VIII. Supplementary Material

The anonymized repository's code is as follows:

https://anonymous.4open.science/r/Submission_24-DB0C/

A. Dataset: Adult; Algorithm: FOLD-SE

Negative Decision: $\leq 50K$

Features and Feature Values used:

- Feature: marital_status
  1) married_civ_spouse
  2) never_married
- Feature: relationship
  1) husband
  2) wife
  3) unmarried
- Feature: sex
  1) male
  2) female
- capital_gain: [0, 99999]
- education_num: [1, 16]
- age: [17, 90]

1) Decision Rules: We run the FOLD-SE algorithm to produce the following decision making rules:

```
label(X,'<=50K') :-
  not marital_status(X,'Married-civ-spouse'),
  capital_gain(X,N1), N1=<6849.0.
label(X,'<=50K') :-
  marital_status(X,'Married-civ-spouse'),
  capital_gain(X,N1), N1=<5013.0,
  education_num(X,N2), N2=<12.0.
```

- Accuracy: 84.5%
- Precision: 86.5%
- Recall: 94.6%

2) Causal Rules: a) FOLD-SE gives Causal rules for the 'marital_status' feature having value 'never_married':

```
marital_status(X,'Never-married'):-
  not relationship(X,'Husband'),
  not relationship(X,'Wife'),
  age(X,N1), N1=<29.0.
```

- Accuracy: 86.4%
- Precision: 89.2%
- Recall: 76.4%

b) FOLD-SE gives Causal rules for the 'marital_status' feature having value 'Married-civ-spouse':

```
marital_status(X,'Married-civ-spouse'):-
  relationship(X,'Husband').
marital_status(X,'Married-civ-spouse'):-
  relationship(X,'Wife').
```

- Accuracy: 99.1%
- Precision: 99.9%
- Recall: 98.2%

c) For values of the feature 'marital_status' that are not 'Married-civ-spouse' or 'never_married' which we shall call 'neither', a user defined rule is used

```
marital_status(X,neither):-
  not relationship(X,'Husband'),
  not relationship(X,'Wife').
```

d) FOLD-SE gives Causal rules for the 'relationship' feature having value 'husband':

```
relationship(X,'Husband'):-
  not sex(X,'Male'),age(X,N1),not(N1=<27.0).
```

- Accuracy: 82.3%
- Precision: 71.3%
- Recall: 93.2%

e) For the 'relationship' feature value of 'wife', a user defined rule is used

```
relationship(X,'Wife') :- sex(X,'Female').
```

B. Dataset: Adult; Algorithm: RIPPER

Negative Decision: $\leq 50K$

Features and Feature Values used:

- Feature: marital_status
  1) married_civ_spouse
  2) never_married
  3) divorced
- Feature: relationship
  1) husband
  2) wife
  3) own_child
  4) not_in_family
  5) unmarried
- Feature: education
  1) hs_grad
  2) some_college
- Feature: occupation
  1) farming_fishing
  2) adm_clerical
  3) machine_op_inspct
  4) other_service
- Feature: workclass
  1) never_worked
  2) private
- Feature: native_country
  1) japan
  2) united_States
- Feature: sex
  1) male
  2) female
- capital_gain: [0, 99999]
- education_num: [1, 16]
- age: [17, 90]
- hours_per_week: [1, 99]
- capital_loss: [0, 4356]