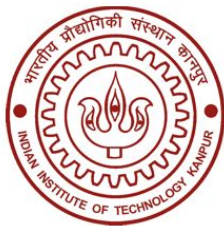


TABPERT: An Effective Platform for Tabular Perturbation

<https://tabpert.github.io/>

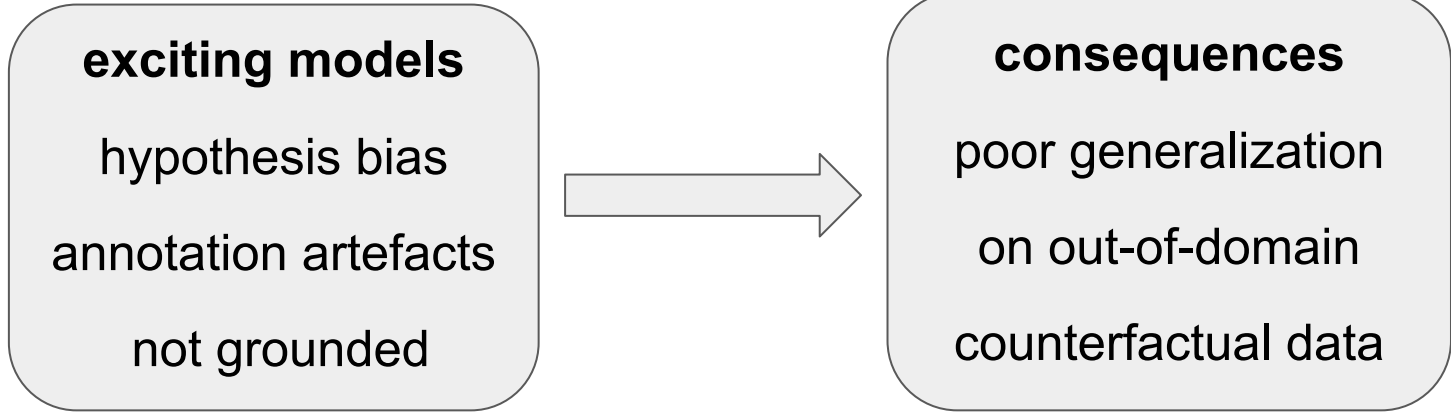
Nupur Jain¹, Vivek Gupta², Anshul Rai¹, Gaurav Kumar¹

¹IIT Kanpur; ²University of Utah



EMNLP 2021
(Demo Track)

Motivation



The right prediction does not always imply reasoning!

Evaluation on Challenging **Adversarial** Datasets

Challenges Tabular Adversarial Data Annotation

1. High **Diversity** + **Constraint** requirement → **Manual** Annotation
2. Current tools (spreadsheets) are **inadequate for Tabular data**
3. **Inefficient** process **not streamlined** - usability and utility issues
4. No insight on the **effectiveness** of the **augmentation techniques**

TabPert is specifically built to tackle these problems

Case Study: Tabular Inference Task (InfoTabS)

The **tabular natural language inference** problem is **similar** to **standard NLI**

But here, the **premises are tabular data**

Task: to decide whether given hypothesis is **true** (entailment), **false** (contradiction) or **undetermined** (neutral) given a premise table

Check out InfoTabs (Gupta et al., 2020)
<https://infotabs.github.io>

Coca-Cola with Lime/Diet Coke with Citrus Zest	
Type	Lime flavoured, citrus flavoured Cola-Cola
Manufacturer	The Coca-Cola Company
Country of origin	United States, United Kingdom
Introduced	2005, 2007
Variants	Diet Coke with Lime Diet Coke with Citrus Zest
Related products	Coca-Cola with Lemon

- H1: Coca-Cola with Lime/Diet Coke with Citrus Zest was introduced more than once.
- H2: Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the USA.
- H3: Coca-Cola with Lime/Diet Coke with Citrus Zest was a best-seller in the UK.

In this example from the InfoTabS dataset (Gupta et al., 2020),

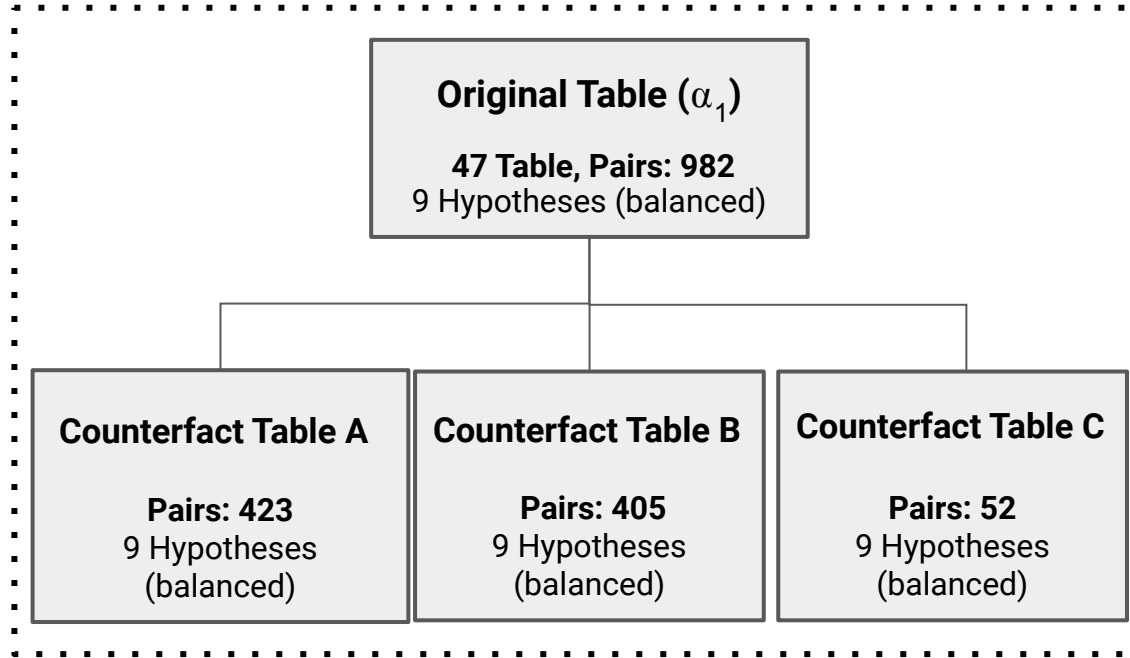
H1: entailment ; **H2: contradictory** ; **H3: neutral**

Annotation Procedure

We augment this dataset as a two step procedure

Automated Stage: Shuffle table values to create 3 new counterfactual tables (A,B,C)

Human Intervention: Fix logical discrepancies / constraints in the table values and modify the related hypotheses accordingly



Automated stage: via value shuffling

It is randomly decided that the value *“The Coca-Cola Company”* is to be replaced.

The new value can come from another table in the :

Set: α_1 Test Set

Table Category: Drinks

Key Category (Manufacturer): Company Name

Table Number: T733

Coca-Cola with Lime/Diet Coke with Citrus Zest	
Type	Lime flavoured, citrus flavoured Cola-Cola
Manufacturer	The Coca-Cola Company
Country of origin	United States United Kingdom
Introduced	2005 2007
Variants	Diet Coke with Lime Diet Coke with Citrus Zest
Related products	Coca-Cola with Lemon

Automated stage: via value shuffling

It is randomly decided that the value “*The Coca-Cola Company*” is to be replaced.

The new value can come from another table in the :

The α_1 Test Set			
The Training Set			

Set: α_1 Test Set

Table Category: Drinks

Key Category (Manufacturer): Company Name

Table Number: T733

Coca-Cola with Lime/Diet Coke with Citrus Zest	
Type	Lime flavoured, citrus flavoured Cola-Cola
Manufacturer	The Coca-Cola Company
Country of origin	United States United Kingdom
Introduced	2005 2007
Variants	Diet Coke with Lime Diet Coke with Citrus Zest
Related products	Coca-Cola with Lemon

Automated stage: via value shuffling

It is randomly decided that the value “*The Coca-Cola Company*” is to be replaced.

The new value can come from another table in the :

The α_1 Test Set	Table category <i>Drinks</i>		
The Training Set	Some other table category (e.g. <i>People</i>)		

Set: α_1 Test Set

Table Category: Drinks

Key Category (Manufacturer): Company Name

Table Number: T733

Coca-Cola with Lime/Diet Coke with Citrus Zest	
Type	Lime flavoured, citrus flavoured Cola-Cola
Manufacturer	The Coca-Cola Company
Country of origin	United States United Kingdom
Introduced	2005 2007
Variants	Diet Coke with Lime Diet Coke with Citrus Zest
Related products	Coca-Cola with Lemon

Automated stage: via value shuffling

It is randomly decided that the value **“The Coca-Cola Company”** is to be replaced.

The new value can come from another table in the :

The α_1 Test Set	Table category <i>Drinks</i>	The key <i>Manufacturer</i>	
The Training Set	Some other table category (e.g. <i>People</i>)	A different key of category <i>Company Name</i> (e.g. <i>Producer</i>)	

Set: α_1 Test Set

Table Category: Drinks

Key Category (Manufacturer): Company Name

Table Number: T733

Coca-Cola with Lime/Diet Coke with Citrus Zest	
Type	Lime flavoured, citrus flavoured Cola-Cola
Manufacturer	The Coca-Cola Company
Country of origin	United States United Kingdom
Introduced	2005 2007
Variants	Diet Coke with Lime Diet Coke with Citrus Zest
Related products	Coca-Cola with Lemon

Automated stage: via value shuffling

It is randomly decided that the value *“The Coca-Cola Company”* is to be replaced.

The new value can come from a table in the :

The α_1 Test Set	Table category <i>Drinks</i>	The key <i>Manufacturer</i>	Within table <i>T733</i>
The Training Set	Some other table category (e.g. <i>People</i>)	A different key of category <i>Company Name</i> (e.g. <i>Producer</i>)	A different table

Set: α_1 Test Set

Table Category: Drinks

Key Category (Manufacturer): Company Name

Table Number: T733

Coca-Cola with Lime/Diet Coke with Citrus Zest	
Type	Lime flavoured, citrus flavoured Cola-Cola
Manufacturer	The Coca-Cola Company
Country of origin	United States United Kingdom
Introduced	2005 2007
Variants	Diet Coke with Lime Diet Coke with Citrus Zest
Related products	Coca-Cola with Lemon

Automatic Shuffling: Table Value Metadata

Store the source of the shuffling as metadata

- Can be later used for any rollback operation
- Analyse which shuffled approach is effective

Set: α_1 Test Set
Table Category: Drinks
Key Category (Manufacturer): Company Name
Table Number: T733

Coca-Cola with Lime/Diet Coke with Citrus Zest	
Type	Lime flavoured, citrus flavoured Cola-Cola
Manufacturer	The Coca-Cola Company
Country of origin	United States United Kingdom
Introduced	2005 2007
Variants	Diet Coke with Lime Diet Coke with Citrus Zest
Related products	Coca-Cola with Lemon

Automatic Shuffling: Table Value Metadata

Store the source of the shuffling as metadata

→ Can be later used for any rollback operation

→ Analyse which shuffled approach is effective

Bit	Location	Same	Different
1	Dataset	0	1
2	Category	0	1
3	Table	0	1
4	Key	0	1

Metadata : 0110 means replaced shuffle value

the α_1 Test Set, a different table category, and a different table with the same key (Manufacturer).

Atari. Inc.: α_1 set, Games,, T1241, Manufacturer

Set: α_1 Test Set

Table Category: Drinks

Key Category (Manufacturer): Company Name

Table Number: T733

Coca-Cola with Lime/Diet Coke with Citrus Zest	
Type	Lime flavoured, citrus flavoured Cola-Cola
Manufacturer	Atari. Inc.
Country of origin	United States United Kingdom
Introduced	2005 2007
Variants	Diet Coke with Lime Diet Coke with Citrus Zest
Related products	Coca-Cola with Lemon

Human Intervention

Consider the table on the right.

→ It is unique - values are difficult to 'shuffle'
(dataset is diverse)

e.g. Keys: Type, Knowledge/ skill tested,
Offered, Purpose are difficult to find in other
tables

National Eligibility cum Entrance Test (Undergraduate)	
Acronym	NEET (UG)
Type	Pen and paper based
Developer / administrator	Central Board of Secondary Education (2013-2018) National Testing Agency (From 2019)
Knowledge / skills tested	Biology, Chemistry and Physics
Purpose	Admission to undergraduate MBBS and BDS courses in government and private colleges
Year started	2013. Formerly AIPMT
Duration	3 hours
Score / grade range	-180 to +720
Offered	Once a year
Restrictions on attempts	Maximum nine attempts in successive years (unreserved category) Maximum 14 attempts in successive years (reserved category)

Human Intervention

Consider the table on the right.

→ It is unique - values are difficult to 'shuffle' (dataset is diverse)

e.g. Keys: Type, Knowledge/ skill tested, Offered, Purpose are difficult to find in other tables

→ There could be logical discrepancies, e.g. years corresponding to developers could overlap or be before 'Year Started' (inconsistencies must be corrected)

e.g. Year started cannot be before 2013

National Eligibility cum Entrance Test (Undergraduate)	
Acronym	NEET (UG)
Type	Pen and paper based
Developer / administrator	Central Board of Secondary Education (2013-2018) National Testing Agency (From 2019)
Knowledge / skills tested	Biology, Chemistry and Physics
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Duration	3 hours
Score / grade range	-180 to +720
Offered	Once a year
Restrictions on attempts	Maximum nine attempts in successive years (unreserved category) Maximum 14 attempts in successive years (reserved category)

Human Intervention

Tables and hypotheses are modified concurrently.

Table values can be :

→ Insert, Deleted, Edited

→ Drag/Copy/Cut from table

1. Original → Counterfactual
2. Counterfactual → Counterfactual

Coca-Cola with Lime/Diet Coke with Citrus Zest

Add a new value here! (write text, then drag and drop)

Drag and drop a value here to delete it

Original Table	Table A	Table B	Table C
Country of origin United States , United Kingdom	Country of origin / Salzburg, Austria	Country of origin / Jakarta	Country of origin / Poland
Introduced 2005 , 2007	Introduced / 2003	Introduced / 2005 , 2007	Introduced / Southern California, 2008
Manufacturer The Coca-Cola Company	Manufacturer / Hood River Distillers	Manufacturer / Atari, Inc.	Manufacturer / The Coca-Cola Company
Related products Coca-Cola with Lemon	Related products / ESB, London Pride, Honey Dew	Related products / Britvic 55	Related products / Kola Real, Crush Naranja, Concordia, Perú Cola
Type Lime flavoured, citrus flavoured cola Cola	Type / Diet Cola	Type / Lime flavoured, citrus flavoured cola Cola	Type / Vodka
Variants Diet Coke with Lime Diet Coke with Citrus Zest	Variants / grape Kas Fruit	Variants / Bombardier CRJ700 series Diet Raspberry Coke	Variants / Diet Coke with Lime Diet Coke with Citrus Zest

Original Hypotheses
N Coca-Cola Lime was accidentally created when a manager mixed Lime,

Table A Hypotheses
C Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United

Table B Hypotheses
C Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United

Table C Hypotheses
C Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United

Human Intervention

Tables and hypotheses are modified concurrently.

Table values can be :

- Insert, Deleted, Edited
- Drag/Copy/Cut from table

1. Original → Counterfactual
2. Counterfactual → Counterfactual

Similarly,

Table sections can be →
Added, Deleted, Edited

Main View **Table A** **Table B** **Table C**

Add a new value here! (write text, then drag and drop)

Drag and drop a value here to delete it

Original Table	Table A	Table B	Table C
Country of origin United States , United Kingdom	Country of origin / Salzburg, Austria	Country of origin / Jakarta	Country of origin / Poland
Introduced 2005 , 2007	Introduced / 2003	Introduced / 2005 , 2007	Introduced / Southern California, 2008
Manufacturer The Coca-Cola Company	Manufacturer / Hood River Distillers	Manufacturer / Atari, Inc.	Manufacturer / The Coca-Cola Company
Related products Coca-Cola with Lemon	Related products / ESB, London Pride, Honey Dew	Related products / Britvic 55	Related products / Kola Real, Crush Naranja, Concordia, Perú Cola
Type Lime flavoured, citrus flavoured cola Cola	Type / Diet Cola	Type / Lime flavoured, citrus flavoured cola Cola	Type / Vodka
Variants Diet Coke with Lime Diet Coke with Citrus Zest	Variants / grape Kas Fruit	Variants / Bombardier CRJ700 series Diet Raspberry Coke	Variants / Diet Coke with Lime Diet Coke with Citrus Zest

Original Hypotheses: N Coca-Cola Lime was accidentally created when a manager mixed Lime.

Table A Hypotheses: C+ Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United

Table B Hypotheses: C+ Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United

Table C Hypotheses: C+ Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United

Inserting a New Value

[Main View](#)
[Table A](#)
[Table B](#)
[Table C](#)

Add a new value here! (write text, then drag and drop)

Drag and drop a value here to delete it

Coca-Cola with Lime/Diet Coke with Citrus Zest

Original Table	Table A	Table B	Table C
Country of origin United States , United Kingdom	Country of origin ✓ Salzburg, Austria	Country of origin ✓ Jakarta	Country of origin ✓ Poland
Introduced 2005 , 2007	Introduced ✓ 2008	Introduced ✓ 2005 , 2007	Introduced ✓ Southern California, 2008
Manufacturer The Coca-Cola Company	Manufacturer ✓ The Coca-Cola Company Hood River Distillers	Manufacturer ✓ Atari, Inc.	Manufacturer ✓ The Coca-Cola Company
Related products Coca-Cola with Lemon	Related products ✓ ESB, London Pride, Honey Dew	Related products ✓ Britvic 55	Related products ✓ Kola Real, Crush Naranja, Concordia, Perú Cola
Type Lime flavoured, citrus flavoured cola Cola	Type ✓ Diet Cola	Type ✓ Lime flavoured, citrus flavoured cola Cola	Type ✓ Vodka
Variants Diet Coke with Lime Diet Coke with Citrus Zest	Variants ✓ grape Kas Fruit	Variants ✓ Bombardier CRJ700 series Diet Raspberry Coke	Variants ✓ Diet Coke with Lime Diet Coke with Citrus Zest

[Original Hypotheses](#)
[Table A Hypotheses](#)
[Table B Hypotheses](#)
[Table C Hypotheses](#)

Coca-Cola Lime was Coca-Cola with Lime/Diet Coca-Cola with Lime/Diet Coca-Cola with Lime/Diet

Deleting a Value

[Main View](#)
[Table A](#)
[Table B](#)
[Table C](#)

Drag and drop a value here to delete it

Citrus Zest

pineapple

Original Table	Table A	Table B	Table C
Country of origin United States , United Kingdom	Country of origin ✓ Salzburg, Austria	Country of origin ✓ Jakarta	Country of origin ✓ Poland
Introduced 2005 , 2007	Introduced ✓ 2008	Introduced ✓ 2005 , 2007	Introduced ✓ Southern California, 2008
Manufacturer The Coca-Cola Company	Manufacturer ✓ The Coca-Cola Company Hood River Distillers	Manufacturer ✓ Atari, Inc.	Manufacturer ✓ The Coca-Cola Company
Related products Coca-Cola with Lemon	Related products ✓ ESB, London Pride, Honey Dew	Related products ✓ Britvic 55	Related products ✓ Kola Real, Crush Naranja, Concordia, Perú Cola
Type Lime flavoured, citrus flavoured cola Cola	Type ✓ Diet Cola	Type ✓ Lime flavoured, citrus flavoured cola Cola	Type ✓ Vodka
Variants Diet Coke with Lime Diet Coke with Citrus Zest	Variants ✓ pineapple grape Kas Fruit	Variants ✓ Bombardier CRJ700 series Diet Raspberry Coke	Variants ✓ Diet Coke with Lime Diet Coke with Citrus Zest

[Original Hypotheses](#)
[Table A Hypotheses](#)
[Table B Hypotheses](#)
[Table C Hypotheses](#)

Coca-Cola Lime was Coca-Cola with Lime/Diet Coca-Cola with Lime/Diet Coca-Cola with Lime/Diet

Editing any Value

Main View Table A Table B Table C

Coca-Cola with Lime/Diet Coke with Citrus Zest

Add a new value here! (write text, then drag and drop) Drag and drop a value here to delete it

Original Table	Table A	Table B	Table C
Country of origin United States , United Kingdom	Country of origin ✓ Salzburg, Austria	Country of origin ✓ Jakarta	Country of origin ✓ Poland
Introduced 2005 , 2007	Introduced ✓ 2003	Introduced ✓ 2005 , 2007	Introduced ✓ Southern California, 2008
Manufacturer The Coca-Cola Company	Manufacturer ✓ Hood River Distillers	Manufacturer ✓ Atari, Inc.	Manufacturer ✓ The Coca-Cola Company
Related products Coca-Cola with Lemon	Related products ✓ ESB, London Pride, Honey Dew	Related products ✓ Britvic 55	Related products ✓ Kola Real, Crush Naranja, Concordia, Perù Cola
Type Lime flavoured, citrus flavoured cola Cola	Type ✓ Diet Cola	Type ✓ Lime flavoured, citrus flavoured cola Cola	Type ✓ Vodka
Variants Diet Coke with Lime Diet Coke with Citrus Zest	Variants ✓ grape Kas Fruit	Variants ✓ Bombardier CRJ700 series Diet Raspberry Coke	Variants ✓ Diet Coke with Lime Diet Coke with Citrus Zest

Original Hypotheses Table A Hypotheses Table B Hypotheses Table C Hypotheses

N Coca-Cola Lime was accidentally created when a manager mixed Lime.	Cv Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United +	Cv Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United +	Cv Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United +
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Drag & Drop Across Table

Main View Table A Table B Table C

Coca-Cola with Lime/Diet Coke with Citrus Zest

Add a new value here! (write text, then drag and drop) Drag and drop a value here to delete it

Original Table	Table A	Table B	Table C
Country of origin United States , United Kingdom	Country of origin ✓ Salzburg, Austria	Country of origin ✓ Jakarta	Country of origin ✓ Poland
Introduced 2005 , 2007	Introduced ✓ 2008	Introduced ✓ 2005 , 2007	Introduced ✓ Southern California, 2008
Manufacturer The Coca-Cola Company	Manufacturer ✓ Hood River Distillers	Manufacturer ✓ Atari, Inc.	Manufacturer ✓ The Coca-Cola Company
Related products Coca-Cola with Lemon	Related products ✓ ESB, London Pride, Honey Dew	Related products ✓ Britvic 55	Related products ✓ Kola Real, Crush Naranja, Concordia, Perù Cola
Type Lime flavoured, citrus flavoured cola Cola	Type ✓ Diet Cola	Type ✓ Lime flavoured, citrus flavoured cola Cola	Type ✓ Vodka
Variants Diet Coke with Lime Diet Coke with Citrus Zest	Variants ✓ grape Kas Fruit	Variants ✓ Bombardier CRJ700 series Diet Raspberry Coke	Variants ✓ Diet Coke with Lime Diet Coke with Citrus Zest

Original Hypotheses Table A Hypotheses Table B Hypotheses Table C Hypotheses

N Coca-Cola Lime was accidentally created when a manager mixed Lime.	Cv Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United +	Cv Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United +	Cv Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United +
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Editing existing Section

Main View Table A Table B Table C

Coca-Cola with Lime/Diet Coke with Citrus Zest

Add a new value here! (write text, then drag and drop) Drag and drop a value here to delete it

Original Table	Table A	Table B	Table C
Country of origin United States , United Kingdom	Country of origin Salzburg, Austria	Country of origin Jakarta	Country of origin Poland
Introduced 2005 , 2007	Introduced 2003	Introduced 2005 , 2007	Introduced Southern California, 2008
Manufacturer The Coca-Cola Company	Manufacturer Hood River Distillers	Manufacturer Atari, Inc.	Manufacturer The Coca-Cola Company
Related products Coca-Cola with Lemon	Related products ESB, London Pride, Honey Dew	Related products Britvic 55	Related products Kola Real, Crush Naranja, Concordia, Perù Cola
Type Lime flavoured, citrus flavoured cola Cola	Type Diet Cola	Type Lime flavoured, citrus flavoured cola Cola	Type Vodka
Variants Diet Coke with Lime Diet Coke with Citrus Zest	Variants grape Kas Fruit	Variants Bombardier CRJ700 series Diet Raspberry Coke	Variants Diet Coke with Lime Diet Coke with Citrus Zest

Original Hypotheses Table A Hypotheses Table B Hypotheses Table C Hypotheses

N Coca-Cola Lime was accidentally created when a manager mixed Lime,	C Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United	C Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United	C Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United
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Deleting a Section

pineapple Drag and drop a value here to delete it

Original Table	Table A	Table B	Table C
Country of origin United States , United Kingdom	Country of origin Salzburg, Austria	Country of origin Jakarta	Country of origin Poland
Introduced 2005 , 2007	Introduced 2008	Introduced 2005 , 2007	Introduced Southern California, 2008
Manufacturer The Coca-Cola Company	Manufacturer The Coca-Cola Company Hood River Distillers	Manufacturer Atari, Inc.	Manufacturer The Coca-Cola Company
Related products Coca-Cola with Lemon	Related products ESB, London Pride, Honey Dew	Related products Britvic 55	Related products Kola Real, Crush Naranja, Concordia, Perù Cola
Type Lime flavoured, citrus flavoured cola Cola	Type Diet Cola	Type Lime flavoured, citrus flavoured cola Cola	Type Vodka
Variants Diet Coke with Lime Diet Coke with Citrus Zest	Variants pineapple grape	Variants Bombardier CRJ700 series Diet Raspberry Coke	Variants Diet Coke with Lime Diet Coke with Citrus Zest

New Section Name
add new text

Inserting a New Section

Main View Table A Table B Table C

Coca-Cola with Lime/Diet Coke with Citrus Zest

pineapple Drag and drop a value here to delete it

Original Table	Table A	Table B	Table C
Country of origin United States , United Kingdom	Country of origin ✓ Salzburg, Austria	Country of origin ✓ Jakarta	Country of origin ✓ Poland
Introduced 2005 , 2007	Introduced ✓ 2008	Introduced ✓ 2005 , 2007	Introduced ✓ Southern California, 2008
Manufacturer The Coca-Cola Company	Manufacturer ✓ The Coca-Cola Company Hood River Distillers	Manufacturer ✓ Atari, Inc.	Manufacturer ✓ The Coca-Cola Company
Related products Coca-Cola with Lemon	Related products ✓ ESB, London Pride, Honey Dew	Related products ✓ Britvic 55	Related products ✓ Kola Real, Crush Naranja, Concordia, Peru Cola
Type Lime flavoured, citrus flavoured cola Cola	Type ✓ Diet Cola	Type ✓ Lime flavoured, citrus flavoured cola Cola	Type ✓ Vodka
Variants Diet Coke with Lime Diet Coke with Citrus Zest	Variants ✓ pineapple grape	Variants ✓ Bombardier CRJ700 series Diet Raspberry Coke	Variants ✓ Diet Coke with Lime Diet Coke with Citrus Zest

Original Hypotheses Table A Hypotheses Table B Hypotheses Table C Hypotheses

Coca-Cola Lime was Coca-Cola with Lime/Diet Coca-Cola with Lime/Diet Coca-Cola with Lime/Diet

NLI Focus View

Main View Table A Table B Table C

Coca-Cola with Lime/Diet Coke with Citrus Zest

pineapple Drag and drop a value here to delete it

Original Table	Table A	Table B	Table C
Country of origin United States , United Kingdom	Country of origin ✓ Salzburg, Austria	Country of origin ✓ Jakarta	Country of origin ✓ Poland
Introduced 2005 , 2007	Introduced ✓ 2008	Introduced ✓ 2005 , 2007	Introduced ✓ Southern California, 2008
Manufacturer The Coca-Cola Company	Manufacturer ✓ The Coca-Cola Company Hood River Distillers	Manufacturer ✓ Atari, Inc.	Manufacturer ✓ The Coca-Cola Company
Related products Coca-Cola with Lemon	Related products ✓ ESB, London Pride, Honey Dew	Related products ✓ Britvic 55	Related products ✓ Kola Real, Crush Naranja, Concordia, Peru Cola
Type Lime flavoured, citrus flavoured cola Cola	Variants ✓ pineapple grape	Type ✓ Lime flavoured, citrus flavoured cola Cola	Type ✓ Vodka
Variants Diet Coke with Lime Diet Coke with Citrus Zest	New Section Name ✓ add new text	Variants ✓ Bombardier CRJ700 series Diet Raspberry Coke	Variants ✓ Diet Coke with Lime Diet Coke with Citrus Zest

Original Hypotheses Table A Hypotheses Table B Hypotheses Table C Hypotheses

Coca-Cola Lime was Coca-Cola with Lime/Diet Coca-Cola with Lime/Diet Coca-Cola with Lime/Diet

Human Intervention

Tables and hypotheses are modified concurrently

→ Hypothesis Edit

→ Label Modification

	Original Hypotheses	Table A Hypotheses	Table B Hypotheses	Table C Hypotheses
N	Coca-Cola Lime was accidentally created when a manager mixed Lime, Tequila, and Coca-Cola together.	C ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United States.	C ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United States.	C ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United States.
E	Coca-Cola with Lime is a soda produced by Coca-Cola that was both produced in the UK/US.	N ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest came after Coca-Cola with Lemon.	N ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest came after Coca-Cola with Lemon.	N ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest came after Coca-Cola with Lemon.
C	Coca-Cola with Lime was introduced in Northern Ireland before being made in the U.K.	E ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest has been introduced more than once.	E ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest has been introduced more than once.	E ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest has been introduced more than once.
N	Coca-Cola with Lime/Diet Coke with Citrus Zest came after Coca-Cola with Lemon.	C ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest contained an actual wedge of lime.	C ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest contained an actual wedge of lime.	C ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest contained an actual wedge of lime.
C	Coca-Cola with Lime/Diet Coke with Citrus Zest contained an actual wedge of lime.	N ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest was a best-seller in the United Kingdom.	N ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest was a best-seller in the United Kingdom.	N ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest was a best-seller in the United Kingdom.
E	Coca-Cola with Lime/Diet Coke with Citrus Zest has been introduced more than once.	E ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest is a British-American beverage.	E ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest is a British-American beverage.	E ▾ + Coca-Cola with Lime/Diet Coke with Citrus Zest is a British-American beverage.
E	Coca-Cola with Lime/Diet Coke with Citrus Zest is a British-American beverage.	C ▾ + Coca-Cola with Lime was introduced in Northern Ireland before being made in the U.K.	C ▾ + Coca-Cola with Lime was introduced in Northern Ireland before being made in the U.K.	C ▾ + Coca-Cola with Lime was introduced in Northern Ireland before being made in the U.K.
C	Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United States.	N ▾ + Coca-Cola Lime was accidentally created when a manager mixed Lime, Tequila, and Coca-Cola together.	N ▾ + Coca-Cola Lime was accidentally created when a manager mixed Lime, Tequila, and Coca-Cola together.	N ▾ + Coca-Cola Lime was accidentally created when a manager mixed Lime, Tequila, and Coca-Cola together.
N	Coca-Cola with Lime/Diet Coke with Citrus Zest was a best-seller in the United Kingdom.	E ▾ + Coca-Cola with Lime is a soda produced by Coca-Cola that was both produced in the UK/US.	E ▾ + Coca-Cola with Lime is a soda produced by Coca-Cola that was both produced in the UK/US.	E ▾ + Coca-Cola with Lime is a soda produced by Coca-Cola that was both produced in the UK/US.

Submit

Modifying Hypotheses & Hypothesis Metadata

Tables and hypotheses are modified concurrently

→ Hypothesis Edit

→ Label Modification

meta-data is also stored:

→ *'strategy'* for annotation

→ hypothesis related table rows

The screenshot displays a data management interface with a search bar at the top containing the text 'pineapple'. Below the search bar, there are four tables: 'Original Table', 'Table A', 'Table B', and 'Table C'. Each table has a header row and several data rows. The 'Original Table' is highlighted in purple, 'Table A' in blue, 'Table B' in teal, and 'Table C' in orange. Each table has a 'Country of origin' field, an 'Introduced' field, a 'Manufacturer' field, a 'Related products' field, a 'Type' field, and a 'Variants' field. The 'Variants' field in 'Table A' contains 'pineapple' and 'grape'. Below the tables, there are four hypothesis rows, each corresponding to one of the tables. The hypothesis rows are also highlighted in the same colors as the tables. The first hypothesis row is highlighted in purple and contains the text 'Coca-Cola Lime was accidentally created when a manager mixed Lime, Tequila, and Coca-Cola together.' The other three hypothesis rows are highlighted in blue, teal, and orange respectively and contain the text 'Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United States.' There are 'Add section +' buttons below each table and hypothesis row. At the bottom right, there is a search bar with the text 'Drag and drop a value here to delete it'.

Strategy and Other Metadata

Manual stage:

Hypothesis metadata (entered by user)

- Relevant rows
- Strategies used

Table value metadata (automatic collect)

- Editing Values
- Dragging and Dropping
- Addition of New Values

The screenshot displays a data management interface with a grid of tables. At the top, there is a search bar containing 'pineapple' and a 'Drag and drop a value here to delete it' instruction. The main area is divided into four columns representing different tables: 'Original Table', 'Table A', 'Table B', and 'Table C'. Each table has several metadata fields, such as 'Country of origin', 'Introduced', 'Manufacturer', 'Related products', 'Type', and 'Variants'. Below the metadata fields, there are sections for 'Original Hypotheses', 'Table A Hypotheses', 'Table B Hypotheses', and 'Table C Hypotheses'. Each hypothesis section contains a list of hypotheses with a dropdown menu and a plus sign. The interface is dark-themed with light-colored text and buttons.

Original Table	Table A	Table B	Table C
Country of origin United States , United Kingdom	Country of origin Salzburg, Austria	Country of origin Jakarta	Country of origin Poland
Introduced 2005 , 2007	Introduced 2008	Introduced 2005 , 2007	Introduced Southern California, 2008
Manufacturer The Coca-Cola Company	Manufacturer The Coca-Cola Company Hood River Distillers	Manufacturer Atari, Inc.	Manufacturer The Coca-Cola Company
Related products Coca-Cola with Lemon	Related products ESB, London Pride, Honey Dew	Related products Britvic 55	Related products Kola Real, Crush Naranja, Concordia, Perú Cola
Type Lime flavoured, citrus flavoured cola Cola	Variants pineapple grape	Type Lime flavoured, citrus flavoured cola Cola	Type Vodka
Variants Diet Coke with Lime Diet Coke with Citrus Zest	New Section Name add new text	Variants Bombardier CRJ700 series Diet Raspberry Coke	Variants Diet Coke with Lime Diet Coke with Citrus Zest
Original Hypotheses N Coca-Cola Lime was accidentally created when a manager mixed Lime, Tequila, and Coca-Cola together	Table A Hypotheses C Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United States.	Table B Hypotheses C Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United States.	Table C Hypotheses C Coca-Cola with Lime/Diet Coke with Citrus Zest is only made in the United States.

Annotation Guideline a.k.a Strategies

Table A

$C \rightarrow E$
 $E \rightarrow C$

Change Table to
Flip Label

Table B

$C \rightarrow E$
 $E \rightarrow C$

Change Hypothesis
to Flip Label

Table C

Write new
hypotheses

$N \rightarrow N$

Add **'true'** information (**overlap**) to the hypothesis to make it
closer to entailment

Performance on Counterfactual Data

Model Type	Original	Counterfactual
Majority	33.33	33.33
Hypothesis Only	64.32	44.85
All Rows	78.91	61.26
Relevant Rows	74.11	65.85
Human	84.8	85.8

Reduction in hypothesis bias

Relevant vs Irrelevant Rows

Model uses the irrelevant rows for prediction

On counterfactual using only relevant rows benefits

Performance (accuracy %) of the InfoTabs Roberta_{Large} model on original and counterfactual annotated data

Strategy vs Performance Analysis

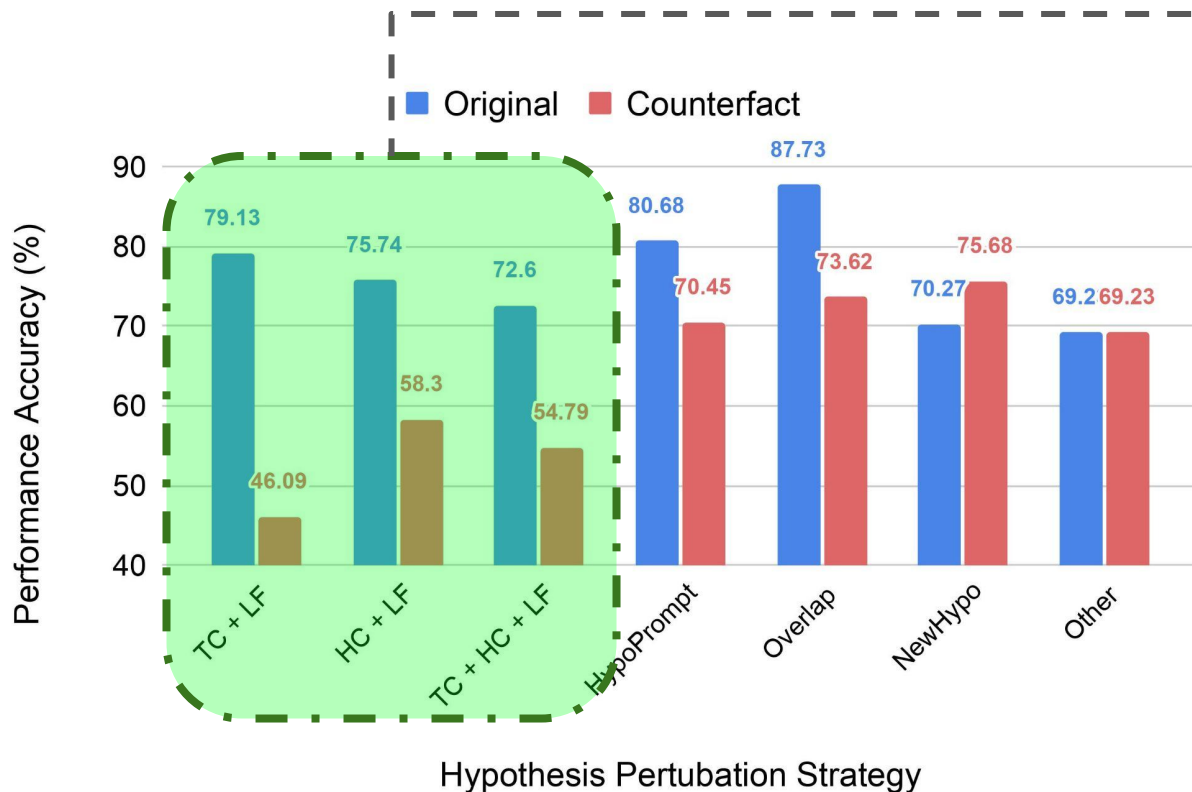
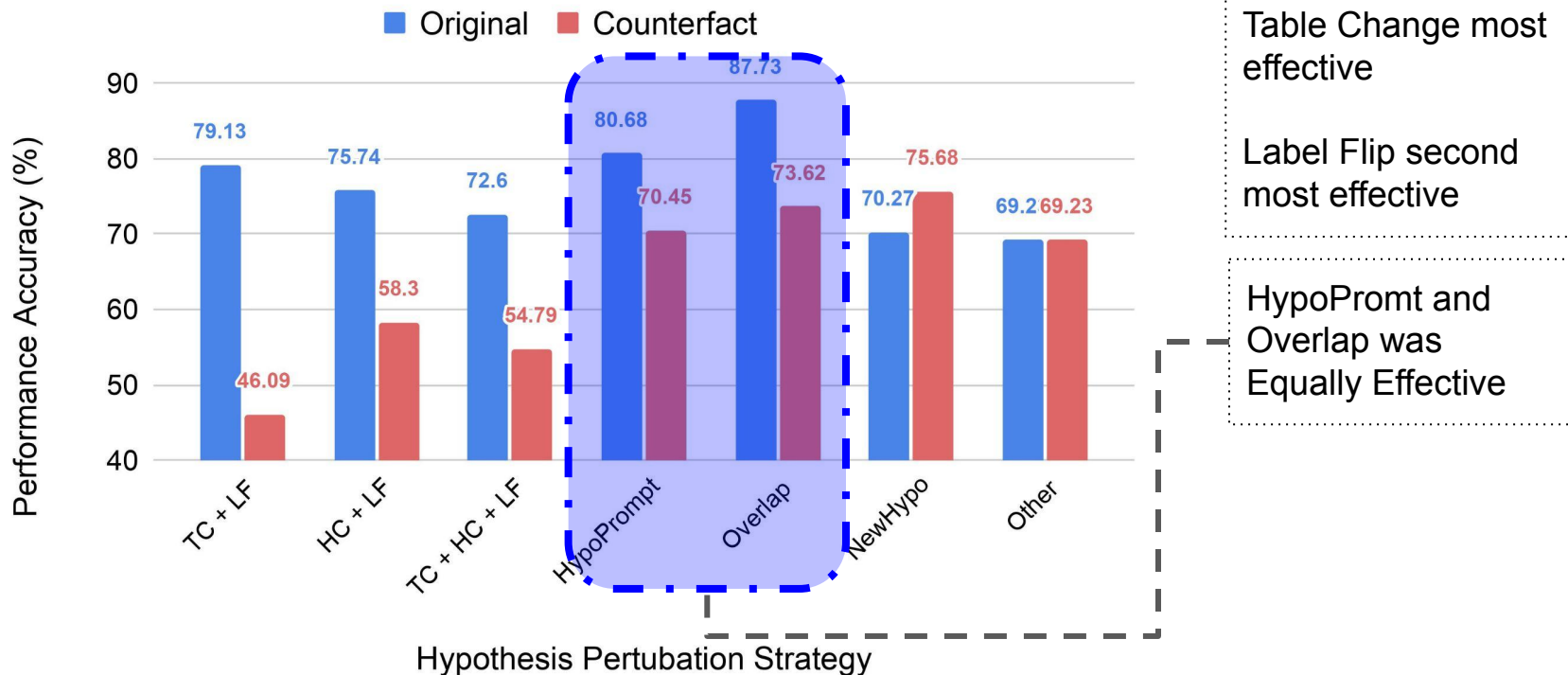


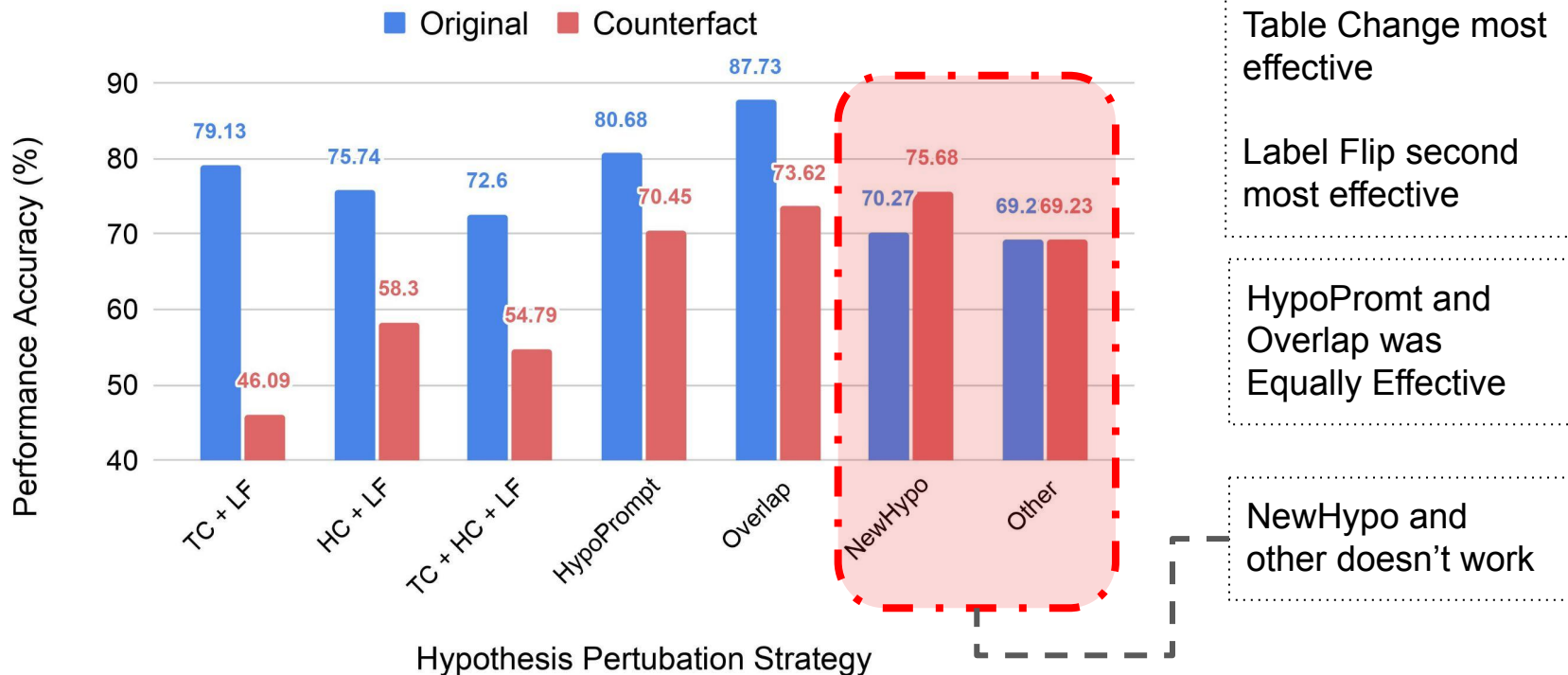
Table Change most effective

Label Flip second most effective

Strategy vs Performance Analysis



Strategy vs Performance Analysis



Utility of TabPert Platform

Efficient and
Streamlined

Table
Manipulation

Modular
+
Customisable
Code

Collect
Important
Metadata
Information

TakeAway

- **TabPert** is an **effective platform** for examining **semi-structured tabular data** and generating **counterfactual tabular perturbations**.
- **Metadata** collected can be used to **analyse data deeply** and **generate better adversarial datasets**.

Check out **TabPert**: <https://tabpert.github.io/>

Watch the **demo video** : https://www.youtube.com/watch?v=sbCH_zD53Kg