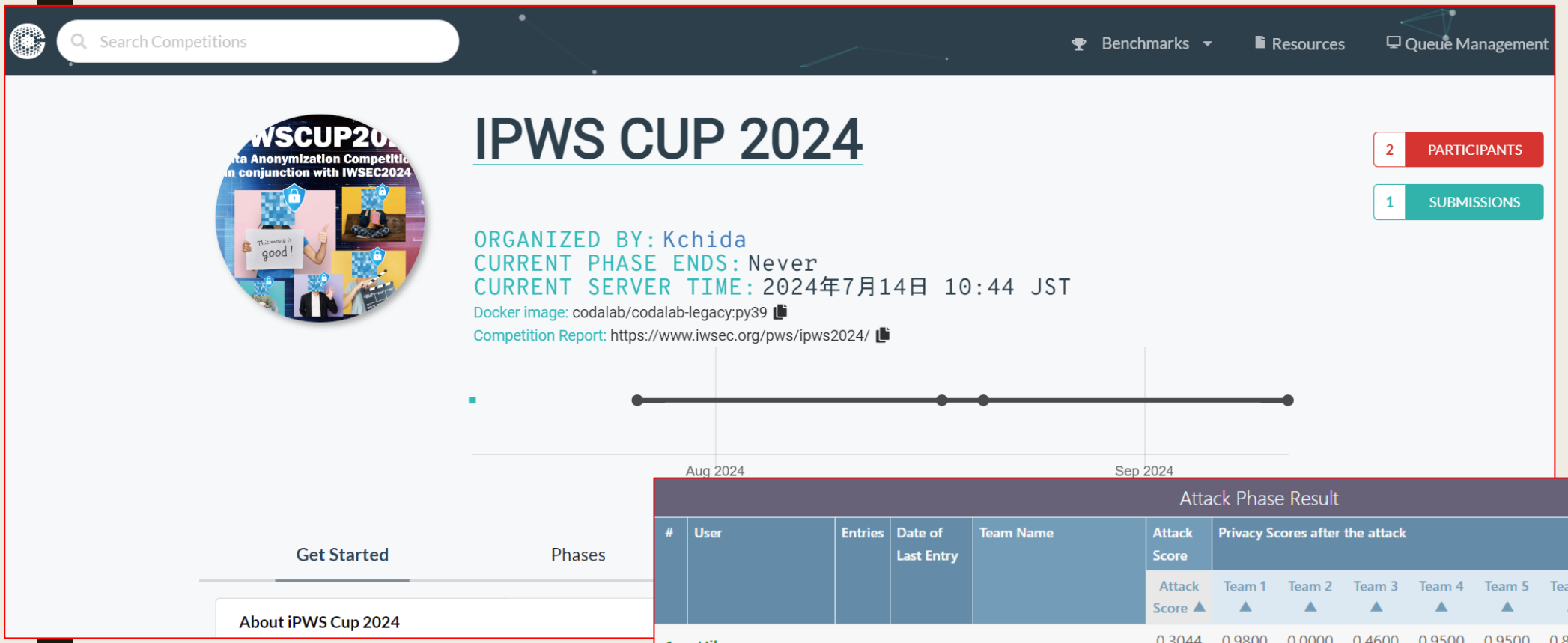
- Anonymization
  - Random shuffling (sampleRandomShuffle.py)
    - Read a csv file and randomly replace the order of records (rows).
    - However, the first line (header line) is not replaced.
  - Randomization (samleRandomization.py)
    - Load a csv file, specify the attributes and the number of changes n, randomly select n data in the specified columns and randomize each of them.
    - Ex. If attribute="A", change numbers=100, randomly select 100 elements from the column A and randomly replace them.
- Attack
  - Identification attack (sampleIdentificationAttack.py)
    - Read 50 records of User ID & BAs, 50 ratings records and $C_i^{(1)}$-$C_i^{(10)}$, connect 50 ratings records one by one for each record of User ID & BAs, calculate the Hamming distance to each record of $C_i^{(1)}$-$C_i^{(10)}$. The ratings record number with the smallest sum of the minimum Hamming distances of $C_i^{(1)}$-$C_i^{(10)}$ is estimated as the correct answer and output.
    - If the minimum sum is more than one, one is randomly selected for output.
  - DB reconstruction attack (sampleDBReconstructionAttack.py)
    - Output the data of the $C_i^{(1)}$-$C_i^{(10)}$ records for which the sum of the minimum Hamming distances for $C_i^{(1)}$-$C_i^{(10)}$ is the smallest, as calculated in sampleIdentificationAttack.py.
    - If multiple data exist, select the mode value; if multiple mode values exist, select one at random for output.

Administrative codes (also available to participating teams)

- Score calculation
  - Utility score (utilityScore.py)
    - Input B_i and $C_i^{(1)}$-$C_i^{(10)}$, calculate MAE of all cross-tabulations and use the worst value w (0-1) to calculate and output utility score $S_{\mathrm{util},i} = (1 - w) \times 100$.
  - Attack score (attackScore.py)
    - Input attack result data E_{ij} and correct answer data X_i and output the number of matches.
      - E_{ij} and X_i have 50 rows and 2 columns.
  - Sample anonymity score (sampleAnonymityScore.py)
    - Input attack data D_i and correct data X_i, run sampleIdenticationAttack.py and sampleDBReconstructionAttack.py to obtain the attack result data E_{ij}, and use the output t (0-100) of attackScore.py to calculate the anonymity score $S_{\mathrm{anon},i} = 100 - t$.
- Checker
  - C_i (checkCi.py)
    - Check for correct format of anonymized data C_i.
    - Checkers for distribution data B_i, attack data D_i, attack result data E_{ij} and correct answer data X_i will be created.
  - Hash value generator (genHash.py)

How to Participate

- See "How to participate in the iPWS Cup 2024" on the iPWS Cup 2024 HP.
  - https://www.iwsec.org/pws/2024/cup24.html
- Use the competition platform "CodaBench".

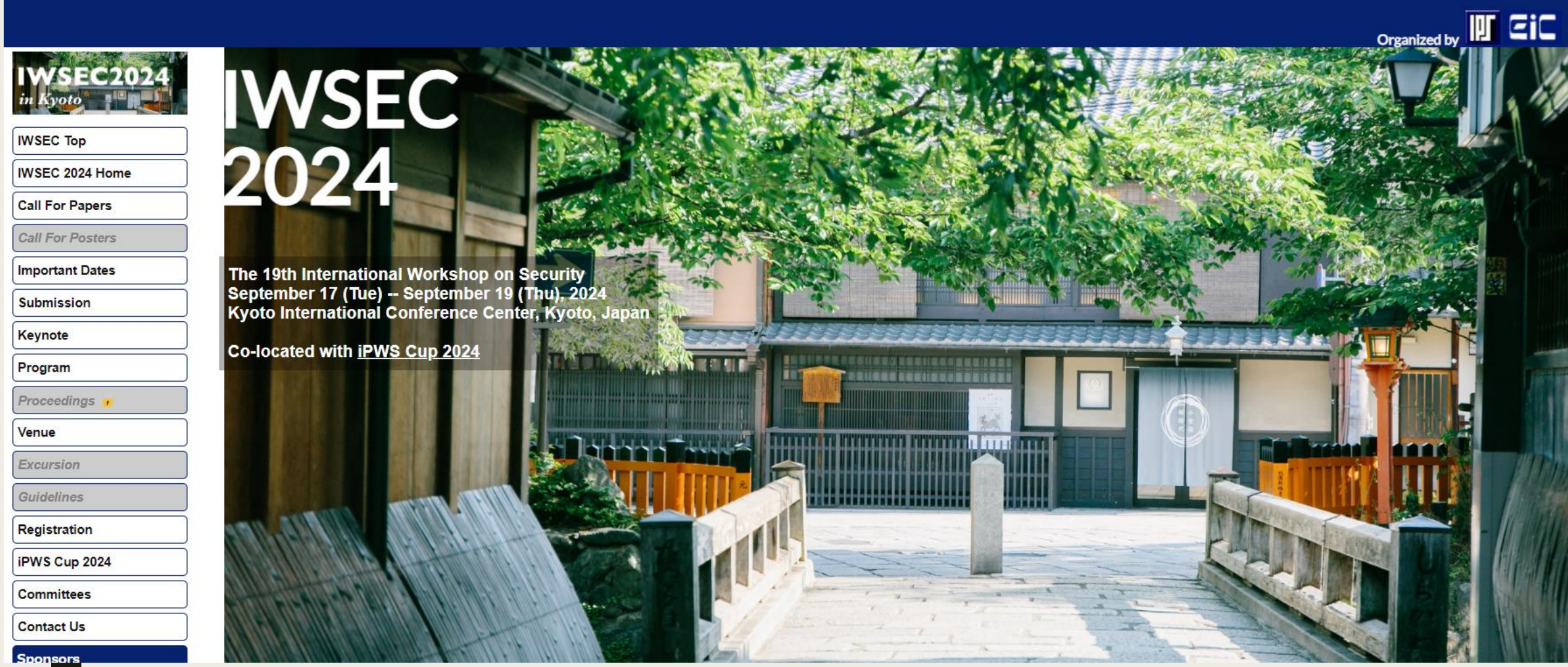


Attack Phase Result

#	User	Entries	Date of Last Entry	Team Name	Attack Score	Privacy Scores after the attack								
					Attack Score	Team 1	Team 2	Team 3	Team 4	Team 5	Team 6	Team 7	Team 8	Team 9	Team 10
1	Hikaru	13	08/21/23	08: THREE	0.3044 (1)	0.9800 (1)	0.0000 (1)	0.4600 (1)	0.9500 (1)	0.9500 (1)	0.8667 (2)	0.8833 (4)	- (9)	0.4100 (1)	0.7600 (2)
2	kchida	11	08/17/23	04: Gunmataro116luxuary	0.2911 (2)	0.9800 (1)	0.0267 (3)	0.4667 (2)	- (9)	0.9533 (2)	0.8433 (1)	0.8833 (4)	0.8900 (1)	0.5533 (6)	0.7833 (4)

A screen shot of iPWS Cup 2023 (Attack phase result)

See you in Kyoto, Japan!



https://www.iwsec.org/2024/