[

'manipulated',

'record',

'date',

'ssn',

'firstname',

'lastname',

'address',

'zip\_5',

'dob',

'homephone',

'fraud\_label',

'dob\_str',

'zip5\_str',

'nameDOB',

'fulladdress',

|  |  |
| --- | --- |
| Single（day since variable） | Combination（day since variable） |
| Days\_since\_per\_ssn | 'Days\_since\_per\_ssnfirstname', |
| Days\_since\_per\_fulladdress | 'Days\_since\_per\_ssnlastname', |
| Days\_since\_per\_nameDOB | 'Days\_since\_per\_ssnaddress', |
| Days\_since\_per\_homephone | 'Days\_since\_per\_ssnzip5\_str', |
|  | 'Days\_since\_per\_ssndob\_str', |
|  | 'Days\_since\_per\_ssnhomephone', |
|  | 'Days\_since\_per\_ssnnameDOB', |
|  | 'Days\_since\_per\_ssnfulladdress', |
|  | 'Days\_since\_per\_firstnamelastname', |
|  | 'Days\_since\_per\_firstnameaddress', |
|  | 'Days\_since\_per\_firstnamezip5\_str', |
|  | 'Days\_since\_per\_firstnamedob\_str', |
|  | 'Days\_since\_per\_firstnamehomephone', |
|  | 'Days\_since\_per\_firstnamenameDOB', |
|  | 'Days\_since\_per\_firstnamefulladdress', |
|  | 'Days\_since\_per\_lastnameaddress', |
|  | 'Days\_since\_per\_lastnamezip5\_str', |
|  | 'Days\_since\_per\_lastnamedob\_str', |
|  | 'Days\_since\_per\_lastnamehomephone', |
|  | 'Days\_since\_per\_lastnamenameDOB', |
|  | 'Days\_since\_per\_lastnamefulladdress', |
|  | 'Days\_since\_per\_addresszip5\_str', |
|  | 'Days\_since\_per\_addressdob\_str', |
|  | 'Days\_since\_per\_addresshomephone', |
|  | 'Days\_since\_per\_addressnameDOB', |
|  | 'Days\_since\_per\_addressfulladdress', |
|  | 'Days\_since\_per\_zip5\_strdob\_str', |
|  | 'Days\_since\_per\_zip5\_strhomephone', |
|  | 'Days\_since\_per\_zip5\_strnameDOB', |
|  | 'Days\_since\_per\_zip5\_strfulladdress', |
|  | 'Days\_since\_per\_dob\_strhomephone', |
|  | 'Days\_since\_per\_dob\_strnameDOB', |
|  | 'Days\_since\_per\_dob\_strfulladdress', |
|  | 'Days\_since\_per\_homephonenameDOB', |
|  | 'Days\_since\_per\_homephonefulladdress', |
|  | 'Days\_since\_per\_nameDOBfulladdress', |

|  |  |  |
| --- | --- | --- |
| Single (velocity) | Combination (velocity) | Combination name |
| 'datassn0agg', | 'datassnfirstname0agg', | ssn+firstname |
| 'datassn1agg', | 'datassnfirstname1agg', |
| 'datassn3agg', | 'datassnfirstname3agg', |
| 'datassn7agg', | 'datassnfirstname7agg', |
| 'datassn14agg', | 'datassnfirstname14agg', |
| 'datafulladdress0agg', | 'datassnlastname0agg', | Ssn+lastname |
| 'datafulladdress1agg', | 'datassnlastname1agg', |
| 'datafulladdress3agg', | 'datassnlastname3agg', |
| 'datafulladdress7agg', | 'datassnlastname7agg', |
| 'datafulladdress14agg', | 'datassnlastname14agg', |
| 'datanameDOB0agg', | 'datassnaddress0agg', | Ssn+address |
| 'datanameDOB1agg', | 'datassnaddress1agg', |
| 'datanameDOB3agg', | 'datassnaddress3agg', |
| 'datanameDOB7agg', | 'datassnaddress7agg', |
| 'datanameDOB14agg', | 'datassnaddress14agg', |
| 'datahomephone0agg', | 'datassnzip5\_str0agg', | Ssn+zip5\_str |
| 'datahomephone1agg', | 'datassnzip5\_str1agg', |
|  | 'datassnzip5\_str3agg', |
|  | 'datassnzip5\_str7agg', |
|  | 'datassnzip5\_str14agg', |
|  | 'datassndob\_str0agg', | Ssn+dob\_str |
|  | 'datassndob\_str1agg', |
|  | 'datassndob\_str3agg', |
|  | 'datassndob\_str7agg', |
|  | 'datassndob\_str14agg', |
|  | 'datassnhomephone0agg', | Ssn+homephon |
|  | 'datassnhomephone1agg', |
|  | 'datassnhomephone3agg', |
|  | 'datassnhomephone7agg', |
|  | 'datassnhomephone14agg', |
|  | 'datassnnameDOB0agg', | Ssn+nameDOB |
|  | 'datassnnameDOB1agg', |
|  | 'datassnnameDOB3agg', |
|  | 'datassnnameDOB7agg', |
|  | 'datassnnameDOB14agg', |
|  | 'datassnfulladdress0agg', | Ssn+fulladdress |
|  | 'datassnfulladdress1agg', |
|  | 'datassnfulladdress3agg', |
|  | 'datassnfulladdress7agg', |
|  | 'datassnfulladdress14agg', |
|  | 'datafirstnamelastname0agg', | Firstname+lastname |
|  | 'datafirstnamelastname1agg', |
|  | 'datafirstnamelastname3agg', |
|  | 'datafirstnamelastname7agg', |
|  | 'datafirstnamelastname14agg', |
|  | 'datafirstnameaddress0agg', | Firstname+address |
|  | 'datafirstnameaddress1agg', |
|  | 'datafirstnameaddress3agg', |
|  | 'datafirstnameaddress7agg', |
|  | 'datafirstnameaddress14agg', |
|  | 'datafirstnamezip5\_str0agg', | Firstname+zip5\_str |
|  | 'datafirstnamezip5\_str1agg', |
|  | 'datafirstnamezip5\_str3agg', |
|  | 'datafirstnamezip5\_str7agg', |
|  | 'datafirstnamezip5\_str14agg', |
|  | 'datafirstnamedob\_str0agg', | Firstname+dob\_str |
|  | 'datafirstnamedob\_str1agg', |
|  | 'datafirstnamedob\_str3agg', |
|  | 'datafirstnamedob\_str7agg', |
|  | 'datafirstnamedob\_str14agg', |
|  | 'datafirstnamehomephone0agg', | Firstname+homephone |
|  | 'datafirstnamehomephone1agg', |
|  | 'datafirstnamehomephone3agg', |
|  | 'datafirstnamehomephone7agg', |
|  | 'datafirstnamehomephone14agg', |
|  | 'datafirstnamenameDOB0agg', | Firstname+nameDOB |
|  | 'datafirstnamenameDOB1agg', |
|  | 'datafirstnamenameDOB3agg', |
|  | 'datafirstnamenameDOB7agg', |
|  | 'datafirstnamenameDOB14agg', |
|  | 'datafirstnamefulladdress0agg', | Firstname+fulladdress |
|  | 'datafirstnamefulladdress1agg', |
|  | 'datafirstnamefulladdress3agg', |
|  | 'datafirstnamefulladdress7agg', |
|  | 'datafirstnamefulladdress14agg', |
|  | 'datalastnameaddress0agg', | Lastname+address |
|  | 'datalastnameaddress1agg', |
|  | 'datalastnameaddress3agg', |
|  | 'datalastnameaddress7agg', |
|  | 'datalastnameaddress14agg', |
|  | 'datalastnamezip5\_str0agg', | Lastname+zip5\_str |
|  | 'datalastnamezip5\_str1agg', |
|  | 'datalastnamezip5\_str3agg', |
|  | 'datalastnamezip5\_str7agg', |
|  | 'datalastnamezip5\_str14agg', |
|  | 'datalastnamedob\_str0agg', | Lastname+dob\_str |
|  | 'datalastnamedob\_str1agg', |
|  | 'datalastnamedob\_str3agg', |
|  | 'datalastnamedob\_str7agg', |
|  | 'datalastnamedob\_str14agg', |
|  | 'datalastnamehomephone0agg', | Lastname+homephone |
|  | 'datalastnamehomephone1agg', |
|  | 'datalastnamehomephone3agg', |
|  | 'datalastnamehomephone7agg', |
|  | 'datalastnamehomephone14agg', |
|  | 'datalastnamenameDOB0agg', | Lastname+nameDOB |
|  | 'datalastnamenameDOB1agg', |
|  | 'datalastnamenameDOB3agg', |
|  | 'datalastnamenameDOB7agg', |
|  | 'datalastnamenameDOB14agg', |
|  | 'datalastnamefulladdress0agg', | Lastname+fulladdress |
|  | 'datalastnamefulladdress1agg', |
|  | 'datalastnamefulladdress3agg', |
|  | 'datalastnamefulladdress7agg', |
|  | 'datalastnamefulladdress14agg', |
|  | 'dataaddresszip5\_str0agg', | Address+zip5\_str |
|  | 'dataaddresszip5\_str1agg', |
|  | 'dataaddresszip5\_str3agg', |
|  | 'dataaddresszip5\_str7agg', |
|  | 'dataaddresszip5\_str14agg', |
|  | 'dataaddressdob\_str0agg', | Address+dob\_str |
|  | 'dataaddressdob\_str1agg', |
|  | 'dataaddressdob\_str3agg', |
|  | 'dataaddressdob\_str7agg', |
|  | 'dataaddressdob\_str14agg', |
|  | 'dataaddresshomephone0agg', | Address+homephone |
|  | 'dataaddresshomephone1agg', |
|  | 'dataaddresshomephone3agg', |
|  | 'dataaddresshomephone7agg', |
|  | 'dataaddresshomephone14agg', |
|  | 'dataaddressnameDOB0agg', | Address+nameDOB |
|  | 'dataaddressnameDOB1agg', |
|  | 'dataaddressnameDOB3agg', |
|  | 'dataaddressnameDOB7agg', |
|  | 'dataaddressnameDOB14agg', |
|  | 'dataaddressfulladdress0agg', | Address+fulladdress |
|  | 'dataaddressfulladdress1agg', |
|  | 'dataaddressfulladdress3agg', |
|  | 'dataaddressfulladdress7agg', |
|  | 'dataaddressfulladdress14agg', |
|  | 'datazip5\_strdob\_str0agg', | zip5\_str+dob\_str |
|  | 'datazip5\_strdob\_str1agg', |
|  | 'datazip5\_strdob\_str3agg', |
|  | 'datazip5\_strdob\_str7agg', |
|  | 'datazip5\_strdob\_str14agg', |
|  | 'datazip5\_strhomephone0agg', | zip5\_str+homephone |
|  | 'datazip5\_strhomephone1agg', |
|  | 'datazip5\_strhomephone3agg', |
|  | 'datazip5\_strhomephone7agg', |
|  | 'datazip5\_strhomephone14agg', |
|  | 'datazip5\_strnameDOB0agg', | zip5\_str+nameDOB |
|  | 'datazip5\_strnameDOB1agg', |
|  | 'datazip5\_strnameDOB3agg', |
|  | 'datazip5\_strnameDOB7agg', |
|  | 'datazip5\_strnameDOB14agg', |
|  | 'datazip5\_strfulladdress0agg', | zip5\_str+fulladdress |
|  | 'datazip5\_strfulladdress1agg', |
|  | 'datazip5\_strfulladdress3agg', |
|  | 'datazip5\_strfulladdress7agg', |
|  | 'datazip5\_strfulladdress14agg', |
|  | 'datadob\_strhomephone0agg', | dob\_str+homephone |
|  | 'datadob\_strhomephone1agg', |
|  | 'datadob\_strhomephone3agg', |
|  | 'datadob\_strhomephone7agg', |
|  |  |
|  | 'datadob\_strnameDOB0agg', | dob\_strnameDOB |
|  | 'datadob\_strnameDOB1agg', |
|  | 'datadob\_strnameDOB3agg', |
|  | 'datadob\_strnameDOB7agg', |
|  | 'datadob\_strnameDOB14agg', |
|  | 'datadob\_strfulladdress0agg', | dob\_str+fulladdress |
|  | 'datadob\_strfulladdress1agg', |
|  | 'datadob\_strfulladdress3agg', |
|  | 'datadob\_strfulladdress7agg', |
|  | 'datadob\_strfulladdress14agg', |
|  | 'datahomephonenameDOB0agg', | Homephone+nameDOB |
|  | 'datahomephonenameDOB1agg', |
|  | 'datahomephonenameDOB3agg', |
|  | 'datahomephonenameDOB7agg', |
|  | 'datahomephonenameDOB14agg', |
|  | 'datahomephonefulladdress0agg', | Homephone+fulladdress |
|  | 'datahomephonefulladdress1agg', |
|  | 'datahomephonefulladdress3agg', |
|  | 'datahomephonefulladdress7agg', |
|  | 'datahomephonefulladdress14agg', |
|  | 'datanameDOBfulladdress0agg', | nameDOB+fulladdress |
|  | 'datanameDOBfulladdress1agg', |
|  | 'datanameDOBfulladdress3agg', |
|  | 'datanameDOBfulladdress7agg', |
|  | 'datanameDOBfulladdress14agg', |

|  |
| --- |
| Risk table + others （6+11） |
| 'smoothed\_zip3', |
| 'smoothed\_homephone3', |
| 'smoothed\_byear', |
| 'smoothed\_bmonth', |
| 'smoothed\_bday', |
| 'smoothed\_dayofweek |
| 'freq\_zip\_1', |
| 'freq\_zip\_12', |
| 'freq\_zip\_25', |
| 'freq\_zip\_5', |
| 'no\_of\_apps', |
| 'len\_ssn', |
| 'len\_zip', |
| 'mean\_fraud', |
| 'num\_phones', |
| 'num\_zip', |
| 'num\_fraud' |
|  |